ENVIRONMENTAL IMPACT ASSESSMENT STUDY

OF THE PROJECT FOR THE CONSTRUCTION OF WASTE-TO-ENERGY PLANT AT CP NO. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. PRAHOVO AND PHASED CONSTRUCTION OF A LANDFILL FOR NON-HAZARDOUS WASTE WITHIN THE CHEMICAL INDUSTRY COMPLEX "ELIXIR PRAHOVO" ON CP NO. 2300/1, 1491/1 AND 1541/1 C.M. PRAHOVO, NEGOTIN MUNICIPALITY

Project holder:
ELIXIR CRAFT DOO
Hajduk Veljkova 1, 15000 Šabac

Study Processor:
ELIXIR ENGINEERING DOO
Hajduk Veljkova No. 15000 Sabac
License No.: 000221880 2023 14810 010 000 000 001

Belgrade, March 2025

Project holder:	**COMPANY FOR MECHANICAL ELECTRICAL AND CONSTRUCTION WORKS ELIXIR CRAFT DOO ŠABAC** Hajduk Veljkova 1, 15000 Šabac
Facility:	**WASTE-TO-ENERGY PLANT, CP no. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. PRAHOVO** **NON-HAZARDOUS WASTE LANDFILL, CP no. 2300/1, 1491/1 AND 1541/1 C.M. PRAHOVO** **WITHIN THE IHP (eng. ICP) ELIXIR PRAHOVO COMPLEX** Braće Jugovića no.2, 19330 Prahovo
Name and designation of the project part:	**ENVIRONMENTAL IMPACT ASSESSMENT STUDY OF THE PROJECT FOR THE CONSTRUCTION OF WASTE-TO-ENERGY PLANT AT CP NO. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. PRAHOVO AND PHASED CONSTRUCTION OF A NON-HAZARDOUS WASTE LANDFILL WITHIN THE CHEMICAL INDUSTRY COMPLEX "ELIXIR PRAHOVO" ON CP NO. 2300/1, 1491/1 AND 1541/1 C.M. PRAHOVO, NEGOTIN MUNICIPALITY**
Project engineer:	Elixir Engineering DOO Hajduk Veljkova 1, 15000 Šabac License No.: 000221880 2023 14810 010 000 000 001
Responsible person of designer:	Nenad Milutinović
Signature Elixir Engineering DOO Hajduk Veljkova 1, 15000 Šabac, Srbija 10	Responsible person of designer: (place of electronic signature) НЕНАД МИЛУТИНОВ ИЋ 011879603 Auth Digitally signed by НЕНАД МИЛУТИНОВИЋ 011879603 Auth Date: 2025.05.27 10:29:39 +02'00'
Project leader:	Jadranka Radosavljević, M.Sc. in Chem. Eng.
Licence Number:	371 I00567 19
Signed by:	Responsible person: (place of electronic signature) Jadranka Radosavljević 508847 Digitally signed by Jadranka Radosavljević 508847 Date: 2025.05.27 10:38:50 +02'00'
Number of part of the design:	23-WTE-SPUŽS-01
Place and date:	Belgrade, March 2025

ENVIRONMENTAL IMPACT ASSESSMENT STUDY

OF THE PROJECT FOR THE CONSTRUCTION OF WASTE-TO-ENERGY PLANT AT CP NO. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. PRAHOVO AND PHASED CONSTRUCTION OF A NON-HAZARDOUS WASTE LANDFILL WITHIN THE CHEMICAL INDUSTRY COMPLEX "ELIXIR PRAHOVO" ON CP NO. 2300/1, 1491/1 AND 1541/1 C.M. PRAHOVO, NEGOTIN MUNICIPALITY

Consent of the Investor **COMPANY FOR MECHANICAL ELECTRICAL AND CONSTRUCTION WORKS ELIXIR CRAFT DOO ŠABAC** **DIRECTOR OF THE COMPANY FOR THE OPERATION OF THE BRANCH ECO ENERGY**	**Study Processor:** **ELIXIR ENGINEERING DOO** **DIRECTOR**
Dragan Stanojević	Nenad Milutinović

Elixir Craft DOO
Ogranak Eco Energy
Braće Jugovića 2, 19330 Prahovo, Srbija
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ElixirEngineering
Elixir Engineering DOO
Hajduk Veljkova 1, 15000 Šabac, Srbija
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Belgrade, March 2025

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Abbreviations and Definitions

AMSKV	Network of automatic air quality monitoring stations
ACGIH	American Conference of Governmental Industrial Hygienists (scientific association)
AEGL	Acute Exposure Guideline Levels
BAT	Best Available Techniques
BLEVE	Boiling Liquid Expanding Vapour Explosion
CBAM	Carbon Border Adjustment Mechanism
CBD	Convention on Biological Diversity
CCS	Carbon Capture and Storage
CCUS	Carbon Capture and Usage/Storage
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNG	Compressed natural gas
CO2	Carbon dioxide
DGE	Lower explosive limit - LEL
DIPDR	Other changes to the detailed regulation plan
DNEL	Derived No Effect Level
DRBMP	Danube River Basin Management Plan
DRP	Detailed regulation plan
ECWWT	Wastewater treatment plant licensed by Envirochemie
EIA	Environmental Impact Assessment
EMS-98	European macroseismic scale
EU	European Union
EZD	European Green Deal
FBC	Fluidized bed combustion
FGC	Flue gas cleaning
GHG	Greenhouse gas emissions
GWL	Ground water level – Water table
ICPDR	International Commission for the Protection of the Danube River
ICSM	Initial conceptual site model
IDLH	Median concentration that may be life-threatening to humans when exposed for more than 30 minutes (Immediately dangerous to life or health)
0.1 IDLH	Median concentration that may be life-threatening to vulnerable populations, when exposed for more than 30 min
IED	Industrial Emissions Directive
IPPC	Integrated Pollution Prevention and Control
ISWA	International Solid Waste Association
JDS	Joint Danube Survey
LC50	Median lethal inhalation concentrations, in 50% of cases (Lethal Dose 50% (LD50) or Lethal Concentration 50%)
LEL	Lower Explosive limit
LOC	Level of Concern
LV	Limit value
ELV	Emission limit value
MAC	Maximum Allowable Concentracion
MSC	Mercalli-Cancani-Seiberg scale, better known as the Mercali scale
NIOSH	National Institute for Occupational Safety and Health
OPC	Ordinary Portland cement
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated biphenyls, polychlorinated terphenyls (PCTs), monomethyl-tetrachlorodiphenylmethane, monomethyl-dichlorodiphenylmethane, monomethyl-

	dibromodiphenylmethane, or any mixture containing any of these substances in a concentration greater than 0.005 percent by weight; PCB wastes are wastes, including devices, facilities, materials, or liquids containing, consisting of, or contaminated with PCBs
PCDD/F	Polychlorinated dioxins and furans Polychlorinated dibenzo-p-dioxins and -furans)
PEL	Permissible Exposure Limit
POP	Persistent Organic Pollutants
RDF	Fuel derived from waste
REL	Recommended Exposure Limits
RHMSS	Republic Hydrometeorological service of Serbia
RV	Remediation value
RZS	Statistical Office of the Republic of Serbia
S/S	Stabilization/solidification
SCR	Selective catalytic reduction
SNCR	Selective non-catalytic reduction
SRF	Secondary fuel
STEL	Short-term exposure limit
TEQ	Toxic equivalent
TLV	Threshold Limit Values
TOC	Total Organic Carbon
TS	Transformer substation
TWA	Time Weighted Average
UEL	Upper Explosive Limit
WEL	Workplace Exposure Limits
WFD	Water Framework Directive
WtE	Waste to Energy
WtE Plant	Waste to Energy Plant
WWF	World Wide Fund For Nature
WWTP	Wastewater treatment plant

The terms used in this document have the following meanings:

accident means a sudden and uncontrolled event resulting from the release, spillage or dissipation of hazardous substances, the performance of activities in the production, use, processing, storage, disposal or long-term inadequate storage (hereinafter: chemical accident);

accident prevention is a set of measures and procedures at the level of plants, complex and the wider community, aimed at preventing accidents, reducing the likelihood of accidents and minimizing the consequences;
Risk is a certain level of probability that an activity, directly or indirectly, causes a danger to the environment, life and health of people;

best available techniques means the best available techniques in accordance with the law governing integrated prevention and control of environmental pollution;

biodiversity (biological diversity) means the diversity of organisms within a species, between species and between ecosystems and includes the total diversity of genes, species and ecosystems at the local, national, regional and global levels;

commercial waste means waste generated in enterprises, institutions and other institutions that are wholly or partially engaged in trade, services, office work, sports, recreation or entertainment, except household and industrial waste;

complex means a spatial unit under the control of an operator, where hazardous substances are present in one or more installations, including individual or joint infrastructure, or individual or joint activities;

construction and demolition waste is waste generated by construction and other works on the construction and demolition of facilities, adaptations, renovation, reconstruction of residential, industrial and other facilities, maintenance and replacement of infrastructure facilities, as well as excavations for residential, industrial and road infrastructure, as follows:

- non-hazardous construction and demolition waste that does not contain hazardous substances (recyclable, inert, etc.),

- hazardous construction and demolition waste requiring special treatment, which has one or more hazardous characteristics that make it hazardous waste (waste containing asbestos, waste with a high content of heavy metals, etc.) to which special regulations apply;

emission means the discharge and efflux of pollutants in gaseous, liquid and solid form or the emission of energy from sources of pollution into the environment;

environment is a set of natural and created values whose complex interrelations make up the environment, i.e. space and living conditions.
fire is a process of uncontrolled combustion that endangers human life and health, material goods and the environment;

environmental degradation is a process of deterioration of the environment quality that occurs naturally or humanly;

environmental pollution means the introduction of pollutants or energy into the environment, caused by human activity or natural processes that has or may have adverse effects on the quality of the environment and human health;

environmental quality is the state of the environment expressed by physical, chemical, biological, aesthetic and other indicators;

environmental quality requirements are a set of conditions and requirements that must be met at a certain time and in a certain area or in certain environmental media, in accordance with special regulations;

hazardous matter are chemicals and other substances that have harmful and hazardous characteristics;

hazardous substance is a substance defined by the European Union regulation governing the control of major accident hazards involving hazardous substances;

hazardous waste means waste that by its origin, composition or concentration of hazardous substances may cause a risk to the environment and human health and has at least one of the hazardous characteristics determined by special regulations, including the packaging in which the hazardous waste was or is packaged;

incineration is the waste thermal treatment in a stationary or mobile plant with or without the use of energy produced by combustion through oxidation, as well as other waste thermal treatment processes, such as pyrolysis, gasification or plasma treatment, if the substances resulting from the treatment are subsequently incinerated;

industrial waste means waste from any industry or from the location where the industry is located, except tailings and accompanying mineral raw materials from mines and quarries;

inert waste means waste that is not subject to any physical, chemical or biological change, does not dissolve, burn or otherwise physically or chemically react, is not biodegradable or does not adversely affect other substances when contacting them in a way that may lead to an increase in environmental pollution or endanger human health, and the total leaching and content of pollutants in the waste and the ecotoxicity of the leached substances must not be significant, and in particular must not endanger the quality of surface and/or groundwater;

landfill is a site for the final sanitary disposal of waste on the surface or below the surface of the earth including:

- internal disposal sites (landfill where the producer disposes of its own waste at the place of origin),

- permanent sites (more than one year) used for temporary storage of waste, but excluding warehouses where waste is unloaded for preparation for further transport to treatment sites, i.e. reuse or disposal at other locations and storage of waste before treatment, i.e. reuse for a maximum of up to three years or storage of waste before disposal for a maximum of up to one year);

level of pollutant is the concentration of pollutant in the environment, which expresses the quality of the environment in a given time and space;

manufacturer of the product means a legal entity or entrepreneur who, within the scope of its activity, manufactures, produces and sells the product, regardless of the manner of sale, including distance selling or importing the product into the Republic of Serbia and placing the product on the market of the Republic of Serbia;

municipal waste means separately collected household waste, including paper, cardboard, glass, metal, plastic, bio-waste, wood, textiles, packaging, waste electrical and electronic equipment, waste batteries and accumulators, bulky waste and mixed municipal waste and/or separately collected waste from other sources, if that waste is similar in nature and composition to household waste, but does not include waste from production, agriculture, forestry, fisheries and aquaculture, end-of-life vehicles and construction and demolition waste;

non-hazardous waste means waste that does not have the characteristics of hazardous waste;

operator means any legal person or entrepreneur who, in accordance with regulations, operates or controls the plant or is authorized to make economic decisions in the field of technical operation of the plant and in whose name a waste management permit is issued;

packaging waste means any packaging or packaging material that cannot be used for its original purposes, with the exception of residues generated in the production process;

plant is a stationary technical unit one or more activities are performed in which, that are determined by a special regulation and for the operation of which a permit is issued, as well as any other activity in which there is a technical connection with the activities performed at that place and which can produce emissions and pollution;

pollutants are substances whose release into the environment affects or may affect its natural composition, properties and integrity;

prevention includes measures taken before a substance, material or product becomes waste, which reduce the quantities of waste, including reusing the product or extending the life cycle of the product or the adverse effects of the waste produced on the environment and human health or the content of harmful substances in materials and products;

recycling means any operation (R2 to R10 and R12) of reuse whereby waste is reprocessed into a product, material or substance whether or not it is used for its original purpose, including the remanufacturing of organic materials, other than reuse for energy purposes and reprocessing into materials intended to be used as fuel or to cover landfills;

remediation is the process of taking measures to stop pollution and further degradation of the environment to a level that is safe for future use of the site including landscaping, revitalization and reclamation

repair, i.e. remediation is the process of taking measures to stop pollution and further degradation of the environment to a level that is safe for future use of the site including landscaping, revitalization and reclamation

reuse means any operation whereby products or non-waste parts thereof are reused for the same purpose for which they were intended;

risk is a certain level of probability that an activity, directly or indirectly, causes a danger to the environment, life and health of people;

secondary raw material is waste that can be used for recycling to obtain raw material for the production of the same or another product (paper, cardboard, metal, glass, plastic, etc.);

seveso plant, or a plant in which activities are performed in which hazardous substances are present or may be present in equal or greater quantities than prescribed (hereinafter: seveso plant) is a technical unit within a complex where hazardous substances are produced, used, stored or handled. The plant includes all equipment, buildings, pipelines, machines, tools, internal tracks and depots, docks, unloading docks for plants, docks, warehouses or similar structures, on water or land, which are necessary for the operation of the plant;

sludge means treated or untreated residue from a process of wastewater treatment plant;

sludge waste is sludge generated in municipal and industrial wastewater treatment plants and other similar wastewater treatment plants;

solidificate means non-hazardous or non-reactive waste generated as a result of the process of stabilization and solidification of residues from waste thermal treatment and residues from dry and wet flue gas cleaning carried out in a purpose-designed plant within the Waste to Energy Plant;

sources of environmental pollution are location determined and spatially limited point, line and surface sources of pollutants and energy into the environment;

special waste streams are those for the management of which it is necessary to prescribe special measures related to the collection, transport, storage, treatment, i.e. reuse and disposal (spent batteries and accumulators, waste oils, waste tires, waste from electrical and electronic products, waste vehicles, packaging waste, waste fluorescent pipes containing mercury, waste from the production of titanium dioxide, pharmaceutical and medical waste, PCB and PCB waste, asbestos waste, POPs waste, construction and demolition waste, waste sludge, waste mercury and mercury compounds);

stabilization/solidification is a process in which the possibility of emission of hazardous and harmful substances from waste is reduced by applying physical and/or chemical procedures;

vulnerable zone is an area within which hazardous substances released during an accident can be in concentrations defined as concentrations of importance (KOZ);

vulnerable objects are all people, flora, fauna, objects and elements of the environment within the vulnerable zone, which may have consequences due to a chemical accident;

waste means any substance or object that the holder discards, intends or is necessary to discard;

waste characterization is a test procedure that determines the physico-chemical, chemical and biological properties and composition of waste, i.e. determines whether the waste contains or does not contain one or more hazardous characteristics;

waste classification is the process of classifying waste on one or more lists of waste that are determined by a special regulation, and according to its origin, composition and further purpose;

waste disposal means any operation other than the reuse of waste, even when that operation has the secondary consequence of generating substance or energy (D list);

waste management is the implementation of prescribed waste management measures within the framework of collection, transport, storage, treatment, i.e. reuse and disposal of waste, including the supervision of these activities and the care of waste management facilities after closure and activities undertaken by the trader and the intermediary;

waste management activity is the collection, transport, storage, treatment, or reuse or disposal of waste, as well as the import, export and transit of waste;

waste management permit is a decision of the competent authority authorizing a legal entity or entrepreneur to perform waste management activities and determining the conditions for waste management in a way that ensures the lowest risk to human health and the environment;

waste management plant is a stationary or mobile technical unit for the treatment or reuse or disposal of waste, which together with the construction part forms a technological unit;

waste reuse is any operation the main result of which is the use of waste for a useful purpose when the waste replaces other materials that should otherwise be used for that purpose or waste prepared to meet that purpose, in the plant or more broadly in economic activities (operations from the R list of waste);

waste storage is the temporary storage of waste at the location of the producer or owner and/or other waste holder, as well as the activity of the operator in a facility equipped and registered for waste storage;

waste treatment includes reuse or disposal operations, including prior preparation for reuse or disposal;

waste used as a secondary raw material is waste that can be reused for the reuse of products for the same or another purpose, for recycling or waste treatment, in order to obtain raw material for the production of the same or another product (paper and cardboard, metal, glass, plastics, construction and demolition waste, ash and slag from the coal combustion from thermal power plants, gypsum and sulfur from flue gas desulphurisation, etc.).

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1.0. INFORMATION ON THE PROJECT HOLDER AND THE CONTRACTOR

1.1 Project holder data

Name of Enterprise:	COMPANY FOR MECHANICAL, ELECTRICAL AND CONSTRUCTION WORKS ELIXIR CRAFT DOO ŠABAC
Short name	ELIXIR CRAFT DOO
Address:	Hajduk Veljkova 1, 15000 Šabac
Registration No.	21417092
TIN:	111037913
Activity code:	4399 – Other unspecified specific construction works
Responsible person:	Dragan Stanojević, Director of the Eco Energy Branch Company
Phone number:	+381 69 805 3060
e-mail:	office@elixircraft.rs dragan.stanojevic@elixircraft.rs
Contact person:	Jadranka Radosavljević, lead designer in the field of environmental protection
Phone number:	+381 69 8053 061
e-mail:	jadranka.radosavljevic@elixirengineering.rs

Elixir Group is a business system that is continuously developing in the field of chemical industry and agricultural business, through numerous projects dedicated to sustainable development, the application of the circular economy model and the improvement of resource efficiency. For more than three decades, the Elixir Group has been investing in the application of state-of-the-art technologies, innovative and sustainable solutions in all spheres of business. The Elixir Group business system consists of fourteen member companies with over 1,800 employees. All companies of the Elixir Group are administratively and logistically networked and located on the banks of the Danube and Sava rivers, connected thus to the whole world by waterways. The member companies Elixir Zorka and Elixir Prahovo form the production activity of the business system, in a total of 5 factories located at the sites of industrial and chemical complexes in Prahovo and Šabac. The Elixir Group business system follows the path of stable growth and development, diversifying its operations through three divisions:

- Chemical Division
- Industrial Services Division
- Eco Energy Division

Company for Mechanical, Electrical and Construction Works Elixir Craft d.o.o. Šabac, with its registered office at Hajduk Veljkova street No. 1 (hereinafter: Elixir Craft), was established in 2018 with the activity code: 4399 – other construction works not mentioned. Elixir Craft is a subsidiary (member company) of the Elixir Group business system from Šabac, whose parent company is Elixir Group d.o.o. Šabac, as the founder and sole member (100%) in the company Elixir Craft. Elixir Craft is a company responsible for the construction and maintenance of facilities, plants and equipment in accordance with standards, regulations and technical regulations. The Elixir Craft team consists of professional and motivated employees of different profiles who have the state-of-the-art equipment and expertise necessary to provide services in the field of maintenance and construction of industrial facilities and plants of Elixir Group members and other investors in the country and the region. Elixir Craft operates within the Elixir Prahovo and Elixir Zorka complex and is engaged in the construction of the infrastructure of the Prahovo Industrial and Chemical Park, including the construction of the facility for Waste-to-Energy (Waste-to-Energy Plants).

Eko Energy Division is the activity of the Elixir Group Business System, which includes the provision and development of services in the field of waste management for the needs of other divisions and activities of the Business System, as well as other clients on the market. The Eco Energy Division is committed to the decarbonization of heat and electricity sources used in the production processes of the Chemical Division and contributes to the development of the circular economy at the level of the entire Business System. Implementation of the concept of "**Waste-to-Energy**" investment in plants for temporary storage and energy utilization of industrial and non-recyclable waste with the aim of successful synergy with all activities of the business system.

Elixir Craft d.o.o., a branch of Eco Energy - In order to launch and develop a completely new business activity, the company Elixir Craft d.o.o. established a new business unit in 2023 - the Eco Energy branch, which is registered with the Business Registers Agency (activity code: 3822 – treatment and disposal of hazardous waste), with its registered office at Braće Jugovića no.2, in Prahovo, Negotin Municipality.

Eco Energy complex is an integrated technological complex consisting of the Waste Energy Plant and the Non-hazardous Waste Landfill planned to be built in the Energy Ecological Island zone within the chemical industry complex in Prahovo.

The operator of the plants that make up the Eco Energy complex will be the aforementioned Elixir Craft doo, a branch of Eco Energy established and registered in the Business Registers Agency for the purpose of performing this activity (activity code: 3822).

The **Waste-to-Energy Plant** is part of the Eco Energy complex, which consists of several technologically connected facilities at a location that is fenced off and with a controlled entrance/exit. Within the Waste Energy Plant there is a plant for waste thermal treatment and waste-to-energy of non-hazardous and hazardous types of non-recyclable waste, closed warehouses for solid and liquid waste, lines for physical and mechanical pretreatment of waste intended for thermal treatment, a plant for stabilization and solidification of residues from waste thermal treatment and residues from dry and wet flue gas cleaning, as well as other accompanying facilities necessary for the performance of the subject activity.

The Landfill for non-hazardous waste is part of the Eco Energy complex and is located in the immediate vicinity of the site of the Waste to Energy Plant. It is intended for the disposal of solidificates from the Waste to Energy Plant, which can be characterized as non-hazardous or non-reactive waste, in accordance with the regulations defining the types of waste allowed for disposal in landfills for non-hazardous waste.

In accordance with the Decree on Waste Disposal at Landfills ("Official Gazette of the RS", No. 92/2010), Article 13, paragraph 3, item 3, the following may be disposed of at a non-hazardous waste landfill:

> 3) solid, non-reactive hazardous waste (solidified), whose leachate is equivalent to that of the non-hazardous waste referred to in item 2 of this paragraph, and which meets the limit values for parameters applicable to the disposal of hazardous waste at non-hazardous landfills.

The disposal of biodegradable waste is not planned at the non-hazardous waste landfill, nor are any dedicated cells for biodegradable waste foreseen.

Elixir Prahovo - Formerly Prahovo Chemical Industry, was founded in 1960, first as a superphosphate factory, and then various granulants, as part of the technological chain of the Basin-Bor metallurgical complex. From the metallurgical gases of RTB Bor, the obtained sulfuric acid was used in Prahovo to produce phosphoric acid and artificial mineral fertilizers. Elixir Group privatizes ICP Prahovo in August 2012 and changes the name of the company to Elixir Prahovo Industry of chemical products DOO Prahovo (hereinafter: Elixir Prahovo). With the necessary investments in the reconstruction of production and storage capacities, it ensures the launch of the production of phosphoric acid and products based on the phosphoric component.
The chemical industry complex in Prahovo is a spatial unit within the CM Prahovo for which a Detailed

Regulation Plan has been developed.

The Elixir Prahovo complex is part of the chemical industry complex in Prahovo, which is defined in the Detailed Regulation Plan[1] as Zone I - Existing Industrial Complex (within the Technological Unit "A") and Zone II – Phosphogypsum Warehouse (within the Technological Unit "B").

The Energy Ecological Island is part of the chemical industry complex in Prahovo, which is defined in the Detailed Regulation Plan[1] as zone IV – Energy and Ecological Island (within the Technological Unit "C").

The Elixir Group business system has invested EUR 266 million in production capacities and new technologies, environmental protection, renewal and improvement of storage, logistics capacities and industrial infrastructure in the past 10 years.

Sustainable development of Elixir Group is focused on investments in increasing the production capacity of phosphoric acid, higher phases of phosphoric acid processing, quality improvement, product portfolio expansion, development of service, logistics and energy infrastructure, with a synchronized and comprehensive improvement of resource efficiency.

The Elixir Group Sustainable Development Strategy also includes investments in the development of the circular economy, resource efficiency and substitution of fossil fuels by renewable sources, in line with the strategy of business decarbonisation and achieving carbon neutrality by 2030.

[1] "Second Amendment to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo", adopted on 9th Session of the Municipal Assembly of Negotin 17 June 2022, published in the Official Gazette of the Municipality of Negotin no.17 of 17 June 2022

1.2 Contractor data

1.2.1 Decision on the registration of the company "ELIXIR ENGINEERING DOO"

Република Србија
Агенција за привредне регистре

Republic of Serbia
Serbian Business Registers Agency

5000216587048

The Business Entities Register
БД 58416/2023

On 26 June 2023
Belgrade

Registrar of the Business Entities Register ran by the Business Registers Agency, in accordance with Article 15, paragraph 1 of the Law on the Procedure of Registration with the Serbian Business Registers Agency ("Official Gazette of the RS", no. 99/2011, 83/2014, 31/2019, 105/2021), deciding on the registration application for data change at PROCES PROJEKT INŽENJERING DOO, BEOGRAD, registration number: 20222123, submitted by:

Name and surname: Nenad Milutinović

hereby adopts the following

DECISION

ON THE ADOPTION of the registration form, thereby registering the change of data with the Business Entities Register for:

PROCES PROJEKT INŽENJERING DOO, BEOGRAD

Registration number/company code: 20222123

namely, the following changes:

Modification of the business name:
The following is deleted:
PROCES PROJEKT INŽENJERING DOO, BEOGRAD
The following is registered:
ELIXIR ENGINEERING DOO ŠABAC

Modification of the abbreviated business name:
The following is deleted:
PPI DOO BEOGRAD
The following is registered:
ELIXIR ENGINEERING DOO

Change of registered address of the company:
The following is deleted:
Address: PROTE MATEJE 70A, BELGRADE (VRAČAR), VRAČAR, 11000, Serbia
The following is registered:
Address: HAJDUK VELJKOVA 1, ŠABAC, 11500, Serbia

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Change of e-mail address:

The following is deleted:

office@ppibgd.com

The following is registered:

office@elixirengineering.rs

Change of other representatives:

Natural persons:

The following is registered:

- Name and surname: Darko Vuković
  Gender: Male
  UMCN: 2111981772028
  Method of representation: independent

- Name and surname: Zorica Popović
  Gender: Female
  UMCN: 1603971777028
  Method of representation: independent

Rationale

On 26 June, 2023, the applicant submitted the registration application for the change of data, number БД 58416/2023 and enclosed the documentation stated in the confirmation on the receipt of the registration application.

Having reviewed the compliance with requirements for the registration of the change of data prescribed by the provision of Article 14 of the Law on the Procedure of Registration with the Serbian Business Registers Agency, the Registrar established that the requirements for registration have been met, and decided as in the enacting terms of the decision in accordance with the provision of Article 16 of the Law.

The amount of the fee for conducting the registration procedure was determined by the Decision on Fees for Registration and Other Services provided by the Business Registers Agency ("Official Gazette of the RS", no. 131/2022).

INSTRUCTIONS CONCERNING LEGAL REMEDIES:
An appeal may be lodged against this decision within 30 days from the date of publication of the decision on the website of the Business Registers Agency, to the Minister in charge of Business Affairs, and through the Business Registers Agency. An administrative appeal fee in the amount of RSD 490.00 and a decision on appeal in the amount of RSD 570.00 shall be paid into the budget of the Republic of Serbia. An appeal may also be submitted in the form of a transcript of a verbal statement with the Business Registers Agency.

REGISTRAR

Miladin Maglov

Digitally signed by
Miladin Maglov
Certificate Issuer:
Posta CA 1
26.06.2023. 08:52:12

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Република Србија
Агенција за привредне регистре

5000216631130

The Business Entities Register
No. БД 59960/2023
Reference: БД 58416/2023

On 26 June 2023
Belgrade

Registrar of the Business Entities Register ran by the Business Registers Agency, pursuant to Article 4, of the Law on the Procedure of Registration with the Serbian Business Registers Agency ("Official Gazette of the RS", nos. 99/2011, 83/2014, 31/2019 and 105/2021) and Article 144, paragraph 1 of the Law on General Administrative Procedure ("Official Gazette of the RS", nos. 18/2016 and 95/2018 - authentic interpretation) acting ex officio,

hereby adopts the following

DECISION

The error in decision number **БД 58416/2023** of **26 June 2023** is corrected, so instead of:

Registered address of the company:

Address: HAJDUK VELJKOVA 1, ŠABAC, 11500, Serbia

should be stated:

Address: HAJDUK VELJKOVA 1, ŠABAC, 15000, Serbia

Rationale

The Registrar of the Business Entities Register issued a decision no. **БД 58416/2023** of **26 June 2023** registering the data with the business entity registered in the Register as:

ELIXIR ENGINEERING DOO ŠABAC

Registration number/company code: **20222123**,

Page 1 of 2

Acting ex officio, the Registrar, in accordance with the provision of Article 144, paragraph 1 of the Law on General Administrative Procedure determined that an error was made during the adoption of the said Decision, so this Decision corrects the error in Decision БД 58416/2023 of 26 June 2023 and in the Business Entities Register, in the manner specified in the enacting clause.

INSTRUCTIONS CONCERNING LEGAL REMEDIES:

An appeal may be lodged against this decision with the Minister in charge for Business Affairs, within 15 days from the date of delivery of the decision to the party, through the Business Registers Agency directly in writing, orally for the record, or by registered mail, with administrative fee to be paid to the budget of the Republic of Serbia in the amount of RSD 490.00 for a notice of appeal according to Tarrif no. 6. and the fee for the second-instance decision in the amount of RSD 570.00 according to Tariff no. 9. of the Republic Law of state administrative fees ("Official Gazette of the RS", nos. 43/03... 86/19, 90/19 corr., 98/20-al.din.am., 144/20, 62/21-al.din.am. and 138/22).

REGISTRAR

Miladin Maglov

Digitally signed by
Miladin Maglov
Certificate Issuer:
Posta CA 1
26.06.2023. 11:33:41

АПР

1.2.2 License of the company "ELIXIR ENGINEERING DOO"

Republic of Serbia

MINISTRY OF CONSTRUCTION, TRANSPORT AND INFRASTRUCTURE
000221880 2023 14810 010 000 000 001
Date: 28 November 2023
Nemanjina 22-26, 11000 Belgrade

ElixirEngineering
ENG DEL 231208-0004
Datum 08.12.2023.
Elixir Engineering DOO

Ministry of Construction, Transport and Infrastructure, Sector for Construction Affairs, implementation of the unified procedure and legalization, based in Belgrade, Nemanjina 22-26, deciding at the request of the company **ELIXIR ENGINEERING DOO ŠABAC** from Šabac, Hajduk Veljkova street, no. 1, for the issuance of licenses for the preparation of technical documentation for facilities for which the building permit is issued by the ministry responsible for construction, pursuant to Article 7 of the Law on Ministries ("Official Gazette of the RS", nos. 128/2020 and 116/2022), Article 126, Article 126a and Article 150 of the Law on Planning and Construction ("Official Gazette of the Republic of Serbia", nos. 72/2009, 81/2009 - correction, 64/2010 - CC, 24/2011, 121/2012, 42/2013 - CC, 50/2013 - CC, 98/2013 - CC, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law, 9/2020 and 52/2021), Article 136 of the Law on General Administrative Procedure ("Official Gazette of the RS", nos. 18/2016, 95/2018 - authentic interpretation and 2/2023-CC), the Rulebook on the conditions to be met by legal entities and entrepreneurs for the preparation of technical documentation, i.e. construction of facilities, for facilities for which the building permit is issued by the ministry, i.e. the competent authority of the autonomous province ("Official Gazette of the RS", nos. 41/2022 and 77/2022) and the authorization given to Ranko Šekularac, Acting Assistant Minister, by the decision of the Minister of Construction, Transport and Infrastructure, No. 031-01-35/2023-02 of 16 May 2023, adopts the following:

DECISION

1. It is established that the company **ELIXIR ENGINEERING DOO ŠABAC** FROM ŠABAC, Hajduk Veljkova street, no. 1, registration number: 20222123, TIN: 104713960, **MEETS THE REQUIREMENTS** for obtaining licenses for the preparation of technical documentation for facilities for which the building permit is issued by the ministry responsible for construction, as follows:

- **P030G1** - designs of construction structures of oil and gas refining facilities that are built outside the exploitation fields according to the previously obtained consent of the ministry responsible for the exploitation of mineral resources, production of biofuels and bioliquids in plants with a capacity of over 100 t per year, oil and product pipelines, gas pipelines with a nominal overpressure of over 16 bar if it crosses the territory of two or more municipalities, oil storage, liquid petroleum gas and petroleum products with a capacity of over 500 t that are built outside the exploitation fields defined by the law governing mining and geological exploration and main heating pipelines;
- **P031M1** - projects of thermotechnical, thermal energy, process and gas installations of oil and gas refining facilities built outside the exploitation fields according to the previously obtained

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consent of the ministry responsible for the exploitation of mineral resources;

- **P031T1** - designs of technological processes of oil and gas refining facilities that are built outside the exploitation fields upon previously obtained consent of the ministry responsible for the exploitation of mineral resources;
- **P032M1** - designs of thermotechnical, thermal energy, process and gas installations of oil and product pipelines, gas pipelines with a nominal working overpressure of over 16 bar if it crosses the territory of two or more municipalities, oil storage facilities, liquid petroleum gas and petroleum products with a capacity of over 500 t, which are built outside the exploitation fields defined by the law governing mining and geological exploration;
- **P032T1** - designs of technological processes of oil and product pipelines, gas pipelines with a nominal working overpressure of over 16 bar if it crosses the territory of two or more municipalities, oil storage facilities, liquid petroleum gas and petroleum products with a capacity of over 500 t, which are built outside the exploitation fields defined by the law governing mining and geological exploration;
- **P033M1** - designs of thermotechnical, thermal energy, process and gas installations of main heating pipelines;
- **P033T1** - designs of technological processes of main heating pipelines;
- **P040G1** - construction design of basic and processing chemical industry facilities, ferrous and non-ferrous metallurgy, leather and fur processing facilities, rubber processing facilities, pulp and paper production facilities and non-metallic mineral processing facilities that are built outside the exploitation fields defined by the law governing mining and geological exploration, except for facilities for primary processing of ornamental and other stone;
- **P040M3** - designs of means of transportation, warehouses and mechanical structures and technology for basic and processing chemical industry facilities, black and non-ferrous metallurgy, leather and fur processing facilities, rubber processing facilities, pulp and paper production facilities and non-metallic mineral raw material processing facilities built outside the exploitation fields defined by the law governing mining and geological exploration, except for facilities for primary processing of ornamental and other stone;
- **P041T1** - technological process designs for basic and processing chemical industry facilities;
- **P045T1** - technological process designs for pulp and paper production facilities;
- **P046T1** - technological process designs for non-metallic mineral processing facilities that are built outside the exploitation fields defined by the law governing mining and geological exploration, except for facilities for primary processing of ornamental and other stone;
- **P047G1** - designs of construction structures of seveso plants and seveso complexes;
- **P047M3** - designs of means of transportation, warehouses and mechanical structures and technologies for seveso plants and seveso complexes;
- **P047T1** - technological process designs for seveso plants and seveso complexes;
- **P100M1** - designs of thermotechnical, thermal energy, process and gas installations for hazardous waste treatment plants by incineration, thermal and/or physical, physico-chemical, chemical processes, as well as central storage facilities and/or landfills for hazardous waste disposal;
- **P100T1** - technological process designs for hazardous waste treatment plants by incineration, thermal and/or physical, physico-chemical, chemical processes, as well as central storage

facilities and/or landfills for the disposal of hazardous waste and
- **P102T1** - technological process designs for non-hazardous waste treatment plants by incineration or chemical processes, with a capacity of more than 70 t per day.

2. With this Decision, Decision no. 000221880 2023 14810 010 000 000 001 dated 10 October 2023 ceases to be valid.

3. This Decision is valid until 28 November 2025.

RATIONALE

On 9 November 2023, the company **ELIXIR ENGINEERING DOO ŠABAC** from Šabac, Hajduk Veljkova street, no. 1, registration number: 20222123, TIN: 104713960, submitted a request to this Ministry, by request number: 000221880 2023 14810 010 000 001, for the issuance of licenses for the preparation of technical documentation for facilities for which the building permit is issued by the ministry responsible for construction.

In addition to the application for licenses, all necessary documentation prescribed by Article 126 Of the Law on Planning and Construction (hereinafter: the Law) and Article 5 of the Rulebook on the conditions to be met by legal entities and entrepreneurs for the performance of activities related to the preparation of technical documentation, i.e. construction of facilities, for facilities for which the building permit is issued by the ministry, i.e. the competent authority of the autonomous province (hereinafter: the Rulebook).

Article 126, paragraph 1 of the Law stipulates that the technical documentation for the construction of facilities, i.e. execution of works, may be prepared by a legal entity or entrepreneur, established in accordance with the law, that: 1) has employees, i.e. employed licensed engineers, i.e. licensed architects registered in accordance with this Law and regulations adopted on the basis of this Law in the register of licensed engineers, architects and spatial planners with appropriate professional results, and 2) in accordance with the conditions prescribed by this Law and regulations adopted on the basis of this Law, is registered in the register for the preparation of technical documentation kept by the ministry responsible for planning and construction in accordance with this Law. Paragraph 2 of this Article stipulates that expert results, within the meaning of paragraph 1, item 1 of this Article, shall be held by the person who prepared or participated in the preparation of the appropriate type of technical documentation, or in the control of that type of technical documentation in accordance with the regulation adopted on the basis of this Law; paragraph 3 of this Article stipulates that the minister responsible for construction affairs shall prescribe in more detail the conditions to be met by the legal entities and entrepreneurs referred to in paragraph 1 of this Article; paragraph 4 of this Article stipulates that the minister responsible for construction affairs establishes a commission for the determination of compliance with conditions for performing the activities of drafting technical documentation; paragraph 5 of this Article states that, on the proposal of the commission referred to in paragraph 4 of this Article, the minister responsible for construction affairs shall issue a decision on the compliance with conditions for performing the activities of drafting technical documentation and registration referred to in paragraph 1 of this Article; paragraph 6 of this Article stipulates that the decision referred to in paragraph 5 of this Article shall be final on the date of delivery of the decision and shall be adopted with a validity period of two years, while paragraph 7 of this Article stipulates that the minister responsible for construction affairs will issue a decision revoking the compliance decision for the preparation of technical documentation, if it is determined that the legal entity or entrepreneur does not meet the conditions referred to in paragraph 1 of this Article, as well as when it is determined that the decision was issued on the basis of incorrect or untrue data.

Article 126a, paragraph 1 of the Law stipulates that a legal entity or entrepreneur that meets the requirements referred to in Article 126, paragraph 1 and Article 150, paragraph 1 of this Law is obliged to notify in writing the ministry responsible for construction affairs without delay of any change in the conditions set out in the decision of the minister responsible for construction affairs and submit a request for issuance of a new decision within 30 days and submit evidence of compliance with the conditions required for registering in the register for the preparation of the appropriate type of technical documentation, i.e. for the construction of facilities or execution of works.

By the Decision of the Ministry of Construction, Transport and Infrastructure, number: 119-01-01020/2023-09 of 11 July 2023 on the establishment of the Commission for determining compliance with conditions for the preparation of technical documentation and construction of facilities referred to in Article 133, paragraph 2 of the Law on Planning and Construction, adopted in accordance with Article 126, paragraph 4 and Article 150, paragraph 4. of the Law, a Commission was established to determine compliance with the conditions for the preparation of technical documentation and the construction of facilities referred to in Article 133, paragraph 2 of the Law on Planning and Construction (hereinafter: the Commission).

Article 3 of the Rulebook stipulates that, in addition to the conditions prescribed by the Law, the tasks of preparing technical documentation for the construction of facilities for which the building permit is issued by the Ministry of Construction, Transport and Infrastructure, i.e. the competent authority of the Autonomous Province, are performed by legal entities and entrepreneurs who have at least two full-time employees, i.e. employed persons, who have the appropriate professional results (references) and who have obtained the appropriate licenses from Appendix 1 - Activities of preparing technical documentation for facilities for which the building permit is issued by the Ministry of Construction, Transport and Infrastructure, i.e. the competent authority of the Autonomous Province. The professional results referred to in paragraph 1 of this Article shall be held by licensed persons who have prepared or participated in the preparation of the appropriate type of technical documentation at least twice in the capacity of the responsible designer, or in the technical control of that type of technical documentation, or if one person has prepared or participated in the preparation of the appropriate type of technical documentation at least three times, and the other at least once in the capacity of the responsible designer, respectively in the technical control of that type of technical documentation.

Article 5 of the Rulebook stipulates that a legal entity or entrepreneur submits a request for determining compliance with the requirements for the preparation of technical documentation for facilities for which the building permit is issued by the Ministry or the competent authority of the Autonomous Province, which contains: 1) basic information on the legal entity or entrepreneur signed by the authorized person: (1) name of the legal entity or entrepreneur, (2) year of establishment, (3) address of the registered office - place, street, number, postal code, (4) registration number, (5) tax identification number, (6) activity code, (7) number of employees, (8) name and surname of the director, authorized person of the legal entity or entrepreneurs, (9) telephone/fax/e-mail address, (10) contact person; 2) list of employees or employed licensed persons (licensed engineers, licensed architects), who have the appropriate license for the preparation of technical documentation, containing the following information: (1) name and surname, (2) unique master citizen number, (3) title, (4) place and year of graduation, (5) type of license (name of license), (6) number and date of issuance of the license; 3) copies of licenses for persons referred to in item 2) of this paragraph; 4) proof of employment or engagement from the Central Register of Compulsory Social Insurance for the persons referred to in item 2) of this paragraph; 5) data on professional results for the persons referred to in item 2) of this paragraph; 6) data on professional results for a legal entity or entrepreneur (facilities they have built or participated in their construction); 7) a statement by which the applicant referred to in paragraph 1 of this Article explicitly declares whether he will obtain data on the facts on which the official records are kept, as well as 8) proof of fees paid.

At the session of the Commission held on 28 November 2023, it was determined that the applicant meets the conditions for obtaining the aforementioned licenses referred to in paragraph 1 of the enacting clause of the Decision, in terms of the provisions of Article 126 of the Law and Article 3 of the Rulebook.

By inspecting the submitted application and the enclosed documentation, the Commission determined that the applicant had enclosed the following:

- basic information about the legal entity;
- list of employees with the license of the responsible designer for the license required;
- copies of excerpts and decisions on establishment from the Business Registers Agency;
- copies of the licenses of the responsible designers, certified by a personal seal;
- copies of applications for employment for persons with a license of the responsible designer for a full-time license and a certificate that there are registered applications for compulsory social insurance from the Central Register of Compulsory Social Insurance;
- proof of paid fees;
- references of at least two persons for the license requested - certified statements, made by a notary public, under full material and criminal responsibility that these persons developed or participated in the development as responsible designers, i.e. that they performed technical control of the main designs, building permit designs referred to in Article 133, paragraph 2 of the Law on Planning and Construction (hereinafter: the Law), with the specified type and purpose of the facility, type of project developed and date of development, i.e. performance of technical control of the project, referred to in Article 133, paragraph 2 of the Law and copies of the decision on designating employees as the responsible designer or technical control contractor,

stating that the company **ELIXIR ENGINEERING DOO ŠABAC** from Šabac, Hajduk Veljkova street, no. 1, registration number: 20222123, TIN: 104713960, had enclosed the necessary documentation, that the conditions for obtaining the following licenses have been met, for which it also proposed the adoption of a decision:

- **P030G1** - designs of construction structures of oil and gas refining facilities that are built outside the exploitation fields according to the previously obtained consent of the ministry responsible for the exploitation of mineral resources, production of biofuels and bioliquids in plants with a capacity of over 100 t per year, oil and product pipelines, gas pipelines with a nominal overpressure of over 16 bar if it crosses the territory of two or more municipalities, oil storage, liquid petroleum gas and petroleum products with a capacity of over 500 t that are built outside the exploitation fields defined by the law governing mining and geological exploration and main heating pipelines;
- **P031M1** - designs of thermotechnical, thermal energy, process and gas installations of oil and gas refining facilities that are built outside the exploitation fields with the previously obtained consent of the ministry responsible for the exploitation of mineral resources on the basis of three references of Milan Paunović 330 4661 03, four references of Srđan Matijević 330 G492 08 and three references of Danijela Janković 330 J960 11;
- **P031T1** - designs of technological processes of oil and gas refining facilities built outside the exploitation fields upon previously obtained consent of the ministry responsible for the exploitation of mineral resources on the basis of three references of Ljiljana Karanfilov 371 5710 03, two references of Branislav Srndović 371 D066 06, four references of Danijela Slavnić 371 И00763 19 and two references of Jadranka Radosavljević 371 И00567 19;

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- **P032M1** - designs of thermotechnical, thermal energy, process and gas installations of oil and product pipelines, gas pipelines with a nominal working overpressure of over 16 bar if it crosses the territory of two or more municipalities, oil storage facilities, liquefied petroleum gas and petroleum products with a capacity of over 500 t, which are built outside the exploitation fields defined by the law governing mining and geological exploration on the basis of three references of Milan Paunović 330 4661 03, four references of Srđan Matijević 330 G492 08 and four references of Danijela Janković 330 J960 11;
- **P032T1** - designs of technological processes of oil and product pipelines, gas pipelines with a nominal working overpressure of over 16 bar if it crosses the territory of two or more municipalities, oil storage facilities, liquefied petroleum gas and petroleum products with a capacity of over 500 t that are built outside the exploitation fields defined by the law governing mining and geological exploration on the basis of three references of Ljiljana Karanfilov 371 5710 03, two references of Branislav Srndović 371 D066 06, four references of Danijela Slavnić 371 И00763 19 and four references of Jadranka Radosavljević 371 И00567 19;
- **P033M1** - designs of thermotechnical, thermal energy, process and gas installations of main heating pipelines based on three references of Milan Paunović 330 4661 03 and three references of Jovan Stefanović 330 I797 10;
- **P033T1** - designs of technological processes of main heating pipelines based on three references of Ljiljana Karanfilov 371 5710 03 and two references of Branislav Srndović 371 D066 06;
- **P040G1** - designs of construction structures of basic and processing chemical industry facilities, ferrous and non-ferrous metallurgy, leather and fur processing facilities, rubber processing facilities, pulp and paper production facilities and non-metallic mineral processing facilities that are built outside the exploitation fields defined by the law governing mining and geological exploration, except facilities for primary processing of ornamental and other stone based on one reference of Nebojša Spasojević 310 0255 03 and three references of Dragomir Gojgić 310 4119 03;
- **P040M3** - designs of means of transportation, warehouses and mechanical structures and technology for basic and processing chemical industry facilities, black and non-ferrous metallurgy, leather and fur processing facilities, rubber processing facilities, pulp and paper production facilities and non-metallic mineral raw material processing facilities built outside the exploitation fields defined by the law governing mining and geological exploration, except for primary processing facilities for ornamental and other stone based on seven references of Milan Paunović 333 I430 10, three references of Srđan Matijević 333 I431 10 and three references of Danijela Janković 330 J960 11;
- **P041T1** - technological process designs for base and chemical processing facilities based on two references of Ljiljana Karanfilov 371 5710 03, three references of Branislav Srndović 371 D066 06, four references of Danijela Slavnić 371 И00763 19 and four references of Jadranka Radosavljević 371 И00567 19;
- **P045T1** - technological process designs for pulp and paper production facilities based on two references of Ljiljana Karanfilov 371 5710 03 and three references of Branislav Srndović 371 D066 06;
- **P046T1** - technological process designs for non-metallic mineral processing facilities built outside the exploitation fields defined by the law governing mining and geological exploration, except for facilities for primary processing of ornamental and other stone, based on two references by Ljiljana Karanfilov 371 5710 03 and three references by Branislav Srndović 371 D066 06;

- **P047G1** - designs of construction structures of seveso plants and seveso complexes based on five references of Nebojša Spasojević 310 0255 03 and five references of Dragomir Gojgić 310 4119 03;
- **P047M3** - designs of means of transportation, warehouses and mechanical structures and technology for seveso plants and seveso complexes based on three references of Milan Paunović 333 I430 10 and two references of Danijela Janković 330 J960 11;
- **P047T1** - designs of technological processes for seveso plants and seveso complexes based on four references of Danijela Slavnić 371 И00763 19 and four references of Ljiljana Karanfilov 371 5710 03;
- **P100M1** - designs of thermotechnical, thermal energy, process and gas installations for hazardous waste treatment plants by incineration, thermal and/or physical, physico-chemical, chemical processes, as well as central storage facilities and/or landfills for hazardous waste disposal based on three references of Danijela Janković 330 J960 11, four references of Milan Paunović 330 4661 03 and four references of Srđan Matijević 330 G492 08;
- **P100T1** - technological process designs for hazardous waste treatment plants by incineration, thermal and/or physical, physico-chemical, chemical processes, as well as central storage facilities and/or landfills for hazardous waste disposal based on two references of Ljiljana Karanfilov 371 5710 03, three references of Branislav Srndović 371 D066 06, three references of Danijela Slavnić 371 И00763 19 and two references of Jadranka Radosavljević 371 И00567 19 ;
- **P102T1** - technological process designs for non-hazardous waste treatment plants, by incineration or chemical processes, with a capacity of more than 70 t per day based on four references of Ljiljana Karanfilov 371 5710 03 and two references of Danijela Slavnić 371 И00763 19.

Based on all of the above, on the proposal of the Commission and Article 136 of the Law on General Administrative Procedure, it was decided as indicated in enacting clause of the decision.

The fee for this decision was charged in the amount of 29,350.00 (twenty-nine thousand three hundred and fifty).

Decided by the Ministry of Construction, Transport and Infrastructure of the Republic of Serbia, Sector for Construction Affairs, Implementation of the Unified Procedure and Legalization, number: 000221880 2023 14810 010 000 000 001 on 28 November 2023.

Instruction on legal remedy: This decision is final in the administrative procedure and no appeal can be filed against it, but an administrative dispute can be initiated by a lawsuit before the Administrative Court of Serbia within 30 days from the date of delivery.

ACTING ASSISTANT MINISTER

Ranko Šekularac

В. Д. ПОМОЋНИК МИНИСТРА

Ранко Шекуларац

To be delivered to:
- Applicant;
- the competent inspection;
- the archives.

(original seal and signature)

1.3 Decision on the formation of a multidisciplinary team

Number:	R-72/23
Date:	08/08/2023
Location:	Belgrade

Law on Environmental Protection (“Official Gazette of the RS“, nos. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - CC, 14/2016, 76/2018 and 95/2018 - other law and 94/2024 - other law), the Law on Environmental Impact Assessment ("Official Gazette of the RS", nos.135/2004 and 36/2009) and the Law on Planning and Construction ("Official Gazette of the RS" nos. 72/2009, 81/2009 - correction, 64/2010 - CC, 24/2011, 121/2012, 42/13 - CC, 50/2013 - CC, 98/2013 - CC, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law, 9/2020, 52/2021 and 62/2023) and
normative acts of Elixir Engineering, in accordance with the requirements of SRPS ISO 9001:2015, SRPS ISO 14001:2015, SRPS ISO 45001: 2018, I hereby adopt the following:

DECISION
ON THE FORMATION OF A MULTIDISCIPLINARY TEAM FOR DEVELOPMENT OF

ENVIRONMENTAL IMPACT ASSESSMENT STUDY OF THE PROJECT FOR THE WASTE-TO-ENERGY PLANT CONSTRUCTION AT CP NO. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. PRAHOVO AND PHASE CONSTRUCTION OF LANDFILL FOR NON-HAZARDOUS WASTE WITHIN CHEMICAL INDUSTRY COMPLEX „ELIXIR PRAHOVO“ ON CP NO.2300/1, 1491/1 AND 1541/1 C.M. PRAHOVO

PROJECT HOLDER: ELIXIR CRAFT DOO

I DETERMINE THAT: Study on environmental impact assessment of the project for the construction of Waste-to-Energy plant at CP NO. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. Prahovo and phase construction of Landfill for non-hazardous waste within the Chemical industry complex „Elixir Prahovo“ at CP no. 2300/1, 1491/1 and 1541/1 C.M. Prahovo, the Municipality of Negotin - shall develop a multidisciplinary team consisting of the following:

Elixir Engeenering doo:
- Jadranka Radosavljević, M.Sc. in Chem. Eng., Project Manager;
- Višnja Stojanović, M.Sc. in Chem. Eng., team member.
- Zoran Luković, M.Sc. in Chem. Eng., team member,
- Miloš Gligorijević, M.Sc. in Mechanical Engineering, team member;
- Branislav Pajić, M.Sc. in Civ. Eng., team member;
- Lazar Biorac, M.Sc. in Arch., team member;
- Aleksandra Derajić, M.Sc. in Chem. Eng., Associate;
- Prof. Igor Jemcov, PhD, M.Sc. in Hydrogeology, Associate;
- Marina Ćuk Đurović, PhD, M.Sc. in Hydrogeology, Associate.
- Hristina Čarapina, M.Sc. in Chem. Eng., Associate

<u>Associates in the design of the subject study:</u>

Faculty of Mechanical Engineering, University of Belgrade:
- Dušan Todorović, PhD, M.Sc. in Mech. Eng., Acting Prof., Associate;
- Prof. Aleksandar Jovović, PhD, M.Sc. in Mech. Eng., Associate;
- Prof. Dejan Radić, PhD, M.Sc. in Mech. Eng., Associate;
- Marko Obradović, PhD, M.Sc. in Mech. Eng., Acting Prof., Associate;
- Nikola Karličić, PhD, M.Sc. in Mech. Eng., Acting Prof., Associate.

Institute for Biological Research "Siniša Stanković":

- Dr Snežana Jarić, Senior Research Fellow, IBISS, Associate
- Prof. Dr Predrag Jakšić, Faculty of Science, Associate
- Miloš Jović, Senior Curator – Entomologist, Museum of Natural History, Associate
- Dr Vesna Perić-Mataruga, Senior Research Fellow, IBISS,

Associate

- Dr Dajana Todorović, Senior Research Associate, IBISS,
Associate
- Dr Božica Vasiljević, Research Associate, IBISS, Associate
- Dr Momir Paunović, Senior Research Fellow, IBISS, Associate
- Dr Bojana Tubić, Research Associate, IBISS, Associate
- Dr Ana Atanacković, Research Associate, IBISS, Associate
- Dr Jelena Tomović, Research Associate, IBISS, Associate
- Dr Katarina Zorić, Research Associate, IBISS, Associate
- Dr Nataša Popović, Senior Research Associate, IBISS, Associate
- Dr Jelena Đuknić, Research Associate, IBISS, Associate
- Dr Stefan Anđus, Research Associate, IBISS, Associate
- Dr Nikola Marinković, Research Associate, IBISS, Associate
- Dr Maja Raković, Senior Research Associate, IBISS, Associate
- Dr Ana Marić, Assistant Professor, Faculty of Forestry, Associate
- Dr Vesna Đikanović, Senior Research Associate, IBISS,
Associate
- Dr Jelena Čanak Atlagić, Research Associate, IBISS, Associate
- Dr Katarina Jovičić, Research Associate, IBISS, Associate
- Dr Jelena Stanković, Research Associate, IBISS, Associate
- Dr Stoimir Kolarević, Senior Research Associate, IBISS,
Associate
- Dr Margareta Kračun-Kolarević, Research Associate, IBISS,
Associate
- Dr Tanja Vukov, Senior Research Fellow, IBISS, Associate
- Dr Irena Hribšek, Research Associate, IBISS, Associate
- Dr Nada Ćosić, Research Associate, IBISS, Associate
- Dr Ivana Budinski, Senior Research Associate, IBISS, Associate

The appointees are required to, during the preparation of the Environmental Impact Assessment Study for the construction of a Waste-to-Energy plant at CP no. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. Prahovo and phased construction of the Landfill for non-hazardous waste within the Chemical industry complex "Elixir Prahovo" at CP no. 2300/1, 1491/1 and 1541/1 C.M. Prahovo, the municipality of Negotin adhere to technical regulations, norms and standards, according to the Law on Environmental Protection ("Official Gazette of the RS", no. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law). law, 43/2011 - CC, 14/2016, 76/2018 and 95/2018 - other laws and 94/2024 - other law), the Law on Environmental Impact Assessment ("Official Gazette of the RS", no. 135/2004 and 36/2009) , the Rulebook on the content of the environmental impact assessment study ("Official Gazette of the RS", No. 69/2005) and the Decision on determining the scope and content of the environmental impact assessment study, no. 000886163 2024 dated 06/17/2024. issued by the Ministry of Environmental Protection.

ElixirEngineering
Elixir Engineering DOO
Hajduk Veljkova 1, 15000 Šabac, Srbija
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ELIXIR ENGINEERING DOO:
DIRECTOR

/Nenad Milutinović, M.Sc. in Civ. Eng./

1.4 Evidence of the qualification of person for the study preparation

Number: 02-12/2024-13216
Belgrade, 07.06.2024

Pursuant to Article 14 of the Statute of the Serbian Chamber of Engineers ("OG of the RS", no. 36/19), and at the personal request of a Chamber member, the Serbian Chamber of Engineers issues

CERTIFICATE

Confirming that Jadranka M. Radosavljević, M.Sc. in Chem. Eng.
license number

371И 00567 19

Responsible designer of technological processes

on the date of issuance of this certificate, a member of the Serbian Chamber of Engineers, that she has settled the obligation to pay the Chamber's membership fee for the current year, i.e. until 24.05.2025, and that she has not been imposed a measure before the Court of Honour of the Serbian Chamber of Engineers.

Chairman of the Board of
The Serbian Chamber of Engineers,

Mihajlo Mišić, M.Sc. in Civ. Eng.

М.П.

Председник Управног одбора
Инжењерске коморе Србије

Михајло Мишић, дипл. грађ. инж.

(original seal and signature)

Republic of Serbia
Ministry of Interior
Emergency Sector 09 No. 152-1- 34 /20
Belgrade, 31 Omladinskih brigada Street

Pursuant to Article 21 oOf the Rulebook on special training and taking the professional exam in the field of fire protection ("Official Gazette of the RS", nos. 92/10, 11/2011, 16/18, 25/18-correction), the Ministry of Interior of the Republic of Serbia issues:

CERTIFICATE
ON PASSING THE PROFESSIONAL EXAM IN THE FIELD OF FIRE PROTECTION

RADOSAVLJEVIĆ Miroslav JADRANKA
(surname, name of one of the parents, first name)

0607981725028
(UMCN)

born on **06.07.1981** in **Kragujevac**, on **28.01.2020**, PASSED a professional exam for workers working in fire protection under the professional exam program for workers with higher education before the Commission for conducting the Professional Exam for persons working in Fire Protection.

Date of issue of the certificate 05.02.2020.

ASSISTANT MINISTER
HEAD OF THE SECTOR
Police General
Predrag Marić

ПОМОЋНИК МИНИСТРА
НАЧЕЛНИК СЕКТОРА
генерал полиције
Предраг Марић

(original seal and signature)

Form 6

Republic of Serbia
MINISTRY OF THE INTERIOR

LICENSE

for the design and execution of special fire protection systems and measures
(license type)
Master of Science in Chemical Engineering
(specificity of the profession)

1. Preparation of analyses on danger zones and determination of these zones in places that are endangered by the formation of explosive mixtures of flammable gases, vapours of flammable liquids and explosive dusts and explosive substances

(profession-s)

Issued pursuant to Articles 32 and 38 of the Law on Fire Protection and Article 13 of the Law on conducting the Professional Examination and Conditions for obtaining a license and Authorization for the preparation of the Main Fire Protection Design and Special Fire Protection Systems

JADRANKA (MIROSLAV) RADOSAVLJEVIĆ
(first name, name of one parent, surname)

06.07.1981 Kragujevac
(date and place of birth of the candidate)

License number
07-152-7342/23

In Belgrade 25.04.2024
(date of license issuing)

ПРЕДСЕДНИК КОМИСИЈЕ	М.П.	МИНИСТАР
ЛУКА ЧАУШИЋ		БРАТИСЛАВ ГАШИЋ
PRESIDENT OF COMISSION	(original seal and signatures)	MINISTER
LUKA ČAUŠIĆ		*BRATISLAV GAŠIĆ*

EKOSAN
LEARNING CENTER

CERTIFICATE
OF PASSED EXAM FOR

CHEMICALS ADVISOR

JADRANKA Miroslav RADOSAVLJEVIĆ

graduated from **the Faculty of Technology and Metallurgy, University of Belgrade**
born in Kragujevac, UMCN 0607981725028

COMPLETED the training and PASSED the exam for the chemical advisor on 28.06.2022 in accordance with the Rulebook on the chemical advisor and the conditions to be met by the legal entity or entrepreneur who performs the training and verification of the knowledge of the chemical advisor.

The certificate is issued on the basis of Article 36 of the Law on Chemicals ("Official Gazette of the RS", nos. 36/09, 88/10, 92/11, 23/12 and 25/15), Article 15 of the Rulebook on the Chemical Advisor and the conditions that must be met by a legal entity or entrepreneur who performs training and knowledge testing of chemical advisors ("Official Gazette of the RS", nos. 13/11, 28/11 and 47/12) and Approval of the Ministry of Environmental Protection for conducting training and knowledge testing for chemical advisor no. 153-01 00100/2020-03.

Date of issue of the certificate 04.07.2022
This certificate is valid for six years.

Number:
268/2022
In Belgrade, 04.07.2022

Chairman of the Examination Committee

EKOSAN Beograd

(original seal and signature)

Law enforcement in the field of industrial pollution control, prevention of chemical accidents and implementation of the EMAS system

Technical assistance "Law enforcement in the field of industrial pollution control, prevention of chemical accidents and establishing the EMAS system EuropeAid/131555/C/SER/RS"

Certificate of participation

is issued to

JADRANKA RADOSAVLJEVIĆ

For the participation to

Workshop "Seveso principles and obligations for the involved operators"

The Team Leader of the project

BEOGRAD, 10.12.2013.

Place and date

EU FUNDED PROJECT

This project is funded by European Union

human dynamics

Project implemented by the Consortium led by Hulla&Co Human Dynamics KG

Универзитет у Београду
Фармацеутски факултет
Србија

University of Belgrade
Faculty of Pharmacy
Serbia

CERTIFICATE

ON PASSING THE
EXAMINATION FOR
CHEMICALS ADVISOR

Višnja () Stojanović
....
(First Name, name of one parent and surname of the candidate)

graduated from the Faculty of Technology and Metallurgy of the University of Belgrade
....
(Name of Faculty)

born in Kruševac, UMCN 2912980786028.

On 05.11.2018, he/she PASSED the exam for a chemical advisor in accordance with the Rulebook on the chemical advisor and the conditions to be met by the legal entity or entrepreneur performing the training and examination of the knowledge of the chemical advisor.

The certificate was issued on 26.11.2018 and is valid from 5.11.2018 to 4.11.2024.

The certificate is issued pursuant to Article 36 of the Law on Chemicals ("Official Gazette of the RS", nos. 36/09, 88/10, 92/11, 93/12 and 95/15), Article 15 of the Rulebook on the Chemical Advisor and the conditions that must be met by a legal entity or entrepreneur who performs training and knowledge testing of chemical advisors ("Official Gazette of the RS", nos. 13/11, 28/11 and 47/12) and Approval of the Ministry of Agriculture and Environmental Protection for training and knowledge assessment for chemical advisor no. 153-01- 00022/2018-03.

Number: 1/18-0
In Belgrade, 26.11.2018

Chairman of the Examination Committee
Проф. др Биљана Антонијевић
Prof. Biljana Antonijević, PhD

(M.П.)

Dean
Проф. др Слађана Шобајић
Prof. Slađana Šobajić, PhD

(orginal seal and signatures)

11221 БЕОГРАД
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П.Ф. 146
СРБИЈА

phone: +381 11 39 51 380 fax: +381 11 39 72 840
DEKAN/DEAN: (+381 11) 24 73 224
e-mail: info@pharmacy.bg.ac.rs
web site: www.pharmacy.bg.ac.rs

11221 BELGRADE
VOJVODE STEPE 450
P.O. Box 146
SERBIA

Матични број факултета: 7001975
ПИБ: 101746950
Жиро-рачун: 840-1127666-05

Law enforcement in the field of industrial pollution control, prevention of chemical accidents and implementation of the EMAS system

Technical assistance "Law enforcement in the field of industrial pollution control, prevention of chemical accidents and establishing the EMAS system
EuropeAid/131555/C/SER/RS"

Certificate of participation

is issued to

VIŠNJA STOJANOVIĆ

For the participation to

Workshop "Seveso principles and obligations for the involved operators"

The Team Leader of the project

BEOGRAD, 10.12.2013.
Place and date

EU FUNDED PROJECT

This project is funded by European Union

human dynamics
Project implemented by the Consortium led by Hulla&Co Human Dynamics KG

SOCIALIST FEDERAL REPUBLIC OF YUGOSLAVIA
SOCIALIST REPUBLIC OF SERBIA

UNIVERSITY OF BELGRADE

DIPLOMA

ON HIGH SCHOOL EDUCATION AT
THE FACULTY OF TECHNOLOGY AND METALLURGY

THE RECTOR OF THE UNIVERSITY OF BELGRADE AND THE DEAN OF THE FACULTY OF TECHNOLOGY AND METALLURGY CONFIRM BY THEIR SIGNATURES AND STAMP OF THE UNIVERSITY THAT

LUKOVIĆ T. ZORAN

BORN ON 06.01.1956 IN VITOŠ, ENROLLED 1974/75 SCHOOL YEARS, ON 13.11.1979 FINISHED WITH SUCCESS (MEDIUM GRADE DURING STUDIES 8.39/ EIGHT 39/100/, AT THE GRADUATE EXAM 10 – TEN) PASSING THE EXAM, PRESCRIBED TO ACQUIRE THE RIGHT TO A DIPLOMA IN HIGHER EDUCATION
(DEPARTMENT: CHEMICAL – ENGINEERING
GROUP: -)

AT THE FACULTY OF TECHNOLOGY AND METALLURGY.
ON THIS BASIS, THIS DIPLOMA IS ISSUED TO HIM/HER, WHEREBY HE/SHE ACQUIRES A UNIVERSITY DEGREE AND THE PROFESSIONAL TITLE OF A BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING, AS WELL AS THE RIGHTS THAT HE/SHE IS ENTITLED TO BY LAW.

IN BELGRADE, 13.11.1979. no. 6/194

Dean

Rector

(original signatures)

SOCIALIST FEDERAL REPUBLIC OF YUGOSLAVIA
SOCIALIST REPUBLIC OF SERBIA

UNIVERSITY OF BELGRADE

DIPLOMA

ON COMPLETED POSTGRADUATE STUDIES FOR THE MAGISTERIUM
ON THE FACULTY OF TECHNOLOGY AND METALLURGY

THE RECTOR OF THE UNIVERSITY OF BELGRADE AND THE DEAN OF THE FACULTY OF TECHNOLOGY AND METALLURGY CONFIRM BY THEIR SIGNATURES AND STAMP OF THE UNIVERSITY THAT

LUKOVIĆ T. ZORAN

BORN ON 06.01.1956 IN VITOŠ, ENROLLED 1982/83 SCHOOL YEARS FOR POSTGRADUATE STUDIES FOR THE MAGISTERIUM AND ON 26.XII 1986. PASSED ALL PRESCRIBED EXAMS AND DEFENDED THE SATISFACTORILY ASSESSED MASTER'S THESIS:

KINETICS AND MECHANISM OF REACTION 2,2' – DICHLORODIETHYLSULFIDE AND SODIUM METHOXYETHYLATE CATALYZED BY AMINES

AND THUS ACQUIRED THE RIGHT TO A DIPLOMA ON COMPLETED POSTGRADUATE STUDIES.

ON THIS BASIS, HE IS ISSUED THIS DIPLOMA, WHICH ACQUIRES THE ACADEMIC TITLE OF MASTER OF TECHNICAL SCIENCES, AS WELL AS THE RIGHTS THAT HE IS ENTITLED TO BY LAW.

IN BELGRADE 26. XII 1986, no. 25/19

Dean

Rector

(original signatures)

Republic of Serbia
MINISTRY OF THE INTERIOR
Protection and Rescue Sector
06 number 152- 1392 /09.
04.05.2009
Belgrade, Kneza Miloša 101

Pursuant to Article 161 of the Law on General Administrative Procedure (Official Gazette of the SRY, no. 33/97) and Article 5 of THE Rulebook on Professional Exams of Fire Protection Workers (Official Gazette SR of Serbia". no. 48/84) Ministry of the Interior of the Republic of Serbia - Sector for Protection and Rescue issues

CERTIFICATE
ON PASSING THE PROFESSIONAL EXAM

Luković Zoran

born on **06.01.1956** in **Novi Pazar**

worker ______________________

(Name and place of the company, state body and other organization in which the employee is employed)

on **29.04.2009**, PASSED the professional exam for workers working in fire protection according to the professional education program for workers with **university degree** before the Examination Committee formed by the decision of the Ministry of the Interior of the Republic of Serbia, 01 no. 531/2005 of 19.01.2005.

According to the assessment of the examination committee, the appointee passed the expert exam with an average grade of **4.50**

(original seal and signature)

ПОМОЋНИК МИНИСТРА
Предраг Марић

ASSISTANT MINISTER

Predrag Marić

Republic of Serbia
MINISTRY OF CONSTRUCTION, TRANSPORT AND INFRASTRUCTURE
Number: 154-01-01450/2021-07
Date: 20 January 2022 Belgrade,
Nemanjina 22-26

The Ministry of Construction, Transport and Infrastructure with its head office in Belgrade, Nemanjina 22-26, deciding upon the application for the professional examination and the issuance of a license for the preparation of technical documentation for the professional field of mechanical engineering, the narrow professional field of thermotechnics, thermoenergetics and process engineering, submitted by Miloš V. Gligorijević, from Belanovica – Ljig, Kalanjevca bb, pursuant to Article 162, paragraph 1 of the Law on Planning and Construction ("Official Gazette of the RS", nos. 72/09, 81/09 - correction, 64/10 – CC, 24/11, 121/12, 42/13 - CC, 50/13 - CC, 98/13 - CC, 132/14, 145/14, 83/18, 31/2019, 37/2019 - other law and 9/2020, hereinafter: the Law), Article 136 of the Law on General Administrative Procedure ("Official Gazette of the RS", nos. 18/16 and 95/18 - Authentic Interpretation) and the Rulebook on Passing the Professional Examination in the Field of Spatial and Urban Planning, Preparation of Technical Documentation, Construction and Energy Efficiency, as well as licenses for spatial planners, urban planners, architects, urban planners, engineers, architects, landscape architects and contractors and registers of licensed persons ("Official Gazette of the RS", no. 2/2021, hereinafter: the Rulebook), and at the proposal of the Examination Committee for the Professional Examination and Issuing Licenses for Spatial Planner, Urban Planner, Urban Architect, Engineer, Architect, Landscape Architect and Contractor, adopts the following

DECISION

I **IT IS ESTABLISHED** that Miloš V. Gligorijević, UMCN 2710989710022, Master Mechanical Engineer from Belanovica - Ljig, Kalanjevac bb, passed the professional exam for the professional field of mechanical engineering, the narrow professional field of thermotechnics, thermoenergetics and process engineering, for the performance of professional tasks of technical documentation preparation.

II A license for an engineer to perform technical documentation preparation in the professional field of mechanical engineering, the narrow professional field of thermotechnics, thermal energy and process engineering, (license code: **МП 06-01**), number: **361И13821**, is **ISSUED** to the person appointed in paragraph I of the enacting clause, thus acquiring the professional title of licensed mechanical engineer.

Rationale

Article 162, paragraph 1 of the Law stipulates that a person who has passed the appropriate professional exam in accordance with Article 161 of the Law, at the proposal of the Committee referred to in Article 161, paragraph 4 of the Law, the minister in charge of planning and construction issues a license for a spatial planner, urban planner, urban architect, engineer, architect, landscape architect and contractor, on the basis of which entry is made ex officio in the register of licensed engineers, architects and spatial planners, register of licensed contractors and records of foreign persons performing professional tasks.

By the decision of the Ministry of Construction, Transport and Infrastructure no. 119-01-00936/2021-07 of 9 June 2021, adopted in accordance with Article 161, paragraph 4 and 162, paragraph 1 of the Law, the Exmination Committee for the Professional Examination and Issuing Licenses for Spatial Planners, Urban Architects, Engineers, Architects, Landscape Architects and Contractors (hereinafter: Committee) was established.

Miloš V. Gligorijević, from Belanovica - Ljig. Kalanjevca bb, on 13 August 2021, submitted an application for taking the professional exam and issuing a license to perform professional tasks of developing technical documentation for the professional field of mechanical engineering, the narrow professional field of thermotechnics, thermoenergetics and process engineering.

Article 7 of the Rulebook prescribes the general conditions for taking the professional exam, while Article 10 of the Rulebook prescribes the content of the application for taking the professional exam, as well as the documentation that is attached to the application.

By inspecting the application and all attachments, the Committee for the Professional Examination and Issuing Licenses for the Professional Field of Mechanical Engineering, the narrow professional field of thermotechnics, thermo-energetics and process engineering, has determined that the applicant has enclosed the following: read ID card, copy of the birth certificate, copy of the diploma of acquired higher education in the basic academic studies of the first degree at the Faculty of Mechanical Engineering in Belgrade, University of Belgrade, study program: Mechanical Engineering, number: 5261400 of 27 April 2016; copy of the diploma of acquired higher education in the master academic studies of the second degree at the Faculty of Mechanical Engineering in Belgrade, University of Belgrade, study program: Mechanical Engineering, number: 7749900 of 31 January 2018, proof of work experience - confirmation of the employer: "Termoenergo inženjering" from Belgrade, dated 3 August 2021, proof of professional results - personal reference list on the prescribed form, stating that the candidate has enclosed all the documentation required by the Rulebook and that the conditions for taking the professional examination have been met.

On 14 December 2021, the appointed person passed the professional examination in the professional field of mechanical engineering, the narrow professional field of thermotechnics, thermoenergetics and process engineering, for the performance of professional tasks related to the preparation of technical documentation, whereby the Committee noted that the conditions for the issuance of the license were met and proposed the adoption of a decision.

Article 128 of the Law stipulates that professional activities of technical documentation preparation in the capacity of a responsible designer may be performed by a person with the professional title of licensed engineer, licensed architect and licensed landscape architect who is registered in the register of licensed engineers, architects and spatial planners in accordance with the Law and the regulation governing the taking of the professional exam, issuing the license and entry in the register. The professional title of licensed engineer is acquired by issuing licenses in the professional fields of construction, electrical engineering, mechanical engineering, transport, geodetic, technological, metallurgical and geological engineering, forestry and agriculture. A licensed engineer, licensed architect, or licensed landscape architect may be a person with acquired higher education in the relevant professional field determined by the Rulebook on Passing the Professional Examination and Issuing licenses, at academic or professional studies of at least 300 ECTS or an equivalent level determined by other special regulations, passed professional exam, professional experience of at least three years and professional results (references) in the relevant professional or narrow professional field.

The licensed engineer performs the professional activities of preparation of technical documentation in accordance with the Law and the Rulebook, which prescribe in more detail the professional activities of spatial and urban planning, preparation of technical documentation, construction and energy efficiency performed by licensed persons.

Based on all of the above, it has been established that all the conditions prescribed by law have been met, and in accordance with Article 136 of the Law on General Administrative Procedure, it was decided as indicated in enacting clause of the decision.

INSTRUCTION ON LEGAL REMEDY: An appeal may be filed against this decision to the Government within 5 (five) days from the date of its delivery.

(original seal and signature)

MINISTER
Tomislav Momirović

SERBIAN CHAMBER OF ENGINEERS

LICENSE

ON THE CHIEF DESIGNER

Pursuant to the Law on Planning and Construction and
the Statute of the Serbian Chamber of Engineers

BOARD OF DIRECTORS OF THE SERBIAN CHAMBER OF ENGINEERS
establishes that

Branislav R. Pajić

Master of Science in Civil Engineering
UMCN 0603970710007

is responsible designer

of construction structures of buildings, civil engineering and
hydroconstruction

License number
310 4136 03

PRESIDENT OF THE CHAMBER
Prof. Miloš Lazović, PhD
in Civ. Eng.

ПРЕДСЕДНИК КОМОРЕ
Милош Лазовић
Проф. др Милош Лазовић
дипл. грађ. инж.

(original seal and signature)

In Belgrade,
13 November 2003

Republic of Serbia
DEPUTY PRIME MINISTER
MINISTER OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
Number: 154-01-00057/2020-07
Date: 29 May 2020

The Ministry of Construction, Transport and Infrastructure, with head office in Belgrade, Nemanjina 22-26, deciding on the request submitted by Lazar M. Biorac, from Belgrade - Zaplanjska 86A/4/20, for the issuance of the license of the responsible designer for the professional field of architecture (license code: АП 02) pursuant to Article 162, paragraphs 1, 2 and 12. of the Law on Planning and Construction ("Official Gazette of the Republic of Serbia", nos. 72/09, 81/09 - correction, 64/10 - CC, 24/11, 121/12, 42/13 - CC, 50/13 – CC, 98/13 - CC, 132/14, 145/14, 83/18, 31/2019 and 37/2019 - other law), Article 136 of the Law on General Administration Procedure ("Official Gazette of the RS", nos. 18/16 and 95/18-Authentic Interpretation), the Rulebook on Passing the Professional Examination in the Field of Spatial and Urban Planning, Preparation of Technical Documentation, Construction and Energy Efficiency, as well as Licenses for Responsible Persons and the Register of Licensed Engineers, Architects and Spatial Planners ("Official Gazette of the RS", no. 51/2019), and upon the proposal of the Commission for determining compliance with the conditions for the issuance of personal licenses, adopts the following

DECISION

The request submitted by Lazar M. Biorac, UMCN 2904987783927 Master Architectural Engineer, from Belgrade - Zaplanjska 86A/4/20, for the issuance of the license of the responsible designer for the professional field of architecture (license code: АП 02) IS APPROVED.

The appointed person is issued a license for the responsible designer for the professional field of architecture license codes number: 210A0005720.

Rationale

Article 162, paragraphs 1 and 2 of the Law on Planning and Construction ("Official Gazette of the Republic of Serbia", nos. 72/09, 81/09 - correction, 64/10 - CC, 24/11, 121/12, 42/13 - CC, 50/13 - CC, 98/13 – CC, 132/14, 145/14, 83/18, 31/2019 and 37/2019 – other law), stipulates that the license for the responsible planner, responsible urban planner, responsible designer and responsible contractor, is issued by a decision of the ministry responsible for construction, spatial planning and urban planning in accordance with the law, as well as that the license referred to in the previous paragraph may be issued to the person who has acquired the appropriate education and experience in performing professional activities, who passed the professional exam and fulfilled other requirements in accordance with that law and regulations adopted on the basis of that law.

Also, paragraph 12 of the same Article stipulates, inter alia, that the minister responsible for construction, spatial planning and urban planning shall establish by a decision the Commission for determining the compliance with the conditions for issuing and revoking the license, which determines compliance with the conditions for issuing the license and proposes the adoption of a decision on the issuance of these licenses.

By the Decision of the Deputy Prime Minister and Minister of Construction, Transport and Infrastructure number: 119-01-761/2019-07 of 13 August 2019, the Commission was established to determine the compliance with the conditions for issuing and revoking the license for the responsible spatial planner, responsible urban planner, responsible designer and responsible contractor (hereinafter: the Commission), in accordance with Article 162, paragraph 12 of the Law on Planning and Construction.

Lazar M. Biorac. from Belgrade - Zaplanjska 86A/4/20, submitted on 27 January 2020, an application for the issuance of a license for the responding designer for the professional field of architecture (license code: АП 02).

At the session held on 25 May 2020, the expert Commission, by inspecting the application and all appendices, determined that the applicant for the license for the responsible designer for the professional field of architecture (license code: АП 02) submitted the following: a copy of the ID card; a copy of the diploma of completed master academic studies at the Faculty of Architecture of the University of Belgrade in the study program Architecture, number: 1852300 dated 25 December 2013; a copy of the Certificate of the Ministry of Construction, Transport and Infrastructure on the passed professional exam with the regulation for the field of architecture, the narrow professional field of architecture, number: 8521-1/18954 dated 15 November 2019, proof of work experience - employers' certificates; proof of professional results - personal reference list on the prescribed form, two certified recommendations by two responsible designers, through which the Commission stated that the conditions were met in accordance with the law and proposed the adoption of a decision.

Article 128 paragraphs 1 and 2 of the Law on Planning and Construction, stipulate that the responsible designer may be a person with a higher education of the appropriate profession at the level equivalent to academic studies or vocational studies of at least 300 ECTS, at least three years of appropriate professional experience in the preparation of technical documentation, appropriate license in accordance with that law and who is registered in the register of licensed engineers, architects and spatial planners.

The license for the responsible designer may be obtained by a person with acquired higher education of the relevant profession or specialisation, passed professional exam and at least three years of work experience with professional results in the preparation of technical documentation and with the recommendation of at least two responsible designers or the Chamber of Engineers.

Articles 23 and 26 of the Rulebook on Passing the Professional Examination in the Field of Spatial and Urban Planning, Preparation of Technical Documentation, Construction and Energy Efficiency, as well as Licenses for Responsible Persons and the Register of Licensed Engineers, Architects and Spatial Planners ("Official Gazette of the RS", no. 51/2019), stipulate the conditions for issuing the license of the responsible designer, the content of the application for issuance of licences, as well as the documentation that has to be attached to the application, and Article 27 sets out the conditions that must be cumulatively fulfilled for the issuance of licenses.

Deciding on the request in question, and on the basis of the established factual situation and the proposal of the Commission, it was determined that all the conditions prescribed by law were met, and on the basis of all of the above, and in accordance with Article 136 of the Law on General Administrative Procedure, it was decided as indicated in enacting clause of the decision.

INSTRUCTION ON LEGAL REMEDY: An appeal may be filed against this decision to the Government within 5 (five) days from the date of its delivery.

ПОТПРЕДСЕДНИЦА ВЛАДЕ

(original seal and signature)

И МИНИСТАРКА

Проф. др Зорана З. Михајловић

DEPUTY PRIME MINISTER

AND THE MINISTER

Prof. Zorana Z. Mihajlovic, PhD

1.5 Introductory considerations

The Government of the Republic of Serbia has adopted *the Waste Management Programme in the Republic of Serbia for the period* 2022-2031 ("Official Gazette of the Republic of Serbia", No. 12 of 1 February 2022), which sets out strategic goals for the improvement of the waste management system and basic principles to be guided by all actors in waste management. The implementation of this programme, in addition to reducing the adverse impact on the environment and climate change, also aims to achieve the preconditions that irreversible resources that cannot be reused and reused after they have been processed or used due to technological, economic, environmental, social or regulatory impracticability, instead of being intended for disposal after the cycle of their use, can be used for energy reuse. The Waste Management Program is also aimed at achieving the goals that, previously adopted Waste Management Strategy 2010–2019 ("Official Gazette of the RS", no. 29/2010) have not been fully realized, which primarily include organized waste collection throughout the territory of the Republic of Serbia, primary waste selection and achievement of recycling goals, construction of infrastructure and waste incineration plants, as well as cessation of waste disposal in unsanitary landfills and landfills.

Waste management represents the general interest of the society in the Republic of Serbia, and is regulated by the Law on Waste Management ("Official Gazette of the RS", no. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023). This Law and by-laws adopted on the basis of this Law are aimed at ensuring and securing conditions for waste management in a way that does not endanger human health and the environment.

The *Regional Waste Management Plan for the cities of Zaječar and Bor and the municipalities of Boljevac, Kladovo, Majdanpek, Negotin and Knjaževac*, adopted on 14 March 2023, provides for the construction of plants for the energy use of waste (waste-to-energy) in order to establish a long-term sustainable system for regional waste management in a way that has a minimal adverse impact on the environment and the health of current and future generations, with rational use of resources and respect for modern waste management principles. Waste incineration is an essential part of an integrated approach to waste management and has an impact on waste reduction, reuse and recycling.

The current situation in waste management in the Republic of Serbia is such that certain types of waste are generated in larger quantities without providing the treatment, creating thus a problem for both waste producers and operators who undergo complicated and slow export procedures. On the other hand, the European Green Deal[2] has set an ambitious roadmap for transforming the European Union into a sustainable, resource-efficient and climate-neutral economy. The Circular Economy Action Plan stressed[3] the need for action to ensure that shipments of waste for re-use and recycling in the Union are facilitated, and that the Union does not export waste to third countries. In addition to environmental and social benefits, such action may result in a reduction of the Union's strategic dependence on raw materials. By prioritizing the necessary activities: creating a well-functioning EU market for secondary raw materials and tackling waste exports – which is a waste of resources and economic opportunities for the EU recycling industry, a revision of the Regulation on the transboundary movement of waste was also adopted, aimed at limiting the export of waste[4] that can be treated in the country, within the EU. Also the Basel Convention ratified[5] by the Republic of Serbia, Article 4 relating to the general obligations of members defines that each Member State shall take appropriate measures to:

[2] Communication from the Commission to the European Parliament, the European Council, the Council, the European economic and social committee and the committee of the regions, The European Green Deal, Brussels, 11.12.2019, COM(2019) 640 final.

[3] Communication from the Commission to the European Parliament, the European Council, the Council, the European economic and social committee and the committee of the regions A new Circular Economy Action Plan For a cleaner and more competitive Europe, Brussels, 11.3.2020

[4] Regulation (EU) 2024/1157 of the European Parliament and of the Council of 11 April 2024 on shipments of waste, amending Regulations (EU) No 1257/2013 and (EU) 2020/1056 and repealing Regulation (EC) No 1013/2006, Official Journal of the European Union, 2024/1157.

[5] The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, revised in 2019, Secretariat of the Basel Convention (SBC), April 2020.

- Ensure the availability of adequate disposal facilities, for environmentally sound management of hazardous and other waste, which will, as far as possible, be located within the country, regardless of the place of their disposal.
- Ensure that the transboundary movement of hazardous waste and other waste is minimized in accordance with the environmentally sound and efficient management of such waste, and that it is carried out in a way that will protect human health and the environment from adverse effects that may result from such movement.

CEWEP (Confederation of European Waste-to-Energy Plants), which represents about 400 Waste Energy Plants (WtE) from 22 countries and thus accounts for more than 80% of WtE capacity in Europe, provides the public with information on emission levels, energy efficiency, waste incineration technology and the contribution of the Waste Energy Plant to climate protection, in order to raise citizens' awareness of the role that energy from waste plays in a sustainable resource.

CEWEP states that the WtE existence provides the following key climate facts:

- The energy content of waste treated in Europe today[6] can replace between 10 and 54 million tons of fossil fuels (gas, oil, coal and lignite) per year, which would emit 27 - 54 million tons of CO_2.
- Diverting waste from landfills leads to additional greenhouse gas emission savings by avoiding methane emissions[7].
- Also, the recycling of metals from the slag/bottom ash of the WtE plant saves CO_2 emissions.
- About 50% of energy from waste is renewable because it comes from the biodegradable part of waste.

In accordance with all of the above, the Elixir Group business system has carried out a business analysis in terms of the waste it generates, as well as the energy products it uses, and in this regard, a long-term strategic management plan has been developed that would be implemented through several phases and includes, among other things, projects related to the transition of business models and value networks to the circular economy in order to keep the resources stream as closed as possible and to minimize waste, losses and release from the economic system, which includes waste-to-energy projects.

Bearing in mind that the Elixir Group is thinking in the long term about both the development of the company and the decarbonization of production processes and the reduction of production costs, it was decided that, within the chemical industry complex in Prahovo, within the Energy Ecological Island[8], it is necessary to build an **Eco Energy complex** consisting of a plant for the waste-to-energy of non-recyclable types of waste (Waste to Energy Plant) and an accompanying Landfill for non-hazardous waste (solidificate). Thermal energy obtained from the non-recyclable hazardous and non-hazardous waste-to-energy process would be used to evaporate phosphoric acid in the facilities of the Elixir Prahovo complex, as the largest consumer of thermal energy in the existing chemical industry complex in Prahovo.

The waste-to-energy project is implemented as part of the decarbonization strategy of the Elixir Group, i.e. the reduction of the carbon footprint that comes from the use of fossil fuels currently used to obtain thermal energy (fuel oil, coal and CNG) in the production and technological processes of the Elixir Prahovo complex. This Elixir Group strategy fits into the strategy of EU countries, which aims to reduce GHG emissions and implies that only a small percentage of waste is disposed of in landfills, and the largest percentage of waste is treated in appropriate plants, including thermal treatment, thus reducing its volume and obtaining sustainable local energy.

[6] Residual non-recyclable waste treated in WtE plants in Europe 2019 (99 million tonnes). Source: CEWEP members.
[7] Methane is a greenhouse gas that has 28 times the global warming potential of CO_2 in a 100-year perspective and 86 times higher in a 20-year perspective.
[8] The Energy Ecological Island is part of the chemical industry complex in Prahovo, which is defined in the adopted Detailed Regulation Plan as zone IV - Energy and Ecological Island (within the Technological Unit "C").

In order to establish a safe supply chain of waste suitable for thermal treatment and to avoid the accumulation of waste at the location of the plant in question, operating units Eco Lager Šabac and Prahovo were established within the Elixir Group business system, which are registered to perform the hazardous and non-hazardous waste storage activities. For the needs of the plant in question, this operating unit will: store waste according to the types and characteristics, pack the waste in an adequate manner and send it to the plant in question in accordance with the needs. Only those quantities of waste that are necessary for the smooth operation of the plant will be stored at the site of the Waste-to-Energy Plant, without long-term storage and accumulation of waste.

Bearing in mind the types of activities to be performed on the complex (thermal treatment of non-recyclable hazardous and non-hazardous liquid, solid and sludge waste with a capacity of 100,000 t/y and disposal of solidificates at the Landfill for non-hazardous waste landfill with an average of 8964 m^3/year), the plant in question is subject to the issuance of an integrated permit (IPPC) according to the Regulation on the types of activities and plants for which an integrated permit is issued "Official Gazette of the RS", no. 84/2005, item 5 Waste management.

Pursuant to the provisions of the Seveso Directive, i.e. Article 58 Law on Environmental Protection (Official Gazette of the RS, nos. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - decision of the CC, 14/2016, 76/2018 and 95/2018) and the Rulebook on the list of hazardous substances and their quantities and criteria for determining the type of documents prepared by the operator of the seveso plant or complex ("Official Gazette of the RS", no. 41/2010, 51/2015 and 50/2018), taking the maximum possible quantities of hazardous substances that may be present at any time in the Eco Energy complex (Section "H" - HEALTH HAZARD, "E1" and "E2" AQUATIC ENVIRONMENTAL HAZARD...), the status of the waste-to-energy plant was determined. It was noted that the complex in question represents a "higher order" Seveso plant and therefore it is the obligation of the Project Holder, in terms of accident risk management obligations, to prepare a Safety Report and an Accident Protection Plan and obtain the consent of the competent authority.

Environmental prevention is carried out by planning all phases of project implementation, with constant identification and definition of obligations in the field of environmental protection in order to timely define the basic requirements related to environmental protection in order to provide solutions in accordance with the Law on Environmental Protection ("Official Gazette of the RS", no. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - CC, 14/2016, 76/2018 and 95/2018 - other law and 94/2024 - other law), the Law on Environmental Impact Assessment ("Official Gazette of the Republic of Serbia", no.135/2004 and 36/2009), Best Available Techniques (BAT), i.e. BAT EU Reference Documents (BREF), Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). BATC WI – Commission implementing decision EU 2019/2010 of 12 november 2019 establishing the best available techniques (BAT) conclusions, under Direcitive 2010/75/EU of the European Parliaments and the Council for waste incineration (notified under documents C(2019)7987). The Project Holder is obliged to accept such solutions through technical documentation that would ensure minimal impact on the environment.

Based on the available technical documentation, measurement of environmental parameters, site visit and legal regulations, the multidisciplinary team of the company ELIXIR ENGINEERING DOO, whose composition is determined by the decision on the formation of a multidisciplinary team, has prepared a Study on Environmental Impact Assessment in order to define potential impacts and determine the necessary environmental protection measures, in order to prevent negative consequences on the environment during regular operation, and in cases of possible accidents.

Respecting all the above, the Study was done as an integral part of the documentation within the overall project documentation for the project in question. All conclusions and protection measures resulting from this Study are an obligation that must be incorporated into the project documentation and respected in the process of preparation for the construction and future regular operation of the project in question.

1.6 Background for the study preparation

The basic methodological approach and content of the environmental impact assessment are determined by the Law on Environmental Impact Assessment ("Official Gazette of the RS", no. 135/2004 and 36/2009) and the Rulebook on the Content of the Environmental Impact Assessment Study ("Official Gazette of the RS", no. 69/2005), as well as the Decision of the Ministry of Environmental Protection, no. 000886163 2024 of 17 June 2024 (given in the attachment), which determines the content and scope of the Environmental Impact Assessment Study of the project for the construction of an waste-to-energy plant on CP no. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. Prahovo phase construction of Landfill for non-hazardous waste within the Chemical industry complex „Elixir Prahovo“ at CP no. 2300/1, 1491/1 AND 1541/1 C.M. PRAHOVO, NEGOTIN MUNICIPALITY.

Law on Environmental Impact Assessment ("Official Gazette of the RS", No. 135/2004 and 36/2009) is aligned with Directive 2011/92/EU, known by the acronym EIA, which establishes basic rules and guidelines to ensure the correct assessment of impacts arising from projects and activities carried out on the environment and promotes the active participation of citizens and interested organisations. Considering that the Law on Environmental Impact Assessment has responded to the amendments that have accompanied the EIA Directive over the years, it is not lagging behind in terms of transboundary effect, nor in terms of the Aarhus Convention.

Bearing in mind that the project in question is being implemented in the territory located near the Romanian and Bulgarian boundaries, all the provisions of the Law on Ratification of the Convention on Environmental Impact Assessment in a Transboundary Context ("Official Gazette of the RS" 102/07) were implemented during the study preparation.

In the preparation of the Impact Assessment Study, all comments /remarks and required clarifications submitted by the potentially affected parties of this project, Romania and the Republic of Bulgaria were taken into account, which, in accordance with Art. 3. Of the Law on Ratification of the Convention on Environmental Impact Assessment in a Transboundary Context (ESPOO Convention), decided to participate in the procedure of impact assessment in a transboundary context (response of the Ministry of Environment, Water and Forests of Romania, no. DGEIPS/10258 of 9 April 2024 and the reply of the Ministry of Environment and Water of the Republic of Bulgaria, no. 04-00-949 of 26 April 2024).

The Impact Assessment Study also presents a description of the potential impact on environmental factors in the territory of Bulgaria and Romania, bearing in mind that this is a project subjected to the obligations of the impact assessment procedure in a transboundary context. This applies in particular to Natura 2000 sites in Romania ROSPA0011 Blahnita and ROSAC0306 Jiana, as well as to the wetland area of international importance, Ramsar site ROSMS0013 Blahnita; ecological interconnection or ecological continuity of Natura 2000 sites: ROSPA0011 Blahnita, ROSPA0046 Gruia – Garla Mare, ROSAC0299 Danube near Garla Mare – Maglavit.

The Study in question was developed through the following activities:

- By analyzing the location of the future plant and the wider surrounding, including the territory of neighboring Romania and Bulgaria;
- Analysis of data from the project-technical documentation;
- Analysis of data provided by insight into the applicable standards;
- Analysis of domestic and international regulations relevant to the project in question;
- Analysis of data provided from the literature;
- By visiting and inspecting the operation of similar plants in Europe as well as by analyzing the obtained data;
- Consultation with domestic and international experts (“UVP Environmental Managament and Engineering GMBH”);
- Analysis of data provided from external sources and obtained from state and related institutions;
- Consultation with responsible persons for environmental protection as well as with responsible persons for development and investments;
- Comparative analysis of results related to similar projects in other locations in the world;
- Supplementary verification of key findings of the analysis;
- Consultation with other stakeholders (general public, population, international institutions, beneficiaries).

When preparing the environmental impact assessment study, the following was used:

- Legislation of the Republic of Serbia;
- European legislation and recommendations and international conventions;
- Design and technical documentation
- Planning and zoning documents;
- Conditions of the competent authorities;
- BREF documents;
- Supporting documents for the need to prepare technical documentation.

Legislation of the Republic of Serbia

The introductory considerations state that the Environmental Impact Assessment is done in accordance with the provisions of the Law on Environmental Impact Assessment ("Official Gazette of the RS", no. 135/2004 and 36/2009) and the Rulebook on the Content of the Environmental Impact Assessment Study ("Official Gazette of the RS", no. 69/2005), In addition, the interpretation of the results and the proposal of protection measures are done in accordance with the following laws and by-laws:

- Law on Environmental Protection ("Official Gazette of the RS", no. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - CC, 14/2016, 76/2018 and 95/2018 - other law and 94/2024 - other law);
  - Regulation on Criteria for Determining the Status of the Endangered Environment and Priorities for Rehabilitation and Remediation ("Official Gazette of the RS", No. 22/2010);
  - Rulebook on the Content of the Notice about New Seveso Installation or Establishment, Existing Seveso Installation or Establishment and about Permanent Cessation of Seveso Installation or Establishment ("Official Gazette of the RS", No. 41/2010);
  - Rulebook on the Content of Accident Prevention Policy and the Content and Methodology of the Report on the Safety and Accident Protection Plan ("Official Gazette of the RS", No. 41/2010);
  - Rulebook on the list of hazardous substances and their amounts and criteria for determining the type of documents produced by the operator of Seveso installation or establishment ("Official Gazette of the RS", no. 41/2010, 51/2015 and 50/2018);
- Law on Waste Management ("Official Gazette of the RS", no. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023).
  - Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023);
  - Regulation on the Method and Procedure of Sludge Management from Municipal Wastewater Treatment Plants ("Official Gazette of the RS", No. 103/2023);
  - Regulation on the manner and procedure of managing construction and demolition waste ("Official Gazette of the RS", no. 93/2023, 94/2023 - corr.);
  - Regulation on the disposal of waste at landfills ("Official Gazette of the RS", no. 92/2010)
  - Regulation on the type of financial guarantees and equivalent insurance ensuring the performance of waste management activities ("Official Gazette of the RS", No. 103/2023);
  - Regulation on the amount and conditions for the allocation of incentives ("Official Gazette of the RS", no. 88/2009, 67/2010, 101/2010, 86/2011, 35/2012, 41/2013 - other rules, 81/2014 - other rules, 30/2015 - other rules, 44/2016 - other rules, 43/2017 - other rules, 45/2018 - other rules, 20/2019 - other rules, 49/2020 - other rules, 51/2021 - other rules, 49/2022 - other rules and 25/2023 - other rules, 71/2023 - amendment to other rules, 53/2024 - amendment to other rules);
  - Rulebook on the List of Waste Prevention Measures ("Official Gazette of the RS", no. 7/2019
  - Rulebook on waste categories, examination and classification ("Official Gazette of the RS", no. 56/2010, 93/2019 and 39/2021);
  - Rulebook on the manner of storage, packaging and labelling of hazardous waste ("Official Gazette of the RS", no. 92/2010 and 77/2021);
  - Rulebook on conditions and method of collection, transport, storage and treatment of waste used as a secondary raw material or for obtaining energy ("Official Gazette of the RS", No.

98/2010)

- Rulebook on conditions, method and procedure of waste oil management ("Official Gazette of the RS", no. 71/2010
- Rulebook on the Method and Procedure of Pharmaceutical Waste Management ("Official Gazette of the RS", no. 49/2019);
- Rulebook on Medical Waste Management ("Official Gazette of the RS", no. 48/2019);
- Rulebook on the method and procedure of waste tire management ("Official Gazette of the RS", no. 104/2009 and 81/2010);
- Rulebook on the List of Electrical and Electronic Products, Measures of Prohibition and Restrictions on the Use of Electrical and Electronic Equipment Containing Hazardous Substances, Methods and Procedures for the Management of Waste from Electrical and Electronic Products ("Official Gazette of the RS" no. 99/2010);
- Rulebook on the method and procedure of waste vehicles management ("Official Gazette of the RS", no. 98/2010)
- Rulebook on the list of POPs substances, method and procedure for managing POPs waste and limit values of concentrations of POPs substances related to the disposal of waste containing or contaminated with POPs substances ("Official Gazette of the RS", no. 65/2011, 17/2017);
- Rulebook on the form of the document on the movement of hazardous waste, the form of prior notification, the manner of its delivery and the instructions for their completion ("Official Gazette of the RS", no. 17/2017);
- Rulebook on the form of document on the movement of waste and instructions for its completion ("Official Gazette of the RS", no. 114/2013);
- Rulebook on the form of daily records and annual report on waste with instructions for its completion ("Official Gazette of the RS", no. 7/2020 and 79/2021);
- Rulebook on the methodology for the development of national and local registers of pollution sources as well as the methodology for the types, methods and deadlines of data collection ("Official Gazette of the RS", No. 91/2010, 10/2013, 98/2016, 72/2023, 53/2024);
- Rulebook on the National List of Environmental Protection Indicators ("Official Gazette of the RS", no. 37/2011);
- Waste Management Program in the Republic of Serbia for the period 2022-2031 ("Official Gazette of the RS", no. 12/2022

- Law on Packaging and Packaging Waste ("Official Gazette of the RS", No. 36/2009 and 95/2018 - other law);

➢ Law on Integrated Prevention and Control of the Environmental Pollution ("Official Gazette of the RS", No. 135/2004, 25/2015 and 109/2021);

➢ Law on Air Protection ("Official Gazette of the RS", no. 36/2009, 10/2013 and 26/2021 - other law);
- Regulation on monitoring condition and air quality requirements ("Official Gazette of the RS" no. 11/2010, 75/2010 and 63/2013);
- Regulation on measurements of air pollutants emissios from stationary sources of pollution ("Official Gazette of the RS", No. 5/2016 and 10/2024);
- Regulation on Limit Values of Air Pollutant Emissions from Stationary Sources of Pollution, Except from Combustion Installations ("Official Gazette of the RS", No. 111/2015, 83/2021);
- Regulation on the list of installations and activities in which volatile organic compound (VOC) emissions shall be controlled, on VOC emission values at certain consumption of solvents and total allowed emissions, and schemes to reduce VOC emission ("Official Gazette of the RS", No. 100/2011).

➢ Law on waters ("Official Gazette of the RS", no. 30/2010, 93/2012, 101/2016, 95/2018 and 95/2018 - other law);
- Rulebook on Hazardous Substances in Waters ("Official Gazette of the RS", no. 31/1982);
- Rulebook on parameters of ecological and chemical status of surface waters and parameters of chemical and quantitative status of ground waters ("Official Gazette of the RS", No. 74/2011);
- Rulebook on the Manner and Conditions for Measurement the Quantities and Examining the Quality of Waste Water Quality, and the Content of Reports on Performed Measurements

("Official Gazette of the RS", no. 18/2024);

- Rulebook on Determination of Water Units and Their Boundaries ("Official Gazette of the RS", no. 8/2018).
- Regulation on Water Classification ("Official Gazette of the SRS", no. 5/1968);
- Regulation on the categorization of watercourses ("Official Gazette of the SRS", no. 5/1968 - other law);
- Regulation on Emission Limit Values for Pollutants in Surface and Groundwaters and Sediment and Deadlines for Reaching Them ("Official Gazette of the RS", No. 50/2012);
- Regulation on Limit Values of Priority Substances and Priority Hazardous Substances Polluting Surface Waters and the Deadlines for Their Reaching ("Official Gazette of the RS", No. 24/2014
- Regulation on Emission Limit Values for Pollutants in Waters and the Deadlines for their Reaching ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016);
- regulation on the Ecological Network ("Official Gazette of the RS", no. 102/2010).
- Water Management Strategy on the Territory of the Republic of Serbia until 2034 ("Official Gazette of the RS", No. 3/2017);

➢ Law on Ratification of the Convention on Cooperation in the Protection and Sustainable Use of the Danube River ("Official Gazette of FRY - International Treaties", No. 2/2003);

➢ Law on Soil Protection („Sl. glasnik RS“, br. 112/2015);
- Rulebook on the list of activities that may be the cause of soil pollution and degradation, procedure, data content, deadlines and other requirements for soil monitoring ("Official Gazette of the RS", no. 102/2020).
- Rulebook on the methodology for the development of rehabilitation and remediation projects ("Official Gazette of the RS", no. 74/2015);
- Rulebook on the Content and Form of Soil Monitoring Reports ("Official Gazette of the RS", No. 126/2021);
- Regulation on systematic monitoring of soil condition and quality ("Official Gazette of the RS", no. 88/2020);
- Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of the RS", No. 30/2018, 64/2019).

➢ Law on Environmental Noise Protection ("Official Gazette of the RS", No. 96/2021);
- Rulebook on the content and methods of making a strategic noise map and action plan, the manner of presenting them to the public, as well as on their forms ("Official Gazette of the RS", No. 90/2023);
- Rulebook on Noise Measurement Methods, Content and Scope of the Environmental Noise Measurement Report ("Official Gazette of the RS", No. 139/2022);
- Regulation on Noise Indicators, Limit Values, Methods for Evaluating Indicators of Noise, Disturbance and Harmful Effects of Noise in the Environment ("Official Gazette of the RS", no. 75/2010).

➢ Law on Nature Protection ("Official Gazette of the RS", no. 36/2009, 88/2010, 91/2010 - corr., 14/2016, 95/2018 - other law and 71/2021);
- Rulebook on the designation and protection of strictly protected and protected wild species of plants, animals and fungi. (("Official Gazette of the RS", no. 5/2010, 47/2011, 32/2016 and 98/2016);

➢ Law on Climate Change ("Official Gazette of the RS", no. 26/2021);
- Regulation on types of activities and greenhouse gases ("Official Gazette of the RS", No. 13/2022).
- Rulebook on Monitoring and Reporting on Greenhouse Gas Emissions ("Official Gazette of the RS", No. 118/2023);
- Strategy for low-carbon development of the Republic of Serbia for the period from 2023 to 2030 with projections until 2050 ("Official Gazette of the RS", no. 46/2023);
- Program of adaptation to changed climate conditions for the period from 2023 to 2030 ("Official Gazette of the RS", no. 119/2023);

➢ Law on the Use of Renewable Energy Sources ("Official Gazette of the RS",no. 40/2021, 35/2023);

- Law on Energy ("Official Gazette of the RS" no. 145/2014, 95/2018- other law, 40/2021, 35/2023- other law, 62/2023);
- Law on Energy Efficiency and Rational Use of Energy ("Official Gazette of the RS", No. 40/2021);
- Law on Radiation and Nuclear Safety and Security ("Official Gazette of the RS", No. 95/2018, 10/2019);
  - Rulebook on Radioactive Waste and Spent Nuclear Fuel Management ("Official Gazette of the RS", No. 127/2021);
- Law on Cultural Property ("Official Gazette of the RS", no. 71/1994, 52/2011 - other laws, 99/2011 - other law, 6/2020 - other law and 35/2021 - other law and 129/2021 - other law, 76/2023 - other law);
- Law on Planning and Construction ("Official Gazette of the RS" no. 72/2009, 81/2009 - corr., 64/2010 - CC, 24/2011, 121/2012, 42/2013 - CC, 50/2013 - CC, 98/2013 - CC, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law, 9/2020, 52/2021, 62/2023);
- Law on Fire Protection ("Official Gazette of the RS", Nos. 111/2009, 20/2015, 87/2018 and 87/2018 - other laws);
  - Rulebook on organizing fire protection according to the fire hazard category ("Official Gazette of the RS", no. 6/2021);
  - Rulebook on Technical Norms for the Protection of Warehouses from Fire and Explosions ("Official Gazette of SFRY", no. 24/1987);
  - Rulebook on Technical Norms for Fire Protection of Industrial Facilities ("Official Gazette of the RS", No. 1/2018, 81/2023);
  - Rulebook on Technical Norms for Installations for the Hydrant Fire Extinguishing Network ("Official Gazette of the RS", No. 3/2018);
  - Rulebook on technical norms for the protection of facilities from atmospheric dscharge ("Official Gazette of SRY" no. 11/1996)
  - Rulebook on the minimum content of the general part of the training program for workers in the field of fire protection ("Official Gazette of the SRS", no. 40/1990).
  - Regulation on the classification of facilities, activities and land into fire risk categories ("Official Gazette of the RS", No. 76/2010);
- Law on Explosive Substances, Flammable Liquids and Gases ("Official Gazette of SRS", no. 44/1977, 45/1985 and 18/1989 and "Official Gazette of the RS", no. 53/1993 – other law, 67/1993 - other law, 48/1994 - other law, 101/2005 - other law, 54/2015 - other law);
- Law on Flammable and Combustible Liquids and Flammable Gases ("Official Gazette of the RS", no. 54/2015).
  - Rulebook on Technical Standards for Fire and Explosion Safety of Facilities for Flammable and Combustible Liquids and on Storage and Transfer of Flammable and Combustible Liquids ("Official Gazette of the RS", No. 114/2017 and 85/2021);
- Law on Disaster Risk Reduction and Emergency Management ("Official Gazette of the RS", no. 87/2018
  - Regulation on the content of information on hazards, measures and procedures in the event of an accident ("Official Gazette of the RS", no. 18/2012);
  - Regulation on Compulsory Means and Equipment for Personal, Mutual and Collective Protection Against Natural and Other Disasters ("Official Gazette of the RS", No. 3/2011 and 37/2015).
  - Regulation on the Content, Manner of Preparation and Obligations of Entities Related to the Preparation of Disaster Risk Assessment and Protection and Rescue Plans ("Official Gazette of the RS", No. 102/2020).
  - Rulebook on the Organization and Method of Operation of the Fire and Rescue Unit ("Official Gazette of the RS", No. 66/2021);
  - Rulebook on the Manner of Preparation and Content of the Accident Protection Plan ("Official Gazette of the RS", no. 41/2019);
  - Rulebook on the type and quantity of hazardous substances on the basis of which the Accident Protection Plan is drawn up ("Official Gazette of the RS", no. 34/2019);
  - Regulation on the implementation of evacuation ("Official Gazette of the RS", no. 22/2011).
- Law on Occupational Health and Safety (Official Gazette of the RS, no. 35/2023);

- Rulebook on Preventive Measures for Occupational Health and Safety at the Workplace, ("Official Gazette of the RS", Nos. 21/2019, 1/2019);
- Rulebook on preventive measures for safe and healthy work when using work equipment ("Official Gazette of the RS", No. 23/2009, 123/2012, 102/2015, 101/2018, 130/2021);
- Rulebook on the Procedure of Inspection and Verification of Work Equipment and Testing of Working Environment Conditions, ("Official Gazette of the RS", Nos. 15/2023);
- Rulebook on the Manner of Providing First Aid, the Type of Means and Equipment That Must Be Provided at the Workplace, the Manner and Deadlines for Training the Employees for the Provision of First Aid ("Official Gazette of the RS", No. 109/2016);

➢ Law on Public Roads (Official Gazette of the RS, no. 41/2018, 95/2018 - other law);
- Regulation on the categorization of state roads ("Official Gazette of the RS", no. 87/2023);

➢ Law on Transport of Dangerous Goods ("Official Gazette of the RS", No. 104/2016, 83/2018, 95/2018 - other law and 10/2019 - other law)

➢ Law on Chemicals (Official Gazette of the RS; no. 36/2009, 88/2010, 92/2011, 93/2012, 25/2015);
- Rulebook on the List of Classified Substances ("Official Gazette of the RS", no. 41/2023);
- Rulebook on the Classification, Packaging, Labelling and Advertising of Chemicals and Products in accordance with the UN Globally Harmonized System of Classification and Labelling ("Official Gazette of the RS" no. 105/2013, 52/2017, 21/2019, 40/2023);
- Rulebook on the Content of the Safety Data Sheet ("Official Gazette of the RS", No. 11/2024)

➢ Law on Ratification of the Convention on the Transboundary Effects of Industrial Accidents ("Official Gazette of the RS - International Agreements", No. 42/2009).

➢ Law on Ratification of the Convention on Biological Diversity ("Official Gazette of FRY - International Treaties", no. 11/2001);

➢ Law on Ratification of the Convention on the Availability of Information, Public Participation in Decision-Making and the Right to Legal Protection in Environmental Matters ("Official Gazette of RS", No. 38/2009);
- Rulebook on the procedure of public inspection, presentation and public debate on the study and on environmental impact assessment ("Official Gazette of the RS", no. 69/2005),

European legislation and recommendations

➢ Waste incineration: Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration;

➢ Waste Framework Directive: The Waste Framework Directive 2008/98/EC of the EU Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3–30) and its amendments (2018);

➢ EU Waste Catalogue: Commission Decision 2000/532/EC of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste (OJ L 226, 6.9.2000, p. 3). and Commission Decision 2014/955/EU of 18 December 2014 amending Decision 2000/532/EC on the list of pursuant waste to Directive 2008/98/EC of the European Parliament and of the Council (OJ L 370, 30.12.2014, p. 44);

➢ Guide to waste classification: Commission notice 2018/C 124/01 of the EU Commission concerning waste classification assists national authorities, local authorities, and businesses (for instance, in permitting matters) in accurately understanding and implementing EU law related to waste classification;

➢ EU Landfill Directive: (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste);

➢ Industrial Emissions Directive - Industrial Emissions Directive 2010/75/EU (IED);

➢ Environmental Impact Assessment Directive (EIAD, Directive 2011/92/EU, as amended by 2014/52/EU);

- Major Chemical Accidents Directive: The Seveso III Directive (2012/18/EU) on the control of major accident hazards involving dangerous substances;
- Classification, labelling and packaging of chemicals: Regulation (EC) No 1272/2008 of the EU Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (WKO, 2023);
- Chemicals management: Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, last amended by 2022/586;
- Batteries and accumulators management: Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC, last amended by Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018; Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC;
- Ship waste management: Regulation (EU) No 1257/2013 of the European Parliament and of the Council of 20 November 2013 on ship recycling and amending Regulation (EC) No 1013/2006 and Directive 2009/16/EC;
- Waste vehicle management: Proposal for a Regulation of the European Parliament and of the Council on circularity requirements for vehicle design and on management of end-of-life vehicles, amending Regulations (EU) 2018/858 and 2019/1020 and repealing Directives 2000/53/EC and 2005/64/EC, COM/2023/451 final;
- Waste incineration: Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration;
- Transport of dangerous goods: Agreements Concerning the International Carriage of Dangerous Goods by Rail (RID), by Road (ADR) and by Inland Waterways (ADN);
- Aarhus Convention: Regulation (EC) No 1367/2006 of the European Parliament and of the Council of 6 September 2006 on the application of the provisions of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters to Community institutions and bodies.

Design and technical documentation

When preparing the environmental impact assessment study of the project in question, the project-technical documentation listed in Tables 1.1 and 1.2 was used. Attached to the study is:

- Report on the performed expert control of the Preliminary Design of the Construction of an Waste- to-Energy Plant, Ministry of Construction, Transport and Infrastructure, no. 000186359 2024 14810 005 000 000 001 of 26/03/2024 In accordance with the aforementioned Report, the Audit Committee assessed that the technical documentation was complete and that it was accepted.

Table 1.1 Preliminary designs for the waste-to-energy plant

Volume no.	Name	Project Part No.
0	MAIN VOLUME	23-WTE-IDP-00
1.1	ARCHITECTURAL DESIGN W-C01 Reception guardhouse and administrative building	23-WTE-IDP-0101
1.2	ARCHITECTURAL DESIGN W-C08 Pretreatment and waste storage	23-WTE-IDP-0102
1.3	ARCHITECTURAL DESIGN W-C11 Waste thermal treatment plant	23-WTE-IDP-0103

	W-C02 Operations Centre W-C15 Tank for ammonia water with bundwall	
1.4	ARCHITECTURAL DESIGN W-C04 Pumping station and fire station U-C02 Maintenance building and auxiliary systems facility U-C01 Bus stop	23-WTE-IDP-0104
1.5	ARCHITECTURAL DESIGN W-C12 Stabilization and solidification	23-WTE-IDP-0105
2/1.1	STRUCTURAL DESIGN W-C08 Pretreatment and waste storage	23-WTE-IDP-0201
2/1.2	STRUCTURAL DESIGN W-C13 Transfer point	23-WTE-IDP-0202
2/1.3	STRUCTURAL DESIGN W-C11 Waste thermal treatment plant W-C14 Smokestack W-C15 Tank for ammonia water with bundwall	23-WTE-IDP-0203
2/1.4	STRUCTURAL DESIGN U-C06 Wastewater Receiving and Treatment System	23-WTE-IDP-0204
2/1.5	STRUCTURAL DESIGN W-C12 Stabilization and solidification	23-WTE-IDP-0205
2/1.6	STRUCTURAL DESIGN W-C06 Pipe bridges U-C09 Natural Gas Station Reducer	23-WTE-IDP-0206
2/1.7	STRUCTURAL DESIGN W-C03 Fire water tank	23-WTE-IDP-0207
2/1.8	STRUCTURAL DESIGN W-C04 Pumping station and fire station;	23-WTE-IDP-0208
2/1.9	STRUCTURAL DESIGN W-C02 Operations Centre	23-WTE-IDP-0209
2/1.10	STRUCTURAL DESIGN W-C01 Reception guardhouse and administrative building	23-WTE-IDP-0210
2/1.11	STRUCTURAL DESIGN W-C10 Cargo Scales U-C03 Wheel washer unit	23-WTE-IDP-0211
2/1.12	STRUCTURAL DESIGN U-C02 Maintenance building and auxiliary systems facility	23-WTE-IDP-0212
2/1.13	STRUCTURAL DESIGN W-C09 Waste Pretreatment Filter System and Activated Carbon Filter	23-WTE-IDP-0213
2/1.14	STRUCTURAL DESIGN W-C16 Solidification filter system	23-WTE-IDP-0214
2/1.15	STRUCTURAL DESIGN W-C12 Cement silo capacity 50m^3	23-WTE-IDP-0215
2/2	ROAD DESIGN	23-WTE-IDP-0220
3.1	HYDROTECHNICAL DESIGN Internal hydrotechnical installations - technological process facilities W-C08 Pretreatment and waste storage W-C11 Waste thermal treatment plant W-C12 Stabilization and solidification	23-WTE-IDP-0301
3.2	HYDROTECHNICAL DESIGN Internal hydrotechnical installations - Admin facilities, inputs and accompanying functions W-C01 Reception guardhouse and administrative building W-C02 Operations Centre W-C04 Fire Station and Pumping Station	23-WTE-IDP-0302

	U-C02 Maintenance building and auxiliary systems facility	
3.3	HYDROTECHNICAL DESIGN External hydrant installations - Water supply and sewerage	23-WTE-IDP-0303
4.1	ELECTROENERGETIC INSTALLATION DESIGN W-C02 Operations Centre	23-WTE-IDP-0401
4.2	ELECTROENERGETIC INSTALLATION DESIGN Installations of electric motor drives W-C08 Pretreatment and waste storage W-C09 Waste Pretreatment Filter System and Activated Carbon Filter W-C10 Cargo scale U-C03 Wheel washer unit W-C13 Transfer point	23-WTE-IDP-0402
4.3	ELECTROENERGETIC INSTALLATION DESIGN Installations of electric motor drives W-C11 Waste thermal treatment consumption W-C15 Tank for ammonia water with bundwall	23-WTE-IDP-0403
4.4	ELECTROENERGETIC INSTALLATION DESIGN Installations of electric motor drives W-C12 Stabilization and solidification W-C16 Solidification filter system U-C02 Maintenance building and auxiliary systems facility U-C06 Wastewater Receiving and Treatment System W-C03 Fire water tank W-C04 Pumping station and fire station U-C09 Natural Gas Station Reducer	23-WTE-IDP-0404
4.5	ELECTROENERGETIC INSTALLATION DESIGN General electroenergetic installations – internal installations: lighting, sockets, lightning rods and grounding W-C01 Reception guardhouse and administrative building W-C02 Operations Centre; W-C03 Fire water tank W-C04 Pumping station and fire station W-C06 Pipe bridges W-C08 Pretreatment and waste storage W-C09 Waste Pretreatment Filter System and Activated Carbon Filter W-C10 Cargo Scales W-C11 Waste thermal treatment plant W-C12 Stabilization and solidification W-C13 Transfer point W-C14 Smokestack W-C15 Tank for ammonia water with bundwall W-C16 Solidification filter system W-C17 Fence U-C01 Bus stop U-C02 Maintenance building and auxiliary systems facility U-C03 Wheel washer unit U-C06 Wastewater Receiving and Treatment System U-C07 Plateau U-C08 Plateau for separated metal U-C09 Natural Gas Station Reducer Truck parking Passenger car parking Traffic areas of the Waste Energy Plant	23-WTE-IDP-0405
4.6	ELECTROENERGETIC INSTALLATION DESIGN	23-WTE-IDP-0406

	General electroenergetic installations – external installations of the complex: outdoor lighting, lightning rods and grounding	
5.1.1.	SIGNALLING AND TELECOMMUNICATION DESIGN Receipt, storage and pretreatment of solid waste materials W-C08, W-C10, U-C03, W-C09	23-WTE-IDP-0511
5.1.2	SIGNALLING AND TELECOMMUNICATION DESIGN Receipt, storage and pretreatment of liquid waste materials W-C08, W-C13	23-WTE-IDP-0512
5.1.3	SIGNALLING AND TELECOMMUNICATION DESIGN U-C09, W-C11, Ash conveyors	23-WTE-IDP-0513
5.1.4	SIGNALLING AND TELECOMMUNICATION DESIGN Flue gas cleaning and wastewater treatment of boiler plant scrubbers, ammonia water tank bag filters, activated carbon dosing, SCR system, lime milk, lime milk silo, pump dosing, ammonia water tank cooling pumps, W-C14	23-WTE-IDP-0514
5.1.5	SIGNALLING AND TELECOMMUNICATION DESIGN Stabilization and solidification of solid residues from boiler plant W-C12, W-C16	23-WTE-IDP-0515
5.1.6	SIGNALLING AND TELECOMMUNICATION DESIGN Auxiliary Systems U-C02, Compressor Station, Compressed Air Distribution, Nitrogen Generation, Process Water Preparation and Demi Water Distribution	23-WTE-IDP-0516
5.1.7	SIGNALLING AND TELECOMMUNICATION DESIGN Wastewater Treatment Plant and Wastewater Basin U-C02, U-C06	23-WTE-IDP-0517
5.1.8	SIGNALLING AND TELECOMMUNICATION DESIGN Operations center	23-WTE-IDP-0518
5.2	SIGNALLING AND TELECOMMUNICATION DESIGN Telecommunication and signal installations (TIS) of the complex: Telephone system, Local Area Network (LAN), Video surveillance, Access control system, Notification and Alert System (PAGA)	23-WTE-IDP-0520
5.3	SIGNALLING AND TELECOMMUNICATION DESIGN Building Management System (BMS)	23-WTE-IDP-0530
5.4	SIGNALLING AND TELECOMMUNICATION DESIGN Design of telecommunication and signal installations (automatic fire detection and alarm system, natural smoke and heat extraction system and explosive gas and vapour detection system)	23-WTE-IDP-0540
6.1	MECHANICAL DESIGN Receipt, storage and pretreatment of solid waste materials	23-WTE-IDP-0601
6.2	MECHANICAL DESIGN Reception and storage of liquid waste materials	23-WTE-IDP-0602
6.3	MECHANICAL DESIGN Boiler plant	23-WTE-IDP-0603
6.4	MECHANICAL DESIGN Flue gas cleaning and wastewater treatment of the boiler plant	23-WTE-IDP-0604
6.5	MECHANICAL DESIGN Stabilization and solidification	23-WTE-IDP-0605
6.6	MECHANICAL DESIGN Auxiliary systems	23-WTE-IDP-0606
6.7	MECHANICAL DESIGN Wastewater treatment plant and wastewater pool	23-WTE-IDP-0607
6.8	MECHANICAL DESIGN Waste Pretreatment Filter System and Activated Carbon Filter	23-WTE-IDP-0608

6.9	MECHANICAL DESIGN Solidification filter system	23-WTE-IDP-0609
6.10	MECHANICAL DESIGN Inter-plant pipeline distribution	23-WTE-IDP-0610
6.11	MECHANICAL DESIGN Fire water tank	23-WTE-IDP-0611
6.12	MECHANICAL DESIGN HVAC installations W-C01 Reception guardhouse and administrative building W-C02 Operations Centre W-C04 Pumping station and fire station U-C02 Maintenance building and auxiliary systems facility W-C08 Waste pretreatment and waste storage W-C11 Waste thermal treatment plant	23-WTE-IDP-0612
6.13	MECHANICAL DESIGN Stable fire extinguishing installation	23-WTE-IDP-0613
7.1	TECHNOLOGY DESIGN Receipt, storage and pretreatment of solid waste materials	23-WTE-IDP-0701
7.2	TECHNOLOGY DESIGN Reception, storage and pretreatment of liquid waste materials	23-WTE-IDP-0702
7.3	TECHNOLOGY DESIGN Boiler plant	23-WTE-IDP-0703
7.4	TECHNOLOGY DESIGN Flue gas cleaning and wastewater treatment of the boiler plant	23-WTE-IDP-0704
7.5	TECHNOLOGY DESIGN Stabilization and solidification	23-WTE-IDP-0705
7.6	TECHNOLOGY DESIGN Auxiliary systems	23-WTE-IDP-0706
7.7	TECHNOLOGY DESIGN Wastewater treatment plant and wastewater pool	23-WTE-IDP-0707
8	TRAFFIC AND TRAFFIC SIGNALIZATION DESIGN	23-WTE-IDP-0800
E	GEOTECHNICAL STUDY	05/23
E1	FIRE PROTECTION STUDY	23-WTE-IDP-E1
E3	HAZARD AREA ANALYSIS	23-WTE-IDP-E3

Attached to the study is:

- Report on the expert control of the Preliminary design: Phased construction of the landfill for non-hazardous waste within the IHP Elixir complex in Prahov, Ministry of Construction, Transport and Infrastructure, no. 001129027 2023 14810 005 000 000 001 of 06.08.2024. In accordance with the aforementioned Report, the Audit Committee assessed that the technical documentation was complete and that it was accepted.

Table 1.2 Preliminary designs for the Landfill for non-hazardous waste

Volume no.	Name	Project Part No.
0	MAIN VOLUME	431278/2 – 22
3	HYDROTECHNICAL INSTALLATION DESIGN	431278/2 – 22HG
4	ELECTROENERGETIC INSTALLATION DESIGN	431278/2 – 22e
7	TECHNOLOGY DESIGN	24-NHWL-IDP-07

E	GEOTECHNICAL STUDY	GT 60/21

Planning and zoning documents:

- Spatial Plan of the Republic of Serbia, i.e. the Law on Spatial Plan of the Republic of Serbia from 2010 to 2020 ("Official Gazette of the RS", No. 88/2010);
- Draft Spatial Plan of the Republic of Serbia for the period from 2021 to 2035 (Decision on the development of the Spatial Plan of the Republic of Serbia for the period from 2021 to 2035 "Official Gazette of the RS", No. 48/2019);
- Spatial Plan of the Municipality of Negotin ("Official Gazette of the Municipality of Negotin", no. 16/2011);
- General Regulation Plan for the settlement of Prahovo ("Official Gazette of the Municipality of Negotin", no. 44/2014);
- First amendment to the General Regulation Plan for the settlement of Prahovo ("Official Gazette of the Municipality of Negotin", no. 7/2019
- Second amendment to the Detailed Regulation Plan for the chemical industry complex in Prahovo ("Official Gazette of the Municipality of Negotin", No. 17/2022);
- National Strategy for Sustainable Development ("Official Gazette of the RS", No. 57 of 3 June 2008);
- Regional Waste Management Plan for the cities of Zaječar and Bor and the municipalities of Boljevac, Kladovo, Majdanpek, Negotin, and Knjaževac, adopted on 14 March 2023;
- Strategic Plan for Hazardous Waste Management for the City of Zaječar and the Municipalities of Boljevac, Bor, Kladovo, Majdanpek, Negotin and Knjaževac, 2020.
- Operational Plan for Flood Defense for I-order Waters for 2024 ("Official Gazette of the RS", No. 117/2023).

Conditions of the competent authorities

- Location requirements of the Ministry of Construction, Transport and Infrastructure, no. ROP-MSGI-32562-LOC-1/2023 dated 22 November 2023 for the waste-to-energy plant with appendices:
  - Copy of the plot plan no. 952-04-155-21149/2023 of 12 October 2023, Republic Geodetic Authority, Real Estate Cadastre Service Negotin;
  - Copy of the cadastral plan of lines no. 956-309-25298/202 of 11 October 2023, Republic Geodetic Authority Real Estate Cadastre Sector, Department for Lines Cadastre Niš;
  - Water conditions of the Ministry of Agriculture, Forestry and Water Management no. 325-05-1/210/2022-07 of 14 November 2022 and notice no. 285878 2023 14843 000 000 000 001 of 7 November 2023;
  - Requirements regarding fire and explosion protection measures no. 217-8864/23 of 11.04.2023 and for safe installation in terms of fire and explosion protection measures no. 217-8865/23 of 13 October 2023, Ministry of the Interior, Sector for Emergency Situations, Department for Emergency Situations in Bor Conditions of the Public Utility Company "Badnjevo" Negotin no. 2962-06/2023-1 of 20 October 2023;
  - Conditions of the Institute for Nature Protection no. 03 br. 021-3738/2 of 10 November 2023;
  - Conditions of the Civil Aviation Directorate of the Republic of Serbia no. 4/3-09-0222/2022-0002 of 03.11.2022 and no. 4/3-09-0322/2023-0002 of 17 October 2023;
  - Terms of "Elektrodistribucija Srbije" DOO Belgrade, Branch of Elektrodistribucija Zaječar, no. 2540400-D-10.08-452295/2-2023 dated 23 October 2023;
  - Terms of Elektromreža Srbije no. 130-00-UTD-003-1393/2023 of 20 October 2023;
  - Terms of Srbijagas no. 06-07-11/3213-1 of 31 October 2023;
  - Terms of Telekom Srbija no. D211–442574/2–2023 of 13 October 2023.

- Location requirements of the Ministry of Construction, Transport and Infrastructure, no. ROP-MSGI-27919-LOCA-7/2023 of 18 August 2023 for the phased construction of the Landfill for non-hazardous waste within the ICP Elixir complex in Prahovo with appendices:
  - Copy of the plot plan no. 952-04-155-21149/2023 of 12 October 2023, Republic Geodetic Authority, Real Estate Cadastre Service Negotin;
  - Water conditions of the Ministry of Agriculture, Forestry and Water Management no. 325-05-13/125/2023-07 of 17 August 2023;
  - Opinion of the Public Water Management Company Srbijavode 7615/1 of 25 July 2023;
  - Opinion of the Environmental Protection Agency no. 325-00-00001/252/2023-02 of 25 July 2023;
  - Opinion of the Republic Hydrometeorological Institute no. 922-1-223/2022 of 1 November 2022 and no. 922-1-130/2023 of 21 July 2023;
  - Terms of the Institute for Nature Protection no. 03 br. 021-2591/2 of 3 August 2023;
  - Terms of Elektromreža Srbije no. 130-00-UTD-003-1399/2023 of 14 November 2022;
  - Terms of the public utility company "Badnjevo" Negotin no. 3296-06/2022-1 of 04.11.2022 and no. 953-06/2023-1 of 04.11.2022;
  - Notice No. 217-6494/23 of 27 July 2023, Ministry of the Interior, Emergency Situations Sector, Emergency Situations Department in Bor, Preventive Protection Department;
  - Notification of Srbijagas no. 06-07-11/3321 of 27 October 2022;
  - Terms of Telekom Srbija no. D211–430019/2–2022 of 20 October 2022.

BREF documents

- European Commission, Best Available Techniques (BAT) Reference Document for **Waste Incineration**, Industrial Emissions Directive 2010/75/EU, 2019;
- European Commission, Best Available Techniques (BAT) Reference Document for **Waste Treatment**, Industrial Emissions Directive 2010/75/EU, 2018;
- European Commission, Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on **Emissions from Storage**, July 2006;
- European Commission, Integrated Pollution Prevention and Control Reference Document on **Economics and Cross-Media Effects**, July 2006;
- European Commission, Reference Document on Best Available Techniques for **Energy Efficiency**, February 2009 (corrected version as of 09/2021);
- JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations, **Industrial Emissions Directive** 2010/75/EU (Integrated Pollution Prevention and Control), 2018;
- Best Available Techniques (BAT) Reference Document for **Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector**, Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control).
- BREF Industrial **Cooling Systems** (ICS), published in December 2001;
- BREF **Monitoring of Emissions to Air and Water from IED Installations** (ROM), published in July 2018;
- BREF **Large Combustion Plants** (LCP), published in December 2021;

All BREF documents and BAT conclusions are available on the European IPPC Bureau (EIPPCB) website: https://eippcb.jrc.ec.europa.eu/reference/

Supporting documents for the need to prepare technical documentation

- Study of the impact of the Waste-to-Energy plant and Landfill for non-hazardous waste on the air quality of the wider location of the chemical industry complex in Prahovo, University of Belgrade, Faculty of Mechanical Engineering, April 2024;
- Study of the filter system of waste pretreatment and filters with activated carbon impact within the Waste-to-energy plant on the air quality of the wider location of the Chemical industry complex in Prahovo, University of Belgrade, Faculty of Mechanical Engineering, July 2024;

- Study of the impact of the Waste-to-energy plant on the concentration of selected heavy metals in the air of the wider location of the chemical industry complex in Prahovo, University of Belgrade, Faculty of Mechanical Engineering, March 2025;
- Analysis of the state of environmental factors - zones envisaged for the expansion of the chemical industry complex in Prahovo at the address: Braće Jugovića no. 2, Prahovo, Company for Copyright Protection and Engineering, Belgrade Copyright Bureau, March 2023;
- Disaster Risk Assessment, Elixir Prahovo Industry of chemical products LTD. Prahovo, Institute for Integrated Safety Protection Preventive LTD. Novi Sad, May 2023;
- Study of biodiversity of the industrial complex "Elixir Prahovo" – Industry of Chemical Products LTD. Prahovo, Institute for Biological Research "Siniša Stanković", National Institute of the Republic of Serbia, University of Belgrade, April 2024;
- Survey of habits and attitudes of citizens of Negotin regarding waste management, conducted in August 2022 by the Faculty of Geography, University of Belgrade, Green Loop expert network and Elixir;
- Report on Strategic Environmental Impact Assessment - Amendment to the General Regulation Plan for the settlement of Prahovo (obtained decision of the municipal administration of the municipality of Negotin, Department of Urban Planning, Construction and Environmental Protection no. 501-101/2020-IV/02 of 29 March 2021);
- Hydrological Yearbook 1. Surface waters 2022, Republic Hydrometeorological Service, 2023;
- Hydrological Yearbook 2. Groundwater 2022, Republic Hydrometeorological Service, 2023;
- Meteorological yearbook 1 climatological data 2010-2022, Republic Hydrometeorological Service, 2023;
- Danube River Basin Management Plan, ICPDR, Update 2021;
- Danube through Serbia - Results of the national program of the second Joint Danube Survey 2007, Republic of Serbia, Ministry of Agriculture, Forestry and Water Management – Republic Water Directorate, University of Belgrade, Institute for Biological Research "Siniša Stanković", University of Kragujevac, Faculty of Science, 2010;
- Waste-To-Energy Climate Roadmap, The path to carbon negative, Confederation of European Waste-to-Energy Plants (CEWEP), June 2022;
- Analysis of the health status of the population of Bor County in the period from 2018 to 2022, Institute of Public Health "Timok" Zaječar, October-December 2023;
- Environmental Impact Assessment Study for the project: construction of new port capacities of the port of Prahovo, ECOlogica URBO DOO, July 2021;
- Seismic hazard maps, Republic Seismological Institute;
- 2022 Census, Statistical Office of the Republic of Serbia.

2.0. DESCRIPTION OF LOCATION FOR THE PLANNED PROJECT PERFORMANCE

The project holder ELIXIR CRAFT plans to build an Eco Energy complex in Prahovo, Negotin municipality, within the chemical industry complex in Prahovo, which will consist of a plant for waste-to-energy plant (Waste to Energy Plant), as well as the Landfill for non-hazardous waste for the disposal of solidificates.

2.1 Macro-location

The municipality of Negotin is located in the northeastern part of Serbia and extends along the boundary of Serbia, Bulgaria and Romania. The territory of the municipality of Negotin belongs to the Bor Administrative District (according to the regulation of the Republic of Serbia, and according to the Law on Territorial Organization and Local Self-Government). The administrative center of the municipality of Negotin is the settlement of Negotin with all local and state institutions at its headquarters in the city. The total area of the Spatial Plan of the municipality of Negotin, i.e. the territory of the municipality of Negotin, amounts to 1,090 km^2 , which is 1.9% of the total area of the territory of the Republic of Serbia and is in the seventh place by area and includes 39 settlements.

Figure 2.1 Negotin Municipality Settlements

Prahovo is an industrial settlement of compact type located about 9 km northeast of Negotin at 44°17’32" north latitude and 22°35’34" east longitude. Prahovo has a very favorable geographical position. This area is located peripheral to the central parts of our country, and has a significant traffic position.

The geographical position of Prahovo is significant due to the proximity of the Danube. It is located at an average of 60 meters above sea level, on the right bank of the Danube. The basic regional feature of the Prahovo settlement is the Danube position, the border position towards Romania and the proximity of the state border towards Bulgaria.

Figure 2.2 View of the Prahovo settlement in the municipality of Negotin on the map of the Republic of Serbia

The future Waste-to-Energy Plant and landfill for non-hazardous waste (solidification) together with the existing Elixir Prahovo complex and the Phosphea Danube DOO complex, as well as part of the land that is in the immediate surrounding with the project in question, are located within the chemical industry complex in Prahovo, within the limits defined by the Detailed Regulation Plan[9], with a total area of about 321 ha (Figure 2.3).

The subject location of the Eco Energy complex is located next to the bank of the Danube (at a distance of about 500 m in the north direction from the plant border), near the port of Prahovo, in the area of C.M. Prahovo, which belongs to the municipality of Negotin. The Danube River flows in a west-east direction and at the same time represents the state border with Romania.

The following industrial and economic complexes are also located in the surrounding of the Eco Energy complex:

- Elixir Prahovo complex in the direction of west and north along the plant border,
- Port of Prahovo and River Shipping Krajina, at a distance of about 700 m in the north-west direction from the plant border,
- Phosphea Danube DOO – at a distance of about 900 m west of the plant border,
- NIS petroleum products warehouse, at a distance of about 950 m from the plant border in the north-east direction from the plant border,
- Hydro power plant "Djerdap II", at a distance of about 4.5 km in the direction of the west.

[9] *"Second Amendment to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo", adopted on 9 Session of the Municipal Assembly of Negotin 17 June 2022, published in the Official Gazette of the Municipality of Negotin no.17 of 17 June 2022*

Figure 2.3 Macrolocation of Waste-to-Energy plant and Landfill for non-hazardous waste

The proximity of the port and the railway line provide the chemical industry complex in Prahovo, in addition to the road, with the possibility of river and railway transport. The Port of Prahovo is an international port that is capable of receiving, transhipping and shipping all types of cargo, whether in bulk or packaged condition in the amount of two million tons per year.

In the immediate vicinity of the future Eco Energy complex, i.e. Waste-to-Energy plant and Landfill for non-hazardous waste there are no residential buildings. The settlement of Prahovo, located at a distance of about 2 km in the direction of the west, the village of Radujevac is located at a distance of about 4 km in the east-southeast direction of the project in question, the settlement of Samarinovac, at a distance of about 5 km in the southwest direction, the settlement of Srbovo, at a distance of about 6 km in the south direction, the settlement of Dušanovac, at a distance of about 7 km in the northwest direction, and the settlement of Negotin, at a distance of about 10 km in the southwest direction. Along the border of the expansion of the chemical industry complex in Prahovo , at a distance of about 1,300 m from the future Eco Energy complex in the west direction, there is a workers' settlement (a smaller group of residential buildings).

According to the 2022 census, 799 inhabitants live in the settlement of Prahovo, while 735 inhabitants live in the settlement of Radujevac, and 28,261 in the municipality of Negotin. The population density in the municipality of Negotin is 26 apartments/km^2. The average age in Prahovo is 50.68 years, and the Radujevac settlement is 56.33 and both settlements have a predominantly adult population. According to the official data of the Statistical Office of the Republic of Serbia in Prahovo, there are 332 households with an average number of 2.41 members.

The location where the Eco Energy complex is planned to be built is at a distance of about 750 m from the border with Romania. On the other side of the Danube, on the Romanian side, there is undeveloped land. The Romanian settlements closest to the site in question are:
- Izvoarele is located at a distance of about 4 km, north of the location in question. According to the census, 951 inhabitants live in the settlement.
- Gruja is a settlement in Romania, the seat of the municipality of Gruja. It is located in the Mehedinci district, in Oltenia at a distance of about 7 km, east of the site in question. According to the census, there were 1,890 inhabitants in the settlement.

The location of the project in question is located at a distance of about 9 km from the Bulgarian border. The nearest Bulgarian settlements are:
- Balej village in the northwestern Bulgarian municipality of Bregovo, Vidin district and is located at a distance of about 10.5 km from the site in question. According to 2011 estimates, Baley had a population of 437.
- the village of Kudelin in northwestern Bulgaria also, in the municipality of Bregovo in the Vidin district, at a distance of about 10.6 km from the site in question. According to the 2021 census, the village had 229 inhabitants.

2.2 Microlocation

Considered in terms of microlocation, the construction of a waste-to- energy plant is planned within the chemical industry complex in Prahovo at CP no. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2, while the phased construction of the Landfill for non-hazardous waste is planned on CP no. 2300/1, 1491/1 AND 1541/1 C.M. PRAHOVO

The location of the future Eco Energy complex directly borders the following existing facilities:
- Phosphogypsum Warehouse – south, belonging to the Elixir Prahovo complex,
- Waste railway sleeper warehouse, non-hazardous waste warehouse and concrete base – north, belonging to the Elixir Prahovo complex
- Wastewater treatment plant of the chemical industry complex in Prahovo – west, which belongs to the Elixir Prahovo complex,
- Unconstructed land – west,

- Land intended (by DRP amendments) for the expansion of the production part of the industrial complex (towards Radujevac), for the formation of a chemical park, a new production complex of the same or compatible activity, with the necessary accompanying, technologically and functionally related facilities, with several independent units, with new Investors – toward east.

Thus, immediately adjacent to the eastern border and south of the future Waste-to- Energy Plant, there is agricultural land, which has been devastated due to many years of industrial activities in the area in question. The social enterprise IHP Prahovo was founded in 1960, first as a superphosphate factory, i.e. as a chemical part of the Bor basin metallurgical complex. In August 2012, “Elixir Group d.o.o.” Sabac privatized part of the property of IHP Prahovo and then founded a member company "Elixir Prahovo – Industrija hemijskih proizvoda d.o.o." Prahovo (Elixir Prahovo), which in the following period (until 2015) successively privatized all industrial facilities belonging to different legal entities of the former holding company IHP ad Prahovo.

The work of the industry on the IHP Prahovo complex until privatization in 2012, as well as the poor management of waste from the time of pesticide production, which has not been performed on the complex for more than 15 years, resulted in the occurrence of "historical pollution", with negative consequences for the environment.

In accordance with the above, the surrounding land is no longer suitable for performing agricultural activities and it has been mostly purchased by Elixir and other legal entities, and a smaller part is owned by natural persons.

As a result of major construction-technical and technological interventions at the Chemical industry complex in Prahovo after the privatisation in 2012, including the rehabilitation of sites where hazardous waste was inadequately disposed of, but also due to the process of migration of pollutants over time, along with physical-chemical and biological processes in soil and groundwater, today only point pollution, uneven in terms of origin and type, is registered in the part of the site intended for expanding the activities of the company.

Figure 2.4 provides an orthophoto image of the microlocation of the Waste-to-Energy plant (Waste Energy Plant) and the Landfill for non-hazardous waste within the chemical industry complex in Prahovo. The boundary of the project, which is the subject of this study, is marked in red.

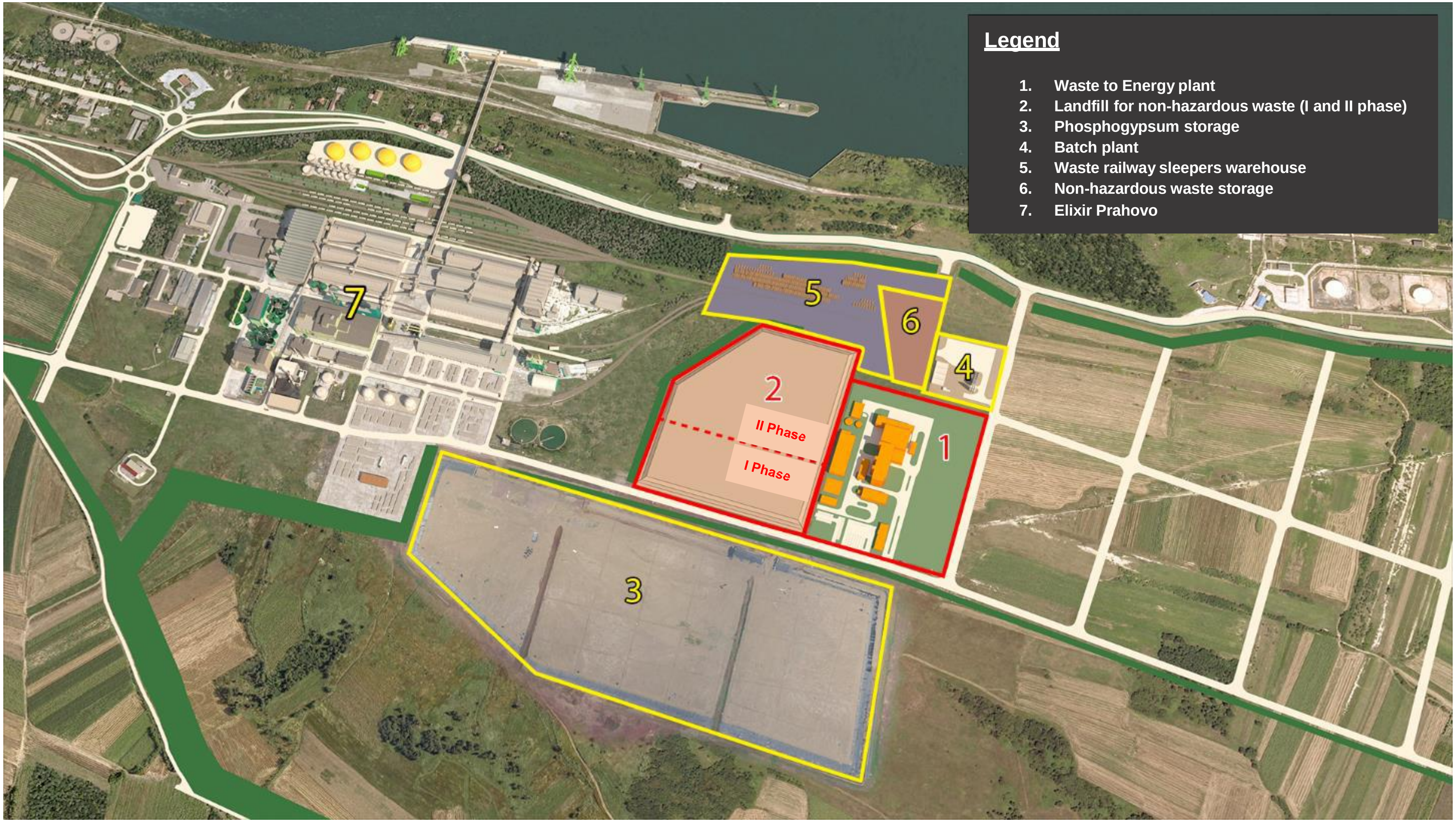


Figure 2.4 Orthoimage of the microlocation of the Waste-to-Energy plant and the Landfill for non-hazardous waste

2.3 Copy of the plan of cadastral parcels intended for the execution of the project with the layout of all facilities

The construction of a waste-to-energy plant is planned within the chemical industry complex in Prahovo at CP no. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2, while the phased construction of the Landfill for non-hazardous waste is planned on CP no. 2300/1, 1491/1 and 1541/1 C.M. PRAHOVO

A copy of the plan of the plots intended for the construction of the waste-to-energy plant is planned no. 952-04-155-21149/2023 of 12 October 2023 and the phased construction of the Landfill for non-hazardous waste no. 952-04-155-6413/2023 of 31 March 2023, issued by the Republic Geodetic Authority, Real Estate Cadastre Service Negotin are attached to the Study. The layout of all facilities within the Waste-to-Energy Plant is shown on the layout plan, drawing number 23-WTE-IDP-00-C00-0001-R00, and the phased construction of the Landfill for non-hazardous waste is shown on the layout plan, drawing number NHWL - IDP - 003. Site plans are attached to the Study.

2.4 Data on the required land area in m² during the execution of works with a description of physical characteristics and a cartographic representation of the appropriate scale, as well as the area that will be covered when the project is executed

Table 2.1 Basic information about the facility and location – Waste-to-Energy Plant (Waste Energy Plant)

Total data for WtE:	Total plot area/plot of zone IV	264,600.00 m²
	Coverage of the area where the Waste-to-Energy Plant (WtE) is located	58,720.69 m²
	Total GFA:	**11,566.43 m²** Note: Plateaus and concrete slabs did not enter the total surface
	Total GROSS built-up area:	**13,095.59 m²** Note: Plateaus and concrete slabs did not enter the total surface
	Land area under the facility/occupancy:	**8,601.97 m²** Note: Plateaus and concrete slabs did not enter the total surface
	Land area under the facility / occupancy index:	A of land under the facility / A of the plot *100= 8,601.97 / 58,720.69*100 =**14.65%**
	Site construction index:	GFA / A parcels= 11,566.43 m² / 58,720.69 m² =**0.20**
	Index of green areas:	**53.99%**

Table 2.2 Dimensions and materialization of facilities within the Waste to Energy Plant

LB	PRODUCTION FACILITIES		
1.	**W-C01 Reception guardhouse and administrative building**		
	Dimensions of the facility:	Total GFA:	1205.08 m²
		Total GROSS area of the facility:	1205.08 m²
		Land area under the facility/occupancy:	621.74 m²
		Dimensions of the facility:	Max.dimensions:16.3x43.3 m
		Number of floors:	GF+1
		Height of facility:	10.0 m
	Materialization of the facility:	Facade materialization:	Facade panel

		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
2.	FACILITY: **W-C02 – Operations Center**		
	Dimensions of the facility:	Total GFA:	1656.00 m^2
		Total GROSS area of the facility:	1745.06 m^2
		Land area under the facility/occupancy:	437.79 m^2
		Dimensions of the facility:	Max.dimensions:21.9x33.1 m dimensions of the main facility: 12.0x33.1 m dimensions of the passageway: 9.9x4.1 m
		Number of floors:	TI+GF+3
		Height of facility:	20.0 m
	Materialization of the facility:	Facade materialization:	Facade panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
3.	FACILITY: **W-C03 - Fire water tank**		
	Dimensions of the facility:	Total GFA:	133.00 m^2
		Total GROSS area of the facility:	133.00 m^2
		Land area under the facility/occupancy:	133.00 m^2
		Dimensions of the facility:	Tank diameter: 12.0 m
		Tank height:	11.85 m
	Materialization of the facility:	Materialization of the tank wall:	Steel
4.	FACILITY: **W-C04 Pumping station and fire station**		
	Dimensions of the facility:	Total GFA:	423.44 m^2
		Total GROSS area of the facility:	423.44 m^2
		Land area under the facility/occupancy:	423.44 m^2
		Dimensions of the facility:	Max.dimensions:15.8x26.8 m
		Number of floors:	GF
		Height of facility:	6.85 m
	Materialization of the facility:	Facade materialization:	Facade panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
5.	FACILITY: **W-C06 - Pipeline bridges**		
	Dimensions of the facility:	Total GROSS area of the plateau:	822 m^2
		Length of facility:	L1=173 m L2=30.5 m L3=22.5 m L4=15.5 m L5=11.5 m Total: L1+L2+L3+L4+L5= 254.0 m
		Height of facility:	8.0 m
	Materialization of the facility:	Structure:	ST

6.	FACILITY: **W-C08 Pretreatment and waste storage**		
	Dimensions of the facility:	Total GFA:	3,585.58 m^2
		Total GROSS area of the facility:	4,967.13 m^2
		Gross underground:	1,381.55 m^2
		Gross above ground:	3,585.58 m^2
		Land area under the facility/occupancy:	2,522.90 m^2
		Dimensions of the facility:	max.dimensions:50.8x67.0 m
		Number of floors:	Tl+GF+3
		Height of facility:	35.0 m
	Materialization of the facility:	Facade materialization:	RC + ST + panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
7.	FACILITY: **W-C09 – Waste Pretreatment Filter System and Activated Carbon Filter**		
	Dimensions of the facility:	Total GROSS area of the plateau:	315.00 m^2
		Plateau dimensions:	14.5x21.80 m
	Materialization of the facility:	Materialization of the plateau:	RC
8.	FACILITY: **W-C10 - Cargo scales**		
	Dimensions of the facility:	Total GFA:	133.0 m^2
		Total GROSS area of the facility:	133.0 m^2
		Land area under the facility/occupancy:	133.0 m^2
		Dimensions of the facility:	2x3,5x19,0 m
	Materialization of the facility:	Materialization of the plateau:	RC
9.	FACILITY: **W-C11 Waste thermal treatment plant**;		
	Dimensions of the facility:	Total GFA:	1570.00 m^2
		Total GROSS area of the facility:	1570.00 m^2
		Land area under the facility/occupancy:	1570.00 m^2
		Dimensions of the facility:	Max. dimensions:64.7x36.8m
		Number of floors:	GF
		Height of facility:	38.16 m
	Materialization of the facility:	Facade materialization:	ST + panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
10.	FACILITY: **W-C12- Stabilization and solidification**		
	Dimensions of the facility:	Total GFA:	755.66 m^2
		Total GROSS area of the facility:	763.22 m^2
		Land area under the facility/occupancy:	623.66 m^2
		Dimensions of the facility:	Max.dimensions:45.8x22.5 m
		Number of floors:	GF+1
		Height of facility:	18.15 m
	Materialization of the facility:	Facade materialization:	RC + ST + panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
11.	FACILITY: **W-C13 – Transfer point**		

	Dimensions of the facility:	Total GFA:	189.00 m^2
		Total GROSS area of the facility:	189.00 m^2
		Land area under the facility/occupancy:	189.00 m^2
		Dimensions of the facility:	9x21 m
		Number of floors:	GF
		Height of facility:	6.5 m
	Materialization of the facility:	Structure:	Steel
		Roof materialization:	Painted electroplated profiled sheet metal
12.	FACILITY: **W-C14 – Smokestack**		
	Dimensions of the facility:	Total GROSS area of the plateau:	84.05 m^2
		Dimensions of the stack foundation:	WxLxH: 6.2 x 6.2 x 2.3 m
		External diameter of the stack:	Ø2.26 m
		Internal diameter of the stack:	Ø1.95 m
		Stack height:	56.30 m
	Materialization of the facility:	Materialization of the smokestack wall:	Steel sheet
		Materialization of the foundation:	RC
13.	FACILITY: **W-C15 – Ammonia water tank with bundwall**		
	Dimensions of the facility:	Total GFA:	44.73 m^2
		Total GROSS area of the facility:	95.72 m^2
		Land area under the facility/occupancy:	44.73 m^2
		Dimensions of the facility:	Tank Dim.: 5.0x5.0 m Dim. of the spray water pool: 10.0x5.1x2.0 m
		Number of floors:	GF
		Height of facility:	11.37 m
		Pool fence height:	1.1 m
	Materialization of the facility:	Facade materialization:	ST + panel
		Roof materialization:	ST +TR sheet metal
		Materialization of the bundwall:	RC
14.	FACILITY: **W-C16 – Solidification filter system**		
	Dimensions of the facility:	Total GROSS area of the plateau:	146.00 m^2
		Plateau dimensions:	16.4x9.0 m
	Materialization of the facility:	Materialization of the plateau:	RC
15.	FACILITY: **W-C17 – Fence**		
	Dimensions of the facility:	Total length of the facility:	756.60 m
		Height of facility:	2.10 m
	Materialization of the facility:	Materialization of the fence:	Steel posts with stretched metal mesh filling
LB	**SERVING FACILITIES**		
16.	FACILITY: **U-C01 – Bus stop**		
	Dimensions of the facility:	Total GFA:	10.2 m^2
		Total GROSS area of the facility:	10.2 m^2
		Land area under the facility/occupancy:	10.2 m^2
		Dimensions of the facility:	1.7x6.0 m
		Number of floors:	GF
		Height of facility:	2.50 m

<table>
<tr><td></td><td rowspan="2">Materialization of the facility:</td><td>Facade materialization:</td><td>ST + tempered glass</td></tr>
<tr><td></td><td>Roof materialization:</td><td>Sandblasted tempered glass</td></tr>
<tr><td rowspan="10">17.</td><td colspan="3">U-C02 Maintenance building and auxiliary systems facility</td></tr>
<tr><td rowspan="6">Dimensions of the facility:</td><td>Total GFA:</td><td>1852.74 m²</td></tr>
<tr><td>Total GROSS area of the facility:</td><td>1852.74 m²</td></tr>
<tr><td>Land area under the facility/occupancy:</td><td>1852.74 m²</td></tr>
<tr><td>Dimensions of the facility:</td><td>Max. dimensions: 25.0x76.3 m
Facility: 25.0x70.8 m
Tanks: 5.5x16.0 m</td></tr>
<tr><td>Number of floors:</td><td>GF</td></tr>
<tr><td>Height of facility:</td><td>11.0 m</td></tr>
<tr><td rowspan="2">Materialization of the facility:</td><td>Facade materialization:</td><td>ST + Sandwich panel</td></tr>
<tr><td>Roof materialization:</td><td>Stacked roof (profiled steel sheet, mineral wool and PVC membrane)</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td rowspan="8">18.</td><td colspan="3">FACILITY: U-C03 – Wheel Washing Unit</td></tr>
<tr><td rowspan="6">Dimensions of the facility:</td><td>Total GROSS area of the plateau:</td><td>115.6 m²</td></tr>
<tr><td>Plateau dimensions:</td><td>Max. dimensions: 2x11.5x3.5+6x2.75 m</td></tr>
<tr><td>Dim. of the buried water tank:</td><td>2 x 5.8x2.2x1.85 m</td></tr>
<tr><td>Dimensions of the wheel washing ramp:</td><td>2 x 11.2x2.92 m</td></tr>
<tr><td>Height of the carriageway wall:</td><td>1.45 m</td></tr>
<tr><td>Height of the tank fence:</td><td>1.1 m</td></tr>
<tr><td>Materialization of the facility:</td><td>Materialization of the tank wall:</td><td>Steel sheet externally protected by anti-corrosion coating</td></tr>
<tr><td rowspan="6">19.</td><td colspan="3">U-C06 Wastewater Receiving and Treatment System</td></tr>
<tr><td rowspan="4">Dimensions of the facility:</td><td>Total GROSS area of the plateau:</td><td>720.00 m²</td></tr>
<tr><td>Plateau dimensions:</td><td>40.0x25.0 m</td></tr>
<tr><td>Pool dimensions:</td><td>25.0x25.0 m</td></tr>
<tr><td>Pool fence height:</td><td>1.1 m</td></tr>
<tr><td>Materialization</td><td>Materialization of the pool wall:</td><td>RC</td></tr>
<tr><td rowspan="4">20</td><td colspan="3">FACILITY: U-C07 – Plateau</td></tr>
<tr><td rowspan="2">Dimensions of the facility:</td><td>Total GROSS area of the plateau:</td><td>262.5 m²</td></tr>
<tr><td>Plateau dimensions:</td><td>19.5x14.0 m</td></tr>
<tr><td>Materialization of the facility:</td><td>Materialization of the plateau:</td><td>RC</td></tr>
<tr><td rowspan="4">21.</td><td colspan="3">FACILITY: U-C08 – Plateau for separated metal</td></tr>
<tr><td rowspan="2">Dimensions of the facility:</td><td>Total GROSS area of the plateau:</td><td>194.4 m²</td></tr>
<tr><td>Plateau dimensions:</td><td>15.3x12.7 m</td></tr>
<tr><td>Materialization of the facility:</td><td>Materialization of the plateau:</td><td>RC</td></tr>
<tr><td rowspan="6">22</td><td colspan="3">FACILITY: U-C09 – Natural gas reducing station</td></tr>
<tr><td rowspan="3">Dimensions of the facility:</td><td>Total GROSS area of the facility:</td><td>8.0 m²</td></tr>
<tr><td>Dimensions of the facility:</td><td>4.0 x 2.0 m</td></tr>
<tr><td>Height of facility:</td><td>3.0 m</td></tr>
<tr><td rowspan="2">Materialization of the facility:</td><td>Materialization of the wall and roof:</td><td>ST + sheet metal</td></tr>
<tr><td>Materialization of the foundation:</td><td>RC</td></tr>
</table>

23	PLATEAU: **Truck parking**		
		Total GROSS area:	**1,799.00 m^2**
24	PLATEAU: **Parking for passenger vehicles**		
		Total GROSS area:	**901.0 m^2**
25	PLATEAU: **Traffic areas of the WtE plant**		
		Total GROSS area:	**10,675.00 m^2**
26	PLATEAU: **Concrete plateaus**		
		Total GROSS area:	**2,659.55 m^2**
27	OPEN AREAS: **Free areas of the WtE plant**		
		Total sidewalk area: Total green spaces:	**2,382.61 m^2** **31,701.56 m^2**

Note:
The construction index and the degree of occupancy are shown in relation to the area of the Waste Energy Plant.
Abbreviations:
LB: Marking on the layout plan, drawing number 23-WTE-IDP-00-C00-0001-R00
Tl: Technical level

Table 2.3 Basic information about the facility and location - Construction in phases of the Landfill for non-hazardous waste (solidificate)

Total data for Landfill for non-hazardous waste	Total plot area:	82,390.00 m^2
	GFA	77,067.00 m^2
	Total GROSS area of the facility	77,067.00 m^2
	Total area net	64,243.00 m^2 PHASE I – 37,283.00 m^2 PHASE II – 26,960.00 m^2
	Land area under the facility	64,243.00 m^2
	Number of floors	-
	Height of facility	46 m
	Absolute elevation	94.00 masl

2.5 Compliance of the selected location with the spatial planning documentation

Spatial Plan of the Republic of Serbia, i.e. the Law on Spatial Plan of the Republic of Serbia from 2010 to 2020 ("Official Gazette of the RS", no. 88/2010) defines the manner of use and protection of natural resources, natural and cultural heritage and the environment. In the field of waste management, the main objective of the Spatial Plan is to develop a sustainable waste management system in order to reduce environmental pollution and spatial degradation, while the operational objectives are:

- promotion and encouragement of recycling and reuse of waste for the preservation of natural resources and the environment;
- construction of a plant for the treatment and disposal of hazardous waste and
- establishment of a system for managing special waste streams.

According to the Spatial Plan of the Municipality of Negotin ("Official Gazette of the Municipality of Negotin", no. 16/2011), the subject area is defined as an industrial zone or an industrial-port center of significant potential for development. The development of the chemical industry complex in Prahovo, consisting of „Elixir Prahovo – Industrija hemijskih proizvoda DOO Prahovo“ (eng. "Elixir Prahovo – Chemical Products Industry LLC Prahovo") and "Phosphea Danube" DOO (hereinafter referred to as the Industrial Complex) is defined by the Second Amendment to the Detailed Regulation Plan for the chemical industry complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 17/2022), by building an industrial park, chemical park, energy island, ecological island, expanding phosphogypsum storage, as well as by providing a buffer zone of greenery and relocating the routes of local roads outside the industrial complex, thus ensuring the isolation of the impact of the industrial complex and the production process. The existing Industrial Complex occupies an area of about 148 ha, and it is planned to expand in the direction of east and west, so that the planned Industrial Complex occupies about 594.41 ha.

Within the scope of the aforementioned Detailed Regulation Plan, the following technological units, zones and special parts of zones have been formed (Figures 2.5 and 2.6):

- Technological unit "A": Zone I - Existing industrial complex, consisting of:
  - I_1 - Production area of the industrial complex;
  - I_2 - Part of the industrial complex without production functions;
  - I_3 - Part of an industrial complex for the production of phosphate mineral nutrients;
  - I_4 - Power Substation zone.
- Technological unit "B": Zone II - Phosphogypsum Storage facility;
- Technological unit "C": Zone III - Chemical Park and Zone IV - Energy and Ecological Island
- Technological unit "D": Zone V - Industrial Park.

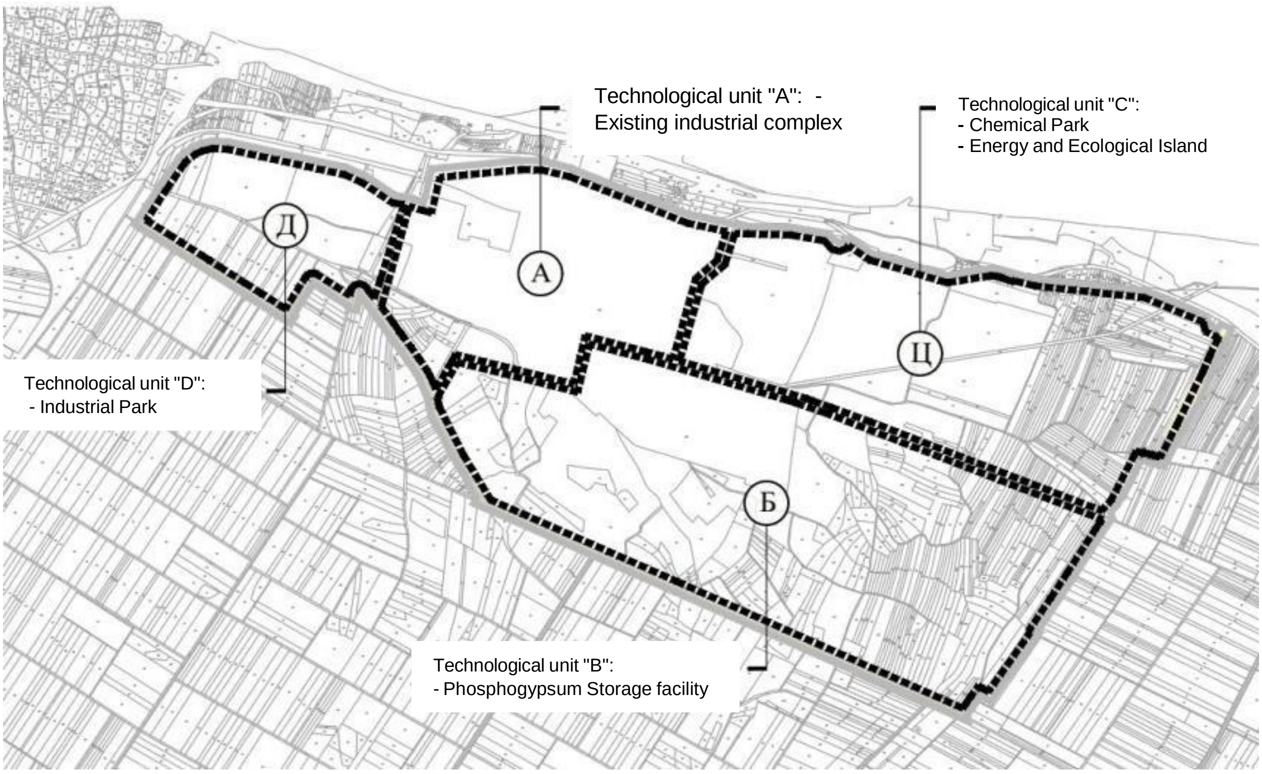


Figure 2.5 Segmentation of the Industrial Complex into technological units (Other amendments to the Detailed Regulation Plan for the chemical industry complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 17/2022).

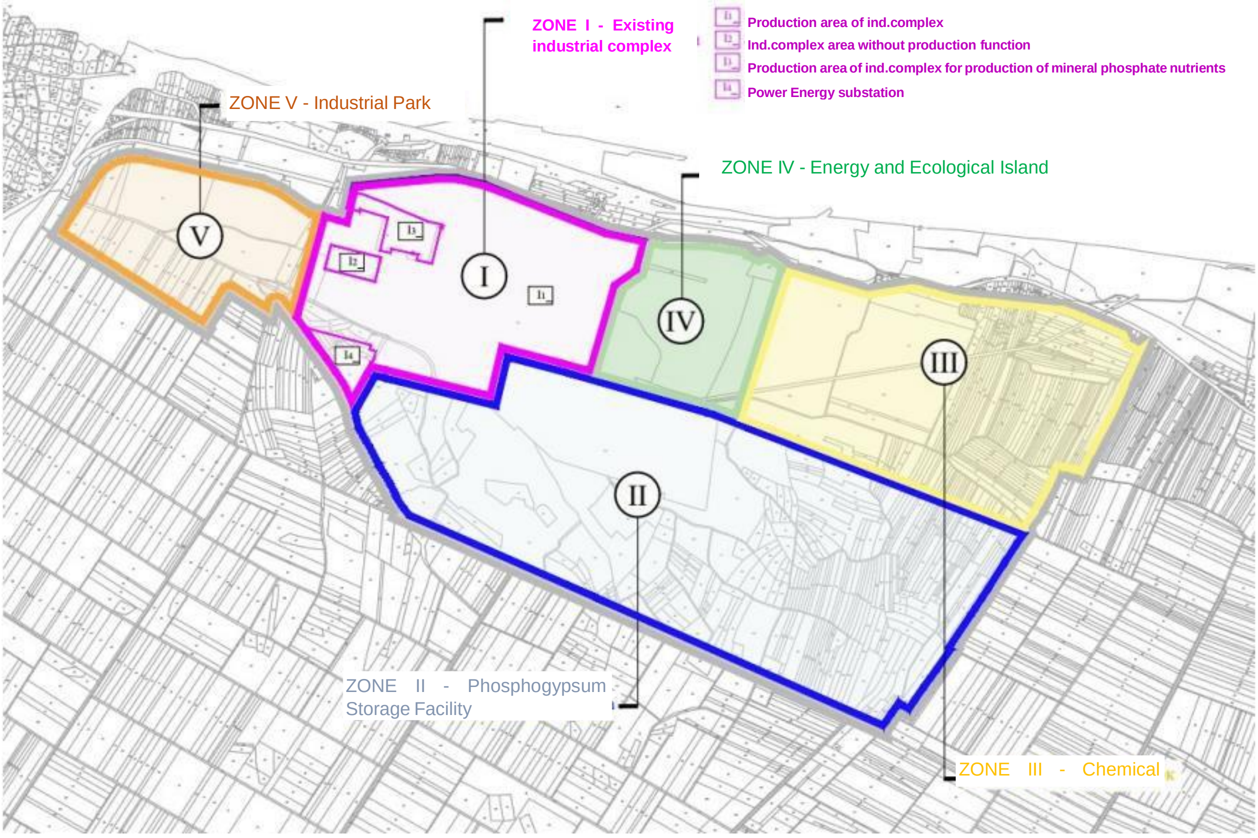


Figure 2.6 Segmentation of the Industrial Complex into zones/parts of zones/plots (Other amendments to the Detailed Regulation Plan for the chemical industry complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 17/2022).

Within zones I, II, III, IV and V, along the limits of the complete Industrial Complex, a protective green belt is planned, which represents an area where the formation of a buffer zone of greenery is mandatory and within which construction is prohibited. The protective green belt has the role of insulating the immediate environment from negative impacts within the economic zone. Within the protective green belt, only the construction of the necessary underground installations and infrastructure routes as well as the necessary above-ground transport systems in the function of the technological process (conveyors) is allowed.

Figure 2.7 shows the planned protective belt marked as GZ (Green Zone) and the existing greenery within zone I marked as:
Ga - Existing protective greenery within the production part of the Industrial Complex,
Gb - Existing protective greenery within the part of the Industrial Complex without production functions.

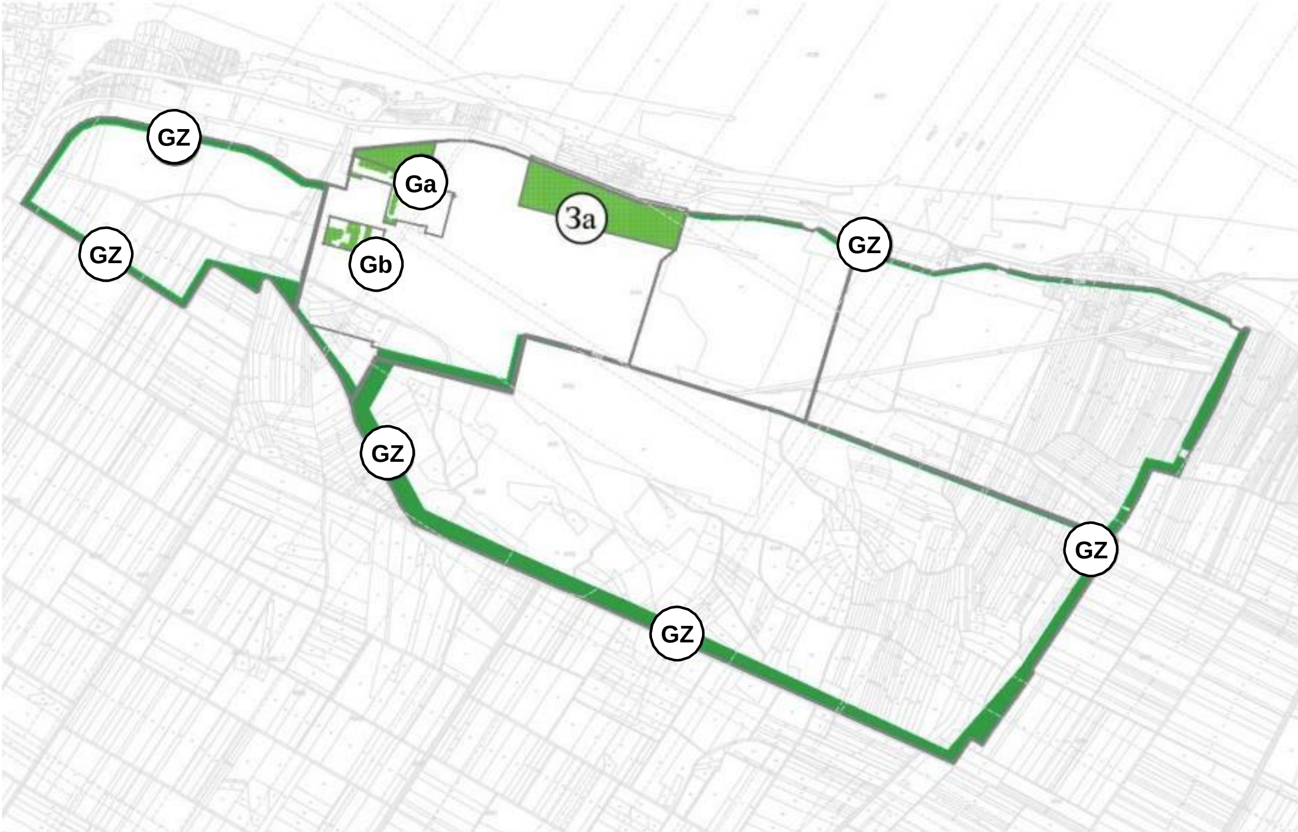


Figure 2.7 Schematic display of green areas within the Industrial Complex

In accordance with the location conditions, the Ministry of Construction, Transport and Infrastructure, for the construction project of the Waste-to-Energy plant no. ROP-MSGI-32562-LOC-1/2023, register no. 000262083 2023 1481 005 001 000 001 dated 22.11.2023 and for the phased construction of the Landfill for non-hazardous waste no. ROP-MSGI-27919-LOCA-7/2023, registration no. 350-02-01642/2023-07 dated 18.8.2023, as well as the Other Amendments to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 17/2022), the cadastral parcels in question are an integral part of Technological Unit C – Zone IV: Energy and Ecological Island.

Within zone IV - Energy and Ecological Island, the construction of facilities for the purpose of providing energy for heating, cooling and electricity is allowed, as well as for providing various types of auxiliary fluids, raw materials and fuels used in the technology of the chemical industry complex, including plants for storage, pyrolysis and thermal treatment of non-hazardous and hazardous industrial waste, non-recyclable municipal waste and residue from municipal wastewater treatment, as well as the production of alternative fuels and co-saturated water vapor, which, as outcome, produce thermal energy and electricity for the needs of the existing chemical complex, industrial and chemical park. Within this zone, the construction of facilities and areas that are in the service of new production facilities in the Industrial Complex is allowed, including the treatment of wastewater, transhipment railway and road terminals, parking lots for passenger and freight vehicles, a storage and logistics center for liquid and solid (general, bulk) cargoes, as well as the construction of the necessary accompanying, technologically and functionally related facilities and warehouses. Within this zone, it is allowed the construction of areas/facilities and infrastructure systems that are in the service of temporary storage, treatment and disposal of waste and residues from storage, pyrolysis and thermal treatment plants. The construction of necessary infrastructure facilities, facilities for the production and distribution of auxiliary fluids, accompanying facilities for monitoring of functioning of infrastructure networks and devices, as well as possible workshops for the maintenance of plants is also allowed.

Other amendments to the Detailed Regulation Plan for the chemical industry complex in Prahovo provide the possibility of connecting the planned facilities to all existing and planned infrastructure lines within the complex.

In order to establish a long-term sustainable system for regional waste management in a way that has a minimal adverse impact on the environment and the health of current and future generations, with rational use of resources and respect for modern waste management principles, a plan to build a plant for waste thermal treatment envised by the Regional Waste Management Plan for the cities of Zaječar and Bor and the municipalities of Boljevac, Kladovo, Majdanpek, Negotin and Knjaževac, was adopted in 2023.

In a broader view, it is noted that the location in question is characterized by the following elements:

- The macro location is within Technological Unit C, in Unit I – Industrial Complex, in Zone IV - Energy and Ecological Island.
- Within Zone IV – Energy and Ecological Island, **it is allowed the construction** of facilities for the provision of energy for heating, cooling and electricity, as well as various types of auxiliary fluids, raw materials and fuels used in the technology of the complex in question, including **plants for storage**, **pyrolysis and thermal treatment of non-hazardous and hazardous industrial and non-recyclable waste with the use of thermal energy, and the production of alternative fuels and co-saturated water vapor for the needs of the existing complex, industrial and chemical park**.
- Within this **zone, the construction of** areas/facilities and infrastructure systems that are in the service of temporary storage, treatment and **disposal of waste and residues from storage, pyrolysis and thermal treatment plants is allowed.**
- Within this part of the zone, the **construction of residential buildings is prohibited** (except for possible apartment units for temporary stay of guards, on-call services, etc.).
- The construction of the waste thermal treatment plant is envised by the Regional Waste Management Plan for the cities of Zaječar and Bor and the municipalities of Boljevac, Kladovo, Majdanpek, Negotin and Knjaževac, adopted in 2023.
- The micro-site is within the chemical industry complex in Prahovo.
- The thermal energy obtained from the Waste-to-Energy process would be used to evaporate phosphoric acid in the plants of the Elixir Prahovo complex, as the largest consumer of thermal energy in the existing chemical industry complex in Prahovo, thus reducing the use of fossil fuels currently used to obtain thermal energy (fuel oil, coal and CNG).
- The industrial complex of the chemical industry in Prahovo, and therefore the Eco Energy complex in question, has at its disposal a complete infrastructure (power substations, telecommunications network, installation of compressed natural gas, water supply and sewerage network, roads, etc.).
- In the event of an accident, in addition to the trained and equipped services of the Eco Energy Prahovo branch, Elixir Prahovo (environmental protection, occupational safety, fire brigade, rescue unit (within the fire brigade), physical and technical security, etc.), the Negotin Fire and Rescue Unit may also come to the rescue.
- The location is situated in the center of new investments in accordance with the Strategic Development Plan in Prahovo 2023 – 2027 (Development of internal roads 2023-2024 Elixir Prahovo, Development of the Port of Prahovo and other facilities in the complex, New state road 12.7 km – bypass around the Prahovo settlement, etc.).
- The realization of the project of reducing the emission of GHG implies that only a small percentage of waste is disposed of in landfills, and the largest percentage of waste is treated in the plant with thermal treatment, which reduces its volume and obtains cheap and sustainable local energy.
- There are no residential buildings in the immediate vicinity of the Eco Energy complex.

2.6 Overview of pedological, geomorphological, geological and hydrogeological and seismological characteristics of the terrain

2.6.1 Pedological, geomorphological and geological characteristics of the soil

Pedological characteristics of the terrain

Pedological factors include the physical, chemical and biological properties of the soil and rocks on which the soil develops. In general, the following types of soil occur in the Negotin region: alluvial soils (fluvisol), vertisol and black soil (marsh and meadow). The name alluvial soils (fluvisols) derives from the way they are forming on alluvial deposits. Alluvial soils (alluvial deposits) in the analyzed area cover significant areas along the larger Danube and Timok river flows, as well as along smaller ones. They are characterized by a light mechanical composition mixed with silt and good fertility, which is why they are widely used for growing vegetable crops, although there are also grass and forest areas. Unlike alluvial soils, vertisols are characterized by deteriorated physical properties, heavy mechanical composition and difficult processing (it is possible only in the semi-humid state). Black soils in the area of Negotinska krajina appear as meadow and marsh (pond).

Marsh black soils occur in alluvial planes at slightly higher positions. They also occur in self-contained closed depressions, which have the character of marsh. These soils are characterized by the presence of water in the profile whose level does not reach the surface. It is characteristic of marsh black soils that they suffer from surface flooding. In the alluvial planes, surface water reaches the marsh black soils through backwaters, and in marshes by pouring from the peripheral parts of marsh. The chemical properties of marsh black soils are generally favorable. Most of them result from the richness of floodplain and groundwater with elements of plant nutrition, and less due to the process of mobilization - mineralization of humus. Due to their depth, physical and chemical properties and abundance of moisture, marsh black soils are, as a rule, fertile soils, which are used as agricultural land. However, difficulties arise when processing because deep processing is usually required, due to low filtration capacity.

Meadow black soils occupy higher positions (loess terraces, loess plateaus, alluvial planes) in relation to marsh black soils and are rarely exposed to flooding. The parent substrate of these soils are loess and precipitated loess rich in carbonate. Due to the relatively low groundwater level, meadow black soils are classified as semi-hydromorphic soils. They are also called meadow chernozems and it is believed that they differ the most from chernozems in the lower part of the horizon, especially in deep meadow black soils, where the gley horizon may not always be present. The basic pedogenetic process is humification and humization that takes place in conditions of favorable humidity. The main part of the water comes from precipitation, and less from groundwater. Meadow black soils are deep soils with a powerful humus-accumulative horizon, with an average depth of 60-80 cm (sometimes >1.0 m). In terms of mechanical composition, they are slightly lighter than marshy, loamy to heavier loamy, which is a consequence of slower decomposition of primary minerals. Water-air properties are favorable, but not always balanced. Water capacity is sometimes increased at the expense of air capacity. Meadow black soils are soils with a mediocre humus content (3.0-4.0 %). Their reaction is neutral to slightly alkaline, as they are mostly high in C_aCO_3. Although under forest vegetation they are carbonless at the entire depth of the profile. The content of nutritional elements (N, P and K) is mediocre. Today, meadow black soil is mainly used as agricultural land, although on the alluvial plains there is still preserved autochthonous forest vegetation of hard deciduous plains.

Figure 2.8 shows a part of the pedological map for Negotin and its surroundings.

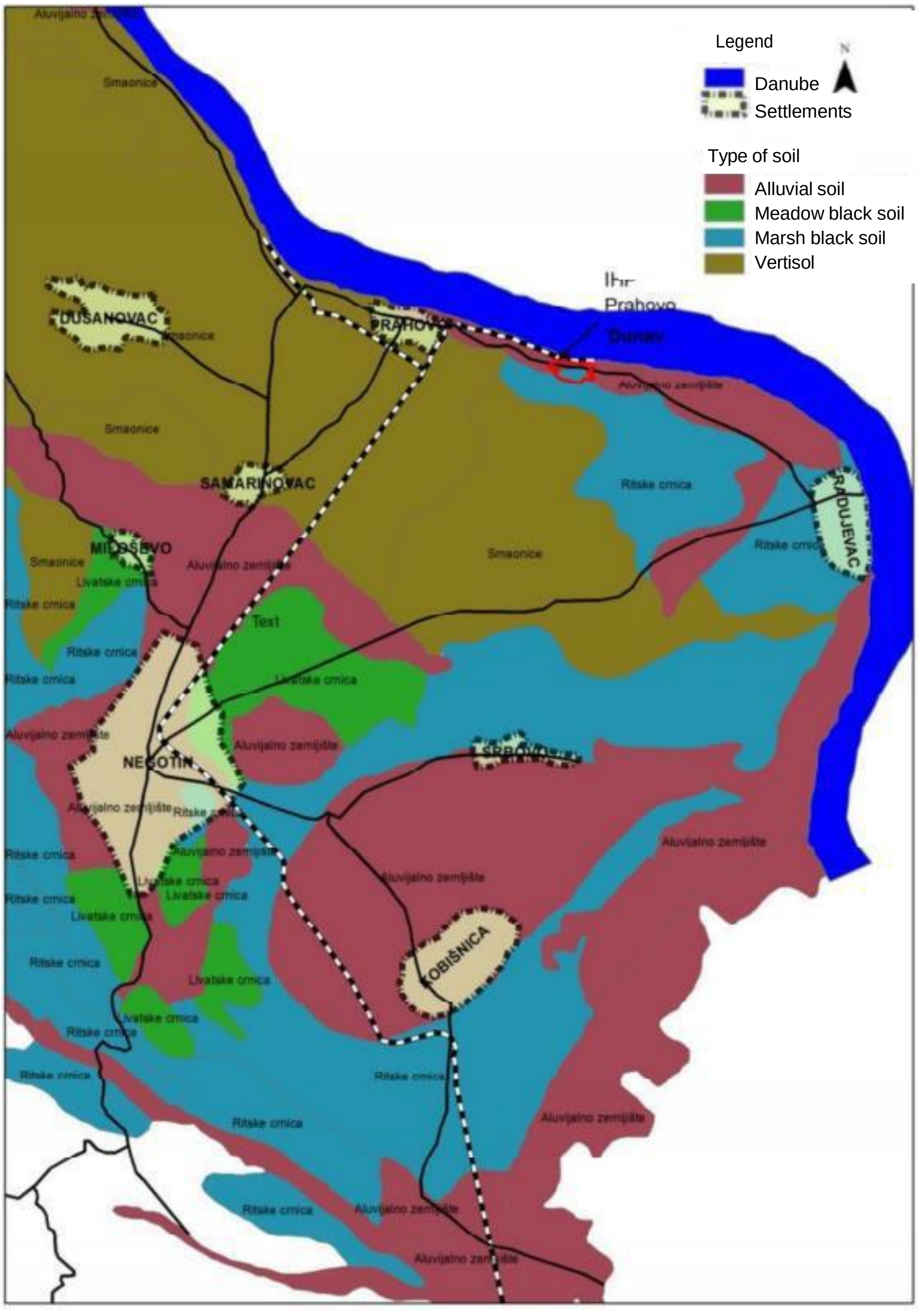


Figure 2.8 Part of the pedological map for Negotin and its surroundings

Geomorphological characteristics

According to the morphological characteristics of the wider terrain, the location in question is an old alluvial terrace and represents the right part of the valley side of the Danube. In this part, the Danube is characterized by a calm flow and passes through a wide almost completely horizontal alluvial plane. The location of the project is located on a sub-horizontal terrain with a maximum elevation of the terrain where the construction of a Waste-to-Energy plant of about 2.50 m is planned (range of absolute terrain elevations of about 47.40 masl-49.90 masl) and with a maximum elevation of the terrain of the Landfill for non-hazardous waste of about 1.50 m (range of absolute terrain elevations of about 46.30 masl-47.80 masl). The location in question, where the construction of Waste-to-Energy plant and the Landfill for non-hazardous waste is planned, is located next to the Danube bank, at a distance of about 500 m in the north direction from the limits of the plant. Based on the terrain reconnaissance, it was established that the terrain is completely stable.

Geological characteristics

In this wide area, the time of origin, as well as the origin itself, are different. The area of the oldest rocks, crystalline shales, sedimentary and volcanic rocks extends from Tekija via Brza Palanka and Štubik to the village of Metriša. In ancient times, this narrow strip of the oldest rocks was the only part of the land in the Negotin region. The western part of Negotin region and Ključ was created before the current geological era, i.e. before the Tertiary Period. This area is called higher as opposed to the Negotin Plain which is called lower. Igneous rocks occupy large areas in Eastern Serbia. Granites of Paleozoic age are represented in the area of Stara Planina and between Deli Jovan, Veliki krš (karst) and Stol. The spacious masses of gabbro are located on Deli Jovan. Of the igneous rocks in Eastern Serbia, andesites are the most represented. Andesites, and Dacite-Andesitic tuffs occupy a large area from Majdanpek in the north, to Knjazevac in the south. In andesite, there are ores of copper, magnetite, tungsten, etc. around Bor and Majdanpek.

Geological structure of the terrain - Data on the geological characteristics of the site in question were obtained on the basis of data obtained from previously performed exploration works, and processed in the geotechnical study.

The basis of the examined terrain of the subject location of the ICP Prahovo complex, and beyond, consists of Pliocene sediments (Pl), which occur at depths of over 18.5 m in the area of the planned Waste-to-Energy plant, i.e. at an absolute level of ~29 masl -30 masl, while in the area of the planned Landfill for non-hazardous waste they occur at depths of over 18 m, i.e. at an absolute level of ~32 masl. Based on the research in the environment, it was noted that the surface of the pliocene was subhorizontal, with a slight drop in the surface of the pliocene from the Danube to the southwest. The pliocene is represented by a marly-clay complex, which in all exploration boreholes in which it is drilled in a wider area is identified with a characteristic thin roof zone of physicochemical change (crust of decomposition up to 1.0 m thick). In the crust of decomposition, dusty marly clay of brown to gray-brown color was found, which quickly turns into hard-plastic low-compressible marly gray-blue clay. This clay is also of small thickness and represents only a transition into a clayey preconsolidated low compressible marl of dark gray-green color. Based on the exploration boreholes, within the existing factory part of the ICP Prahovo complex, to a depth of 30 m as the deepest boreholes, this marl-clay complex is 10-12 m thick, and under it lie compacted sands, weakly connected sandstones and conglomerates. Given the depth of deposition, these sediments are well compacted and low compressible and with favorable characteristics from the aspect of realization of secondary stresses.

The drainage of Pliocene sediments is built by Quaternary sediments, (Q), alluvial terrestrial genesis, gravel with sand G+S, over which lie dusty to medium-grained sands (S^{gr}), while the roof of Quaternary consists of dusty clays (Cl^{du}) of aeolian-aquatic genesis. Quaternary sediments in the zone intended for the construction of the project in question are 17-19 m thick. Quaternary sediments (dusty clay (Cl^{du})) in the geotechnical structure of the terrain of the site in question play the most important role since they are lithological members in which construction works will take place. In this environment, contact will be made between natural and artificial structures, acceptance of loads from the constructed facilities of the planned Power WtE plant, then loads created by the disposal of non-hazardous waste, as well as the realization of most of the secondary stress notations.

Dusty clay (Cl^{du}) is dusty-sandy and dusty-clay composition, medium in the roof, and low in plasticity in the floor of the layer. Occasionally, lenses of bound dusty well compacted sand appear within this environment. It has a relatively low humidity, (always above UWL) hard-plastic and hard-consistency state. It is well consolidated, medium to low compressible, with favorable characteristics from the aspect of permissible load and realization of secondary stresses. With the increase in depth, a change in the granulometric composition is noticeable, where the percentage of sand increases and the percentage of clay fraction decreases. It contains a lot of admixtures of Mn and Fe oxides in the form of oolites and coloring, as well as admixtures of carbonates in the form of powders and concretions, so it depends on the predominantly present admixtures of variable color. Mostly dark brown-brown, and locally (mostly in the floor) and light brown (due to increased amounts of admixtures of evenly distributed carbonate powder). This material is favorable for backfilling trenches, it compacts well and has favorable humidity from the aspect of compaction suitability. In excavation, up to 2.50 m deep, it can be held stable without a support at a slope of 4:1~75°, while excavation of greater depth should be protected by a support, or performed as supporting wall with a stable slope. It is poorly permeable. In hydrogeological terms, this environment is an HG conductor, whereby the drainage of atmospheric waters is mostly carried out through the crack-fissure system of diagenetic secondary cracks.

Sand, (S) as a rule, is dusty, fine-grained, clayey and poorly bonded in roof. Rapidly, with the increase in depth, it passes over fine and medium-grained into coarse and fine-grained sand, locally and into sandy gravel. Practically, this layer of sand is a transition zone from dusty clay to a layer of sandy gravel. Layers and lenses of dusty clay often appear within the sand layer. The layer has a poorly expressed border to the floor and the roof and represents a transition to clean coarse-grained gravel and sandy sediments of the riverbed facies. It is always well granulated and extremely uneven in composition. It is mostly medium to well compacted, medium to low compressible medium, gray-brown to brown. In hydrogeological terms, this environment is an HG conductor. It has favorable characteristics from the aspect of permissible load capacity and realization of secondary stresses.

The layer of sand and gravel (S+G) is heterogeneous and extremely uneven in composition, with an uneven percentage of admixtures of sandy, dusty and clay fractions. In places, it is more clayey (mostly in the roof) and firmly bonded, so it has the characteristics of dry and very hard gravel clay in the mass. Extremely uneven composition, semi-sphered grains. Variable granulations from sandy, fine-grained and well granulated gravel to coarse-grained and very poorly granulated. Changes in the dominant fraction are frequent, so that the sandy fraction dominates in some places and gravel fraction in others. It is extremely well compacted and very low compressible. It is a hydrogeological collector and represents an aquifer horizon that is directly hydraulically connected to the Danube. Favorable characteristics from the aspect of load-bearing capacity and realization of stress notations.

The marl-clay complex (M^{cl}) was not identified in the performed exploration works of the depth of exploration drilling up to 18.0 m in the area provided for the WtE plant and Landfills for non-hazardous waste. It was found in a piezometer well in the zone of the existing factory area of the chemical industry complex in Prahovo. Dusty-clay composition, brownish-brown color, in the roof structure with a lot of admixtures of hydroxide Fe and oxide Mn. It represents the crust of decomposition of the Neogene complex. It is well consolidated, medium to low compressible.

Over the Quaternary sediments there are contemporary sediments, namely anthropogenic heterogeneous filled soil (f^s) and partly humified pedological soil (h^s). These contemporary sediments are small in thickness, 0.30-1.10 m, but locally in piles can be found an embankment of slightly larger thickness. These sediments are macroporous and of poor geotechnical characteristics, so as such they must be removed in the construction zone and, if necessary, replaced with controlled material with installation by layers and with compaction, and with constant control of the achieved compaction. Based on the results of the investigation works, Table 2.4 shows the geological characteristics of the soil.

Table 2.4 Geological characteristics

Sediment	Parameter name	Area designed for WtE plant	Are designed for Landfill for non-hazardous waste
Dusty clay (D^{cl})	Composition	11-23% clay, 68-84% dust and 5-26% sand fraction	10-22% clay, 67-80% dust and 9-13% sand fraction
	Layer thickness	5.0-7.70 m	3.70-5.00 m
	Depth of deposition	approx. 8.00 m	4.10-5.30 m

Sand, dusty (S^{du})	Composition	4-7% clay, 23-59% dust 27-45% sandy fraction and 0-28% gravel	2-14% clay, 21-50% dust 35-76% sandy fraction and 1-6% gravel
	Layer thickness	1.10 m-2.30 m.	1.0-1.80 m
	Depth of deposition	approx. 8.0 m	7.0 m
Gravel (G)	Composition	1-7% clay, 7-40% dust 36-63% sandy fraction and 11-54% gravel	0-2% clay, 3-16% dust 9-31% sandy fraction and 37-73% gravel
	Thickness of a layer of very large gravel with pebbles up to 8 cm	0.70 m	0.30-1.0 m
	Depth of deposition	18.5 m	17.8 m
Marl-clay complex (M^{cl})	Marl-clay complex was not detected during performed exploration works at the drilling depths up to 18.0 m in the area designed for WtE plant and Landfill for non-hazardous waste		

As a whole, it can be concluded that all alluvial sediments are medium to well compacted and generally low compressible environment, with favorable characteristics from the aspect of permissible load and realization of secondary stress notations.

2.6.2 Hydrologic and basic hydrological characteristics of the terrain

Hydrological characteristics

The Danube River flows in the immediate vicinity of the site (≈ 500 m), and its direction of flow is to the east. The Danube is one of Europe's largest rivers and undoubtedly the most important waterway in Europe. It is 2,857 km long, from the Black Forest to the Black Sea. This river connects 17 countries. The Danube River flows through Serbia in the length of 588 km, and the 220 km long waterway represents the natural border between Serbia and Romania.

Considering that the Danube is an international river, on 29 June 1994 the Convention on Cooperation for the Protection and Sustainable Use of the River Danube was signed in Sofia (Bulgaria), which came into force in October 1998 when it was ratified by the ninth signatory. Serbia became a contracting party by adopting the Law on Ratification of the Convention on Cooperation for the Protection and Sustainable Use of the River Danube ("Official Gazette of the SRY - International Treaties", no. 2/2003); The Convention aims to ensure that surface and groundwater in the Danube River Basin is managed and used in a sustainable and equitable manner, including:

- conservation, improvement and rational use of surface and groundwater;
- preventive measures to control hazards arising from accidents involving floods, ice or hazardous substances;
- measures to reduce the burden of pollution entering the Black Sea from sources in the River Danube Basin.

In order to prevent, control and reduce transboundary impact, and based on the Convention, multilateral cooperation has been achieved in developing, adopting and implementing appropriate legal, administrative and technical measures and ensuring national prerequisites and the necessary basis for ensuring effective protection of water quality and sustainable development.

The International Commission for the Protection of the Danube River (ICPDR), in the period August-September 2007, organized a survey (Joint Danube Survey 2 – JDS2) with the support of competent institutions from all "Danube countries", with the aim of collecting comparable information on water quality for the entire course of the Danube. During JDS2, the Serbian portion of the Danube flow was examined, as well as selected tributaries (Tisa, Sava and Velika Morava), with the participation of the Serbian national team.
The first joint research of the Danube (Joint Danube Survey 1 - JDS1) in 2001 was the first expedition whose task was to obtain comparable results of water quality along the entire course of the river. JDS1 has shown that the Danube is still a habitat for numerous rare species, and that there is significant biodiversity in the basin. Research have also indicated the presence of organic and microbiological pollution, heavy metals, oil/petroleum from ships, as well as pesticides and other hazardous substances. The good side of this research was also the "raising public awareness" of the need to implement measures to reduce the pollution of the Danube.

The JDS2 survey program was expanded in relation to JDS1 by additional parameters and sampling locations, and some key tributaries of the Danube were examined for the first time. For the first time, a systematic research of fish, as well as hydromorphological indicators, was carried out along the entire course.

The results of the JDS2 National Programme reveal a generally poorer water quality status of the main tributaries of the Danube in Serbia compared to the main stream. The research revealed increased pollution of sediment with heavy metals, organochlorine pesticides, but also PCBs and PAHs. The values of the saprobic index based on the phytobenthos community indicate the Class II of water quality, i.e. β-mesosaprobic status. Based on the composition of the macroinvertebrate community, the water quality of the main course of the Danube was within the limits of Class II (21 sites) or Class II-III (5 sites), from β-mesosaprobic to β-α-mesosaprobic status. The improvement of the water quality of the Danube indicates progress in comprehensive management at the international level, which is why such an approach should be implemented at the national level as soon as possible.

The ICPDR developed its first “Danube River Basin Management Plan” (DRBMP) in 2009, to provide suitable habitats for indigenous aquatic species, assess status and measures to achieve “good status” by 2015. Given the fact that all waters have not met the target in six years and that river basins are dynamic systems that require a flexible management approach, the EU Directive (Water Framework Directive - WFD) foresaw the update of the River Basin Management Plans in 2015, 2021 and subsequent cycles.

DRBMP updated in 2021[10] notes that the assessment of environmental status/potential according to WFD requirements has been significantly improved in the Danube River Basin, compared to 2015. Biological sampling methods for small and medium rivers in accordance with the WFD are already a part of the standard monitoring programmes in most Danube countries. It was concluded that the further work in the field of collecting basic information on the prevalence of invasive alien species and their impact on the native biota is necessary. Special efforts should be focused on the development of effective tools to assess bioinvasion pressures levels, as well as to design appropriate mitigation measures.

In terms of chemical status, a comparison with 2015 can only be made for priority substances in water, for which the percentage of good chemical status fell from 71% to 67.7% in 2021. This decrease was caused primarily by changes in the chemical status attributes and more comprehensive monitoring information collected (more priority substances were analysed thanks to improved analytical

[10] Source: drbmp_2021_final_hires.pdf (icpdr.org)

methodologies, new priority substances from Directive 2013/39/EU were analysed). While the results for all priority substances in the biota led to a failure to achieve good chemical status in all observed water bodies, the situation improved significantly after neglecting ubiquitous brominated diphenyl ethers and mercury when 28.2% of water bodies achieved good chemical status. A persistent problem in assessing chemical status is that in some countries certain priority substances are not yet analysed due to the lack of analytical instrumentation and due to the lack of appropriate or available sufficiently sensitive methods.

Systematic monitoring of the water levels of the Danube River in the area of the subject location is carried out by the Hydrometeorological Institute through the Prahovo hydrological station. Figure 2.9 shows the basic data of the Prahovo hydrological station[11] for monitoring the characteristics of the surface water regime are presented below, and Table 2.5 shows the data on the water level of the Danube River measured at the Prahovo hydrological station for 2022.

Station	PRAHOVO
River	DANUBE
Basin	BLACK SEA
Foundation year	1925
LEVEL “0” (altitude)	29.02
Distance from the river mouth (km)	861.000
Basin area (km^2)	577085

Figure 2.9 Basic data of the hydrological station Prahovo

[11] *Data source: Hydrological Yearbook 1. Surface waters 2022, Republic Hydrometeorological Institute, 2023*

Table 2.5 Data on the water level of the Danube for 2022 at the hydrological station Prahovo

Station:	**Prahovo**	Level "0" (m alt.):	29.02
River:	**Danube**	Distance from the river mouth (km):	861.0
Code:	42095	Basin area (km^2) :	577085

WATER STAGES FOR 2022 (cm)

DAY	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	274	103	276	98	208	154	41	-	-16	133	-6	275
2	319	96	250	103	211	154	32	-71	-17	112	9	245
3	366	90	234	124	265	151	23	-68	-19	128	10	221
4	367	91	244	210	273	140	33	-67	-18	153	10	183
5	350	90	220	216	235	119	47	-64	-19	178	2	168
6	368	90	190	239	254	111	55	-61	-15	193	-6	160
7	347	86	177	232	240	113	59	-58	-13	216	-12	138
8	367	92	162	277	206	112	56	-54	-12	227	-15	145
9	391	98	145	281	199	114	46	-55	-13	247	-17	162
10	397	132	136	275	197	115	19	-62	-20	250	-19	155
11	379	151	126	288	182	117	14	-66	-34	254	-15	156
12	349	145	117	298	192	122	11	-68	-42	244	-3	193
13	344	147	105	285	207	151	9	-70	-46	184	5	252
14	336	168	109	313	169	198	23	-72	-51	172	20	256
15	311	182	93	316	161	225	14	-	-55	145	5	277
16	305	176	90	276	192	243	14	-	-58	95	7	294
17	261	189	75	277	187	209	2	-	-51	85	3	364
18	265	174	64	294	182	200	-5	-	-41	77	-3	394
19	270	170	68	274	172	174	-15	-	-14	62	-8	436
20	232	169	76	290	176	130	-23	-	-11	52	-9	428
21	202	189	82	295	187	124	-31	-	24	39	18	434
22	158	217	86	260	171	98	-40	-	96	18	81	414
23	127	240	84	237	183	87	-47	-	111	6	133	394
24	135	280	82	202	174	75	-56	-66	121	5	203	413
25	138	296	72	190	166	66	-59	-60	139	1	272	415
26	132	307	70	213	155	52	-60	-55	151	-4	268	377
27	116	287	81	233	144	40	-67	-40	196	-12	297	339
28	103	268	78	219	148	28	-70	-25	185	-20	310	387
29	81		68	213	151	24	-	-11	186	-23	321	419
30	79		64	190	148	27	-	-10	182	-24	304	380
31	98		74		164		-	-13		-19		390
min	74	72	55	96	133	21	-	-	-60	-26	-23	127
day	29	7	30	1	27	28	-	-	16	30	10	8
hour	16:00	05:00	09:00	17:30	06:30	23:00		.	04:00	21:00	15:30	06:00
ave.	257	169	123	241	190	122	-	-	28	102	72	299
max	422	322	286	320	319	250	-	-	215	264	343	452
day	10	26	1	15	4	16	-	-	30	12	29	19
hour	21:30	22:30	02:00	02:00	03:00	21:30	-:	-:	05:00	07:30	02:00	23:30
			Yearly min:	-	Average					Yearly max:		-
			Date:	-	yearly:		-			Date:		-

Systematic monitoring of groundwater levels in the wider area of the site in question is performed by the Hydrometeorological Institute through the Negotin-Kladovo[12] groundwater hydrological station, the basic data of which are shown in Table 2.6. Table 2.7 shows the data on groundwater levels measured at the station in 2022.

[12] *Data source: Hydrological Yearbook 2. Groundwater 2022, Republic Hydrometeorological Service, 2023*

Table 2.6 Basic information about the groundwater station Negotin-Kladovo

Ord.no. Stat.ID	PIEZOMETER location-mark	Station rank No. of meas.	Latitude Longitude ° ′ ″	Level "0" (masl)	Above gr. pipe pt. height (m)	Depth of built pipe (m)	Operation start date	Side
Name and number of water body: **Negotin Kladovo - alluvium (31)**							Total piesometers: 1	
82 N-1	Negotin (N-1)	Main. daily	44 14 17 22 32 29	42.36	0.44	16.60	37653	N: 38 T: 23

Table 2.7 Groundwater level for 2022 at the Negotin-Kladovo hydrological station

GROUNDWATER LEVELS (cm) YEAR: 2022

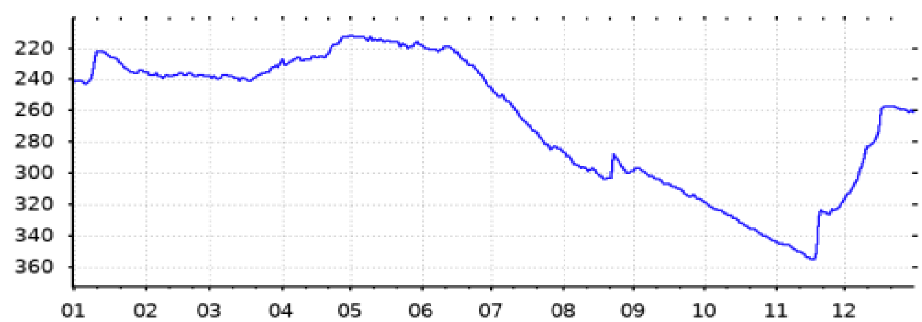
Station ID: N-1
Piezometer: Negotin (N-1)
Water body: 31 D_GW_I_6
Level 0 (masl): 42.36
Site level (masl): 41.92

Day	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	242	235	238	229	212	218	245	286	299	318	343	317
2	241	235	239	227	212	219	248	287	297	319	344	314
3	241	237	238	231	213	220	249	289	297	320	345	313
4	241	237	239	230	213	220	251	289	298	321	345	311
5	241	237	240	229	213	221	251	291	299	322	346	309
6	242	236	239	228	213	221	250	294	300	323	346	306
7	243	238	237	227	213	221	253	294	301	323	346	303
8	241	238	237	226	214	222	254	295	302	324	347	298
9	239	239	237	226	215	221	254	297	302	324	348	295
10	231	238	238	228	213	221	256	296	303	325	349	289
11	223	237	238	228	215	219	258	297	304	326	350	283
12	222	238	239	227	214	219	260	299	304	327	350	283
13	222	238	239	227	215	219	262	298	305	327	351	281
14	222	237	241	227	214	220	264	297	307	329	352	280
15	223	237	239	225	215	221	266	298	307	329	354	277
16	224	236	239	225	216	223	267	300	307	330	354	273
17	225	236	240	226	215	223	269	301	308	332	355	259
18	226	237	241	225	215	226	270	302	309	332	355	258
19	226	237	241	225	216	227	273	304	309	333	351	257
20	227	236	240	226	216	228	273	304	310	334	329	257
21	229	236	239	224	216	230	274	303	310	335	324	257
22	230	237	238	223	216	231	277	303	311	336	325	257
23	232	238	237	219	219	231	278	288	313	336	325	257
24	233	238	236	218	217	233	280	290	314	337	326	258
25	234	237	236	218	218	234	282	292	315	338	326	259
26	235	237	235	217	220	236	282	294	315	339	323	259
27	235	238	235	215	219	237	285	296	314	340	324	259
28	236	238	233	213	219	239	283	298	316	340	323	260
29	236		232	213	217	242	283	300	316	341	322	261
30	234		231	213	216	244	284	300	317	342	319	260
31	234		232		218		284	299		343		261
Min.	243	239	241	231	220	244	285	304	317	343	355	317
Ave.	233	237	238	224	215	226	267	296	307	330	340	278
Max.	222	235	231	213	212	218	245	286	297	318	319	257

Yearly max: 212
Date: 02.05.2022

Ave. yearly: 266
T (°C): YES

Yearly min: 355
Date: 18.11.2022



UWL: 38

Hydrogeological characteristics

The hydrogeological properties of the examined terrain are a consequence of the geological structure, lithological composition, and morphology of the wider zone of the subject location. The surface of the terrain of the subject site in a layer up to 19 m thick is built of quaternary sediments, which are the main hydrogeological conductors of the sinking of atmospheric sediment towards the deeper parts of the terrain. Lithologically speaking, hydrogeological conductors are dusty clay (Cl^{du}), sand (S^{du}) and a clayey layer of sandy gravel (G+S). The layer of clean sandy gravel (G+S) at depths below 14 m is an aquifer and represents a hydrogeological collector, of high water permeability, in which a compacted groundwater source was found during exploratory drilling. The marly-clay complex (M^{cl}) is a complete hydrogeological insulator.

During exploratory drilling and formation of piezometers at the location of the future WtE plant in May 2021, UWL was determined at a relative depth of UWL=-14.50 m. In September 2022, a piezometer was formed in the zone of the planned Landfill for non-hazardous waste and groundwater was found at a depth of about UWL ~15.80 m. At that time, it was also performed by measuring the UWL from the already installed piezometers in the zone of the planned WtE plant and it was determined that it was issued at depths of about 15.0-15.30 m. This slightly lower groundwater level is the result of a prolonged dry period and a lot of low water levels of the Danube. Aquifer was determined to be of the compacted type. Due to the lithological composition and the proximity of the Danube, this aquifer is in constant hydraulic connection with the Danube, through a layer of gravel so that all seasonal oscillations related to the flow of the river are transferred to the aquifer. Due to this, a significant oscillation of the UWL can also be expected. It is noticeable that due to the proximity of the Danube at the location in question, the direct impact of the Danube and the "meniscus" phenomenon is felt. Namely, with the approach of the Danube, the groundwater level drops and approaches the level of the water mirror of the Danube itself. Given the depth of the UWL and the characteristics of the planned Eco Energy complex, it can be concluded that the groundwater level will have no impact either in the construction phase or later in the exploitation phase of the project in question.

According to the Decision on Determining the List of Waters of the First Order ("Official Gazette of the RS", no. 83/2010), the Danube River is classified as 1. Interstate waters 1) natural watercourses. The facilities in question are located in the area of water unit number 12 "Danube-Timok-Negotin", according to the Rulebook on the determination of water units and their boundaries ("Official Gazette of the Republic of Serbia", No. 8/2018). The Danube near Prahovo according to the Regulation on the Categorization of Watercourses ("Official Gazette of the SRS", no. 5/1968) is classified as a category II watercourse (from the Hungarian border to the Bulgarian border), which means that the water should meet the provisions of the Class II of river waters.

According to the Operational Plan for Flood Defense for Waters of the First Order for 2024 ("Official Gazette of the RS" no. 117/2023), the subject location belongs to sector D.1, and is covered by section D.1.1. Right bank of the Danube at the confluence of the Jasenička River; protected floodplain Open cassette "Radujevac-Samarinovac-Miloševo". Protection against external and internal waters and ice on the subject section of the water unit "Danube and Timok-Negotin" is carried out within the Hydromelioration System DD 7. Negotin plain Balta Mare (length of canal network 6,823 meters). The recipient of the canal network is Jasenička reka.

For the assessment of natural disaster hazards for the chemical industries in Prahovo, the „Institut za integrisanu bezbednost zaštita i preventiva DOO" ("Institute for Integrated Safety Protection and Prevention LTD") Novi Sad prepared in May 2023 the Disaster Risk Assessment and the Protection and Rescue Plan in accordance with the provisions of the Law on Disaster Risk Reduction and Emergency Management, Articles 15 and 17 ("Official Gazette of the RS" no. 87/2018), based on the Regulation on the content, manner of preparation and obligations of entities related to the preparation of disaster risk assessment and protection and rescue plans ("Official Gazette of the RS", no. 102/2020) and on the basis of the Instruction on the methodology for the preparation of disaster risk assessment and protection and rescue plan ("Official Gazette of the RS" no. 80/2019).

Decision on granting consent to the Disaster Risk Assessment, Ministry of the Interior of the Republic of Serbia, Sector for Emergency Situations, Department for Emergency Situations in Bor - Department for Civil Protection and Risk Management, no. 217-118/2024 dated 5 January 2024 is attached to the Study. The assessment identified hazards, sources and forms of endangerment, possible effects and consequences, threat-risk assessment, consideration of forces, means and preventive measures to respond to hazards caused by natural disasters and other disasters, protection and saving of life and health of people, animals, protection of material, cultural goods and the environment.

Floods occur as a result of overflow of water beyond natural and artificial limits, i.e. when the inflow of water exceeds the capacity of natural retention or infiltration. The direct causes of floods are most often: precipitation (rain and snow), the appearance of ice on rivers, the state of water levels at the time of its rise, meandering of the flow, the occurrence of landslides, etc.

Figure 2.10 Map of the Danube river basin district in the municipality of Negotin

One of the rivers of the second order, which can potentially endanger the settlement of Prahovo, and thus the complex in question is Jasenička River with its tributaries and constructed canals, and a large amount of water and sediment can cause flooding in the Negotin plain and cause damage to agriculture. Despite the fact that the lower course of this river is channeled, it can damage the roads in the vicinity of Negotin and cause traffic interruption. The following roads are particularly endangered:

Negotin-Štubik, Negotin-Jabukovac, Negotin - Radujevac, Negotin - Samarinovac and a number of local roads.

As for the location in question, it was noted that due to the proximity of the Danube at the location in question, the direct impact of the Danube and the appearance of the "meniscus" are felt. Namely, with the approach of the Danube, the groundwater level drops and approaches the level of the water mirror of the Danube itself.
Based on the analysis of the scenario for the Most Likely Adverse Event and the risk assessment, it was concluded that the risk of flooding is moderate, which does not condition their treatment, but preventive measures are always necessary to control possible adverse consequences:

Ord. no.	DANGER	LEVEL OF RISK	ACCEPTABILITY
1.	Floods	Moderate	Acceptable

Flood protection is an important segment of the complex of works and measures related to river basin management. During the development of this area of water management, the principle was primarily applied in Serbia, which included the construction of significant and expensive investment facilities (dams, reservoirs, embankments, regulation of watercourses, relief canals, etc.), in order to ensure safety for people and goods located in flood zones. Each year, at the level of the Republic, an Operational Plan for Flood Defense is adopted, which contains the name of legal entities responsible for organizing and implementing flood defense in the territory of the Republic of Serbia and the names of flood defense managers and other responsible persons.
The municipality of Negotin is covered by sector D.1.

Schematic designations of sectors, sections, protective water facilities, protected floodplains and criteria for declaring regular and emergency flood defense against external waters and ice congestion are given below (Excerpt from the Operational Flood Defense Plan of the Municipality of Negotin):

<table>
<tr><td>Sector</td><td colspan="5">Sector name
Description and length of flood defense system</td></tr>
<tr><td>Section ID</td><td>Description of a section</td><td>Protective water bodies on which measures of flood defence are conducted</td><td colspan="2">Criteria for declaring state measures of flood defence</td><td>Protected flood area</td></tr>
<tr><td></td><td>Water flow

Name

Length of flood defense system</td><td>1.

2.</td><td>W

WS
RD
ED
R
S

CS</td><td>Water meter ,
(R) –RHMS
(L) – local;
b-bar,
lim-limnigraph,
d-digital
i-tab.1, iv-tab.2;
„0“ – zero level
max observed water stage (date)
Regular defense – water stage & level
Emergency defense – water stage & level
Reference water stage for reference Q_%,
Critical stage / level of defensive system</td><td>Coffer
Regulated area
Node

Length of flood defense system

Municipality</td></tr>
<tr><td>D.1.</td><td colspan="5">NEGOTIN
Danube at Negotin and tributaries Timok and Jasenička river 53.05 kom
„Borsko Lake“ dam</td></tr>
</table>

D.1.1	Danube, tributary Right bank at the confluence of Jasenička river Jasenička river 19.68 km	1. RR 2.	Right embankment along Danube near the confluence of Jasenička river up to high terrain at (0+000), 1.0 km, with Danube high terrain 2.26 km (0+000 -2+262) total 3.26 km Left embankment along Jasenička river from high terrain at (2+262), to the confluence of Dupljanska river (14+377), 12.12 km, with** left embankment along Dupljanska river from the confluence to Jasenička river, 2.30 km, ** right embankment along Dupljanska river from the confluence to Jasenička river up to high terrain (at km 0+731), 073 km, ** high terrain, 0.92 km (0+731-1 +651) and ** right embankment from high terrain uprstream, 0,35 km (1+651-2+000), total 16.42 km	W Danube, confluence of Jasenička river (L); I; „0“ 30.00 WS 784 (20.04.2006.) RD 450 34.50(announced Q>8.000 m³/s) ED 650 36.50 RS CS3 860 38.60 W Jasenička river: km 11+950 (L); „I“ 42.30 WS 350 (7.11.1976.) RD 80 43.10 ED 170 44.00	„Radujevac – Samarinovac – Miloševo“ Open coffer 19.68 km NEGOTIN

D.1.2	Timok, Jasenička river at Negotin 25.77 km	1. 2.	Right embankment along Jasenička river from confluence to Danube up to high terrain at (1+000), 1.0 km, with high terrain 3.30 km (1+000-4+296) and from high terrain at (4+296) upstream 8.32 km total 12.62 km Left embankment along Timok river to the confluence to Danube up to traffic bridge to Bregovo, 12.15 km, with** left embankment along Sikoljska river from the confluence to Timok, 1.00 km, total 13.15 km	W Danube, confluence of Jasenička river (L); I; „0“ 30.00 WS 784 (20.04.2006.) RD 450 34.50(announced $Q>8.000\ m^3/s$) ED 650 36.50 RS 860 38.60 CS3 860 38.60 W Jasenička river: km 11+950 (L); „I“ 42.30 WS 350 (7.11.1976.) RD 80 43.10 ED 170 44.00 W Timok: km 3+200 (L); „I“ 31.78 WS 633 RD 400 35.78 ED 500 36.78	„Bukovče – Negotin – Srbovo - Kobišnica“ Open coffer 25.77 km NEGOTIN

D.Dj.1.1	Danube, „Djerdap 2“ dam		Accumulation dam „Djerdap 2“ on Danube. Operation regime according to Convention from 1998. Flood Evacuation plan according to the Rulebook of Serbia-Romanian joint service for energetics	Monitoring profiles High water HPP „Djerdap 2“ Kladovo (km 933+000)	„Djerdap 2“ NEGOTIN

2.6.3 Seismological characteristics of the terrain

The Mercalli-Cancani-Seiberg scale, better known as the Mercalli Scale (MSC), which contains 12 seismic degrees and is used to assess quakes due to earthquakes, is most commonly used to assess seismic activity in the Republic of Serbia.

In eastern Serbia, seismic micro-regionalization is characterized by possible earthquakes of intensity VII-VIII degree of MCS. The area in which the subject Eco Energy complex in Prahovo will be located is classified as a terrain with a level VIII of seismic intensity according to the MCS, for a period of 500 years.

The European Macro-Sismic Scale (EMS-98) is the basis for estimating seismic intensity in European countries. EMS-98 intensity indicates how strongly an earthquake affects a particular site. According to the seismic hazard map of the Republic of Serbia[13] (Figure 2.12), seismic parameters (soil hazard expressed in gravitational acceleration units – Acc(g) and maximum expected earthquake intensity – Imax expressed in degrees of macroismic intensity (EMS-98)) for the return period of 95, 475 and 975 years, for the location of the project in question are shown in Table 2.8. Figure 2.11 shows the scale of the degree of seismic intensity and the damage classification.

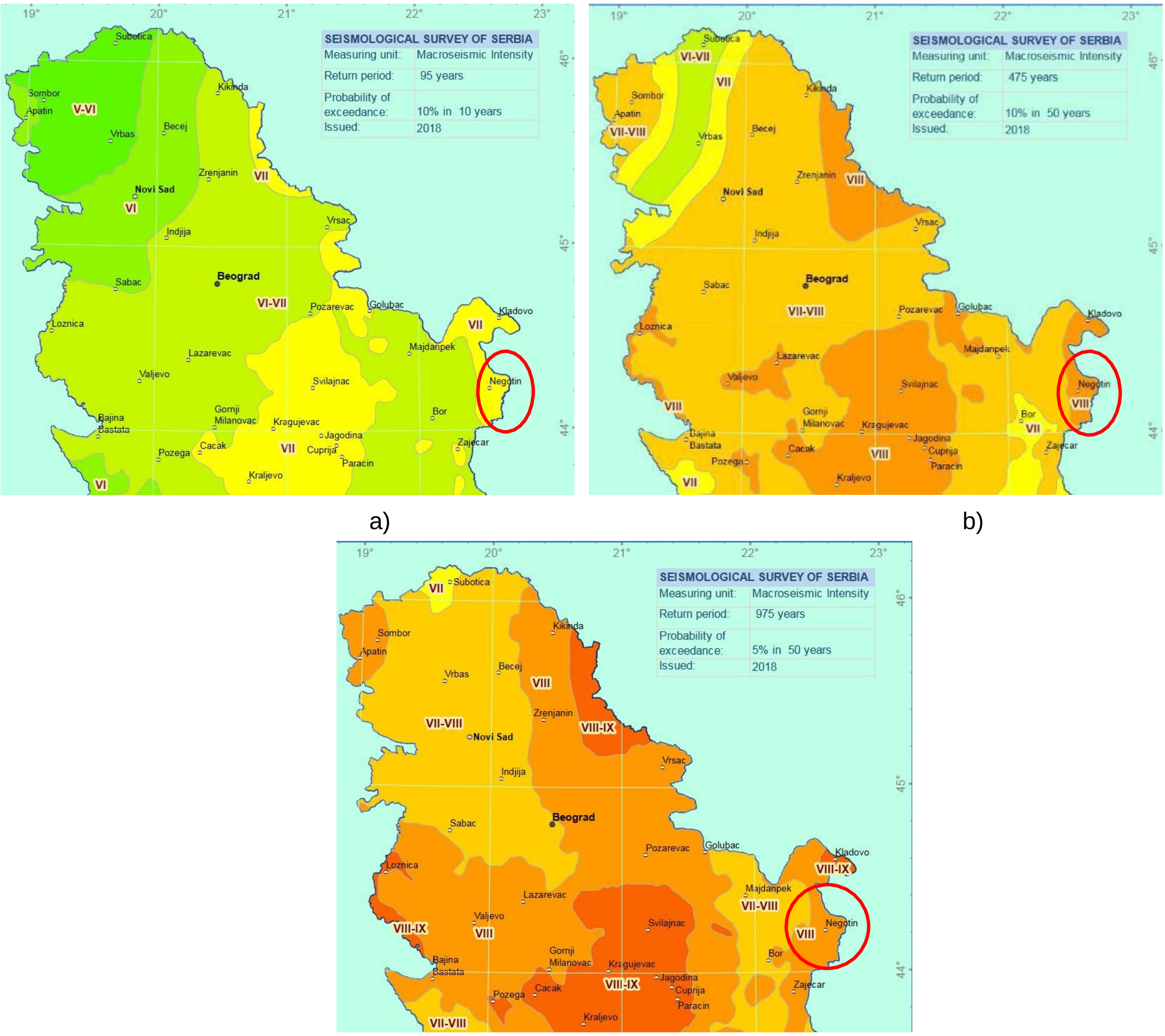
Table 2.8 Seismic parameters for the subject location for different return periods

No.	Seismological parameters	Return period (years)		
		95	475	975
1.	Acc (g) max	0.09	0.15	0.15
2.	Imax (EMS-98)	VII	VIII	VIII

EARTHQUAKE	NOT FELT	WEAK	LIGHT	MODERATE	STRONG	VERY STRONG	SEVERE	VIOLENT	EXTREME
POSSIBLE DAMAGES	NONE	NONE	NONE	VERY SMALL	SMALL	MODERATE	MODERATE TO SEVERE	SEVERE	VERY SEVERE
PGA MAX RANGE (% g)	<0.05	0.6	1.2	2.5	5	10	20	40	80
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X

Figure 2.11 Seismic intensity scale and damage classification

[13] *Data source: Seismic hazard maps by acceleration and macro-seismic intensity parameter, Seismological Survey of Serbia*



a)
b)
c)

Figure 2.12 Seismic hazard maps for return periods: a) 95 years; b) 475 years; c) 975 years

In accordance with the determined earthquake intensities, earthquakes in the area of the location in question can vary from a strong earthquake (VII) to a harmful earthquake (VIII).

The facilities within the Eco Energy complex are designed in accordance with the aforementioned seismological data (facilities made of solid construction material, reinforced concrete, steel and prefabricated elements are envisaged).

The company Elixir Prahovo has not recorded a stronger earthquake threat in the past 50 years. The municipality of Negotin has not been affected by a stronger earthquake in the last 50 years.

Considering the above characteristics of the area and the project in question, it can be concluded that it is not necessary to process a particularly accidental earthquake scenario within the modeling of accidental situations presented in Chapter *7. Environmental impact assessment in case of accident* of this study.

2.7 Data on the source of water supply (distance, capacity, vulnerability, sanitary protection zones) and on basic hydrological characteristics

The hydrographic network and water potential of the Municipality of Negotin consists of the Danube River. According to the Regulation on the Categorization of Watercourses ("Official Gazette of SRS", no. 5/1968), the Danube River belongs to the II category of waters. The Danube, as the largest river in the country and the second in Europe, has a length of 2,857 km, of which 588 km flows through the Republic of Serbia, while the Danube flows 31 km through the municipality of Negotin. The average flow of the Danube is 6,500 m^3/s.

Springs

The "Barbaroš" spring for drinking water supply of the Prahovo settlement and the chemical industry complex in Prahovo, is located at a distance of about 7 km northwest of the complex in the area of the Dušanovac village hill and consists of capped springs and wells (see Figure 2.13). The "Barbaroš" spring is a water resource formed within the alluvial and upper Miocene aquifer, Sarmatian aquifer complex. The aquifer layer is composed of alluvial coarse-grained sands, gravels and Upper Miocene decomposed sandstones and limestones, which lie on watertight lower Cretaceous formations, of flysch-like character. It is characterized by significant distribution, good filtration characteristics and favorable quality of capped groundwater. Primary recharge of groundwater is carried out at the expense of infiltration by atmospheric precipitation, i.e. by underground inflow, and secondary by filtration of water from smaller surface streams and sources into permeable aquifer sediments of sarmates. Groundwater discharge is carried out in several ways: along fault structures, by the appearance of springs and sources (for example, the "Barbaroš" spring is the only source of the ascending type), by underground runoff towards the east and southeast (towards the Negotin Plain and the alluvium of the Danube) and artificially, by the operation of exploitation wells of springs. Under the current conditions, the "Barbaroš" spring consists of five exploitation wells with reduced capacities Bn-1 and Bn-3 (maximum capacity approx. Q=2h(20÷25)=40÷50 l/s), B-1a and B-3a (maximum capacity approx. Q= 2h(4÷5)=8÷10 l/s) and Bk (maximum capacity approx. Q= 5 l/s), gravity pipeline, pumping station "Kusjak" and reservoirs "Kusjak" and "Negotin". In the current conditions, primarily due to the reduction of the number of consumers in this region, and thus the reduction of the need for sanitary water, only the well Bn-1 is located at the source "Barbaroš" in continuous exploitation, while other wells can, if necessary, be occasionally switched on.

The main water supply from the Samarinovac settlement to the chemical industry complex in Prahovo was built in 1987. The pipeline is connected to the main pipeline, Negotin reservoir – Negotin settlement, diameter Ø400 mm. The water reaches the "Negotin" reservoir from the "Barbaroš" spring. The main water supply, from the connection of Samarinovac to the junction for the settlement of Prahovo, is made of PVC pipe DN 280 for 6 bar, about 2.6 km long. From the junction for the settlement of Prahovo, pipes DN 225 were installed, in the length of about 1.9 km.

Figure 2.13 The position of the chemical industry complex in Prahovo in relation to the water supply source of the Prahovo settlement

In the part of the settlement of Prahovo, with predominantly residential buildings, a ring system water supply network was constructed, which increases the safety of power supply, in four main rings, with diameters of pipes DN 160, 140, 125 and 100, to which secondary pipelines are connected. The water system is supplied by a Ø225 mm inlet, from the direction of Samarinovac. There is a pressure booster station at the entrance to the village. The chemical industry complex is also supplied by Ø225 mm PVC pipes.

2.8 Display of climatic characteristics with appropriate meteorological indicators

Climatic characteristics and meteorological conditions are an important factor for assessing the impact of the planned project in the observed area.

Negotin is located in a plain surrounded by mountain ranges (Miroč, Crni Vrh and Deli Jovan) and open space on the east and south sides, which all sets the ambience for a very specific climate of Negotin. Due to the warmest summers and the harshest winters, Negotinska Krajina is the most continental area of eastern Serbia.

The nearest measuring station at which the Republic Hydrometeorological Institute (RHMSS) performs meteorological measurements is Negotin, which is located about 10 km southwest of the location of the chemical industry complex in Prahovo.

Below is an overview of climatological data[14] from the meteorological station Negotin φ 44°14N λ 22°32E H = 42 m, for the period 2010-2022, which was prepared on the basis of data taken from the Meteorological Yearbooks of the RHMSS. As the technical regulation of the World Meteorological Organization defines climatological standard normal values as the mean values of climatological data calculated for consecutive periods of 30 years, the climatological data from the measuring station

[14] *Data source: Meteorological Yearbook 1 climatological data 2010-2022., Republic Hydrometeorological service of Serbia, 2023*

Negotin for the period from 1991-2020 are also presented below. downloaded from the official website of RHMSS.

Table 2.9 Average annual values of climatological data 2010-2022

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Temperature (°C)													
Med.	12.2	12.3	13.2	12.9	12.7	13.7	13.1	13.2	13.1	13.9	13.7	13.1	14.0
Max.	17.2	17.9	18.9	17.9	17.4	19	18.4	18.8	18.6	19.5	19.2	18.6	19.7
Min.	7.7	6.8	7.5	7.8	8.5	8.3	8.1	7.6	8.3	8.6	8.4	7.8	8.4
Relative humidity (%)													
Average	72	67	64	71	77	69	71	66	73	70	69	67	66
Solar radiation duration (h)													
Insolation (h)	1995.9	2497.8	2582.8	2220.1	1897.8	2353.0	2195.5	2364.2	2223.9	2333.4	2306.9	2342	2563.6
Ave. cloudiness	5.5	4.2	4.2	4.9	5.9	4.5	4.8	4.5	5	4.6	4.8	4.9	4.3
Precipitation (mm)													
Ave. monthly sum (mm)	737.1	352.4	532.5	700.1	1237.2	732.1	744.7	565.5	738.6	569.3	571.6	590.9	559.2
Max. sum (mm)	35.3	26.7	42.8	38.9	161.3	91.4	137.1	45.2	38.2	34.1	37.3	35.9	33.0

Table 2.10 Wind frequency for the period from 2010 to 2022

Freq. (m/s)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
N	-	71	75	77	81	71	77	66	-	71	68	72	77
NE	-	116	100	116	123	121	102	81	-	115	103	109	108
E	-	154	140	150	184	144	128	126	-	145	129	106	116
SE	-	66	42	34	58	34	42	53	-	43	35	49	40
S	-	25	29	29	35	26	32	24	-	25	25	35	26
SW	-	67	70	68	54	62	69	85	-	58	68	84	85
W	-	285	321	279	227	279	310	343	-	290	339	333	306
NW	-	72	80	89	78	94	111	83	-	74	81	72	95

Table 2.11 Wind speeds for the period from 2010 to 2022

Speeds (m/s)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
N	-	1.1	1.1	1.1	1	1.1	1.1	0.9	-	1.1	1	1.1	1.2
NE	-	1.2	1.1	1.3	1.2	1.3	1.2	1.3	-	1.3	1.2	1.3	1.3
E	-	1.6	1.6	1.6	1.6	1.8	1.7	1.8	-	1.6	1.6	1.7	1.6
SE	-	1.2	1.3	1.2	1.1	1.1	1.2	1.2	-	1.2	1.2	1.2	1.4
S	-	1.2	1.3	1	1.1	1.5	1.3	1.3	-	1.1	1.4	1.3	1.3
SW	-	1.9	2	1.8	1.9	2	2	2.2	-	1.7	1.9	2.2	2.2
W	-	3.5	3.8	3.6	3.4	3.5	3.8	3.8	-	3.5	3.5	3.9	3.4
NW	-	1.6	1.5	1.3	1.2	1.3	1.3	1.2	-	1.3	1.1	1.2	1.4

Table 2.12 Average monthly, annual and extreme values for the standard climatological period 1991-2020

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Year
AIR TEMPERATURE (°C)													
Normal Value	0.6	2.5	7.3	12.9	18.1	22.2	24.1	23.7	18.1	12.1	6.3	1.4	12.4
Medium maximum	4.2	6.9	12.8	18.7	23.9	28.0	30.4	30.5	24.8	17.8	10.3	4.7	17.8

Medium minimum	-2.9	-1.5	2.3	7.0	11.9	15.6	17.3	17.0	12.5	7.5	3.0	-1.7	7.3
Absolute maximum	21.0	23.5	26.6	32.0	35.5	41.2	42.6	40.4	36.1	32.5	25.9	19.4	42.6
Absolute minimum.	-26.7	-27.5	-14.0	-4.9	1.4	3.1	7.5	7.1	0.6	-5.9	-12.5	-21.9	-27.5
Med no. of frosty days	21.6	16.1	9.5	1.0	0	0	0	0	0	1.5	7.4	17.6	74.7
Med. no. of tropical days	0	0	0	0.2	1.7	10.3	17.8	18.1	4.2	0.1	0	0	52.4
RELATIVE HUMIDITY (%)													
Average	79,5	74.7	67.1	64.6	65.1	62.7	59.3	60.2	67	76.1	81.4	81.9	70.0
SUNLIGHT DURATION (h)													
Average	80.3	104.3	158.2	200.7	250.0	290.2	323.3	300.5	213.5	144.0	72.9	62.7	2200.6
Number of clear days	4.9	5.0	6.1	5.9	5.4	9.0	13.5	15.1	9.6	7.0	4.0	4.6	90.1
Number of cloudy days	13.4	9.9	8.8	6.7	4.8	2.5	1.7	1.5	4.9	9.3	14.5	13.1	91.1
PRECIPITATION (mm)													
Med. monthly sum	47.9	46.7	46.3	48.8	57.8	61.3	55.7	42.7	54.6	57.2	56.0	60.0	635.0
Max. daily sum	48.6	35.2	40.6	44.9	66.5	66.3	137.1	62.1	161.3	61.6	47.4	55.9	161.3
Ave. no. of days ≥ 0.1 mm	11.1	9.4	10.3	10.1	12.0	9.1	7.5	6.4	8.1	10	11.9	11.1	117.0
Ave. no. of days ≥ 10.0 mm	1.6	1.5	1.5	1.5	1.7	2.3	1.9	1.4	1.5	1.9	1.8	1.8	20.4
OCCURRENCES (number of days with....)													
snow	7.1	5.1	2.7	0.1	0	0	0	0	0	0.2	2.1	5.0	22.3
snow cover	13.2	9.3	3.3	0.1	0	0	0	0	0	0	1.9	8.8	36.6
fog	6.7	3.0	0.8	0.3	0.2	0	0	0.1	0.2	2.1	5.4	6.0	24.8
hail	0	0	0	0.1	0.2	0.3	0	0	0	0	0	0	0.6

Table 2.13 Relative frequency of certain speed categories (m/s) by direction for the standard climatological period 1991-2020

Direction/Speed	0.1-2	3-5	6-9	>10
N	2.0	0.7	0.0	0.0
NNE	2.4	0.8	0.0	0.0
NE	2.4	1.0	0.0	0.0
ENE	3.3	2.5	0.0	0.0
E	2.6	2.5	0.0	0.0
ESE	2.3	1.8	0.0	0.0
SE	1.4	0.6	0.0	0.0
SSE	1.1	0.3	0.0	0.0
S	0.8	0.2	0.0	0.0
SSW	0.9	0.5	0.0	0.0
SW	1.1	0.7	0.0	0.0
WSW	1.5	2.8	0.2	0.0
W	1.8	8.1	2.0	0.2
WNW	3.0	8.1	1.8	0.4
NW	2.6	1.7	0.2	0.0
NNW	2.7	1.0	0.0	0.0
NOTE: Cases when a certain phenomenon did not occur and when the relative frequency is 0 are colored white in the tables				

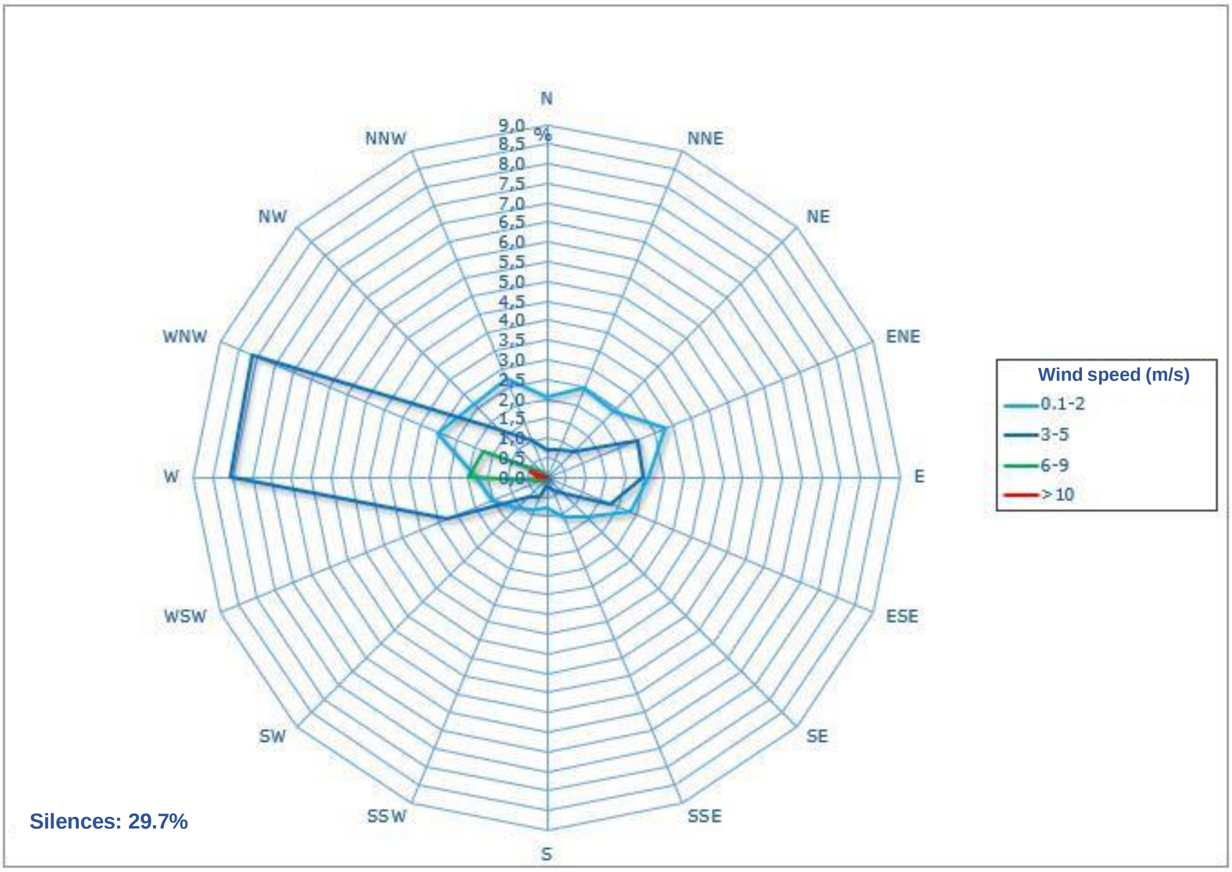


Figure 2.14 Wind rose for the standard climatological period 1991-2020

The climatic factors, which characterize the area of Prahovo, are presented on the basis of meteorological data taken from the Meteoblue website[15].

The Meteoblue climate diagrams shown below are based on 30-year, hourly meteorological models and give a good indication of typical climate patterns and expected conditions (temperature, precipitation, solar radiation and wind)[16].

[15] *Data source: https://www.meteoblue.com/*

[16] *Since 2007, Meteoblue has been archiving meteorological data models. In 2014, they began accounting for meteorological models with historical data from 1985 onwards, creating a continuous 30-year global history with hourly weather data.*

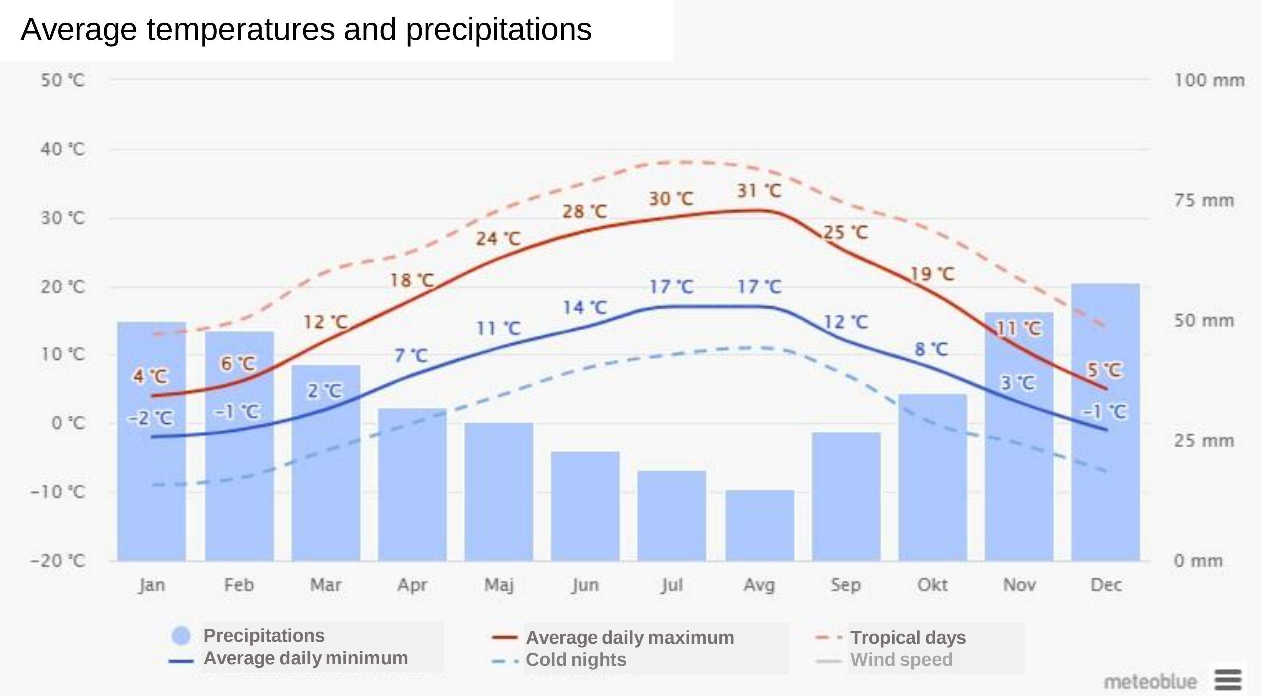


Figure 2.15 Diagram of average temperature and precipitation values for the Prahovo area

Diagram in Figure 2.15 “Average Daily Maximum” (solid red line) shows the average daily value per each month. Likewise, the “average daily minimum” (solid blue line) shows the average daily minimum temperature. Tropical days or icy nights (dashed red and blue lines) show the mean of the warmest day and coldest night each month for the last 30 years. The figure also shows the monthly values of average precipitation. Average monthly precipitation of 41-58 mm is highest during the following months: January, February, March, November and December. Monthly precipitation values over 150 mm show mostly wet seasons, and below 30 mm mostly dry.

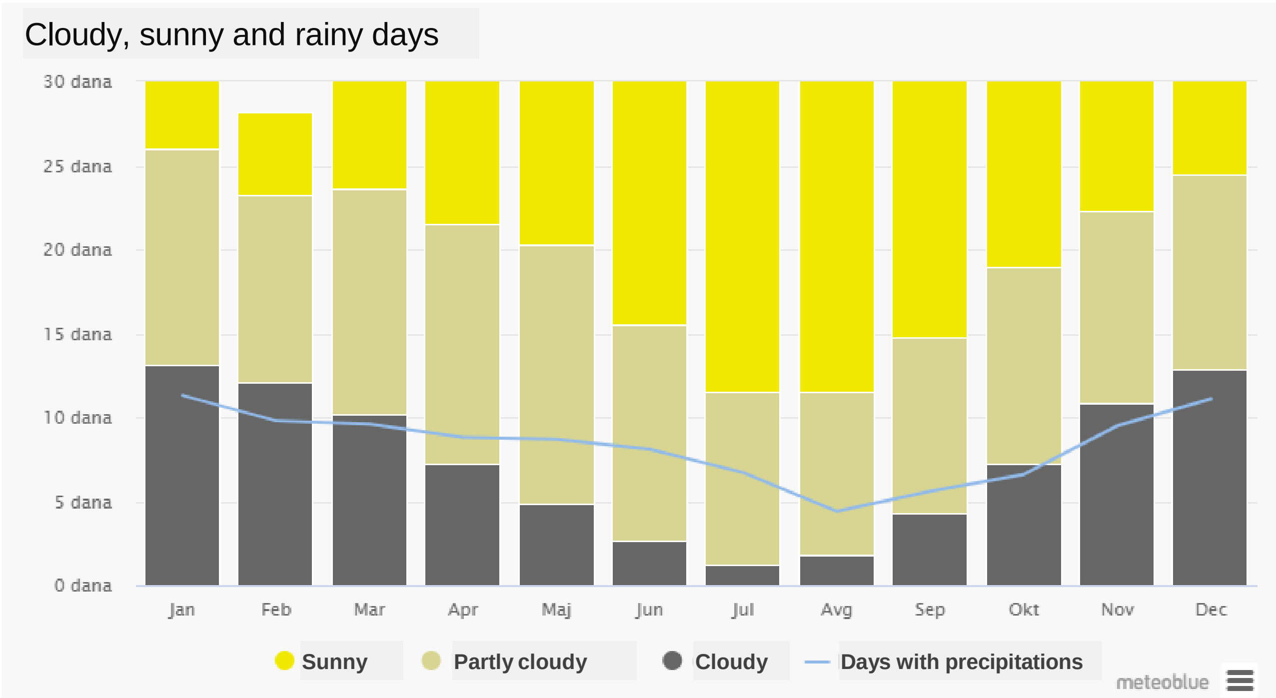


Figure 2.16 Diagram of cloudy, sunny and rainy days for the area of Prahovo

The diagram in Figure 2.16 shows the monthly values of sunny, partly cloudy, cloudy and rainy days. Days with cloud coverage of less than 20% are considered sunny, 20-80% as partly cloudy, and more than 80% as cloudy. The diagram shows that the cloudest period is in January, on average 13.1 days, and the sunniest in July and August, on average 19.5 days, and that the most precipitation is in January and December on average about 11 days.

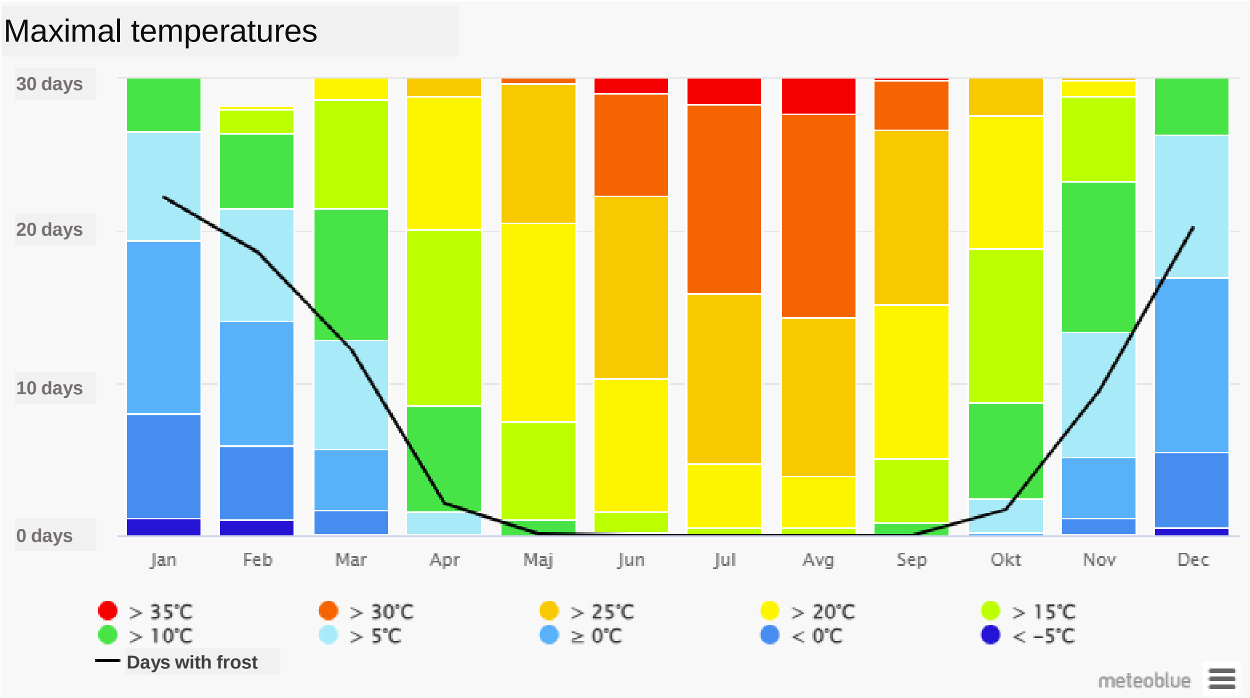


Figure 2.17 Diagram of maximum temperatures for the area of Prahovo

The maximum temperature diagram for Prahovo in Figure 2.17 shows the number of days in a month that reach specific temperatures. The warmest period is July and August, when the temperature is higher than 35 ºC, during 2.5-3.2 days, and the coldest period is January and February, when the temperature is lower than -5 ºC, from 0.5-1.2 in January, February and December, when there are most days with frost of 18.6-22.2 days.

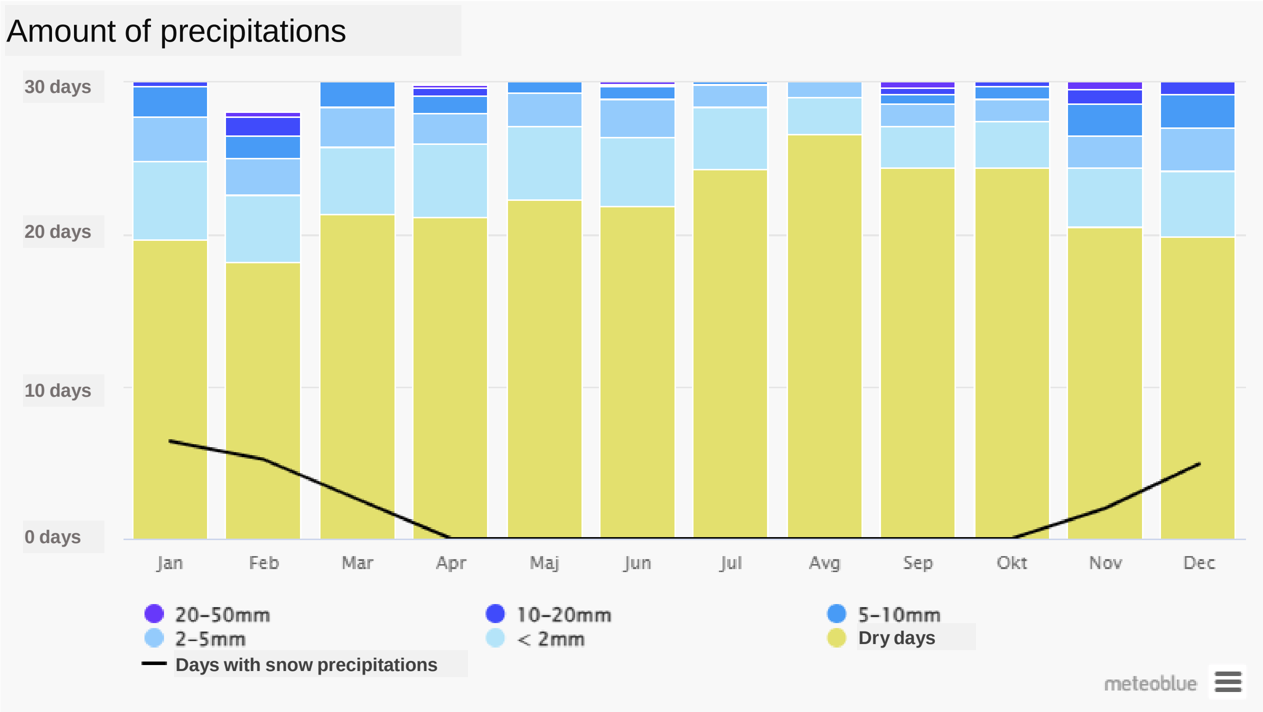


Figure 2.18 Precipitation Diagram for Prahovo Area

The diagram in Figure 2.18 shows the number of days in a month that specific precipitation values have been reached. By their nature, precipitation is the most variable meteorological element and extreme values of their intensity can alternate in a short period of time, so it is necessary to use large portions of data sets to obtain a relevant situation at the site.

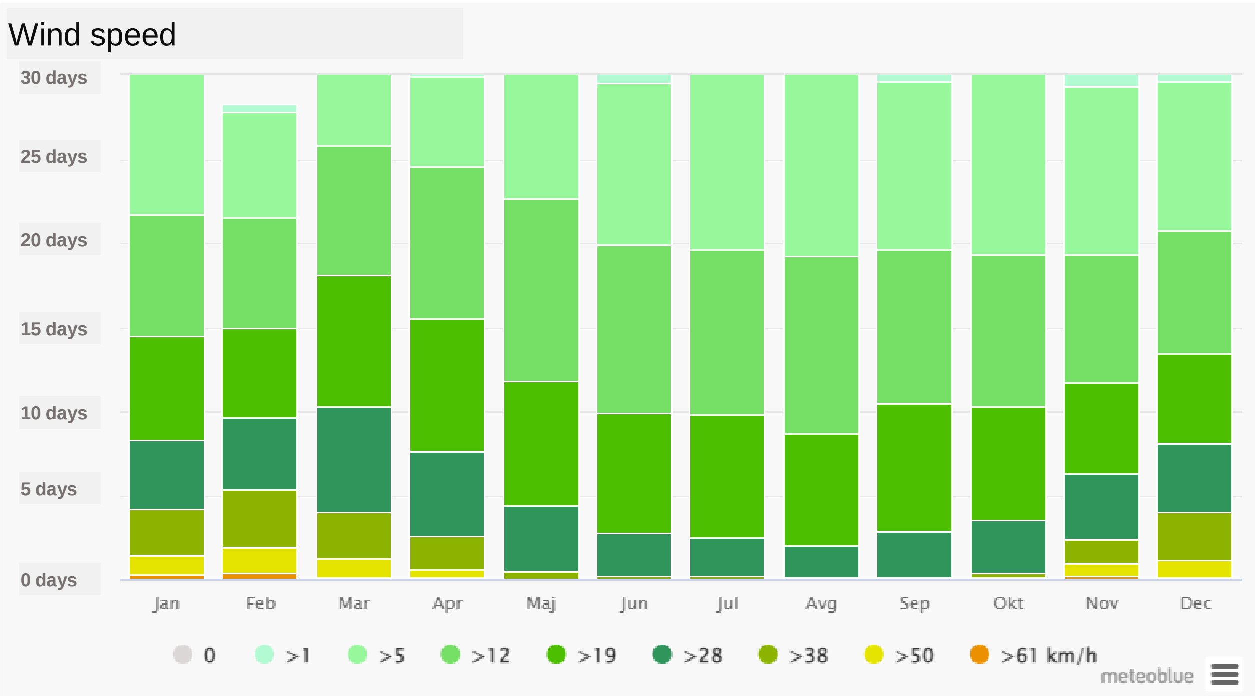


Figure 2.19 Wind speed diagram for Prahovo area

The diagram in Figure 2.19 shows the number of days within one month in which the wind reaches a certain speed. The strongest winds are during January, February, November and December when they reach a speed of 61 km/h and when they blow for an average of 0.1-0.4 days.

In order to analyze the impact of Waste-to-Energy Plant and Landfill for non-hazardous waste on air quality in the wider domain of the location of the chemical industry complex in Prahovo, the AERMOD software package recommended by the EPA (U.S. Environmental Protection Agency) was used[17]. The model consists of one main program (AERMOD) and two preprocessors (AERMET and AERMAP).

The main purpose of the AERMET preprocessor is to determine, on the basis of representative meteorological measurements in the model domain, the boundary layer parameters used to estimate the wind, turbulence and temperature profiles for the needs of the model. The surface layer parameters, which are given by AERMET, are Monin-Obuk length, surface friction velocity, surface roughness, surface heat flux and convection velocity. AERMET also provides estimations of the height of the convective and mechanical mixed layer.

AERMET, meteorological preprocessor, prepares hourly values of surface and upper atmosphere data for use in AERMOD. Input data to AERMET are data on surface observations of hourly values of surface level parameters, which include, among other things, wind speed, temperature and cloud cover, while the data file on the upper layers of the atmosphere provides information on the vertical structure of the atmosphere. This includes layer height, pressure, temperature and relative humidity.

In order to define the local prevailing meteorological parameters, WRF-MMIF hourly meteorological data for a specific location (Prahovo Chemical Complex) and for a time period of five consecutive calendar years (from 2017 to 2021) were acquired from the company Lakes Environmental Consultants from Canada. This dataset consists of information on the surface and upper atmosphere layers, which are required to run the dispersion model. Figure 2.20 shows the analysis of the wind rose (wind blowing direction) and the analysis of the wind blowing frequency, based on meteorological data for the period 2017-2021.

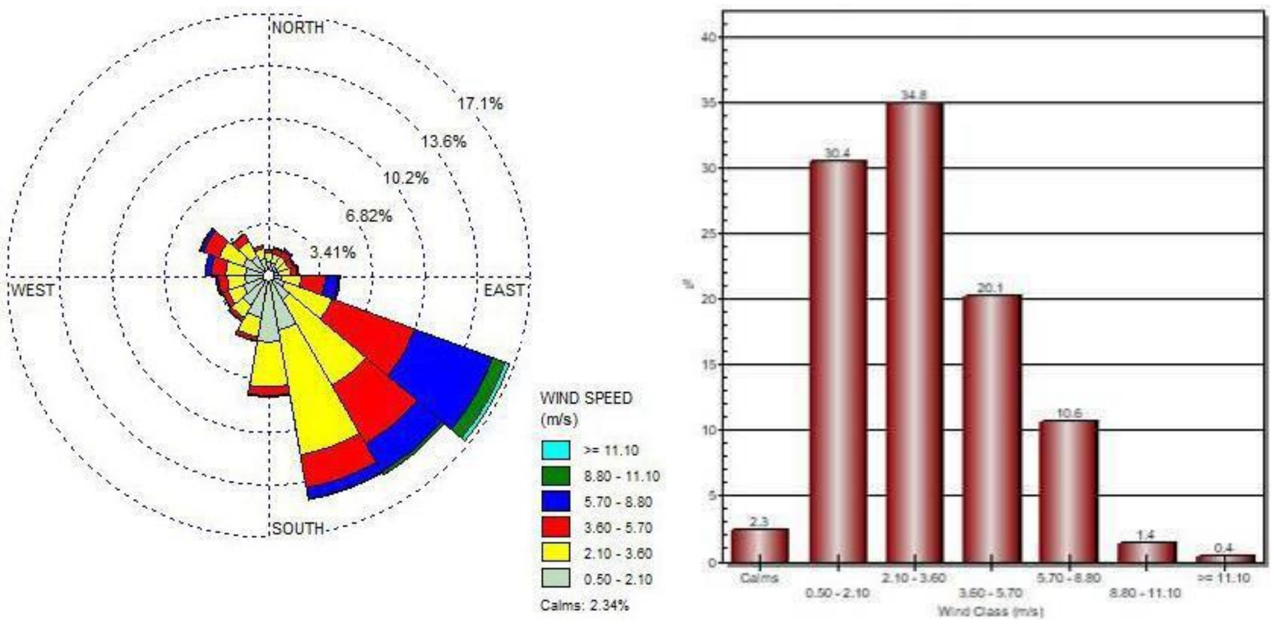


Figure 2.20 Wind Rose and Frequency Diagram for the period 2017-2021

[17] Study of the impact of Waste-to-Energy plant and Landfill for non-hazardous waste on the air quality of the wider location of the chemical industry complex in Prahovo, University of Belgrade, Faculty of Mechanical Engineering, April 2024.

Based on all of the above, it can be concluded that the wind rose can differ significantly at the location of the Eco Energy complex within the chemical industry complex in Prahovo from the wind rose in the wider area of the municipality of Negotin. Therefore, the application of AERMET, a meteorological preprocessor within the AERMOD software package for the specific location of the plant in question, led to more precise data on the wind rose.

Note: Figure 2.14 shows the wind rose at the nearest local station, but which does not correspond to the wind rose at the Chemical industry complex, as the location of the project. For the purposes of the calculation, a more precise base was used (Figure 2.20), which is the best available practice for these calculations. Data on all details are given in the accompanying studies of the Faculty of Mechanical Engineering from Belgrade.

2.9 Description of flora and fauna, natural resources of special value (protected) rare and endangered plant and animal species and their habitats and vegetation

The space in the vicinity of the site in question is located within the ecological corridor - the Danube River. According to the Regulation on the Ecological Network ("Official Gazette of RS", no. 102/2010), the Danube River is part of an extremely important ecological corridor of international importance. At a distance of about 40 km from the border of the Eco Energy complex in the northwest direction, there is the Djerdap National Park.

The **Djerdap National Park** is located in northeastern Serbia, on the border with Romania and covers part of the area of the Djerdap Gorge (Iron Gate) in the middle course of the Danube. It was established in 1974, by the Law on the Djerdap National Park ("Official Gazette of the SRS", no. 31/1974). Its boundaries were determined according to the law from 1983, while the Law on National Parks made the last proclamation of the Djerdap National Park ("Official Gazette of RS", no. 39/1993). The Djerdap National Park covers an area of 63,608.45 ha. The border of the Djerdap National Park is determined by the Law on National Parks and includes parts of three municipalities: Golubac, Majdanpek and Kladovo.

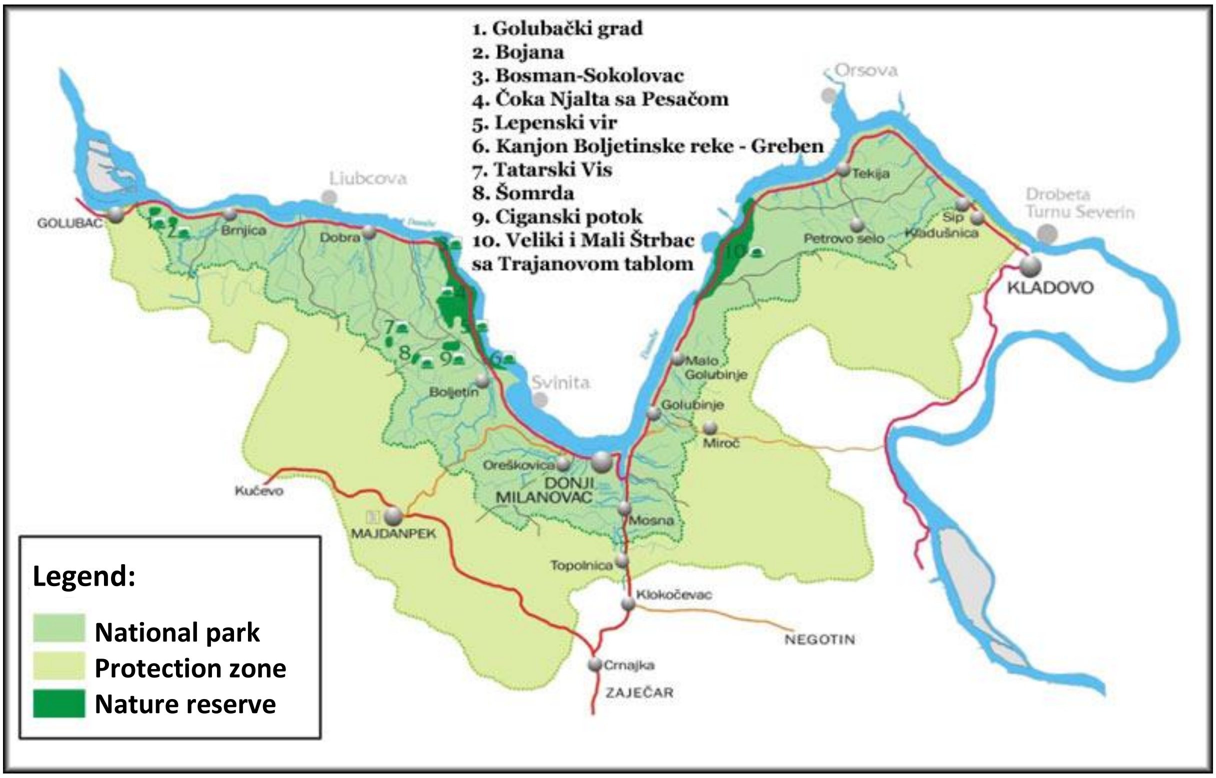
The Spatial Plan establishes the following protection zones in the Djerdap National Park:

- The protection zone I of the area of 5,632.99 ha includes eighteen (18) separate units:
(1) "Golubac", (2) "Bojana", (3) "Bosman – Sokolovac", (4) "Čoka Njalta – Pesača", (5) "Lepenski Vir", (6) "Boljetinska – Greben", (7) "Tatarski vis", (8) "Šomrda", (9) "Ciganski potok ", (10) "Veliki i Mali Štrbac" (11) "Ruđine" , (12) "Ogašu Kazan" , (13)"Čoka Kulejaši", (14) "Golubinska glava", (15) "Gradašnica", (16) "Vidikovac – Kovilovo", (17) "Klisura Brnjice" and (18) "Tilva Tome".
- **Zone of protection II** with an area of 13,414.99 ha extends over fourteen (14) separate units:

(1) "Golubac Gorge" includes the area (in parts not covered by the protection zones of the 1st degree under (1), (2) and (17),
(2) "Brnjica Basin" includes the area in the parts not covered by the protection zone of the 1st degree under (17),
(3) "Štrpsko korito – Miroč" in the part not covered by the zone with the protection regime of the 1st degree under (10),
(4) "Sokolovac – Vlasac", includes the area in the parts not covered by the protection zones of the 1st degree under (3), (4), (5) and (6),
(5) "Šomrda – Tilve Tome" includes the area from Jezdin vrh 685 masl in the west, to the peak of Čoka Frasen 633 masl in the south in the parts not covered by the zones with protection regimes of the 1st degree under (7), (8), and (18),
(6) "Balta Alušonta - Paprenički potok" includes the area surrounding the lakes of Balta Alušonta and part of the gorge valley of Paprenički potok,
(7) "Glavica" includes the area surrounding the characteristic domed elevation around the trigonometer Glavica 286 masl above the settlement of Donji Milanovac
(8) "Velika Peštera" includes the area of the immediate surroundings of the speleological facility (tunnel caves) Velika Peštera,
(9) the Gradašnica site includes the area in the part not covered by the zone with the protection regime of the 1st degree under (15),

(10) "Čezava - Kastrum" includes the area of the immediate vicinity of the (insufficiently explored) archaeological site of the Roman castrum and the medieval necropolis in Cezavsko polje,
(11) the site "Lepenski vir" includes the area of the immediate vicinity of the immovable cultural property of the prehistoric Neolithic site of exceptional importance "Lepenski vir",
(12) "Hajdučke vodenice – Trajanova tabla", includes the area of the shore of the Djerdap Lake under the state road of I order no. 25.1 on which the archaeological site "Hajdučke mills" and immovable cultural property of exceptional importance "Trajan's table" are located,
(13) "Diana – Karataš" includes the area of the archaeological site of the ancient castrum, an immovable cultural property of exceptional importance "Diana",
(14) site "Vlasac", includes the area in the part not covered by the zone with the protection regime of the 1st degree under (6).

- The **III protection zone covers an area** of 44,760 ha from the external border of the National Park towards the state border between the Republic of Serbia and the Republic of Romania on the Danube River, in the part not covered by protection zones I and II degree.



The area of this national park is home to over 1,100 plant species. In addition to numerous other species, the Đerdap Gorge is characterized by tertiary relics such as the hazel (Corylus colurna), walnut (Juglans regia), lilac (Syringa vulgaris), yew (Taxus baccata), silver linden (Tilia argentea), Caucasian linden (Tilia caucasia), Pančić's maple (Acer intermedium), downy oak (Quercus pubescens) and holly (Ilex aquifolium). The Đerdap tulip (Tulipa hungarica) occupies a special place, for which the Đerdap Gorge is the only habitat in the world.

National Park is a habitat for over 150 bird species. There is a golden eagle (Aquila chrysaetos), snake eagle (Circaetus gallicus), white-tailed eagle (Haliaeetus albicilla), black stork (Ciconia nigra), gray heron (Ardea cinerea), as well as many other species.

The mammalian fauna is also diverse and numerous. The most attractive species are otter (Lutra lutra), bear (Ursus arctos), lynx (Lynx lynx), jackal (Canis aureus), wild boar (Sus scrofa), deer (Cervus elaphus), roe deer (Capreolus capreolus) and chamois (Rupicapra rupicapra)."

In order to determine the current state of flora and fauna at the site, the *Biodiversity Study of the industrial complex "Elixir Prahovo" – industrija hemijskih proizvoda d.o.o Prahovo,* April 2024 was conducted by the Institute for Biological Research "Siniša Stanković", National institute of the Republic of Serbia, University of Belgrade. The study of biodiversity is attached. An overview of the exploration of the area of 20 km^2, downstream of HPP Đerdap 2, including the area of the preliminary complex, was carried out and the impact of the construction and operation of the plant on the biological diversity of nearby areas of neighboring countries Romania and Bulgaria was considered.

Biodiversity is biological diversity at the level of species, at the level of genes and landscapes. The diversity of the living world in a given area is often a reflection of the diversity of the soil on which their habitats are located. The presence of species characteristic for different types of landscapes in a relatively small geographical area indicates the richness of environmental conditions – climate, vegetation and substrate.

According to The Convention on Biological Diversity (CDB), adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, biodiversity is defined as "variability among living organisms, including but not limited to terrestrial, marine and other aquatic ecosystems of which they are part; this includes diversity within species, between species and between ecosystems".

Floristic characteristics

Floristic research in the area of the Prahovo settlement and the riparian zone of the Danube indicates the presence of indigenous and introduced plant species as a result of habitat conditions (proximity to the Danube River) on one hand, but also the influence of anthropogenic factors on the other. Ruderal flora is represented at the settlement itself: Erigeron annuus (L.) Pers., Ambrosia artemisiifolia L., Artemisia vulgaris L., Capsella bursa pastoris L., Chenopodium album L., Polygonum aviculare L., Plantago lanceolata L., Urtica dioica L. etc., while in the vicinity there are agricultural areas.

Also, research has shown that habitats characterized by high groundwater levels, periodic flooding and a large impact of the anthropogenic factor are suitable places for inhabiting introduced species (allochthonous) plant species. The most frequent allochthonous species are: Ailanthus altissima (Mill.) Swingle, Amaranthus sp., Amorpha fruticosa L., Echinochloa crus-galli (L.) Beauv, Echinocystis lobata (Michx.) Torr. & A.Gray, Elodea nuttallii (Planch.) H.St.John, Erigeron annuus (L.) Pers., Erigeron canadensis (L.) Cronquist, Helianthus tuberosus L., Paspalum distichum L., Symphyotrichum × salignum (Willd.) G.L.Nesom, Vallisneria spiralis L

In the research zone of Radujevac, Prahovo and Kusjak, among the recorded species that live in the aquatic environment, Salvinia natans (L.) All. and Trapa natans L. are on the European Red List of Vascular Plants, as well as on the list of the Bern Convention. Also, according to the Rulebook on the Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi on the Territory of the Republic of Serbia, Trapa natans L. is on the list of protected plant species.

In addition to the mentioned species (Salvinia natans (L.) All. and Trapa natans L.) on the European Red List of vascular plants in the Prahovo research zone, there are also Berula erecta (Huds.) Coville, Lactuca serriola L., Lemna minor L., Lythrum salicaria L., Medicago arabica (L.) Huds., Mentha aquatica L., Mentha pulegium L., Persicaria lapathifolia (L.) Delarbre, Phragmites australis (Cav.) Trin. ex Steud, Ranunculus repens L., Ranunculus sceleratus L., Urtica dioica L. and Veronica beccabunga. while in the research zones of Radujevac and Kusjak, Ceratophyllum demersum L., Myriophyllum spicatum L. and Vallisneria spiralis L. were recorded.

Among the recorded species at the research sites, there are no endemic and strictly protected species, as well as species covered by the Cites Convention, the Habitats Directive and the Regulation on putting under control the use and trade of wild flora and fauna ("Official Gazette of the RS", no. 31/2005, 45/2005 - corr., 22/2007, 38/2008, 9/2010, 69/2011 and 95/2018 - other law).

CONCLUSION - The vegetation of the study area is heterogeneous. The following stand out: typical water, riparian, ruderal and vegetation of arable surfaces. The narrow zone where the construction is planned is located within the industrial zone, where plant communities of importance to conservation biology are not recorded. It is not expected that the operation of the project in question will have a significant residual impact on vegetation, both locally and in the wider context.

Faunistic characteristics

For the analysis of fauna, the Biodiversity Study covers the geographical area of the right bank of the Danube on the stretch from Kusjak, through Prahovo, downstream to Radujevac. In addition, the area south of the Danube, to Negotin, was processed as a wider zone of interest, as well as the left bank of the Danube on the Romanian side. The area analyzed represents a depression that is shaped by the meander of the Danube.

The hydrological and ecological characteristics of the Danube River have changed significantly after the construction of the dams "Djerdap 1" and "Djerdap 2". The longitudinal continuity of the Danube River has been interrupted, which has a significant impact on the qualitative and quantitative composition of ichthyofauna in the formed reservoirs, as well as the course of the river downstream of the dam (Lenhardt et al., 2019).

Also, some of the established movements in this area have undergone changes long time since, as a result of long time ago built industrial plants, operation of equipment, constant presence of people and means of transportation, fragmentation of the area by the construction of roads and railway tracks.

The results of the Biodiversity Study indicate that:

- Modest faunistic studies of butterfly fauna show the absolute dominance of species related to anthropogenic activities – agriculture and viticulture. These species are for the most part harmful.
- according to the data that can be found on the currently most up-to-date maps of the distribution of Odonata (dragonflies and damselflies) in Europe, in the wider area of interest for the implementation of the study, the presence of the species Stylurus flavipes (Charpentier, 1825) (Boudot & Dyatlova, 2015) was recorded, which is included in Annex IV of the EU Habitats Directive, and in the Republic of Serbia it has the status of a protected species (Rulebook on the Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi (Official Gazette of the RS, 5/2010, 47/2011, 32/2016, 98/2016)).
- due to degraded vegetation, the primary habitats of many insect species have been destroyed, including the shear beetle species.
- The results of the identification of silicate algae (Fitobentos) in the examined part of the course of the Danube indicate the presence of a total of 136 taxa within 48 genera. The analysis of the samples revealed the presence of allochthonous species of Diadesmis confervacea at all investigated sites and Capartogramma crucicula (Vasiljević et al. 2023) at the Radujevac site.
- Of macro-invertebrates, a total of 109 taxa within 14 taxonomic-ecological groups were recorded at the examined sites of the Danube. According to the ecological classification of taxa in relation to saprobial valence (Moog, 2002), β- and α- mesosaprobic taxa are the most represented, with a percentage of 31.74% and 24.55%, while polysaprobic and oligosaprobic organisms were recorded with as much as 8.68% each. The high proportion of α- and β-mesosaprobic organisms in the total community indicates the presence of moderate organic pollution.
- according to the data obtained from field surveys, the presence of only 6 species of fish was recorded, of which two species were protected (bucov and skobalj). By reviewing the literature, in the fishing waters of the fishing area "Danube", a high diversity of fish fauna was ascertained, 74 species of fish from 23 families. This fauna is characterized by a high level of indigenousness, 62 species are indigenous (83.78%), and 12 species are allochthonous. However, the literature states that these waters are inhabited by species from the families Acipenseridae (sturgeon, six species) and Anguillidae (eel, one species), all of which are under protection, and whose safe finding has not been confirmed for a long period of time. Out of a total of 74 species listed in the text, which are expected to be found in this sector of the Danube, 21 species are protected and 25 are strictly protected.
- the fauna of amphibians and reptiles on the territory of Đerdap consists of 25 species, of which according to the Directive on the Protection of Natural Habitats and Wild Fauna and Flora (Habitats Directive) 4 species are protected and 14 strictly protected.

- according to the Rulebook on the Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi, 43 bird species have been recorded or are expected to be present in the zone of Prahovo and Radujevac.
- based on literature data, it can be expected that the study area and its immediate surroundings are inhabited by 38 mammal species (Milenković et al. 2000; Mitchell-Jones et al. 1999; Paunović et al., 2001; Paunović et al., 2008; Paunović and Milenković, 1996; Petrov, 1992; Savić et al., 1995). of which 5 species are strictly protected, and 21 species are protected.
- field research (1 visit in 2023) recorded a small number of bat species and low activity, although the wider region is one of the most diverse in Serbia in terms of the richness of bat fauna (Paunović et al 2020, personal data). This is expected for the given period of the year and weather conditions in the field.

The study of biodiversity concluded that the eradication of the Mesian forest of gray pedunculate and the **drainage of the floodplain of ponds and wetlands in the 1930s, and by the construction of HPP "Đerdap II" permanently destroyed natural potential vegetation, and with it the accompanying fauna.** The area is dominated by anthropogenic communities of arable land (pastures, fields, orchards, vineyards). Current vegetation, flora and fauna are of secondary origin and are of no interest for protection. The subject plant will not lead to additional environmental damage.

Study of biodiversity also found that negative effects on the fish fauna are mainly due to the impact of the HPP dams "Đerdap 1 and 2", which prevent migration upstream and downstream, affect the flow regime and cause large oscillations in the water level, above, between and in the part of the flow below the dams. These significant changes caused changes in the ichthyofauna of the Danube. Migratory fish species such as sterlet and barbel, which favor the faster flow, have migrated to the upstream part of the Danube, while species such as bream showed intensive growth in the newly formed reservoirs.

According to the Rulebook on the Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi. („Official Gazette of the RS“, no. 5/2010, 47/2011, 32/2016 and 98/2016), species from the Order Acipenseriformes (sturgeon) are strictly protected in order to preserve biological diversity, natural genofond, as they represent species of special importance from the ecological, ecosystem, biogeographical, scientific and other aspects. Sturgeons have been on the list of protected species of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 1997. Today, as many as five of the six Danube sturgeon species are extremely endangered (moruna, sim, pastruga, Russian sturgeon and Atlantic sturgeon). Although until recently the morunas were being fished, their presence has not been confirmed with certainty in the lower Danube for a long time. Overfishing, as well as the impact of the Djerdap hydroaccumulation on spawning, has caused a decreasing number of these species in the Danube. The project "Life for Danube Sturgeons"[18] was launched in 2016, with the basic goal of stopping threats to the extremely endangered sturgeon species that inhabit the lower course of the Danube River and the north-western region of the Black Sea, which are caused by illegal fishing and trade. The project is managed and coordinated by the World Wide Fund For Nature (WWF) Austria, and is implemented within the framework of the LIFE programme for the environment and climate action of the European Union.

In accordance with all the above, it can be concluded that the presence of rare, endangered, protected species of flora and fauna has not been registered at the location of the future Eco Energy complex, and that, based on the decision of the Institute for Nature Conservation of Serbia no. 021-3738/2 of 10.11.2023 and no. 021-2591/2 of 3.8.2023, the location in question is not located within the protected area for which the protection procedure has been implemented or initiated, as well as within the spatial scope of the ecological network of the Republic of Serbia.

Cross-border impact on biodiversity – Bearing in mind the position of the site where the

[18] Source: https://rs.danube-sturgeons.org

construction of the plant in question is planned, the Biodiversity Study considered the potential negative impacts of the construction and operation of the plant on the biodiversity of nearby areas of neighboring countries (Romania and Bulgaria). Six NATURA 2000 SITES were identified in the surrounding areas, namely four in Romania (Blahnița – ROSPA0011 and Gruia - Gârla Mare – ROSPA0046, Dunărea la Gârla Mare - Maglavit – ROSAC0299 and Jiana- ROSAC0306) and two in Bulgaria (Timok – BG0000525 and Novo selo – BG0000631). One Ramsar area (Blahnița – ROSMS0013) was also identified in Romania. In the wider area, at a distance of over 62 km, there is the "Domogle-Valea Cherni" National Park in Romania, and in Bulgaria, at air distance of about 33 km, there is the Deleina NATURA 2000 area. Considering the distance of these areas and the type of plant that is the subject of the analysis, the mentioned protected goods have not been considered, as impacts on biological diversity are unlikely.

The Natura 2000 area of Blahnița is located in Romania, along the left bank of the Danube, upstream of the plant in question at air distance of about 920 m. The area covers an area of 44,003.3 ha and has been protected since 2007 (Government Decision no. 1284/2007), first of all, as an area of importance for birds. According to the official review of Natura 2000 sites in Romania[19], which were completed in 2022, 114 significant bird species are recorded in the area. Also, according to the same source, the following data are recorded:
a) number of species referred to in Annex 1 of the Birds Directive: 18;
b) number of other migratory species, listed in the annexes to the Convention on Migratory Species (BON): 88;
c) number of globally endangered species: 5.

The site is particularly important for nesting populations of the following species: Botaurus stellaris, Ikobrichus minutus, Nicticorak nicticorak, Ardeola ralloides, Ardea purpurea, Egretta alba, E. garzetta and Aitia niroca, ,but also as a wetland birds wintering area.

The Natura 2000 area of Gruia - Gârla Mare is located in Romania, along the left bank of the Danube at air distance of about 4,530 m from the project in question. It has been protected since 2007 (Government Decision no. 1284) and is an integral part of the European ecological network Natura 2000. It occupies an area of 2,963.9 ha and is an important area for birds - IBA area. Over 111 species are recorded in this zone, of which 80 species nest here (Aythya nyroca, Falco cherrug, Phalacrocorax pygmaeus, Nycticorax nycticorax, Ardea purpurea, Egretta garzetta, Ardeola ralloides, Haliaeetus albicilla, Botaurus stellaris). Pursuant to Article 4 of Directive 2009/147/EC and Annex II of Directive 92/43/EEC in the area of Gruia - Gârla Mare 16 bird species are under protection[20]

The Natura 2000 area of Dunărea la Gârla Mare - Maglavit is located in Romania, along the left bank of the Danube, downstream of the subject area at air distance of about 12 km. The area has been protected since 2007 (Government Decision no. 2387/2011), covers an area of 9487.6 ha and is protected, above all, as an area important for habitat conservation. It belongs to the continental biogeographical region. According to the official review of Natura 2000 sites in Romania, completed in 2022[21], 8 protected species and 1 type of protected habitat according to the Habitat Directive are recorded in the area.

Among the protected species are 3 species of fish (Rhodeus amarus, Romanogobio kesslerii,

[19] source: https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=ROSPA0011

[20] source: https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=rospa0046).

[21] source: https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=ROSAC0299

Romanogobio vladykovi), 2 species of amphibians (Bombina bomina, Triturus dobrogicus), 1 species of reptile (Emys orbicularis) and 2 species of mammals (Lutra lutra, Spermophilus citellus).

Habitat of importance for protection are white willow (Salix alba) and white poplar (Populus alba) forests.

The Natura 2000 area of Jiana is located in Romania, along the left bank of the Danube at air distance of about 900 m, from the project in question. The area has been protected since 2007 (Government Decision no. 685/2022), covers an area of 13,256.3 ha and is protected, above all, as an area important for habitat conservation.

According to the official review of Natura 2000 sites in Romania[22], which were completed in 2022, 8 significant animal species are recorded in the area. Protected species include 2 species of invertebrates (Lucanus cervus, Morimus apser funereus), 2 species of amphibians (Bombina bomina, Triturus dobrogicus), 2 species of reptiles (Emys orbicularis, Testudo hermanni) and 2 species of mammals (Lutra lutra, Spermophilus citellus).

According to the same source, data are recorded that the Jiana site is of special importance for habitats: 91M0 - Balkan-Pannonian forests of Turkey oak and Sessile oak (6% of the site area), 91I0* - European-Siberian forest steppe vegetation with oak (Quercus spp.) (0.6% of the site area) and 92A0 – white willow and white poplar forests (0.4% of the site area).

The Natura 2000 area Timok is located in Bulgaria, in the lower part of the Timok River basin, at a distance of about 9 km from the project in question. It covers an area of 457.65 ha. It was declared in 2007 (SG 21/2007) as an area of importance under the Habitats Directive (92/43/EEC). Boundary corrections were made in 2021 and 2023 primarily to protect five significant habitat types:
- Pannonian land dunes (28.38 ha);
- Rivers dominated by fine fractions of sediment and along the banks with vegetation Chenopodion rubri pp and Bidentio (12.42 ha);
- Semi-natural dry areas under grasses and shrub vegetation on limestone surfaces of Festuco-Brometalia (especially important for orchids, with an area of 3.76 ha);
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae – area of 7.89 ha) and
- Peripheral (riparian) mixed forests along large rivers with the species Quercus robur, Ulmus laevis, U. minor and Fraxinus excelsior (Ulmenion minoris, with an area of 1.52 ha).

The area is also important for the protection of two species of insects – the Alpine longhorn beetle Rosalia alpina and the European stag beetle Lucanus cervus (Coleoptera), seven species of fish, two species of amphibians and reptiles each, then the species of Romanian hamster Mesocricetus newtoni, and the bat Rhinolophus ferrumequinum. The area is significant for birds, but precise data on identified species are not available.

Natura 2000 area Novo selo is located in Bulgaria, along the right bank of the Danube, downstream from the mouth of the Timok, i.e. from the border of Serbia and Bulgaria. At a distance of about 16 km from the project in question. The site was declared a part of the Natura 2000 network in Bulgaria in 2010 (SG 96/2010), and in 2021 the borders were corrected (SG 67/2021), covering an area of 814.1 ha. The area is of particular importance for migratory fish species[23]. It is also important for the protection of the freshwater clam Unio crassus, as well as 13 species of fish and otter (Lutra lutra).

The Ramsar area of Blahnița is located in Romania, in the same position as the Natura 2000 area of Blahnița at air distance of about 920 m from the project in question. The area has been protected since 2013, and covers an area of 45,286 ha and is protected, above all, as an area important for birds, while

[22] https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=ROSAC0306
[23] Source: Bulgarian Environment Agency (https://natura2000.egov.bg/EsriBg.Natura.Public.Web.App/Home/ProtectedSite?code=BG0000631&siteType=HabitatDirective)

the wetland part of the area occupies an area of 5,600 ha.

According to the official survey of the Ramsar areas[24], 21 significant species of animals are recorded in the area. According to the same source, 16 bird species from Annex 1 of the Birds Directive are recorded, among which 8 species are listed in the annexes to the Convention on Migratory Species (Bon). The site is particularly important for nesting populations of the following species: Nycticorak nycticorak, Phalacrocorax pygmeus, Coracias garrulous, Aythya nyroca, Egretta garzetta and Ixobrychus minutus, but due to the presence of 2 nature reserves – Stramina forest and Bugnet forest.

The biodiversity study found that the cross-border impacts of the construction and operation of the plant in question are negligible from the aspect of biodiversity.

Ecological corridors - The space in the vicinity of the site in question is located within the ecological corridors (Danube River). According to the Decree on the Ecological Network ("Official Gazette of the RS", no. 102/2010), the Danube River is part of an extremely important ecological corridor of international importance. Also, the Danube represents a habitat and migratory route for numerous species that are protected in accordance with the Rulebook on the Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi ("Official Gazette of the RS", nos. 5/2010, 47/2011, 32/2016 and 98/2016); The section of the corridor through the Republic of Serbia stretches northwest – southeast for 588 km. According to Article 8 of the Convention on Biological Diversity ("Official Gazette of the SRY - International Treaties", no. 11/2001) there is a need to regulate or manage "biological resources important for the conservation of biological diversity within or outside protected areas, with the aim of their conservation and sustainable use". The Convention obliges to prevent the introduction, as well as to control or completely exterminate species that endanger natural ecosystems, habitats or (indigenous) species.

Protected natural resources - The site in question, where the construction of the WtE plant and landfill is planned, is not within the protected area for which the protection procedure has been implemented or initiated, as well as within the spatial scope of the ecological network of the Republic of Serbia.

The closest natural resources are:
- General Nature Reserve "Bukovo" located about 12 km southwest;
- „Djerdap“ National Park, located about 36 km northwest;
- Natural monument "Vratna River Canyon" located about 30 km northwest;
- Natural monument "Suteska Sikolska River with waterfalls on Mokranjska stena" about 20 km southwest of the complex.

There are no habitats of protected and strictly protected species of international importance at the Project site, and the closest are at a distance of more than 30 km from the subject location::
- IPA (Important plant area) areas - areas of international importance for plants
  - „Djerdap“ National Park.
  - „Veliki Krš“ and „Mali Krš“;
- IBA (Important Bird Area) Areas - Areas of International Importance for Birds
  - „Djerdap“ National Park.
  - „Mala Vrbica“;
- PBA (Prime butterfly are) areas – areas of importance for butterflies
  - Mount „Deli Jovan“;
  - „Djerdap“ National Park.
  - „Mali Krš“ Mountain;
  - „Stol-Veliki Krš“.

[24] Source: https://rsis.ramsar.org/RISapp/files/RISrep/RO2110RIS.pdf

2.10 Overview of basic landscape characteristics

The landscape characteristics of the analyzed spatial unit are an important element for considering the overall relations between the planned project and the environment.

The area of the chemical industry complex in Prahovo is located on the alluvial plane of the Danube River and belongs to the plain terrain. The Danube River provides the basic feature and beauty of the landscape.

The construction as an element of the existing landscape includes all existing built facilities at the analyzed location, so the industrial complex itself already has an impact on the change of the existing landscape within the chemical industrial zone. Within the industrial complex within Zone I – The existing industrial complex has formed a belt of existing protective greenery within the production part of the industrial complex and part of the complex for the production of phosphate mineral fertilizers, as well as protective greenery within the part of the industrial complex without production functions. The existing protective greenery within the industrial and part of the complex for the production of phosphate mineral fertilizers is in function of the purpose of the facilities and their protection against adverse impacts from the production process. It is positioned to form a buffer zone between the industrial complex and the state road, as well as a buffer zone between the industrial complex and housing within the workers' settlement in the immediate vicinity.

Other amendments to the Detailed Regulation Plan envisage the formation of an additional protective green belt along the border of the complete industrial complex. The protective green belt has the role of isolating the immediate environment from negative impacts within the economic zone. Within this part of the zone, construction is prohibited. The construction of the necessary underground installations and infrastructure routes as well as the necessary above-ground transportation systems as a function of the technological process (conveyors) may be allowed, all in accordance with positive regulations in order not to diminish the importance of the protective greenery belt.

As stated above, the site in question is located in an industrial zone within the chemical industry complex in Prahovo so that there will be no change in the landscape image at the site in question.

2.11 Overview of immovable cultural property

According to the submitted records of the Institute for the Protection of Cultural Monuments in Niš (within the Act on the Conditions for the Preservation, Maintenance and Use of Immovable Cultural Property as well as Goods that Enjoy Prior Protection and Determined Protection Measures for the DRP of the Industrial Complex in Prahovo, no. 818/2 dated 19 August 2013), there are no identified immovable cultural property in the defined area.

Within the defined limits of the scope of the Detailed Regulation Plan for the subject area, there are no recorded natural and ambient units, as well as archaeological sites.

The closest cultural properties to the location of the Project are:

- Hajduk Veljko's powder mill – a cultural monument of exceptional importance is located about 9 km southwest;
- The old church – a cultural monument of great importance is located about 9.5 km southwest;
- The house of Stevan Mokranjac – a cultural monument of great importance is located about 9.5 km southwest;
- Koroglaš Monastery – a cultural monument of great importance is located about 7.5 km southwest;
- Monument of Hajduk Veljko Petrović – cultural monument is located about 9 km southwest;
- The building of the Museum of Krajina – a cultural monument is located about 9 km southwest;
- The building of the Pedagogical Academy – cultural monument is located about 9 km southwest;
- The building of the JNA (Yugoslav National Army) House – a cultural monument is located about 9 km southwest.

2.12 Data on population, population concentration and demographic characteristics in relation to facilities and activities

The municipality of Negotin, on whose territory the chemical industry in Prahovo is located, has an area of 1,090 km^2. The municipality includes 39 settlements (Aleksandrovac, Braćevac, Brestovac, Bukovace, Dupljane, Dušanovac, Jabukovac, Jasenica, Karbulovo, Kobišnica, Kovilovo, Malajnica, Mala Kamenica, Miloševo, Mihajlovac, Mokranje, Plavna, Popovica, Prahovo, Radujevac, Rajac, Rečka, Rogljevo, Samarinovac, Sikole, Slatina, Smedovac, Srbovo, Veljkovo, Vidrovac, Vratna, Štubik, Šarkamen, Dungeon, Trnjane, Urovica, Crnomasnica in Čubra).

There are no residential buildings in the immediate vicinity of the site intended for the construction of the Waste to Energy Plant and the Landfill for non-hazardous waste. The settlement of Prahovo, located at a distance of about 2 km in the direction of the west, the village of Radujevac is located at a distance of about 4 km in the east-southeast direction of the project in question, the settlement of Samarinovac, at a distance of about 5 km in the southwest direction, the settlement of Srbovo, at a distance of about 6 km in the south direction, the settlement of Dušanovac, at a distance of about 7 km in the northwest direction, and the settlement of Negotin, at a distance of about 10 km in the southwest direction. Along the border of the expansion of the chemical industry complex in Prahovo , at a distance of about 1,300 m from the future Eco Energy complex in the west direction, there is a workers' settlement (a smaller group of residential buildings).

According to the 2022 census[25], there were 28,261 inhabitants in 12,386 households in the municipality of Negotin, while according to the 2011 census, there were 37,056 inhabitants in 13,906 households in the municipality of Negotin. According to the 2022 census, there were 14,647 inhabitants in 6,147 households in the city of Negotin, 799 inhabitants in 332 households in Prahovo, and 735 inhabitants in 308 households in Radujevac.

Of the total population in the municipality of Negotin, 13,689 were men and 14,572 were women, of which 393 were men and 406 were women in the settlement of Prahovo. The average age of the population of the municipality of Negotin was 50.36; men 48.83 and women 51.80 years. The average age in Prahovo is 50.68 years, and the Radujevac settlement is 56.33 and both settlements have a predominantly adult population.

According to the national affiliation, Serbs (80.88%), Vlachs (6.24%), Roma (1.14%) and other national minorities live on the territory of the municipality of Negotin.

Table 2.14 shows the composition of the population by age groups and sex in the municipality of Negotin and the settlement of Prahovo according to the results of the 2022 census of the Statistical Office of the Republic of Serbia (RZS).

Table 2.14 Population by age groups and sex

Age of population	2022					
	Municipality of Negotin			Settlement Prahovo		
	f	m	Total	f	m	Total
up to 9 years	870	900	1 770	24	28	52
10 – 14 years	523	508	1.031	15	10	25
15-19 years	554	557	1,111	12	14	26
20-64 years	7,303	7,533	14,836	194	219	413
65+ years	5.322	4,191	9,513	161	122	283

[25] *Source: Statistical Office of the Republic of Serbia*

Total population	14,572	13,689	28,261	406	393	799

Table 2.15 shows an overview of the population by economic activity and gender in the municipality of Negotin according to the results of the 2022 census of the Republic Institute of Statistics (RZS).

Table 2.15 Economic activity of the Negotin municipality population

Ekonomic activity	2022		
	Negotin		
	f	m	Total
Employed	3.464	4.622	8.086
Unemployed	614	747	1.361

The location where the Eco Energy complex is planned to be built is at a distance of about 750 m from the Romanian border. On the other side of the Danube, on the Romanian side, there is undeveloped land. The nearest Romanian settlements are:

- Izvoarele, located at a distance of about 4 km, north of the location in question. According to the census, 951 inhabitants live in the settlement.
- Gruja is a settlement in Romania, the seat of the municipality of Gruja. It is located in the Mehedinci district, in Oltenia at a distance of about 7 km, east of the Eco Energy complex. According to the census, there were 1,890 inhabitants in the settlement.

The location of the Eco Energy complex in question is located at a distance of about 9 km from the Bulgarian border. The nearest Bulgarian settlements are:

- Balej village in the northwestern Bulgarian municipality of Bregovo, Vidin area and is located at a distance of about 10.5 km from the Eco Energy complex; According to 2011 estimates, Balej had a population of 437.
- Kudelin village in northwestern Bulgaria also, in the municipality of Bregovo in the Vidin area, at a distance of about 10.6 km from the Eco Energy complex. According to the 2021 census, the village had 229 inhabitants.

2.13 Data on existing commercial and residential buildings and facilities of infrastructure and suprastructure

2.13.1 Existing commercial and residential buildings

The subject location is within the limits of the Detailed Regulation Plan for the chemical industry complex in Prahovo in the Technological unit C – Zone IV: Energy and Ecological Island. Within Zones I, II, III, IV and V, along the border of the complete Industrial Complex, a protective green belt is planned, which represents an area where the formation of a buffer zone of greenery is mandatory and within which construction is prohibited. The protective green belt has the role of isolating the immediate environment from negative impacts within the economic zone. Within the protective green belt, only the construction of the necessary underground installations and infrastructure routes as well as the above-ground transportation systems necessary for functioning of the technological process (conveyors) is allowed.

The following industrial and economic complexes are also located in the environment of the Eco Energy complex:

- Chemical industry in Prahovo in the direction of west and north along the plant border,
- Port of Prahovo and River Shipping Krajina, at a distance of about 700 m in the north-west direction from the plant border,
- Phosphea Danube DOO – at a distance of about 900 m west of the plant boundary,
- NIS petroleum products warehouse, at a distance of about 950 m from the plant border in the north-east direction from the plant border,
- Hydro power plant "Djerdap II", at a distance of about 4.5 km in the direction of the west.

The following existing facilities are located immediately next to the boundary of the subject location of the future Eco Energy complex:

- Phosphogypsum Storage facility – south, belonging to the Elixir Prahovo complex,
- Waste railway threshold warehouse, non-hazardous waste storage and concrete base – north (belongs to the Elixir Prahovo complex),
- Wastewater treatment plant of the chemical industry complex in Prahovo – west, (belongs to the Elixir Prahovo complex),
- Unconstructed land – west,
- Land intended for the expansion of the production part of the industrial complex (towards Radujevac), for the formation of a chemical park, a new production complex of the same or compatible activity, with the necessary accompanying, technologically and functionally related facilities, with several independent units, with new Investors - east.

In immediate vicinity and along the eastern border and south of the future Eco Energy complex is agricultural land, which has been devastated and is no longer suitable for carrying out agricultural activities. This land was mostly purchased by Elixir and other legal entities, and a smaller part is owned by natural persons.

There are no residential buildings in the immediate vicinity of the future Eco Energy complex. The settlement of Prahovo, located at a distance of about 2 km in the direction of the west, the village of Radujevac is located at a distance of about 4 km in the east-southeast direction of the project in question, the settlement of Samarinovac, at a distance of about 5 km in the southwest direction, the settlement of Srbovo, at a distance of about 6 km in the south direction, the settlement of Dušanovac, at a distance of about 7 km in the northwest direction, and the settlement of Negotin, at a distance of about 10 km in the southwest direction. Immediately along the border of the expansion of the chemical industry complex in Prahovo, in the direction of the west, at a distance of 1,300 m, there is a workers' settlement (a smaller group of residential buildings). The nearest Romanian settlements are: Izvoarele at a distance of about 4 km, north of the site in question and Gruja at a distance of about 7 km, east of the site in question. The nearest Bulgarian settlements are: the village of Balej at a distance of about 10.5 km from the site in question and the village of Kudelin at a distance of about 10.6 km from the site in question.

2.13.2 Infrastructure and suprastructure facilities

Roads

In accordance with the Regulation on the Categorization of State Roads ("Official Gazette of the RS", no. 87/2023), along one border of the complex passes II B Category state road No. 400, Negotin – Radujevac – Prahovo – Samarinovac – connection with state road 168. From the aforementioned road, the location of the chemical industry complex in Prahovo is accessed. North of the site in question are an industrial railway track and a port on the Danube River. The proximity of the port and the railway line provide the chemical industry complex in Prahovo, in addition to the road, with the possibility of river and railway transport.

Other amendments to the Detailed Regulation Plan for the chemical industrial complex in Prahovo envisage the conversion of certain parts of the subject area, which are not systematically and comparably distributed, the formation of zones for the construction of an industrial park, chemical park, energy island, ecological island, expansion of phosphogypsum storage, **as well as the provision of a buffer zone of greenery and the relocation of routes of local roads outside the industrial complex, thus ensuring** the isolation of the zone of agricultural activities and housing from the impact of the industrial complex and the production process.

In addition to the aforementioned roads, within the chemical industry complex in Prahovo there are also:

- The network of internal roads within the complex, which together with the plateaus, provide communication between all facilities on the plot.

- Industrial railway tracks within the chemical industry complex in Prahovo that serve for transportation.
- Transportation systems - in the function of transporting within the industrial complex and to the Port of Prahovo.

As the existing traffic solutions are not adequate, because it occures a mixing of local roads and roads in the service of industry, it is necessary to physically isolate the industrial complex, provide a controlled entrance and exit and provide a solution that separates transport routes from the roads used by the local population as much as possible. For these reasons, other amendments to the Detailed Regulation Plan for the settlement of Prahovo envisage the construction of a state road in order to relocate traffic for the purpose of serving the port of Prahovo and the industrial complex. For the corridor of the state road from the Dušanovac traffic node to the end of C.M. Prahovo, about 12.7 km long, a Detailed Regulation Plan has been developed, the adoption of which is in progress.

The main access to the Waste Energy Plant is provided from the public road as an entrance/exit, and also for access to the parking lot for buses and freight vehicles as well as the parking lot for passenger cars. For the purpose of accessing emergency vehicles at the entrance/exit, an additional traffic lane has been designed. The designed width of the entrance/exit is 7.0 m, with strips 3.5 m wide.

Internal roads within the Waste to Energy Plant are designed to be of different widths depending on the type of vehicle intended to move in those places. Widths range from 3.5 m to 7.0 m. Radii of roads and manipulative spaces are designed based on the passability of the relevant vehicle. Semi-trailer truck (tanker) with a maximum length of 16.5 m was adopted as the relevant vehicle. The speed of the vehicle is limited to 10 km/h. The traffic regime is predominantly one-way, except in the part of the entrance road where a two-way, but with separate directional lanes, is envisaged. Internal roads will be marked with appropriate signalization. For the purposes of pedestrian movement, sidewalks are planned to be interconnected by marked pedestrian crossings.

On the southeast side of the plot, the perimeter road of the landfill is connected to the internal road of the future Waste-to-Energy plant - CP no. 1491/1 CM Prahovo. There is no direct connection to the public road. One-way traffic will be organized around the landfill. The service road will take the crown of the initial embankment. The width of the driving part of the service road will be 3.5 m with sidewalks of 1.0 m on each side. The service road runs around the entire landfill and should be formed with a solid base, since it will be the basic road for the entire time of use of the landfill.
The formation of a service road is planned around each planned phase of the construction of the landfill. The service road must be solid and allow one-way traffic around the landfill. In addition to the service road, each phase must have its own access road. The access road is formed on the slope of the landfill itself. The main function of this road is to enable mechanization to move around the landfill. All slopes and radii of curves must meet the minimum requirements for safe movement of all planned machinery. The access road itself is formed on the solidification and the upper part is specially treated with ordinary concrete in order to avoid destruction and dusting of the solidification itself.

Water supply and sewerage network

By Water conditions of the Ministry of Agriculture, Forestry and Water Management no. 325-05-1/210/2022-07 of 14 November 2022 and notice no. 285878 2023 14843 000 000 000 001 of 7 November 2023, it is allowed to connect the project in question to the existing Elixir Prahovo system in accordance with the issued water permit for the manner, conditions and scope of abstraction and usage of surface water from the Danube River, or to the public water supply network according to the conditions of the competent public utility company "Badnjevo" Negotin in accordance with the regulations, with the definition of the required quantities.

By connecting to the existing installation of the Elixir Prahovo complex, a hydrotechnical structure will be provided at the location of the future Waste to Energy Plant for:

- Sanitary water (drinking water);
- Technological and hydrant water (industrial water);

- Fecal sewage;
- Rain sewage;
- Technological sewage.

At the location of the future Landfill for non-hazardous waste, the construction of:

- Leachate collection system;
- Atmospheric water collection system.

Sanitary (drinking water), for an industrial complex of the chemical industry in Prahovo, is supplied from the source of Barbaroš with a capacity of 43 l/s, with a DN200 diameter AC pipeline. There is a network of sanitary water pipelines built on the complex to all facilities where sanitary facilities are planned. The current consumption of sanitary water of the existing chemical industry complex in Prahovo is about 2,500 m^3/month. The pressure at the connection point is about 3 bar.

For the purpose of supplying the subject Waste to Energy Plant with waste-to-energy process (max quantity of water Q=3 l/s), a water meter manhole with water meter DN40 and with the necessary waterpipe fittings (dirt catcher, inlet and outlet shutters, reductions, etc.) was designed. The sanitary network pipelines are designed from the material HDPE PE100 PN10 and are sized to ensure optimal flow conditions under pressure in the pipes and that the water velocity in them is about 1 m/s in order to reduce hydraulic losses in the pipelines.

The Elixir Prahovo complex is supplied with industrial water from the water intake, in accordance with the Decision on the issuance of water permit no. 325-04-281/2023-07 dated 30 June 2023. Industrial water is used within the complex for technological needs and the hydrant network. The current capacity of the Danube pumping station is about 3,000 m^3/h (outlet steel pipeline with a diameter of 900 mm), and the pressure of technological water at the outlet of the pumping station is 5 bar.

Note: The implementation of the project will not increase the amount of water needed for steam production compared to the current needs of the Elixir Prahovo complex. Namely, currently the steam used for the evaporation of phosphoric acid in the plants of the Elixir Prahovo complex, as the largest consumer of thermal energy, is produced in a boiler plant that uses fossil fuels as an energy source, and after the commissioning of the Waste-to-energy plant, the same amount of steam will be obtained, instead from the boiler plant on fossil fuels, from the process of thermal treatment of waste as part of Waste-to-Energy plant.

The Waste-to-Energy plant will be supplied with technological and hydrant water from the existing chemical industry complex in Prahovo, and from the newly designed manhole in which the gate valve and water meter will be located. The connection pipeline of technological and hydrant water will be DN200 PN10 and with a pressure of up to 5 bar. The projected amount of process water is Q= 122 m^3/h, of which 50 m^3/h will be spent on the preparation of process water, and 72 m^3/h (20 l/s) for refilling the tank for fire protection purposes. Figure 2.21 shows the existing water intake from the Danube River.

Table 2.16 Display of the existing water intake from the Danube River

FECAL SEWAGE

Fecal sewage collects all sanitary-fecal wastewater and conducts it to the treatment plant (mechanical and biological treatment). Buried biological purifier type ACO-INTERPLAN BIOTIP cup 20ES with the technology of continuous recirculation of activated sludge with a capacity of 20 PE (40 employees), hydraulic load 3 m3 /day, biological load BOD: 1.2 kg/day, intended for biological treatment of sanitary wastewater. The device will be designed and manufactured in accordance with the standards: MEST EN 12255-1; 12255-6; 12566-1; 12566-3 and ATV 122 and its performance must meet the prescribed standards.

The treated wastewater is connected to the shaft of conditionally clean rain sewerage and then discharged into the internal network of the Elixir Prahovo complex and into the Danube.

The recipient for all clean and treated wastewater is the Central collector of clean and treated waters of the Elixir Prahova complex that can be discharged into the recipient of the Danube River.

Purified clean wastewater is discharged by a gravity collector in continuous mode.

A sufficient number of inspection descents necessary for the normal maintenance of the network are planned on the network.

The adopted material of the fecal sewage pipeline is PVC-U of load capacity class SN8. Pipelines made of PVC material are very easy to install, and they are connected to each other by connecting elements, whereby rubber rings ensure complete sealing of the joint.

CALCULATION OF SANITARY-FECAL SEWAGE

Dimensioning of the sanitary wastewater drainage system

The dimensioning of large sanitary wastewater drainage systems was done according to SRPS EN 12056-2:2011.

Sanitary devices are connected to partially filled connection lines. Partially filled lines have a degree of fulfillment of 0.5 (50%) and are connected to individual vertical lines of the sanitary sewer.

Flow calculation

The expected flow of sanitary and fecal wastewater in one part or the entire drainage system at repaired connections is calculated according to the formula:

$$Q_{ww} = K\sqrt{\sum Du} = 0.5\ \sqrt{62{,}6}$$

Qww = wastewater flow (l/s)
K = frequency factor
Du = connection value of the sanitary device

Frequency factor K

The following table provides typical values of frequency factor K for different uses:

Method of use:	K
Irregular use (boarding houses, guest houses, offices...)	0.5
Regular use (hospitals, schools, restaurants, hotels,...)	0.7
Frequent use (public WC and/or showers)	1
Special use (laboratory,..)	1.2

On the basis of the aforementioned data, since these are industrial facilities with offices for further calculation, the Frequency Factor K=0,5 was taken.

Connection values Du:

The connection values of *Du* for individual sanitary devices are given in the following table:

Sanitary device	Du (l/s)
Toilet with cistern 6l	2.0
Trocadero	2.0
Sink,bidet	0.5
Pisoar	0.5
Shower tray	0.6
Bathtub	0.8
Kitchen sink	0.8
Dishwasher	0.8
Washing machine (up to 6kg)	0.8

Taking into account the total number of sanitary devices in the facilities in question, the total connection value Σ *Du* was calculated, and then the expected maximum flow of sanitary and faecal wastewater Q_{ww} (see table below).

Expected maximum flow of sanitary-fecal wastewater Q_{ww}

Sanitary device	Pieces	Du	∑Du
		K=	0,5
		l/sec	l/sec
Toilet with cistern 6 l	16	2,00	32
Trocadero	3	2,00	6
Sink, bidet	23	0,50	11,5
Pisoar	0	0,50	0
	0	0,50	0
Shower tray	9	0,50	4,5
Bathtub	9	0,60	5,4
Kitchen sink	0	0,80	0
	4	0,80	3,2
Dishwasher	0	0,80	0
Washing machine (up to 6 kg)	0	0,80	0
Expected maximum flow of sanitary-fecal wastewater	$Q_{ww} = K\sqrt{\sum Du} = 0,5\sqrt{62,6}$		**3,96**

The stated expected flow of sanitary and fecal wastewater (Qww) represents the maximum value, i.e. the peak of wastewater generated within all the mentioned effluents by type and vertical, and which would in the most unfavorable case last only a few minutes (provided that all the mentioned sanitary devices work simultaneously).

The value of the expected maximum flow of sanitary-fecal wastewater in accordance with the standard SRPS EN 12056-2 was further used for the dimensioning of the pipe distribution of wastewater and pumping station to the biological purifier.

Based on the above, a pipe was designed to the BP ES20 biological purifier with a dimension of Ø200 under a slope of 0.5%, which with a fulfillment of 0.5D, allows water flow of 11.67 l/s at a speed of 0.74 m/s. The designed pipe meets the designed requirements.

Sizing of the sanitary-fecal wastewater treatment system (biological purifier)

Water consumption, and therefore the amount of wastewater, is determined on the basis of the specific water consumption and the number of population equivalent (PE). The specific water consumption q_{sp} (l/st/d) is defined as the water consumption per one inhabitant per day.

The system for biological treatment of sanitary and faecal wastewater within the WtE plant is dimensioned on the basis of generally applicable norms of water consumption, which for industrial facilities and administrative facilities (offices, etc.) amounts to 50 to 75 l per employee.

The daily consumption of Qsr,dn (l/d) of water for employees is determined using the expression:

$$\mathbf{Q_{sr,dn} = q_{sp} \times M_k}$$

where:
Qsr,dn - Daily water consumption
q_{sp} - Specific water consumption per one inhabitant per day
M_k – number of users (employees)

Bearing in mind that 40 employees will be engaged at the same time within the WtE plant (in one shift), the calculation resulted in the maximum daily water consumption, i.e. the amount of wastewater from sanitary and faecal water of 3,000 l, i.e. 3 m^3/day.

Buried biological purifier type ACO-INTERPLAN BIOTIP cup 20ES with the technology of continuous recirculation of activated sludge with a capacity of 20 PE (40 employees), hydraulic load 3m ^{3}/day, biological load BOD: 1.2 kg/day, intended for biological treatment of sanitary wastewater of WtE plant.

The device is constructed as a plastic waterproofing pool divided into parts according to separate mechanical and biological units in which the sewage treatment phases take place. In the pool there is an inlet chamber, an aeration system consisting of an air distribution, an aerator and a pump.
The inlet chamber is an easily removable perforated chamber located at the inlet of the appliance. Hydraulic and aeration system are connected device systems. The hydraulic system is made of polypropylene pipes and is located on the pool frame. This system allows automatic circulation of water and sludge. The aeration system consists of compressors, air distribution and aerators.

Wastewater is fed through the sanitary-fecal water sewage pipeline system to the CS2 collection shaft from where the pump with a capacity of 15 m^3/h (i.e. 4.20 l/s) sends to the inlet chamber adjacent to the biological purifier. After that, the wastewater passes under the barrier into the aeration part. Aerators are located here and aerated water goes into the final settling box. In the settling box, the purified water is separated from the bioactive sludge. Purified water via the outlet pipe gravitationally leaves the device, and the activated sludge is returned to aeration by the pump.

Bearing in mind the characteristics of the biological wastewater treatment plant described above, which is divided into parts according to separate mechanical and biological units (chambers), at the moment of short-term impact, i.e. the calculated maximum peak of 4 l/s (i.e. 0.24 m^3/min) if the peak lasted for 10 minutes, the amount of water for treatment would be 2.4 m^3 (provided that all sanitary devices work at the same time). Based on all of the above, it was concluded that the selected biological purifier meets the requirements of the plant and that it will be able to accept these waters and purify them, while the hydraulic load will not exceed 3 m^3/day.

CONDITIONALLY CLEAN RAINWATER SERVICES

Clean rainwater services collects atmospheric water fallen on the roofs of facilities W-C08, W-C11, W-C12, W-C01 and carries them to the border of the complex closest to the drainage collector of all clean and treated water that can be discharged into the recipient of the Danube River. Other objects freely spill into the surrounding green belt.

The collectors of the atmospheric sewage are routed in such a way as to follow the planned roads, and after calculating the amount of water entering the system, the sizing of the collector was performed.

Prefabricated AB inspection descents are planned on the network at all turns and on straight sections at longer lengths than the recommended 160xD required for normal network maintenance.
The adopted material of the pipeline of conditionally clean sewage is made of corrugated polypropylene pipes PP-B of load capacity class SN8 according to EN 13476-3 with a diameter of DN630/DN500/DN315/ DN200 /DN160, with a drop and a drop of the bottom i = 0,2-1%.

EXTERNAL OILY RAINWATER SERVICES

Oily rainwater services from the complex for the WASTE-to-ENERGY PLANT collects stormwater fallen on roads, plateaus and parking lots and takes them to the border of the complex.

Before discharge into the collector of all clean and purified water, two bypass separators of petroleum products are planned, made and tested according to SRPS EN 858, rated size NS10/100 (flow through the separator 10 l/s while the max flow is 100 l/s) and rated size NS15/150 (flow through the separator 15 l/s while the max flow is 150 l/s). The separator must have the efficiency of separating light petroleum products of class I - light liquids in the outlet water up to 5 mg/l.

Thus, the purified oily sewer is connected to the conditionally clean rainwater sewer and conducted to the drainage Central collector for the entire Elixir Prahovo complex, and through it is discharged into the Danube. A sufficient number of inspection descents necessary for the normal maintenance of the network are planned on the network.

The adopted material of the pipeline of conditionally clean sewage is made of corrugated polypropylene pipes PP-B of load capacity class SN8 according to EN 13476-3 with a diameter of DN500/DN315/ DN200 /DN160, with a drop and a drop of the bottom i = 0,2-1%.

CALCULATION OF RAINWATER SERVICES

The facility is connected to the previously designed conditionally clean rain sewage network of the Elixir Prahovo complex with a diameter of DN 600. Conditionally clean rainwater is drained through one connection at the boundary of the plot into the KK21 shaft.

The runoff of surface wastewater from a surface is defined according to the relevant intensity of precipitation of a given return period, and for the duration of precipitation of 20 minutes. The relevant precipitation intensities for the Prahovo area are 125 l/s/ha.
For the calculation of the maximum discharge of atmospheric water, a rational method was used, i.e. the maximum runoff from a surface was calculated according to the following formula:

$$Q_T = C i_T A$$

where are:
Q_T discharge of atmospheric wastewater (l/s)
C runoff coefficient
i_T rain intensity duration 20 min for the defined return period, T (l/s/ha)
A catchment area (ha)

The following runoff coefficients were used for the calculation of rainwater sewage:

Area	Runoff coefficient
Paved surfaces (concrete)	0,9
Green areas	0,2

The tables below provide the results of the hydraulic calculation of all planned collectors of atmospheric sewage that are dimensioned by the rational method with the "Urbano-Canalis" program package.

Table 0.1 Calculation of the oily sewerage that gravitates to Separator 1

Pipe Name	Start shaft	End shaft	L [m]	A [ha]	k [-]	i [l/s/ha]	Q [l/s]	I [%]	D [mm]	Velocity [m/s]	h/D
Z34	ZZ17	ZZ20	17,89	0,199	0,9	125	22,41	0,35	315	0,8	0,43
Z35	ZZ20	N71	28,66	0,059	0,9	125	29,09	0,35	315	0,85	0,49
S12	N71	ZZ21	8,13	0,017	0,9	125	30,99	0,35	315	0,87	0,51
Z36	ZZ21	N66	24,1	0,05	0,9	125	36,61	0,37	315	0,91	0,56
Z42	N66	N64	26,79	0,056	0,9	125	42,86	0,34	315	0,9	0,65
Z43	N64	ZZ22	4,22	0,009	0,9	125	43,84	0,35	315	0,92	0,65
Z37	ZZ22	ZZ23	12,09	0,025	0,9	125	46,66	0,35	315	0,92	0,69
Z38	ZZ23	ZZ24	8,91	0,018	0,9	125	51,16	0,35	315	0,92	0,75
Z39	ZZ24	ZZ25	23,89	0,105	0,9	125	62,97	0,25	400	0,89	0,61
Z40	ZZ25	N79	23,4	0,012	0,9	125	64,26	0,25	400	0,89	0,61
S23	N79	ZZ40	4,09	0,1	0,9	125	75,51	0,25	400	0,91	0,7
Z12	ZZ40	sep.01	1,3			125	80,78	0,25	400	0,91	0,75

The NS10/100 ST1000 petroleum product SEPARATOR with BYPASS was adopted.

Table 0.2 Calculation of the oily sewerage that gravitates to Interceptor 2

Pipe Name	Start shaft	End shaft	L [m]	A [ha]	k [-]	i [l/s/ha]	Q [l/s]	I [%]	D [mm]	Velocity [m/s]	h/D
Z2	ZZ28	N83	16,6	0,177	0,9	125	19,89	0,4	315	0,82	0,38
S27	N83	ZZ29	28,19	0,049	0,9	125	25,37	0,4	315	0,87	0,44
Z3	ZZ29	ZZ30	33,32	0,112	0,9	125	37,94	0,4	315	0,95	0,56
Z4	ZZ30	ZZ31	28,84	0,097	0,9	125	48,82	0,25	400	0,85	0,51
Z5	ZZ31	ZZ32	21,23			125	48,82	0,25	400	0,85	0,51
Z6	ZZ32	ZZ33	37,73	0,061	0,9	125	55,69	0,25	400	0,87	0,56
Z7	ZZ33	ZZ34	30,87			125	55,69	0,25	400	0,87	0,56
Z8	ZZ34	ZZ35	17,58	0,208	0,9	125	79,09	0,25	400	0,91	0,73
Z9	ZZ35	sep.02	0,7			125	91,76	0,25	500	0,99	0,53

The NS15/150 ST1500 petroleum product SEPARATOR with BYPASS was adopted.

Table 0.3 Calculation of conditionally clean rainwater sewage that gravitates to the manhole KK21

Pipe Name	Start shaft	End shaft	L [m]	A [ha]	k [-]	i [l/s/ha]	Q [l/s]	I [%]	D [mm]	Velocity [m/s]	h/D
K1	KK53	KK43	12,72	0,049	1	125	6,16	0,5	200	0,67	0,37
K2	KK43	KK20	21,05	0,075	1	125	15,55	0,5	200	0,81	0,65
K3	KK20	KK22	30,72				15,55	0,35	315	0,73	0,35
K4	KK22	KK23	29,88				15,55	0,35	315	0,73	0,35
K19	KK57	KK56	4,93	0,125	1	125	15,67	0,5	250	0,84	0,44
K20	KK56	KK59	14,55				15,67	0,5	250	0,84	0,44
K21	KK59	KK23	5,2				15,67	0,5	250	0,84	0,44
K5	KK23	KK25	34,32	0,02	1	125	33,76	0,35	315	0,88	0,54
K6	KK25	KK26	9,66	0,006	1	125	34,48	0,35	315	0,88	0,55
K12	KK31	KK33	37,17	0,077	1	125	9,58	0,4	315	0,67	0,26
K13	KK33	KK34	35				9,58	0,4	315	0,67	0,26
K14	KK34	KK35	14,85				9,58	0,4	315	0,67	0,26
K15	KK35	KK50	10,8	0,011	1	125	10,95	0,4	315	0,7	0,28
K16	KK50	KK52	10,8	0,011	1	125	12,32	0,4	315	0,72	0,3
K17	KK52	KK38	11,8	0,012	1	125	13,81	0,4	315	0,74	0,31
K18	KK38	KK26	24,32	0,025	1	125	16,9	0,4	315	0,78	0,35
K7	KK26	KK27	23,12	0,014	1	125	53,09	0,2	500	0,8	0,41
K8	KK27	KK28	30,98				53,09	0,2	500	0,8	0,41
K15	KK14	KK28	1,31				80,78	0,3	400		
K9	KK28	KK29	19,01				133,87	0,2	630	1	0,49
K24	KK39	KK40	25,24	0,062	1	125	7,77	0,5	200	0,71	0,42
K25	KK40	KK29	28,29				7,77	0,5	200	0,71	0,42
K10	KK29	KK30	23,87				141,64	0,2	630	1	0,51
ZS20	KK24	KK30	1,01				91,76	0,25	500		
K11	KK30	KK21	3,07				233,4	0,2	630	1,09	0,73

Table 2.18 refers to the total clean sewage from the WtE complex including treated oily rainwater after separator 1 NS10/100 ST1000 with BYPASS flowing into shaft KK28 (in table 80.78 l/s) and after separator 2 NS15/150 ST1500 with BYPASS flowing into shaft KK30 (in table 91.76 l/s).

Conclusion: the total load of 233 l/s of atmospheric water is:
- oily water via interceptor 1: 80.78 l/s
- oily water via interceptor 2: 91.76 l/s
- clean atmospheric water, which does not pass through the interceptor: 60.86 l/s

CHECKING THE CAPACITY OF THE EXISTING INSTALLATION OF THE CHEMICAL INDUSTRY COMPLEX IN PRAHOVO

Current condition - Hydrotechnical installations of the chemical industry complex in Prahovo

The system of hydrotechnical installations within the existing Elixir Prahovo complex consists of the following units:

- Sanitary sewer system
- Storm Water Network
- Technological sewerage

Fecal wastewater from the Elixir Prahovo complex is drained by a closed system of collectors that drain it to septic tanks located near appropriate facilities.

The atmospheric waters from the Elixir Prahovo complex are taken to the recipient, the Danube River, via a mixed system (a combination of drains, closed collectors and line grids). On the complex there is a collector of atmospheric sewage in the northern part of the complex that collects water and drains independently to the recipient, the Danube River, as well as a collector in the southern part of the complex that collects water and drains to the recipient, the Danube River, through the existing Central Collector. Oily atmospheric waters formed on the complex, before discharge, are treated through a grease and oil separator system.

Technological wastewater from the Elixir Prahovo complex is brought through the sewage network "technological sewage" to the existing plant for the treatment of technological wastewater, where the neutralization and deposition of solids is carried out. Then, the purified water is discharged into the recipient, the Danube River via the existing Central Collector, which is common to the entire Prahovo chemical industry complex. (According to the last report of the Institute of Prevention, the mean flow of purified water during sampling is 142 l/s.)

The total amount of purified water discharged from the Elixir Prahovo complex into the existing Central Collector ranges from 0 to 1,182 m^3/h (max 328 l/s).

Therefore, the recipient of all purified water from the Prahovo chemical industry complex is the existing Central Collector, which drains clean water into the Danube via the inlet structure. The central collector of the Prahovo chemical industry complex is DN800 in diameter with an average drop of 0,4%, with a total length of approximately 500 m. The total maximum capacity of the Central Collector is **870 l/s**.

Newly designed condition - Hydrotechnical installations of the Waste-to-Energy Plant complex (WtE plant)

In accordance with the attached hydraulic calculation, the total quantities of treated water discharged from the Energy Plant complex to waste in the Central Collector of the Prahovo Chemical Industry Complex are as follows:

- The amount of conditionally clean (from the roofs of the facilities) and oily atmospheric water that is treated through two separators of NS10/100 ST1000 and NS15/150 ST1500 petroleum products with BYPASS is **233 l/s**.
- The amount of sanitary and fecal wastewater that is treated through the BP ES 20 biological purifier is a maximum of **4 l/s (only in the case of peak consumption that can last only a few minutes, while in regular operation this amount is significantly less, i.e. an average of 0,035 l/s).**
- The amount of purified process water is a maximum of **4 l/s (discontinuous discharge)**.

To the existing Central Collector of the Prahovo DN800 chemical industry complex, which drains water to the final recipient, the Danube River, from the WtE Plant complex to the waste of treated water, is brought through the DN600 canal with a total length of 385 m with a drop of 0,2%, into which the maximum discharge is made (233 + 4 + 4 = **241 l/s of water)**.

Conclusion:

According to all of the above, the maximum amount of purified water discharged from the Elixir Prahovo complex and the Waste-to-Energy Plant into the existing Central Collector of the Prahovo Chemical Industry Complex is:

328 l/s (purified water from the Elixir Prahovo complex) + 241 l/s (purified water from the Waste-to-Energy Plant complex) = **569 l/s**

In accordance with the above calculation, and bearing in mind the maximum capacity of the existing Central Collector of the Prahovo Chemical Industry Complex of 870 l/s, it can be concluded that the existing Central Collector DN800 is of sufficient capacity to accept, in addition to the purified waters of the Elixir Prahovo Complex, all purified waters discharged from the Waste-to-Energy Plant (WtE plant).

Technological sewerage will direct the collected technological wastewater from the Waste to Energy Plant site to the appropriate wastewater basin chambers (a total of 4 chambers). Technological sewerage consists of the following lines:

- Line T1 - Technological wastewater from wastewater treatment plant of the boiler plant (wastewater generated in flue gas cleaning);
- Line T2 - General technological wastewater from the waste thermal treatment plant W-C11 (water from service gullies, water from the dehumidification of the boiler, wastewater from fire extinguishing in the facility W-C11);
- Line T3 - Wastewater from washing sand filters from preparation of process water;
- Line T4 - Wastewater from filter washing from wastewater treatment plant (WWTP).
- Line T5 – Filtered wastewater directed to treatment at the WWTP (Wastewater Treatment Plant).

The T1 technological sewerage line will bring treated technological wastewater from the wastewater treatment plant in the boiler plant to chamber 2 of the wastewater basin. Process wastewater during the process of waste thermal treatment material will be generated during wet flue gas cleaning and washing of the residue from the dry flue gas cleaning which is necessary to remove water-soluble salts from residues from the dry flue gas treatment, and thus directly affects the prevention of salt leaching after the solidification process of this material. These wastewater will be discharged to a wastewater treatment plant (licensed by Envirochemie (ECWWT)) consisting of three-stage neutralization, heavy metal containment, flocculation, sedimentation and filtration. The capacity of the plant is 10 m3/h and is designed to receive all wastewater for treatment, including the water stream from washing the residue from the dry flue gas treatment as well as the leachate coming from the non-hazardous waste landfill. Wastewater treatment plant from boiler plant which will be described in more detail in Chapter 3. of the Study. The project envisages that after testing the quality parameters, treated wastewater, in case they meet the required quality for discharge into the final recipient, is gravitationally discharged first into the treated water collector, and then by the collector of the industrial complex of the chemical industry in Prahovo into the natural recipient – the Danube River. If the quality of the treated water is not of satisfactory quality prescribed for the discharge of water into the recipient (Danube River), it is designed that it will be gravitationally drained to the chamber 3 of the basin from where it will be drained to the wastewater treatment plant (WWTP) consisting of filtration in the sand filter column and the activated carbon column. After purification on the filter plant, water will be sent for re-treatment in the ECWWT plant. If the required quality for the discharge of wastewater into the recipient (Danube River) is still not achieved, the wastewater will be pumped from chamber 3 to chamber 4 of the basin from where it will be pumped to the liquid waste storage tanks in the W-C08 facility and then sent for thermal treatment to the boiler plant.

The T2 general technological sewerage line will collect technological wastewater that is periodically generated during the servicing of the waste thermal treatment plant W-C11, as well as in the event of an accident, fire, equipment washing, etc., and they will be drained to the chamber 3 of the pool. Thus, the general technological sewage system T2 will collect the following types of technological wastewater: wastewater from the drains from W-C11, water from the defrosting of the boiler, water from the washing of equipment and maintenance, as well as water from fire extinguishing in W-C11. From chamber 3, wastewater will be treated in the WWTP plant and then in the ECWWT plant, after which, if it meets the required quality, it will be discharged into the treated water collector, and then into the recipient. If it does not meet the quality, it will be pumped through the chamber 4 of pool to the storage tanks of liquid waste in the W-C08 facility and further taken to the boiler plant for thermal treatment.

The T3 technological sewerage line will bring the wastewater generated during the washing of sand filters from the process water preparation plant, to the chamber 1 of the wastewater tank where the sedimentation of suspended substances will be performed. Bearing in mind that after precipitation, clean technical water is obtained, it will be used for wet washing of gases. Excess water will be firstly discharged into the purified water collector, and then into the receiving collector and further into the recipient - the Danube River.

The T4 technological sewerage line will bring wastewater obtained from the sand filter and activated carbon filter washing in the WWTP plant to the chamber 4 of the wastewater pool, from where it will be transported to the W-C08 liquid waste storage, and then thermally treated in the boiler plant.

The line of general technological sewage – T5 transports wastewater after filtration in the facility U-C02 for re-treatment in the plant for the treatment of wastewater generated in the treatment of flue gases, which is located in the facility W-C11.

Attached to the Study is a block diagram of technological wastewater with discharges

At the location of the future Landfill for non-hazardous waste, the construction of:

- Leachate collection system;
- Atmospheric water collection system.
- Wheel washing water collection system.

The leachate collection system will consist of collecting pipelines, with a nominal diameter of DN400, for the collection of leachate (drainage) water, which will first drain the water into a pool for the temporary reception of leachate, which will be concreted and waterproofed. In the pool for the reception of leachate, a pumping station (PS_1) of the shaft type is planned, in which the pumps (P_1) intended for further transport of leachate to the wastewater pool located in the area of the waste to energy plant (chamber 3) will be located. From chamber 3, wastewater will be pumped for treatment in accordance with the above.

The system for collecting atmospheric water - Atmospheric water that flows from the outer slopes of the future landfill will be introduced, through the channel in the embankment foot, into the basin for receiving atmospheric water, next to which a pumping station of the shaft type is planned, with pumps intended for water recirculation by spraying. Wetting with water is intended for protection against air pollution, i.e. in order to prevent the spreading of fine-grained material from the landfill. The designed canal has a trapezoidal cross-section, at the bottom 1.0 m wide on the south side of the landfill and 0.75 m on all other sides. The channel will be lined with a geomembrane made of high density polyethylene (HDPE), not less of 1.5 mm thick. An emergency overflow from the stormwater pool is planned, which, in the event of extreme precipitation, will allow water to be evacuated into the peripheral canal of the phosphogypsum storage facility, which is located on the south side of the future Landfill for non-hazardous waste.

Water collection system from the truck wheels washing - The water from washing of the truck wheels by which the waste material is delivered to the landfill will be drained into a collection shaft that will be located within the packaged unit for wheels washing, and then transferred by pump to the tank where the deposition of solids will be performed. Purified water will be reused for washing the wheels so that there is no discharge into the recipient, and precipitated substances will be handed over for treatment to the plant.

Electroenergetic installations

Mains power supply - For the power supply of all consumers in the WtE plant, the power supply from 6x1600kVA, 10/0.4kV transformer substation is planned, which will be located in the facility W-C02 - Operational Center, which will be powered from the transformer substation TS 110/10kV (in the perspective TS 110/20kV), from transformer no.1 - Supply 1 and transformer no.2 - Supply 2. In the facility W-C02, in the technical room, the main distribution cabinet of general consumption, GRO-OP, is planned, from which all main distribution cabinets in the facilities will be supplied with electricity.

Backup power source (diesel electric generator DEG) - In the event of a failure of the mains power source to supply certain consumers in the facilities, a backup power source, diesel electric generator (DEG) with power 1385 kVA, is provided. For the power supply of all general electrical consumers, from a backup power source, the main distribution cabinet GROA-OP is planned, which will be located in the electrical room with a low-voltage plant.

Outdoor lighting distribution cabinets are powered by GRO-OP and GROA-OP.

The connection of the Landfill for non-hazardous waste to the electroenergetic network will be carried out through TS 10/0.4kV, which is owned by the Prahovo chemical industry complex. The distribution cabinet of pumps and lighting will be powered by cable line from the substation. Along the perimeter of the landfill, lighting is planned to be installed on the outer sidewalk of the road. A cabinet for powering and managing the leachate pump and a pump for spraying water around the landfill are also planned at the landfill. The planned total installed power is 44.2kW.

All facilities in the Waste to Energy Plant will have their own lightning protection, which will be achieved by installing receiving conductors on the roofs of the facilities and connecting them, using grounding down conductors, to the gound. All lightning protection installations will be connected to the foundation grounding by placing the Fe/Zn strip in the foundations of the facilities. These foundation grounding conductors will be connected, each at two places as a minimum, to the base grounding conductor. As a basic grounding device, a grounding device made of steel galvanized strip Fe/Zn 25x4 mm is provided. The grounding strip will be laid in the ground and all objects will be connected to the grounding. The distribution cabinet housings on the plateau, external lighting poles, as well as all other metal parts and structures in the WtE plant will also be connected to the basic grounding.

The galvanized FeZn 25x4 mm strip will be placed along the entire length of the trench under the cable of the external lighting of the Landfill for non-hazardous waste, so that each pole will be connected to the strip via the grounding screw, and at the beginning of the route with the grounding of the associated substation 10/0.4 kV. The distribution cabinet of the outdoor lighting is visibly connected to the grounding in the interior of the cabinet by means of a galvanized screw of at least M12. The screw will be secured against unscrewing by an elastic washer or by means of two nuts.

The landfill will be fenced with a wire fence, about 2 m high, on the north, west and south sides. There will be a WtE plant on the eastern side of the landfill and there will be no wire fences to that side, but the initial embankment will be an obstacle separating the Waste to Energy plant and the landfill. Steel columns with mesh filling made of stretched metal will be placed around the Waste to Energy plant in the length of 756.6 m and height of 2.1 m.

Gas pipeline

Natural gas will be supplied from the existing chemical industry complex in Prahovo to the location of the Waste to Energy plant, i.e. to the U-C09 natural gas reduction station where the pressure will be reduced from 4 barg to 0.5 barg. The following parts are housed in the burner housing: diffuser, combustion air vortex, gas lance, flame detector, ignition burner with its own flame detector (ionizing electrode) and igniter. Combustion air is taken from the discharge of the fresh air fan and continuously introduced into the burner. During the operation of the burner, the air is also used for cooling. Cooling air for burner equipment (flame detector, igniter) is also taken from the fresh air fan thrust. The burners have a rated power of 2x12MW.

Basic technical characteristics of burner:

Name Burner - VPH 12

Number of pieces - 2

Fuel - Natural Gas

Gas pipeline dimension - DN 150

Overpressure in front of the burner - 500 mbar +/- 5%

Design power of one burner - 12 MW

Before entering the burner, natural gas is brought to the skid with valves for safety interruption of natural gas supply and injection of atomization air.

Natural gas will only be used to start and stop the boiler and in case the temperature in the furnace drops below 850°C.

3.0 PROJECT DESCRIPTION

Introduction

Long-term changes in average weather conditions on Earth, i.e. changes in meteorological and climatological parameters – temperature, precipitation, wind and others are marked as climate change. The main cause of human impacts on climate change is the emission of greenhouse gases (GHGs), such as carbon dioxide (CO_2), methane (CH_4) and nitrogen dioxide (N_2O), which mainly occur as a result of the work of the energy sector (predominantly when fossil fuels are used), industry, transport, construction, intensive agriculture. These gases retain the heat of sunlight in the atmosphere, thus increasing the temperature on Earth - a phenomenon known as global warming. The consequences of climate change are increasingly visible today and it is proved that, in addition to being dangerous to the environment, they endanger the health and life of living beings.

The response of European Union (EU) to fight against climate change and the obligations arising from the Paris Agreement adopted in 2015 at the United Nations (UN) summit is the **European Green Deal** adopted in 2019. The European Green Deal (EGD) is a growth strategy to achieve climate neutrality in EU countries by 2050, which at the same time involves decoupling economic growth from resource consumption. The main objective of the European Green Deal is to reduce greenhouse gas emissions in the fields of energy, transport, industry and agriculture, and to increase the absorption of atmospheric gases by forests and soils (e.g. by expanding the network of protected areas, restoring ecosystems and forest natural resources).

In order to achieve climate neutrality, a radical reduction of greenhouse gas emissions, primarily carbon dioxide, and thus the decarbonization of the economy, is required.

The Green Agenda for the Western Balkans, to which the Republic of Serbia is a signatory, is based on the European Green Deal and represents a regional development strategy that aims to respond to the challenges of climate change and green transition and to help the countries of the Western Balkans to harmonize environmental regulations with European standards and norms. The key areas of the Green Agenda for the Western Balkans are:

- Decarbonisation
- Circular Economy
- Pollution reduction
- Sustainable agriculture
- Protection of biodiversity

One of the preventive **decarbonisation** measures is the Carbon Border Adjustment Mechanism (CBAM) which mandates the taxation of embedded greenhouse gas emissions in products imported into the EU market. This Mechanism is complementary to the EU Emissions Trading System (EU ETS), which collects GHG emissions. The introduction of the CBAM will have a significant impact on the socio-economic picture of non-EU countries, depending on the total exports of products covered by the CBAM to its market and on the degree of decarbonisation. By signing the Sofia Declaration on the Green Agenda for the Western Balkans, the Republic of Serbia committed to reduce GHG emissions by 33.3% by 2030 compared to 1990, i.e. by 13.2% compared to 2010. In order to achieve this, it is necessary to carry out numerous activities, first of all the abandonment of fossil fuels in favor of renewable energy sources, as well as the transition to a circular model of the economy and the reduction of waste. Accordingly, the Ministry of Environmental Protection adopted the Law on Climate Change ("Official Gazette of the RS", no. 26/2021) with accompanying by-laws, the Nationally Determined Contribution (NDC) to the Reduction of Greenhouse Gas Emissions of the Republic of Serbia for the period 2021 – 2030, as well as the Low-Carbon Development Strategy of the Republic of Serbia for the period from 2023 to 2030 with projections until 2050 ("Official Gazette of the RS", no. 46/2023).

The circular economy is a renewable industrial economy that has a changed concept of production and consumption according to the design, use of resources and attitude towards waste generation. In the concept of circular economy, waste does not exist, but only raw material that can be reused again for the same or other production processes. Also, renewable energy sources have priority, energy is used efficiently, innovative technologies are encouraged, as well as green public procurement, replacing hazardous chemicals with less hazardous ones and inevitable changes in consumer habits.

Bearing in mind all the above, the Project Holder ELIXIR CRAFT DOO, a branch of Eco Energy, a member company of the Elixir Group business system, has strategically determined to invest in the construction of plant for Waste-to-Energy (Waste-to-Energy Plant) within the industrial chemical complex in Prahovo, Negotin municipality. This strategic decision is motivated with the aim of accelerating the green transformation of the business, the Elixir Group business system, optimizing the use of resources in a responsible and efficient manner and ensuring long-term environmental protection.

The purposefulness of the construction of the Waste-to-Energy Plant in Prahovo is multiple and includes significant environmental, economic and social benefits.

The environmental benefits of this project are supported by the fact that the use of waste as a resource for energy production reduces the amount of waste disposed of in landfills, which directly reduces the negative impact of landfills on the environment in accordance with the policies of the European Union, which advocate the minimum disposal of waste in landfills and maximum treatment in appropriate plants, including thermal treatment. By reducing the amount of waste disposed of in landfills, the area of land occupied by landfills is also reduced. The project also contributes to the diversification of energy sources and the improvement of energy efficiency, which is of particular importance for long-term energy security, the preservation of natural resources and the reduction of harmful gas emissions. Another of the benefits of the project in question is that the construction of the Waste-to-Energy Plant will provide capacities for the disposal of hazardous waste generated in Serbia, which has so far been disposed of mainly by export to EU countries due to the lack of capacity for reuse treatment or disposal in RS. This ensures the disposal of hazardous waste as close as possible to the place of origin, which is in accordance with the waste management hierarchy, and also achieves economic benefit by reducing the costs of export, transport and disposal in EU countries.

In particular, by switching to the use of waste as an alternative energy source (Waste to Energy), 37% of the total needs for steam that drives the production of phosphoric acid within the existing industrial chemical complex in Prahovo will be met. In this way, the use of fossil fuels is also reduced, which reduces greenhouse gas (GHG) emissions per tonne of phosphoric acid produced by as much as 28% by 2027.

In addition to environmental benefits, the Waste-to-Energy Plant in Prahovo is also an economically sustainable solution that enables more efficient waste management and generates new jobs. The estimation of the Project Holder is that the Waste-to-Energy Plant in Prahovo will employ between 80 and 90 people, mostly highly educated staff of the engineering profession.

At the Waste-to-Energy Plant, non-recyclable hazardous and non-hazardous liquid and solid waste (industrial, commercial and municipal) will be thermally treated in a stationary plant where the obtained thermal energy is used for the production of steam, which will be further delivered and used for the evaporation of phosphoric acid in the plants of "Elixir Prahovo - Industrija hemijskih proizvoda d.o.o. Prahovo", (eng. "Elixir Prahovo - Industry of Chemical Products ltd, Prahovo") as the largest consumer of thermal energy in the existing chemical industry complex in Prahovo.

The Preliminary Design (attached to the Study is an excerpt from the PD) designed the Waste-to-Energy Plant, with a total boiler capacity of 30 MW, based on the technology of the Austrian company "TBU Stubenvoll" GMBH, which has proven references with plants of a similar type throughout Europe. Attached to the Study is the reference of the Austrian company "TBU Stubenvoll" GMBH (Presentation

TBU_EN for TBF October 2018, ABRG_Waste Quality Acceptance, Live data from the ABRG website on emissions from 2 Fluidized Bad). **The applied technology complies with the highest EU standards and BAT (see Annex - OVERVIEW OF COMPLIANCE with the CONCLUSIONS OF THE REFERENCE DOCUMENT ON BEST AVAILABLE TECHNIQUES):**

- Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987) **– Conclusions on best available techniques for waste incineration**

- Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) – **Conclusions on best available techniques for waste treatment**

- European Commission, Reference Document on Best Available Techniques on Emissions from Storage, July 2006 – **Best available techniques on Emissions from Storage**

In addition to the Austrian partner ''TBU Stubenvoll" GMBH, as the selected technology holder with numerous references in the design and construction of plants for thermal treatment and energy utilization of hazardous and non-hazardous waste, the investor additionally established consulting and technical cooperation with other Austrian experts, including "UVP Environmental Management and Engineering GMBH" (https://www.uvp.at/) and " AK2Energy " GMBH from Austria (http://www.ak2energy.com/), also with numerous references in the field of inserting and energy utilization of hazardous and non-hazardous waste.

Cooperation with UVP Environmental Management and Engineering GMBH includes expert consultations on the implementation of the relevant EU regulatory framework and support in the process of cross-border consultations.

Cooperation with "AK2Energy" GMBH includes expert technical audit of the project, confirmation of compliance of all technical solutions of the plant, from the technical and regulatory aspect (applied in the EU).

In order to eliminate any doubt regarding the adequacy of the selected technology and the adopted technical solutions in accordance with which the Waste-to-Energy plant in Prahovo was designed, as well as its suitability for thermal treatment of various types of hazardous and non-hazardous waste listed in the list of index numbers attached to the Study, the investor approached the partners from Austria, ''TBU Stubenvoll "GMBH and " AK2Energy " GMBH, with the request for additional written expert confirmation of the acceptability of the specified list of index numbers (EWC codes) of hazardous and non-hazardous waste, suitability for thermal treatment in accordance with the designed technology of the plant, all adopted technical solutions and in accordance with the restrictions that are explicitly defined in terms of unacceptable types of waste, unacceptable hazardous characteristics of waste, as well as explicitly defined limit values in terms of the physical and chemical composition of waste fuel that will be thermally treated in the Waste-to-Energy plant in Prahovo at the same time.

Expert certificates of the partners from Austria, TBU Stubenvoll GMBH (Confirmation on Technology Suitability for Treatment of EWC Codes in the Waste-To-Energy Plant in Prahovo) and AK2Energy GMBH (Confirmation on Technology Suitability for Treatment of EWC Codes in the Waste-To-Energy Plant in Prahovo), are attached to the Study.

In order to round up the process and dispose of residues from the bubbling fluidized bed boiler plant (unburned solid residues of slag, ash, sludge/thickened sediment from wastewater treatment) as close as possible to the place of origin, all in accordance with the principles of waste management defined in Article 6 of the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023), Rulebook on the waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021), the Regulation on the disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010) and the EU Landfill Directive (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste), the **Landfill for Non-hazardous waste** for the disposal of non-reactive waste will be built directly next to the Waste-to-Energy Plant. The landfill will be built in accordance with the design and technical documentation, and an excerpt from the PD is attached to the study. In this way, the application of the principle of self-sufficiency in waste reuse is also ensured, taking into account the geographical characteristics of the region and the need for special plants for certain types of waste in order to ensure a high level of environmental and public health protection.

Through these projects, the Elixir Group confirms its commitment to environmentally sustainable practices and innovations, thus contributing to environmental safety and sustainable development of both the local community and beyond, while also achieving greater competitiveness in the market.

Operations that the Project Holder ELIXIR CRAFT DOO, of the Eco Energy branch, plans to apply during the performance of the subject activity are waste utilization operations from the R list and disposal operations from the D list in accordance with the Rulebook on the waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021), which are listed exhaustively below:
R waste management operations at the Eco Energy complex (WtE + NHWL)

R designation	R waste management operations		Max Capacity (up to t/h)	Max Daily qapacity Q (up to t/day)	Max annual capacity (up to t/year)
R1	Use of waste primarily as a fuel or other means of energy production	Thermal treatment of non-recyclable liquid waste (dosing from storage tanks)	5	120	40,000
		Thermal treatment of sludge waste (dosing from a concrete storage bunker)	10	240	80,000
		Thermal treatment of pre-treated packaged waste of heterogeneous physical state (dosing after pre-treatment line)	10	240	80,000
		Thermal treatment of pretreated solid waste (dosing from storage concrete bunker S8_SGG)	17	408	100,000
		Maximum thermal treatment capacity of all types of waste, total (cumulative)	**17**	**408**	**100,000**

R12	Changes to subject waste to any of the operations from R1 to R11 ****	Pre-treatment (grinding) of packaged waste of heterogeneous physical state (IBC, barrels, jumbo bags, etc.)	10	240	80,000
		Pre-treatment (shredding) of solid waste >100mm and separation of metal for recycling (intended for R4)	20	480	104,531
		Maximum pre-treatment capacity of all types of waste, total (cumulative)	20	480	104,531
R13	Storage of waste designed for any operation from R1 to R12 (excluding temporary storage of waste at its generation site) Storage of waste destined for R1, in closed warehouses (bunkers, tanks, racks) Storage of waste intended for shipment to recycling (R4), in an open warehouse (plateaus)	Liquid waste storage (storage tanks)	152	152	40,152
		Sludge Waste Warehouse (Storage Bunker)	109	109	80,109
		Warehouse of packaged waste of heterogeneous physical state (liquid, sludge, solid)	261	261	80,261
		Solid waste storage >100mm, before mechanical pretreatment (storage box)	140	620	104,671
		Solid mechanically pre-treated waste warehouses (storage bunkers)	4,531	480	104,531
		Maximum storage capacity of all types of waste, total (cumulative)	**5,197**	**620**	**105,197**

(****) Where no other suitable R code applies, this may include preparatory operations preceding recovery processes, including preliminary treatment such as, among others, dismantling, sorting, crushing, compacting, baling, drying, cutting, conditioning, repackaging, separating or mixing prior to submission to any of the operations listed from R1 to R11.

The appendix to the Study provides an overview of:
R1 operation – Capacities by waste index numbers
R12 operation – Capacities by waste index numbers
R13 operation – Capacities by waste index numbers
The data on the maximum annual thermal treatment capacities for specific waste types (EWC codes) have been calculated in accordance with:

- the expected physical state and/or composition of the waste, and
- The maximum annual capacity of each waste dosing line/system, designed for different physical states and/or compositions of waste (i.e., liquid, sludge-like, solid, and heterogeneous multi-

phase waste), as shown in the following table:

Waste dosing line/system		**Max annual capacity of each waste dosing line/system (up to t/year)**	
1	Liquid waste dosing line (from liquid waste storage tank)	Liquid waste	40,000
2	Sludge Dosing Line (from sludge storage hopper)	Sludge waste	80,000
3	Dosing line for previously treated waste of heterogeneous composition (e.g. packaged liquid, solid and sludge waste in IBC containers, barrels, etc., after fine grinding in inert/nitrogen atmosphere)	Finely ground waste of heterogeneous multiphase composition	80,000
4	Dispensing line for previously treated solid waste (i.e. after shredding, from a solid waste storage hopper)	Chopped solid waste	100,000
Maximum annual capacity of thermal treatment of waste in the waste energy recovery plant (total for all types of waste / EWC codes)			**100,000**

D waste management operations at the Eco Energy complex (WtE + NHWL)

D-Label	R waste management operations		Max capacity at one moment (up to t)	Max daily capacity (up to t/day)	Max annual capacity (up to t/year)
D5	Disposal of waste in specially designed landfills (e.g. disposal of waste in linearly arranged covered compartments, mutually isolated and isolated from the environment)	Solidificate disposal on NHWL (non-hazardous or hazardous non-reactive waste)	1,713,000	111	38,346
D9	A physico-chemical treatment not specified elsewhere in this list, the final products of which are compounds or mixtures which are disposed of by any process from D1 to D12	Physico-chemical treatment of residues from the boiler plant by stabilization and solidification process (S)	10 t/h	74	25,730
		Physico-chemical treatment of residues from the boiler plant by the solidification process	14 t/h	111	38,346

	(e.g. evaporation, drying, calcination)	(S) after the stabilization process			
D13	Mixing waste before subjecting it to any of the operations from D1 to D12	Mixing of residues from thermal treatment of waste, for stabilization procedure (prior to D9 operation)	10 t/h	74	25,730
D15	Waste storage preceding any of the operations from D1 to D14 (excluding temporary storage, during collection, at the place where the waste was produced	Storage of residues from thermal treatment of waste, in the S/S facility before mixing for stabilization procedure (prior to D9 and D13 operations)	74	74	**25,804**
		Storage of residues from thermal treatment of waste, in the S/S facility before mixing for stabilization procedure (prior to D9 and D13 operations)	**1,042**	**74**	**26,846**

D waste management – Capacities by waste index numbers are provided in Appendix xx of the Study. In accordance with the above, the maximum annual capacity for solidified waste production is 25,564 m³/year, which, when multiplied by its projected density of 1.5 t/m³, results in a maximum annual mass of 38,346 t/year of solidified waste for disposal at the Non-Hazardous Waste Landfill (NHWL). The expected annual production and disposal capacity of solidified waste is lower than the maximum design capacity of the solidification equipment, which is stated as 8,964 m³/year, or 13,446 t/year, therefore the solidification unit will operate primarily in a non-continuous (batch) mode.

Bearing in mind the types of activities to be performed on the complex (thermal treatment of non-recyclable hazardous and non-hazardous liquid and solid waste with a capacity of 100,000 t/y and disposal of solidificates at the landfill for non-hazardous waste with an average of 8,964 m³/year), the plant in question is subject to the issuance of an integrated (IPPC) permit according to the Regulation on types of activities and installations for which integrated permits are issued "Official Gazette of the RS", no. 84/2005, item 5 Waste management.

Pursuant to the provisions of the Seveso Directive, Article 58 of the Law on Environmental Protection ("Official Gazette of the RS", nos. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - decision of the CC, 14/2016, 76/2018 and 95/2018 and 94/2024 - other law) and the Rulebook on the list of hazardous substances and their amounts and criteria for determining the type of documents produced by the operator of seveso installation or establishment ("Official Gazette of the RS", nos. 41/2010, 51/2015 and 50/2018), taking activities that are carried out and the maximum possible amounts of hazardous substances that may be present at any time in the Eco Energy complex (Section "H" - HEALTH HAZARD, "E1" and "E2" AQUATIC ENVIRONMENTAL HAZARD...), the status of the plant was determined. A complete list of waste types and maximum planned quantities is attached to the Study as well as the list of excluded waste index numbers from the R1 operation, i.e., the list of waste codes that will not be accepted at the facility in question. In accordance with the aforementioned, it has been determined that the complex in question represents a Seveso 'upper-tier' establishment and therefore it is the obligation of the Project Holder, with regard to accident risk management obligations, to prepare a Safety Report and an Accident Protection Plan and to obtain the approval for these from the competent authority.

3.1 Description of previous works on the project

Previous works, according to the Law on Planning and Construction ("Official Gazette of the RS", nos. 72/2009, 81/2009 - corr., 64/2010 - CC decision, 24/2011, 121/2012, 42/2013 - CC decision, 50/2013 - CC decision, 98/2013 - CC decision, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law, 9/2020, 52/2021 and 62/2023), depending on the class and characteristics of the facility, may include: research and development of analyses and projects and other professional materials; obtaining data that analyze and elaborate engineering-geological, geotechnical, geodetic, hydrological, meteorological, urban, technical, technological, economic, energy, seismic, water management and traffic conditions; fire protection and environmental protection conditions, as well as other conditions from the impact on the construction and use of a particular facility.

As part of the previous works, field research, IN SITU tests and laboratory research were carried out at the locations foreseen for the construction of the Waste-to-Energy Plant and the Non-hazardous Waste Landfill at the request of the Client.

Based on the performed examinations, Geotechnical studies were prepared by the processor GT Soil Inženjering d.o.o., based on the existing documentation, and purposefully performed investigations. The studies provide engineering-geological cross-sections of the terrain through the dimensions of the planned Non-hazardous Waste Landfill and through significant facilities of the Waste-to-Energy Plant (including locations of waste storage and transfer facilities, boiler plant, plant for stabilization and solidification of residues from the boiler plant, wastewater reception basin, etc.), geotechnical model of the terrain with physical and mechanical characteristics of separated lithogenetic environments, a geostatic calculation of consolidation subsidence of the soil below the embankment of the location planned for the non-hazardous waste landfill is given. The geotechnical conditions for the construction of the complex facilities were analyzed, from the aspect of load-bearing capacity, subsidence and safety during the execution of foundation excavations. In the conclusion of the text, geotechnical recommendations for the safe construction of the facilities of the Waste-to-Energy Plant and the Non-hazardous Waste Landfill are given.

As part of the previous works in accordance with the request of the Client, and in order to determine the so-called "zero" state, the COMPANY FOR COPYRIGHT PROTECTION AND ENGINEERING, THE BELGRADE COPYRIGHT BUREAU ("AUTORSKI BIRO BEOGRAD"), performed an analysis of the state of environmental factors in the zones designed for the construction of the facilities in question. For the preparation of the Analysis in question, the authors applied the methodology "by research tiers" (Tiered approach), based on the procedures published by ASTM 2015. (American Society for Testing and Materials) in guides E2081 and E1739. The analysis used the results of the analyses performed in the previous period and they present the extent of historical pollution, which is a consequence of decades of work of the former industrial complex IHP Prahovo. In addition to these analyses, more recent tests were used, which are representative of the subject area (studies, detailed studies and reports of authorized and accredited laboratories that were carried out in the period from privatization in 2012 to 2020), as well as targeted environmental research performed for the construction of new facilities within the Waste-to-Energy Plant and the Landfill for Non-Hazardous Waste.

A Biodiversity Study of the Impact Zone of the Industrial Complex "Eliksir Prahovo" – Industrija hemijskih proizvoda d.o.o. Prahovo" was also prepared by the Institute for Biological Research "SINIŠA STANKOVIĆ", National Institute of the Republic of Serbia, University of Belgrade, 25 April 2024. The biodiversity study was developed on the basis of available data on the state of the environment available at the said Institute, published data, as well as field research conducted during 2023.

The analyzed area included the spatial units of the Danube and coastal habitats in the direct impact zone of the Industrial Complex "Eliksir Prahovo" – Industrija hemijskih proizvoda d.o.o. Prahovo", which includes the for Waste-to-Energy Plant and the Landfill for Non-Hazardous Waste, the construction of which is planned, the surrounding zone with potential direct impacts, with an area of 20 km^2(from km 857 to km 862) downstream of HPP Đerdap 2.

Bearing in mind that the subject area is located on the border of Serbia, Romania and Bulgaria and that the Danube is the border between Serbia and Romania, and the Timok River demarcates Serbia and Bulgaria, the Study of Biodiversity of the Impact Zone of the Industrial Complex "Elixir Prahovo" – Industrija hemijskih proizvoda d.o.o. Prahovo" considers the potential negative impacts of the construction and operation of the plant on the biodiversity of nearby areas of neighbouring countries. Six NATURA 2000 SITES were identified in the surrounding areas, namely four in Romania (Blahnița – ROSPA0011 and Gruia - Gârla Mare – ROSPA0046, Dunărea la Gârla Mare - Maglavit – ROSAC0299 and Jiana- ROSAC0306) and two in Bulgaria (Timok – BG0000525 and Novo selo – BG0000631). One Ramsar area (Blahnița – ROSMS0013) was also identified in Romania. The study provides an overview of the value of these areas and potential impacts from the aspect of biodiversity.

More detailed information on the results of the research is given in Chapter 2 and Chapter 5 of the Study, as well as in the report attached to the subject Environmental Impact Assessment Study.

The design and technical documentation was prepared:
- Preliminary Design of the CONSTRUCTION OF THE WASTE-TO-ENERGY PLANT (which includes all planned activities related to the management of waste from the reception, storage, pretreatment and preparation of waste for thermal treatment, then thermal treatment itself, treatment of residues from the plant by stabilization and solidification, as well as all other activities necessary for uninterrupted functioning of the plant as the preparation of technical water, distribution of auxiliary fluids and gases, treatment of wastewater and waste gases, etc.) and
- Preliminary Design PHASE CONSTRUCTION OF LANDFILL FOR NON-HAZARDOUS WASTE WITHIN THE ICP ELIXIR PRAHOVO COMPLEX IN PRAHOVO

A complete list of all volumes is given in Chapter 1.6.

A positive opinion of the Republic Audit Commission on the projects was also obtained. Attached to the study is:
- Report on the performed expert control of the Conceptual Design of the Construction of the Waste-to-Energy Plant, Ministry of Construction, Transport and Infrastructure, no. 000186359 2024 14810 005 000 000 001 dated 26.03.2024 In accordance with the aforementioned Report, the Audit Committee assessed that the technical documentation was complete and that it was accepted.
- Report on the performed expert control of the Preliminary Design: Phase construction of the Landfill for Non-hazardous Waste within the ICP ELIXIR PRAHOVO complex in Prahovo, Ministry of Construction, Transport and Infrastructure no. 001129027 2023 14810 005 000 000 001 of 06.08.2024. In accordance with the aforementioned Report, the Audit Committee assessed that the technical documentation was complete and that it was accepted.

Description of preparatory works for the construction of the Eco Energy complex

According to the Law on Planning and Construction ("Official Gazette of the RS", nos. 72/2009, 81/2009 - corr., 64/2010 - CC decision, 24/2011, 121/2012, 42/2013 - CC decision, 50/2013 - CC decision, 98/2013 - CC decision, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law, 9/2020, 52/2021 and 62/2023) preparatory works are works that precede the construction of the facility, and in the case in question on the construction of the Eco Energy complex in Prahovo, relate in particular to:
- Marking the construction site with an appropriate board containing: information on the facility being built, the investor, the responsible designer, the number of the building permit, the contractor, the beginning of construction and the deadline for completion of construction,
- Provision of space for the delivery and storage of construction products and equipment, construction and installation of facilities, installations and equipment of a temporary nature for the purpose of performing works (installation of construction fences, containers for employees, containers for storing chemicals, standard cages for cylinders with technical gases, etc.),
- Clearance of the terrain (about 59,000 m^2),
- Removal of the surface layer of soil (humus and backfilled soil) unfavorable for the foundation of buildings (about 30,000 m^3),
- Leveling the terrain by filling it with appropriate material suitable for embankment construction (about 27,000 m^3),
- Works that ensure the safety and stability of the terrain (execution of piles, head beams, subgrade, etc.),
- Excavation and preparation of the subsoil for the construction of facilities,
- Examination of the removed surface layer of soil and excavated soil by engaging an authorized, accredited laboratory in order to determine the quality of the soil and the manner

of its further disposal. If the analysis determines that the concentration of pollutants in the soil is higher than the prescribed limit and/or remediation values, it is necessary to remediate it or obtain a waste examination report and dispose of it as hazardous waste through an authorized operator.

- Disposal of used construction materials by authorized operators, i.e. transport of non-hazardous construction waste to the landfill,
- Handover of other generated hazardous and non-hazardous waste to authorized operators for further disposal in accordance with the previously obtained Waste Examination Report,
- Ensuring the unimpeded running of traffic and the use of the surrounding area.

The preparatory works will be carried out in accordance with the **permit of the competent authority** and the **Project of preparatory works.**

There are no existing construction facilities, equipment or installations on the plot intended for the construction of the Eco Energy complex, which is why this project does not envisage demolition works.

Clearance and preparation of the terrain includes removal of shrubs up to 10 cm thick, felling of trees of all thicknesses with cutting of branches, excavation, extraction and relocation of stumps of new and old cut trees and everything else of excessive plant and other material, for the works that are needed. The location in question is dominated by low vegetation and shrubs.

The removed surface layer of soil – humus, with a thickness of up to 40 cm, will be temporarily disposed of in the designated place (in the belt of road land) and upon completion of the works, it can be reused for the landscaping of the green areas of the plant. Transport, i.e. pushing of material to the landfill, will be carried out carefully in order to preserve the quality of the excavated humus for later needs when arranging slopes and green areas, so that this material does not mix with other non-humus material.

The filling of the terrain for the construction of the plateau is envisaged with new, drainage material of appropriate properties in terms of suitability for filling, whereby the final layer must be made of gravel or crushed stone. Filling is carried out in layers up to 30-40 cm thick. Each layer is compacted before the next one is spread out.

When the plateau is prepared, the execution of piles is started. Before starting the construction of piles, it is necessary to create an access road and a plateau for the work required for the delivery and installation of drilling equipment, (as well as for its undisturbed operation), for the installation of reinforcement baskets and for the approach to concreting. The work plateau depends on the drilling equipment and is planned to be 5-7m wide, and the passable part of the road is 3-5m. The final layer on the working plateau should be made of quality materials (gravel, crushed stone, rock...). The technology of making piles consists of three basic phases: drilling with a drill bit to the required depth, grouting concrete through the central part of the drill bit and installing a reinforcement basket.
Only when all designed piles are executed, the hidden pile curtain head beam and the foundation slab for the facility W-C11 - Waste Thermal Treatment Plant, excavation for the facility W-C08 - Pretreatment and waste storage up to a depth of 6.0 m can be started.

Considering that the maximum level of groundwater at the site intended for the construction of the Non-hazardous Waste Landfill is 7-10 m, the area below the landfill will be arranged as follows:

- removal of low vegetation and shrubs and excavation of humus and other surface material will be carried out in the area where future compartments will be formed to a depth of 0.3-1.3 m, so that a uniform bottom elevation of 48 masl will be achieved,
- the cleaned area will be well rolled by multiple passage of rollers and compactors, which will fully prepare the terrain for the commencement of works on the construction of the landfill according to the conditions of the geotechnical study.

For the purpose of performing works on the construction of planned facilities at the subject location planned for construction according to the Second Amendment to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 350-123/2022-I/07 of 17.06.2022), a construction site will be formed, within which prefabricated type facilities, ground floor office containers will be installed, in which there are work and auxiliary premises of common purpose (sanitary facilities, café kitchen, meeting room and warehouse space), containers for storing chemicals (additives, means for ACP of resins, fire protection coatings, oils and lubricants, paints, varnishes, thinners, etc.), standard cages for bottles with technical gases, etc. All containers with liquid substances where there is a possibility of leakage will be installed in facilities on portable standard tanks to prevent soil and groundwater pollution. At the location of the construction site, there will be a clearly defined space for parking of construction machinery, trucks and passenger vehicles.
Internal roads and plateaus for the movement of vehicles and employees will be formed within the construction site itself. The width of traffic areas will be greater than 5 m and will allow two-way movement of vehicles. Traffic areas, places for loading and unloading equipment will be arranged and built in such a way as to ensure the safe movement of employees within the construction site. Plateaus for parking freight vehicles, passenger vehicles and work machines will also be foreseen within the construction site. The construction site will be fenced off with a wire fence to prevent unauthorized persons from entering the construction site.
Vessels and enclosures will be provided at the construction site for sorting and temporary storage of various types of hazardous and non-hazardous construction waste, packaging waste, municipal waste, secondary raw materials, etc. All waste containers must be labelled in accordance with waste management regulations. The warehouse must be secured from access by unauthorized persons with a waterproof base. All containers with liquid waste materials will be placed on bundwalls and protected from atmospheric influences.

In accordance with the Regulation on the Manner and Procedure of Construction and Demolition Waste Management ("Official Gazette of the RS", nos. 93/2023 and 94/2023 - corr.), all types of waste will be treated in accordance with the Construction and Demolition Waste Management Plan, to which the Project Holder will obtain the consent of the competent Ministry of Environmental Protection. The construction and demolition waste management plan and consent to the same will be submitted to the competent authority along with the request for the issuance of the Decision on the building permit.The producer of construction and demolition waste (contractors) will be obliged to fully organize the implementation of the said Plan.

3.2 Description of the facility, the planned production process or activities, their technological and other characteristics

THE PLANT FOR ENERGY RECOVERY OF WASTE (Waste-to-Energy Plant), with a total boiler capacity of 30 MW, was designed for the purpose of thermal treatment of hazardous and non-hazardous, liquid and solid waste (industrial, commercial and municipal). In the stationary plant in question, the thermal energy obtained will be used for the production of 35 t/h of steam, which will be further delivered and used only for the operation of the existing industrial plant Elixir Prahovo. When the consumers of steam produced by the Waste-to-Energy Plant do not work, then the subject plant will not work either. The total capacity of the Waste-to-Energy Plant is 100,000 t of thermally treated waste for 8,000 h on an annual basis.

Within the Waste-to-Energy Plant, there will be facilities of the production part, accompanying and auxiliary facilities, as well as roads, handling areas and facilities necessary for the functioning of the industrial plant.
The Waste-to-Energy Plant will be physically isolated by a fence, whereby access gates for pedestrian, motor and freight vehicles will be provided.

The Waste-to-Energy Plant is built on a planned area of about 5.8721 ha, within the limits defined by the conceptual engineering provider of 217x270.7 m. The layout of facilities, spatial organization, technological operations, internal roads and manipulative surfaces of the Waste-to-Energy Plant are defined by the provider of the conceptual design, the company "TBU Stubenvoll" GMBH. The position of the Waste-to-Energy Plant and the construction line are defined in drawing *23-WTE-IDP-00-C00-0001-R00 Situation Plan of the closer environment*, which is attached.

Traffic areas within the Waste-to-Energy Plant are roads intended for circular movement and manoeuvring of trucks through the plant itself. One entrance/exit from the plant on the southeastern station is planned towards the newly designed road in Zone IV – Energy and Ecological Island. Newly designed roads in Zone IV are connected to the internal infrastructure network of roads. The widths of the roads meet the requirements of the applicable regulations of the Republic of Serbia.

The basic characteristics of the Waste-to-Energy Plant are shown in Tables 3.1 and 3.2.

Table 3.1 Basic data of the Waste-to-Energy Plant

Total data for WtE:	Total plot area/plot of zone IV	264,600.00 m^2
	Coverage of the area where the Waste-to-Energy Plant (WtE) is located	58,720.69 m^2
	Total GFA:	**11,566.43 m^2** Note: Plateaus and concrete slabs did not enter the total surface
	Total GROSS built-up area:	**13,095.59 m^2** Note: Plateaus and concrete slabs did not enter the total surface
	Land area under the facility/occupancy:	**8,601.97 m^2** Note: Plateaus and concrete slabs did not enter the total surface
	Land area under the facility / occupancy index:	A of land under the facility / A of the plot *100= 8,601.97 / 58,720.69*100 =**14.65%**
	Site construction index:	GFA / A parcels= 11,566.43 m^2 / 58,720.69 m^2 =**0.20**
	Index of green areas:	**53.99%**

Table 3.2 Dimensions and materialization of facilities within the Waste-to-Energy Plant

LB	*PRODUCTION FACILITIES*		
1.	**W-C01 Reception guardhouse and administrative building**		
	Dimensions of the facility:	Total GFA:	1205.08 m^2
		Total GROSS area of the facility:	1205.08 m^2
		Land area under the facility/occupancy:	621.74 m^2
		Dimensions of the facility:	Max.dimensions:16.3x43.3 m
		Number of floors:	GF+1
		Height of facility:	10.0 m
	Materialization of the facility:	Facade materialization:	Facade panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
2.	FACILITY: **W-C02 – Operations Centre**		
	Dimensions of the facility:	Total GFA:	1656.00 m^2
		Total GROSS area of the facility:	1745.06 m^2
		Land area under the facility/occupancy:	437.79 m^2
		Dimensions of the facility:	Max.dimensions:21.9x33.1 m

			dimensions of the main facility: 12.0x33.1 m dimensions of the passageway: 9.9x4.1 m
		Number of floors:	TI+GF+3
		Height of facility:	20.0 m
	Materialization of the facility:	Facade materialization:	Facade panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
3.	FACILITY: **W-C03 - Fire water tank**		
	Dimensions of the facility:	Total GFA:	133.00 m^2
		Total GROSS area of the facility:	133.00 m^2
		Land area under the facility/occupancy:	133.00 m^2
		Dimensions of the facility:	Tank diameter: 12.0 m
		Tank height:	11.85 m
	Materialization of the facility:	Materialization of the tank wall:	Steel
4.	W-C04 **Pumping station and fire station**;		
	Dimensions of the facility:	Total GFA:	423.44 m^2
		Total GROSS area of the facility:	423.44 m^2
		Land area under the facility/occupancy:	423.44 m^2
		Dimensions of the facility:	Max.dimensions:15.8x26.8 m
		Number of floors:	GF
		Height of facility:	6.85 m
	Materialization of the facility:	Facade materialization:	Facade panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
5.	FACILITY: **W-C06 - Pipeline bridges**		
	Dimensions of the facility:	Total GROSS area of the plateau:	822 m^2
		Length of facility:	L1=173 m L2=30.5 m L3=22.5 m L4=15.5 m L5=11.5 m Total: L1+L2+L3+L4+L5= 254.0 m
		Height of facility:	8.0 m
	Materialization of the facility:	Structure:	ST
6.	W-C08 **Pretreatment and waste storage**		
	Dimensions of the facility:	Total GFA:	3,585.58 m^2
		Total GROSS area of the facility:	4,967.13 m^2
		Gross underground:	1,381.55 m^2
		Gross above ground:	3,585.58 m^2
		Land area under the facility/occupancy:	2,522.90 m^2
		Dimensions of the facility:	max.dimensions:50.8x67.0 m
		Number of floors:	TI+GF+3
		Height of facility:	35.0 m

	Materialization of the facility:	Facade materialization:	RC + ST + panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
7.	FACILITY: **W-C09 – Waste Pretreatment Filter System and Activated Carbon Filter**		
	Dimensions of the facility:	Total GROSS area of the plateau:	315.00 m^2
		Plateau dimensions:	14.5x21.80 m
	Materialization of the facility:	Materialization of the plateau:	RC
8.	FACILITY: **W-C10 - Cargo scales**		
	Dimensions of the facility:	Total GFA:	133.0 m^2
		Total GROSS area of the facility:	133.0 m^2
		Land area under the facility/occupancy:	133.0 m^2
		Dimensions of the facility:	2x3,5x19,0 m
	Materialization of the facility:	Materialization of the plateau:	RC
9.	W-C11 **Waste thermal treatment plant**		
	Dimensions of the facility:	Total GFA:	1570.00 m^2
		Total GROSS area of the facility:	1570.00 m^2
		Land area under the facility/occupancy:	1570.00 m^2
		Dimensions of the facility:	Max. dimensions:64.7x36.8m
		Number of floors:	GF
		Height of facility:	38.16 m
	Materialization of the facility:	Facade materialization:	ST + panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
10.	FACILITY: **W-C12- Stabilization and solidification**		
	Dimensions of the facility:	Total GFA:	755.66 m^2
		Total GROSS area of the facility:	763.22 m^2
		Land area under the facility/occupancy:	623.66 m^2
		Dimensions of the facility:	Max.dimensions:45.8x22.5 m
		Number of floors:	GF+1
		Height of facility:	18.15 m
	Materialization of the facility:	Facade materialization:	RC + ST + panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
11.	FACILITY: **W-C13 – Transfer point**		
	Dimensions of the facility:	Total GFA:	189.00 m^2
		Total GROSS area of the facility:	189.00 m^2
		Land area under the facility/occupancy:	189.00 m^2
		Dimensions of the facility:	9x21 m
		Number of floors:	GF
		Height of facility:	6.5 m
	Materialization of the facility:	Structure:	Steel
		Roof materialization:	Painted electroplated profiled sheet metal
12.	FACILITY: **W-C14 – Smokestack**		

	Dimensions of the facility:	Total GROSS area of the plateau:	84.05 m^2
		Dimensions of the stack foundation:	WxLxH: 6.2 x 6.2 x 2.3 m
		External diameter of the stack:	Ø2.26 m
		Internal diameter of the stack:	Ø1.95 m
		Stack height:	56.30 m
	Materialization of the facility:	Materialization of the smoketack wall:	Steel sheet
		Materialization of the foundation:	RC
13.	FACILITY: **W-C15 – Ammonia water tank with bundwall**		
	Dimensions of the facility:	Total GFA:	44.73 m^2
		Total GROSS area of the facility:	95.72 m^2
		Land area under the facility/occupancy:	44.73 m^2
		Dimensions of the facility:	Tank Dim.: 5.0x5.0 m Dim. of the spray water pool: 10.0x5.1x2.0 m
		Number of floors:	GF
		Height of facility:	11.37 m
		Pool fence height:	1.1 m
	Materialization of the facility:	Facade materialization:	ST + panel
		Roof materialization:	ST +TR sheet metal
		Materialization of the bundwall:	RC
14.	FACILITY: **W-C16 – Solidification filter system**		
	Dimensions of the facility:	Total GROSS area of the plateau:	146.00 m^2
		Plateau dimensions:	16.4x9.0 m
	Materialization of the facility:	Materialization of the plateau:	RC
15.	FACILITY: **W-C17 – Fence**		
	Dimensions of the facility:	Total length of the facility:	756.60 m
		Height of facility:	2.10 m
	Materialization of the facility:	Materialization of the fence:	Steel posts with stretched metal mesh filling
LB	**SERVING FACILITIES**		
16.	FACILITY: **U-C01 – Bus stop**		
	Dimensions of the facility:	Total GFA:	10.2 m^2
		Total GROSS area of the facility:	10.2 m^2
		Land area under the facility/occupancy:	10.2 m^2
		Dimensions of the facility:	1.7x6.0 m
		Number of floors:	GF
		Height of facility:	2.50 m
	Materialization of the facility:	Facade materialization:	ST + tempered glass
		Roof materialization:	Sandblasted tempered glass
17.	U-C02 **Maintenance building and auxiliary systems facility**		
	Dimensions of the facility:	Total GFA:	1852.74 m^2
		Total GROSS area of the facility:	1852.74 m^2
		Land area under the facility/occupancy:	1852.74 m^2
		Dimensions of the facility:	Max. dimensions: 25.0x76.3 m Facility: 25.0x70.8 m Tanks: 5.5x16.0 m

		Number of floors:	GF
		Height of facility:	11.0 m
	Materialization of the facility:	Facade materialization:	ST + Sandwich panel
		Roof materialization:	Stacked roof (profiled steel sheet, mineral wool and PVC membrane)
18.	FACILITY: **U-C03 – Wheel Washing Unit**		
	Dimensions of the facility:	Total GROSS area of the plateau:	115.6 m^2
		Plateau dimensions:	Max. dimensions: 2x11.5x3.5+6x2.75 m
		Dim. of the buried water tank:	2 x 5.8x2.2x1.85 m
		Dimensions of the wheel washing ramp:	2 x 11.2x2.92 m
		Height of the carriageway wall:	1.45 m
		Height of the tank fence:	1.1 m
	Materialization of the facility:	Materialization of the tank wall:	Steel sheet externally protected by anti-corrosion coating
19.	U-C06 **Wastewater Receiving and Treatment System**		
	Dimensions of the facility:	Total GROSS area of the plateau:	720.00 m^2
		Plateau dimensions:	40.0x25.0 m
		Pool dimensions:	25.0x25.0 m
		Pool fence height:	1.1 m
	Materialization	Materialization of the pool wall:	RC
20	FACILITY: **U-C07 – Plateau**		
	Dimensions of the facility:	Total GROSS area of the plateau:	262.5 m^2
		Plateau dimensions:	19.5x14.0 m
	Materialization of the facility:	Materialization of the plateau:	RC
21.	FACILITY: **U-C08 – Plateau for separated metal**		
	Dimensions of the facility:	Total GROSS area of the plateau:	194.4 m^2
		Plateau dimensions:	15.3x12.7 m
	Materialization of the facility:	Materialization of the plateau:	RC
22	FACILITY: **U-C09 – Natural gas reducing station**		
	Dimensions of the facility:	Total GROSS area of the facility:	8.0 m^2
		Dimensions of the facility:	4.0 x 2.0 m
		Height of facility:	3.0 m
	Materialization of the facility:	Materialization of the wall and roof:	ST + sheet metal
		Materialization of the foundation:	RC
23	PLATEAU: **Truck parking**		
		Total GROSS area of the facility:	**1,799.00 m^2**
24	PLATEAU: **Parking for passenger vehicles**		
		Total GROSS area of the facility:	**901.0 m^2**
25	PLATEAU: **Traffic areas of the WtE plant**		
		Total GROSS area of the facility:	**10,675.00 m^2**
26	PLATEAU: **Concrete plateaus**		
		Total GROSS area of the facility:	**2,659.55 m^2**

27	OPEN AREAS: **Free areas of the WtE plant**		
		Total sidewalk area: Total green spaces:	**2,382.61 m^2** **31,701.56 m^2**

Notes:

1. LB: Marking on the layout plan, drawing number 23-WTE-IDP-00-C00-0001-R00
2. Tl: Technical level
3. The construction index and the degree of occupancy are shown in relation to the area of the Waste-to-Energy Plant.

THE LANDFILL OF NON-HAZARDOUS WASTE is intended for the disposal of non-hazardous and non-reactive hazardous waste (solidification) on an area of about 8.5 ha. The average annual production of solidificates to be disposed of at the landfill is 8,964m^3/year, i.e. a maximum of 25,564m^3/year. The capacity of solidification as a physical chemical treatment of residues from thermal treatment, i.e. the capacity of production and disposal of solidificates, is directly correlated with the amount of residues from thermal treatment, the amount of which depends on the ash content in the waste fuel that is simultaneously thermally treated in the plant. The range of production and disposal of solidificates ranging from 8,964 m^3/year to 25,564 m^3/year is derived from the mass balances of the operation regime of the plant with different types of waste fuels (rating case) and is directly related to the range of ashes in the incoming waste fuel that will be thermally treated in the plant at the same time. The design of the WtE boiler plant envisages a large range of ash generation of the input mixture of waste fuels, which amounts to 0-40 wt.%, which implies a wide range in the generated amount of solid residues from thermal treatment treated by the solidification process, i.e. a range in the amount of solidificate produced that is disposed of at the Landfill of non-hazardous waste. The solidification process is batch, and its capacity is designed so that the maximum daily amount of residues from the thermal treatment can be solidified and disposed of at the Non-Hazardous Waste Landfill during one 8h shift.

The landfill is designed as a landfill for non-hazardous waste in accordance with the Regulation on landfill waste disposal ("Official Gazette of RS", No. 92/2010) and the following will be disposed of:

1) non-hazardous waste of any origin that meets the limit values of the parameters for disposal of non-hazardous waste;

2) solid, non-reactive hazardous waste (solidified) whose leachate is equivalent to that for non-hazardous waste from point 2) of this paragraph and which meets the limit values of the parameters for disposal of hazardous waste at non-hazardous waste landfills.

At the non-hazardous waste landfill, the disposal of biodegradable waste is not envisaged, nor are special cassettes for biodegradable waste envisaged.

The selected incineration technology precisely defines the restrictions regarding the type of waste, hazardous characteristics of the waste and the limit values regarding the physical and chemical composition of the waste fuel that will be thermally treated in the Waste-to-Energy plant at the same time. Based on this, all adopted technical solutions and capacities for the treatment of expected contaminations and waste streams were designed and dimensioned, including stabilization and solidification as the intended physical and chemical treatment of residues from thermal treatment. The control of leachate of the non-hazardous waste landfill and proving the inactivity of the solidification will be carried out by an accredited laboratory in accordance with the Rulebook on Categories, Testing and Classification of Waste ("Official Gazette of RS", No. 56/2010, 93/2019, 39/2021 and 65/2024), according to the NEN 7345 standard or equivalent standard.

Table 3.3 Basic information about the Non-hazardous Waste Landfill

Type of facility:	Outdoor non-hazardous waste landfill

Type of works:	New construction	
Category of facility:	G	
Classification of individual parts of the facility:	Share in the total area of the facility (%):	Classification code:
	100%	230301 (buildings and plants for the chemical industry)
Dimensions of the facility:	Total plot area:	82 390.00 m^2
	GFA	77 067.00 m^2
	Total GROSS area of the facility:	77 067.00 m^2
	Total net area	64 252.00 m^2 (I-A PHASE – 18 200.00 m^2 I-B PHASE – 18 400.00 m^2 II PHASE – 27 652.00 m^2)
	Land area under the facility	64 252.00 m^2
	Number of floors	-
	Height of facility	46 m
	Absolute elevation	94.00 masl

3.2.1 Description of the main characteristics of the production process of the Waste-to-Energy Plant

The basic characteristics of the waste to be treated in the plant in question, as well as the basic characteristics of the boiler are given in Table 3.4 and Table 3.5, respectively.

Table 3.4 Basic characteristics of waste

Waste type	Non-recyclable municipal, commercial and industrial waste (non-hazardous and hazardous)
Waste mass flow, t/h	3.43 – 17.24 *
Waste flow rate, m^3/h	11.0 – 57.0 *
Nominal moisture content, wt. %	50% per 7 MJ/kg 10% per 20 MJ/kg
Designed moisture content, wt. %	5 - 50
Ash content, wt. %	40% at 7 MJ/kg

* Depends on the thermal power of the waste

Table 3.5 Basic characteristics of the boiler

Boiler capacity, MW	30
Steam production, t/h	35
Vapour pressure produced, barg	13
Temperature of steam produced, ˚C	207
Incineration technology	in the fluidization bed
Flue gas temperature in the furnace	850-950 ˚C
Energy Efficiency	81.55

As part of the Waste-to-Energy Plant, the management of hazardous and non-hazardous waste will be carried out under the strict control of the company ELIXIR CRAFT DOO, a branch of Eco Energy from the moment of taking over the waste through the following activities:

- ✓ Pre-check and acceptance of waste (collection of waste information, verification of the Waste Examination Report received from the waste generator before delivery to the plant in order to determine the types of waste that can be received and treated at the plant)
- ✓ Reception control and waste examination;
- ✓ Reception of waste (waste measurement and washing of vehicle wheels);
- ✓ Unloading and temporary storage of solid waste;
- ✓ Unloading, transfering and temporary storage of liquid waste;
- ✓ Unloading and temporary storage of sludge waste
- ✓ Physical and mechanical pretreatment of solid waste (shredding of hazardous and non-hazardous waste, separation, etc.);
- ✓ Transportation-manipulation operations and accompanying technological procedures;
- ✓ Waste thermal treatment and production of thermal energy in the form of steam.

In addition to the aforementioned activities, the following are also envisaged for the purpose of the operation of the plant in question:

- ✓ Preparation of process water for the needs of the operation of the plant;
- ✓ Distribution of auxiliary fluids (CNG, nitrogen, compressed air, ammonia water);
- ✓ Treatment of gases (from the process of pretreatment, storage, waste thermal treatment, stabilization and solidification) emitted at the plant in question;
- ✓ Treatment of residues from thermal waste treatment plants – Stabilization and solidification;
- ✓ Dispatch of solidificates to the landfill for non-hazardous waste and handover of secondary raw materials (metal, plastic, etc.) to authorized operators for further disposal;
- ✓ Wastewater collection and treatment.

The Figure 3.1 shows schematic representation of the Waste-to-Energy Plant.

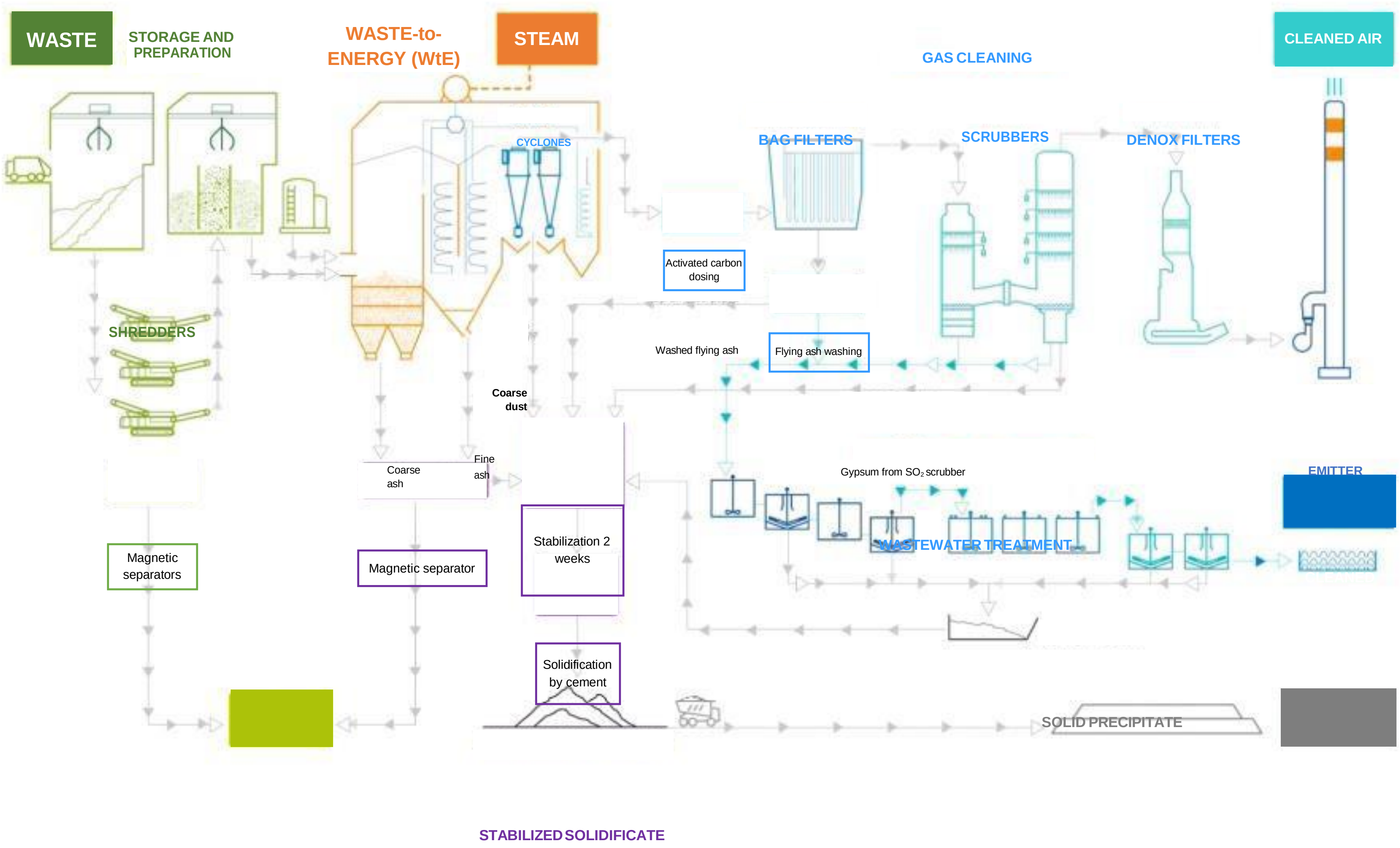


Figure 3.1 Schematic representation of the Waste-to-Energy Plant in Prahovo

3.2.1.1 Pre-check and acceptance of waste

Liquid and solid non-hazardous and hazardous waste will be taken over by the Project Holder from the waste generator or authorized operators who have the permission of the competent authority for the collection, transport and/or storage of waste. During the contracting process, all generators and operators will be provided with clear instructions and guidelines on the types of waste, the way the waste should be packaged and labelled, and the required accompanying documentation, so that the waste can be received and treated at the relevant Waste-to-Energy Plant. Having in mind the above, previously sorted and adequately packaged waste that meets all the requirements for admission to the plant will be delivered to the complex in question.

In accordance with the conclusions on best available[26] techniques BAT9(b), the Project holder shall provide all waste suppliers with clear and precise procedures and instructions for waste testing and characterization and submission of waste data before its delivery to the Waste-to-Energy Plant site, all as part of **the pre-acceptance** procedure. This procedure includes the collection of information on waste coming to the plant, the report on the characterization of waste for the needs of thermal treatment in accordance with the Rulebook on categories, testing and classification of waste ("Official Gazette of RS", no. 56/2010, 93/2019, 39/2021 and 65/2024), checking the compliance of the physical condition and the index number of waste from the report with the technical characteristics of waste intended for thermal treatment (index numbers intended for treatment are given as an annex to the study and form an integral part thereof). If necessary, the waste will be sampled in accordance with SRPS CEN/TR 15310- (1-5):2009, ASTM D 6051:2015, SRPS EN ISO 21645:2021 and further tested to determine the adequacy for treatment at the plant (see chapter 7.1.2.1).

Verification of waste samples begins with an insight into the existing documentation on waste, i.e. the report on waste categorization, and detailed verification will be carried out as part of the pre-acceptance and later as part of the acceptance procedure, in accordance with the said Rulebook on categories, testing and classification of waste ("Official Gazette of the Republic of Serbia", no. 56/2010, 93/2019, 39/2021 and 65/2024) and the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of the RS, no.103/2023)[27].

The Project holder, as a future plant operator, intends to carry out a detailed pre-acceptance control of each new generator and type of waste as part of the pre-acceptance procedure, which includes a visit to the generator plant, insight into the technological process in which the waste was generated, the method of waste treatment at the place of generation, analysis of the complete waste documentation and safety data sheets (MSDS) of all chemicals involved in the technological process in which the waste was generated. An integral part of the pre-acceptance control are representative sampling and additional detailed testing of the composition of waste, which will be performed by contracting the services of an accredited sampling laboratory and laboratory testing of the physical and chemical parameters of waste provided for in the said Rulebook and Regulation, and, if necessary, additional parameters.

In the case of waste for which, for any reason, it is not possible to carry out pre-acceptance control and insight into the origin at the place of origin (in the generator plant) in the described manner, or in the case of heterogeneous waste or small quantities of waste of one or more generators, the pre-acceptance procedure or detailed pre-acceptance control of waste will be carried out in the storage of hazardous and non-hazardous waste with the operator with whom a contract on business and technical cooperation will be concluded and which will define the implementation of the pre-acceptance procedure and mutual obligations on that basis. In accordance with the contract to be concluded, sampling and pre-acceptance control will be carried out in the operator's warehouse, also by the contracted accredited laboratory by detailed sampling and laboratory testing of the physical and chemical parameters of the waste provided

[26] Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C (2019) 7987)

for in the said Rulebook and Regulation, and, if necessary, additional parameters. Only after a detailed pre-acceptance protocol has been implemented, a decision is made on the acceptance or non-acceptance of the delivery of the waste in question for thermal treatment in the plant.

3.2.1.2 Reception control and examination, waste measurement and reception of non-hazardous and hazardous waste

Waste reception control

After a detailed pre-acceptance control, a positive decision on acceptance of waste and contracting of delivery, within the acceptance procedure, for each contracted delivery of waste before acceptance to the plant (unloading), a acceptance control of waste will be performed by inspecting the complete documentation of the pre-acceptance control, including visual inspection of waste, acceptance sampling and testing in the internal laboratory of the plant by the specified rapid methods, which can be performed for approximately 60 min (with the correction that it is not ash but dry matter). Acceptance control is carried out in order to check compliance and additional verification that the said waste corresponds to the agreed delivery and quality determined by the accredited report of the pre-acceptance control, in accordance with the work protocol to be established.

The delivery of waste to the subject facility for Waste-to-Energy plant in Prahovo will be carried out by the operator itself or other operators, with their means of transport in accordance with the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023) and the Law on the Transport of Dangerous Goods ("Official Gazette of the RS", nos. 104/2016, 83/2018, 95/2018 - other law and 10/2019 - other law).

Access to the Eco Energy complex will be done through internal roads that have been formed within the existing industrial chemical complex Elixir Prahovo. Vehicles with waste materials will enter through the gate of the Elixir Prahovo complex where the ramp and the guardhouse are located. After identification, the vehicle moves along the internal road and enters through the gate from the southeast side of the Waste-to-Energy Plant.

At the very entrance of the Waste-to-Energy Plant, the facility *W-C01 Reception guardhouse and administrative building* are planned, where the acceptance control and testing of the delivered waste will be carried out.

In accordance with the conclusions on the best available techniques BAT9[27] (c) and BAT11, as well as in accordance with the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023), the Project Holder will carry out a clearly defined **procedure of acceptance of waste** at the plant when receiving waste. These procedures define the elements that are checked and verified when accepting the waste into the plant, as well as the criteria for accepting or not accepting waste. These procedures include the review of supporting documentation, sampling, inspection and analysis of waste. The waste acceptance procedures shall be risk-based taking into account, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as information provided by previous waste owners. The elements to be monitored for each type of waste are described in detail below.

After a detailed pre-acceptance control, a positive decision on acceptance of waste and contracting of delivery, within the acceptance procedure, for each contracted delivery of waste before acceptance into the

[27] Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)

plant and unloading of waste, a acceptance control of waste will be performed by inspecting the complete documentation of the pre-acceptance control, including visual inspection of waste, acceptance sampling and testing in the internal laboratory of the plant by rapid methods. Acceptance control is carried out in order to check compliance and additional verification that the said waste corresponds to the agreed delivery and quality determined by the accredited report of the pre-acceptance control, in accordance with the work protocol to be established.

Within the receiving control, the radioactivity of the delivered waste will be tested. If the meter detects elevated radioactivity, the relevant Republic inspection and the ministry are immediately notified, and the driver is instructed to park the vehicle in the designated truck parking lot until the inspection arrives.

The project documentation defines that waste containing more than 1% of halogen organic substances expressed as chlorine **cannot be treated** on the boiler. It is strictly forbidden to accept waste that is explosive, flammable, infectious, radioactive, waste materials containing or contaminated with polychlorinated biphenyls (PCBs) and/or polybrominated triphenyls (PCTs) and/or polybrominated biphenyls (PBB), waste containing cyanides, isocyanates, thiocyanates, asbestos, peroxides, biocides, cytostatics. Additional restrictions on acceptance to the plant in question are waste substances in the form of aerosols, as well as organometallic compounds (spent metal-based catalysts, or organometallic wood preservatives) and aluminized paints. The acceptance of substances exceeding the POPs limit values of substances pursuant to Article 4 and Annex I Part A of Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 shall not be permitted.

The complete List of waste to be managed by the Project Holder at the location in question, given by waste groups (hazardous and non-hazardous), index numbers and hazardous waste characteristics according to the Waste Catalogue, as well as planned capacities, is shown in the appendix to the Study. The List is determined on the basis of the characteristics of the thermal treatment plant, the identification of types of waste that can be thermally treated (in terms of e.g. physical condition, chemical characteristics, hazardous properties and acceptable ranges of calorific value, humidity, ash content, etc.), as well as in accordance with the provisions of the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019, 39/2021 and 65/2024) and the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official 103/2023). Attached to the Study is also a List of excluded index numbers from the R1 operation, i.e. a list of index numbers of waste that will not be received at the plant in question.

Acceptance control **of non-hazardous waste** includes the implementation of the following verification procedures:

1) documentation accompanying the waste (Documents on the movement of waste, delivery notes, weighing sheet, etc.);
2) Waste Examination Report prepared in accordance with the list of parameters for waste examination for the needs of thermal treatment in accordance with Annex 9 of the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019, 39/2021 and 65/2024);
3) characteristics of waste, the substances with which it should not be mixed and precautions to be taken when handling waste;

At the acceptance of waste, the recipient checks:

- all data on the waste generation process contained in the documents monitoring the movement of waste;
- the label, name, description of the waste and its physical and chemical properties and all necessary information required for the sampling and characterization of the waste before the thermal treatment;
- a description of the hazardous characteristics of the waste, the substances with which the waste cannot be mixed and the precautions to be taken by the operator when handling the waste in the

thermal treatment process.

Acceptance control **of hazardous waste** includes the implementation of a acceptance procedure identical to that for the acceptance of non-hazardous waste, and particularly carries out:

1) checking the documentation accompanying hazardous waste (Documents on the movement of hazardous waste, delivery notes, weighing sheet, etc.), and, if necessary, the documentation defined by the regulations governing the transport of hazardous goods (in accordance with the Law on the Transport of Dangerous Goods, etc.);
2) takingrepresentative samples of waste before unloading to perform rapid analyses during the reception of waste, inorder to check compliance with the data from the accompanying documentation and the Waste Examination Report prepared in accordance with Annex 9 of the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021);
3) measures enabling the relevant authority to inspect and identify waste subject to thermal treatment.

Note: During the performance of rapid analyses (about 60 min.), until the results of examination and confirmation of compliance with the data from the accompanying documentation are obtained, the transport vehicle with waste material will be temporarily parked in the planned area, *Truck Parking,* which is located directly next to the facility *W-C01 Reception guardhouse and administrative building,* and outside the fence of the Waste-to-Energy Plant itself. During the rapid analyses, the following parameters will be examined: determination of sensory properties, determination of the calorific value of waste, ash content, moisture, concentration of total halides.

If the finding of the receiving control determines that the waste does not correspond to the report of the pre-acceptance control and as such is not acceptable for acceptance and thermal treatment in the plant, the Document on the movement of waste (DKO) initiated by the generator is not concluded and the waste is returned to the generator on the same day with the notification of the causes of non-compliance.

Waste examination

Representative samples will be taken exclusively by trained and equipped employed operators in accordance with the standard and defined procedure in accordance with the regulations and standards in this field. The representative sample of waste will be a sample taken from the total amount of waste that has the same characteristics as the average waste composition and that is subject to chemical analysis.

Waste sampling will be performed by the following accredited methods:

Parameter	Accredited method
Waste sampling	ASTM D 6051:2015
Waste characterization/ Waste sampling	SRPS CEN/TR 15310-1:2009 SRPS CEN/TR 15310-2:2009 SRPS CEN/TR 15310-3:2009 SRPS CEN/TR 15310-4:2009 SRPS CEN/TR 15310-5:2009
Solid fuels derived from waste (SRF) / Waste sampling method	SRPS EN ISO21645:2021 EN ISO 21645:2021

For the purpose of performing analyses of waste samples taken in accordance with the standards SRPS ISO/IEC 17025:2017 (General requirements for the competence of testing and calibration laboratories) and SRPS CEN/TR 15310-1:2009 (Characterization of waste - Sampling of waste materials - Part 1: Guidance on selection and application of criteria for sampling under various conditions) and checking compliance with the data from the accompanying documentation accompanying each shipment, one smaller laboratory on the ground floor of the facility is envisaged within the *W-C01 Reception guardhouse and administrative building* for performing rapid analyses during the reception control of waste, with an area of 23.93 m^2 and one internal central laboratory, with an area of 112.50 m^2, on the floor of the facility, in which the necessary detailed analyses of waste will be performed to determine the recipe of waste thermal treatment. Detailed waste analyses include examination of the following parameters: sensory properties, ignition temperature, calorific value (MJ/kg), water or moisture content, ash content, total halogen content expressed as chlorine (Cl), sulphur content (S), polychlorinated biphenyls (PCB) content, heavy metal content: arsenic (As), antimony (Sb), copper (Cu), beryllium (Be), vanadium (V), mercury (Hg), cadmium (Cd), tin (Sn), cobalt (Co), nickel (Ni), lead (Pb), thallium (Ta), chromium (Cr) and zinc (Zn). If necessary, additional detailed analyses will be performed, such as the content of halogen substances individually (Cl, F, Br, I), cyanide content, viscosity, density, mechanical impurities, content of macro elements (SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, TiO_2, Mn_2O_3, K_2O) and more.

In addition to the central laboratory on the first floor of the facility, a warehouse for storing laboratory samples, the documentation archive room and the laboratory office are also planned.

Within the central laboratory, 4 digesters are planned to prevent the spread of unpleasant odours when performing experiments. Each digester is equipped with a ventilation system with an air purification filter and a roof outlet. Digesters are also equipped with the necessary package unit for the production of demi water used in sample examination. Within the laboratory, there will be 5 laboratory central tables with a sink, shelves and undercounter elements, work tables and other laboratory furniture, safety cabinets, etc.

Figure 3.2 Elixir Zorka Quality Control Laboratory in Šabac (as a model for the construction of the subject laboratory of similar floor area)

Of the equipment that will be used to perform laboratory analyses in the internal central laboratory, the following will be installed:

- Laboratory central table with sink, shelves, undercounter elements
- Ultra clean water dispenser
- Sample preparation mill
- ICP-MS for heavy metal examination (Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn, As, K, Ti)
- TOC - for the determination of total organic carbon
- Waste heat capacity calorimeter
- Spectrophotometer - Measurement of phenol concentration in ash eluates, for wastewater

- Flash point apparatus - Measuring flash point
- COD, BOD analyzers – Measurement of wastewater characteristics
- Ionic chromatograph with post-column derivatisation and UV-VIS detector - IC-PCR-VIS
- Microwave for sample preparation and accessories.

Of the equipment that will be used to perform laboratory analyses in the rapid analysis laboratory, the following will be installed:
- Sample preparation mill
- XRF for the analysis of the basic composition of materials and heavy metal content
- Laboratory digester with safety undercounter elements
- Calorimeter for determining the calorific value of waste
- Carl Fisher - volumetric and coulometric
- TOX, AOX, EOX analyzer - Measurement of organic halogen concentration at acceptance
- IC-CD - Measurement of halogen element concentration and ash eluate analysis
- CIC – Combustion module for IC-CD measurement purposes, etc.
- pH meter
- Other laboratory equipment.

The planned analyses will be performed by professional staff of the appropriate profession (engineers, chemists, laboratory technicians, sampling technicians, etc.). The planned number of samples on a daily basis will depend in the first place on the dynamics of waste delivery to the location in question, the type of waste to be delivered, the method of waste delivery (bulk, trucks in IBC containers/barrels/jumbo bags). The expected number of samples will be up to 70 samples per day. Waste examination will be carried out in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021), *Appendix 9. List of parameters for waste examination for the needs of thermal treatment* and applicable standards in this field.

Wastewater generated from washing dishes and equipment in the laboratory that will be collected and piped into a buried polypropylene tank (V=5 m^3), and then pumped into IBC containers and transported to liquid waste storage tanks for unloading by a forklift and then treated at the boiler plant in question.

3.2.1.3 *Reception of waste (waste measurement and washing of vehicle wheels)*

Waste measurement

If all the conditions for the reception of waste are met, at the entrance to the Waste-to-Energy Plant complex on the cargo scale (W-C10), the mass of the vehicle for the transport of waste and the measurement of waste received at the plant will be measured.The waste recipient completes Part D of the Document on the movement of waste/hazardous waste in accordance with the *Rulebook on the form of waste movement document and filling in instructions* ("Official Gazette of the Republic of Serbia", no. 114/13).

In the event of receiving hazardous waste, the shipper of hazardous waste is obliged to submit to the ministry responsible for environmental affairs and the Environmental Protection Agency, at least 48 hours before the start of movement, a prior notification with data on waste in electronic form, by entering the data into the information system of the National Register of Pollution Sources, in accordance with the Rulebook on the form of the Document on the movement of hazardous waste, the form of prior notification, the manner of its delivery and instructions for their completion. ("Official Gazette of the RS", No. 17/17) and the law governing the protection of personal data. Upon receipt of hazardous waste at the subject location of the Waste-to-Energy Plant, it is the obligation of the Project Holder to submit to the Environmental Protection Agency, in electronic form, no later than 15 days from the end of the movement of waste, by entering the data into the information system of the National Register of Pollution Sources, the Form of the Document on the Movement of Hazardous Waste with the final, supplemented data on waste, in accordance with the law governing the protection of personal data. The recipient of hazardous waste shall also submit a fully certified and signed Waste Movement Document to the postal address of the Ministry and the Agency, in accordance with the law governing waste management.

Washing the wheels of transport vehicles

After the measurement, the vehicle is referred to the truck wheel washer *(U-C03 Wheel Washing Unit*). It is envisaged to install a package unit that is based on a modular concept and is distinguished by a robust construction, as well as a large cleaning capacity. As the vehicle approaches the wheel washer unit, the wash cycle is automatically activated via the sensor contact. A technically compliant spray system creates an effective wash result over the entire length of the vehicle as it slowly passes through the wheel washing unit at walking speed. Specially developed nozzles provide an effective water spray profile for targeted cleaning of the tire profile, outer and inner surfaces of the wheels and part of the chassis. The spray nozzles are arranged in such a way that the driver of the vehicle is not disturbed during the washing cycle and that only the minimum amount of spray is transferred to the environment.

The water from the washing of the wheels of the trucks that deliver the waste material is drained into the collection shaft located within the package wheel washer unit. The wastewater is then pumped into a tank where solids are deposited by passing water through the overflow chamber. The purified water is then reused by the pump to wash the wheels and therefore no outflow of water into the recipient is foreseen. Water reception tanks need to be periodically cleaned of precipitated substances, and the contents of the cleaning will be temporarily stored in the W-C08 facility until treatment at the plant in question.
The length of the wash cycle depends on the operating conditions and is progressively adjusted via the timer located on the front of the control cabinet.
The wheels of the vehicles with which the waste was delivered to the site of the Waste-to-Energy Plant are also washed after the unloading of the waste, and before leaving the site in question.

3.2.1.4 *Unloading and temporary storage of solid waste*

As part of the subject plant, upon reception, solid waste passes through the following units:
- Unloading and temporary storage of solid waste in the designated area with an impermeable surface (areas marked with the following technical designations: P1, S1, S2, or S3).
- Physical-mechanical pretreatment of waste (material with dimensions greater than 100 mm) for the purpose of preparing the waste for thermal treatment (incineration) in the boiler facility.
- Temporary storage of pre-treated (mechanically treated and homogenised) waste in one of the designated storage bunkers (areas marked as: S4, S5, and S6) until the point of mixing and homogenisation of waste in bunker S7_MIX, and subsequent storage in bunker S8_SGG, from which the prepared waste is fed via moving floors and conveyor systems into the boiler facility.

The detailed engineering of the solid waste reception, storage and pretreatment plant, on the basis of which the subject technology project was developed, was developed by the Austrian company Ingenieurgemeinschaft Innovative Umwelttechnik GmbH (IUT), which has many years of experience in this field. **The applied pretreatment and waste storage technology is in accordance with the highest EU standards and BATC (see appendix - OVERVIEW OF COMPLIANCE WITH THE CONCLUSIONS OF THE BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT:**

- Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) – **Conclusions on best available techniques for waste treatment**
- European Commission, Reference Document on Best Available Techniques on Emissions from Storage, July 2006 – **Best available techniques on Emissions from Storage**

Unloading and temporary storage of solid waste (hazardous and non-hazardous waste)

- **Operations: R13 Storage of waste designed for any operation from R1 to R12 (excluding temporary storage of waste at its generation site)**[28]

[28] [28] Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021)

Upon completion of the procedure of reception control, testing and reception of waste, solid waste will be unloaded at the designated place within the facility *W-C08 Pretreatment and waste storage:*

Receipt and storage of solid waste >100mm, before mechanical pretreatment (pretreatment hall)	Technological warehouse designations	KKS mark	Area (m2)	Volume, m^3	Max storage volume occupancy, %	Average bulk density of waste t/m^3
	P1	00 EAB 00 BB 001	80	160	< 75	0.70

Acceptance and storage of solid mechanically pre-treated waste (pre-treated waste storage bunkers)	Technological warehouse designations	KKS mark	Solid waste storage volume		Max occupancy of solid waste storage	
			% volume	m^3	% volume	m^3
	S1 (receiving)	00 EAB 01 BB 002	100	268	75	201
	S2 (receiving)	00 EAB 10 BB 003	100	227	75	170
	S3 (receiving)	00 EAB 01 BB 004	100	229	75	172

In the maximum operating mode, the boiler plant can treat 17 t/h of waste, which is the most relevant indicator of the maximum possible hourly load. Therefore, the maximum acceptance of waste at the plant can be 3 trucks per hour, in the circumstances of the least possible bulk weight of waste and/or ADR restrictions when transporting trucks.

Upon arrival of the truck with solid, previously prepared waste (granulation <100mm) in bulk, to the unloading point, the industrial segment door opens and the truck enters the reception part of the W-C08 facility, after which the door closes. The unloading points in the reception bunker itself will also be equipped with industrial segment doors, which open only when the truck is ready to unload waste into one of the two mentioned reception bunkers. The industrial segments of the doors are equipped with an electric drive with an automatic door stop when encountering an obstacle and the possibility of manual opening in the event of a power failure. The door opening speed is about 0.5m/s, closing speed about 0.25 m/s.

When the unloading of the waste is completed, the bunker door closes, the truck can then leave the facility, after which the main door at the entrance to the facility closes again. The bunker doors are also automatically linked to the waste crane, so the doors cannot be opened and unloading cannot begin while the crane is in operation, and conversely, the crane cannot operate while waste is being unloaded into the receiving bunkers. When the unloading process is completed, the truck goes to the wheel washer unit, the scale where it is measured and then leaves the plant.

All waste bunkers are made of waterproof concrete.

Waste with dimensions greater than 100 mm will be unloaded within the facility W-C08 at the designated place (concrete plateau P1 (00 EAB 00 BB 001)), from where the waste will be transferred by means of graphene and dosed to the facility for pre-treatment of solid non-hazardous and hazardous waste (shredder). The solid non-hazardous and hazardous waste pre-treatment plant will be located in the part of the facility W-C08 marked 0.4 (00 EBC 00 EB 001) Pre-treatment of non-hazardous and hazardous waste.

Within the facility W-C08, three receiving bunkers marked S1 (00 EAB 01 BB 002), S2 (00 EAB 01 BB 003) and S3 (00 EAB 01 BB 004) are planned in which the previously prepared i.e. mechanically pre-treated waste, which meets all the requirements for thermal treatment, is of appropriate granulation (<100 mm), so that it can be dosed into the boiler plant without additional pre-treatment.

After unloading into the receiving bunkers, the waste material is transferred from the receiving bunkers to one of the storage bunkers intended for temporary storage of mechanically treated waste of different physico-chemical characteristics (pollutant content, calorific value, etc.) by means of cranes (00 EAE 01 AF 001, 00 EAE 02 AF 001), which are used for waste handling, in order to later form a mixture of waste (finished fuel) that is suitable for thermal treatment, all in accordance with the defined requirements for the operation of the boiler plant. The following table shows storage bunkers intended for temporary storage of mechanically treated waste:

Acceptance and **storage of solid mechanically pre-treated waste** (pre-treated waste storage bunkers)	Technological warehouse designations	KKS mark	Solid waste storage volume		Max occupancy of solid waste storage	
			% volume	m^3	% volume	m^3
	S4 (storage)	00 EAE 00 BB 001	100	1,871	75	1,403
	S5 (storage)	00 EAE 00 BB 002	100	1,857	75	1,393
	S6 (storage)	00 EAE 00 BB 003	100	1,028	75	771

In the manner described above, the temporarily stored waste material is then taken from the waste storage bunkers and appropriate ratios depending on the characteristics of the material and the recipe requirements for the thermal treatment by means of cranes (00 EAE 01 AF 001, 00 EAE 02 AF 001) and transferred to the storage bunker for the preparation of the pre-treated solid waste mixture for thermal treatment S7_MIX (00 EAE 00 BB 004).

Warehouse for the preparation of a mixture of pre-treated solid waste for thermal treatment (storage bunker for mixing and homogenization of solid fuel)	Technological warehouse designations	KKS mark	Solid waste storage volume		Max occupancy of solid waste storage	
			% volume	m^3	% volume	m^3
	S7_ MIX	00 EAE 00 BB 004	100	1,970	75	1,478

In the storage bunker S7_MIX, solid waste is mixed and homogenized using a crane. Homogenized waste material is transferred by means of cranes to the bunker of the prepared fuel, code S8_SGG (00 EAE 00 BB 005), from where the prepared waste material is then dosed to the boiler plant:

Warehouse of the finished mixture of pre-treated solid waste for thermal treatment (storage bunkers for almost solid fuel)	Technological warehouse designations	KKS mark	Solid waste storage volume		Max occupancy of solid waste storage	
			% volume	m^3	% volume	m^3
	S8_SGG	00 EAE 00 BB 005	100	1,181	75	886

Figure 3.3 shows a schematic view of the acceptance, storage and pre-treatment of solid and sludge waste (hazardous and non-hazardous) within the W-C08 facility.

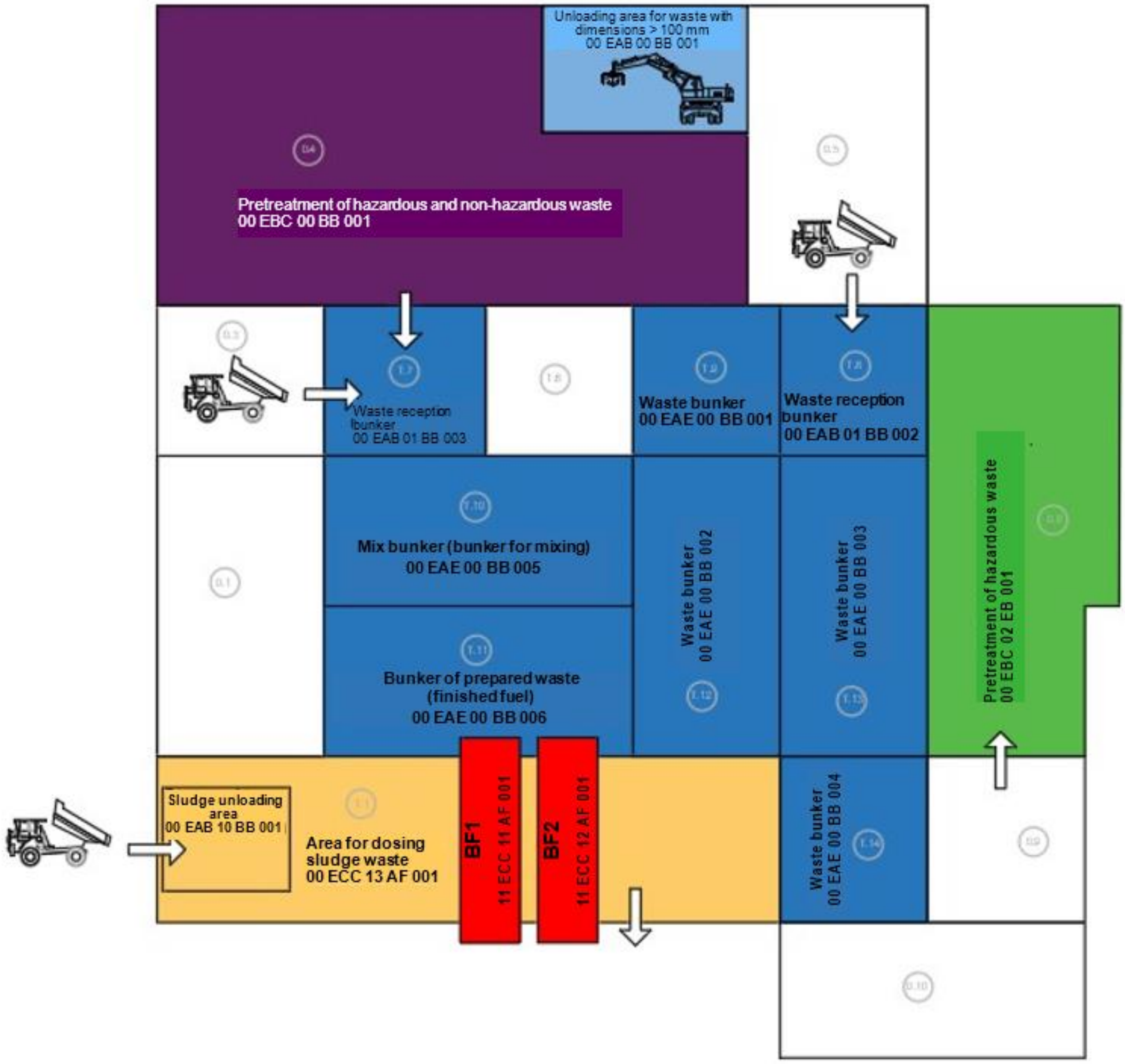


Figure 3.1 Schematic representation of acceptance, storage and pre-treatment of solid and sludge waste (hazardous and non-hazardous) within the facility W-C08 Pre-treatment and waste storage

In the process of preparing solid waste for treatment, a mixture of shredded solid waste (finished waste fuel) is prepared for simultaneous dosing and thermal treatment in the boiler. During this process, it is important to manage contaminations, to have the compatibility of different types of waste entering the process of preparation of the finished waste fuel mixture that will have a homogenized calorific value according to which the hourly and daily capacity of simultaneous dosing and thermal treatment in the boiler will be defined. The recipe according to which the mixing of different types of waste is performed, i.e. the preparation of the finished solid waste fuel, is defined in the process of preliminary detailed technological preparation depending on the specific physical and chemical characteristics of individual types of waste, in accordance with the defined limit values of the chemical composition of the finished waste fuel, as well as all technical requirements for the operation of the boiler plant. Contamination is managed so that the chemical composition of the solid waste fuel mixture does not exceed the limit values defined as allowed for the designed combustion process on the boiler, according to which the technical solutions and efficiency of the flue gas treatment system are designed.

Solid waste will be classified before and after shredding depending on the type and physico-chemical characteristics of the waste (type and content of pollutants, calorific value, etc.). Shredded material will be transported immediately after shredding by outgoing conveyor to the receiving storage bunker marked S1, from where it is first transferred by means of a crane to one of the receiving storage bunkers marked S2 and S3, and then to one of the storage bunkers S4, S5 or S6, which are intended for the storage of compatible types of waste with similar physical and chemical characteristics. The shredded material, classified in the manner described above, will then be taken from the storage bunkers (S4, S5, S6) by means of cranes, and transferred to the mixing hopper S7_MIX - T.10 (00 EAE 00 BB 005) in which the mixing and homogenization, i.e. the preparation of the finished solid waste fuel is performed by means of a crane (see Figure 3.3). In this way, the prepared mixture of finished solid waste fuel is transferred from the S7_MIX bunker by a crane to the S8_SGG bunker, from where it is simultaneously dosed into the boiler furnace by the solid waste fuel dosing system. The prepared solid waste fuel mixture is thermally treated in the boiler at the same time, thus all contaminants are thermally treated.

A tabular overview of all storage bunkers and their capacities is attached to the Study.

In order to reduce the emission of particulate matter in the facility, generated during the transfer of waste from one bunker to another for the purpose of waste mixing, water misting during crane manipulation is planned. The system consists of a uniformly distributed network of stainless steel pipes with a diameter of 12 mm with built-in stainless steel nozzles. The nozzles will be mounted at a 90-degree angle to the pipeline and the steel structure itself. The pipe network is connected by a 20-22 mm diameter vertical stainless steel pipe to the pumping station. The system provides 9 l/min of water at a pressure of 70 bar. The adopted bulk density of waste is: 600 kg/m^3.

The prepared (homogenized) waste material is transferred by means of cranes from the bunker S8_SGG (00 EAE 00 BB 005) to the mobile floors BF1 (11 ECC 11 AF 001) and BF2 (11 ECC 12 AF 001), which transport the waste to the conveyors leading to the boiler plant.
Cranes can operate in manual, semi-automatic and fully automatic mode. Manual mode is usually considered for maintenance purposes only. Two crane maintenance areas are provided inside the waste storage hall. These areas will be used during workover activities in the event of crane failures, i.e. rakes or downtime for any other reason.
Cranes will be operated by operators from the facility W-02 Operations Centre.

Removal of dust and unpleasant odours and prevention of their emission outside the facility is achieved by keeping the hall constantly under pressure, drawing air from the hall and by incineration in the boiler plant. The amount of gases extracted from the hall and sent to the boilers conditioned by the required amount of combustion air, which ranges between 23-47,000 Nm^3/h depending on the current capacity of the boiler plant and the characteristics of the waste.

For additional protection, the removal of dust and unpleasant odours, and to prevent their emission outside the waste storage bunker area in building W-C08, during periods when the boiler facility is not operational (due to maintenance, shutdowns, etc.), extraction will be carried out using fans that direct the air to a bag filter system and activated carbon filter (W-C09). There, as with the air from the pretreatment area, the air will be purified and then discharged into the atmosphere via the stack (chimney) of the filtration unit.

Table 3.6 provides an overview of the bunkers for the reception and storage of solid waste.

Table 3.6 Inspection of solid waste acceptance and storage bunkers

Technological warehouse designations	KKS mark	Area in m^2	Volume, m^3	Max storage volume occupancy, %	Average bulk density of waste t/m^3
Acceptance and storage of solid waste >100mm, before mechanical pretreatment (pretreatment hall)					
P1	00 EAB 00 BB 001	80	160	< 75	0.70
Technological warehouse designations	KKS mark	Solid waste storage volume		Max occupancy of solid waste storage	
		% volume	m^3	% volume	m^3
Acceptance and storage of solid mechanically pre-treated waste (pre-treated waste storage bunkers)					
S1 (receiving)	00 EAB 01 BB 002	100	268	75	201
S2 (receiving)	00 EAB 10 BB 003	100	227	75	170
S3 (receiving)	00 EAB 01 BB 004	100	229	75	172
Acceptance and storage of solid mechanically pre-treated waste (pre-treated waste storage bunkers)					
S4 (storage)	00 EAE 00 BB 001	100	1,871	75	1,403
S5 (storage)	00 EAE 00 BB 002	100	1,857	75	1,393
S6 (storage)	00 EAE 00 BB 003	100	1,028	75	771
Warehouse for the preparation of a mixture of pre-treated solid waste for thermal treatment (storage bunker for mixing and homogenization of solid fuel)					
S7_ MIX	00 EAE 00 BB 004	100	1,970	75	1,478
Warehouse of the finished mixture of pre-treated solid waste for thermal treatment (storage bunkers for almost solid fuel)					
S8_SGG	00 EAE 00 BB 005	100	1,181	75	886

3.2.1.5 Unloading and temporary storage of sludge waste (municipal and industrial sludge)

The project also envisages the delivery, reception and thermal treatment of waste sludge, municipal and industrial: sludge from municipal wastewater treatment plants and septic tanks, sludge from industrial wastewater treatment plants, sludge from the bottom of tanks and of grease and oil separators, sludge and filter - cakes from the gas treatment process containing hazardous substances, sludge from industrial effluents, sludge and liquid waste from the waste treatment process. Reception of all types of sludge is envisaged, both stabilized and non-stabilized, dewatering (average dry matter content and average specific weight of dewatering sludge 25% DM), dried sludge (average dry matter content and average specific weight of dried sludge 70% DM), with ash content after incineration of sludge (monoinsineration) 96% DM. The only restrictions related to the reception of waste sludge refer to the content of illicit hazardous substances whose reception and treatment is prohibited at the subject Waste-to-Energy Plant in accordance with the above: radioactive sludge, sludge containing or contaminated with polychlorinated biphenyls (PCBs) and/or polybrominated triphenyls (PCTs) and/or polybrominated biphenyls (PBB), sludge containing cyanides, isocyanates, thiocyanates, asbestos, peroxides, biocides, as well as sludge classified as explosive, highly flammable and flammable, infectious and sludge releasing toxic or highly toxic gases in contact with water, air or acid. It will not be allowed to receive substances that exceed the limit values of the amount of POPs substances according to Article 4 and Annex I part A, Regulation (EU) 2019/1021 of the European Parliament and the Council of June 20, 2019.

In the attachment of the Study, there is also a list of excluded index numbers from the R1 operation, that is, a list of index numbers of waste that will not be accepted at the plant in question.

Upon arrival of the truck with waste sludge to the unloading point in the designated part of the facility *W-C08 Pretreatment and waste storage* (Figure 3.3), an industrial vertically lifting door of large dimensions, made of vinyl-polyester fabric, is opened and the truck enters theunloading area for sludge waste SOM (00 EAB 10 BB 001). Table 3.7. gives the dimensions and capacity of the sludge waste area. The door opening speed is about 0.5m/s, closing speed about 0.25 m/s.
Unloading of waste sludge will be carried out by tipping it from the truck directly into the receiving sludge bunker located in the sludge unloading area (see Figure 3.4).

Table 3.7 Dimensions and capacity of sludge waste area

Receipt and storage of sludge waste (storage bunker)	Technological warehouse designations	KKS mark	Volume of sludge waste storage		Max occupancy of sludge waste storage	
			% volume	m^3	% volume	m^3
	SOM	00 EAB 10 BB 001	100	116	75	87

Equipment for unloading, storage and dosing of sludge waste is a package unit and consists of:

- the reception bunker with a movable floor
- screw conveyor
- piston pump

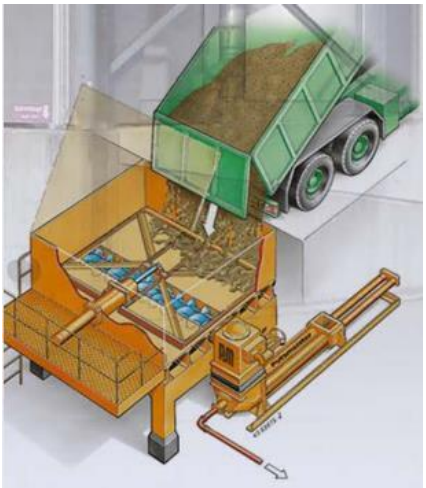


Figure 3.4 Package unit for sludge reception and dosing

When the transport vehicle enters the sludge unloading area, the ultrasonic sensor is activated and the lid on the reception sludge bunker opens, after which the sludge waste unloading starts. After the unloading is completed, the transport vehicle leaves the facility, and the lid of the reception bunker closes.

The reception bunker is of rectangular shape with provided connections for the level meter, methane concentration (CH_4) and ventilation. Within the sludge reception bunker there is a movable floor under which the unloaded sludge waste is removed from the bunker. The moving floor moves forward - backward on the base of the bunker with a hydraulic cylinder and transports the sludge waste to the screw conveyor. The movable floor guarantees complete and even discharge into the screw conveyor and prevents clogging of the medium. The speed of the moving floor can be adjusted manually to suit operational needs.

The installation of pressure sensors (-1 to +4 bar) is planned within the subject package unit for sludge reception and dosing. In the event of a blockage of the moving floor (leading to excessive pressure), the reverse operation is started automatically.

Using a screw conveyor, the sludge waste is delivered to the piston pump, with a capacity of 8 m^3/h, with a high pressure of 40 bar, which dispenses the sludge to the boiler where the thermal treatment is performed. The screw conveyor and piston pump are located in the sludge dosing area.
The sludge discharge screw from the two-bolt receiving hopper is designed to horizontally discharge sludge from the receiving hopper. It is designed to create positive pressure at the pump inlet to increase the filling efficiency of the inlet cylinder during suction stroke.

The project envisages that, if necessary, compatible liquid waste can be dosed into sludge waste in order to facilitate the transport of sludge to the boiler and to avoid congestion of the medium in the transport system.

The sludge reception and dosing system is automated to control and monitor the process from the reception of sludge to its dosing into the thermal treatment furnace.

Air from the sludge compartment will also be taken to the boiler plant (2,000 m^3/h) by means of combustion air fans, in order to keep the storage under pressure and prevent the spread of unpleasant odours outside the facility. Air compensation is from the facade of the building. When the boiler plant does not work, nitrogen is automatically introduced into the sludge reception bunker in order to inertise the space.

The following graphical appendices are attached to the study:

Waste storage block diagram	23-WTE-PGD-0701-WC08-1002-R00
Block diagram - pretreatment of non-hazardous and hazardous waste, storage of sludge waste	23-WTE-PGD-0701-WC08-1003-R00
P&ID – Reception, storage and transport of sludge waste	23-WTE-PGD-0701-WC08-3002-R00

3.2.1.6 Liquid waste transfer and storage

Within the plant in question, after reception control and acceptance, liquid waste passes through the following units:

- Discharge/unloading of liquid waste in the designated area.
- Liquid waste storage.

Reloading of truck tanks

Attached is a drawing: P&ID: 23-WTE-PGD-0702-NN-3003-R00

Liquid waste will be delivered to the plant in question by truck tanks, usually with a volume of 30 m^3.

After the inlet control and acceptance, measurement and washing of the wheels, the tanks will be directed to the transfer point (W-C13) where they will be emptied into one of the planned storage tanks. The transfer point consists of one lower unloading arm for the liquid phase and one lower unloading arm for the gas phase. The liquid phase arm is connected to the suction pipeline of the pump. A pressure balancing line is connected to the arm for the gas phase, which represents the connection with the gas compartment of the tank to which the transfer is carried out in the event that the discharge is carried out in one of the tanks under overpressure of nitrogen, in order to prevent evaporation of easily volatile liquids when discharging. If transfer is carried out into tanks under atmospheric pressure, the gas compartment of the tank must be opened to the atmosphere before the start of discharge in order to prevent the occurrence of a vacuum. For the purpose of transferring liquid waste from truck tanks, two membrane pumps, working and spare, with a capacity of 30 m^3/h are planned.

After the tanker is parked, the operator connects the discharging arm and checks the fulfilment of all conditions for the start of transfer (valve status, connection of the grounding of the tanker...), after which starts the pump, by which the process of discharging liquid waste into storage tanks begins. The liquid waste discharge pipeline is made of stainless steel, with electric trace heating and thermal insulation.

The following auxiliary fluids will be brought to the transfer point:

- Compressed air for valve drive purposes
- Nitrogen, for inertisation of the gas tank space, cleaning and blowing of the pipeline.

Within the transfer point (W-C13), the installation of a line grate is planned, which will collect any leaked liquids during discharging and drain them to the collection pit. In this way, the possibility of possible leakage of the leaked fluid into the atmospheric sewage and the surrounding soil is avoided. The contents of the collection pit will be pumped into IBC containers by the pump, which will be transported to the IBC container warehouse, and then treated at the Hazardous Waste Treatment Line (delivered in IBC containers, barrels, etc.).

In the event of a small-scale spillage, appropriate absorbents for the collection of potentially leaked content (sawdust, sand, oil, base and acid absorbents) will be provided within the transfer station for the collection and dry cleaning of the leaked content. The contaminated sorbent will be disposed of in containers and subsequently treated at the plant in question.

In addition to the transfer point (W-C13), it is also planned to install a shower for the purpose of rinsing hands and eyes in case of pouring on the operator when discharging liquid waste (in case of an accident). The water from the shower flows into the aforementioned manhole.

Liquid waste storage.

Liquid waste storage consists of 3 units that are located in independent rooms within the facility *W-C08 Pretreatment and waste storage*. Table 3.8 gives the storage capacities of liquid waste.

Table 3.8 Liquid waste storage capacities

	Technological markings of the tank	KKS mark	Storage tanks	Volume, m^3
Liquid waste storage (storage tanks)			**Liquid Waste Storage 1**	
	R17-1	21EGB20BB001	Liquid non-combustible waste storage tank	17
	R17-2	21EGB21BB001	Liquid non-combustible waste storage tank	17
	R17-3	21EGB22BB001	Liquid non-combustible waste storage tank	17
	R17-4	21EGB23BB001	Liquid non-combustible waste storage tank	17
	R17-5	21EGB24BB001	Liquid combustible waste storage tank	17
	R17-6	21EGB25BB001	Liquid combustible waste storage tank	17
			Liquid Waste Storage 2	
	R30-1	21EGB26BB001	Bilge and oily water storage tank	30
	R30-2	21EGB27BB001	Bilge and oily water storage tank	30
Warehouse of packaged heterogeneous (liquid, sludge and solid) waste (rack warehouse for IBC containers, barrels, etc.)			**Liquid Waste Storage 3**	**No. of pallet spaces**
	SKL_ GT		Storage of combustible liquids (IBC/barrels)	20
	SKL_NGT SKL_NGČ		Warehouse for non-combustible waste (IBC/barrels/ etc.)	159
	CC		Quarantine zone	30

Liquid Waste Storage 1
The following graphical appendices are attached to the Study:
P&ID: 23-WTE-PGD-0702-NN-3004-R00
P&ID: 23-WTE-PGD-0702-NN-3005-R00
P&ID: 23-WTE-PGD-0702-NN-3006-R00
P&ID: 23-WTE-PGD-0702-NN-3007-R00
P&ID: 23-WTE-PGD-0702-NN-3008-R00
P&ID: 23-WTE-PGD-0702-NN-3009-R00

Liquid waste storage 1 is positioned in the southern part of the W-C08 facilities, directly next to the W-C11 facility, at an elevation of +8.40m. Within the storage space in question, 6 storage tanks are envisaged in which various waste liquids will be stored depending on the thermal power and physical and chemical characteristics, as follows:

- Four storage tanks for non-combustible liquids with a usable volume of 17 m^3 marked R17-1, R17-2, R17-3 and R17-4.

- Two storage tanks for combustible liquids with a useful volume of 17 m^3 marked R17-5 and R17-6.

Accompanying dosing pumps are installed next to each tank, which transport liquid waste to thermal treatment via nozzles on the boiler. The dosing pumps will be membrane pumps with an electric motor, with a capacity of 0.3 to 1.5 m^3/h. In addition to the tanks from R17-1 to R17-5, centrifugal pumps are installed to mix the contents of the tank. The R17-6 tank for combustible liquids is planned for storage of liquids with higher viscosity, so a membrane pump for liquid mixing is provided. All mixing pumps have a capacity of 70 m^3/h.

The tanks are equipped with a nitrogen blanketing system and an exhaust gas drainage system. Nitrogen maintains a constant overpressure of 0.1 barG in tanks, which ensures that there are no unpleasant odours or vapours of stored liquids in the room. Exhaust gas drainage system via automatic valves on the outlet pipelines from the gas tank compartment. The valves are adjusted to always maintain the pressure in the vessel up to 0.3 barG. Upon reaching this value, the valves open and release the gas that is piped to the intake of the combustion air fan in the boiler installation, and then to the thermal treatment. As the vessels are maintained under nitrogen overpressure, the composition of the exhaust gas is predominantly nitrogen.

These two systems allow the pressure inside the tank to always be within 0.1-0.3 barG. If for any reason these systems fail, the tanks are equipped with safety and relief valve that allows pressure relief, i.e. prevents the occurrence of vacuum. The set value for pressure or vacuum is 0.5 / –0.005 barG.

Each tank will be equipped with the necessary instrument equipment with a level meter with remote indication on the DCS, a high level switch as overfill protection, which upon reaching the high level stops the pump for receipt from the auto discharge station and IBC container discharge station.

The tanks will be located in a reinforced concrete waterproof bundwall that provides the required 110% capacity in relation to the capacity of the container containing liquid waste, all in accordance with the provisions of the Rulebook on the Method of Storage, Packaging and Labelling of Hazardous Waste ("Official Gazette of RS", No. 95/2024). In the bundwall there is also a drainage pit where all possible leaked contents are collected, and then returned to the tanks by a membrane pump with a capacity of 2.5 m^3/h.
A single rail crane is planned in the tank storage room for the purpose of installation and servicing of equipment.

Ventilation of the space in which the storage tanks are located is provided through a duct with associated elements for inserting and sucking air from the space. The total quantity of insertion/suction is 2,500 m^3/h. The total quantity of insertion/suction is 2,500 m^3/h.

Liquid Waste Storage 2
The following graphical appendices are attached to the Study:
P&ID: 23-WTE-PGD-0702-NN-3011-R00
P&ID: 23-WTE-PGD-0702-NN-3012-R00

At the level of 0.00 of the W-C08 facility within the waste storage, two tanks (2x30m^3 under atmospheric pressure are foreseen for the storage of non-combustible liquids (bilge and oily water and liquids that are not easily volatile). One membrane pump with an electric motor, with a capacity of 2.5 m^3/h, is planned for each of the tanks, which transports liquid waste for thermal treatment. In addition to the tank, centrifugal pumps are installed to mix the contents of the tank. The mixing pumps have a capacity of 140 m^3/h. The tanks are located in a concrete bundwall that is connected to the pools for receiving water from the fire extinguishing of the W-C08 facility, as well as for receiving the contents of the tank in the event of an emergency liquid spill, so that in this way the required 110% capacity is provided in relation to the capacity of the container in which the liquid waste is located, all by the provisions of the Rulebook on the manner of storage, packaging and labelling of hazardous waste ("Official Gazette of RS", No. 95/2024). Below the room where the tanks are located, at an elevation of -5.0 m, there are two pools for collecting water from fire extinguishing in the W-C08 facility. Each of the pools has its own centrifugal pump, with a capacity of 10 m^3/h, by which the collected water from fire extinguishing or the leaked contents from the tank are sent to the liquid waste tanks. Each of the tanks is equipped with a radar level measurement system.

Ventilation of the space in which the storage tanks for oily and bilge water are located is foreseen through the suction ducts by which the air is taken to the intake of the combustion air fan in the boiler plant, and then to the thermal treatment. In case of downtime of the boiler plant, for ventilation of this space an axial wall fan with a floating blind is provided for suction from the space with a capacity of 4,500m^3/h. The compensation of air is from the external roller doors from this room, as well as the rooms for unloading waste and service rake reception and pretreatment of non-hazardous and hazardous waste.

Liquid Waste Storage 3

The following graphical appendix is attached to the Study:

23-WTE-PGD-0702-NN-3013-R00

23-WTE-PGD-0702-NN-4001-R00

Liquid waste that is transported to the subject Waste-to-Energy plant in IBC containers/barrels will be delivered by trucks. After the entrance control and reception, measurement and washing of the wheels, the truck will be directed to the unloading point located near the entrance to the Liquid Waste Storage 3 - Storage of packaged heterogeneous waste (liquid, sludge-like, and solid) (racked storage for IBC containers, drums, etc) positioned within the facility W-C08, along the eastern facade of the facility W-C11, at elevation +0.0.

After the vehicle is parked in the designated location, the operator, using a forklift, unloads and transports the containers to the designated temporary storage location in the Liquid Waste Storage 3. The storage capacity is 209 pallet spaces, i.e. 20 m^3 of combustible liquids and 159 m^3 of non-combustible liquid and solid waste and 30 m^3 within the quarantine zone. In the Liquid Waste Warehouse 3, in addition to the storage of liquid waste, it is also planned to transfer liquid waste from IBC containers and barrels to liquid waste storage tanks - Liquid Waste Warehouse 1 with membrane pumps with a capacity of 5 m^3/h.

In accordance with the clear guidelines of the Project Holder, packaged and labelled waste will be delivered to the storage depending on the degree of hazard and characteristics of the waste. Typical types of packaging in which hazardous waste that is temporarily stored in the facility in question is packaged are as follows:

- Metal barrels made of steel or aluminum, protected against corrosion, with a capacity of 200 l or 280 l, with lids or with a cap made of the same material that breathes well so as not to spill the contents during manipulation, transport and storage. For the purpose of safe transport, metal barrels are most often palletized and secured with stretch film.
- IBC containers made of hard plastic (PP, PE), with a volume of 1 m^3, certified for impact, porosity and resistance to UV rays, in order to avoid corrosion of IBC due to the physical and chemical characteristics of the hazardous substance contained in the packaging
- Big bags made of fibres of synthetic origin with different weaving densities with different method of binding and closing. The big bag can be packed from 400 kg to a maximum of 1000 kg, depending on the type of material. Big bags are most often palletized for the purpose of safe transport.

The containers with liquid waste in the warehouse in question will be placed on mobile bundwalls that provide the required 110% of the capacity in relation to the capacity of the container in which the liquid waste is located, all in accordance with the provisions of the Rulebook on the manner of storage, packaging and labelling of hazardous waste ("Official Gazette of RS", no. 95/2024).

Liquid hazardous waste must be packed in packaging that is approved (UN code, http://www.unpackaging.com/) for the international transport of dangerous goods, and that meets the following criteria:

- strong enough to withstand shocks, loading, displacement from pallets or removal from over-pack packaging, suitable for manual or mechanical handling,
- made and closed in such a way as to prevent loss of contents during preparation for transport, transport, due to vibration or change in temperature, pressure, humidity,

- is closed according to the manufacturer's instructions so as to prevent the occurrence of waste outside the packaging.

Since only certified packaging is used for the packaging, transport and storage of hazardous waste, the classic cracking of the packaging cannot occur, but only its partial damage and leakage of small quantities of liquid down the packaging itself, and not leakage in stream and in large quantities. A sufficient number of mobile bundwalls will be provided for the collection of any leaked contents, as well as appropriate absorbents for the collection and dry cleaning of the leaked contents (sawdust, sand, oil, alkalis and acid absorbents).

In the room, drainage grids will also be installed, which will carry all possibly leaked contents or water from the washing to the collection pit, from which the liquid will be transferred by mobile pump to the IBC container, and then sent for pre-treatment, and then thermal treatment.

The technological process of manipulation and the height of the storage space enables the use of racks and pallets in order to maximize the use of storage space. The racks are positioned in such a way that the volume of the useful space of the warehouse that will be used for storing waste covers less than the maximum prescribed 75% of the volume of the total space of the closed warehouse. Hydrogen sulphide (H_2S) detection is envisaged within the liquid waste storage 3 area and the transfer station from IBC containers/barrels, given its highly toxic properties.
Hydrogen sulphide (H_2S) detection is envisaged within the liquid waste storage 3 area and the transfer station from IBC containers/barrels, given its highly toxic properties.

Waste of higher mass will be placed on the lower parts of the rack, and the highest shelves will be used for waste of lower weight or waste for which there is no pronounced danger of discharging harmful substances if it comes to its damage. Liquid and sludge waste in the warehouse will be separated by waste groups. The boxes with compatible waste will be visibly marked with boards indicating the groups of stored waste. Different types of waste will be physically separated, and rollers filled with absorbents will be used to avoid mixing different types of waste in case of leakage.

Solid waste in the warehouse will be separated by waste groups and compatibility, the warehouse will be visibly marked with boards indicating the groups of stored waste. Solid waste is packed in IBC, metal or PVC barrels or jumbo bags.

Ventilation of the space in which IBC containers/barrels/jumbo bags are located is provided through 3 axial wall fans for suction from the space with floating blinds with a total capacity of 17,000 m^3/h. The air compensation is from the facade of the building over 4 rain blinds.

Quarantine zone

In the event that, after receiving the waste in one of the storage tanks, the fee analysis determines that the waste does not meet the requirements of the requirements or the needs of the operator, the contents of the tank will be transferred to IBC containers, via the designated pump within the IBC container transfer station and it will then be temporarily stored within the quarantine zone within the Warehouse of packaged heterogeneous (liquid and sludge) waste (rack warehouse for IBC containers, barrels, etc.).

The following graphic attachment is attached to the Study: P&ID: 23-WTE-PGD-0702-NN-3009-R00
P&ID: 23-WTE-PGD-0702-NN-3013-R00

In the event that after additional analysis of the received waste in IBC containers/ barrels, etc., it is determined that the waste does not meet the requirements of the requirements or needs of the waste container operator, it will be moved to the designated quarantine zone within the Warehouse of packaged heterogeneous (liquid and sludge) waste (rack warehouse for IBC containers, barrels, etc.).

For the needs of the temporary storage of containers within the quarantine zone, 30 pallet places are foreseen for the storage of a maximum of 30 m^3 of waste in containers, until it is handed over to the authorized operator for further disposal. Waste containers temporarily stored within the quarantine zone will be secured against access by unauthorized persons by installing a protective fence.

Piping

In order to cover the acceptance of different types of liquid waste, one X2CrNiMo17-12-2 stainless steel tank 21EGB20BB001 is provided, while the filling pipelines from the auto-transfer station, and the pipelines for dosing liquid waste for thermal treatment are made of X2CrNiMo17-12-2. All other tanks and pipelines will be made of carbon steel P235GH. All liquid waste pipelines will be equipped with electric trace heating, and the temperature at which the waste will be heated is 60°C. Transport of liquid waste (combustible and non-combustible liquids) from warehouse 1 to thermal treatment will be carried out through two pipelines to the nozzles on the boiler,which are located on the left and right sides of the boiler.

Transport of liquid waste (bilge and oily water) from warehouse 2 will be carried out to the sludge acceptance bunker (P&ID: 23-WTE-PGD-0701-WC08-3002), and the hazardous waste pre-treatment unit, i.e. the rotary drum for waste mixing (P&ID 23-WTE-PGD-0701-WC08-3004).

3.2.1.7 Physical – mechanical pretreatment of solid hazardous and non-hazardous waste

Operations:

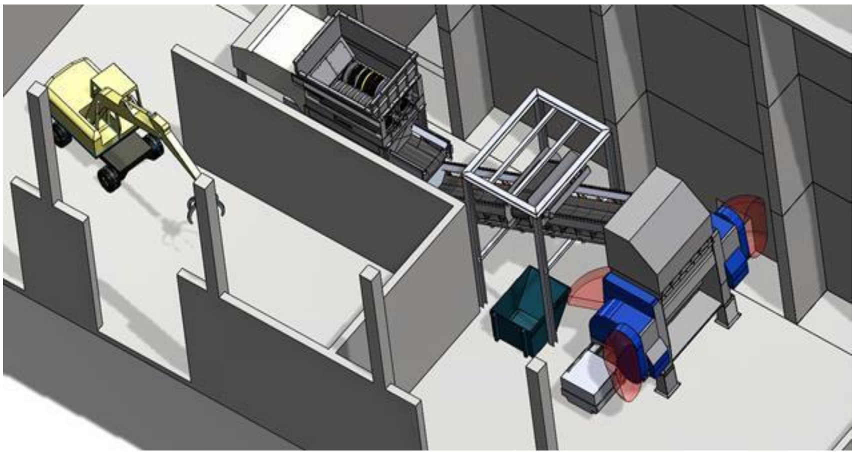
- **R12 Changes to subject waste to any of the operations from R1 to R11[29]**

Within the subject plant, in the facility, W-C08 *Pretreatment and storage of waste*, two lines for physical and mechanical pretreatment of waste are foreseen:

- Pretreatment line for bulk solid non-hazardous and hazardous waste (railway sleepers, etc.)
- Pretreatment line for hazardous waste (delivered in IBC containers, barrels, etc.)

A pretreatment line for bulk solid hazardous and non-hazardous waste (Figure 3.5) is provided in the annex of facility W-C08 in the area marked 0.4 (00 EBC 00 EB 001). The hazardous and non-hazardous waste pretreatment line consists of the following equipment:

- primary shredder
- belt conveyors
- magnetic separator
- secondary (fine) shredder
- outlet conveyor.



[29] Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021)

Figure 3.5 Line for pretreatment of solid hazardous and non-hazardous bulk waste

The delivered waste material previously unloaded within the Solid Waste Warehouse >100mm, marked P1 (00 EAE 01 BB 001) will be taken from the temporary warehouse using a graphene and transferred to the feed hopper of the primary shredder (01 EBC 10 AJ 001), with a capacity of 20-40 t/h (depending on the type of waste to be treated).

Primary shredded waste is sent from the primary shredder via a belt conveyor (01 EBA 11 AF 001) to the magnetic separator (01 EBA 13 AT 001). The purpose of the magnetic separator is to separate ferromagnetic metals from waste (e.g. iron) before the next steps of treatment, i.e. secondary shredding. The separated metal fraction is collected in containers for temporary storage of secondary raw materials. When the container is filled with separated metal waste, it is transported to the concrete plateau for the separated metal marked U-C08, where it is temporarily stored before further dispatch, i.e. handed over to authorized operators for further disposal.

After removing ferromagnetic metals from the waste, primarily shredded waste is sent via the belt conveyor to a fine (secondary) shredder. The main function of the fine shredder is to additionally shred the waste to a granulation <100 mm, which is the appropriate size of waste ready for thermal treatment in a fluidized bed boiler plant. Finely shredded waste is fed through a conveyor (01 EBA 15 AF 001) into the receiving hopper marked S1 (00 EAB 00 BB 001), from where it is first transferred by means of a crane to one of the storage hoppers marked S4 (00 EAE 00 BB 001), S5 (00 EAE 00 BB 002) or S6 (00 EAE 00 BB 003), and then, according to a predefined procedure within the warehouse for the preparation of a mixture of pre-treated solid waste for thermal treatment S7_ MIX (00 EAE 00 BB 004), the waste is mixed and homogenized.

The following graphical appendices are attached to the study:

Waste storage block diagram	23-WTE-PGD-0701-WC08-1002-R00
Block diagram - pre-treatment of non-hazardous and hazardous waste, storage of sludge waste	23-WTE-PGD-0701-WC08-1003-R00
P&ID - pretreatment of non-hazardous and hazardous waste	23-WTE-IDP-0701-WC08-3002-R00

In order to reduce the emission of particulate matter and unpleasant odours, the Mechanical Installations Design - Waste Pretreatment Filter System and Activated Carbon Filter envisages a dusting and ventilation system consisting of exhaust hoods, pipelines, filter unit with accompanying equipment, activated carbon filters, fans, with a capacity of 24,000 m^3/h and emitter (smokestack) through which purified air is discharged into the atmosphere. The design envisages that the suction hoods are placed at the connection points on the equipment itself (primary shredder, belt conveyors, metal separator, secondary shredder). Also, on the collection pipeline of these extraction points, the connection of the pipeline is planned as the mean for ventilation of the hall or the pretreatment facility.

The hazardous waste pretreatment line (delivered in IBC containers, barrels, jumbo bags, etc.) is provided in a separate room of the *W-C08 Hazardous waste pretreatment* facility and consists of the following equipment:

- roller conveyor C1 and C2
- elevator
- closing chamber
    - hopper with pusher
- primary shredder
- mixer
- double screw conveyor
- piston pump
- desintegrator
- screw conveyor

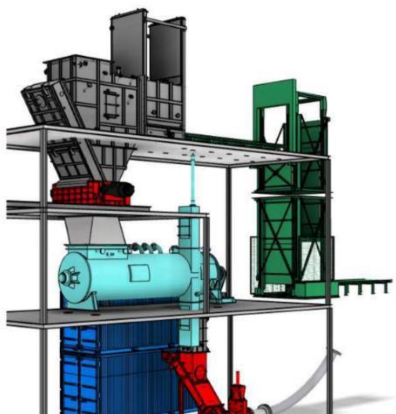


Figure 3.6 Hazardous waste treatment line (delivered in IBCs, barrels, jumbo bags)

Previously received and stored IBC containers/barrels/jumbo bags with solid and liquid waste, as well as empty packaging waste, will be transported by forklift from the Warehouses of packaged heterogeneous (liquid and sludge) waste (rack warehouse for IBC containers, barrels, etc.) marked SKL (SKL_NGT, SKL_NGČ and SKL_GT) to room 0.8 (00 EBC 02 EB 001) where hazardous waste pre-treatment equipment is located. Both rooms are located within the facility *W-C08 Pre-treatment and waste storage* and are separated from each other by two FP sliding doors that automatically close in the event of a fire alarm.

The forklift lowers the delivered IBC container/barrel/jumbo bag onto a roller conveyor C1 by which the vessel is transported to the elevator by which it is then lifted vertically to the closing chamber. From the elevator to the closing chamber IBC containers/barrels are brought by means of roller conveyor C2. When the IBC container/barrel/bag reaches the chamber, the first door opens and the vessel is automatically inserted into the chamber, the first door closes and at that moment nitrogen (N_2) is inserted into the chamber. When the atmosphere in the chamber is inertised, a second door opens and the vessel is then inserted into the primary shredder. By the action of a pusher, the waste is pushed towards the shredder knives. Primary shredded material is introduced into the mixer, after which it is brought to the piston pump by means of a double screw conveyor. Primarily shredded hazardous waste is transporting by the piston pump to the disintegrator, where additional homogenization and shredding of waste to the required granulation (<100 mm) is performed. After the disintegrator, hazardous waste is taken by means of a screw conveyor (02EBC15AF001) to the solid waste dosing conveyor on the left side of the boiler, from where the waste is sent for thermal treatment to the boiler.

The waste shredding process takes place at atmospheric pressure and temperature conditions. The treated waste is also at atmospheric pressure and temperature conditions. Having in mind the above, there is no condition to create conditions for the formation of explosive atmospheres during the crushing of combustible liquids in IBC containers on the shredder in question.

Ventilation of the area in which the pretreatment of hazardous waste will be performed will be done through an axial wall fan with a floating blind with a capacity of 3,500 m^3/h. Air compensation is from the facade of the building.

The complete pretreatment process, on both pretreatment lines described above, will be operated by operators from the operations centre (W-C02).

See drawings given in the graphic documentation:

Waste storage block diagram	23-WTE-PGD-0701-WC08-1002-R00
Block diagram - pre-treatment of non-hazardous and hazardous waste, storage of sludge waste	23-WTE-PGD-0701-WC08-1003-R00
P&ID – pre-treatment of non-hazardous and hazardous waste	23-WTE-PGD-0701-WC08-3004-R00

3.2.1.8 Waste thermal treatment and production of thermal energy in the form of steam

Operation: R1 Use of waste primarily as a fuel or other means for production of energy[30]

[30] Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021)

The project envisages one line of boiler plant for thermal treatment of non-recyclable hazardous and non-hazardous waste, **with a capacity of up to 100,000 t per year (the mass flow rate of waste depends on its calorific value and ranges from 3.43 to 17.24 t/h)**, located within the facility W-C11. The thermal treatment line contains an incineration chamber in the fluidized bed, to which the heating surfaces of the boiler are connected in three flue gas passages, which then pass through the evaporator and economizer. Upon leaving the exchange part, the flue gases enter the part of the gas treatment plant. Flue gas cleaning is performed by dusting, absorption, adsorption and catalytic reactions. Dry cleaning of the emitted gases is carried out by dusting on filter bags and adsorption on activated carbon. Wet cleaning is performed in two-stage scrubbers. The water from the scrubber is cleaned in the water treatment plant. Calcium hydroxide is added to the bottom of the second scrubber and oxygen (air) is blown in, to regulate pH and oxidation. The reduction of the content of nitrogen compounds in the emitted gases is achieved by primary methods of stepwise incineration, which involves incineration in a low oxygen zone with subsequent incineration in a high oxygen zone, thus achieving minimal formation of NO_x in the incineration process. The equipment also includes the existence of secondary methods for reducing nitrogen oxides through the Selective Catalytic Reduction (SCR) unit, which is also the last step in the flue gas cleaning process. Cleaned gases are emitted through the smokestack into the atmosphere. Below is a more detailed description of these systems.

The subject boiler Waste-to-Energy Plant includes the following functional units:

- system for dosing prepared waste for thermal treatment (hereinafter referred to as fuel),
- combustion air and recirculation gas system,
- boiler,
- sand storage and dosing system,
- system for ignition and auxiliary fuel,
- slag and ash transport system,
- feed water system,
- venting/drainage system and
- other auxiliary systems.

3.2.1.8.1 System for dosing prepared waste for thermal treatment

Mechanically treated waste (fuel) is lifted with a crane from the bunker and poured into short-term storage bins that are equipped with movable floors that periodically supply fuel to the screw conveyors for dosing to the boiler. The housing of the dosing screw is mounted on a load cell (scale) that generates a charging signal for the dosing screw. To avoid overfilling, an additional level sensor is installed, which in a case of high level stops the filling of the dosing screw. The fuel level in the dosing conveyor is maintained constant with the help of the two rear transport conveyors.

Dosing screws operate at less than 5 rpm to reduce conveyor wear. Since the fuel flow is not constant during one rotation, the mass flow is equalized by two rear conveyors on each dosing conveyor, which continuously push the fuel forward and allow the dosing conveyors to be filled, and thus adequate regulation of the fuel flow over the number of conveyor revolutions. The fuel then falls on a double flap whose operation is controlled based on the number of revolutions of the dosing conveyor. The double flap has a dual role. The first is to prevent the transfer of heat and the possible spread of fire to the fuel storage, and the second is to prevent the penetration of air into the furnace. As combustion is performed in the lower free zone under substoichiometric conditions, the penetration of additional air would endanger these conditions. The double flap works so that one flap is completely closed at all times. When the dosing screw reaches a certain number of revolutions, and enough fuel falls on the upper flap, it opens and leaks fuel. The fuel falls on the lower flap, and after closing the upper flap, the lower flap opens and leaks fuel into the conveyors with integrated rotary dispensers. The drive of the double valves is enabled through independent hydraulic units. The rotary dispensers then continuously inject fuel into the injection dispenser.

Injection air is blown through the annular portion at the inlet of the injection tube. The steep angle of the pipe and the high pulse of the injection air ensure a good distribution of fuel in the furnace.

In order to ensure continuous supply and avoid the return flow of hot gases from the incineration chamber, the following parameters are continuously monitored:

- differential pressure between the injection air upstream of the injector and the annular sector and
- pressure and temperature at the end of the dispenser.

In the event of a deviation of the operating parameters from the prescribed values, the fuel supply is stopped via double valves. Fire protection system is a system for detecting elevated temperature that activates the sprinkler system in the dosing screws.

In addition to the dosing of solid fuel into the boiler plant, the project also envisages the dosing of liquid waste and sludge. Liquid waste is dosed into the boiler at the designated location, at the upper level of secondary air. The sludge dosing point on the boiler is located in the immediate vicinity of the solid waste dosing point. This technical solution enables the dosing of pre-treated solid waste through 2 screw dispensers, where the sludge delivered by a specially designed sludge pump is dosed before the entrance to the boiler, and the pre-treated packaged waste of heterogeneous physical state (liquid, sludge, solid) is delivered and dosed after grinding in an inert atmosphere by a specially designed pump for the specified waste characteristics. Liquid waste is dosed into a boiler with 2 independent injection torches that allow supercritical atomization of the liquid.

Figure 3.7. shows the dosing system for the prepared waste for thermal treatment.

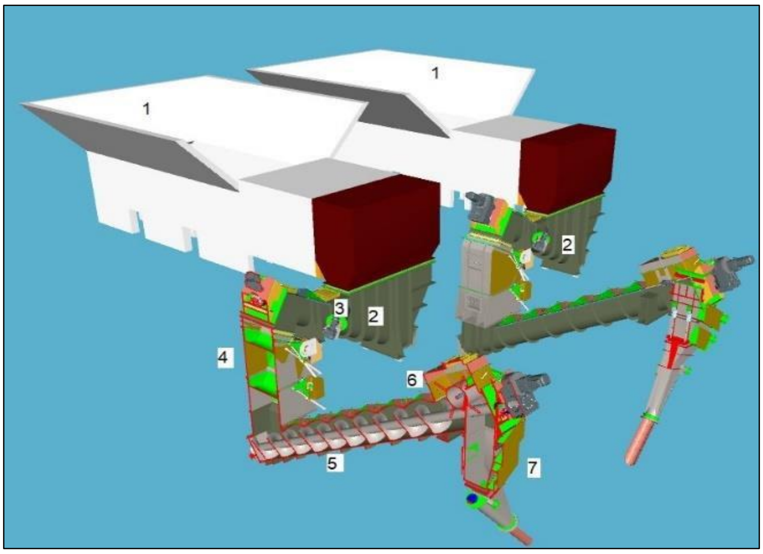


Figure 3.7 Fuel delivery and dosing system: 1-Short-term storage hoppers with movable floor; 2- Dosing conveyors; 3- Rear conveyors; 4-Double fuel dosing flap; 5- Conveyors with integrated rotary dispensers; 6-Rotary dispensers; 7-Injection dispensers

Below is a tabular overview of the maximum capacity of waste dosing in the thermal treatment plant, and in the appendix to the Study, capacities by index numbers R1, R12, R13 and D of the operation are given, as well as a list of excluded index numbers from the R1 operation.

Waste dosing line in the WtE thermal treatment and energy recovery plant			R 1 Operation Capacities		
			Maximum dosing and heat treatment capacity, t/h	Maximum dosing and heat treatment capacity, t/h	Maximum dosing and heat treatment capacity, t/h
1	Liquid waste dosing line (from liquid waste storage tank)	Liquid waste	5	120	40,000

2	Sludge Dosing Line (from sludge storage bunker)	Sludge waste	10	240	80,000
3	Dosing line for previously treated waste of heterogeneous composition (e.g. packaged liquid, solid and sludge waste in IBC containers, barrels, etc., after fine grinding in inert/nitrogen atmosphere)	Finely ground waste of heterogeneous physical state	10	240	80,000
4	Dispensing line for previously treated solid waste (i.e. after shredding, from a solid waste storage bunker)	Shredded solid waste	17	408	100,000
Maximum simultaneous dosing and thermal treatment capacity of all types of waste in the WtE plant			**17**	**408**	**100,000**

In order to optimize the thermal treatment process and prevent adverse reactions when mixing and dispensing fuel (waste) to the boiler, the Project Holder initiated the development of software for the preparation of recipes of compatible types of waste that can be thermally treated, and a pilot project of laboratory examinations of the expected recipes was launched. This software solution is intended for the organization of logistics and management of expected mass or energy balances in operational work. The software is not intended to provide warranties and as such is not subject to or intended for external validation. The specified parameters for software optimization of the process will be available to the operator through the procedure of preliminary waste testing. Therefore, the operator has the possibility of creating the expected mass and energy balances on the basis of the "first principle" calculation, on the basis of which the software solution was created. Limit values regarding the physical and chemical composition of the waste mixture, which can be simultaneously thermally treated in the boiler of the plant and as such constitute a limitation of the composition during the preparation of mass and energy balances, are listed in Chapter 3.2.1.8.3 Boiler, Table 3.10.

3.2.1.8.2 Combustion air and recirculation gas system

The combustion air and recirculation gas system consists of:

- Combustion air supply system,
- Recirculation gas system and,
- Fluidization air system.

Combustion air is taken from two places:

- from the storage and mechanical pretreatment plant
- from the environment as fresh air.

The flow ratio of these two flows is adjusted by the flaps in each channel. In order to prevent the formation of sediment in the equipment, air from the storage is first introduced into the bag filter, while fresh air is introduced through the noise silencer at the top of the boiler plant building. Dust from bag filters is transported by screw conveyors to the fuel dosing screw. The air is then sent through the steam heater using a combustion air fan and then intoduced as heated into the combustion air system.

Air heating is carried out in order to prevent condensation on contact with heated recirculation gas. The steam heater consists of two separate heaters, in which the first air is heated by a condensate formed in the second heater, in which the heating is carried out by steam. Directly adjacent to the steam air heater is a vertical leveling pipe that is connected to the steam and condensate line of the second stage heater, equipped with a level gauge, from where the condensate is sent to the first heater. The level in the pipe is maintained by a constant control valve on the condensate outlet line from the first heater. The pre-heated air is led in three directions: it is directly led to the upper secondary air nozzles; it is mixed with recirculation gas and is led to the burners through which it is blown into the boiler; and it enters together with the second line of recirculation gas to the intake of the fluidization fan and is further distributed to the air distribution boxes, the upper secondary air nozzles and to the fuel dosing system.

The recirculation gas is taken from the duct between the bag filter and the scrubber using the recirculation gas fan and divided into two streams. One stream of recirculation gas is directly mixed with the combustion air and is led to the burners through which it is blown into the boiler, while the other stream is mixed with the combustion air in the fluidization fan and further distributed to the air distribution boxes, upper secondary air nozzles and to the fuel dosing system. Recirculation of flue gases regulates the combustion temperature and consequently reduces the generation of NOx.

The recirculated gas stream has undergone full combustion and as such contains full combustion gases. Restoring the aforementioned flow, enabling adequate temperature profiles for thermal exchange in the transitional modes of boiler operation, also the aforementioned return enables adequate temperature regime and homogenization on the boiler. The consequence is also the reduction of thermal NOx because there is no overheating of excessive amounts of fresh combustion air. The operating parameters of the boiler are such that the corrosion introduced by the return current is minimal, so that the equipment is not endangered from the point of view of integrity. Consequently, the boiler is not hammered and does not have the INCONEL protection characteristic of high-pressure boilers.

The fluidization air consists of combustion air and recirculation gas that are mixed at the intake of the fluidization gas fan. This air is considered to be primary air in the incineration process. Fluidization gas flow depends on the boiler load. Measurement of combustion air flow and recirculation gas is performed upstream of the fluidization gas fan, and measurement of fluidization air flow is performed on the left and right arms of the fluidization air duct. The fluidizing gas is brought to the required pressure and flow by means of a fan equipped with a frequency regulator. Fluidizing gas enters the incineration area through distribution boxes and nozzles integrated into the furnace floor. The ratio of air to recirculation gas depends on the temperature in the fluidized bed and is regulated by flaps.

Secondary combustion air is a mixture of combustion air and recirculation gas and supplies the boiler with the required amount of air in the first passage of the boiler. This air is led to the boiler in the following ways:

- via gas burners for ignition and auxiliary fuel, through which the air is continuously supplied (in the zone of the fluidized bed on the side of the left and right side walls),
- via the left and right injection dispensers together with the fuel (on the side of the left and right side walls),
- via upper secondary air nozzles (on the front and back walls four nozzles each and on the right and left side walls four nozzles each),
- via a return pipeline that pneumatically returns part of the material from the bed to the boiler (on the side of the right side wall).

All these flows are introduced into the boiler in its first passage.

Figure 3.8 schematically shows the Combustion Air and Recirculation Gas System.

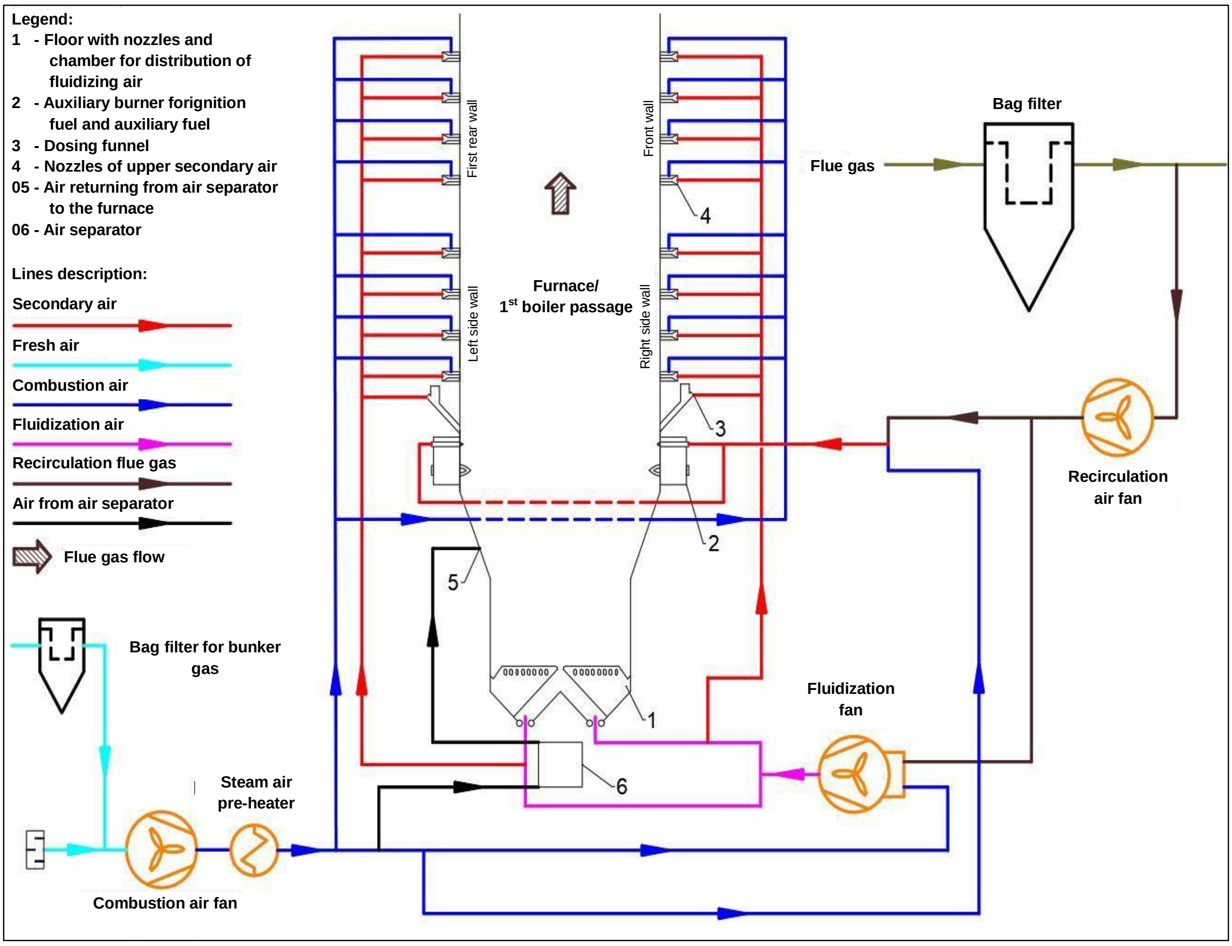


Figure 3.8 Schematic diagram of the Combustion Air and Recirculation Gas System

3.2.1.8.3 Boiler

Based on the design capacity, the lower thermal power of the fuel, the type and amount of fuel, i.e. the prepared waste for thermal treatment, a vertical boiler with optimized energy recovery and incineration in a bubbling fluidized bed was selected.

The boiler consists of three passages and an economizer with an integrated first pass furnace. The system for removing unburned material (slag) and sand from the fluidized bed is located under the furnace. The boiler ash drainage system is located at the bottom between the 2nd and 3rd passages. Within the third passage of the boiler there is one steam superheater and four evaporator bundles, while in the economizer there are three evaporator bundles of economizers and three evaporator bundles of flue gas preheaters that serve to control the temperature of flue gases in the process of their purification.

The boiler furnace is integrated in the first passage of the boiler and consists of:

- two slag hoppers,
- floor with nozzles into which fluidizing gas is introduced,
- fluidized bed,
- the lower free zone and
- upper free zone.

There are two main processes in the furnace:

- I: drying, devolatilization, gasification and partial oxidation under sub-stoichiometric conditions in the stationary fluidized bed and
- II: oxidation of gases from the fluidized bed in the upper zone.

In the furnace, in the fluidized bed, the incineration products, i.e. flue gases, reach a temperature in the range of 850 to 950°C. The heat of the flue gases is transferred through the heating surfaces of the boiler in which heating, water evaporation and saturated steam production are performed. The liquid and vapor phase are separated in the drum. The dry saturated steam from the drum then passes through the superheater in the third passage and is heated to T= 207°C and p=14 bar. After the superheater on the main steam line, there is a steam flow meter, a branch towards the starting line with a boiler heating control valve, a safety valve and a main boiler valve. The safety valve on the main steam line is sized for 100% of the nominal boiler capacity of 46.5 t/h and enables operation in special modes and controls the direct gross production of steam on the boiler. Part of the water vapor is consumed for the boiler's own needs (overheating of primary combustion air, heating of boiler feed water, heating of bag filters and blowers).

Figure 3.9 shows the first boiler passage with an integrated furnace, and the systems essential for the operation of the boiler plant. Combustion air, recirculation gas, natural gas, sand and fuel are supplied to the boiler furnace, and slag is drained from the furnace.

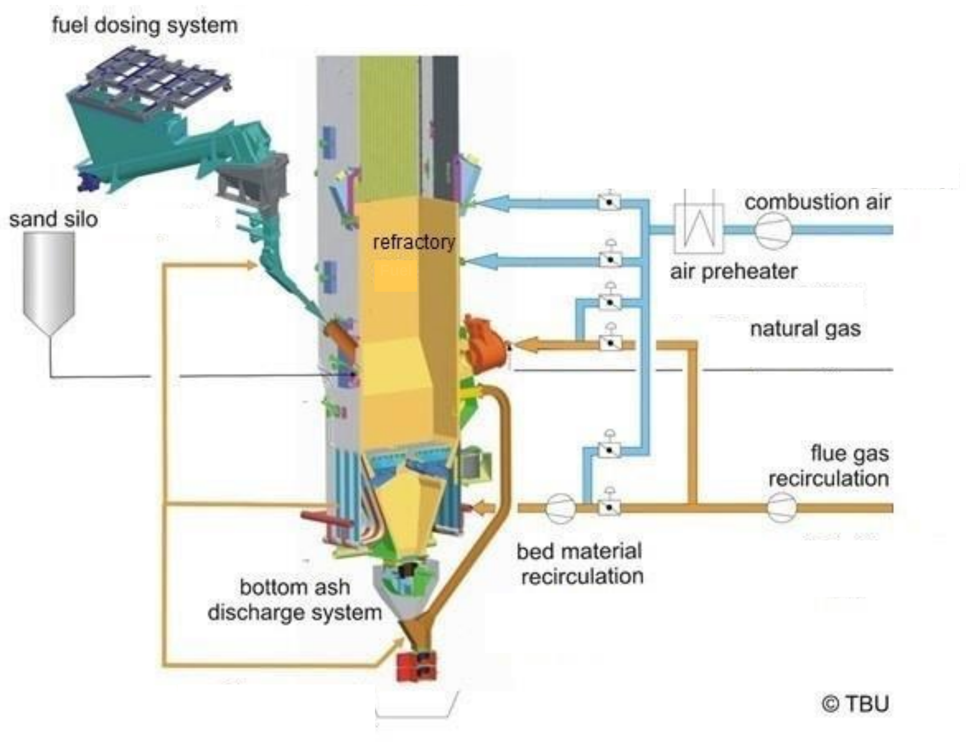


Figure 3.9 Integrated boiler furnace with nozzle jet floor and other equipment

Boiler heating surfaces

The boiler is a welded structure consisting of (see Figure 3.10):

- screen tubes,
- boiler drum,
- evaporator bundles,
- economizer,
- steam superheater,
- flue gas preheater and
- collector pipes.

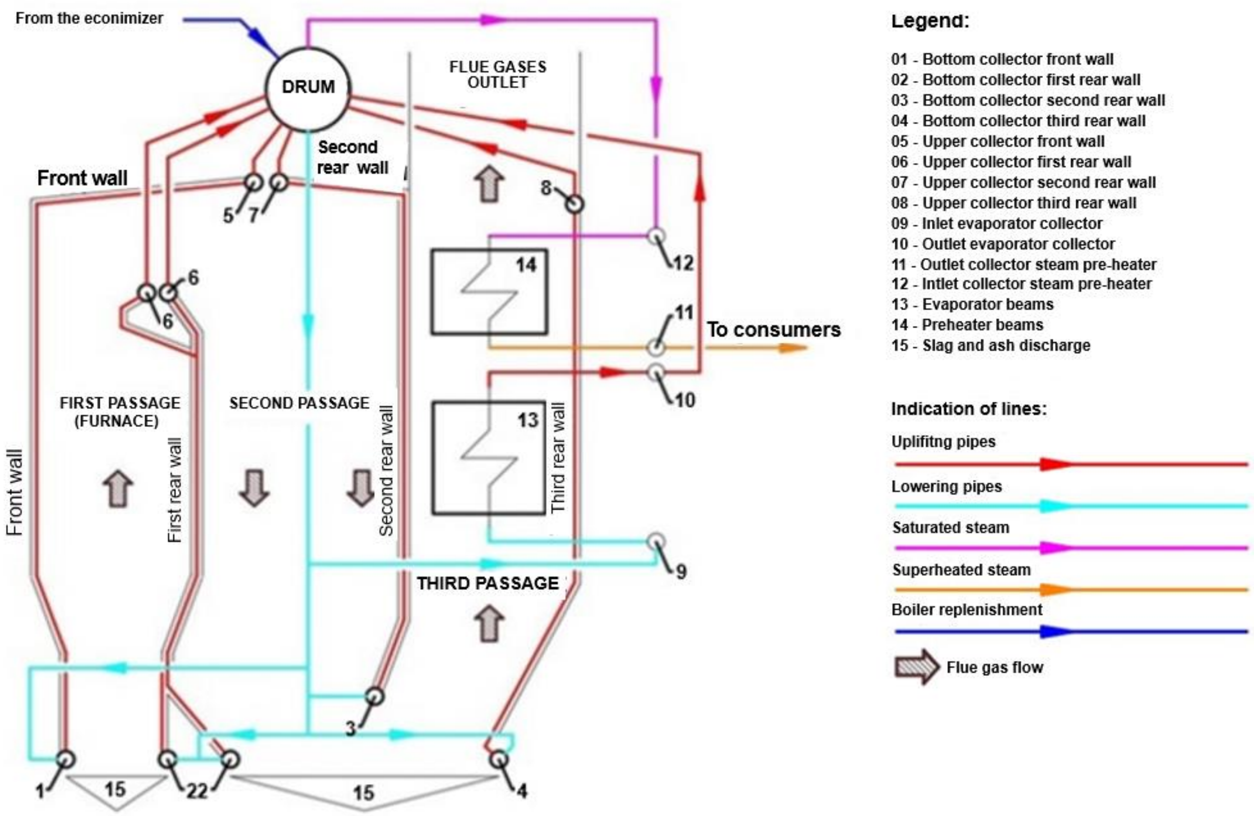


Figure 3.10 Schematic representation of boiler heating surfaces

The boiler consists of 3 flue gas passages and an economizer. The walls of the first, second and third passages are walls with screen tubes. The walls of the fourth passage are insulated steel plates. Heat transfer in the first and second passages is predominantly carried out by radiation. In the third passage there are heat exchanger bundles: evaporators and superheater. In the fourth passage there is an economizer and wet gas superheaters and a SCR superheater. The heating surfaces of the third and fourth pass of the boiler are equipped with soot blowers. Soot blowers are steam, and for a certain period of time they are inserted into the zone of heating beams and with a steam pulse they blow away deposits from the heating surfaces. The drive of the blower insertion mechanism is electric.

The boiler is designed to work with various types of non-recyclable municipal, industrial hazardous and non-hazardous waste as fuel, and is designed to meet the following requirements in order to reduce soiling, erosion and corrosion, namely:

- low flow rates in all passages,
- wide passages in the radiation zone to maintain a low temperature at the entrance to the 3rd passage and
- there are no narrow sections in the slag and boiler ash pits to avoid the risk of clogging.

Mechanically treated waste (dimensions < 100 cm) is sprayed on the surface of the bed to ensure good distribution of fuel in the bed. The fuel inlet is installed on the left and right side vertical walls to avoid erosion on the refractory material of the wall caused by the fuel supply. The inclined closed bottom in combination with the open horizontal floor create internal circulation of the bed for the best possible distribution of fuel and movement of coarse particles to the flat part of the bottom where the unburned material is separated.

The flow of air and recirculation gas is carried out in a controlled manner to ensure a uniform temperature profile, and therefore a low production of NO_x and gases that can cause boiler corrosion.
The flow of recirculation gas and additional air depends on the value of the thermal power of the fuel and the moisture content.

Fluidization air dosing
In the incineration process, fluidization air is considered primary air. The base of the fluidization bed consists of a sloped closed floor with nozzles and a horizontal open floor with nozzles. Fluidization air is dosed from distribution boxes located under the floor with nozzles. The corners at the bottom of the nozzle housings and distribution boxes ensure that the bed material flows to the receiving slag bunkers, where it is periodically removed with slag. The nozzles blow the fluidization air in the direction of the open floor. The specific air flow per surface unit over the closed floor with nozzles is lower than in the open floor with nozzles. Therefore, internal circulation is created, which improves the distribution of fuel in the bed and the flow of larger material to the open floor with nozzles. All nozzles from the open floor are arranged in a horizontal level. Therefore, there is uniform pressure from the layer on each nozzle. Each nozzle on the open floor has the same geometry which ensures an even distribution of fluidization air through the open bottom. Nozzles located on the inclined closed floor are designed according to the level and flow of fluidizing air.

Fluidized bed
The zone of the fluidized bed is integrated into the boiler. The screen walls surrounding the fluidized bed are protected from corrosion and excessive heat exposure by the refractory material. Fuel is introduced into the fluidized bed via the injector, dispersed over the surface of the bed and incinerated in the bed. There are two criteria for maintaining a fluidized bed:

- the total amount of fluidization air must maintain a sand-dependent velocity in the bed between approximately 1 and 1.8 m/s to maintain stable fluidization
- the total amount of oxygen in the bed. This is the most important parameter affecting the heat release and must maintain a temperature in the range of 650 – 800 °C depending on the fuel composition.

There are several processes that take place simultaneously in the fluidized bed:

- fuel drying,
- fuel devolatilization (pyrolysis),
- fuel gasification,
- fuel oxidation,
- heat exchange on the walls and
- heat exchange with the free zone.

These processes are facilitated by an internal circulating fluidized bed, in particular by:

- sand circulation in the bed,
- good fuel distribution in the bed,
- high heat transfer in the bed,
- stabilization of the temperature by the mass of sand (bed material) and
- high reaction surfaces and high turbulence between combustion air and fuel.

Endothermic processes are drying and devolatilization. Moisture and volatile matter in the fuel evaporate using energy from the fuel.

Exothermic processes are gasification and oxidation. Flammable substances react with oxygen mainly to CO, H_2O and CO_2 releasing thermal energy into the bed. The more oxygen available in the bed, the more energy released in the bed.

The plant is designed so that for each case of load diagrams, CO and CO_2 are produced simultaneously in the bed, which means that there is more than enough air to gasify the carbon in the fuel, but less than necessary for complete incineration. The bed is managed sub-stoichiometrically, which is the basic parameter for controlling the process of mixing combustion air and recirculation gas depending on the temperature in the bed at a constant flow of total fluidization gas (consisting of combustion air and recirculation gas).

In order to maintain the fluidized bed in the thermal waste treatment boiler, sand must be periodically added to the bed to compensate losses that are separated at the bottom along with slag. Sand consumption mostly depends on the content of non-incinerable substances and fuel composition and is about 20 kg/h. Sand for replenishment is delivered by truck and pneumatically transported to the silo, with a volume of 60 m^3. The silo is equipped with a filter for ventilation during charging/discharging. A compressed air pipeline was supplied to the bag filter for the purpose of regenerating (shaking) the bag filter.

Bottom boiler zone
The bottom boiler zone is located between the lower and upper secondary air dosing levels. Basically, the same processes as in the fluidized bed take place simultaneously:
- fuel drying,
- fuel devolatilization (pyrolysis),
- fuel gasification,
- fuel oxidation,
- heat exchange on the walls and
- heat exchange according to the bed and the upper free zone.

The previously mechanically treated waste enters the incineration chamber below the level of secondary air and is spread over the bed. Endothermic processes, drying and evaporation, partially take place on the fuel path from the injector to the bed surface. The smaller the particle size of the fuel, the faster it will react in the bed. Flammable gases for the gasification and oxidation process are partially produced above the bed or unburned leave the bed and react with oxygen to form mainly CO, H_2O and CO_2 with the release of thermal energy in the bottom zone of the boiler. The bottom zone is also in a sub-stoichiometric relationship.

Maintaining a low concentration of O_2 in the flue gas is important due to the following parameters:
- lower load on flue gas cleaning equipment,
- NO_x generation was reduced and
- greater boiler efficiency due to lower losses through flue gases.

The low concentration of O_2 can be controlled throughout the operating range of the boiler using recirculation gas. The recirculation gas is partially added with the fluidization gas, to maintain the temperature in the fluidized bed. An additional amount to maintain low O_2 concentration is added to the lower secondary air. The amount of combustion air to the lower secondary air nozzles controls the temperature of the bottom boiler zone.

Boiler upper zone
The upper zone of the boiler is between the upper level of secondary air and the end of the refractory material. The incineration processes that take place in the upper boiler zone are:
- oxidation of produced flammable gases and remaining solid fuels,
- heat exchange on the walls and
- heat exchange with the bottom boiler zone and radiation zone.

In the upper boiler zone, gases coming from the bottom boiler zone are mixed with the upper secondary air. The nozzles are arranged to create a vortex movement of the gas. Flue gases enter this zone sub-stoichiometrically and react with secondary air in the turbulent flow zone. At the end of this reaction, the flue gases have an excess of oxygen and a temperature between 850 and 950°C.

The recirculation gas to combustion air flow ratio depends on the boiler load. The temperature after the upper boiler zone is controlled by the fuel supply. The recirculation gas and air flow is controlled to keep the boiler load at a constant temperature after the upper boiler zone. The recirculation gas is used as part of the fluidization gas to control the temperature in the bed. Part of the recirculation gas is blown into the incineration chamber at a lower secondary level to control the oxygen concentration. **The retention time after the secondary air level at a minimum temperature of 850°C is more than 2 seconds, which is in accordance with the conditions prescribed by the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023).**

One of the most important parameters in the operation of the boiler is maintaining a constant temperature in the furnace. Too low a temperature leads to unburned gases such as carbon monoxide and hydrocarbons in the flue gas. At too high temperatures, there is a higher production of NO_x, ash melting and the formation of gaseous salts, which cause corrosion in the boiler.

Material and energy balance

The following figure shows a diagram of the boiler operating modes (at the ordinate of which the boiler power is in MW, and the abscissa reads the mass flow of fuel – prepared waste in kg/h).

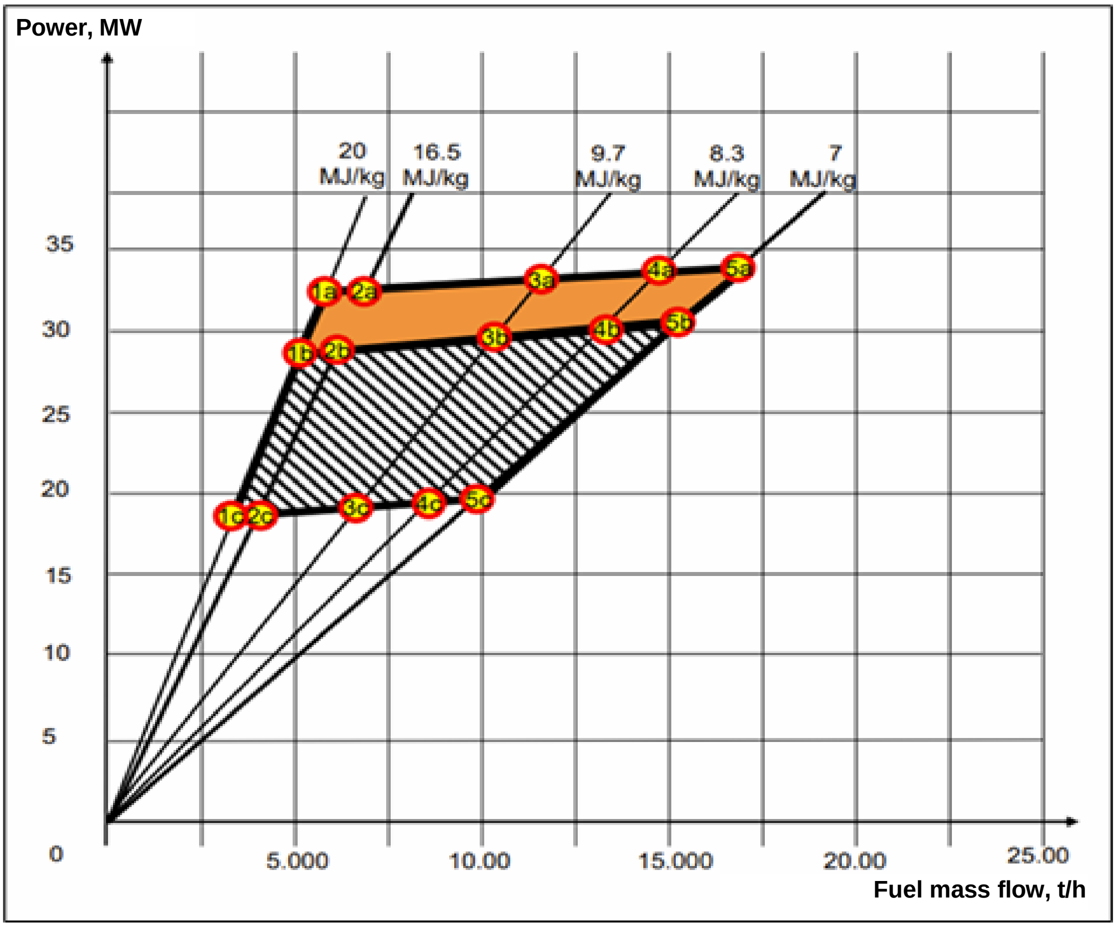


Figure 3.11 Boiler operating modes diagram

The diagram shows that the boiler is designed for continuous operation with lower thermal power fuel in the range from 7 MJ/kg to 20 MJ/kg with calculation points between range of 16.5 MJ/kg, 9.7 MJ/kg and

8.3 MJ/kg. Point 2b represents the calculation point for the boiler and the parameters in this point are given in Table 3.9.

Table 3.9 Calculation parameters of the boiler

Parameter name	Value	Unit
MCR – maximum continuous rating	29.20	*MW*
LCV – lower calorific value of fuel	16.5	*MJ/kg*
Calculated fuel consumption	6322	*kg/h*
Calculated steam production	35.24	*t/h*

The boiler and accompanying equipment are adapted in type and quality to the purpose - thermal treatment of industrial hazardous and non-hazardous waste and meeting the requirements for steam production of appropriate characteristics.

The design of the thermal treatment technology, the design of the boiler plant and the flue gas treatment system are designed in accordance with the predefined chemical composition of the waste fuel, i.e. the mixture of waste that simultaneously enters the combustion process (thermal treatment), in terms of calorific power, moisture content, ash, chlorine and other conditions that the waste fuel should meet for the operation of the boiler under defined operating conditions. Predefined restrictions in the chemical composition of waste fuel represent the basis for the preparation of recipes, i.e. restrictions that must be met in the operational operation of the plant and which must be applied for the preparation of a mixture of waste that is simultaneously thermally treated. For each further optimization of the operation mode of the plant, which includes the preparation of recipes and mass balances, the above data are taken as limitations that must not be exceeded. The stated limitations of simultaneous thermal treatment are expressed in Table 3.10.

The characteristics of the prepared waste material (fuel) are shown in Table 3.10.

Table 3.10 Thermal calculation of the fuel combustion boiler (prepared waste material) of different thermal power ranging from 7 MJ/kg to 20 MJ/kg

Fuel composition	**Lower calorific value of fuel**		
	7 MJ/kg	**16.5 MJ/kg**	**20 MJ/kg**
Carbon	16.41% w	33.88% w	45.23% w
Hydrogen	3.30%w	6.78% w	7.70%w
Oxygen	8.88%w	18.42% w	29.41%w
Sulfur	0.15%w	2.00%w	0.51%w
Ash	20.00% w	18.40% w	4.50%w
Moisture	50.00% w	20.00% w	10.00%w
Nitrogen	0.30%w	0.31%w	0.60%w
Chlorine content (total)	0.96% w	3.02% w	2.01% w
Fluorine	< 0.02 %w	< 0.02 %w	< 0.02 %w
Mercury	< 10 mg/kg	< 10 mg/kg	< 10 mg/kg

* organic chlorine content <1%

Material and energy balance by flows given in the technological scheme 23-WTE-IDP-0704-WC11- 2001 and in the table *Material and energy balance by flows*, which is attached to the Study.

The defined chemical composition of the waste mixture, which is simultaneously thermally treated in the subject plant, was used for the design of key equipment, boiler and adequate design of the flue gas contamination treatment system. The mixture of waste that is simultaneously referred to thermal treatment in the boiler plant as a fuel must not contain characteristics that are outside the range defined in Table 3.10. These characteristics are used as a limit when making logistics plans and simultaneously sending waste for thermal treatment. Consequently, it is clear that there is no possibility of variation in relation to the defined restrictions on the composition of waste allowed for simultaneous thermal treatment in the plant. Table 3.10 also clearly shows that the equipment is designed for a technical maximum total chlorine content of <3% in the fuel input, while the share of branch halides is limited to <1% in accordance with the limits expressed in Article 8, paragraph 2 of the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", No. 103/2023).

3.2.1.8.4 Sand storage and dosing system

To maintain the fluidized bed, sand must be periodically added to the bed to compensate for losses. Sand consumption mostly depends on the content of non-combustible substances and fuel composition.
The sand dosing system consists of:
- sand silo,
- feed pipes for filling the silo with sand,
- bag air filter,
- dosing screw and
- rotary dispenser.

Sand is delivered by truck and pneumatically transported to the silo, with a 60 m^3 volume. The silo is equipped with a filter for ventilation during charging/discharging. A compressed air pipeline is brought to the bag filter for the purpose of regenerating (shaking) the bag filter. Sand is dosed from the silo using the dosing screw and via the rotary dispenser to the injector. Sand falls through the opening into the sand pipe where it is pneumatically transported and sprayed over the fluidized bed.

To ensure smooth dosing of sand, the air pressure upstream of the injector is continuously monitored. Transport air is taken from the lower secondary air. This air is always "in operation" in order to prevent the penetration of flue gases into the dosing sand pipeline and causing a corrosion. Replenishment of sand into the fluidized bed is done on the basis of measuring the pressure in the furnace. Also, a direct connection of the truck is envisaged, which delivers sand with a fluidized bed via special pipeline and valves.

The sand granulometry specification is provided in the appendix to the Study.

Figure 3.12 shows the system for storing and dosing sand into a fluidized bed.

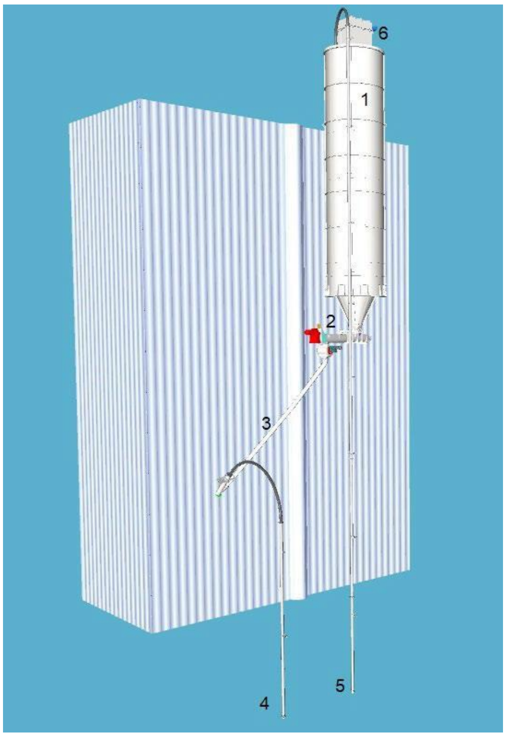


Figure 3.12 Sand storage and dosing equipment: 1 – sand storage silo; 2 – sand dosing screw conveyor; 3 – sand dosing pipeline; 4 – connection for direct insertion of sand into the bed; 5 – connection for filling the sand silo; 6 – bag filter

3.2.1.8.5 Ignition fuel and auxiliary fuel system

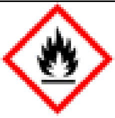
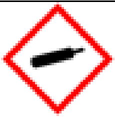
Natural gas will be used to operate the boiler burner as an ignition and auxiliary fuel, with an auto-ignition temperature of 595 °C and a minimum lower heating value of 34.4 kJ/m³. Two natural gas burners with a nominal power of 2x12 MW are planned for boiler start-up and operation with low-calorie fuel. The burners are only used to start and stop the boiler and in case the temperature in the furnace drops below 850 °C, while in regular operation the burners are only used to introduce secondary combustion air. Heat transfer by flame will predominantly be carried out by irradiation. Prolonged operation of a gas burner would create high temperatures locally with a risk of ash melting.

The following parts are housed in the burner housing: diffuser, combustion air vortex, gas lance, flame detector, ignition burner with its own flame detector (ionizing electrode) and igniter. Combustion air is taken from the combustion air system and continuously introduced into the burner. During the operation of the burner, the air is also used for cooling. Cooling air for burner equipment (flame detector, igniter) is also taken from the fresh air fan thrust.

Natural gas is brought to the Waste-to-Energy Plant site from the installation of the existing Elixir Prahovo complex, i.e. to the U-C09 natural gas reduction station, which is immediately located next to the W-C11 boiler plant facility. Before entering the burner, natural gas is brought to the skid with valves for safety interruption of natural gas supply and injection of atomization air.

Classification of natural gas

INDEX number: 601-001-00-4	EC number: 200-812-7	CAS Number: 74-82-8	UN Number: /
Classification			
Flam. gas. cat. 1;H220 Throttle under the press.; H280			
Label elements			

GHS pictogram danger	 GHS02  GHS04
A word of warning.	Hazard
Hazard notification: **H-labels**	H220: Highly flammable gas H280: Contains gas under pressure, may explode if exposed to heat
Precautionary statements **P-labels**	**Prevention:** P210: Keep away from heat sources/ sparks/ open flames/ hot surfaces. **Reacting** P377: Gas leak fire: Do not extinguish unless leakage can be stopped safely. P381: Remove all ignition sources, if possible safely. P410 + P403 – Protect from sunlight. Store in a place with good ventilation.

Seveso data		
Seveso substance	**Main seveso category / Other seveso categories (Hazard classes from Table II of the Rulebook on the list of hazardous substances)**	**Table I and II** **Limit quantities (t)** **Column1** **(1.Accident prevention policy)/** **Column 2** **(1.Safety Report;2.Accident Protection Plan)**
Yes	Table I -no.18: named substances ''P2''- flammable gases category 1	50/200 10/50

Information on the physical and chemical properties of the chemical

Aggregate state	Gas
Chemical color:	Colorless
Odor:	Odor threshold is subjective and inadequate for early warning
pH of chemical:	Not applicable to gases and gas mixtures
Odour threshold	The data is not relevant, because it is an odorless gas
Melting point / freezing point.	-182.5°C
Initial boiling point and boiling range	-161.5°C
Flash point	Not applicable to gases and gas mixtures
Evaporation rate:	Not applicable to gases and gas mixtures
Flammability:	Highly flammable gas
Explosion limits :	5 - 15% (literature data)
Lower explosion limit (LEL) : Upper explosion limit (UEL) :	4.4 17
Vapout pressure:	Inapplicable.
Vapour density:	0.555 kg/m^3 (for pure methane, at 15°C)
Relative density liquid (water=1) :	0.42
Relative density, gas (air=1) :	0.6
Water solubility :	26 mg/l

Partition coefficient in	11.2 µPa at 27°C
n-octanol/water system (Log Kow):	1.09
Auto-ignition temperature	595°C
Decomposition temperature	1000-1200 °C
Critical temperature:	-82°C
Molar mass	16 g/mol

Stability and Reactivity

Reactivity:	Airborne gas can create explosive mixtures.
Chemical Stability:	Stable under normal conditions
Possibility of hazardous reactions:	With air, it can create an explosive mixture. Reacts violently with oxidants
Conditions to avoid.	P210: Keep away from heat sources/ sparks/ open flames/ hot surfaces. - No smoking. Avoid moisture in installation systems.
Incompatible Materials:	Air, oxidizer. For further compatibility information see SRPS ISO 11114
Hazardous decomposition products:	Under normal conditions of use and storage, there are no hazardous decomposition products

Acute Toxicity

Toxicological effects of this product are not expected unless the limit values for the working environment are exceeded.

LD50/ Oral	The study is not technically feasible
LD50/ Dermal	The study is not technically feasible
LC100/inhalation (87%)/1.5h/cat	606687 mg/m^3, - induces anesthesia
LC100 inhalation (90%)/1.5h/cat	627607 mg/m^3, - causes respiratory toxicity and death

Local effect:

Skin corrosion/irritation:	The study is not technically feasible
Severe eye damage/irritation:	The study is not technically feasible
Respiratory/skin sensitisation:	That information is not available.
Carcinogenicity :	No known effects from this product
Sex cells mutagenicity:	No known effects from this product
Toxicity to reproduction	No known effects from this product
Specific susceptible organs – toxicity	No known effects from this product
(single exposure):	No known effects from this product
Specific susceptible organs – toxicity	No known effects from this product

Ecotoxicological data

Ecotoxic properties: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

EC50 48h - Daphnia magna [mg/l] : 69.4 mg/l
EC50 72h - Algae [mg/l] : 19.4 mg/l
LC50 96 h - Fish [mg/l] : 147.5 mg/l

Persistence And Degradability

The substance is biodegradable. They are unlikely to stick around.

Bioaccumulation potential
Due to low log Kow (log Kow <4), bioaccumulation is not expected.

Mobility in soil
Due to its high volatility, the product will not cause soil or water pollution.
Soil retention is unlikely
Greenhouse effect potential [CO2=1]: 25

3.2.1.8.6 Feed water system

The feed water system consists of:
- feed water tank with degasser
- feed water pumps and
- feed water pipeline with control valves for water supply to the economizer.

In the feed water tank, the feed water is heated and degassed with low-pressure steam taken from the steam divider. The pressure in the feed water tank is set to maintain a constant temperature of 120°C at the saturation line. The regulation of the steam flow for heating and degassing of the feed water is carried out through control valves on the steam inlet lines based on the temperature in the tank. The feed water tank is equipped with a continuous level measurement on the basis of which the tank is refilled via the control valve at the entrance to the tank, as well as a safety valve.

Replenishment of the feed water tank is done with DEMI water from the auxiliary systems facility (U-C02).

Before entering the feed water tank, DEMI water is heated in the steam heater. Steam flow control is performed by a control valve at the inlet of the heater based on the temperature of the DEMI water at the outlet of the heater. The DEMI water heating steam is taken from the steam manifold. The feed water is then sent from the tank to the feed water pumps via the feed water control valve and the economizer into the drum and partially into the evaporators. In the suction line of the feed water pumps, the dosing of the chemical BT-21 for the elimination of oxygen and BT-26 for the regulation of the pH value is performed to prevent corrosion in the boiler. The MSDS sheets for chemicals BT-21 and BT-26 are provided in the appendix to the Study.

In the degasser of the feed water tank, about 99% of the dissolved oxygen is extracted, the rest (1%) is extracted from the water by adding the chemical BT-21. In order to prevent the occurrence of corrosion in the boiler, it is necessary to maintain the pH value of the water in the boiler at greater than 9.2 (max. 10), which is achieved by adding the chemical BT-26. Both of these chemicals are dosed from plastic tanks with a volume of 100l, using membrane dosing pumps. The quantity adjustment is done manually based on the O_2 content (%) and pH data from the sampling station.

The parameters to be controlled in the feed water system are as follows:
- pressure on the discharge of the feed water pumps - it must be high enough so that the water can be sprayed in the evaporators,
- the amount of steam and water produced that is separated from the system (continuous blowdown, drum overflow) - it is necessary to replace it with the same amount of feed water and
- level in the drum - it needs to be maintained constant.

The control of the feed water flow is carried out on the basis of the above parameters, and by the frequency regulation of the feed water pumps and the control valve on the feed water supply line. Three-way valves are installed on the discharge of the feed water pumps, which recirculate part of the flow into the feed tank so that the pump does not enter the operating mode below the minimum flow.

3.2.1.8.7 Venting/drainage system

A 2.5 m^3 blowdown reservoir is planned within the boiler plant. The basic function of the tank is to connect water from the continuous blowdown process of the boiler as well as all drainage from the boiler plant in the water/steam system. Continuous blowdown of the boiler is carried out via a manual drainage valve provided for blowdown, which is adjusted depending on the operating parameters of the boiler to a certain percentage of openness, in order to obtain a blowdown water flow of about 3% of the total steam production. The drains collected in the reservoir are, in addition to the drainage of the pipeline and the overflow of the drum and the feed tank, condensate from the air preheater, sealing air heater, bag filter heater, drainage of the safety valve on the feed tank, noise muffler of the safety valve on the main steam line, drainage of the steam line, soot blower, steam superheater and other drainage. The tank is equipped with a vent (breather) to the atmosphere via a pipeline that leads the vent above the roof of the boiler building. A service water pipeline was brought to the tank, which is used to cool the tank (from the inter-plant distribution). The water from the tank is then pumped to the safety supply tank, from where it is further sent to the HCl scrubber within the flue gas cleaning plant. An overflow pipe is also installed on the tank through which excess water is discharged into the technological sewer.

Ash hopper

Underneath the open bottom with fluidization air nozzles is a hopper protected by refractory material. The corners of the walls are steep to ensure a smooth flow of ash.

In normal operation, the hopper is filled with material from a bed that is continuously removed by ash discharge equipment – hydraulically driven pendulums. The material fills two ash bunkers passing between the nozzles. Between the nozzles, the velocity of the fluidizing gas is higher than in the bed, therefore the zone above the nozzles behaves like an air sieve, but also cools the material passing through.

3.2.1.8.8 Other auxiliary systems within the boiler plant

Other auxiliary systems of the boiler plant are:

- closed cooling water system,
- sampling system,
- compressed air distribution,
- process water and demi water distribution
- Nitrogen distribution

Closed cooling water system

Process water is supplied to the W-C11 facility from the U-C02 auxiliary systems facility. Part of this water is used to cool the water in the blowdown tank, and part as a supplement to the closed cooling water system and the first filling of the cooling system.

The closed cooling water system in its circuit includes the following equipment:

- expansion vessel
- two cooling water circulation pumps (capacity 10 m^3/h) and
- two air coolers with associated fans (thermal power 115 kW).

Cooling water from a closed system cools the following systems and devices:

- sampling station
- screw conveyor of boiler ash between the 2^{nd} and 3^{rd} boiler passage.

Sampling system

The water/steam sampling and analysis system is designed for automatic conditioning and analysis of water and steam samples. Includes sample conditioning equipment, analytical equipment and a central electrical cabinet for power and signal wiring. The station consists of one double-sided sampling rack and four lines of samples and six instruments. The fluids to be sampled are: feed water, boiler water, steam and return DEMI water.

Table 3.11 provides the reference values of the parameters monitored in the sampling station.

Table 3.11 Parameter reference values

Sample line number	Line 1	Line 2	Line 3	Line 4
Fluid name KKS mark	Feed water 11QUC10	Boiler water 11QUC20	Steam 11QUC30	DEMI water return 11QUC40
Inlet pressure	30 bar	20 bar	20 bar	6 bar
Inlet temperature	130 °C	250 °C	250 °C	120 °C
Operating fluid	Water	Water	Water	Water
Outlet pressure	30 bar	20 bar	20 bar	6 bar
Outlet temperature	25 °C	25 °C	25 °C	25 °C
Operating fluid	Water	Water	Water	Water
Mass flow	40 kg/h	30 kg/h	30 kg/h	40 kg/h

As mentioned earlier, the sampling system is supplied with cooling water from the closed cooling water system. The cooling water requirements of the sampling station are given below.

Table 3.12 Required cooling water parameters for the sampling station

Sample line number	Line 1	Line 2	Line 3	Line 4
Fluid name KKS mark	Feed water 11QUC10	Boiler water 11QUC20	Steam 11QUC30	DEMI water return 11QUC40
Inlet temperature	22 °C	22 °C	22 °C	22 °C
Operating fluid	Cooling water	Cooling water	Cooling water	Cooling water
Outlet temperature	32 °C	32 °C	32 °C	32 °C
Operating fluid	Water	Water	Water	Water
Mass flow	550 kg/h	800 kg/h	2500 kg/h	500 kg/h

Compressed air distribution

Compressed air is distributed from the compressed air tank from the auxiliary systems facility (U-C02) to the boiler plant facility (W-C11) and used as instrument air and as process air for the purpose of regenerating (shaking) flue gas bag filters, combustion air, etc. Compressed air is delivered to the boiler plant (W-C11) at a pressure of 6 barG.

Table 3.13 Compressed air characteristics

Nominal flow, Nm^3/h	1320
Nominal pressure, barg	6.5
PDP*, °C	- 40

*PDP – dew point, compressed air quality measure

Process and demi water

Replenishment of the feed water tank is done with DEMI water from the auxiliary systems facility *(U-C02)*. DEMI water is delivered to the U-C02 facility from the central plant for the preparation of process water located in the existing Elixir Prahovo complex (the central CWP is the subject of another project) and has the characteristics shown in Table 3.14.

Table 3.14 Physical characteristics of demi-water

Boiler water standard:	SRPS EN 12952-6:2012 Water-tube boilers	
Electrical conductivity:	µS/cm	< 30
pH value		6.5 to 8
SiO_2	mg/l	<0.02
Water hardness (total)	mg/l	0

Dynamic water pressure at the outlet of the plant (column):	bar-g	3-5

Process water is delivered to the boiler plant from the auxiliary systems facility (U-C02) and has the characteristics shown in Table 3.15.

Table 3.15 Physical and chemical characteristics of process water

Parameter name	Unit	Min.	Max.
pH	-	6.75	8.13
Electrical conductivity	(µS/cm)	359	451
$KMnO_4$	(mg/l)	16.66	60
Bicarbonates / m-alkalinity	-	150	250
SiO_2	(mg/l)	1.25	3.5
Temp.	(°C)	9	25
Turbidity	(NTU)	2.72	30
TOC	(mg/l)		5.948
Content of suspended solids	(mg/l)	0	10
Cl	(mg/l)	14	39
NH_4	(mg/l)	0.041	39.09
Fe	(mg/l)	0.01	0.12

Nitrogen distribution

Nitrogen is generated from compressed air in the auxiliary systems facility (U-C02) and delivered from there to the boiler plant. In the boiler plant, nitrogen is used in bag filters, for inertization, as well as in the activated carbon dosing system. The required nitrogen characteristics are given in Table 3.16.

Table 3.16 Physical characteristics of nitrogen

Nominal flow, Nm^3/h	100
Pressure, barg	7.1
Temperature, °C	Ambient
Cleanliness	>98%

3.2.1.9 Boiler plant flue gas cleaning systems

The largest and most complex part of the Waste-to-Energy Plant are the cleaning systems of flue gas generated during the incineration of waste. These systems are designed on the basis of the defined chemical composition of the recipes of different types of waste entering the incineration process and include:

- Dry flue gas cleaning (cyclone and activated carbon reactor and bag filters)
- Wet flue gas cleaning in scrubbers
- Selective catalytic filter (SCR system for selective catalytic reduction of nitrogen oxides (NO_x)

The flue gas treatment plant includes a number of operations that use flue gases to:

- remove powdery substances,
- absorb acidic compounds such as SO2, HCl and HF,
- adsorb organic compounds such as PCDD/PCDF,
- adsorbed by heavy metals such as mercury Hg,
- reduced by nitrogen oxides (NOx).

Removal of fly ash or dust from flue gases is done in bag filters that have high dusting efficiency (up to 99.99%).

The absorption of compounds such as SO2, HCl and HF from flue gases takes place in the scrubber system (wet washing of gases), while the adsorption of heavy metals such as Hg and organic compounds such as dioxins and furans PCDD/PCDF from the flue gas stream takes place by dosing activated carbon into the reactor (the rector is part of the equipment of the bag filter system).

The removal of nitrogen oxides is achieved by injecting an aqueous solution of ammonia (ammonia water) into the smoke channel after the scrubber system, i.e. upstream of the catalyst box in which the selective catalytic reduction reaction occurs.

Dry flue gas cleaning

The flue gases generated in the boiler are first purified in cyclone separators where larger particles of fly ash are separated. Cyclone separators are located between the 3rd and 4th passage of the boiler as described above. The flue gases from the boiler plant after the cyclone enter the bag filter system by passing first through the reactor into which the activated carbon is injected, which is located between the two sections of the filter chambers (filter chambers with bag filters).

Flue gases from the 4th passage of the boiler (economizer) reach the reactor with activated carbon in which dioxins, Hg and heavy metals are separated (the reactor is located between the sections of the bag filter chambers). In the reactor with activated carbon, flue gases and activated carbon come into contact and mass transfer occurs, i.e. there is a removal of heavy metals and dioxins and furans from the flue gas stream.

After the dry cleaning, the flue gases enter the wet flue gas cleaning system, and further into the SCR system.

Activated carbon reactor system and mechanical bag filters

P&ID is given in the graphical appendices of the Study*: 23-WTE-PGD-0704-WC11-3002 – Bag filters*
23-WTE-PGD-0704-WC11-3003 – Activated carbon system

The activated carbon reactor is located between two sections of the filter chambers (filter chambers of bag filter). The flue gas first passes through the reactor and then through the bag filters.
In the reactor, flue gases and activated carbon come into contact and mass transfer occurs. Dioxins and heavy metals present in the flue gas are adsorbed on the surface of the activated carbon, i.e. heavy metals and dioxins and furans are removed from the flue gas stream. From the bottom of the activated carbon reactor, separated solid non-combustible particles and activated carbon particles are collected by the screw conveyor and sent to the collection screw conveyor. The ash from the bag filter consists of solid non-combustible particles, which were formed in the combustion process and carried by the flue gas stream to the bag filter system and activated carbon particles mixed with non-combustible particles. Solid particles carried by the flue gas stream collide with the cloth bags that make up the bag filter system and accumulate on their surface. After the pneumatic bag cleaning sequence, the accumulated solid particles fall towards the bag filter funnel and are further drained by the screw conveyor system under the bag filters to the ash boiler conveyors. The ash is separated on two screw conveyors. Both conveyors are served by three bag filters in one row. The flows of these two conveyors are collected on two collection screw conveyors from where, together with the separated solid non-combustible particles and activated carbon particles separated at the bottom of the reactor on the conveyor, they are sent constantly to two recirculation conveyors that send the ash and activated carbon to the entrance to the bag filter reactor. Excess ash that cannot be returned to recirculation is sent to the boiler ash conveyor system and referred to the Wet Ash Treatment).
In order to successfully perform dry flue gas treatment, it is necessary that there is a certain concentration of activated carbon in the gases. The role of recovering the mixture of activated carbon and ash in the reactor is to increase efficiency and reduce the consumption of activated carbon. Once in the reactor, activated charcoal, along with other ash, is deposited on the canvas of the bag filter. After shaking the bags, most of the activated charcoal is not saturated and is returned back to the purification process. The

recirculation ash is returned by a frequency-controlled screw conveyor. The quantity depends on the process parameters and the mass balance of combustion. The expected consumption of activated carbon during the treatment of the calculated composition of waste is expressed in the attached material balance, 8 kg/h.

System for storage and dosing of activated carbon into the reactor

Activated carbon is stored in two containers that are placed one above the other.
Activated carbon containers are placed in the immediate vicinity of the reactor. The lower container is fixed and from it the dosing of activated carbon into the reactor is performed, while the upper container is replaced if necessary and serves to supplement the lower, dosing container. When the upper container is emptied, it is replaced.
Vibrating elements are installed on the activated carbon containers to allow emptying of the containers.
On the lower, dosing container, a level meter with a high value alarm is installed to protect this container from overfilling.
Nitrogen connections are provided on the dosing container, which enters the container if there is an increase in temperature in this device (nitrogen as an inert gas prevents the appearance of flames).

In addition to the two activated carbon storage containers, the dosing system also includes:

- air filter to which the lower, dosing container is attached. This filter prevents the emission of particulate matter during operation,
- compressed air system delivered to the air filter. Compressed air is used to clean the filter, that is, to shake/regenerate the filter,
- scale for measuring activated carbon installed in the lower part of the dosing container (lower container),
- double screw conveyor for transportation of activated carbon,
- rotary activated carbon dispenser and
- compressed air and air system for pneumatic transport of activated carbon to the reactor.

Compressed air for pneumatic transport is delivered to the rotary dispenser from U-C02. In addition, air for pneumatic transport is introduced into the activated carbon line to the reactor by means of a fan.
Activated carbon is discharged from the dosing container into a double screw conveyor, and then introduced into the activated carbon dosing line into the reactor via a rotary dispenser. This line uses an air fan to pneumatically transport activated carbon to the reactor.

Activated carbon is discharged from the dosing container into a double screw conveyor, and then it is introduced into the line for dosing activated carbon into the reactor via a rotary dispenser. This line uses air fans to transport activated carbon pneumatically to the reactor.

Mechanical bag filter system

Each of the chambers of the bag filter consists of 196 vertically placed fabric filter bags.

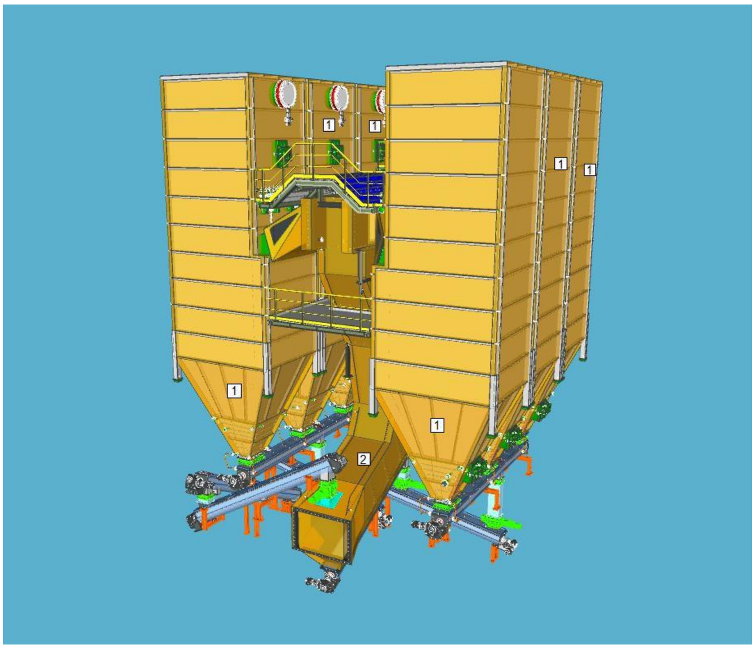


Figure 3.13 Bag filter chambers and reactor
1– Bag filter chambers; 2 – Reactor

The flue gas temperature at the inlet to the bag filters ranges from 205 to 246 ^{o}C, and at the outlet from 142 to 163 ^{o}C. Bag filters are equipped with temperature gauges with high and low value alarms.

In the lower part of the filter chambers, heaters are installed to prevent flue gas condensation when starting the boiler. Steam supplied from the main steam distributor is used for heating.

Nitrogen supply connections are provided in the lower zone of the bag filter chambers. Nitrogen is supplied to these connections from the maintenance facility and auxiliary systems (U-C02). If there is an increase in temperature in the bag filter chambers, the valve at the connection opens and releases nitrogen. Nitrogen is introduced as an inert gas to prevent the appearance of flames.

During the gas passing through the filter bags, fly ash particles remain on the outer surface of the bags, forming a layer of deposited dust. Cleaned flue gases exit to the top of the filter chamber. At the inlet and outlet of the filter chambers, the pressure change is monitored using a differential pressure gauge. The increase in differential pressure is an indicator of filter fouling, i.e. that there is an increased amount of particulate matter on the filter bags.

Filter bags are periodically shaken (when there is an increase in the value of differential pressure) with compressed air (regeneration/cleaning of filter bags). Namely, after a certain period of work, compressed air is blown into the bags, which shakes off the layer of deposited solid particles from the bags. The particles fall to the bottom, from where the separated flying ash is drained by a system of screw conveyors. One part of this ash together with activated carbon with adsorbed dioxins and heavy metals is returned to the reactor, and the other part is sent for wet ash treatment, as mentioned earlier.

After the bag filters, the flue gases are sent to the HCl scrubber for further purification using a first stage fan. A small part of the flue gases is recirculated to the incineration system in the boiler.

At the exit from the bag filters, a bypass channel is also provided, whose role is to redirect the flue gases from the bag filters straight to the smokestack in the accident situations.

Wet flue gas cleaning
After dry flue gas cleaning in bag filters, flue gases enter the wet flue gas cleaning system.

The wet flue gas cleaning system includes a two-stage scrubber system - I: HCl scrubber system and II: SO_2 scrubber system.

The composition of the gases at the inlet to the wet flue gas cleaning system, i.e. at the outlet from the bag filter system, is given in Table 3.17.

Table 3.17 Composition of gases at the outlet of the dry flue gas cleaning system

Parameter	Unit	Flue gas Inlet to the wet flue gas treatment system	
Boiler mode		I - min/max	II - max/min
Volume flow	Nm³/h	27110	63291
Temperature	°C	142	163
Pressure	mbar	1006	1005
Flow rate	m/s	8.80	15.93
Content O_2	%w	5.21	4.32
Content CO_2	%w	10.82	8.33
Content H_2O	%w	11.54	26.15
Content of N_2	%w	72.43	61.20
Content of pollutants			
Particulate matter	mg/Nm³	<5	<5
HCl	mg/Nm³	1527.29	1544.87
HF	mg/Nm³	10.14	10.90
SO_2	mg/Nm³	492.40	498.87
NO_x	mg/Nm³	200	200
Heavy metals			
Cd+Tl	mg/Nm³	<0.02	<0.02
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	mg/Nm³	<0.3	<0.3
Hg	µg/Nm³	<20	<20
CO	mg/ Nm³	<50	<50
NH_3	mg/Nm³	<20	<20
TVOC	mg/Nm³	<10	<10

Parameter	Unit	Flue gas	
		Inlet to the wet flue gas treatment system	
Dioxins and furans PCDD/F	ng I-TEQ/Nm^3	<0.04	<004

The first stage of cleaning – HCl scrubber

In the graphical attachments of the Study, the P&ID is given: 23-WTE-PGD-0704-WC11-3007 – HCl scrubber system

The first scrubber system (HCl scrubber) was designed as a gas-liquid parallel flow system (co-current flows) with quenching zone on the top. The flue gases enter the scrubber from the upper side, through the quencher, at a temperature of 140-200 °C, depending on the load of the boiler and the time interval during which the boiler is in operation without the cleaning process. The quencher is one of the most critical parts of the scrubber because corrosion can occur in it, and for this reason the quenching zone is made of a combination of fiberglass and Teflon.

The HCl scrubber system consists of the following elements:

- one scrubber with associated equipment (compensator at the flue gas inlet, quencher with nozzles, nozzles for the supply of circulating water, connecting chamber with droplet separator),
- two circulation pumps for the scrubber liquid (HCl),
- one HCl scrubber fluid tank pump, one safety water supply tank,
- one tank for the safety supply of water,
- one tank of HCl scrubber liquid,
- one plastic tank under the HCl scrubber.

The following processes take place in the scrubber:

- cooling of flue gases to saturation temperature in contact with water, and
- absorption of halogen compounds and SO_3.

The flue gas cooling process takes place in the so-called quenching zone where flue gases come into contact with water (which recirculates through the scrubber) via two independent lines. In the quenching zone, the liquid is sprayed from 9 nozzles (3 nozzles are supplied with scrubber liquid by the first circulating pump for the HCl solution, the other 3 nozzles are supplied with scrubber liquid with the second circulating pump for the HCl solution, and the remaining 3 nozzles are gravity supplied with water from the safety supply tank) whereby the flue gas cools from the initial 140-200 °C to 55-70°C. The tank for safety supply is always filled with water, so that in case of interruptions in the supply of fresh process water or power failure (stopping the operation of circulation pumps for HCl solutions), cooling of flue gases in the quenching zone is ensured until the complete stop of boiler operation.

Absorption of halogen compounds and SO_3 takes place in the purification zone (zone below the quenching zone). The scrubber liquid (circulation water) is pumped from the lower part of the scrubber using two circulation pumps for the HCl solution to the level of the nozzles, which are arranged in such a way as to achieve a homogeneous distribution of the circulation water in the form of fine droplets in the flue gas. Most of the drops fall directly to the bottom of the scrubber, while a smaller part of the drops is carried away in the flow of the gas phase. At the outlet of the flue gases, that is, the gas phase from the HCl scrubber, a droplet separator is provided, from which the separated liquid phase is drained to the bottom of the scrubber (drops separated from the flow of the gas phase from the scrubber. The flue gases from which the liquid drops are separated enter the second scrubber system – the SO_2 scrubber system.

As already mentioned, the scrubber liquid is recirculated using two circulation pumps. When the saturation of the liquid occurs, i.e. when a certain pH value (0.5-1) is reached, part of the scrubber liquid

is sent to the wastewater treatment plant, which is also located in the W-C11 facility (described in the chapter entitled *Wastewater treatment boiler plant).*
Refilling of water, i.e. scrubber liquid, is carried out from the tank for safety supply.
At the exit of flue gases from the HCl scrubber, immediately after the droplet separator, three independent temperature gauges were installed. If a high flue gas temperature is detected, the bypass channel is opened, all fans stop working, and the flue gases coming out of the bag filters bypass the entire Wet flue gas cleaning system as well as the SCR system and go directly into the stack (emergency situation).

It is sufficient for one circulation pump to work for cooling the flue gas, while for maximum absorption of pollutants from the flue gas, it is necessary for both circulation pumps to work. If the pumps are not running, the control valves are opened and water from the safety supply tank is discharged to the scrubber. At the outlet of the tank, a flow meter is installed to monitor (measure) the amount of water sent to the scrubber.

The temperature of the flue gas inside the scrubber is 60 °C (operating temperature), except when the fuel - the waste material - is extremely moist - then the temperature is slightly higher (70-75 °C). Considering that the scrubber is made of plastic materials, the maximum temperature of the flue gas inside the scrubber must not be higher than 80-90°C. Also, the temperature of the water at the outlet of the safety supply tank must not be higher than 60°C.

Under the HCl scrubber, a plastic tank is provided for the reception of possibly leaked contents during the regular operation of the scrubber system, i.e. in case of repair of some of the system components (e.g. pumps). The bundwall content is gravitationally diverted to the HCl scrubber fluid reservoir, which can directly accept the content from the HCl scrubber. The HCl scrubber fluid reservoir is connected by an overflow to the HCl scrubber, which allows the scrubber to be relieved by overflow. By means of a pump, with a capacity of 2.5 m^3/h, the contents from the tank are transported to the transfer tank, from where they are sent to the wastewater treatment plant also located in the W-C11 facility. Pressure transmitters with alarm are installed on the pump suction and discharge. The pump suction pressure gauge with low pressure alarm is set to detect suction problems, such as lack of liquid, suction line clogging or leakage at joints, thus preventing “dry running” and pump cavitation. The pump discharge pressure gauge with high pressure alarm is used to detect obstructions in the outlet pipeline, such as clogging or closed valves, to avoid pump overload and system failures.

The second stage of cleaning – SO_2 scrubber

In the graphical attachments of the Study, the P&ID is given: 23-WTE-PGD-0704-WC11-3008 – SO_2 scrubber system

After purification in the HCl scrubber system, the flue gases enter the second scrubber system - SO_2 scrubber system.

The second (SO_2) scrubber is a countercurrent scrubber where the flue gases flow from the bottom to the top of the scrubber, while the scrubber liquid - a solution of calcium hydroxide ($Ca(OH)_2$) is sprayed through nozzles placed on the top of the scrubber, and flows from the top to its bottom.

The SO_2 scrubber system consists of the following elements:

- one scrubber equipped with nozzles for the supply of process (clean) and circulation water,
- four circulation pumps of the SO_2 scrubber,
- one gypsum suspension tank,
- two mixers for the gypsum suspension tank,
- one tank for the overflow of gypsum suspension,
- two mixers for the gypsum suspension overflow tank,
- one pump to return the overflow of the gypsum suspension,
- one tank for the sedimentation of gypsum,
- one tank of saturated gypsum suspension,
- one tank mixer of saturated gypsum suspension,

- one pump for the transport of saturated gypsum suspension,
- two fans for oxidation air,
- one air humidifier for oxidation.
- immersed pump for emptying the SO2 pit.

The removal of sulfur oxides from flue gases is carried out by applying slaked lime $Ca(OH)_2$ according to the following chemical reaction:

$$Ca(OH)_2 + SO_2 + H_2O \rightarrow CaSO_3 \cdot 2H_2O$$

An additional reaction of oxidation and neutralization takes place in the gypsum suspension tank, whereby calcium sulfate $CaSO_4$ is formed, which forms a gypsum compound with water (calcium sulfate di-hydrate) according to the following chemical reaction:

$$Ca(OH)_2 + SO_2 + ½\ O_2 + H_2O \rightarrow CaSO_4 \cdot 2H_2O$$

As mentioned above, the process water is supplied from the upper side of the scrubber and sprayed through the nozzles. During the contact of two phases - flue gases and water, SO_2 absorption occurs. In addition to the introduction of process water (clean water), the scrubber liquid from the gypsum suspension tank is also introduced through the nozzles in the lower zone of the device using four circulation pumps of the SO_2 scrubber. Formed drops of liquid (with absorbed sulfur oxides) fall counterdirectionally with flue gases and are collected in the gypsum suspension tank.

Next to the gypsum suspension tank, there is also a gypsum suspension overflow tank. These two tanks are connected by a chamber through which, if there is a high level of liquid in the gypsum suspension tank, a part of the liquid overflows to the overflow tank. An overflow return pump is located between the tanks, which returns part of the suspension directly to the tank, while the other part is sent to the centrifuges. Slaked lime ($Ca(OH)_2$) is dosed in both tanks in order to regulate the pH value of the scrubber liquid (neutralization of the scrubber liquid). The tanks are equipped with two side mixers, which serve for fine mixing of slaked lime and circulating water in them.

Air for oxidation is introduced by two fans into the gypsum suspension tank where the oxidation reaction takes place. Before entering the tank, the dry air passes through a humidifier. In this way, premature crystallization of gypsum due to contact of dry air with gypsum is prevented.

The controlled discharge of gypsum maintains a constant value of the concentration of solids in the circulating water. The slaked lime solution is recirculated to the scrubber, while the solution "rich" in gypsum is sent to the gypsum sedimentation tank, where the gypsum is deposited and the water produced in the process is separated. Separated water and deposited gypsum are sent to the ash suspension reactor where the first step of wet ash purification takes place in the process wastewater treatment plant (plant in facility W-C11; wastewater from wet flue gas cleaning).

In addition, it is also possible that part of the saturated gypsum suspension can be led to centrifuge 2 (30GNS20AT001) via hydrocyclones (30GNS30AT001 and 30GNS40AT001), which is described in the treatment of the process wastewater of the boiler plant, while the other part can be led to the saturated suspension tank 11HTM30BB001. From the reservoir, the gypsum suspension can be sent by pump to the filtrate reservoir 30GNR10BB001, to the gypsum suspension reservoir 11HTD21BB001 or to the gypsum suspension overflow reservoir 11HTD21BB002. The flow of the saturated gypsum suspension is regulated by means of automatic pneumatic valves.

The process water supplied to the scrubber system is used, in addition to refilling the scrubber itself, to seal the circulation pumps of the SO_2 scrubber and to rinse the station for measuring pH values and flushing the pipelines.

Underneath the SO_2 scrubber, i.e. two of its tanks, a concrete tank is provided for the reception of any liquid that may have leaked. The contents of the bundwall are gravitationally sent to the wastewater pit equipped with an immersed pump, 11HTT20 AP001, and a barbotting (air blowing) system. The pit with barbotting under the SO_2 scrubber was installed to collect and neutralize any leaked liquid. Barbotting removes harmful gases from the liquid, allows mixing and controlling the pH value. The immersed pump transports the collected liquid into the saturated gypsum suspension reservoir 11HTM30BB001 or into the gypsum suspension overflow reservoir 11HTD21BB002.

At the exit from the SO_2 scrubber, the flue gases pass through a two-stage droplet separator, and in this way water loss and the corrosive effect of the outgoing gas mixture are reduced. The separated liquid phase is drained from the droplet separator to the lower part of the HCl scrubber as a supplement to the circulating water (scrubber liquid of the HCl scrubber).
After leaving the SO_2 scrubber, flue gases are heated and introduced into the SCR system.

Figure 3.14. shows the previously described scrubber system.

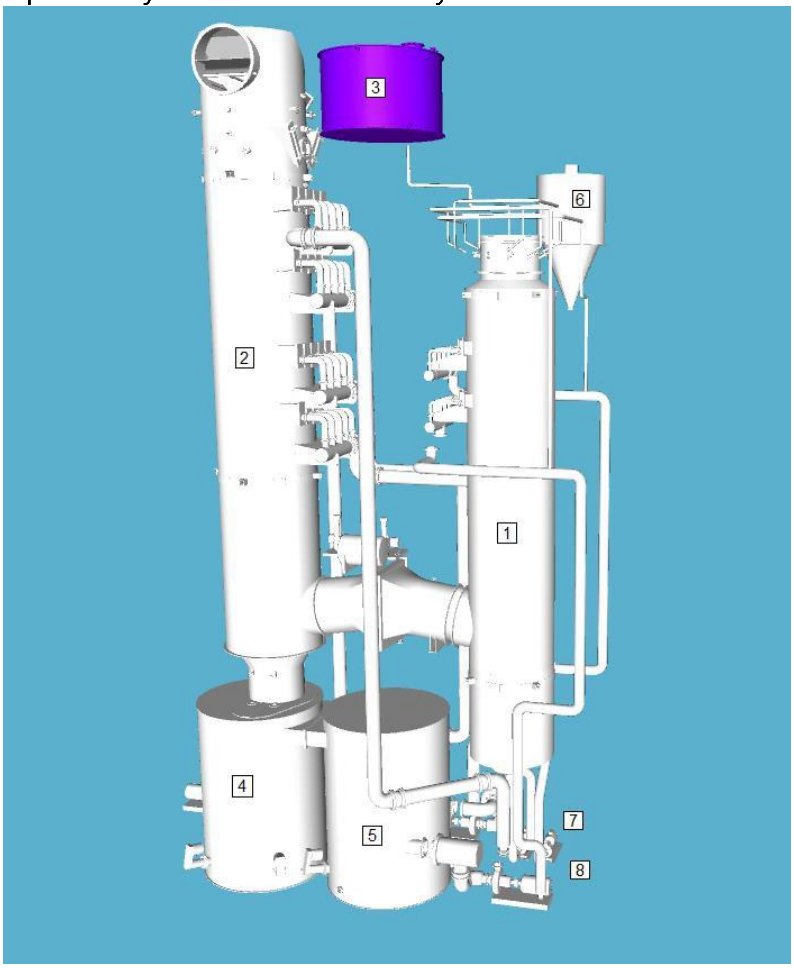


Figure 3.14 – Scrubber system
1 – HCl scrubber; 2 – SO_2 scrubber; 3 – Tank for safety supply; 4 – Tank for the gypsum suspension; 5 – Tank for the overflow of gypsum suspension; 6 – Tank for the sedimentation of gypsum; 7 – Circulation pump for HCI solution; 8 – Circulation pump for SO_2 scrubber.

Slaked lime storage and dosing system

In the graphical attachments of the Study, the P&ID is given: 23-WTE-PGD-0704-WC11-3015 – Slaked lime storage and dosing system

As described above, slaked lime, i.e. aqueous solution of hydrated lime, is used in the plant for the treatment of process waste water of the boiler plant, as well as for adjusting the pH value of the circulating water in the gypsum suspension tank and the gypsum suspension overflow tank. The slaked lime is prepared in a system for its storage and dosing.

Hydrated lime ($Ca(OH)_2$) is supplied by silo-tankers, from which it is pneumatically transported to the silo located in the W-C11 facility, in the immediate vicinity of the scrubber system tank. There is a filter on top of the silo, which serves to remove particulate matter. The silo is equipped with a safety valve to avoid inner overpressure during filling, a material level gauge, as well as connections for air supply for fluidization and drying of lime in the silo.
Lime from the bottom of the silo hopper is transported using a rotary dispenser and a screw conveyor to the slaked lime preparation tank. Process water is supplied to the tank, where it is mixed with lime (in powder form) with the help of a mixer to obtain slaked lime with a lime concentration of about 10%.

Slaked lime is transported from the tank to consumers using two centrifugal dosing pumps. Part of the slaked lime is constantly recirculated to the slaked lime preparation tank to prevent lime deposition, while the other part is sent to the waste water treatment plant and scrubber system. At the wastewater treatment plant, it is used as a chemical for water neutralisation. Heavy metals are precipitated as poorly soluble hydroxides by adding lime milk. In the scrubber system, it is used as the scrubbing liquid for removing sulphur oxides from flue gases.

Figure 3.15 shows the slaked lime storage and dosing system.

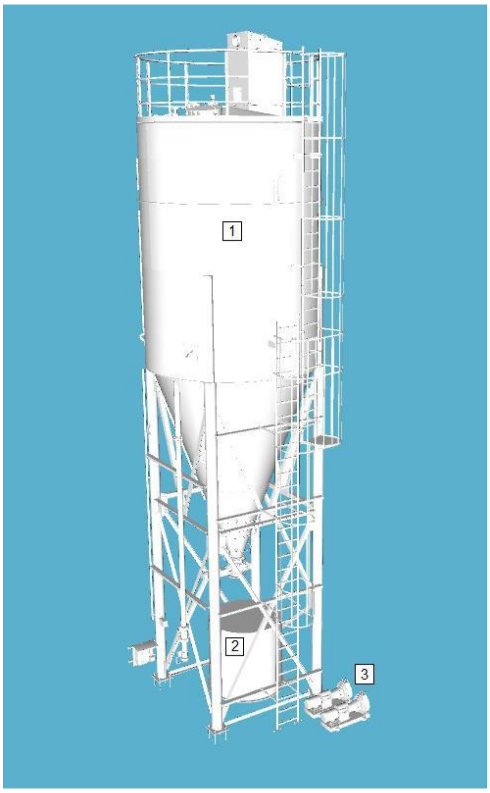


Figure 3.15 – Slaked lime storage and dosing system
1 – $Ca(OH)_2$ silo; 2 – Tank for preparation of slaked lime; 3 – Dosing pumps for slaked lime.

Selective catalytic reduction (SCR SYSTEM)

In the process of burning waste material - fuel, nitrogen oxides (NO_x) are generated in the boiler. Nitrogen monoxide (NO) and nitrogen dioxide (NO_2) are the nitrogen oxides that have the greatest impact on environmental pollution, while the other oxides occur in relatively low concentrations, so their impact is negligible.

During the operation of the boiler plant, nitrogen oxides can be generated as follows:

- in thermal processes - this mechanism represents the reaction of nitrogen and oxygen from the air during combustion at very high temperatures that prevail in the flame zone. At combustion temperatures above 1000 °C, NO_x formation grows exponentially,
- from the nitrogen present in the fuel - nitrogen oxides are formed at lower combustion temperatures (below 1000 °C),
- in chemical reactions of hydrocarbon radicals - in this way, NO_x is generated in chemical reactions of nitrogen with hydrocarbons (CH_n - compounds). These reactions are caused by produced hydrocarbon radicals, which are intermediates during the combustion reaction.

The following measures can be used to reduce the emission of nitrogen oxides:

- primary measures, which affect the amount of formed nitrogen oxides NO_x and are related to lowering the combustion temperature, i.e. lowering the concentration of oxygen in the flame,
- secondary measures, which refer to flue gas cleaning.

The boundary conditions in the flue gas can be influenced locally by primary measures, such as by running the combustion process at temperatures below 1000 °C, by controlling the temperature profile and reducing the O_2 content, especially in high temperature zones, by gradually supplying combustion air or by additionally supplying recirculation gas.

The subject boiler plant is designed in such a way that the combustion of waste material - fuel takes place in several stages in a reduced atmosphere, at low temperatures and low O_2 content in the flue gas.

Secondary measures are used to reduce the NO_x content in flue gas by using a reducing agent with or without a catalyst. The method that involves the use of a catalyst is commonly known as selective catalytic reduction (SCR).

The process of selective catalytic reduction implies the use of a reduction reagent (so-called agent) containing bound nitrogen in compounds such as ammonia NH_3 or urea $CO(NH_2)_2$.

When the flue gas passes through the catalyst, a reduction reaction occurs where nitrogen oxides are reduced with ammonia into nitrogen and water:

$$4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6H_2O$$

or

$$8NH_3 + 6NO_2 \rightarrow 7N_2 + 12H_2O$$

The flue gases exiting the SO_2 scrubber are mixed with the flue gases that are recirculated by means of a wet gas reheating fan to the 4th passage of the boiler (where they are heated in the wet gas reheater), after which the flue gas mixture goes to the SCR system.

The heating of the flue gases exiting from the SO_2 scrubber also contributes to reducing the corrosive effect of the gases that are further directed to the SCR.

As mentioned earlier, the final clealning of flue gas (reduction of NO_x gas emissions) takes place in an SCR reactor with a packed catalyst layer. The reduction of NO_x emissions is achieved by injecting a 25% aqueous ammonia solution (ammonia water) into the flue gases of the boiler immediately before they enter the SCR reactor. Selective catalytic reduction of NO_x takes place in an SCR reactor. After the SCR system, the purified flue gases are discharged into the atmosphere via the stack.
The SCR system is composed of the following elements:

- one unloading pump for ammonia water,
- one tank for the storage of ammonia water,
- two dosing pumps for ammonia water,
- one mixing and distribution unit,
- one fan for wet gas reheating,
- one gas-gas heat exchanger,
- one SCR reactor with catalysts.

The specifications of the selected type of SCR catalyst are attached to the Study. Cleaning from mechanical fouling of the catalytic converter is expected every 3 years. After irreversible loss of catalyst activity due to fouling in accordance with the manufacturer's recommendations, the spent catalyst will become a waste stream.

System for supply and storage of ammonia water

A tank with a double wall, with a capacity of 40 m^3, which will be placed in a concrete watertight tank, is designed for the storage of ammonia water (25% solution). The tank is located in the building W-C15, with a facade of 10 cm thick sandwich panels. A high-profile trapezoidal galvanized sheet was placed over the steel roof structure.

Ammonia water (25% solution) is delivered to the location by tank trucks. The tank truck is parked in the place provided for it, right next to the facility where the ammonia water tank (W-C15) is located. Ammonia water is transferred by the unloading pump to the tank for the storage of ammonia water. At the place for parking the tank truck, a manhole is provided, into which any leaked contents during the transfer of ammonia water are poured. This manhole is connected to the oily sewer. During the reception/discharge of ammonia water, the valve on the line from the manhole to the oily sewer is closed. In case of leakage of the contents, it is transferred from the manhole into the IBC by a mobile pump and sent to the liquid waste storage (IBC container storage in facility W-C08) and further disposed of in the prescribed manner.

It is planned to install a shower next to the tank (for rinsing in case the operator is doused with ammonia water - in case of an accident). The water from the shower drains into the manhole mentioned earlier.

Ammonia water from the tank is sent to the mixing and distribution unit by means of dosing pumps and piping. The flow of ammonia water depends on the concentration of nitrogen oxides (NO_x) in the flue gas and can be adjusted by means of frequency converters of dosing pumps.

Cooling the tank for the storage of ammonia water is necessary during the summer months when the outside temperature is higher than 25°C. The tank is cooled with spraying water from the corresponding pool with water (water recirculates). Two pumps (working and reserve) are provided for spraying the tank. The floor of the building is made of waterproof concrete.

Unit for mixing and distribution

In the graphical attachments of the Study, the P&ID is given: 23-WTE-PGD-0704-WC11-3005 – SCR preparation module

The unit for mixing and distribution is located near the system for injecting the reducing agent, and inside the W-C11 facility.

The following three fluids are introduced into the unit for mixing and distribution:

- compressed air,
- water for dilution,
- nitrogen oxide (NO_x) reducing agent – 25% ammonia water solution.

The diluted NO_x reducing agent exits the unit for mixing and distribution.

Inside the unit for mixing and distribution, there is a measuring and regulating equipment for dosing and diluting ammonia water - a NO_x reducing agent. The flow of compressed air used for liquid atomization is also controlled within the unit for mixing and distribution.

Prior to mixing, ammonia water and dilution water are passed through filters to avoid clogging of the nozzles in the injection lance. The amount of ammonia water and dilution water is monitored and controlled by means of a flow meter. In addition, the pressure of the diluted reducing agent is also monitored before its exit from the unit for mixing and distribution. Compressed air for liquid atomization also passes through the filter. Compressed air pressure is controlled by a reducing valve, and the flow and pressure of compressed air is monitored after the reducer.

A device for detecting ammonia (gas) with an alarm is provided in the unit for mixing and distribution. The alarm is activated when the concentration of ammonia in the air is ≥ 400 ppm, while at a concentration of 800 ppm, the unit stops working.

At the entrance to the SCR reactor, the concentration of NO_x in the flue gas is measured and based on the measured value, the amount of ammonia water is adjusted, so that the concentration of NO_x gases at the exit is within the range of prescribed values.

The volumetric flow of dilution water and reducing agent is regulated by appropriate valves. The flow of dilution water is controlled so that the total amount of liquid always remains the same, regardless of reducing agent requirements. The flow of the liquid is measured continuously using a flow meter (for dilution water, for NO_x reducing agent). Defined flows of water and reducing agent are mixed, and the pressure is monitored by a pressure transmitter. After mixing, the diluted reducing agent is distributed to the outlet of the unit and finally to the lance for injection into the SCR reactor.

In the unit for mixing and distribution of reducing agent, compressed air is primarily used for atomizing the liquid. Part of the compressed air is used as instrument air for the regulating valves inside the unit.

Compressed air is supplied to the injection lance in the SCR reactor, under a pressure that depends on the operating conditions. The set pressure is manually adjusted by means of a reduction valve and monitored via a pressure transmitter and flow meter.

The diluted NO_x reducing agent is injected before the SCR reactor at a temperature of 240-250 °C. On the lance there are nozzles on which drops are formed and in this way the evaporation and distribution of the NO_x reduction agent in the flue gas channel is ensured.

Compressed air is supplied to the lance even when the reducing agent is not supplied to it, in order to avoid clogging of the nozzles.

SCR reactor system

In the graphical attachments of the Study, the P&ID is given: 23-WTE-PGD-0704-WC11-3004 – SCR system

The SCR reactor is located immediately after the reducing agent injection lance, and before the 2nd stage flue gas fan and the stack. In contact of the catalyst with flue gases in which a diluted reducing agent is present, ammonia and nitrogen oxides are transformed into nitrogen and steam, according to the following chemical reaction:

$$4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6H_2O$$

The SCR reactor is a reactor with a packed catalyst layer and is designed so that two layers of catalyst can be placed in it (if necessary - if a higher concentration of NO_x occurs in the flue gas, the second layer of catalyst can be placed). Pressure drop measurement is provided on the reactor (pressure measurement at the inlet and outlet of the reactor). An increased value of the pressure drop in the reactor indicates that the catalyst is dirty. The reactor also has two doors for mounting and dismounting the module with the catalyst layer.

The mixture of diluted reducing agent and flue gas enters the top of the reactor and flows vertically through the packed layer of the catalyst. The packed catalyst layer consists of 10x10 modules. The total catalyst volume is approximately 6.48 m^3.

Table 3.18. shows the composition of the flue gases at the entrance to the SCR reactor, that is, at the exit from the wet gas purification system.

Table 3.18 The composition of the flue gases at the inlet to the SCR reactor

Parameter	**Unit**	**Flue gas**	
		Input to SCR reactor	
Boiler mode		I - min/max	II - max/min
Volume flow	Nm^3/h	31625	70198
Temperature	°C	235	236
Pressure	mbar	983	948
Flow rate	m/s	2.10	4.86
Content O_2	%w	6.46	4.80
Content CO_2	%w	9.27	7.51
Content H_2O	%w	14.69	29.14
Content of N_2	%w	69.58	58.56
Content of pollutants			
Particulate matter	mg/Nm^3	<5	<5
HCl	mg/Nm^3	< 6	< 6
HF	mg/Nm^3	< 1	< 1
SO_2	mg/Nm^3	< 30	< 30
NO_x	mg/Nm^3	200	200
Heavy metals			
Cd+Tl	mg/Nm^3	<0.02	<0.02
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	mg/Nm^3	<0.3	<0.3
Hg	$\mu g/Nm^3$	<20	<20
CO	mg/Nm3	<50	<50
NH3	mg/Nm3	<20	<20
TVOC	mg/Nm3	<10	<10
Dioxins and furans PCDD/F	ng I-TEQ/Nm^3	<0.04	<004

On the flue gas line at the entrance, that is, the exit from the SCR reactor, in addition to pressure measurement, temperature measurement is also provided. In order to compensate for the temperature expansion in the flue channels and the reactor (due to the high temperature of the flue gases), the installation of compensators is planned before and after the reactor.

In the heat recovery system, reheating of flue gases is carried out. The highest flue gas temperature in the SCR system is between the mixing of the hot gas from the SCR preheater of the boiler (boiler part) and the entrance to the secondary side of the gas-gas heat exchanger (204-250°C). In the gas-gas heat exchanger, heat is transferred from the hot gases leaving the catalyst to the inlet gases of the primary side, which are heated from 120 °C to 219 - 229 °C in the exchanger. Consequently, the purified flue gas is cooled to 140-150 °C before entering the stack. Part of the heated gases from the primary side of the gas-gas heat exchanger is led to the SCR preheater of the boiler. The reheated gases returning from the boiler are mixed with the remaining gas stream at the exit of the gas-gas heat exchanger.

Temperature gauges were installed at all inlets and outlets of the heat exchanger to monitor its operation, while pressure transmitters were installed at the inlet and outlet of the heater on the primary side. Temperature control (setting the appropriate temperature value) is performed by changing the gas flow to the SCR boiler preheater.

The flue gases at the exit from the gas-gas heat exchanger enter the 2nd stage flue gas fan, which is used to achieve the flow of flue gases in the system as well as to overcome the resistance of the flow of flue gases in the stack. The entire flow of flue gases is kept under pressure during operation. Fan speed depends on the pressure in the combustion chamber (fan speed results in corresponding pressure).

Table 3.19 shows the composition of the flue gases that are released into the atmosphere.

Table 3.19 Composition of flue gases at the stack outlet (after SCR system) under different boiler operating conditions

Parameter	**Unit**	**Flue gas composition** at min boiler load/max lower heat output (7 MJ/kg)	**Flue gas composition** at max continuous boiler production/ calculated lower thermal power of fuel (16.5 MJ/kg)	**Flue gas composition** at max boiler load/min lower heat output (20 MJ/kg)	**ELV in accordance with BATC for WI (1)**	**Averaging time according to BATC for WI (1)**	**ELV in accordance with RS regulations (2)**	**Averaging time in accordance with RS regulations (2)**
		Mean daily value / mean value during the sampling period						
Volume flow	Nm^3/h	31625	47209	70198	-	-	-	-
Temperature	°C	151	147	151	-	-	-	-
Pressure	mbar	1007	1007	1007	-	-	-	-
Streaming rate	m/s	7.77	11.48	17.24	-	-	-	-
Particulate matter	mg/Nm^3	<1-5	<1-5	<1-5	<2–**5**	Mean Daily Value	10	Mean Daily Value
							30	Mean half-hourly emission limit 100%
							10	Mean half-hourly emission limit 97%
							150	Total concentration expressed as half-hourly average
SO_2	mg/Nm^3	5-30	5-30	5-30	5–**30**	Mean Daily Value	50	Mean Daily Value

							200	Mean half-hourly emission limit 100 %
							50	Mean half-hourly emission limit 97%
HCl	mg/ Nm^3	<1-6	<1-6	<1-6	< 2–**6**	Mean Daily Value	10	Mean Daily Value
							60	Mean half-hourly emission limit 100%
							10	Mean half-hourly emission limit 97%
HF	mg/ Nm^3	0.05 - 1	0.05 - 1	0.05 - 1	< 1	Mean daily value / mean value during the sampling period	1	Mean Daily Value
							4	Mean half-hourly emission limit 100%
							2	Mean half-hourly emission limit 97%
Cd+Tl	mg/ Nm^3	0.005-0.02	0.005-0.02	0.005-0.02	0.005–**0.02**	Mean value during the sampling period	total 0.05	Mean value during sampling for a minimum of 30 min and a maximum of 8 h
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	mg/ Nm^3	0.01-0.3	0.01-0.3	0.01-0.3	0.01–**0.3**	Mean value during the sampling period	total 0.5	Mean value during sampling for a minimum of 30 min and a maximum of 8 h
Hg	µg/N m^3	5-20	5-20	5-20	< 5–**20**	Mean daily value / mean value	50	Mean value during sampling for a minimum of 30 min and a

						during the sampling period		maximum of 8 h
					1-**10**	Long sampling period		
NOx (NO and NO_2 expressed as NO_2)	mg/ Nm^3	1-120	1-120	1-120	50–**120**	Mean Daily Value	200	Mean Daily Value
							400	Mean half-hourly emission limit 100 %
							200	Mean half-hourly emission limit 97%
CO	mg/ Nm^3	10-50	10-50	10-50	10–**50**	Mean Daily Value	50	Mean Daily Value
							100	Half-hour values
							150	Mean ten-minute value
							100	Mean hourly value (for fluidized bed furnaces)
NH_3	mg/ Nm^3	2-10	2-10	2-10	2-**10**	Mean Daily Value	-	-
TVOC	mg/ Nm^3	1-10	1-10	1-10	< 3–**10**	Mean Daily Value	10	Mean Daily Value
							20	Mean half-hourly emission limit 100%
							10	Mean half-hourly emission limit 97%
Dioxins and furans	ng I-TEQ /Nm^3	0.01-0.04	0.01-0.04	0.01-0.04	< 0,01–**0,04**	Mean value during the	0.1	Mean value during sampling for a minimum of 30

PCDD/F						sampling period		min and a maximum of 8 h
					< 0.01–**0.06**	Long sampling period (the limit value does not apply if it is proven that the emission value is sufficiently stable)		

(1) Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)

(2) Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", br.103/2023), Appendix 2

The projected values of concentrations of pollutants in flue gases emitted into the atmosphere, for different boiler operation regimes, are below the prescribed emission limit values, therefore the mean values during the sampling period will be lower than the prescribed limit values in accordance with the *Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", br.103/2023) and limit values prescribed by the conclusions on the best available techniques for thermal treatment of waste (Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C (2019) 7987).*

The concentrations of polluting substances in flue gases released into the atmosphere are in accordance with the limit values of emissions prescribed in the *Regulation on technical and technological conditions for the design, construction, equipment and operation of plants and types of waste for waste thermal treatment, limit values of emissions and their monitoring ("Official Gazette of the Republic of Serbia", No. 103/2023).* In addition, the concentrations of pollutants in the flue gases at the exit from the stack are in accordance with the limit values prescribed by the document: *Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C (2019) 7987).*

3.2.1.10 Treatment of waste water from the boiler plant

Technological waste water in the boiler plant is produced during the process of wet purification of emitted flue gases and washing of the residue from the process of dry treatment of flue gases. This waste water is sent to a waste water treatment plant designed under the license of the company Envirochemie (ECWWT).

The following technological processes are carried out in the waste water treatment plant as part of the boiler plant:

- three-stage neutralization,

- deposition of heavy metals,
- flocculation,
- sedimentation, and
- filtration.

The maximum capacity of the plant is 10 m^3/h.

The boiler plant's process waste water treatment plant consists of:

- Acid reactor;
- First-stage sedimentation tank;
- Neutralization reactor;
- Second-stage sedimentation tank stage;
- pH adjustment reactor;
- Precipitation reactor;
- Flocculation reactor;
- Final sedimentation tank;
- Clear water tank;
- Ash slurry reactor;
- Sedimentation ash slurry;
- Filtrate tank;
- Centrifuge.

This plant is part of a technological unit and is directly connected to the boiler plant and is located in the W-C11 facility. The block diagram of the plant for the treatment of process waste water is shown in Figure 3.16.

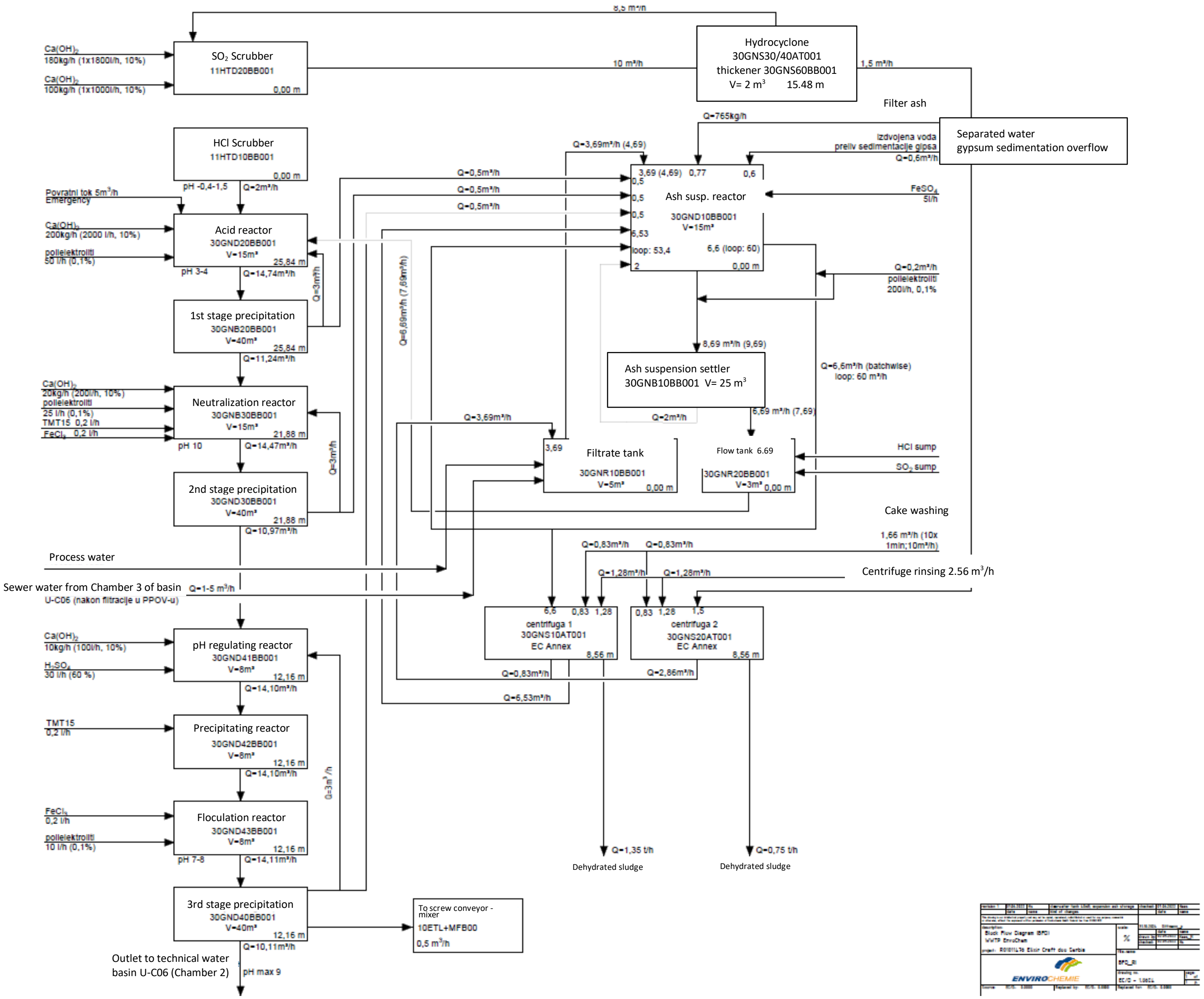


Figure 3.16 Block diagram of the process wastewater treatment plant of the boiler plant

The flue gas treatment water in the first HCl scrubber is acidic (pH from 0.5 to 1.5).

The first stage of neutralisation of this water is carried out in the acid reactor. In addition to acid water from the HCl scrubber, ash slurry filtrate from the wet ash treatment filtrate tank and acid suspension from the first-stage sedimentation tank are introduced into the acid reactor (recirculation).

The first stage of neutralization entails increasing the pH value to 3-4 by adding slaked lime. The slaked lime is dosed directly into the acid reactor from the tank for the preparation of slaked lime.

Polyelectrolytes are also dosed into the acid reactor, in order to accelerate the sedimentation of suspended particles in the water.

The sedimentation of suspended particles takes place in the first-stage sedimentation tank. The acid reactor is equipped with a mixer for fine mixing of all wastewater and slaked lime and for preventing sedimentation of solids in the acid reactor. The reactor is also equipped with a pH meter for monitoring and controlling the pH value and a level meter with an alarm in case of high level values in the reactor. The suspension of waste water and sludge from the acid reactor is poured into the first-stage sedimentation tank where sedimentation of solids takes place. The first-level sedimentation tank is equipped with a scraper that prevents permanent deposition and collects sludge (sediment) that is further transported by an acid suspension pump to the ash slurry reactor for further treatment. A part of this suspension is recirculated to the acid reactor. Sludge contains carbonates, fluorides, sulfates and sediment heavy metals. The first-stage sedimentation tank is equipped with a level gauge with an alarm that controls the liquid level in it.

The second stage of neutralization takes place in the neutralization reactor. Polyelectrolytes and slaked lime TMT15 I $FeCl_3$ are dosed and in it the suspension reaches an approximate value of pH=10.. As in the case of an acid reactor, the neutralization reactor is equipped with a stirrer, a pH meter and an associated alarm level meter.

The mixture from the neutralization reactor is poured into a second stage precipitator where solids are separated with the help of a scraper. The precipitator contains a scraper that prevents deposition and collects precipitated sludge (sediment), which is further transported by the pump for further treatment to the ash suspension reactor 30GND10 BB001. Part of the suspension is returned (recirculation) to the neutralization reactor. The precipitator is equipped with a level meter with an alarm to control the level of liquid in the settling box.

In the graphical attachments of the Study, the P&ID is given: 23-WTE-IDP-0704-WC11-3011 – Wastewater treatment from wet flue gas cleaning system – stage 3+4

The third stage of neutralization - Further adjustment of the pH value takes place in three reactors that are placed next to each other - **pH adjustment reactor, precipitation reactor** and **flocculation reactor**. Each of the reactors is equipped with mixers, while the pH adjustment and precipitation reactors are equipped with pH meters. The control and adjustment of the pH value in these two reactors is performed in order to achieve the required pH value in the flocculation reactor (pH= 10 is the required value).

Heavy metals are precipitated as poorly soluble hydroxides by adding lime milk to the pH-regulating reactor. Final precipitation of heavy metals (especially mercury Hg) is achieved by adding organic sulfur complex agents (e.g., trimercapto-s-triazine – TMT15) to the precipitation reactor, which form sulfides with heavy metals that are slightly soluble. Subsequently, sulfide metals are precipitated from the water by adding iron trichloride ($FeCl_3$) to serve as a flocculant. The purpose of wastewater flocculation (which takes place in a flocculation reactor) is to encourage suspended particles or emulsions to agglomerate into precipitates and more easily separate.

The last stage of the separation of suspended particles takes place in the final settling box (third stage settling box). The third stage settler is equipped with a scraper that prevents settling and collects sediment. One part of the sludge generated on this occasion is sent by pump to the ash suspension reactor for further treatment, whereby the recirculation of a certain part of the suspension to the pH-regulating reactor is also performed.

The second part of the resulting suspension (sludge) is transported by pump to the equalization tank, after which it is sent to the screw conveyor – mixer and further to the stabilization and solidification process.

The water from the final third stage settling box flows into the tank, where the pH value is tested using a meter, as well as the temperature measurement using a temperature transmitter. After that, the purified water is gravitationally sent to the wastewater basin U-C06. Purified water from the ECWWT plant is fed to the chamber 2 of the wastewater tank U-C06 within the Waste Energy Plant by a separate line T1. The basic role of the basin is to accept these waters in order to perform quality testing before discharging them into the recipient.

The quality of process wastewater after treatment/purification must be in accordance with the Regulation on technical and technological conditions for the design, construction, equipment and operation of plants and types of waste for waste thermal treatment, limit values of emissions and their monitoring ("Official Gazette of the Republic of Serbia", No. 103/2023), as well as in accordance with LVE defined BAT Conclusions for waste incineration (Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019)).

Testing regarding the fulfillment of the quality requirements of treated technological wastewater will be carried out in the internal laboratory, which will be located within the Waste-to-energy plant, i.e. in the W-C01 facility. Samples for testing will be taken, as already stated, from the U-C06 waste water basin, whereby each batch of 80 m^3 of purified waste water will be tested before being discharged into the recipient.

If the required quality of the treated waters is achieved, their discharge into the recipient will be carried out, while in the event that they do not meet the quality parameters, they will be returned for re-treatment.

Sludges generated during the wastewater treatment process (from the final sedimentation tank) together with residues from dry flue gas cleaning in bag filters are sent to the ash slurry reactor, for wet ash treatment.

Wet ash treatment

In the Study's graphical attachments are given:
P&ID: 23-WTE-IDP-0704-WC11-3012 – Wet Ash Treatment
See P&ID: 23-WTE-IDP-0704-WC11-3013 – Centrifuge System

The first stage of purification/treatment of wet ash takes place in the **ash slurry reactor**. Wastewater from the HCl and SO_2 scrubbers, separated sediment (sludge) from waste water treatment (stages 1+2 and 3+4 described above) and filter ash separated in bag filters (the first part of the activated carbon, which is sent together with the filter ash for further treatment) are mixed in the ash slurry reactor and leachate from the Non-Hazardous Waste Landfill. In addition, part of the sludge from the centrifuges, from the sedimentation ash slurry tank as well as from the filtrate tank is introduced into the ash slurry reactor. In order to accelerate and increase the efficiency of the process of extracting heavy metals and soluble salts from sludge, polyelectrolytes and iron (III) sulfate ($Fe(III)SO_4$) are dosed into the reactor. The reactor is equipped with a mixer, a pH meter and a local level indicator.

The mixture from the ash slurry reactor is poured into the sedimentation ash slurry tank, where the process of sedimentation and separation of heavy metals continues. The sedimentation ash slurry tank, in addition to the scraper, is equipped with a level gauge with a high and low value alarm.

The sludge is sent by the ash slurry pump from the sedimentation ash slurry tank to the centrifuge (two centrifuges) to separate the solid and liquid phases. The ash slurry pipeline also includes a recirculation line to the ash slurry reactor, as well as an ash slurry drainage line to the ash slurry storage (stabilization and solidification facility W-C12). The flow of ash slurry is regulated by pneumatic valves that are placed on the two pipelines mentioned above.

The further course of treatment takes place in the filtrate tank, from where the resulting suspension is sent by a centrifugal pump to the acid reactor for the first stage of treatment of the boiler plant's waste water. A recirculation line of this suspension to the ash slurry reactor is also planned. The ash slurry from the reactor and ash slurry storage with gypsum suspension from the SO_2 scrubber is delivered to the centrifuges (where the solid and liquid phases are separated) and ends up in the equipment for transporting combustion residues in the boiler plant (slag and ash). Namely, two centrifuges are planned, from where the separated liquid phase is sent to wet ash treatment - to the filtrate tank, while the thickened sediment is taken to the stabilization and solidification facility W-C12 via the conveyor system. The SO_2 scrubber suspension is constantly circulated in a closed loop from the gypsum suspension tank through the centrifuges back to the tank, as well as the ash slurry which is continuously circulated from the wet ash treatment plant to the centrifuges and back.

The system for dosing chemicals

The waste water treatment plant is supplied with chemicals for the purpose of regulating the pH value of waste water and sedimentation of suspended particles in water. The chemicals that are prepared, stored and later dosed to consumers in this system are the following:

- P150 and P1000 polymers,
- iron trichloride- $FeCl_3$,
- iron(III) sulfate- $Fe(III)SO_4$,
- trimercapto-s-triazine- TMT15.
- Sulfuric acid (H_2SO_4)

The system for dosing chemicals consists of:

- two dosing stations for P150 and P1000 polymers,
- mixer of the P150 polymer dosing station,
- two mixers of the P1000 dosing station,
- two screw conveyors to the P150 and P1000 polymer dosing stations,
- screw conveyor heater to the P150 polymer dosing station,
- IBC container for $FeCl_3$,
- IBC container for $Fe(III)SO_4$,
- IBC container for TMT15,
- $FeCl_3$ excess container – IBC tank,
- $Fe(III)SO_4$ excess container – IBC tank,
- TMT15 – excess container – IBC tank,
- two P150 polymer dosing pumps from the dosing station,
- two P1000 polymer dosing pumps from the dosing station,
- dosing pump for $FeCl_3$,
- dosing pump for $Fe(III)SO_4$,
- dosing pump for TMT15.
- H_2SO_4 dosing pumps

The dosing station for P150 polymer consists of: one line for supplying P150 polymer powder and one line for supplying process water. In the dosing station, the polymer powder and water are finely mixed using a mixer, which ensures the appropriate homogeneity of the resulting solution.

The P150 polymer is transported by means of dosing pumps to the first and second stage of neutralization in the boiler plant waste water treatment process.

The dosing station for P1000 polymer is equipped with three chambers (dosing/ preparation/ reserve) and an ultrasonic level gauge that is installed on the last chamber and enables continuous monitoring and independent operation of the device as well as alarm setting for the maximum and minimum level in the chamber. Polymer powder and process water are mixed in the dosing and preparation chambers using a mixer, from where polyelectrolytes are dosed by pumps to the third stage of neutralization in the boiler plant waste water treatment plant, as well as to the wet ash treatment plant.

Dosing stations for $FeCl_3$, $Fe(III)SO_4$ and TMT15 consist of one IBC container and one tank placed under each of the IBC containers, the purpose of which is to collect and retain any leaked contents from the IBC container. These dosing stations are located within a separate annex of the boiler plant.

$FeCl_3$, which is used as a flocculant in the wastewater treatment plant, is dosed by a membrane pump into the flocculation reactor, while Fe(III)SO_4 is dosed by a membrane pump into the ash slurry reactor in order to accelerate and increase the efficiency of extracting heavy metals and soluble salts from sludge. TMT15 is delivered by membrane pump to the precipitation reactor, and its dosage intensifies the precipitation of heavy metals in water (especially mercury).

3.2.1.11 *Description of the method of handling solid residues from the boiler plant*

The regular operation of the subject bubbling fluidized bed (BFB) boiler plant can produce the following solid (unburned) residues:

- Bottom ash (large fraction of unburnt material that is separated at the bottom of the boiler under the furnace);
- Boiler ash (separated between the second and third passage of the flue gases through the boiler);
- Cyclone ash (fraction of fly ash from the boiler that is separated from the emitted gases when passing through two cyclone separator, T>400 ^{0}C);
- Ash from the economizer (fine fraction of fly ash separated by the passage of flue gases through the economizer, T>150 ^{0}C);
- Filter ash (fine fraction of fly ash separated by the passage of flue gases through a system of bag filters; so-called fly ash);
- Activated carbon with a fraction of fine particles from flue gas;
- Sludge/thickened sediment from wastewater treatment from the wet flue gas cleaning system (which is separated in the form of thickened sediment by centrifugation);

In order to manage all the aforementioned waste flows, and in order to dispose of them in accordance with the Law on Waste Management and related by-laws, the subject project envisages that all flows are collected in a controlled manner by a designed system of boiler conveyors, which take the solid residues to the stabilization and solidification plant (W-C12).

The following is an overview of flows from the boiler plant and the method of handling each individual flow.

Bottom ash or coarse fraction of unburned material. The Waste-to-Energy plant boiler is equipped with a system for discharging bottom ash from the furnace. Sand with non-combustible solid products of combustion (bottom ash) falls from two boiler funnels at the bottom of which there are two screw conveyors(1) that continuously exclude material from the layer. Screw conveyors send the material via vibrating sieves with magnetic separators, where ferromagnetic metals are separated, fraction >2mm and fraction <2mm. The fraction <2mm is sent to the sand silo via a chain conveyor and pneumatic transport. If it is not possible to return this fraction to the sand silo, it can be pneumatically transported via the cyclical separator to the conveyor or discharged into the container after the chain conveyor. The fraction >2mm is separated in closed containers located on the plateau immediately next to the facility, and then taken by forklift to the W-C12 solidification facility for further treatment. The metal extracted from the botom ash on the magnetic separator is collected in containers and transported to the designated concrete plateau where it is stored until it is handed over to authorized operators for further disposal.

Index Number	19 01 - waste from incineration or pyrolysis of waste
19 01 11*	bottom ash containing hazardous substances
19 01 12	bottom ash other than that specified in 19 01 11*

Boiler ash consists of non-combustible solid particles that are of insufficient weight to gravitationally fall into the combustion funnels and separate below the boiler's firebox (particles larger than 50 microns). These particles carried by the flue gas stream reach the second boiler passage and are separated at the point of flue gas diversion between the second and third boiler passage, due to inertial forces and gravity, at the bottom of the flue channel, and the flue gas continues towards the cyclone separators. Separated boiler ash, which has a temperature higher than 400°C, falls into the ash collection funnel, which is equipped with an integrated, water-cooled screw conveyor (closed cooling circuit). This screw conveyor transfers ash to the screw conveyor system and further to the collection screw conveyor (mixer) where it is mixed with other solid residues from the boiler plant. From the collection screw conveyor (mixer), the solid residues are transported by the conveyor system to the stabilization and solidification facility for their further treatment.

Cyclone ash - After passing through the third boiler passage, flue gases enter two cyclone separators. The flue gases, which contain fine unburned solid particles, begin to move spiraly inside the cyclone upon entering it. This spiral movement creates centrifugal forces that push the unburned solid particles (fine ash) towards the wall of the cyclone. The particles collide with the wall, fall into the conical part of the cyclone and are separated from its bottom.

Beneath each of the two cyclone separators, there is a rotary dispenser that sends the separated cyclone ash to the chain conveyor. With this chain conveyor, cyclone ash is transferred through a system of ash screw conveyors to a collection screw conveyor (mixer), where cyclone ash is mixed with other solid residues from the boiler plant. From the collection screw conveyor, the solid residues are sent for further treatment (stabilization and solidification facility), as previously mentioned.

Index Number	**19 01 - waste from incineration or pyrolysis of waste**
19 01 15*	boiler dust containing hazardous substances
19 01 16	boiler dust other than that specified in 19 01 15*

Ash from the economizer and bag filters – After the cyclone separators, the flue gases enter the economizer (the fourth flue gas passage within the boiler plant) and further into the bag filter system. Before entering the bag filter chambers, flue gases pass through a reactor into which activated carbon is dosed. Activated carbon is dosed to remove heavy metals like Hg, and organic components like dioxins and furans (PCDD/PCDF). **Activated carbon with adsorbed materials,** as well as ash from the economizer (present in the flue gases) are separated at the bottom of the reactor and further directed to the screw conveyor system. In the bag filters, particles smaller than 50 microns are separated from the flue gases (particles are deposited/accumulated on the surface of the cloth of the bag filters). After the sequence of pneumatic cleaning of the bags, the collected particles fall towards the funnel of the chamber of bag filters. From the funnel, the filter ash is transported to the screw conveyor system by means of conveyors for collecting ash from bag filters. Filter ash is mixed with separated ash from the economizer and activated carbon with adsorbed materials (from the reactor). The ash is separated on two screw conveyors that serve three bag filters in one row. The flows of these two conveyors are collected on two collection screw conveyors from where, together with the separated solid non-combustible particles and activated carbon particles separated at the bottom of the reactor on the conveyor, they are sent constantly to two recirculation conveyors that send the ash and activated carbon to the entrance to the bag filter reactor. Excess ash that cannot be returned to recirculation is sent to the boiler ash conveyor system and referred to the Wet Ash Treatment.

The wet ash treatment aims to reduce the chlorine concentration and neutralize the ash (to achieve approximately neutral pH value). The concentration of heavy metals, such as lead, cadmium and mercury, as well as the concentration of chlorine in the filter ash (with activated carbon), is usually more than 10 times higher compared to the concentration of these substances in the ash from the boiler and cyclone. After washing the filter ash, the thickened sediment is transported by the conveyor system to the screw conveyor mixer where it is mixed with other residues from the boiler plant, after which it is transported by the conveyor system to the facility for stabilization and solidification.

Index Number	19 01 - waste from incineration or pyrolysis of waste
19 01 13*	fly ash containing dangerous substances
19 01 14	fly ash other than that mentioned in 19 01 13*

Sludge/thickened sediment from the wet flue gas cleaning system – After treatment in bag filters, flue gases that contain more than 50% HCl, HF and SO_2 are directed to the wet flue gas cleaning system - a two-stage scrubber system (HCl and SO_2 scrubber system). In the first scrubber (HCl scrubber), flue gases (in contact with water) are cooled down to a temperature of 55-70°C and HCl, HF and SO_3 are removed. The scrubber is designed as a co-current gas and process water flow system, with top quenching. The waste water separated at the bottom of the scrubber is taken to the waste water treatment plant of the boiler plant, where a three-stage neutralization, sedimentation, flocculation, precipitation and filtration is performed. Sludge (thickened sediment) that is separated in the waste water treatment plant is transported by the transport system to the wet ash treatment plant for further processing. In the second scrubber, SO_2 is extracted from flue gases by adding slaked lime $Ca(OH)_2$. The second scrubber is constructed as a countercurrent system, where the flue gases flow from the bottom to the top, while the slaked lime solution is sprayed using nozzles placed on top of the scrubber. Separated sedimentary gypsum and SO_2 suspension from the second scrubber are also sent to the wet ash treatment plant, where an additional oxidation and neutralization reaction is carried out, which results in the formation of calcium sulfate $CaSO_4$, which, in contact with water, forms gypsum.

In order to achieve a neutral pH value, within the wet ash treatment system, in the ash slurry reactor, previously separated filter ash, sludge from the wastewater treatment plant of the first scrubber, as well as gypsum and SO_2 suspension from the second scrubber are mixed. In order to accelerate and increase the removal efficiency of heavy metals and soluble salts from sludge, polyelectrolytes and iron(III) sulfate ($Fe(III)SO_4$) are added to the ash slurry reactor.
The suspension is poured from the ash slurry reactor into the sedimentation ash slurry tank, where the process of sedimentation and removal of heavy metals continues. Separation of sludge and liquid phase from wet ash treatment is carried out in a system of two centrifuges. The thickened sediment from the centrifuges contains gypsum ($CaSO_4*2H_2O$), calcium fluoride, lime impurities and traces of chemicals that are added in the treatment of waste water. The filtrate from the centrifuge is gravitationally drained to the ash suspension reactor or to the filtrate tank, while the dewatered sludge (thickened sediment) is transported to the W-C12 facility where the stabilization and solidification process is carried out. The gypsum suspension from the SO2 scrubber passes through the hydrocyclones after which it is discharged into the buffer tank of the gypsum suspension with the mixer. From this buffer tank, the gypsum suspension is gravitationally discharged to centrifuge 2 where the solid and liquid phase are separated. In addition, a recirculation line is provided by which the gypsum suspension is gravitationally returned back to the gypsum suspension tank located under the SO2 scrubber.
As already stated, the separated liquid phase from centrifuge 2 (centrifuge filtrate) is taken to the ash suspension reactor or to the filtrate tank, while the dewatered sludge (thickened sediment) is transported to the subject facility W-C12 where the stabilization and solidification process is carried out.

Index Number	19 01 - waste from incineration or pyrolysis of waste
19 01 05*	filter - cake from gas treatment

In order to achieve uniform mixing and homogenization of all the mentioned flows of solid residues from the boiler plant, process water is also added at the mixing point, in the screw conveyor - mixer.

3.2.1.12 Description of the procedure for the treatment of solid residues from the boiler plant as part of the W-C12 stabilization and solidification facility and the procedure for obtaining solidificates that will be disposed of at the subject landfill for non-hazardous waste

- **Operation: D9 Physical-chemical treatment not specified elsewhere in this list, the final products of which are compounds or mixtures disposed of by any process from D1 to D12 (e.g. evaporation, drying, calcination)**[31]

The project envisages the construction of a facility for stabilization and solidification of solid homogenized residues from the boiler plant – facility W-C12. The S/S procedure involves a series of operations to ensure the safe management of solid residues from the boiler plant.
Operations that the Project Holder ELIXIR CRAFT DOO, of the Eco Energy branch, plans to apply when performing the activity of **stabilization and solidification of solid residues from the boiler plant** are waste utilization operations from the R list and D waste disposal operations, given in accordance with the Rulebook on categories, testing and classification of waste ("Official Gazette of RS", no. 56/2010, 93/2019, 39/2021 and 65/2024), and which are exhaustively given below:

R designation	Description	Note
R12	R12 Changes to subject waste to any of the operations from R1 to R11	Pre-treatment and preparation of waste intended for R1 Extraction of metal for recycling (intended for R4)
R13	R13 Storage of waste designed for any operation from R1 to R12 (excluding temporary storage of waste at its generation site)	Storage of waste intended for shipment to R4, in an open warehouse (plateaus)

D-Label	Description	Note
D5	Disposal of waste in specially designed landfills (e.g. disposal of waste in linearly arranged covered compartments, mutually isolated and isolated from the environment)	Solidificate NHWL disposal (non-hazardous or hazardous non-reactive waste)
D9	**A physico-chemical treatment not specified elsewhere in this list, the final products of which are compounds or mixtures which are disposed of by any process from D1 to D12 (e.g. evaporation, drying, calcination)**	**Stabilization and solidification**

In order to standardize the characteristics of the above-mentioned solid residues from the boiler plant and bring them to a state suitable for disposal at the relevant landfill for non-hazardous waste in accordance with the criteria defined in the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021), Regulation on disposal of waste in

[31] Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021)

landfills ("Official Gazette of the RS", No. 92/2010) i.e. EU Directive on landfills (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste), the first stage in the process of treating solid residues is the procedure of magnetic separation, and then induced magnetic („eddy current“) separation of large ash ("bottom ash"), while the second stage is the procedure of their stabilization (prevention of uncontrolled reactions) and solidification (curing). The goal of the entire treatment is the processing of solid residues from the boiler plant and obtaining material that is formed at the landfill into a material with high mechanical strength, low permeability and encapsulated pollutants, i.e. which has a low leaching rate.

Considering the fact that the Waste-to-Energy plant has not yet been constructed, there are currently no ash samples available that could be analyzed and for which a Waste Examination Report would be prepared, in accordance with the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021). The characteristics of the residues from the boiler plant were discussed based on the experiences related to plants of this type in Austria and other European countries. Therefore, during the design phase of the Waste-to-Energy plant, the relevant BREF documents[32] and the experience of operators at similar Waste-to-Energy plants were used.

Considering the variety of waste that, in accordance with the selected technology, can be treated in the WtE plant, in order to manage the operation of the plant in accordance with the restrictions prescribed by the Regulation on technical and technological conditions for the design, construction, equipment and operation of plants and types of waste for waste thermal treatment, limit values of emissions and their monitoring ("Official Gazette of the Republic of Serbia", No. 103/2023), as well as in order to manage the composition of residuals from the boiler plant, as well as the solidificate that needs to be disposed of on subject landfill for non-hazardous waste, the project holder initiated the development of software for creating recipes for compatible types of waste that can be thermally treated, and a pilot project for laboratory tests of the expected recipes was also launched. The aim of the above is to simulate and analyze the most expected types of waste that will be taken to the plant, to analyze their physico-chemical properties, quantity and define the recipes that will be formed for thermal treatment in this plant, with minimal deviations and correlations that will be necessary during its operation. On the basis of the above, different recipes, material balances and the method of conducting the process will be defined, which will in many ways ensure a uniform composition of residuals for each intended recipe, and therefore a uniform composition of solidificates that will be disposed of at the landfill for non-hazardous waste.

Equipment design and mass balances obtained from the technology holder and the designer of key equipment determine the most unfavorable possible waste composition scenarios. These data are used as the maximum input restriction for all further operational procedures and optimizations. This experimental and modelling work serves the needs of more efficient plant management.

In order to define all pollutants and define the recipe for the process of stabilization/solidification of solid residues from the boiler plant, which is required to obtain **non-hazardous or non-reactive hazardous waste that can be disposed of at the relevant landfill for non-hazardous waste**, as part of WtE, it is foreseen, before the very beginning of the solidification process, performing regular analyzes and tests of combustion residues from the boiler plant. In the laboratory provided as part of WtE, analyzes of the physico-chemical properties of waste will be performed on a representative sample, in accordance with the criteria defined in the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021). Recipes and material balances for the solidification process will be defined on the basis of the test results.

[32] Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) i Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)

The storage part of the stabilization and solidification facility W-C12 will be made into separate boxes that will serve to receive botom ash and sludge in containers, receive botom ash after treatment and metal extraction, receive solid residues from the boiler plant from the conveyor connected to the boiler plant, as well as boxes that will serve to stabilize and mix all solid residues from the boiler plant.

Bottom ash from the boiler plant, previously separated from sand and ferromagnetic metals, is delivered to the solidification facility in metal containers using forklifts. The contents from the container are delivered by forklift to the appropriate place in the facility, and cooled. Once the material has cooled down, it is mechanically treated via a metal separator.

As stated above, residues from the combustion process in a fluidized bed boiler collected in the form of coarse ash, i.e. unburned pieces of metal, glass, concrete, stone, etc. are first treated by magnetic separation, and then by induced magnetic (eddy current) separation of coarse ash, during which metal and non-metal impurities are separated, which are further directed to recycling as a secondary raw material. The separated solid fraction of concrete and stone is combined with other residues from the boiler plant in the stabilization and solidification facility. It is known that non-hazardous coarse ash ("bottom ash") has excellent binding characteristics of other materials due to the fact that it has an adequate specific surface area, and as such is a desirable factor in the solidification recipe. The aforementioned contributes to solving the way of disposal and use of this type of waste, for which there is currently no commercial way of use in the Republic of Serbia. **These settings of the procedure are harmonized with the European Commission Directorate-General environment The Director-General Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste, 2012**.

All other residuals from different parts of the boiler plant process are mixed in the collection screw conveyor (mixer), moistened with water if necessary and entered the stabilization process. Therefore, the homogenized residues from the boiler plant are introduced from the conveyor, through the suction funnel, from the boiler plant to the stabilization and solidification facility (reception site). The maximum amount of residuals introduced into the facility is 3.1 t/h. From this position (reception site), the residuals are transferred by crane to the appropriate field in the facility. The stabilization and solidification facility is divided into fields (boxes) for aging residues. Therefore, apart from the fact that the boxes within the W-C12 facility function as warehouses, **the process of stabilization of solid residues, which lasts 7-14 days, takes place in them**. In that time period, the stabilization of the residues takes place. During the stabilization period, chemical reactions of hydrogen release, reduction of chromium (Cr(VI)), etc. take place. **In the facility, nozzles are also provided to spray the aging residues (in order to reduce the emission of particulate matter and promote stabilization).** Aluminum, possibly present in solid residues from the boiler plant, reacts with H_2O in a chemical reaction catalyzed by carbonates, during which hydrogen (H_2) is released. Due to all of the above, it is planned that in the first stage of coarse ash treatment, the separation and extraction of aluminum is performed on an eddy-current separator. In the described manner, the possibility of forming an explosive mixture of hydrogen in the solidification process as well as later in the landfill is also reduced. This method allows all reactions to be brought to an end under controlled conditions and thus protects the integrity of the later formed solidified, which would otherwise be susceptible to cracking due to the release of gases in the residual reactions. Preservation of the crystal lattice of the material is an important factor for preventing the leaching of contaminants when solidificate and water come into contact.

In addition to regular spraying of the stored material, in order to dedust, the W-C12 stabilization and solidification facility will be connected to a closed ventilation and dedusting system that includes a bag filter. As part of the stabilization and solidification facility, an H2 detection system is also planned, which has executive functions at 10% and 25% of DGE. When a concentration of 10% of the lower explosive limit is reached, the control unit turns on an intermittent sound signal, after which the executive function of turning on the ventilation is activated. As stated, the facility has a dedusting system that works constantly as primary ventilation, and fans on the facade of the facility are also provided as a backup ventilation system that is turned on in the event that the dedusting system stops working or in the event that the hydrogen concentration reaches 10% DGE. When a concentration of 25% of the lower explosive limit is reached, the control unit turns on a continuous sound signal and a flashing light, the "GAS" panel lights up, and an alarm signal is sent to the central fire alarm system, after which the executive function is activated and the power is turned off.

As stated above, after aging, i.e. stabilization, residue samples are taken and analyzed in accordance with the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/ 2021), Annex 8. List of parameters for determining the physico-chemical properties of hazardous waste intended for physico-chemical treatment.

Previously stabilized residues are sent for solidification. Solidification is a technological procedure that reduces the potential danger of waste material by physically binding contaminants (heavy metals, etc.) - encapsulating them in a stabilized mass and converting them into solid, stable forms. Solidification is based on the application of cement (without Al components or any other binding agent) to pollutants, which results in the formation of a crystalline structure that encapsulates the target molecules, water absorption, adsorption of solid matter in the pores - matrix, as a result of which the possibility of atmospheric influence on the deposited solidificate and the leaching of contaminants from the solidificate in leachate from the body of the landfill is reduced.

The projected capacity of the solidification plant is 60 m^3/h of solidificate, that is, 30 cycles per hour. One cycle includes filling the mixer, mixing and emptying the mixer (discharging the solidificate from the mixer). Mixing time is 32s.

Stabilized residues and coarse ash are inserted into the hopper of the screw conveyor using a crane for transport to the scale. The material is dosed from the scale into a stationary mixer with a stirrer, volume 2.25 m^3 (working volume 2m^3), according to the prescribed standard. The mixer is equipped with a planetary mixer and a filter that prevents the emission of particulate matter. In the housing (cylindrical part) of the filter, elements representing the filtration medium are mounted vertically. Particulate matter separated from the gas stream is returned to the mixer by the action of the integrated automatic pulsejet cleaning system, which removes the particulate matter from the filter medium The construction of the filter medium enables a higher purification capacity with the use of a filter with a smaller area. This results in a lower pressure drop on the filter.

Simultaneously with the dosing of residues and coarse ash, cement from the cement silo is introduced into the mixer via the dosing screw conveyor and the scale for measuring the required amount of cement. Cement stabilizes most metals, transforming them into more stable chemical forms, and on the other hand, it converts the material into solid forms, thereby reducing its mobility in the surrounding environment. Cement also has a function in neutralizing acidified materials.

The cement is delivered to the location by tank trucks equipped with a system for transporting the material to the silo. A scale with a high level (amount) alarm is provided on the silo. The high level alarm protects the silo from overfilling. The silo has a capacity of 60 t and is equipped with a filter that prevents the emission of particulate matter into the atmosphere. The scale for weighing cement and the scale for weighing solid residues are also equipped with filters that prevent the emission of particulate matter into the atmosphere. These filters are of the same type as the filter on the mixer. Differential pressure measurement with a high value alarm is provided on the mentioned filters. If there is an increase in the differential pressure, the alarm and the self-shaking system are activated (the filter self-shaking system is part of the filters themselves).

It is planned to add process water from the U-C2 facility to the mixer, in addition to cement. The amount of water dosed into the mixer is measured on the water scale. If necessary, liquid additives for solidification are added to the water scale. Liquid additives are contained in IBC containers (in which they are delivered to the site) which are located in the W-C12 facility (2 IBCs) from where they are transported by dosing pumps to the water scale. Under each of the IBC containers there is a tank that is used to collect and hold any leaked contents from the IBC container. The exact recipe (quantity ratio: solid residues-cement-water-additive) is determined for each batch individually, depending on the results of testing solid residues from the boiler plant.

After this time, the resulting solidificate is discharged from the underside of the mixer, directly into the dump truck by which it is transported as a batch to the non-hazardous waste landfill in question. Under the mixer, a weighbridge is installed that measures each truck with a solid certificate intended for dispatch to the landfill. In this way, accurate records and more accurate statistics on the quantities of waste submitted for permanent disposal are provided. Before entering the landfill complex, trucks will pass over the wheel washing unit U-C03.2 installed at the entrance gate of the landfill. Also, when returning from the landfill to the incinerator complex, the trucks will cross the same unit again. This measure ensures effective dust control and prevents material dispersion, thus contributing to maintaining cleanliness within the industrial complex.

The average expected quantity of solidificate production is 1.09 m^3/h, while the maximum simultaneous logistical load of solidificate production is 3.08 m^3/h. Taking into account the annual working time of 8300 h/year, the average annual production of solidificate for storage amounts to 8964 m^3/year (13,446 t/year), i.e. the maximum 25564 m^3/year (38,346 t/year). The capacity of solidificate as a physical chemical treatment of residues from thermal treatment, i.e. the capacity of production and disposal of solidificates, is directly correlated with the amount of residues from thermal treatment, the amount of which depends on the ash content in the waste fuel that is simultaneously thermally treated in the plant. The range of production and disposal of solidificates ranging from 8,964 m^3/year to 25,564 m^3/year is derived from the mass balances of the operation regime of the plant with different types of waste fuels (rating case) and is directly related to the range of ashes in the incoming waste fuel that will be thermally treated in the plant at the same time. The design of the WtE boiler plant envisages a large range of ash generation of the input mixture of waste fuels, which amounts to 0-40 wt.%, which implies a wide range in the generated amount of solid residues from thermal treatment treated by the solidification process, i.e. a range in the amount of solidificate produced that is disposed of at the Landfill of non-hazardous waste. The solidification process is batch, and its capacity is designed so that the maximum daily amount of residues from the thermal treatment can be solidified and disposed of at the Non-Hazardous Waste Landfill during one 8h shift.

The maximum designed capacity and the expected capacity of solidification (D9 operation) and disposal of the produced solidificate at the Non-hazardous Waste Landfill - NHWL (D5 operation) are specified in the following table.

Production and disposal capacity of the solidificate at NHWL, total	m^3/h	t/m^3	t/h	m^3/day	t/day	m^3/year	t/year
The expected average capacity	*3.7*	*1.5*	*5.6*	*26*	*39*	*8,964*	*13,446*

Index numbers of solidificates, which will be produced and disposed of at the Non-hazardous Waste Landfill, in accordance with the Regulation on Waste Disposal at Landfills ("Official Gazette of RS", No. 92/2010), Article 13, item 3) are:

- 19 03 06* - waste marked as hazardous, solidified
- 19 03 07 - solidified wastes other than those mentioned in 19 03 06*

The maximum design capacity and the expected capacity of all thermal treatment residues (D15 and D13 operations) are specified in the following table:

Mixing capacity of residues from thermal treatment of waste for stabilization process, total	m^3/h	t/m^3	t/h	m^3/day	t/day	m^3/year	t/year
The expected average capacity	*3.2*	*1.1*	*3.5*	*22*	*24*	*7,634*	*8,397*

Maximum capacity	8.4	1.2	10	63	74	21,770	25,730

The project envisages performing solidification during one working shift. At the end of the shift, the solidification mixer is washed with water (process water from facility U-C02). The washing water is directed to the equipment washing water pit located in the W-C12 facility. The maximum amount of washing water is about 2-3 m^3. The water from washing the equipment will be returned to the solidification process.

Dedusting system

The subject project envisages the construction of a dedusting and ventilation system for the W-C12 stabilization and solidification facility. The dedusting and ventilation system includes suction louvers, pipelines, filter units with accompanying equipment and an emitter (stack). Louvers are installed on the exhaust channel W-C12 (16 louvres). The louvers are arranged on the facility in such a way that it is possible to efficiently collect the particles that are separated during the stabilization of the homogenized mixture of solid residues from the boiler plant. The louvers are connected by piping to a bag filter with pulsed shaking using compressed air located near the W-C12 facility. A centrifugal fan is provided behind the bag filter, which is used for dedusting, ventilation and filtration, as well as the transport of purified air further into the emitter and the atmosphere. The centrifugal fan is frequency regulated and has a capacity of 25,000 m^3/h. The emitter is 21.5m high and 1.2m in diameter.

Figure 3.17 shows a simplified technological scheme of stabilization and solidification of solid residues from the boiler plant before transportation and disposal on the body of the landfill for non-hazardous waste.

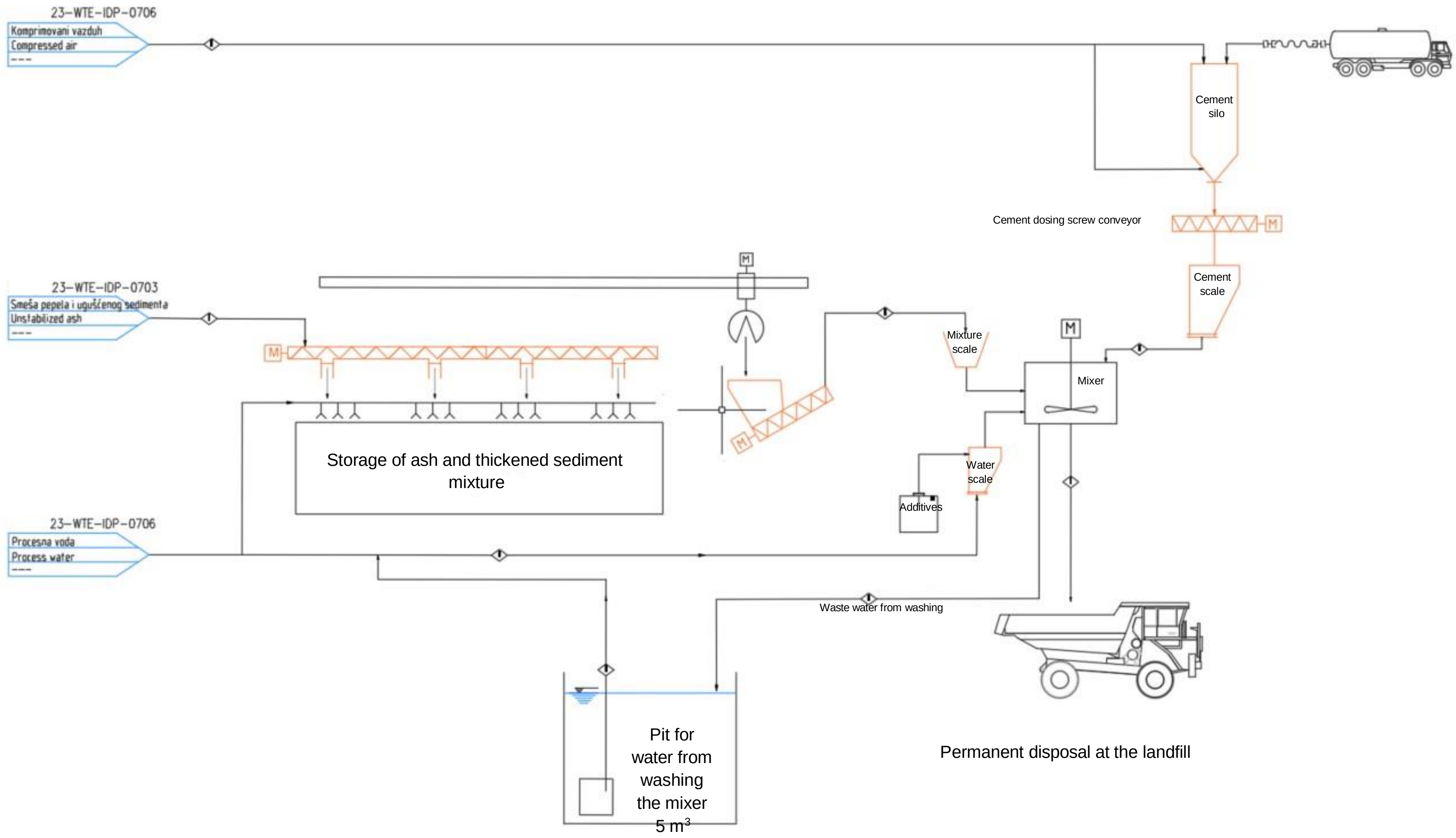


Figure 3.17 Simplified technological scheme of stabilization and solidification of solid residues from the boiler plant before transportation and disposal on the body of the Landfill for non-hazardous waste.

As stated above, after the completion of the process of stabilization and solidification of solid residues from the boiler plant, the resulting solidificate is discharged from the lower side of the mixer directly into a dump truck (volume 7 m^3), which, after measurement and creation of accompanying documentation (weighing sheet, document on the movement of waste, etc.) is immediately sent to the subject Landfill for non-hazardous waste.

The resulting solidified, a product of physical and chemical treatment, will be tested and classified in accordance with the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/ 2021): Disposal of non-reactive hazardous waste at Landfills for non-hazardous waste. If the obtained test results meet the conditions prescribed for the disposal of non-reactive hazardous waste at Landfills for non-hazardous waste, the solidified material will be disposed of at the Landfill for non-hazardous waste. Otherwise, the solidified material will be sent for disposal to the authorized operator of landfills and/or hazardous waste storage facilities. The procedure is in accordance with the EU Landfill Directive (EU 1999/31/EC).

All waste management steps at the subject facility will be defined through the EMS system of procedures and instructions. One of these documents is the Management Handbook, waste pre-acceptance procedures as well as waste reception and acceptance procedures, etc.

3.2.1.13 Auxiliary systems necessary for the operation of Waste-to-Energy plant

For the regular operation of the WtE plant, it is necessary to provide the following auxiliary process fluids:
- demineralized DEMI water for boiler operation,
- process water (for scrubbers, solidification, cooling of the sludge tank, dosing of chemicals, etc.)
- compressed air,
- nitrogen, and
- natural gas (CNG).

Technological and energy fluids are distributed via pipe bridges: demi-water, steam, CNG, compressed air, nitrogen, liquid waste.

Supplying the Waste-to-Energy plant:
- **Supply of Waste-to-Energy plant with sanitary water** (by connecting to the existing sanitary water supply system of the industrial complex Elixir Prahovo and distribution to the final consumers of WtE plant);
  Sanitary water will be used in the complex for the needs of employees in facilities W-C01 (Reception and administrative building), W-C02 (Operation Centre 1), W-C04 (Pump station and fire station), U-C02 – (Maintenance building and auxiliary systems object). Sanitary water will also be used at the safety showers for incident situations at the facility W-C13 (Place for liquid transfer) and W-C15 (tank for ammonia water). The facility will be supplied with sanitary water from the Elixir Prahovo industrial complex through a D90 diameter pipeline, to which a D63 connecting pipeline must be connected for the needs of the Waste-to-Energy facility. Total capacity: Q=1.5 l/s
- **Supply of Waste-to-Energy plant with process water** for scrubbers, solidification, cooling of the sludge tank, dosing of chemicals, etc. (connection to the existing Danube water supply system, primary treatment of the same on the sand filter system, supply to receiving basins and distribution to the final consumers of the WtE plant are planned); Therefore, the largest amount of process (technological) water flow Q = 122 m^3/h, of which 50 m^3/h at the WtE plant location is brought to the U-C02 facility where process water is prepared and 72 m^3/h (20l/s) is intended for replenishment of the tank for fire-fighting purposes).
  In accordance with the above, within the process water preparation system, raw water from the Danube is treated, which is brought from the existing water intake (pumping station) that supplies the Elixir Prahovo complex (the water permit is given in the attachment of the study), whereby the technological process is based on removal of suspended matter by filtration.
  The quality of the incoming water from the Danube varies during the calendar year. Variations in pH, content of organic matter, alkalinity, ammonium ions and chloride were observed in the highest

percentage. The turbidity and concentration of dissolved salts such as sodium, calcium, sulfates and conductivity, which ranges from 350 to 450 µS/cm, varies to a lesser extent.

The system for preparing process water includes the following components:

- Two sand filters (working and spare),
- Air blower for washing filters,
- Process water basin, 80 m^3,
- Set of pumps for process water distribution,
- Set of pumps for washing filters, and
- Two filters (working and spare)

Filtration is an operation in which water containing suspended particles is passed through a filter filling in order to separate them.

Two sand filters (one working and one spare, with quartz sand) with a capacity of 50 m^3/h are provided for the preparation of process water.

The filtration speed is 5-15 m/h. The filter is washed using water and air.

The filters are made of steel with a drainage system at the bottom. The filter consists of a filter body with a filter filling, a distribution system and connections for the supply of raw water and the drain of filtered water. A layer of supporting material is laid on the drainage system, the supporting layer, while the filter filling is placed on the said drainage system. By passing through the volume of the filter filling, the water becomes clear and suspended substances in the water are retained on the filter filling. Depending on the characteristics of the filling, the projected filtration speed is selected, as well as the time of normal operation, after which washing is performed. In order to increase the time interval between two washes and thereby reduce water losses in the plant, the use of double-layer filters is planned. Thanks to this arrangement of the filter filling, the formation of a surface crust on the filter is prevented, which would otherwise lead to a decrease in the filter's permeability. Also, the planned arrangement of filling provides 2-2.5 times larger space for accepting suspended substances.

After passing through the sand filter (filtration process completed), the water is sent to the process water basin with a volume of 80 m^3. Process water is distributed from this basin to consumers using a set of pumps (one working and one backup). A set of pumps will be installed next to the process water basin.

Filters (working and backup, respectively), which are installed on the pressure pipeline of the pump set, have a role in removing mechanical impurities from the process water, before distributing the water to consumers. The filters have fine openings with a diameter of 100 microns with a stainless steel sieve and a capacity of max 60 m^3/h. When soiling occurs, the filters are rinsed with water for 20-30 seconds, generating 100-200 liters of waste water.

During filtering, the filter filling becomes muddy, which causes a decrease in the filtration speed, that is, a decrease in the filter capacity. Filter washing is done using a combination of air and water, which is the practice for filters with a diameter of > 1 m. First, the initial blowing and loosening of the filter filling is done with air, after which the filter is washed with water. Water from the process water basin will be used to wash the filter.

The waste water from washing the filter will be drained through the technological sewer T3 to chamber 1 of the waste water basin located within the U-C06 unit, where it will be treated - sedimentation in the gravity sedimentation tank. After sedimentation, the purified water will be sent either to the scrubber system for the treatment of flue gases of the boiler plant, or it will be discharged into the clean water tank and further into the natural recipient – the Danube River.

The consumption of water for washing one sand filter is: 35 m^3.

Based on the quality of the incoming water, it is expected that it will be necessary to wash the filter 3 times a day, which in total amounts to **105 m^3/day** of waste water from washing the filter.

- **With fire-fighting water** from the hydrant network (by connecting to the existing Danube water supply system, supply to the fire-fighting water tank and distribution to the end consumers of WtE plant).

Hydrant network connection: The plant is connected to the existing D600 system of the Elixir Prahovo complex for supplying technological/fire-fighting Danube water. The plant will be supplied with technological-hydrant and fire-fighting water from a 1200 m^3 fire-fighting water tank, which will be supplemented with technical water, for which a connecting pipeline will need to be constructed.

Total capacity:
External and internal hydrant network: According to valid fire-fighting regulations, and in relation to the purpose and size of the facility, it is envisaged to install an internal fire-fighting network with the capacity of simultaneous operation of two internal hydrants (2x2.5 l/s), as well as an external ring hydrant network with simultaneous operation of five external hydrants with a capacity of 5x5.0 l/s, which amounts to a total of 30.0 l/s.

Refilling the fire-fighting water tank 1200 m^3: Q=20 l/s

- **With demineralized DEMI water, i.e. boiler water** (by connecting to the existing Central HPV (Chemical Water Preparation) plant of the Elixir Prahovo complex, supply to DEMI water receiving basins and distribution to end consumers of WtE plant);

The facilities in the Waste-to-Energy plant that will use demi water are:
- W-C11 - Boiler plant
- W-C11 - SCR system - selective catalytic reduction of nitrogen oxides (NO_x)
- W-C15 - Water refilling for ammonia water tank spraying

The reception and distribution system of demi water includes:
- Basin of demi water, 80 m^3,
- Set of pumps for demi water distribution (two pumps, working and spare)
- Two filters (working and spare)

From the central HPV of the Elixir Prahovo complex, demineralized water is delivered to the demineralized water basin, which is positioned next to the process water tank in the room intended for the preparation of process water as part of the WtE plant. The demi water is transported from the basin to the boiler plant in the W-C11 facility with a capacity of 40 m^3/h, at a pressure of 5 bar(g), into the feed water tank using a set of demi water pumps (two centrifugal pumps, one working and one spare) which are installed next to demi water basin.

TOTAL ESTIMATED DEMI WATER CONSUMPTION:	**40.25 m^3/h**
TOTAL ESTIMATED ANNUAL CONSUMPTION OF DEMI WATER:	**322,000 m^3/year**

Filters (working and spare, respectively) that are placed on the pressure pipeline of the set of pumps, have a role in removing possible mechanical impurities from the demi water, before distributing the water to consumers. The filters have a fineness of 100 microns with a stainless steel sieve and a maximum capacity of 60 m^3/h. When soiling occurs, the filters are rinsed with water for 20-30 seconds, generating 100-200 liters of waste water.

Compressed air

Compressed air is supplied to the Waste-to-Energy plant from the centralized compressor station located within the existing Elixir Prahovo complex (the aforementioned compressor station is not the subject of this project). Compressed air of technical quality 1.4.1 according to Standard SRPS ISO 8573-1:2020 is supplied from the existing Elixir Prahovo complex to compressed air tanks in the U-C02 facility of auxiliary systems. Compressed air is distributed to end consumers from tanks that serve to calm the air and to cover peak air consumption. The volume of each of these tanks is 30 m^3, whereby the tank is dimensioned based on the maximum consumption of compressed air of 3,510 Nm3/h.

The system of receiving and distributing compressed air of technical quality consists of the following elements:
- A tank for holding compressed air

- Supporting fittings and piping.

The tank has connections for filling, emptying and drainage. Connections for measuring and regulating equipment as well as openings for audit/maintenance are also provided.

Plants that use produced compressed air of technical quality are the following:

- W-C11- Plant for waste thermal treatment
- W-C16 – Solidification filter system
- W-C09 – Waste Pretreatment Filter System and Activated Carbon Filter

A part of the compressed air of technical quality is fed from the compressed air retention tank to the package unit of the adsorption dryer in order to obtain instrument quality compressed air. In addition to adequate pressure and purity, instrument-quality compressed air must have a favorable dew point (PDP -40°C) to prevent moisture condensation inside the instruments. The dew point of the air is achieved by drying at a uniform pressure value. For this reason, compressed air is introduced into the package unit only after the buffer tank, where the adsorption drying of the air is performed.

Package unit - adsorption dryer consists of:

- Coarse filter
- Adsorption dryer
- Fine filter

After drying, compressed air is taken to the instrument quality compressed air storage tank, with a capacity of 30 m3, which has identical characteristics to the compressed air retention tank of technical quality. The purity class of compressed air of instrumental quality 1.2.1 is in accordance with the standard SRPS ISO 8573-1:2020 (Compressed air contaminants and purity classes).

Compressed air of instrumental quality is taken from the tank to the end consumers by one line, and to the package nitrogen generation unit by the other line.

The plants that use instrument quality compressed air are:

- W-C11 Waste thermal treatment plant;
- W-C13 – Liquid Waste Transfer Point
- W-C08 Pre-treatment and waste storage
- U-C06 Wastewater receiving and treatment system
- U-C02 Maintenance building and auxiliary systems facility
- W-C12 Stabilization and solidification

	Compressed air of technical quality **(1.4.1 - SRPS ISO 8573-1)**	**Compressed air of instrument quality** **(1.2.1 - SRPS ISO 8573-1)**	**Total compressed air consumption**
TOTAL ESTIMATED ANNUAL CONSUMPTION:	**15,760,000 Nm^{3}year**	**12,320,000 Nm^3/year**	**28,080,000 Nm^3/year**

The distribution of nitrogen

Nitrogen is generated from compressed air in the facility of U-C02 auxiliary systems, from where it is distributed to consumers.

The nitrogen production system consists of the following elements:

- package units for the production of nitrogen
- nitrogen holding tanks

The plants that use nitrogen produced in this way are:

- W-C11- Plant for waste thermal treatment
- W-C13- Liquid waste transfer station
- W-08- Waste pretreatment and storage

After generating nitrogen in the package unit, it is transported to a 30m^3 nitrogen holding tank, sized based on a maximum nitrogen consumption of 400 Nm^3/h. This tank has the role of a buffer tank, as well as to cover the peaks of nitrogen consumption. Connections are provided on the tank for: filling, emptying and drainage. Connections for measuring and regulating equipment as well as openings for audit/maintenance are also provided.

TOTAL ESTIMATED NITROGEN CONSUMPTION:	**325 Nm^3/h**
Simultaneity factor:	0.85
TOTAL ESTIMATED NITROGEN CONSUMPTION: (with a simultaneity factor of 0.85):	**275 Nm^3/h**
TOTAL ESTIMATED NITROGEN CONSUMPTION:	**2,200,000 Nm^3/year**

Natural gas

The plant is connected to the internal installation of compressed natural gas CNG within the existing Elixir Prahovo complex at KP2300/1 K.O. Prahovo.

Natural gas is used to operate the boiler's burners as ignition and auxiliary fuel. The two natural gas burners envisaged by the design are used only for starting and stopping the boiler and in the event that the temperature in the furnace drops below 850° C. In normal operation, the burner is used only as a secondary air supply, i.e. it works without burning natural gas.

The nominal consumption of natural gas for the operation of these two burners is 2,600 Nm^3/h with full load operation. Considering that the plant in question operates 8,000 hours a year and taking into account the above-mentioned intermittent mode of operation of natural gas burners (only 15-20% of the total operation of the plant), the assumed total annual consumption of natural gas of 4,160,000 Nm^3/year can be reached.

3.2.2 Description of main features of the Landfill for non-hazardous waste

3.2.2.1 Technical and technological description of the Landfill for non-hazardous waste

The landfill of non-hazardous waste is designed for the disposal of solidificates resulting from the treatment of solid residues from thermal waste treatment plants generated as a product of the waste energy recovery process.

For the formation of a landfill for the disposal of non-hazardous and non-reactive hazardous waste (solidified), an area with an irregular base, a gross area of about 8.5 ha, a length of about 330 m, a width of about 280 m and a triangular shortening in the northwest corner is available (see Figure 3.17).

The subject project plans to divide the landfill into a total of 2, i.e. 3 phases, considering that the initial phase I is divided into 2 (sub)phases:

1.PHASE I-A – net surface area of 1.82 ha
2.PHASE I-B – net surface area of 1.84 ha, and
3.PHASE II – additional area of 2.76 ha,

which gives a total of 6.42 ha of net utilized space for waste disposal.

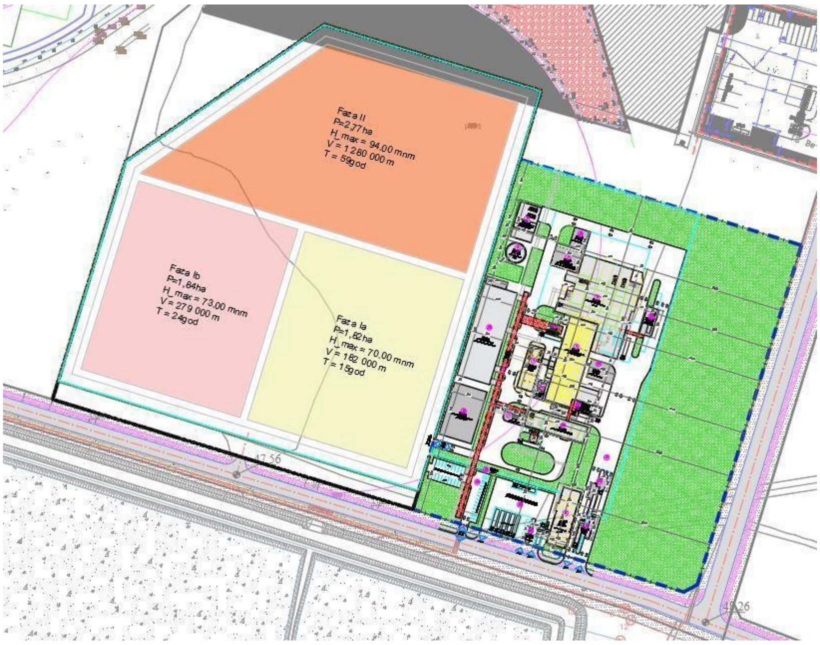


Figure 3.18 The space provided for the formation of the Landfill for non-hazardous waste (left) and the construction of a Waste-to-Energy plant (right)

Daily cells are formed on the intended work surface, which will be variable surfaces because it depends primarily on the daily amount of waste that will arrive at the landfill. When disposing of waste, it will first be spread into layers about 30 cm thick. Considering the predicted daily solidificate quantities of 360 m^3/day, it is predicted that the area to be occupied by the daily cells will be:

$P_{Daily\ cells} = 360\ m^3/0.3\ m = 1200\ m^2$

After filling the area along the complete sector (phase), it moves to the formation of the next layer in an identical manner. When the level of the initial embankment is exceeded, each layer will be retracted inside the cassette so that the slope of each floor from V:H – 1:1.7 (slope 30^o) is obtained towards the outside.

When one cassette is raised to a height of about 3 m, the working front is moved by 3 m, on all sides. In this way, it will be achieved that for each 3 m elevation of the landfill, the horizontal displacement will be about 7.8 m, i.e. a general slope of the landfill of about 21^o will be obtained (H:H ~ 1:2.6). The planned total height of the landfill is 46 m from the level of the bottom of the cassettes (from the level of 48.00 masl to the level of 94.00 masl), i.e. 45 m from the level of the leveled surrounding terrain, which is 49.00 masl, in order to harmonize with the height of the phosphogypsum warehouse, which to enable the unhindered movement of machinery on the last floor. Table 3.20 shows the landfill capacity by phase.

Table 3.20 Capacity of the landfill by phase

	I-Phase A	I-Phase B	II Phase	Total
A_base (ha)	1.82	1.84	2.76	6.42
V (m^3)	182,000	279,000	681,000	1,142,000
Z_max (masl)	70.00	73.00	94.00	-
h (m)	21.00	24.00	45.00	-
T_expected (ann.)	20.1	30.8	75.2	126.1
T_min (ann.)	7.1	10.9	26.6	44.6

where:
A_base (ha) – surface area of the phase in the base;
V (m^3) – volume of the storage space available in the phase;
Z_max (masl) – maximum level of phase elevation;
h (m) – maximum height of the phase, relative to the level of 48.00 masl;

T_expected (annual) - disposal time for estimated waste production of 1.09 m^3/h and annual working time of 8300 h/year.
T_min (annual) – minimum lifetime of the landfill for maximum waste production of 3.08 m^3/h and annual working hours of 8300 h/year.

3.2.2.2 The construction of the Landfill for non-hazardous waste

The technical and technological conditions for the construction of a landfill for the disposal of solid residues from a boiler plant for thermal waste treatment, at the selected location, refer to:
1) landfill body;
2) manipulative service plateau;
3) service roads and necessary infrastructure;
4) basins for the collection of atmospheric and leachate waste water;
5) vegetation protection zone.

The technical and technological conditions for the construction of the subject landfill are defined in accordance with the Regulation on Disposal of Waste on Landfills ("Official Gazette of the RS", no.92/10), Annex 2. - *Technical and technological conditions for the design, construction and commissioning of the landfill.*

Landscaping of the bottom and inner slope of the initial embankment

In accordance with the results of geotechnical tests of the subject area, which are presented in the *Geotechnical study for the purposes of forming the Landfill for non-hazardous waste in the IHP Elixir complex in Prahovo (GT Soil inženjering d.o.o., January 2023*), where it was determined that the groundwater level is 7-10 m below the level of the storage space, space ie. the bottom of the landfill body will be arranged as follows (see Figure 3.20):

- humus and other surface material will be excavated in the area where future cassettes will be formed to a depth of 0.3-1.3 m, so as to achieve a uniform bottom elevation of 48.00 m above sea level,
- the cleaned area will be well rolled by multiple passes of rollers and compactors, which will ensure sufficient compaction that imitates a mineral barrier and at the same time prevent damage to the film during installation,
- a geomembrane made of high-density polyethylene (HDPE), with a thickness of not less than 1.5 mm, will be placed on the rolled surface, and depending on the manufacturer's guarantee, a final decision will be made on the choice of HDPE foil thickness in the next design phase (PGD/PZI),
- a protective layer of geotextile, with a minimum weight of 200 g/m^2, will be placed on the geomembrane,
- above the protective layer of geotextile, a drainage and load-relief layer of gravel with a minimum thickness of 50 cm will be placed,
- corrugated perforated drainage pipes Ø160 mm will be laid on the gravel, at a distance of 15 m from each other, and drains from full pipes with a 20% slope, which will lead the drainage water from the contours of the landfill and drain it to the eastern, western and southern sides of the landfill into the collection pipes of the drainage water, which are located on the outside of channels for collecting atmospheric water.
- drainage pipes will be filled with a layer of gravel with a minimum thickness of 50 cm, which will be wrapped with a layer of geotextile according to the detail in the Figure 9,
- drainage pipes are placed in the interior of the landfill up to a maximum length of 30 m, in order to maintain their structural strength, while further inside the landfill a drainage layer is formed of stone pile at the same distance as the drainage pipes.

During the installation of HDPE films, they will be anchored.

Figure 3.19 shows the mentioned layers of the lining of the bottom of the landfill body

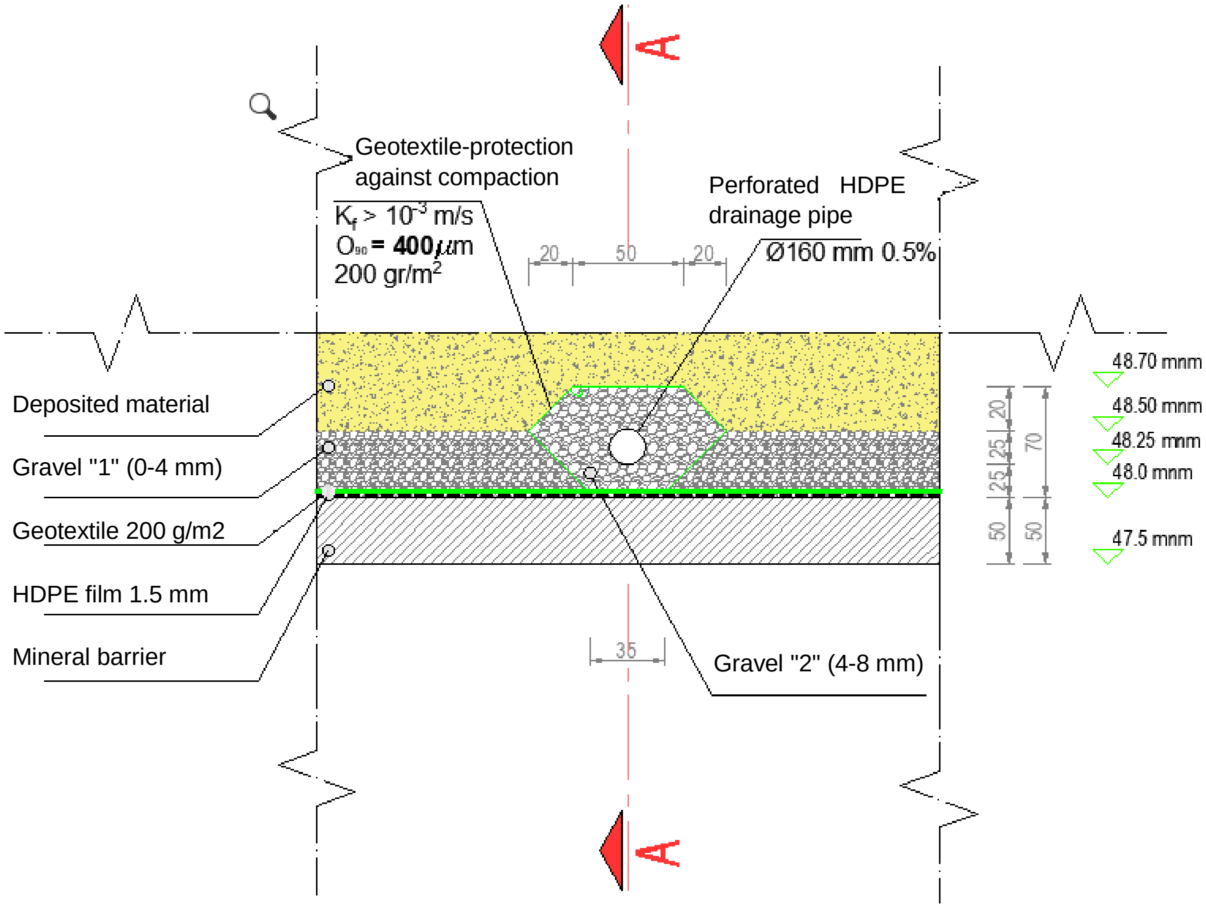


Figure 3.19 View of the insulation of the bottom of the landfill body

Formation of the initial embankment and internal slope

The initial embankment has the task of providing the initial accumulation space for the placement of waste. Since the waste will be in a dry state, the height of the initial, perimeter embankment will be 1.0 m, at an altitude of 49.00 meters above sea level.

The width of the crown of the embankment on all four sides will be 5.5 m. The slope of this embankment will be V:H - 1:2. The embankment will be built by applying a mixture of Danube sand and gravel in layers using construction machinery. Compaction should achieve a compressibility modulus above 25 MPa. After forming the geometry of the embankment on the rolled surface, a geotextile with a minimum weight of 200 g/m^2 will be placed on the bottom of the landfill and of 400 g/m^2 on the slopes, as a protection of the geomembrane (which extends continuously along the bottom of the landfill and over the initial embankments and along the bottom of the channel for atmospheric water). The geomembrane on the embankments must be protected by another layer of geotextile and a layer of gravel (above which there will be concrete) from UV radiation and mechanical damage, since the crown of the embankment also serves as a service road. A cross-section of the landscaping of the initial embankment, the bottom and the slope of the deposited material is shown in Figure 3.20.

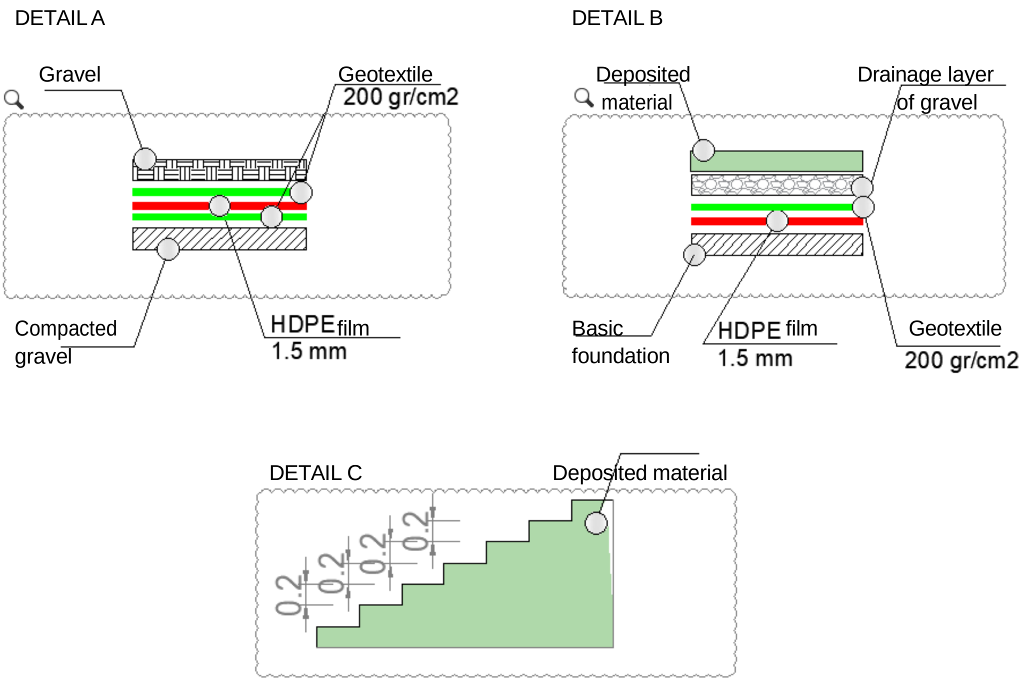


Figure 3.20 Cross-section through the Landfill for non-hazardous waste showing landscaping details of the initial embankment (detail A), bottom (detail B) and slope of the deposited material (detail C)

For the purpose of measuring the waste to be disposed of at the subject non-hazardous waste landfill within the Waste-to-Energy Plant, it is envisaged to place a weighbridge under the solidification mixer. The weighbridge is used to measure each solidified truck intended for shipment to a landfill. In this way, accurate records and more accurate statistics on the quantities of waste submitted for permanent disposal are provided. Before entering the landfill complex, trucks will pass over the wheel washing unit U-C03.2 installed at the entrance gate of the landfill. Also, when returning from the landfill to the incinerator complex, the trucks will cross the same unit again. This measure ensures effective dust control and prevents material dispersion, thus contributing to maintaining cleanliness within the industrial complex.

Service roads and necessary infrastructure

The Landfill for non-hazardous waste will be accessed directly from the internal road within the Waste-to-Energy plant.
One-way traffic will be organized around the landfill. The service road will be constructed over the crown of the initial embankment. The width of the carriageway of the service road will be 3.5 m with 1.0 m banks on both sides. The service road will surround the entire landfill and should be formed with a solid surface, considering that it will represent the main road during the use of the landfill.

The construction of a service road is planned around each planned phase of landfill construction. The service road must be in a solid design and allow one-way traffic around the landfill. In addition to the service road, each phase must have its own access road. The access road will be constructed on the landfill slope. The main function of this road is to enable the movement of machinery around the landfill. All slopes and radii of curves of the access road must meet the minimum requirements for the safe movement of all planned machinery. The access road is formed on the solidificate, and the upper part is specially treated with classic concrete in order to prevent the solidificate from being destroyed and dusted.

Collection of water from the landfill

The establishment of a landfill water circulation system is planned at the landfill. Two separate water collection systems are planned:

1. **The leachate collection system**, which first collects water in the leachate basin within the landfill, and then transports it to the waste water basin provided in the area of the Waste-to-Energy plant, from where it will be sent for treatment, and
2. **The system for the collection of atmospheric water from the slopes of the landfill**, which will be collected and used to spray water on the slopes of the landfill to achieve water recirculation.

The leachate collection system:

- The collection pipeline for water drainage will be made of plastic pipes, with a nominal diameter of DN400, which will be buried from the west, east and south sides of the future landfill (leachate collection pipelines). The pipeline will have a fall in the direction from north to south, considering that the leachate collection basin will be located on the southeast side of the landfill, closer to the WtE plant and the wastewater treatment plant. Inspection manholes will be constructed every 60 m on the pipeline to ensure the smooth functionality of the system during the exploitation period.
- The collection pipelines of drainage water are introduced into the basin for the reception of leachate, in which a pump station (CS_1) of the shaft type is planned, which will house the pumps (P_1) designed for the further transport of leachate into the waste water basin located in the area of the WtE plant. (Figure 3.21). Two pumps are planned, one working and one spare, with a power of Np = 1.5 kW. The leachate collection basin will be concreted and waterproofed, with a special fence for access safety.

The system for the collection of atmospheric water:

- On all sides of the landfill, there are canals in the foot of the embankment, which follow the route of the initial embankment, through which the atmospheric water that flows from the outer slopes of the landfill is introduced into the basin for its collection. A shaft-type pumping station (CS_2) is planned in the basin, which will house pumps (P_2) intended for water recirculation by spraying around the landfill. Two pumps are planned, with a total power of about Np = 25 kW.
- The channel has a trapezoidal cross-section, with a bottom width of 1.0 m on the southern side of the landfill and 0.75 m on all other sides. The slope of the sides of the channel is 1:2. The maximum depth of the channel is 0.80 m. The channel will also be lined with a geomembrane made of high-density polyethylene (HDPE) with a thickness not less than 1.5 mm. The basin for the reception of atmospheric water will also be made of concrete and waterproofed, with a special fence for access safety purposes.

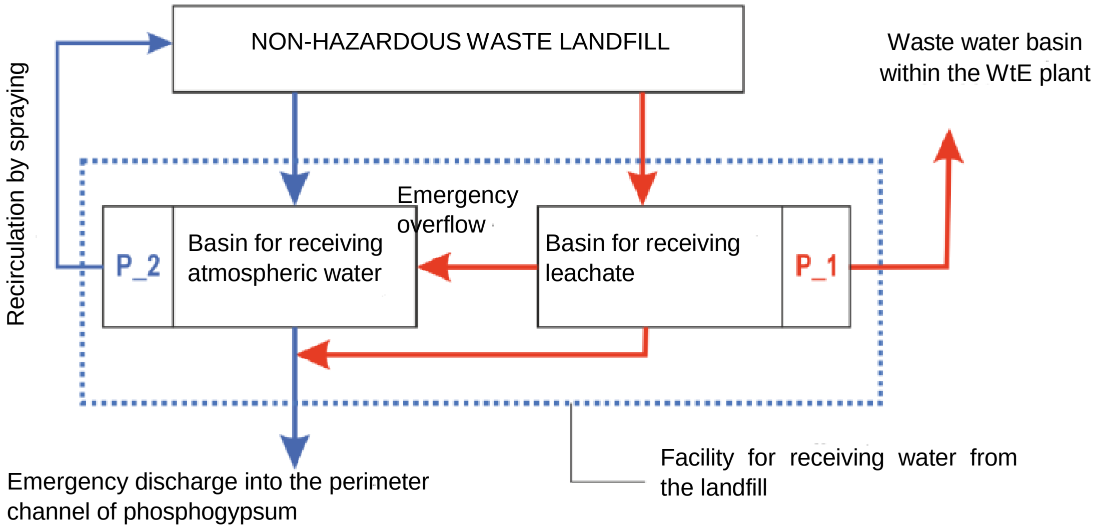


Figure 3.21 Schematic representation of water flows (leachate and atmospheric water) at the Landfill for non-hazardous waste

Both basins for receiving water from the landfill, for atmospheric and leachate runoff, together with the pumps, form one object as shown in Figure 3.22.

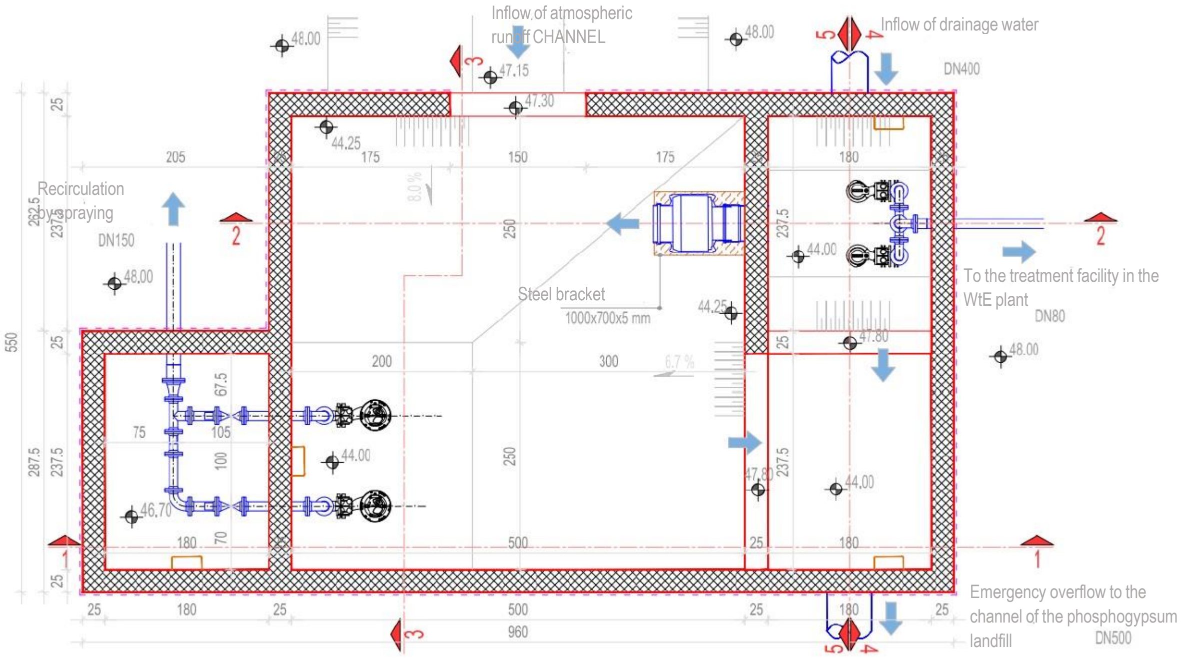


Figure 3.22 Layout of the facility for receiving water from the landfill

Within the facility, it is planned to connect the basin with emergency overflows in order to prevent flooding of the system in all possible modes of operation.

An emergency overflow from the leachate basin to the atmospheric water basin is planned, in case of more extensive precipitation over a longer period of time, in the initial stages of waste disposal when larger amounts of leachate can be expected, and taking into account the limited capacity of the wastewater treatment plant within the WtE plant (maximum 5 m^3/h).
An emergency overflow from the atmospheric water basin is planned, which in the event of heavy rainfall for a long period of time, will enable the evacuation of water into the peripheral channel of the phosphogypsum storage, which is located on the south side of the future Landfill for non-hazardous waste. Direct evacuation from the basin for leachate is planned for this emergency overflow. Water from the peripheral channel of phosphogypsum storage is used in Elixir Prahovo production facilities, so that in this way water recirculation in a closed system is ensured.

Vegetation protective zone

The built-up zone, as an element of the existing landscape, includes all existing built objects at the analyzed location within the area of the Prahovo industrial chemical complex. On the southern side of the subject landfill, there is a phosphogypsum storage location that is higher in level than the Landfill for non-hazardous waste, and on the eastern side there is a WtE plant complex, so these facilities represent a physical barrier between the landfill and the surrounding land.

Within the industrial complex in which the construction of the subject landfill and Waste-to-Energy plant is planned, within zone I - Existing industrial complex, a belt of protective vegetation has been formed, specifically within the production part of the industrial complex and the part for the production of phosphate mineral fertilizers, with protective vegetation within the part of the industrial complex where there are no production functions. The existing protective vegetation within the industrial complex and part of the complex for the production of phosphate mineral fertilizers serves the purpose of the buildings and their protection from adverse effects from the production process. The protective vegetation is positioned in such a way that it forms a buffer zone between the industrial complex and the state road, as well as between the industrial complex and residential buildings within the workers' settlement in the immediate vicinity.

The Detailed regulation plan for the chemical industry complex in Prahovo (other amendments and additions), "Official Gazette of Negotin", No. 350-123/2022-I/07 dated June 17, 2022) foresees the formation of an additional protective belt of vegetation along boundaries of the complete industrial complex, which, as stated above, also includes the subject Landfill for non-hazardous waste and the WtE plant. The protective green belt has the role of isolating the immediate environment from the negative impacts of the chemical industrial complex zone. Construction is prohibited within this part of the zone. The construction of the necessary underground installations and infrastructure routes as well as the necessary above-ground transport systems in function of the technological process (transporters) may be allowed, all in accordance with positive regulations so as not to diminish the importance of the belt of protective vegetation.

3.2.2.3 Technological description, method and procedure of operation of the Landfill for non-hazardous waste

- **Operation: D5 Waste disposal in specially designed landfills (e.g. waste disposal in linearly arranged covered cassettes, mutually isolated and isolated from the environment)**[33]

The subject Landfill for non-hazardous waste is designed exclusively for the disposal of solidificated residues from the boiler plant of the subject Waste-to-Energy plant, therefore it is not foreseen for the disposal of waste from other producers. Waste that meets the prescribed criteria for non-hazardous waste disposal, with the following index numbers, will be disposed of at the subject landfill:

19	**Waste from waste treatment plants, waste from waste water treatment plants outside the place of their origin and for the preparation of water for human consumption and use in industry**
19 03	stabilized/solidified waste
19 03 05	stabilized wastes other than those listed in 19 03 04
19 03 06*	waste marked as hazardous, solidified
19 03 07	solidified wastes other than those listed in 19 03 06

Methods and procedures of landfill operation, i.e. Work plan of waste landfill, determination of a qualified person to work at the landfill, obligations of the landfill operator, technical and technological conditions for the design, construction, operation and equipment of the landfill, organization of waste management at the landfill, disposal operations, issuing a permit for waste disposal, daily records, annual report on waste, costs of design, construction, operation, closure of the landfill and its maintenance after closure, are carried out in accordance with the Regulation on the waste landfilling ("Official Gazette of the RS", nos. 92/2010), Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016, 95/2018 -other law and 35/2023) and special regulations.

The procedures and operating mode of the landfill, which is carried out during the technological process of exploitation of the subject landfill, will be carried out in accordance with *Annex 5. - Procedures and operating mode of the landfill* of the previously mentioned regulation.

In order to improve the overall performance from the point of view of landfill management and environmental protection, the establishment and implementation of an environmental protection management system (EMS) is foreseen. The procedures and instructions for the management and operation of the plant (Management Handbook) will define all activities in accordance with the above, precise environmental protection policy, quality guarantee policy for waste disposed of at the landfill, organization, work protocols, working conditions, monitoring, reporting, work procedures in accident situations, etc.

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[33] Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021)

As stated above, after the completion of the process of stabilization and solidification of solid residues from the boiler plant, the resulting solidified is discharged from the lower side of the mixer, directly into a tipper truck (volume of 7 m^3), which, after measurement within the WtE plant and creation of accompanying documentation (weighing sheet, waste movement document, etc.) is immediately sent to the subject Landfill for non-hazardous waste.

At the very entrance to the landfill complex, there is a gate and a reception area, so the waste is checked first, i.e. control upon receipt of waste and sampling for the purposes of waste analysis is carried out.
At the entrance to the landfill, a board made of permanent material with indelible inscriptions will be placed, which contains the name of the landfill operator, the class of the landfill, the address of the company that disposes of the waste, working hours, the types of waste whose disposal is permitted and the types of waste whose disposal is not permitted, as well as other important information.

When the truck with each batch of solidified material enters the location of the Landfill for non-hazardous waste, the recipient of the waste, in this case a qualified person responsible for professional work at the landfill, first visually checks the condition of the waste, then assesses the amount of waste (in m3 and/or t), checks accompanying documentation and takes over the waste. The recipient of waste fills out part D of the Document on the movement of waste/hazardous waste in accordance with the Rulebook on the form of waste movement document and filling in instructions ("Official Gazette of the RS", no. 114/13) or Rulebook on the form of hazardous waste movement document, the form of advance notification, the manner of its delivery and filling in instructions ("Official Gazette of the RS" no. 17/17)).

When receiving each waste batch, authorized persons of the accredited laboratory will take a sample (minimum amount of matter necessary for laboratory tests) of the solidificate, which will be further analyzed in accordance with the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021): *Disposal of non-reactive hazardous waste at Landfills for non-hazardous waste*.

One batch of manufactured and delayed solidification (solidified residues from thermal treatment) is equal to the maximum daily output amount of solidificate from the solidification plant, which is 111t and is in accordance with the capacity of the batch solidification process during 1 eight-hour shift (see table_D of the operation_Capacities by index numbers attached to the Study).

Sampling of input material (residues from thermal treatment) and physical and chemical tests will be performed daily, in order to control the chemical characteristics of combustion residues in the internal laboratory of the plant, monitor the stabilization process and prepare recipes for the solidification process. The solidification process is preceded by the process of combining the produced combustion residues, further the material is subject to the stabilization process, the aging process takes a maximum of 14 days. A sample of the material intended for the treatment of solidificate is taken before the solidification procedure from the storage area after the completion of the crane homogenization procedure, the sample is analyzed by an accredited laboratory, in accordance with the requirements of the Rulebook on Categories, Testing and Classification of Waste ("Official Gazette of RS", no. 56/2010, 93/2019, 39/2021 and 65/2024) for the purposes of determining the physical and chemical treatment.

Representative sampling of the output material from the solidification process (produced solidificate certificate) from the truck will be performed by accredited methods. Physical and chemical tests of a composite sample of 1 batch of 111 t of the produced and disposed solidificate will be performed by an accredited laboratory, in accordance with the requirements of the Rulebook on Categories, Testing and Classification of Waste ("Official Gazette of RS", No. 56/2010, 93/2019, 39/2021 and 65/2024);

Detailed mass balances of the production of solidificates for disposal at the Non-hazardous Waste Landfill (NHWL) are indicated below.

1 mixer cycle in solidification plant		
duration time of 1 mixer cycle, minutes	1 cycle, m^3	1 cycle, ton
2,4	**1,85**	**2,8**

1 solidificate truck for disposal to NHWL			
number of mixer cycles for 1 solidificate truck	duration time 5 cycles to charge 1 truck, minutes	m^3 in 1 truck	tons in 1 truck
5	**12**	**9.25**	**14**

1 BATCH of solidificate deposited at NHWL, subject to testing according to the NEN standard (or equivalent EU standard) by an accredited laboratory			
number of trucks for 1 batch of solidificate	time to produce and dispose of 1 batch of solidificate	m^3 in 1 truck	tons in 1 truck
8	**1 shift from 8h**	**74**	**111**

No. of Mixer Cycles	**Activities in the production and disposal of 1 batch of solidificate**	**Needed Time, min**	**1 solidification truck, tons**	**Sampling of solidificate**
1	5 mixer cycles for 1 truck + transport and disposal on the NHWL	12 40	14	1 sample from truck
2	5 mixer cycles for 1 truck + transport and disposal on the NHWL	12 40	14	1 sample from truck
3	5 mixer cycles for 1 truck + transport and disposal on the NHWL	12 40	14	1 sample from truck
4	5 mixer cycles for 1 truck + transport and disposal on the NHWL	12 40	14	1 sample from truck
5	5 mixer cycles for 1 truck + transport and disposal on the NHWL	12 40	14	1 sample from truck
6	5 mixer cycles for 1 truck + transport and disposal on the NHWL	12 40	14	1 sample from truck
7	5 mixer cycles for 1 truck + transport and disposal on the NHWL	12 40	14	1 sample from truck
8	5 mixer cycles for 1 truck + transport and disposal on the NHWL	12 40	14	1 sample from truck
40 mixer cycle	**1 shift operation of the solidification plant**	416	**111** 1 batch solidificate	***1 composite sample for 1 batch of solidificate**

** out of 5 individual samples of solidificate from each truck, 1 composite sample is formed representative of 1 batch of 111 t of solidificate produced and disposed of at the NHWL, for which a complete analysis and testing by an accredited laboratory is performed, in accordance with the Rulebook on Categories, Testing and Classification of Waste ("Official Gazette of RS", No. 56/2010, 93/2019, 39/2021 and 65/2024).;*

In the in-house laboratory, which was designed as part of the Waste-to-Energy plant, the examination of the waste samples will also be carried out for the purposes of obtaining preliminary rapid analyses. Leaching tests for the subject monolithic waste (solidificate) will be carried out according to standard NEN 7345 Leaching Characteristics of Soil and Stony Building and Waste Materials – Leaching Tests – Determination of the Leaching of Inorganic Components from Building and Monolithic Waste Materials with the Diffusion Test or equivalent method. The concentration limit values are given in the aforementioned Regulation in relation to the 64-day test. For the purposes of obtaining preliminary rapid analyzes for the test, a shorter testing time will be used, whereby the limit values of the concentration will be adjusted to the leaching time applied during the test, given in the aforementioned Regulation.

The data obtained from the examination of the waste for disposal at the landfill, in particular, refer to the following:

1) description of the pretreatment of the waste (the stabilization and solidification procedure to which the waste is subjected) or a statement that the waste can be disposed of without pretreatment;
2) waste composition and leachate quality test;
3) class of landfill where waste is disposed of (Landfill for non-hazardous waste);
4) records that the waste is not on the list of waste, the disposal of which is prohibited in accordance with the regulations;
5) special requirements and measures that should be taken, if necessary, when disposing of waste at the Landfill for non-hazardous waste;
6) certain key parameters for compliance verification, as well as its dynamics.

Considering all of the above, within the Waste-to-Energy plant, the waste that is regularly produced in the same procedure and according to the defined recipes in the same plant will be categorized, therefore the testing will provide data that specifically relate to the following:

1) the variability of the composition of individual recipes of incoming types of waste that are sent to thermal treatment/residuals that are treated by the stabilization and solidification process;
2) variability limits of significant waste properties for each recipe.

After establishing a uniform operating mode and uniform recipes for incoming types of waste that are sent for thermal treatment within the WtE plant, in accordance with the Regulation on disposal of waste in landfills ("Official Gazette of the RS", nos. 92/2010) for waste that is regularly produced in the same procedure and in the same plant, if the measurement results show small deviations in relation to the limit values of the parameters for disposal, testing will be performed during the first delivery, and then a periodic **compliance check** will be performed.

Compliance check is a periodic check of waste that is regularly delivered for disposal in order to determine whether the parameters of the waste correspond to the parameters obtained by testing the waste for disposal and whether they meet the limit values of the parameters for disposal of waste at the Landfill for non-hazardous waste. The compliance check will be performed only for those parameters that were determined as critical during the testing of waste for disposal.

When checking compliance, the same tests will be applied that were used when testing waste for disposal.

The compliance check will be carried out at least once a year, and the landfill operator will take care that it is carried out according to the scope and dynamics in accordance with the Regulation on disposal of waste in landfills ("Official Gazette of the RS", no. 92/2010).

In accordance with the aforementioned Regulation, the operator will perform a regular on-site check, which consists of a visual inspection of each batch of waste before and after unloading, as well as a check of accompanying documentation. Waste is accepted at the landfill if it is determined on the spot that it is identical to the waste that was tested, i.e. the conformity check test, as well as the description in the waste test report.

In the case of deviations from the defined recipes within the WtE plant, testing of waste for disposal will be carried out at each individual receipt of waste at the landfill.

Below are the criteria for accepting or not accepting waste at the subject landfill.

3.2.2.4 Criteria for accepting and disposing of waste

Waste is accepted at the subject landfill only if it meets the criteria for waste acceptance for the designed Landfill for non-hazardous waste, which are as follows:

1) non-hazardous waste that meets the limit values of parameters for disposal of non-hazardous waste;
2) solid, non-reactive hazardous waste (solidified) whose leachate is equivalent to that of non-hazardous waste and which meets the limit values of parameters for disposal of hazardous waste in non-hazardous landfills.

Only pre-treated waste can be deposited at the subject landfill in accordance with the Law on Waste Management and other regulations in this area.

The criteria for accepting or not accepting waste at the landfill are the limit values of the parameters for waste disposal, which are defined in the Rulebook on waste categories, examinations and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021), Annex 8, item 2 and are presented in Table 3.21.

Table 3.21 Disposal of non-reactive hazardous waste[a] at Landfills for non-hazardous waste in cassettes not used for biodegradable waste disposal

Parameter	Concentration limit value in granular waste
Total Organic Carbon (TOC)	5%
pH	Minimum 6
Acid neutralizing capacity (ANC)	Must be evaluated
	Concentration limit value in leachate in mg/ kg dm* (L/S= 10 l/kg)**
Antimony, Sb	0.7
Arsenic, As	2
Copper, Cu	50
Barium, Ba	100
Mercury, Hg	0.2
Cadmium, Cd	1
Molybdenum, Mo	10
Nickel, Ni	10
Lead, Pb	10
Selenium, Se	0.5
Chromium total, Cr	10
Zinc, Zn	50
Evaporation residue at 105°C	60000
Dissolved organic carbon (DOC)	800
Sulfates (SO42-)	20000
Fluorides (F-)	150
Chlorides (Cl-)	15000
	Concentration limit value in leachate in mg/m²kg dm (monolithic waste)* **
Antimony, Sb	0.3

Arsenic, As	1.3
Copper, Cu	45
Barium, Ba	45
Mercury, Hg	0.1
Cadmium, Cd	0.2
Molybdenum, Mo	7
Nickel, Ni	6
Lead, Pb	6
Selenium, Se	0.4
Chromium total, Cr	5
Zinc, Zn	30
Dissolved organic carbon (DOC)	Must be evaluated
Sulfates (SO42-)	10000
Fluorides (F-)	60
Chlorides (Cl-)	10000
	Additional concentration values in monolithic waste
pH	Must be evaluated
Acid neutralizing capacity (ANC)	Must be evaluated
Conductivity, mS/cm at 20°C/m²	Must be evaluated

a- non-reactive hazardous waste is hazardous waste in which the leaching behavior does not deteriorate over a long period of time, under the conditions present at the landfill or in a possible accident, in the waste itself, both due to the influence of external factors (temperature, air, etc.) and other waste including waste disposal products such as landfill gas and leachate.

** dm – dry mass*

*** It refers to granulated or broken monolithic waste. Leaching tests are performed according to the following standards:*

EN 12457-2:2002 Characterization of waste -Leaching – Compliance test for leaching of granular waste materials and sludges – Part 2: One stage batch test at liquids to solid ratio of 10l/kg for materials with particle size below 4mm (without or with size reduction),

EN 12457-4:2002 Characterization of waste -Leaching – Compliance test for leaching of granular waste materials and sludges – Part 4: One stage batch test at a liquids to solid ratio of 10l/kg for materials with particle size below 10mm (without or with size reduction).

**** Leaching tests for monolithic waste are performed according to the NEN 7345 standard Leaching Characteristics of Soil and Stony Building and Waste Materials – Leaching Tests – Determination of the Leaching of Inorganic Components from Building and Monolithic Waste Materials with the Diffusion Test. The concentration limit values are given in relation to the 64- day test, but it is possible to use a shorter test in the first four steps, where the concentration limit values are a quarter of the concentration values for individual parameters, given in the above Table.*

In addition to the parameters given in the above Table, it is possible to examine other parameters that can be found in waste, such as pollutants that are significant from the aspect of risk assessment.

3.2.2.5 Procedures for non-acceptance of waste to landfill

Delivered waste is not accepted when it does not meet the disposal conditions established by the permit, when the delivered waste poses a risk to human health and the environment and when the conditions for disposal of waste at the Landfill for non-hazardous waste prescribed by the Regulation on disposal of waste in landfills ("Official Gazette of the RS", no. 92/2010) and Law on Waste Management ("Official Gazette of the RS", No. 36/2009, 88/2010, 14/2016, 95/2018 -other law and 35/2023) are not fulfilled.

If the acceptance of waste that is determined to require additional or re-examination is refused, the temporary storage of waste in the landfill space provided for this may be allowed, **for a period not longer than four months** in accordance with Article 22 of the Decree on Waste Disposal at Landfills ("Official Gazette of the Republic of Serbia," No. 92/2010). In accordance with the Law, the authority responsible for issuing the permit shall be notified of non-acceptance of waste to the landfill.

Waste solidificate which, based on the test report, is determined not to meet the criteria for acceptance to the landfill, will be, based on the site plan of the landfill with the exact micro-locations of the cassettes in which it was deposited, excavated and removed from the location where it was deposited and handed over in due time for disposal to the operator of landfills and/or storage of hazardous waste or to an operator who has an export permit, in the event that there is no operator in the Republic of Serbia who could dispose of that type of hazardous waste. The mentioned procedure is in accordance with the European

Directive on landfills (EU Landfill Directive - Directive - EU 1999/31/EC i 2008/98/EC[34]).

3.2.2.6 Description of phased disposal of waste at the Landfill for non-hazardous waste

After checking the accompanying documentation and taking a representative sample, if all the prerequisites for receiving waste at the landfill are met and in accordance with the predefined dynamics and technology of landfill formation, the truck with solidified is directed by an internal service road to the location intended for waste unloading. A truck with waste coming from the direction of the Waste-to-Energy plant enters from its southeast side, the transport continues on the south side and from that side the initial waste disposal is carried out, so that the front of the waste unloading from the truck goes in the north direction.

The waste will be unloaded by tipping from the truck in reverse, after which the unloaded material will be spread using a combined machine in order to achieve layers of a uniform thickness of about 30 cm. After spreading, the deposited material will be compacted by multiple passes of the roller to obtain a layer up to 20 cm thick.

When disposing of waste, it will be necessary to respect the defined disposal technology and to apply general rules for waste disposal:

- waste disposal starts at the lowest level of the landfill;
- provide as little daily, operational space as possible (in accordance with the anticipated deposit technology);
- immediately distribute and compact each delivered lot of waste;
- "layers" of waste should be formed up to the designed height;
- ensure the designed slopes of the operating space.

When disposing of waste on the body of the landfill, it is the operator's obligation to keep regular records of the disposal location of each batch of waste received (the amount of waste that is delivered to the landfill in one delivery) and to keep a **location plan of the landfill** with exactly indicated micro-locations of cassettes where non-hazardous waste is deposited /solid non-reactive hazardous waste that will be available even after the landfill is closed.

In order to protect the lining of the bottom of each sector, i.e. the smooth HDPE film and the drainage system for collecting leachate, it is necessary to carry out careful disposal of waste, as well as its spreading and compaction from the very beginning of the exploitation of individual phases. During the initial filling of the waste in the first layer, it is necessary to take care that the roller does not move on the drainage layer in order to protect the film and the drainage system.

After the formation of the initial layer of waste, depositing continues according to the described principle - in the direction of the north, by tipping from the truck in reverse. The truck reaches a certain working zone where the waste is shaken onto the body of the landfill, after which it is spread out with a combined machine (loader). In order to dispose of waste in a controlled manner, a technology based on the system of forming daily cells and stacking them "layer by layer" has been adopted, which provides the possibility for the final disposal of waste with maximum environmental protection measures. Waste disposal in this way also enables "mapping" of the landfill, so that it is possible to track where the disposal and depositing of certain batches of solidificate.

When the level of the initial embankment is exceeded, each layer will be pulled inside the cassette so that the slope of each floor of V:H - 1:1.7 (inclination of 30°) is obtained towards the outside. When one cassette is raised to a height of about 3 m, the working front is moved by 3 m, from all sides. In this way, it will be achieved that for every rise of the landfill of 3 m, the horizontal movement will be about 7.8 m, that is, the general slope of the landfill will be about 21° (V:H ~ 1:2,6).

The planned total height of the landfill is 46 m, relative to the level of 48.00 m above sea level (up to the level of 94.00 m above sea level), in order to harmonize it with the height of the storage for

[34] DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL of 19 November 2008 on waste and the repeal of certain Directives

phosphogypsum, which is located in the immediate vicinity and enable unhindered movement of machinery on the last floor.

Figure 3.23 shows the cross section of the final height of the landfill.

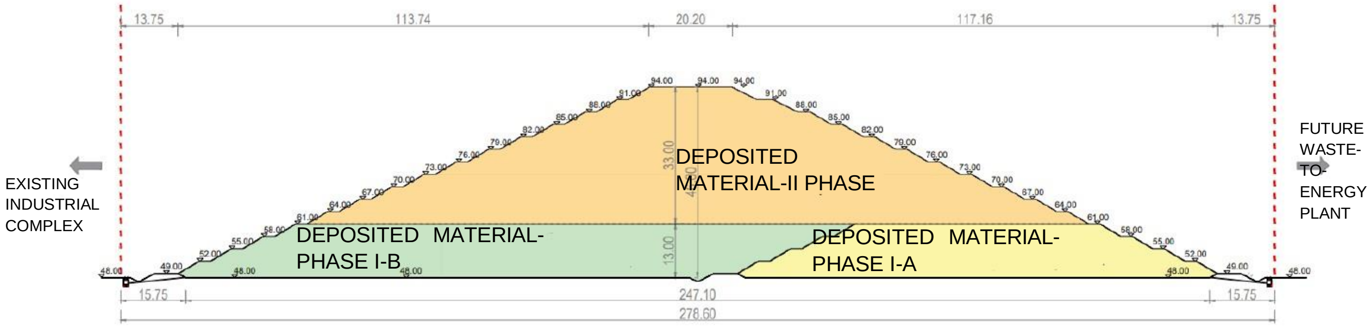


Figure 3.23 Cross section of the final height of the landfill

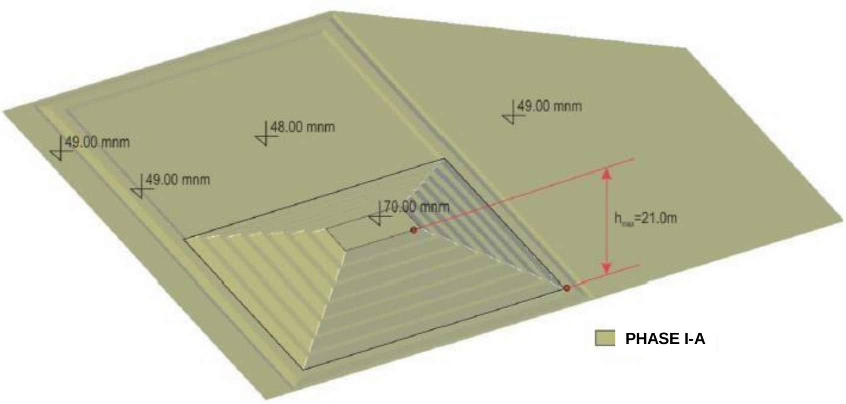
As mentioned above, the landfill body will be filled in phases. First, the initial embankment for phase I-A and the pipeline for receiving leachate from the south and east sides of phase I-A will be built. The perimeter channel will be built on all 4 sides of the stage.

Within phase I-B, the channel is extended from the north side of phases I-A and I-B, while the channel between the phases, on the side where phase I-B now abuts phase I-A, is covered with soil because it will no longer have a function. As part of this phase, the pipeline for the reception of leachate is extended from the south and west side of phase I-B.

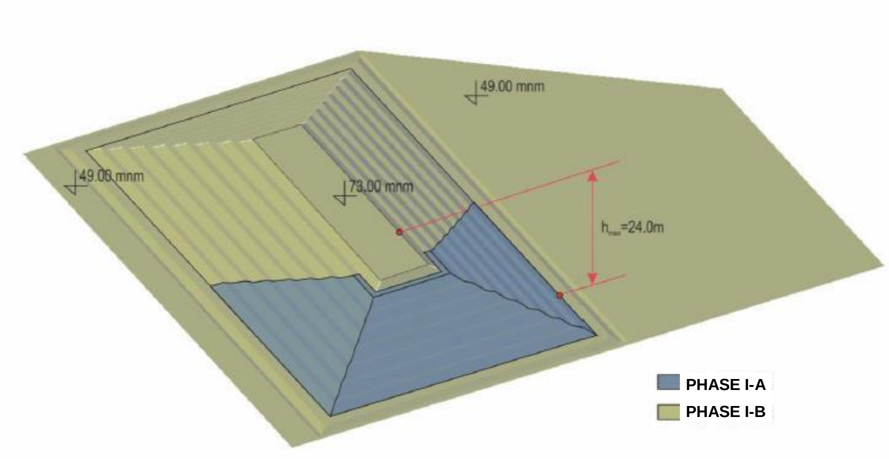
The same principle is applied during the construction of phase II, which will be adjacent to both phases I-A and I-B, and the available space per phase will be filled in several passages, i.e. floors. The height of one passage (floor) is 3 meters. When waste is deposited on the area of the corresponding phase up to that height, the waste is moved from all sides of the floor towards its center by 3 m and work continues on the formation of a new floor with a height of 3 m. An approach ramp for unloading waste will be formed and follow the raising of the landfill. The final layer of the access ramp is intended to be made of classic concrete, with a minimum thickness of 15 cm, in order to prevent solidificate erosion.

Upon reaching the projected height of each phase, the filling of the next phase begins. It begins with the disposal of waste within phase I-A, and depositing is carried out according to the described procedure. The final level of phase I-A is 70.00 meters above sea level, after which waste disposal begins in phase I-B. For the final level of phase I-B, a level of 73.00 m above sea level was determined, after which the filling of phase II, which also occupies the largest storage area, begins. Phase II is being filled up to the final level of 94.00 masl, which is also the final level for closing the landfill.

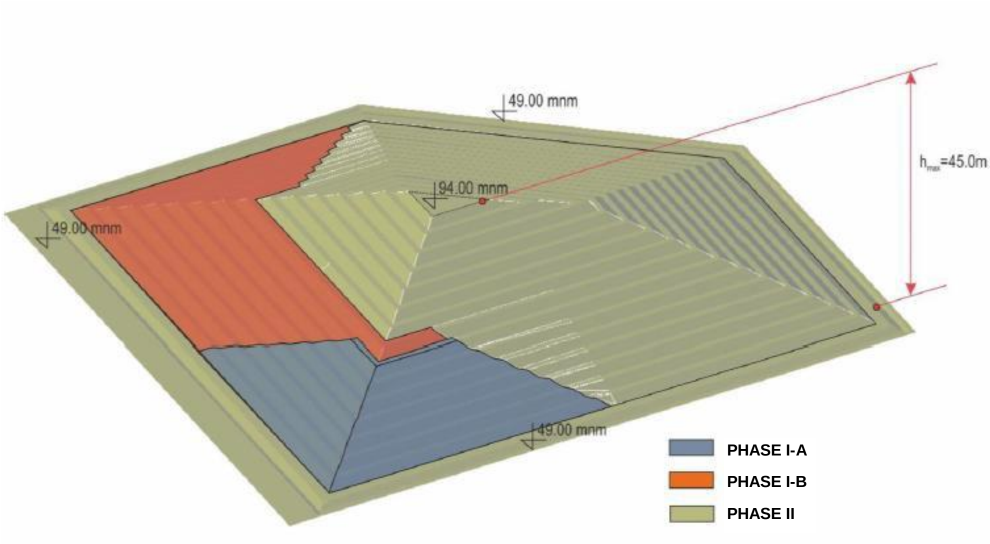
Figure 3.24 shows the 3D models of the landfill by stages. On the basis of these models, the total volume of the storage space, i.e. the capacity of the landfill, which is shown in Table 3.20, was calculated.



Presentation of the 3D model of Phase I-A



Presentation of the 3D model of Phase I-B



Presentation of the 3D model of Phase II

Figure 3.24 Presentation of the 3D model of the construction phases of the landfill

3.2.2.7 *Truck wheel washing unit*

Before entering the landfill complex, trucks will pass over the wheel washing unit U-C03.2 installed at the entrance gate of the landfill. Also, when returning from the landfill to the incinerator complex, the trucks will cross the same unit again. This measure ensures effective dust control and prevents material dispersion, thus contributing to maintaining cleanliness within the industrial complex.

The water from the washing of the wheels of the trucks that deliver the waste material is drained into the collection shaft located within the package wheel washer unit. The wastewater is then pumped into a tank where solids are deposited by passing water through the overflow chamber. The purified water is then reused by the pump to wash the wheels and therefore no outflow of water into the recipient is foreseen. Water acceptance tanks need to be periodically cleaned of precipitated substances, and the contents of the cleaning will be handed over for treatment at the Energy Plant for waste. The length of the wash cycle depends on the operating conditions and is progressively adjusted via the timer located on the front of the control cabinet.

3.2.2.8 *Control of particulate matter emissions from the landfill body*

In order to protect against air pollution, i.e. to prevent the spreading of fine-grained material from the landfill, wetting of the landfill with water has been foreseen. The water for wetting the landfill will be provided from the atmospheric water basin, and the water will be transported to the landfill by equipment installed in the CS_2 shaft pumping station, which is planned directly next to the atmospheric water basin.

The use of long-range sprinklers with a rainfall intensity of about 10 mm/h is planned for the purpose of spraying water over the landfill.

Along the perimeter of the landfill, a pipeline for bringing water to a total of 5 sprinklers with the above characteristics is planned. On this peripheral distribution pipeline, 5 places are provided to which sprinklers would be connected via a flexible hose, up to 40 m long, and distributed as needed along the slopes of the landfill. The approximate diameter of this peripheral pipeline is D=150 mm. The diameter of the flexible hose is 63 mm.

3.2.2.9 Technology of closing the landfill

By advancing the landfill in height, recultivation of its outer slope will be carried out. First, a waterproof layer with a minimum thickness of 50 cm will be placed, then a 20 cm drainage layer of gravel, over which a humus layer with a thickness of 50 cm will be placed. A geotextile with a minimum mass of 150g/ m^2 will be placed between the gravel and the humus layer. In this way, potential air pollution will be prevented and surface runoff will be slowed down, which can be significant in the case of higher landfill heights.

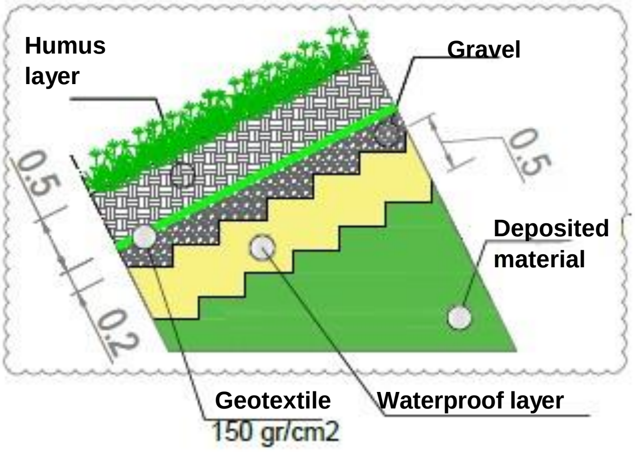


Figure 3.25 Landfill slope arrangement

After the end of the exploitation period (the minimum lifespan of the landfill for maximum waste production is 3.08 m3/h and the annual working time of 8,300 h/year is 44.6 years), the landfill is closed for further disposal of waste by forming an upper covering layer that meets the following technical and technological conditions:

Applied measures in terms of forming the top covering layer	Landfill class For non-hazardous waste
A layer for drainage of landfill gas ≥ 0.3 m	Not required*
Artificial waterproof lining – foil	Not required
Impermeable mineral layer ≥ 0.5 m	Required
A layer for recultivation ≥ 0.5 m	Required

*Landfill gas emissions will not occur at the subject landfill for the disposal of non-hazardous waste / solid, non-reactive hazardous waste (solidified) whose leachate is equivalent to that of non-hazardous waste and which meets the limit values of the parameters for the disposal of hazardous waste in Landfill for non-hazardous waste. All chemical reactions that may lead to the emission of hydrogen, etc., will take place during the process of stabilization and solidification under strictly controlled conditions in the object of stabilization and solidification within the WtE plant, and before the actual process of disposal of the solidificate at the subject landfill.

Compost or waste obtained by other biological treatment technologies can be used for the recultivation layer, which by its composition meets the limit values of waste disposal parameters.

After closing the landfill until its complete shutdown, the operator of the landfill undertakes the following measures:

(1) maintenance, supervision, control and monitoring of landfill space, in accordance with the Regulation on disposal of waste in landfills ("Official Gazette of the RS", no. 92/2010) and Law on Waste Management (“Official Gazette of the RS”, nos. 36/2009, 88/2010, 14/2016, 95/2018 -other law and 35/2023);

(2) creation of a report on the state of the landfill for each calendar year and its submission to the competent authority by March 31 for the previous calendar year at the latest;

(3) reporting of irregularities determined by control and monitoring, which may have a harmful impact on the environment and submission to competent institutions, within seven days from the date of determination of irregularities.

Measures to prevent or reduce environmental pollution are carried out by the operator at his own expense and within the given time frame, in accordance with the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016, 95/2018 -other law and 35/2023).

3.3 Overview of the type and amount of required energy and energy products, water, raw materials, necessary materials for construction, etc.

3.3.1 Types and amounts for the operation of the Waste-to-Energy Plant

3.3.1.1 Types and amounts of energy and energy products required

The supply of the Waste-to-Energy Plant with electricity is planned through the connection to the existing substation TS 110/10kV in the perspective of TS 110/10(20) kV. The total capacity is Pi=7067kW, Pj=6243kW.

Required energy capacities for different purposes (sorted by inputs):

Technological consumers:

Pi=6367kW, Pj=5858kW

General power consumption

Pi=700kW, Pj=385kW

Connection to the gas pipeline: The plant is connected to the internal installation of compressed natural gas (CNG) within the existing Elixir Prahovo complex at KP2300/1 C.M. Prahovo. Natural gas is used to operate the boiler burner as an ignition and auxiliary fuel.

NATURAL GAS CONSUMPTION FOR OPERATION OF TWO BURNERS AT FULL LOAD:	**2,600 Nm^3/h**
TOTAL ASSUMED ANNUAL NATURAL GAS CONSUMPTION (WITH MAX. OPERATION OF THE NATURAL GAS BURNER OF 20%*):	**4,160,000 Nm^3/year**

* Natural gas is used as an ignition and auxiliary fuel to start and shut down the boiler and work with low-caloric fuel.

The impact of the subject plant in terms of the use of natural resources is reflected in water consumption. The Waste-to-Energy plant is not connected to the public water supply and public sewerage, but to the internal network of the existing Elixir Prahovo complex.

The existing Elixir Prahovo complex is supplied with sanitary water from the "Barbaros" spring (capacity 43 l/s), which also supplies water to the settlements of Dušanovac, Prahovo, Radujevac and part of Negotin. This spring is under the jurisdiction of PUC ''Badnjevo '' Negotin.

The following auxiliary process fluids must also be provided for the regular operation of the Waste-to-Energy Plant:

emineralized DEMI water for boiler operation,
rocess water (for scrubbers, solidification, cooling of the sludge tank, dosing of chemicals, etc.)
ompressed Air
itrogen
atural gas (CNG).

3.3.1.2 Types and amounts of water required

The supply of the complex with sanitary water will be carried out by connecting to the existing system for the supply of sanitary water of the existing Elixir Prahovo complex and distributing to the final consumers of the Energy Plant to waste.

The plant will be supplied with sanitary water from the industrial complex Elixir Prahovo with a diameter of D90, to which it is necessary to connect the D63 connection pipeline for the needs of the Waste-to-Energy Plant. Total capacity: Q=1.5 l/s

Demineralized DEMI water (boiler water) will be supplied to the complex by connecting it to the existing Central HPV (chemical preparation of water) plant of the Elixir Prahovo complex (central HPV is the subject of another project), supplying it to DEMI water receiving pools and distributing it to the final consumers of the Waste-to-Energy Plant. The characteristics and estimated consumption of DEMI water are shown in Tables 3.22 and 3.23 respectively.

Table 3.22 Characteristics of DEMI water

Boiler water standard:	SRPS EN 12952-6:2012 Water-tube boilers	
Electrical conductivity	µS/cm	< 30
pH value		6.5 to 8
SiO2	mg/l	<0.02
Water hardness (total)	mg/l	0
Dynamic water pressure at the outlet of plant (column):	bar-g	3-5

Table 3.23 Estimated DEMI Water Consumption

Facility	Consumption (m^3/h)
W-C11 - Boiler	40
W-C11 - SCR	0.15
W-C15 – Spray water refill ammonia water tank	0.1
TOTAL	40.25

Note: The realization of the project will not lead to an increase in the amount of water required for the production of steam compared to the current needs of the Elixir Prahovo complex. Namely, currently, steam used for the evaporation of phosphoric acid in the plants of the Elixir Prahovo complex, as the largest consumer of thermal energy, is produced in a boiler room that uses fossil fuels as an energy source, and after the commissioning of the Waste-to-Energy Plant, the same amount of steam will be obtained from the process of waste thermal treatment within the Waste-to-Energy Plant instead of from the fossil fuel boiler room.

The complex will be supplied with process water (for scrubbers, solidification, cooling of the sludge tank, dosing of chemicals, etc.) by connecting to the existing system of the Elixir Prahovo complex for the delivery of Danube water, after which the primary treatment will be performed on the sand filter system, and the supply to the receiving pools in the U-C02 facility, and then distribution to the final consumers of the Energy Plant to waste.

The existing Elixir Prahovo complex is supplied with **technological water** from the existing pumping station that pumps water from the Danube River. Further, the water is distributed via the main pipeline to the Elixir Prahovo industrial complex. The current capacity of the Danube pumping station is about 3000 m^3/h, and the pressure of technological water at the outlet of the pumping station is 5 bar. The existing Elixir Prahovo complex uses process water and for the needs of hydrant water, i.e. there is a single pipeline on the site for both purposes. The maximum required amount of process water is Q= 122 m^3/h (of which 50 m^3/h is used to prepare process water for the needs of consumers at the complex, and 72 m^3/h (20l/s) is used to refill the tank for fire protection purposes).

Characteristics and estimated process water consumption are shown in Tables 3.24 and 3.25 respectively.

Table 3.24 Process water characteristics

Parameter name	Unit	Min.	Max.
pH	-	6.75	8.13
Electrical conductivity	(µS/cm)	359	451
$KMnO_4$	(mg/l)	16.66	60
Bicarbonates / m-alkalinity	-	150	250
SiO_2	(mg/l)	1.25	3.5
Temp.	(°C)	9	25
Turbidity	NTU	2.72	30
TOC	(mg/l)		5.948
Content of suspended matter	(mg/l)	0	10
Cl	(mg/l)	14	39
NH_4	(mg/l)	0.041	39.09
Fe	(mg/l)	0.01	0.12

Table 3.25 Estimated process water consumption

Facility	Consumption (m^3/h)
Acceptance and storage of liquid waste materials	5
W-C11 – Desludging tank	1
W-C11 – Closed system refill	0.5
W-C11 – Ash suspension reactor	1
W-C11 – Centrifuge 1 and Centrifuge 2	3.5
W-C11 – HCl scrubber, SO_2 scrubber, pH station, Emergency water tank,	7
W-C11 – Washing instruments	0.5
W-C11 – Lime milk preparation tank	3
W-C11 – Chemical dosing – polymer dosing stations	1
W-C12 – Storage of ash mixture and thickened sediment (water for	1
W-C12 – Water scale/ mixer	10
W-C11 – washing screen walls / washing heating surfaces	6
TOTAL	**39.5**
Filter washing process water consumption (per filter)	
U-C02 – Auxiliary systems (sand filter washing capacity 50m^3/h)	35 (m^3/wash)
U-C02 – Wastewater treatment plant (washing sand filters and activated carbon filters with a capacity of 5m^3/h)	5 (m^3/wash)
TOTAL	**40 (m^3/wash)**

The total estimated annual consumption of process water is approximately 316,000 m^3/year.

With firefighting water (hydrant network and fire extinguishing), the complex will be supplied by connecting to the above-mentioned existing system of delivery of Danube water, delivery to the FP water tank and distribution to the final consumers of the Energy Plant to waste. Hydrant network connection: The plant is connected to the existing D600 system of the Elixir Prahovo complex for the delivery of technological/fire-fighting Danube water. The plant will be supplied with technological-hydrant and FP water from the fire water tank 1200 m^3, which will be replenished with technical water, for which it is necessary to construct a connection pipeline.

Total capacity

External and internal hydrant network: According to the applicable fire regulations, and in relation to the purpose and size of the facility, it is envisaged to install an internal fire protection network with a capacity of simultaneous operation of two internal hydrants (2x2.5 l/s), as well as an external annular hydrant network with simultaneous operation of five external hydrants with a capacity of 5x5.0 l/s, which amounts to a total of 30.0 l/s.
Refill of fire water tank 1200 m^3: Q=20 l/s

3.3.1.3 Compressed Air

Compressed air is brought to the Waste-to-Energy Plant from the existing Elixir Prahovo complex. Compressed air of technical quality is supplied from the existing Elixir Prahovo complex to the compressed air tanks in the U- C02 auxiliary systems facility. Compressed air is distributed from the tank to the end consumers.

The compressed air of technical quality coming from the Elixir Prahovo Central Compressor Station has the following characteristics:

- Nominal flow, 3510 Nm^3/h
- Nominal pressure, 6.5 barg
- Dew point, compressed air quality measure (PDP) +3°C

The total produced compressed air supplied from the Central Compressor Station is of quality 1.4.1 according to SRPS ISO 8573-1:2020 (Compressed air contaminants and purity classes).

A part of the compressed air of technical quality is used to obtain compressed air of instrumental quality. In addition to adequate pressure and purity, instrument-quality compressed air must have a favorable dew point (PDP -40°C) to prevent moisture condensation inside the instruments.

The purity class of compressed air of instrumental quality is shown in Table 3.26, in accordance with SRPS ISO 8573-1:2020 (Compressed air contaminants and purity classes).

Table 3.26 Compressed air purity class

Cleanliness class for	Compressed Air
Particles	Class 2
Humidity and water	Class 2 Dew point temperature ≤ -40°C
Oil	Class 2 Total oils ≤ 0.01 mg/m^3

The estimated consumption of compressed air within the Waste-to-Energy Plant is shown in Table 3.27.

Table 3.27 Estimated compressed air consumption

Facility	**Compressed air of technical quality (1.4.1 - SRPS ISO 8573-1) (Nm^3/h)**	**Compressed air of instrument quality (1.2.1 - SRPS ISO 8573-1) (Nm^3/h)**	**Total compressed air consumption (Nm^3/h)**
W-C11 - Boiler plant	710	140	850
W-C11 – Liquid Waste Atomization Air	1000	-	1000
W-C11 – Envirochemie air	40	60	100
W-C13 - Transfer station and W-C08 Liquid waste pre-treatment and storage	-	10	100
W-C09 and W-C16 Bag filters	120	-	120
U-C06 - Wastewater basin, wastewater treatment plant and U-C02 - process water preparation	-	60	60
W-C12-Solidification	-	40	40
U-C02 - Air for nitrogen generators	-	1040	1040
Reserve	100	100	200
TOTAL	**1970**	**1540**	**3510**
TOTAL ANNUAL CONSUMPTION	**15,760,000 Nm^3/year**	**12,320,000 (Nm^3/year**	**28,080,000 Nm^3/year**

3.3.1.4 Nitrogen distribution

Nitrogen is generated from compressed air in the U-C02 auxiliary systems facility and distributed to consumers from there. Table 3.28 shows the estimated nitrogen consumption.

Table 3.28 Estimated nitrogen consumption

Facility	Consumption (Nm^3/h)
W-C11 - Waste thermal treatment plant;	60
W-C13 - Liquid waste transfer point	15
W-C08 - Pretreatment and waste storage	250

Total (simultaneity factor 0.85)	275

3.3.1.5 *Types and amounts of raw materials*

Waste-to-Energy of non-recyclable waste implies thermal treatment of non-recyclable hazardous and non-hazardous liquid and solid/sludge waste (industrial, commercial and municipal) in the stationary plant in question.

The total capacity of the Waste-to-Energy plant (Waste-to-Energy Plant) is 100,000 t/g of thermally treated waste for 8,000 (h) per year.

The basic characteristics of the waste to be treated in the plant in question are given in Table 3.29.

Table 3.29 Basic characteristics of waste

Waste type	Non-recyclable utility, commercial and industrial waste (non-hazardous and hazardous)
Waste mass flow, t/h	3.43 – 17.24 *
Waste flow rate, m^3/h	11.0 – 57.0 *
Nominal moisture content, wt. %	50% per 7 MJ/kg 10% per 20 MJ/kg
Designed moisture content, wt. %	5 - 50
Ash content, wt. %	40% at 7 MJ/kg

* Depends on the thermal power of the waste

The complete List of waste to be managed by the Project Holder at the location in question, given by waste groups (hazardous and non-hazardous), index numbers and hazardous waste characteristics according to the Waste Catalogue, as well as planned capacities, is shown in the appendix to the Study. The list is determined on the basis of the characteristics of the thermal treatment plant, the identification of types of waste that can be thermally treated (in terms of e.g. physical condition, chemical characteristics, hazardous properties and acceptable ranges of calorific value, humidity, ash content, etc.), as well as in accordance with the provisions of the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", No. 56/2010, 93/2019 and 39/2021) and the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023). The annex to the Study also includes a list of excluded index numbers from the R1 operation.

The project documentation defines that waste containing more than 1% of halogen organic substances expressed as chlorine **cannot be treated** on the boiler. It is strictly forbidden to receive waste that is explosive, flammable, infectious, radioactive, waste materials containing or contaminated with polychlorinated biphenyls (PCBs) and/or polybrominated triphenyls (PCTs) and/or polybrominated biphenyls (pbb), waste containing cyanides, isocyanates, thiocyanates, asbestos, peroxides, biocides, cytostatics, electronic waste. Additional restrictions on admission to the plant in question are waste substances in the form of aerosols, as well as organometallic compounds (spent metal-based catalysts, or organometallic wood preservatives) and aluminized paints. The acceptance of substances exceeding the threshold limits for POPs shall not be permitted, in accordance with Article 4 and Annex I, Part A of Regulation (EU) 2019/1021 of the European Parliament and of the Council dated 20 June 2019.

Table 3.30 contains a List of hazardous characteristics of waste/properties of waste that make it hazardous in accordance with Annex 5 - H list, Rulebook on waste categories, examination and classification ("Official Gazette of the RS", no. 56/2010, 93/2019 and 39/2021), **whose acceptance at the Waste-to-Energy Plant is strictly prohibited.**

Table 3.30 Overview of hazardous characteristics of waste/properties of waste that make it hazardous, whose acceptance at the Waste-to-Energy Plant is strictly prohibited

HP 1	"Explosive": waste in which, due to chemical reactions, gas can be generated at such temperatures, pressures and rates that it can cause destruction in the environment. This includes self-igniting waste, explosive organic peroxide waste and explosive self-reactive waste.
HP 3	"Flammable": waste which, according to its properties, is easily ignited or which, due to friction, can ignite or contribute to the creation of a fire: - flammable liquid waste: liquid waste whose ignition point is below 60°C or waste gas oil, diesel and light fuel oil whose ignition point is in the temperature interval between > 55 °C and ≤ 75 °C; - self-igniting liquid and solid waste: solid or liquid waste that, even in small quantities, can ignite within five minutes after coming into contact with air; - flammable solid waste: solid waste that is easily flammable or can cause or promote fire by friction; - flammable gaseous waste: gaseous waste that can ignite after coming into contact with air at a temperature of 20 °C and a standard pressure of 101.3 kPa; - waste that reacts with water: waste that in contact with water releases flammable gases in dangerous quantities; - other flammable waste: flammable aerosols, flammable self-heating waste, flammable organic peroxides and flammable self-reactive waste.
HP 9	"Infectious": waste containing active microorganisms or their toxins, which are known or suspected to cause disease in man or other living organisms
HP 12	"Release of acute toxic gases": waste that releases toxic or highly toxic gases in contact with water or acid (classified as acute toxic, cat. 1, 2 or 3)

In the event that it is determined that the waste does not meet the requirements of the request or the needs of the operator, it shall be immediately returned to the supplier, by the same means of transport by which the waste was delivered.

Table 3.31 provides a list of waste intended for thermal treatment in the Waste-to-Energy Plant.

Table 3.31 List of waste foreseen for thermal treatment in the Waste-to-Energy Plant by waste groups

Group of waste	Place of generation and origin of waste (activity from which waste is generated)
02	WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING
03	WASTES FROM WOOD PROCESSING AND PRODUCTION OF PAPER, CARDBOARD, PULP, PANELS AND FURNITURE
04	WASTES FROM TEXTILE, FUR AND LEATHER INDUSTRY

05	WASTES FROM OIL REFINING, NATURAL GAS PURIFICATION AND PYROLYTIC TREATMENT OF COAL
06	WASTES FROM INORGANIC CHEMICAL PROCESSES
07	WASTES FROM ORGANIC CHEMICAL PROCESSES
08	WASTES FROM PRODUCTION, FORMULATION, SUPPLY AND USE COATINGS (PAINTS, VARNISHES AND GLASS GLAZES), ADHESIVES, SEALANTS AND PRINTING INKS
09	WASTES FROM THE PHOTOGRAPHY INDUSTRY
10	WASTES FROM THERMAL PROCESSES
11	WASTES FROM CHEMICAL TREATMENT OF THE SURFACE AND PROTECTION OF METALS AND OTHER MATERIALS; HYDROMETALLURGY OF NON-FERROUS METALS
12	WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METAL AND PLASTICS
13	WASTES FROM OILS AND RESIDUES OF LIQUID FUELS (EXCEPT EDIBLE OILS AND THOSE IN CHAPTERS 05, 12 AND 19)
14	WASTE ORGANIC SOLVENTS, REFRIGERANTS AND PROPELLANTS GASES (EXCEPT 07 AND 08)
15	PACKAGING WASTE, ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE FABRICS, UNLESS OTHERWISE SPECIFIED
16	WASTES NOT OTHERWISE SPECIFIED IN THE CATALOG
17	CONSTRUCTION AND DEMOLITION WASTE (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)
18	WASTES FROM HUMAN AND ANIMAL HEALTH CARE AND/OR RELATED RESEARCH (EXCLUDING KITCHEN AND RESTAURANT WASTES NOT COMING FROM IMMEDIATE HEALTH CARE)
19	WASTES FROM WASTE TREATMENT PLANTS, OFF-SITE WASTEWATER TREATMENT PLANTS AND WATER PREPARATION FOR HUMAN CONSUMPTION AND USE IN INDUSTRY
20	MUNICIPAL WASTE (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL AND INDUSTRIAL WASTE), INCLUDING SEPARATELY COLLECTED FRACTIONS

Table 3.32 gives an overview of the hazardous characteristics of waste to be managed within the Waste- to-Energy Plant, in accordance with the H list of the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", no. 56/2010, 93/2019, 39/2021 and 65/2024).

Table 3.32 List of hazardous characteristics of waste to be managed within the Waste-to-Energy Plant, in accordance with the H list of the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", No. 56/2010, 93/2019, 39/2021 and 65/2024)

<table>
<tr><td>HP 2</td><td>"Oxidizing": waste that can, mainly by releasing oxygen, cause the combustion of other materials or contribute to the combustion of other materials.</td><td>Waste containing one or more substances classified in the hazard classes and hazard categories and hazard notification codes in Table 1, waste shall be assessed, as appropriate and proportionate, with regard to the HP 2 waste label in accordance with the test methods set out in the regulations governing the methods of testing hazardous properties of chemicals. If the presence of any of these substances in the waste indicates that the waste is oxidizing, the waste is classified as hazardous and is assigned HP 2.
Table 1: Hazard classes, category codes and hazard statements for waste constituents regarding its classification as hazardous under HP 2
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th></tr>
<tr><td>Oxidizing gases, category 1</td><td>H 270</td></tr>
<tr><td>Oxidizing liquids, category 1</td><td>H 271</td></tr>
<tr><td>Oxidizing solids and mixtures, category 1</td><td></td></tr>
<tr><td>Oxidizing liquids, category 2 or 3</td><td>H 272</td></tr>
<tr><td>Oxidizing solids or mixtures, categories 2 and 3</td><td></td></tr>
</table>
</td></tr>
<tr><td>HP 4</td><td>"Irritant – skin irritation and eye damage": waste that may cause skin irritation or eye damage when handled.</td><td>Wastes containing one or more substances in concentrations above the limit value to be taken into account in the hazard assessment, which are classified in one of the following classes, categories and hazard notices, and whose concentrations are equal to or higher than the threshold concentration, are classified as hazardous by HP 4.
The limit value to be considered in the hazard assessment for hazard classes "Skin corrosion" category 1A (H314), "Skin irritation" category 2 (H315), "Serious eye damage" category 1 (H318) and "Eye irritation" category 2 (H319) is 1%.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>When the sum of the concentrations of all substances present in the waste and also classified as "Skin Corrosion" category 1A (H314) is equal to or greater than the 1% concentration limit, the waste is classified as hazardous by HP 4.
When the sum of the concentrations of all substances present in the waste and also classified as "Serious eye damage" category 1 (H318) is equal to or greater than the 10% concentration limit, the waste is classified as hazardous by HP 4.
When the sum of the concentrations of all substances present in the waste and also classified as "Skin Irritation" category 2 (H315) and "Eye Irritation" category 2 (H319) is equal to or greater than the 20% concentration limit, the waste is classified as hazardous by HP 4.
Wastes containing substances classified as "Skin Corrosion" category 1A, 1B or 1C (H314) in a concentration equal to or greater than 5% are classified as hazardous by HP 8. In this case, HP 4 does not apply to waste already classified as HP 8.</td></tr>
<tr><td>HP 5</td><td>'Specific target organ toxicity/Aspiration hazard': waste which may cause specific target organ toxicity due to single (SE) or repeated exposure (RE) or which may cause acute toxic effects after aspiration.</td><td>Waste containing one or more substances that are cladified into one or more of the hazard category classes in Table 2, while reaching or exceeding the values of one or more concentration limits in Table 2, is classified as hazardous by HP 5. Where substances classified in the "Specific target organ toxicity" class are present in the waste, the individual concentrations of these substances must be equal to or greater than the values of the concentration limits for the waste to be classified as hazardous by HP 5.
Waste containing one or more substances classified as "Aspiration Hazard", category 1, and the sum of the concentrations of these substances reaches or exceeds the concentration limit value for that hazard class, is classified as hazardous by HP 5 only if the total kinematic viscosity (at a temperature of 40 °C) does not exceed the value of 20.5mm2/s. Note: Kinematic viscosity is determined exclusively for fluids.

Table 2. Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 5
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Specific target organ toxicity – SE, category 1</td><td>H370</td><td>1%</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>HP 6</td><td>“Acute toxicity”: waste which may cause acute toxic effects after oral administration, dermal contact or after exposure by inhalation.</td><td>When the sum of the concentrations of all substances present in the waste classified in the acute toxicity hazard class and according to the hazard notification categories and codes in Table 3 reaches or exceeds the concentration limit value specified in Table 3 for that hazard class and category, the waste is classified as hazardous by HP 6. When more than one substance classified as acutely toxic is present in the waste, the sum of the concentrations refers exclusively to substances belonging to the same hazard category.
The following substance limit values are taken into account in the hazard assessment:
– For substances classified as acutely toxic category 1, 2 or 3 (H300, H310, H330, H301, H311, H331): 0.1%
– For substances classified as acutely toxic, category 4 (H302, H312, H332): 1%.

Table 3 Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 5
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Acute oral toxicity, category 1</td><td>H300</td><td>0.1%</td></tr>
<tr><td>Acute oral toxicity, category 2</td><td>H300</td><td>0,25%</td></tr>
<tr><td>Acute oral toxicity, category 3</td><td>H301</td><td>5%</td></tr>
<tr><td>Acute oral toxicity, category 4</td><td>H302</td><td>25%</td></tr>
<tr><td>Acute dermal toxicity, category 1</td><td>H310</td><td>0,25%</td></tr>
<tr><td>Acute dermal toxicity, category 2</td><td>H310</td><td>2,5%</td></tr>
<tr><td>Acute dermal toxicity, category 3</td><td>H311</td><td>15%</td></tr>
<tr><td>Acute dermal toxicity, category 4</td><td>H312</td><td>55%</td></tr>
<tr><td>Acute inhalation toxicity, category 1</td><td>H330</td><td>0.1%</td></tr>
<tr><td>Acute inhalation toxicity, category 2</td><td>H330</td><td>0.5%</td></tr>
<tr><td>Acute inhalation toxicity, category 3</td><td>H331</td><td>3,5%</td></tr>
<tr><td>Acute inhalation toxicity, category 4</td><td>H332</td><td>22.5%</td></tr>
</table></td></tr>
<tr><td>HP 7</td><td>“Carcinogenic”: waste that causes or increases the incidence of cancer.</td><td>Waste containing a substance classified as "Carcinogenicity", category 1A, 1B or 2 and which reaches or exceeds the value of the concentration limits in Table 4 for that hazard category, is classified as hazardous by HP 7. When more than one substance classified as carcinogenic is present in the waste, the individual substance must be present at a concentration equal to or greater than the concentration limit for the waste to be classified as hazardous by HP 7.

Table 4 Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 7
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>Carcinogenicity, category 1A</td><td>H350</td><td>0.1%</td></tr>
<tr><td>Carcinogenicity, category 1B</td><td></td><td></td></tr>
<tr><td>Carcinogenicity, category 2</td><td>H351</td><td>1.0%</td></tr>
</table>
</td></tr>
<tr><td>HP 8</td><td>“Corrosive”: waste in contact with which skin corrosion may occur.</td><td>Waste containing one or more substances that are classified as “Skin Corrosion” category 1A, 1B or 1C (H314), and the sum of their concentrations reaches or exceeds 5%, waste is classified as hazardous by HP 8.
The limit value to be taken into account when assessing the hazard of waste with regard to the hazard class “Skin Corrosive” of categories 1A, 1B and 1C (H314) is 1.0%.</td></tr>
<tr><td>HP 10</td><td>“Toxic to reproduction”: waste that adversely affects the sexual function and fertility of men and women, as well as the development of the fetus.</td><td>Waste containing a substance classified as "Toxic to reproduction", category 1A, 1B or 2 and which reaches or exceeds the value of the concentration limits in Table 5 for that hazard category, is classified as hazardous by HP 10. When more than one substance classified as toxic to reproduction is present in the waste, the individual substance must be present at a concentration equal to or greater than the concentration limit for the waste to be classified as hazardous by HP 10.

Table 5 Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 5
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Reproductive toxicity, category 1A</td><td>H360</td><td>0.3%</td></tr>
<tr><td>Reproductive toxicity, category 1B</td><td></td><td></td></tr>
<tr><td>Reproductive toxicity, category 2</td><td>H361</td><td>3.0%</td></tr>
</table>
</td></tr>
<tr><td>HP 11</td><td>“Mutagenicity”: Waste that may cause a mutation that is a permanent change in the amount or structure of genetic material in a cell.</td><td>Waste containing a substance classified as " Mutagenicity of germ cells ", category 1A, 1B or 2 and which reaches or exceeds the value of the concentration limits in Table 6 for that hazard category, is classified as hazardous by HP 11. When more than one substance classified as mutagenic is present in the waste, the individual substance must be present at a concentration equal to or greater than the concentration limit for the waste to be classified as hazardous by HP 11.

Table 6 Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 5
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Germ cell mutagenicity, category 1A</td><td>H340</td><td>0.1%</td></tr>
<tr><td>Germ cell mutagenicity, category 1B</td><td></td><td></td></tr>
<tr><td>Germ cell mutagenicity, category 2</td><td>H341</td><td>1.0%</td></tr>
</table>
</td></tr>
<tr><td>HP 13</td><td>“Sensitising”: waste containing one or more substances that are known to have the ability to cause a skin or respiratory</td><td>When a waste contains a substance that has been classified as sensitizing and to which hazard statements H317 or H334 have been assigned, and whose individual concentration reaches or exceeds the 10% concentration limit value, the waste is classified as hazardous by HP 13.</td></tr>
</table>

	sensitisation (hypersensitivity) reaction.	
HP 14	HP 14 "Ecotoxic": waste that poses or may pose short- or long-term risks to one or more environmental media.	Waste that meets any of the following conditions listed below is classified as hazardous by HP 14: – waste containing a substance classified as hazardous to the ozone layer and to which Hazard statement H420 has been assigned in accordance with the regulations governing the classification, packaging and labelling of chemicals and certain products, the concentration of which reaches or exceeds the concentration limit value of 0.1%. **[c (H420) ≥ 0.1%]** – waste containing one or more substances classified as acutely toxic to the aquatic environment and assigned a hazard notification N400 in accordance with the regulations governing the classification, packaging and labelling of chemicals and certain products, and the sum of their concentrations reaches or exceeds a concentration limit value of 25%. These substances are subject to a limit value taken into account in the hazard assessment for acute aquatic toxicity hazard classes of 0.1%. **[Σ c (H400) ≥ 25%]** – waste containing one or more substances classified as chronically toxic to the aquatic environment of categories 1, 2 or 3 and assigned one or more of the following hazard notices: H410, H411 or H412 in accordance with the regulations governing the classification, packaging and labelling of chemicals and certain products, the sum of the concentrations of all substances classified as chronically hazardous to the aquatic environment, category 1 (H410) multiplied by 100, added to the sum of the concentrations of all substances classified as chronically hazardous to the aquatic environment, category 2 (H411) multiplied by 10 and added to the sum of the concentrations of all substances classified as chronically hazardous to the aquatic environment, category 1 (H410) equal to or greater than the limit concentration value of 25%. The limit value applicable to substances to which the H410 hazard statement has been assigned is 0.1%, while the limit value of 1% applies to substances to which the H411 or H412 hazard statements have been assigned. **[100 × Σc (H410) + 10 × Σc (H411) + Σc (H412) ≥ 25%]** – waste containing one or more substances classified as chronically toxic to the aquatic environment of categories 1, 2 or 3 and assigned one or more of the following hazard notices: H410, H411 or H412 in accordance with the regulations governing the classification, packaging and labelling of chemicals and certain products, and the sum of the concentrations of all substances classified as chronically toxic to the aquatic environment is equal to or greater than the limit concentration value of 25%. The limit value applicable to substances to which the H410 hazard statement has been assigned is 0.1%, while the limit value of 1% applies to substances to which the H411 or H412 hazard statements have been assigned. **[Σ c (H410) + Σ c (H411) + Σ c (H412) + Σ c (H413) ≥ 25%]** Where: Σ = sum and s = individual concentration of the substance in the waste.

<table>
<tr>
<td>HP 15</td>
<td>“Waste that may exhibit some of the hazardous properties from the HP markings (HP 1 – 14) and that it did not originally exhibit”.</td>
<td>Waste containing one or more substances that has been assigned one of the hazard statements or additional hazard statements (H205, EUH001, EUH019 or EUH044) listed in Table 7 is classified as hazardous by HP 15 unless the waste is in such a form that under no circumstances can it exhibit explosive or potentially explosive properties.

Table 7: Hazard statement and additional hazard statement for waste constituents regarding its classification as hazardous by HP 15
<table>
<tr><th colspan="2">Hazard Statement/
Additional Hazard Notification</th></tr>
<tr><td>May explode en masse in a fire</td><td>H205</td></tr>
<tr><td>Explosive when dry</td><td>EUH001</td></tr>
<tr><td>Can form explosive peroxides</td><td>EUH019</td></tr>
<tr><td>Risk of explosion if heated indoors</td><td>EUH044</td></tr>
</table>
</td>
</tr>
</table>

Note: The methods used for testing are prescribed by the regulation governing the methods of testing hazardous properties of chemicals in accordance with the Rulebook on Methods of Testing Hazardous Properties of Chemicals ("Official Gazette of RS", No. 117/13) or the Institute for Standardization of Serbia and other relevant notes of the European Committee for Standardization or other internationally recognized testing methods and guidelines.

3.3.1.6 Use of auxiliary raw materials

Sand

In order to maintain the fluidized layer in the thermal waste treatment boiler, sand must be periodically added to the layer to compensate for losses that are separated at the bottom along with slag. Sand consumption mostly depends on the content of non-combustible substances and fuel composition and is about 20 kg/h. Sand for replenishment is delivered by truck and pneumatically transported to the silo, with a volume of 60 m^3.

The granulometric specification of the sand is provided in the annex to the Study.

Activated carbon

As part of the plant in question, activated carbon will be used in the filters for the treatment of waste gases and the filter for the treatment of wastewater.

Activated carbon is delivered and stored in containers in close proximity to the dosing site itself.

For the needs of the activated carbon reactor to achieve a mass flow of 8 kg/h, two containers are provided within the boiler plant, which are placed one above the other. The lower container is fixed and from it the dosing of activated carbon into the reactor is performed, while the upper container is replaced if necessary and serves to supplement the lower, dosing container. When the upper container is emptied, it is replaced.

As part of the system, dusting and ventilation of the waste pretreatment facility, in addition to bag filters, an activated carbon filter is also provided (activated carbonvolume: ~70 m^3).

Table 3.33 Physical and chemical characteristics of activated carbon

Composition	Moisture - 0.5% (mass)	
	Ash - 9 % (mass)	
	Volatile Components – 3% (mass)	
	Carbon 87.5% (mass)	
Granulation	> 0.315mm)	5% (mass)
	0.200-0.315 mm	8% (mass)
	0.125-0.200mm	12% (mass)
	0.090-0.125mm	15% (mass)
	0.063 – 0.090 mm	10% (mass)
	<0.063 mm	50% (mass)
	d_{50}	63 µm
Bulk density	0.55 g/cm^3	
Specific Surface Area	300(+/- 30)m^2/g	

Corrosion Inhibitors: Nalco BT-21

The Nalco BT-21 anticorrosive binds oxygen and thus provides corrosion protection within the boiler system. Nalco BT-21 is an organic inhibitor that is dosed into the feed water.

Table 3.34 Physical and chemical characteristics of Nalco BT-21

Physical state and color	Liquid, colorless
Odour	Odorless
Density	kg/m^3
Freezing point	-2°C
pH	8.0
Solubility in water	Fully soluble
Flammability	Non-flammable
Explosiveness	Non-explosive
Reactivity	Not reactive

Nalco BT-26

The anticorrosive Nalco BT-26 is a corrosion inhibitor containing a mixture of low and medium volatility amines. NALCO BT-26 effectively minimizes potential corrosion-induced boiler pipe failures.

Table 3.35 Physical and chemical characteristics of Nalco BT-26

Physical state and color	Liquid, light yellow
Odor	Amminous (unpleasant)
Density	kg/m^3
Flash point	>93.3°C
Freezing point	-11°C
pH	11.0
Solubility in water	Fully soluble
Flammability	Non-flammable
Explosiveness	Non-explosive
Reactivity	Not reactive

Ammonia water or ammonium hydroxide is a colourless, clear liquid with a sharp characteristic odour. It is completely mixed with water. The aqueous solution of ammonia has pronounced corrosive properties.

Table 3.36 Physical and chemical characteristics of ammonia water

Chemical formula	NH_4OH
Concentration	25% solution
Physical state and color	Colorless liquid
Odor	Pungent odour
Density	0.907 g/cm³ @20ºC
Viscosity	1.1 mPas @20ºC, 26% solution
Vapour pressure	41690 Pa @20ºC, 23% solution
Freezing point	-69.2ºC @ 28% solution
Solubility	soluble in water; 510-531 g/L@ 20ºC
pH	Approx. 11
Flammability	Not flammable
Explosiveness	Not explosive
Oxidizing properties	No
Reactivity	Violent reaction with strong alkalines

Lime milk, i.e. an aqueous solution of hydrated lime is used in the process wastewater treatment plant of the boiler plant, as well as to adjust the pH value of the circulating water in the suspension tank and the gypsum suspension overflow tank. The lime milk is prepared in the lime milk storage and dosing system.

Table 3.37 Physical – chemical characteristics of hydrated lime

Chemical formula	$Ca(OH)_2$
Concentration of calcium hydroxide in aqueous suspension	1-5% (mass)
Physical state and color	White powder
Odor	Odorless
Density	2.211 g/cm³
Molar mass	74,093 g/mol
Melting point	580 ºC
Solubility in water	0.189 g/100 mL@ 0 ºC 0.173 g/100 mL@ 0 ºC
Flammability	Non-flammable
Explosiveness	Non-explosive

Chemicals to regulate pH value

The wastewater treatment plant is supplied with chemicals for the purpose of regulating the pH value of wastewater and the deposition of suspended particles in water. Chemicals that are prepared, stored and later dosed to consumers in this system are:

- iron (3) chloride – $FeCl_3$,
- iron (III) sulfate - $Fe(III)SO_4$,
- trimercapto-s-triazine - TMT15,
- polymers P150 and P1000.

Table 3.38 Physical – chemical characteristics of iron III chloride

Chemical formula	$FeCl_3$
Components	Water, 58-72% (mass)

	$FeCl_3$, 28-42%(mass)
Physical state and color	Red-brown liquid
Odor	Slight pungent
Density	1,2,-1,6 g/cm^3
Molar mass	162.2 g/mol
Boiling point	106 °C
pH	<2
Vapour pressure	40 mmHg@ 20 °C
Solubility in water	Fully soluble
Flammability	Non-flammable
Explosiveness	Non-explosive
Reactivity	It can react with metals. In that reaction hydrogen separation may occur

Table 3.39 Physical – chemical characteristics of iron III sulphate

Chemical formula	$Fe_2(SO_4)_3$
Components	Water, 39-65% (mass)
	$Fe_2(SO_4)_3$, 35-50% (mass)
	Sulfuric acid, <1%(mass)
Physical state and color	Red-brown liquid
Odor	Slight pungent
Density	1,2,-1,6 g/cm^3
Molar mass	399.88 g/mol
Boiling point	100-113 °C
pH	<2
Solubility in water	Fully soluble
Flammability	Non-flammable
Explosiveness	Non-explosive
Reactivity	Corrosive in contact with iron, bronze and brass. If heated, separation of SOx gases may occur

Table 3.40 Physical – chemical characteristics of TMT15 (trimercapto-s-triazine)

Chemical formula	$C_3N_3Na_3S_3$
Physical state and color	Colorless or light yellow liquid
Odour	/
Density	1.78 g/cm^3
Molar mass	243.2
Boiling point	242.5°C@ 760mmHg
pH	10-12
Vapour pressure	1.05E-05 mmHg at 25 °C
Flash point	100.5°C

Table 3.41 Physical – chemical characteristics of polymer P150

Components	Water, 54-55% (mass)
	Acrylic polymer, 45-46% (mass)

Physical state and color	Black viscous liquid
Odor	Ammonia smell
Boiling point	Approx. 100 ºC
pH	pH: 7.5-8.5
Vapour pressure	17 mmHg at 20 ºC
Flammability	Non-flammable

Table 3.42 Physical – chemical characteristics of polymer P1000 (flocculant)

Density	0.6-0.8 g/cm^3
pH	5-8
Flammability	Non-flammable
Explosiveness	Non-explosive

Reduction Reagent

The process of selective catalytic reduction involves the use of a reduction reagent (so-called agent) containing bound nitrogen such as ammonia NH_3.

Table 3.43 Physical – chemical characteristics of ammonia

Chemical formula	NH_3
Physical state and colour	Gas at 20°C /101.3kPa), colourless
Odor	Intense and pungent scent
Density	0.7 kg/m^3
Molar mass	17.031 g/mol
Boiling point	-33°C
pH	Dissolved in water affects pH value
Vapour pressure	8.6 bar at 20°C
Explosiveness	Lower explosion limit (LEL): 15.4 vol % Upper explosion limit (UEL): 33.6 vol %

Material energy balances of raw materials consumption are given in the graphic appendices of the study.

Cement

Cement is a hydraulic binder, i.e. a finely ground inorganic material that, when mixed with water, creates a paste that binds and hardens by reaction and hydration process and which, after curing, retains its strength and stability even under water.

Portland cement that does not contain aluminum (i.e. without Al_2O_3, aluminates,etc.) and whose characteristics are in accordance with the Rulebook on Cement Quality ("Official Gazette of the RS", no. 34/2013, 44/2014).

Plain Portland cement is a hydraulic binder obtained by grinding Portland cement clinker to which, in addition to calcium sulfate - cement bonding time regulator, can be added: granulated blast furnace slag, Pucolan materials, fly ash, burnt shale, limestone, silicate soot and possibly additives to improve cement production or properties; hydraulic hardening of ordinary Portland cement is primarily due to the hydration of calcium silicate, but other chemical compounds can also have a part in the hardening process. Table 3.44 shows the requirements regarding the chemical properties of cement.

Table 3.44 Chemical Properties Requirements

1	2	3	4	5
Feature	Testing method	Class/Type of cement	Strength class	Requirements[a]
Loss of ignition	SRPS EN 196-2	CEM I CEM III	all clases	≤ 5,0 %
Insoluble residue	SRPS EN 196-2b)	CEM I CEM III	all clases	≤ 5,0 %
Sulfate content (as SO_3)	SRPS EN 196-2	CEM I CEM II[v] CEM IV CEM V	32,5 N 32,5 R 42,5 N	≤ 3,5 %
			42,5 R 52,5 N 52,5 R	≤ 4,0 %
		CEM III[g]	all clases	
Chloride content	SRPS EN 196-2	all types[d]	all clases	≤ 0,10 %[d]
Pozzolanic activity	SRPS EN 196-5	CEM IV	all clases	satifies the testing

a) Requirements are given in mass percentages of finished cement
b) Determination of insoluble residue in hydrochloric acid and sodium carbonate.
c) CEM II/B-T type cement can contain up to 4.5% sulfate for all strength classes
d) CEM III/C type cement may contain up to 4.5% sulfate.
e) CEM III type cement may contain more than 0.10% chloride, but in this case the highest chloride content must be indicated on the packaging and/or the delivery note.
f) For prestressing applications, cements may be manufactured according to lower requirements. If so, the value of 0.10% is replaced by this lower value which must be indicated in the delivery note.
g) Expressed as Na_2O equivalent ($Na_2O + 0.658K_2O$)

In accordance with the most commonly used recipe for solidification, for the mean value of cement consumption per cycle of 0.32 t, and 6 hours of effective working time per day, the balance of cement consumption is:

Per hour: 0.32 t/cycle x 30 cycles/h=9.6 t/h
Per day: 9.6t/h x 6h=57.6 t/d
Per year: 57.6 t/d x 156 days=8985.6 t/y.

For the storage of cement, the project envisages a silo with a volume of 50m^3, i.e. a capacity of 60t, which is enough for one-day work.

Types and quantities of materials required for construction

For the purposes of construction and other works on the construction of the project in question, the use of various construction materials (gravel, sand, stone, cement, reinforcement, steel, plastic, wood, anti-corrosion protection agents, various coatings and protective agents, etc.) is envisaged.

Below is a rough overview of the dominant materials that will be used during construction:

PRODUCTION FACILITIES	Gravel [m³]	Crushed stone [m³]	Lean concrete [m³]	Reinforced concrete [m³]	Reinforcement [kg]	Steel [kg]
FACILITY: W-C01 Reception guardhouse and administrative building			55.00	513.00	72,773.00	8,000.00
FACILITY: W-C02 - Operations Centre - PREFABRICATED			55.00	917.00	154,494.00	11,000.00
FACILITY: W-C03 - Fire water tank	78.00	113.00	15.00	133.00	12,000.00	
FACILITY: W-C04 - Pumping station and fire station	114.00	172.00	24.00	204.00	22,100.00	8,640.00
FACILITY: W-C06 - Pipeline bridges	116.40	92.12	28.00	132.55	11,233.00	77,000.00
FACILITY: W-C08 - Pretreatment and waste storage	1,450.00	640.00	200.00	5,200.00	8,067,844.00	200,000.00
FACILITY: W-C09 - Waste Pretreatment Filter System and Activated Carbon Filter			6.23	91.00	6,500.00	12,750.00
FACILITY: W-C10 - Cargo scales	25.00	17.00	8.00	27.00	3,700.00	
FACILITY: W-C11- Waste thermal treatment plant	390.00	260.00	130.00	2,300.00	300,000.00	1,070,653.00
FACILITY: W-C12 - Stabilization and solidification	228.00	342.00	48.00	820.00	82,000.00	55,200.00
FACILITY: W-C13 - Transfer point	35.00	24.00	16.00	59.00	6,488.00	10,318.00
FACILITY: W-C14 - Smokestack	12.00	8.00	4.00	81.00	16,974.00	
FACILITY: W-C15 - Tank for ammonia water with bundwall	23.00	15.00	5.00	68.00	11,000.00	5,000.00
FACILITY: W-C16 – Solidification filter system			3.19	41.60	4,450.00	7,560.00
FACILITY: W-C17 – Fence						
SERVING FACILITIES						
FACILITY: U-C01 – Bus stop						
FACILITY: U-C02 – Maintenance Building and Auxiliary Systems Facility	600.00	1,000.00	51.20	701.59	60,331.13	19,100.00
FACILITY: U-C03 – Wheel Washing Unit	18.00	12.00	6.00	32.00	4,000.00	
FACILITY: U-C06 – Wastewater Receiving and Treatment System	814.00	117.00	56.00	573.00	82,761.00	2,589.00
FACILITY: U-C07 – Plateau						
FACILITY: U-C08 – Plateau for extracted metal						
FACILITY: U-C09 – Natural gas reducing station	2.00	1.00	1.00	10.00	9.00	
PLATEAU: Truck parking						
PLATEAU: Parking for passenger vehicles						
PLATEAU: Traffic areas of the WtE plant						

PLATEAU: Concrete plateaus						
OPEN AREAS: Free surfaces of the WTE plant						

For the purposes of the construction of concrete preparation facilities, an aggregate that meets the quality requirements according to the applicable standards will be used. The aggregate must not contain earthy or organic ingredients, or other admixtures harmful to concrete and reinforcement.

For the preparation of concrete, use cement and water that meet the quality requirements determined according to the applicable standards.

For reinforced concrete structures, reinforcement made of smooth steel, ribbed steel, or finished mesh will be used, all in accordance with the applicable "Rulebook on Technical Norms for Concrete and Reinforced Concrete" (Official Gazette of FRY, no. 11/87).

All installed material must meet the prescribed quality standards and possess appropriate attestations and certificates.

Water will be used for the purpose of performing hydro tests and for the purpose of performing works, and electricity for the purpose of operating machines and equipment for the purpose of performing the works in question.

3.3.2 Types and quantities required for the operation of the Landfill for Non-hazardous Waste

3.3.2.1 Types and quantities of energy and energy products required

Use of electricity - Within the Landfill for non-hazardous waste, electricity will be used for the needs of lighting, operation of water pumps, package unit for washing truck wheels.

For the purpose of supplying the plant with electricity, a connection to the electroenergetic network via TS 10/0.4kV owned by the Project Holder is planned.

For the truck washing plant, it is necessary to provide a power connection of about 15kW. The installation of lighting is planned along the perimeter of the landfill, on the outer shoulder of the road. High-efficiency street lights made in 109W LED technology were selected.

A cabinet for powering and managing the leachate pump and a pump for spraying water around the landfill are also planned at the landfill

spraying water around the landfill. The pump intended for the transport of leachate in the wastewater pool in the Waste-to-Energy Plant has a power of Np = 1.5 kW. The estimated power of the pumping station for water spraying per landfill is about Np = 25 kW. The planned total installed power is 44.2kW.

Table 3.45 List of electric consumers

CONSUMER	SIMULTANEOUS POWER Pj (kW)
Truck wheel washing plant	15
Pumping station for pumping leachate water CS-1	1.5
Pumping station for recirculation (spraying) CS-2	25.0
Outdoor lighting	2.7
TOTAL	**44.2**

3.3.2.2 Landfill water use

In order to reduce air pollution, the use of long-range sprinklers is envisaged to spray water on the landfill body. Required amount of water per sprinkler – **about 6 L/s**. Landfill wetting water will be provided from the stormwater collection basin. In accordance with the stated in the regular operation of the Landfill for non-hazardous waste, the intake of new quantities of water is not envisaged.

In the event that there is an insufficient amount of rainwater for landfill spraying, a water tanker will be provided.

3.3.2.3 Types of material required to build the landfill

All installed material must meet the prescribed quality standards and possess appropriate attestations and certificates.

Water will be used for the purpose of performing hydro tests and for the purpose of performing works, and electricity for the purpose of operating machines and equipment for the purpose of performing the works in question.

For the purposes of forming the bottom of the landfill and protection of groundwater and soil, it is envisaged to install a geomembrane built of high-density polyethylene (HDPE), with a thickness of not less than 1.5 mm, which meets the requirements of the Geosynthetic Research Institute (GRI) Test method GM 13 “Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes”3 or the relevant European standards (EN 134934) and recommendations, gravel with a minimum thickness of 50 cm, corrugated perforated drainage pipes Ø160 mm, drainage layer made of stone. The drainage pipes will be covered with a layer of gravel with a minimum thickness of 50 cm, which will be wrapped with a layer of geotextile.

3.3.2.4 Types of material required for landfill closures

By advancing the landfill in height, the external slope will be recultivated by placing first a waterproof layer with a minimum thickness of 50 cm, then a 20 cm drainage layer of gravel, over which a 50 cm thick humus layer will be placed. A geotextile with a minimum mass of 150 g/m^2 will be placed between the gravel and the humus layer.

After the completion of the exploitation period, the landfill is closed for further disposal by forming an upper covering impermeable mineral layer ≥ 0.5 mi reclamation layer ≥ 0.5 m. For the reclamation layer, compost or waste obtained by other biological treatment technologies can be used, which in composition meets the limit values of waste disposal parameters.

3.4 Review of the type and amount of released gases, water and other liquid and gaseous waste substances, observed by technological units including emissions into the air, discharge into surface and underground water recipients, disposal on land, noise, vibration, heat, radiation (ionizing and non-ionizing), etc.

3.4.1 Review of the type and amount of gases, water and other liquid and gaseous waste substances released during the construction of the facilities in question

The environmental impacts that may occur during the execution of works on the construction of the Waste-to-Energy Plant and the Landfill for non-hazardous waste are temporary in nature. These impacts can be manifested by increased noise levels, exhaust emissions resulting from the operation of machinery from the construction site, as well as the dispersal of dust particles during earth and other construction works.

Environmental protection at this stage of work is carried out by appropriate organization of work on the construction site as well as by careful handling of machines. The accompanying emission of pollutants occurs in the process of welding metal parts of equipment structures, painting, the use of protective and anti-corrosive agents, as well as the presence of working machines and is of a temporary nature. The amount of pollutants decreases with distance from the emission source, so a temporary, short-term negative impact can only be expected on the site and the nearest environment.

In order to implement the Waste-to-Energy Plant, a **Construction and Demolition Waste Management Plan** was prepared in accordance with the Law on Environmental Protection "Official Gazette of the RS", no. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - CC, 14/2016, 76/2018 and 95/2018 - other law), the Law on Waste Management ("Official Gazette of the RS", no. 36/2009, 88/2010, 14/2016 and 95/2018 - other law and 94/2024 – other law), the Law on Packaging and Packaging Waste ("Official Gazette of the RS", no. 36/2009 and 95/2018 - other law), the Regulation on the Method and Procedure of Waste Management from Construction and Demolition ("Official Gazette of the RS", No. 93/2023 and 94/2023 - corr.), Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", No. 56/2010, 93/2019 and 39/2021), the Rulebook on the conditions and manner of collection, transport, storage and treatment of waste used as a secondary raw material or for obtaining energy ("Official Gazette of the RS", no. 98/2010), Rulebook on the manner of storage, packaging and labelling of hazardous waste ("Official Gazette of the RS", no. 92/2010 and 77/2021) and other regulations governing this area.

During the execution of the subject works on the construction of facilities within the Waste-to-Energy Plant and the Landfill for non-hazardous waste, the generation of hazardous, non-hazardous and inert waste on the construction site is expected. Expected types of waste and estimated quantities to be generated are shown in Tables 3.46 and 3.47.

Table 3.46 List of expected construction waste and estimated quantities of waste to be generated on the site of the Waste-to-Energy Plant

Index Number	Name of waste	Unit	Estimated total mass/volume of waste to be generated on site
17	**CONSTRUCTION AND DEMOLITION WASTE (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**		
17 01	**17 01 concrete, bricks, tiles and ceramics**		
17 01 01	Concrete	t	3
17 01 02	Bricks	t	0.5
17 01 03	tiles and ceramics	t	0.5
17 02	**wood, glass and plastic**		
17 02 01	Wood	t	3
17 02 02	Glass	kg	100
17 02 03	Plastic	kg	100
17 04	**metals (including their alloys)**		
17 04 01	copper, bronze, brass	t	1
17 04 02	aluminum	t	0.1
17 04 04	zinc	t	0.1
17 04 05	iron and steel	t	2
17 04 07	mixed metals	t	1
17 04 11	cables other than those mentioned in 17 04 10*	t	0.1
17 05	**soil (including soil excavated from contaminated sites), stone and excavation**		
17 05 04	soil and stone other than those listed in 17 05 03*	m^3	50,000
17 08	**Gypsum-based construction material**		
17 08 02	gypsum-based construction material other than those mentioned in 17 08 01*	kg	100
17 09	**Other construction and demolition wastes**		
17 09 03*	**Other construction and demolition waste (including mixed waste) containing hazardous substances**	kg	100
17 09 04	mixed construction and demolition wastes other than those mentioned in 17 09 01 and 17 09 02 and 17 09 03	kg	200

Table 3.47 List of expected construction waste and estimated amount of waste to be generated at the construction site of the Landfill for non-hazardous waste in powder

Index Number	Name of waste	Unit	Estimated total mass/volume of waste to be generated on site
17	**CONSTRUCTION AND DEMOLITION WASTE (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**		
17 02	**wood, glass and plastic**		
17 02 03	Plastic	kg	300
17 05	**soil (including soil excavated from contaminated sites), stone and excavation**		
17 05 04	earth and stone other than those mentioned in 17 05 03*	m³	10,000

Table 3.47 shows the quantities of waste plastics expected for the construction of Phase I of the Non-hazardous Waste Landfill. For the construction of the entire landfill (a total of three phases), waste plastic (waste when installing waterproof and protective film) of about 1,000 kg is expected to be generated.

Vessels and enclosures will be provided at the construction site for sorting and temporary storage of various types of hazardous and non-hazardous construction waste, packaging waste, municipal waste, secondary raw materials, etc. All waste containers must be labelled in accordance with waste management regulations.

The warehouse must be with a waterproof base and secured from access by unauthorized persons. All containers with liquid waste materials will be placed on bundwalls and protected from atmospheric influences.

During the construction of facilities within the Eco Energy complex, noise will occur as a result of the operation of construction machinery during site preparation and clearing of the terrain, filling of soil, gravel and concreting, due to the execution of prefabricated reinforcement works, construction of the facilities in question and installation and installation of process equipment, as well as due to transport and manipulation of material, equipment. Noise is a necessary consequence of the execution of works and is temporary in nature and only for the duration of the works. Construction machines and trucks that will be engaged in construction represent a source of noise that reaches from 80 dB(A) to 90 dB(A), depending on the type of machine, degree of load, technical correctness and method of operation.

The amount of pollutants decreases with distance from the emission source, so a short-term negative impact can be expected only in the construction site area and the nearest environment, so it ***can be concluded that, with the application of prevention measures, there will be no significant deterioration in the quality of the environment during the construction of the facilities in question.***

3.4.2 Review of the type and amount of gases, water and other liquid and gaseous waste substances released during the regular operation of the plant

3.4.2.1 <u>Overview of the type and amount of emissions and generated substances during the regular operation of the Waste-to-Energy Plant</u>

During the regular operation of the Waste-to-Energy Plant, the following may occur:

- **Emission to Air:**
  - emissions of powdered substances, TVOC and unpleasant odours on the emitter of the pretreatment and waste storage plant, which arise in the process of unloading, storage and physical and mechanical pretreatment of waste
  - emission of pollutants into the air at the boiler plant emitter: particulate matter, heavy metals, HCl, HF, SO_2, NOx, CO, NH_3, TVOC, PCDD/F, CDD/F+ dioxins as PCBs, Hg, generated during waste thermal treatment
  - emissions of particulate matter on the emitter of the filter system of the stabilization and solidification process, cement mixer and silo
  - emissions of gases from means of transport, during the delivery of waste materials and other substances
- **Wastewater Generations:**
  - conditionally clean atmospheric water from the roofs of the facilities,
  - potentially oily atmospheric water from handling surfaces, roads and parking lots,
  - sanitary faecal wastewater,
  - technological wastewater,
  - wastewater from extinguishing possible fires.

- **Waste generation**
  - separated secondary raw materials (metals, plastics...)
  - residues from the boiler plant: slag or coarse fraction of unburned material, boiler ash, cyclone ash, ash from economizers and bag filters, sludge (thickened sediment) from the wet flue gas cleaning system,
  - sludge from cleaning the grease and oil separator and the truck wheel washer unit,
  - waste from the overhaul of the plant (EE waste, waste filter bags, etc.)

- **Noise emissions.**

3.4.2.1.1 Emissions to air

During the regular operation of the Waste-to-Energy Plant, the emission of pollutants will occur:

- from the emitter of the pretreatment and waste storage plant (pre-treatment line for bulk solid non-hazardous and hazardous waste): particulate matter and unpleasant odours
- from boiler plant emitter: particulate matter, heavy metals, HCl, HF, SO2, NOx, CO, NH3, TVOC, PCDD/F, CDD/F+ dioxins as PCBs, Hg)
- from the emitter of the stabilization/solidification plant: particulate matter

Emissions from pretreatment and waste storage facilities - During the unloading and pretreatment activities (mechanical treatment) of bulk solid hazardous and non-hazardous waste, there will be an emission of unpleasant odours and particulate matter. The appearance of particulate matter will occur at all filling points and conveyors.

For the purpose of dedusting and removing unpleasant odours, the air from the area where the solid non-hazardous and hazardous waste intended for energy production (Annex to facility W-C08) is unloaded and pre-treated, will be taken away by means of a fan, with a **capacity of 24,000m^3/h**, by a system of suction hoods and pipelines to the filter unit (W-C09 **Waste Pretreatment Filter System and Activated Carbon Filter) consisting of a bag filter with** impulse shaking with compressed air, an activated carbon filter and an emitter (smokestack). The design envisages that the suction hoods are placed at the connection points on the equipment itself (primary shredder, belt conveyors, metal separator, secondary shredder). Also, on the collection pipeline of these extraction points, the connection of the pipeline is planned as the mean for ventilation of the hall or the pre-treatment facility. Air purified to a quality that meets the requirements of the applicable regulations of the Republic of Serbia as well as the requirements defined by the BAT conclusions for waste treatment plants is taken to the smokestack after treatment and discharged into the atmosphere (see Table 3.48 below).

Table 3.48 Review of the type and quantity of emitted pollutants on the emitter of the Waste Pretreatment Filter System and Activated Carbon Filters

Emitter	**Pollutants**	**Expected value**	**Mass flow**	**ELV in accordance with the regulations of the RS[35]**	**BAT WT[36]**
Smokestack after bag filter and activated carbon filter	Particulate matter	< 5 mg/Nm^3	<0.120 kg/h	10 mg/Nm^3	2-5 mg/Nm^3
	TVOC	<30 mg/Nm^3	<0.720 kg/h	-	10-30* mg/Nm^3

*BAT- AEL applies only when the organic compounds in question have been identified as relevant in the waste gas stream, based on the inventory mentioned in BAT 3

BAT 3. In order to facilitate the reduction of emissions to water and air, BAT is to establish and maintain an inventory of wastewater and gas streams as part of an environmental management system (see BAT 1) that includes all of the following characteristics:

(i) information on the properties of the waste to be treated and the waste treatment procedures, including:

(a) a simplified overview of the flow of procedures showing the origin of emissions;

(b) descriptions of techniques integrated into the production process and treatment of effluents/waste gases at source including their performance;

(ii) information on the properties of wastewater streams, such as:

(a) average values and variability of flow, pH, temperature and conductivity;

(b) average values of concentrations and loads of relevant substances and their variability (e.g. COD/TOC, nitrogen types, phosphorus, metals, priority substances/micro-pollutants);

(c) biodegradability data (e.g. biochemical oxygen demand, ratio of biochemical oxygen demand to chemical oxygen demand, Zahn-Wellens test, biological inhibition potential (e.g. activated sludge inhibition)) (see BAT 52);

(iii) information on the properties of waste gas streams, such as:

(a) average values and variability of flow and temperature;

(b) average values of concentrations and loads of relevant substances and their variability (e.g. organic compounds, persistent organic pollutants such as PCBs);

(c) flammability, lower and upper explosive limit, reactivity;

(d) the presence of other substances that may affect the waste gas treatment system or the safety of the plant (e.g. oxygen, nitrogen, water vapor, dust).

Applicability: The scope (e.g. level of detail) and nature of the inventory will, in general, be related to the nature, scale and complexity of the plant, as well as the extent of the environmental impact it may have (which is conditioned by the type and amount of waste to be treated).

It is the obligation of the Project Holder to regularly monitor air emissions at the smokestack emitter in accordance with the dynamics and monitoring that will be defined by the Monitoring Plan, Chapter 9 of the subject Environmental Impact Assessment Study and applicable regulations in this field.

During the process of **storing solid waste materials inside the bunkers** located in the facility W-

[35] **ELV in accordance with the regulations of the RS[35]**

[36] Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C (2018) 5070) (Text with EEA relevance.)

C08 Pretreatment and waste storage, as well as during the operation of the crane by which the waste material (granulation <100 mm) is transferred and distributed in the bunkers, emissions of unpleasant odours and dust can be expected. Removal of dust and unpleasant odours and prevention of their emission outside the facility is achieved by keeping the hall constantly under pressure, drawing air from the hall and burning it in the boiler plant. **The amount of gases extracted from the hall and sent to the boiler**is conditioned by the required amount of combustion air, which **ranges between 23-47,000 Nm^3/h** depending on the current capacity of the boiler plant and the characteristics of the waste. During the operation of the crane, i.e. when transferring waste material from the receiving and storage bunkers to the mixing bunker, water misting will be carried out in order to reduce the emission of dusty substances into the air.

Note: In cases where the boiler plant does not work (due to overhaul, downtime, etc.), the air from the waste storage facility will be directed to the bag Waste Pretreatment Filter System and Activated Carbon Filter (W-C09), where it is treated together with the air from the pre-treatment facility, by means of a fan, where it is purified, and then the purified air is discharged into the atmosphere via the emitter (smokestack) of the filter unit.

Emissions from sludge waste storage - Air from the sludge compartment will also be taken to the boiler plant (**2,000 m^3/h)** by means of combustion air fans, in order to keep the storage under pressure and prevent the spread of unpleasant odours outside the facility. When the boiler plant does not work, nitrogen is automatically introduced into the sludge receiving hopper in order to inertise the space.

Hazardous waste treatment line (delivered in IBC containers, barrels, etc.) – In order to inertise, the Hazardous Waste Treatment Line is of a closed type and nitrogen (N_2) is dispensed intothe shredder chamber itself, so that **no air emissions will occur** in regular operation.

Emissions of easily volatile compounds may occur during the process of **transfering and storage of liquid waste materials** and the emission of unpleasant odours may occur. When transferring liquid waste from tank trucks to the gas phase arm, a pressure balancing line is connected, which represents the connection with the gas space of the tank to which the transfer is carried out in the event that the discharge is carried out into one of the tanks under overpressure of nitrogen, in order to prevent the evaporation of easily volatile liquids when discharging.

In order to reduce air emissions from storage tanks, the tanks are equipped with:

- **nitrogen blanketing system** that maintains a constant overpressure in the tanks
- **exhaust gas drainage system** via automatic valves on the outlet pipelines from the gas tank space. When reaching a pressure of 0.3 barG in the tank, the valve is opened and the gas is discharged, which is taken by pipeline to the intake of the combustion air fan in the boiler installation, and then to the thermal treatment. As the vessels are maintained under nitrogen overpressure, the composition of the exhaust gas is predominantly nitrogen.

If for any reason these systems fail, the tanks are equipped with safety and respiratory reinforcement that allows pressure relief, i.e. prevents the occurrence of vacuum.

Ventilation of the space in which the storage tanks are located is provided through a duct with associated elements for inserting and sucking air from the space.

Ventilation of the space in which IBC containers/barrels/jumbo bags are located is provided through 3 axial wall fans for suction from the space with floating blinds with a total **capacity of 17,000 m^3/h.** The air compensation is from the facade of the building over 4 rain blinds.

Emissions from boiler plant emitters

The largest and most complex part of the Waste-to-Energy Plant are the **flue gas cleaning systems generated during the incineration of waste** and include:

ry flue gas cleaning (cyclone and activated carbon reactor and bag filters)
et flue gas cleaning in scrubbers
elective catalytic filter

As described earlier, the dry cleaning of flue gases begins in cyclones in which the separation of coarse particles falling into the collector at the bottom is enabled through the spiral movement of gases, and the flue gases continue until the next purification phase.

Flue gases released from coarse particles pass through an activated carbon reactor that absorbs heavy metals, dioxins and furans formed during flue gas cooling. The reacted particles together with the ash particles are extracted from the flue gas on the surface of the bag filters. At precise time intervals, the nozzles blow the separated particles into the collector located at the bottom, thus completing the dry purification of the gases.

After dry purification, the gases further reach the scrubber system where their wet purification begins.

In the first scrubber, the nozzle system flushes the gases in the acidic environment (pH 1), which translates the acidic components from the gaseous to the liquid phase. In this way, chlorides, fluorides and heavy metals are separated from the gases.

In the second scrubber, the nozzles shower the flue gases with a solution of lime milk (pH 7). By the process of oxidation and neutralization, sulfur gas oxides are converted into solid calcium sulfate or gypsum.

The last step in gas purification is $DeNO_x$ filters. In them, gases pass through catalytic modules where, with precise dosing of ammonia water, nitrogen oxides (NO_x) are reduced to nitrogen (N_2) with the degradation of possibly residual dioxins and furans that were not absorbed in the previous stages of purification. After dry and wet purification, purified air is conducted to the emitter through which it is discharged into the atmosphere.

Thus, from the emitter of the boiler plant (stack), there may be an emission of: particulate matter, heavy metals, HCl, HF, SO_2, NOx, CO, NH_3, TVOC, PCDD/F, CDD/F+ dioxins as PCBs, Hg in accordance with

Table 3.49 Review of the type and maximum concentration of emitted pollutants at the boiler plant emitter

Pollutant	**Unit**	**Expected emissions to air**			**Maximum mass flow rate**	**ELV in accordance with RS regulations**[37]		**BAT-AELs in accordance with BATC for WI**[38]	
		min	**max**	**Averaging period**		**ELV**	**Averaging period**	**BAT-AEL**[39]	**Averaging period**
Total Particulate matter	mg/ Nm^3	< 1	5	Mean Daily Value	0.35 kg/h	10	Mean Daily Value	<2–**5**	Mean Daily Value
						30	Mean half-hourly emission limit 100%		
						10	Mean half-hourly emission limit 97%		
						150	Total concentration expressed as half-hourly average		

37 Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of the RS", no. 103 of 21st November 2023).

38 The Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration):

39 New plants.

Pollutant	Unit	Expected emissions to air			Maximum mass flow rate	ELV in accordance with RS regulations		BAT-AELs in accordance with BATC for WI	
		min	max	Averaging period		ELV	Averaging period	BAT-AEL	Averaging period
Cd+Tl	mg/ Nm^3	0.005	0.02	Mean value during sampling	0.0014kg/h	total 0.05	Mean value during sampling for a minimum of 30 min and a maximum of 8 h	0.005–**0.02**	Mean value during the sampling period
Sb+As+Pb+ Cr+Co+Cu+ Mn+Ni+V	mg/ Nm^3	0.01	0.3	Mean value during sampling	0.021 kg/h	total 0.5	Mean value during sampling for a minimum of 30 min and a maximum of 8 h	0.01–**0.3**	Mean value during the sampling period
HCl	mg/ Nm^3	< 1	6	Mean Daily Value	0.42 kg/h	10	Mean Daily Value	< 2–**6**	Mean Daily Value
						60	Mean half-hourly emission limit 100%		
						10	Mean half-hourly emission limit 97%		
HF	mg/ Nm3	0.05	1	Mean Daily Value	0.07 kg/h	1	Mean Daily Value	< 1	Mean daily value or mean value during the sampling period
						4	Mean half-hourly emission limit 100%		
						2	Mean half-hourly emission limit 97%		
SO_2	mg/ Nm^3	5	30	Mean Daily Value	2.1 kg/h	50	Mean Daily Value	5–**30**	Mean Daily Value
						200	Mean half-hourly emission limit 100%		
						50	Mean half-hourly emission limit 97%		
NOx (NO and NO_2 expressed as NO_2)	mg/ Nm^3	1	120	Mean Daily Value	8.4 kg/h	200	Mean Daily Value	50–**120**	Mean Daily Value
						400	Mean half-hourly emission limit 100%		
						200	Mean half-hourly emission limit 97%		
CO	mg/ Nm^3	10	50	Mean Daily Value	3.5 kg/h	50	Mean Daily Value	10–**50**	Mean Daily Value
						100	Half-hour values		
						150	Mean ten-minute value		
						100	Mean hourly value (for fluidized bed furnaces)		
NH_3	mg/ Nm^3	2	10	Mean Daily Value	0.7 kg/h	-	-	2-**10**	Mean Daily Value

Pollutant	Unit	Expected emissions to air			Maximum mass flow rate	ELV in accordance with RS regulations		BAT-AELs in accordance with BATC for W	
		min	max	Averaging period		ELV	Averaging period	BAT-AEL	Averaging period
TVOC	mg/ Nm^3	1	10	Mean Daily Value	0.7 kg/h	10	Mean Daily Value	< 3–**10**	Mean Daily Value
						20	Mean half-hourly emission limit 100%		
						10	Mean half-hourly emission limit 97%		
Dioxins and furans PCDD/F	ng I-TEQ/ Nm^3	0.01	0.04	Mean value during sampling	0.0000000028 kg/h	0.1	Mean value during sampling for a minimum of 6 h and a maximum of 8 h	< 0.01–**0.04**	Mean value during the sampling period
		0.01	0.06					< 0.01–**0.06**	Long sampling period (the limit value does not apply if it is proven that the emission value is sufficiently stable)
Hg	µg/Nm^3	5	20	Mean Daily Value	0.0014 kg/h	50	Mean value during sampling for a minimum of 30 min and a maximum of 8 h	< 5–**20**	Mean daily value or mean value during the sampling period
		1	10	Mean value during sampling				1–**10**	Long sampling period

Emissions from the emitter of the stabilisation and solidification process

All sources of emission of particulate matter into the air from the stabilisation/solidification process are equipped with bag filters on which powder matter is separated (ash mixture and thickened sediment storage bunker in which the stabilisation process takes place; mechanical treatment of slag or separation of ferrometals using magnetic separators and non-ferrous metals using eddy current separators; mixer reactor in which the process of mixing cement, ash and water takes place or the solidification; cement storage silo; cement weighing scale and ash weighing scale). In the Table 3.50 is an overview of the type and quantity of emitted pollutants on the emitter of the filter system of the stabilisation and solidification process.

Table 3.50 Overview of the type and quantity of emitted pollutants on the emitter filter system of the stabilisation and solidification process

Emitter	**Pollution matter**	**Expected value**	**Expected mass flow**	**ELV according to RS regulations**[40]	**BAT WT**[41]
Stack after bag filter	Particulate matter	< 5 mg/Nm^3	0,125 kg/h	10 mg/Nm^3	2-5 mg/Nm^3

Emissions of gases from means of transport, during the delivery of waste materials and other substances

Air pollution at the site in question may occur due to the emission of gases from means of transport, during the delivery of waste materials and other substances. In order to reduce air emissions, unloading of bulk solid waste material and sludge will be carried out by entering the vehicle inside the W-C08 facility, after which the door of the facility is closed and only then unloading begins. When transfering liquid waste, the engine of the means of transport must be switched off. **Bearing in mind the above, it can be concluded that the emissions of gases, which occur as a result of the combustion of diesel fuel, are of a local character and negligible.**

3.4.2.1.2 Wastewater generation within the Waste-to-Energy Plant

A separate sewage system is planned within the Waste-to-Energy Plant for the purpose of wastewater collection. The wastewater to be generated at the plant in question is as follows:

- Atmospheric conditionally clean water from the roof of the facility;
- Atmospheric potentially oily wastewater (treatment on grease and oil separator);
- Sanitary foul wastewater (biological treatment);
- Process wastewater (treatment at the wastewater treatment plant of the boiler plant, sand filter and activated carbon filter);
- Wastewater from extinguishing possible fires (there is no discharge of these waters since they are collected and subsequently thermally treated in the boiler plant).

Atmospheric clean water from the roof of the building
Clean rainwater services collect atmospheric water falling on the roofs of facilities and carries them to the boundary of the complex closest to the drainage collector of all clean and treated water that can be discharged into the recipient - the Danube River. **The precipitation load is calculated as 300 l/sec/ha.**

Atmospheric potentially oily wastewater
Oily rainwater services from the Waste-to-Energy Plant collect atmospheric water from roads, plateaus and parking lots and takes them to the border of the complex. There are two "by pass" separators of petroleum products, made and tested according to SRPS EN 858, rated size NS10/100 (**flow through the separator 10 l/s while the max flow is 100 l/s) and rated size NS15/150 (flow through the separator 15 l/s while the max flow is 150 l/s).** The efficiency of the separation of light petroleum products - light liquids in the outlet water is separable up to 5mg/l.

Thus cleaned oily sewerage works is connected to the conditionally clean rainwater services and conducted to the drainage Central collector for the entire Elixir Prahovo complex, and discharged into the Danube.

The Project Holder is obliged to perform regular monitoring of wastewater quality on grease and oil separators before discharge into the recipient, by monitoring the physical and chemical parameters prescribed by the Rulebook on the manner and conditions for measuring the quantity and testing of wastewater quality and the content of the report on performed measurements ("Official Gazette of the RS", No. 18/2024), Regulation on Limit Values of Emissions of Pollutants into Water and Deadlines for Their Reach ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016), Appendix 2, Emission limit values for wastewater; II Other wastewater; Section 4. Limit values for emissions of wastewater containing mineral oils:

Parameter	Unit	Limit value (I)
Temperature	°C	30
pH		6.5-9
Biochemical Oxygen Demand (BOD_5)	mgO_2/l	40
Chemical Oxygen Demand (COD)	mgO_2/l	150
Hydrocarbon index	mg/l	10

(I) The values refer to a two-hour sample.

Sanitary foul wastewater
Foul water sewage works collects all sanitary-foul wastewater from the buildings' sanitary premises and conducts it to the treatment plant (mechanical and biological treatment). A dug biological purifier type

ACO-INTERPLAN BIOTIP kup 20ES with technology of continuous recirculation of activated sludge with a capacity of 20 PE (**40 employees), hydraulic load 3 m^3/day, biological load BOD: 1.2 kg/day**, intended for biological treatment of sanitary waste water. The treated wastewater is connected to the shaft of conditionally clean rainwater sewage and then discharged into the internal network of the Elixir Prahovo Industrial Complex.

The recipient for all clean and treated wastewater is the collector of all clean and treated waters of the Elixir Prahova complex that can be discharged into the recipient the Danube River.

Purified clean wastewater is discharged by a gravity collector in continuous mode. A sufficient number of inspection manholes necessary for the normal maintenance of the network are planned on the network.

The adopted material of the foul sewage pipeline is PVC. Pipelines made of PVC material are very easy to install, and they are connected to each other by connecting elements, whereby rubber rings ensure complete sealing of the joint.

Process wastewater from the Waste-to-Energy Plant complex

Process wastewater will be collected and directed through separate lines (T1-T4) to the designated chambers of the wastewater pool U-C06 within the Waste-to-Energy Plant:

- Process wastewater from the boiler plant wastewater treatment plant – collected by process sewage works: line T1
- General process wastewater (water from the gully in W-C11, water from the boiler blowdown) is collected by general technological sewage works: line T2
- Wastewater from fire extinguishing in the facility W-C11 - the system of collection and drainage of FP wastewater drains it into the general process sewerage works: line T2
- Wastewater from washing sand filters from process water preparation – collected and drained by separate sewer works: line T3
- Wastewater from filter washing from WWTP wastewater treatment plant is collected and drained by separate sewer works: line T4

Note: The project also envisages pumping leachate from the body of Landfill for the non-hazardous waste (solidificate) into the wastewater pool U-C06 within the Waste-to-Energy Plant. Namely, the excess leachate generated within the Landfill for non-hazardous waste will be pumped into chamber 3 of the wastewater basin U-C06 (maximum 2-3 m^3/h) when there are conditions for this. From chamber 3 of the pool, the leachate from the landfill will be sent first to the wastewater treatment plant (WWTP), and then after filtration it will be sent to the wastewater treatment plant of the boiler plant (ECWWT). Considering that these wastewaters may contain heavy metals from ash, alkaline oxides, organic matter, sulfates and chlorides, they will be purified in the aforementioned water treatment system to the quality for discharge into the existing Central Collector of the Elixir Prahovo industrial complex, which brings wastewater to the existing inlet structure and discharges it into the Danube River.

Line T1: Process wastewater from wastewater treatment plant of the boiler plant

For wastewater arising from Wet Flue Gas Cleaning System, a treatment plant is envisaged, as follows: for water from HCl scrubber, the plant consists of three-stage neutralization, heavy metal deposition, flocculation, sedimentation and filtration. Purified waters from the ECWWT plant, as stated above, are brought to chamber 2 by a separate line T1, whose main role is to accept these waters in order to perform quality testing of them before discharge to the recipient.

In order to facilitate manipulation and possible response in the event that the water quality does not correspond to the required quality for discharge into the recipient, chamber 2 is divided into 4 identical parts (subchambers 2a, 2b, 2c, 2d). The volume of each part, i.e. each subchamber is 80 m^3, which is enough for each subchamber to accept wastewater for 8 hours of operation.

Table 3.51 shows the type and quantity of pollutants emitted in wastewater after treatment at the boiler plant's wastewater treatment plant.

Table 3.51 Overview of the type and amount of pollutants emitted in the wastewater after treatment at the boiler plant's wastewater treatment plant:

Parameter		Process	Unit of measure	Expected emission range to waters		BAT-AELs in accordance with BATC for WI[40]	Averaging time	ELV expressed as mass concentrations of unfiltered samples in accordance with the regulations of the RS[41]	
				min	max			95% of the measured values	(100% of measured values)
Total suspended solids (TSS)		FGC Treatment of bottom ash	mg/l	-	30	10-30	Random sampling	30	45
Total organic carbon (TOC)		FGC Treatment of bottom ash		-	40	15 – 40	Daily average value or 24 h flow proportional composite samples Composite sampling may be applied in proportion to the time provided that sufficient flow stability has been demonstrated	-	
Metals and metalloids	As	FGC		0.002	0.05	0.01-0.05		0.15	
	Cd	FGC		0.003	0.03	0.005-0.03		0.05	
	Cr	FGC		0.001	0.1	0.01-0.1		0.5	
	Cu	FGC		0.002	0.15	0.03-0.15		0.5	
	Hg	FGC		0.001	0.01	0.001-0.01		0.03	
	Ni	FGC		0.03	0.15	0.03-0.15		0.5	
	Pb	FGC Treatment of bottom ash		0.02	0.06	0.02–0.06		0.2	
	Sb	FGC		0.02	0.9	0.02–0.9		-	
	Tl	FGC		0.005	0.03	0.005-0.03		0.05	
	Zn	FGC		0.006	0.5	0.01–0.5		1.5	
Dioxins and furans PCDD/F		FGC	ng I-TEQ/l	0.004	0.05	0.01-0.05		0.3	

The emissions to water from the plants comply with the applicable RS regulations, the highest standards of the European Union, the conclusions on the best available technologies and BREF documents from 2019 and are therefore lower than most European plants built before 2019 <u>(see Annex - REVIEW OF COMPLIANCE WITH THE CONCLUSIONS OF THE BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT).</u>

Description of the general technological sewage line - T2

The general technological sewerage line T2 collects process wastewater generated within the facility W-C11 Waste Thermal Treatment Plant. These wastewaters are not generated constantly but periodically during the servicing of the plant, in the event of an accident, fire, equipment washing, etc., and they are fed by the T2 line into a separate chamber in the wastewater basin U-C06, which is marked as chamber 3.

40 Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)

41 Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of the RS", no. 103 of 21st November 2023).

Thus, the general technological sewage system T2 collects the following types of process wastewater:

- wastewater from the gully from W-C11,
- water from the boiler blowdown (2 m^3/h),
- water from equipment washing and maintenance,
- as well as water from fire extinguishing in W-C11 (maximum 600 m^3 for 2 hours of fire extinguishing).

It is envisaged that chamber 3 operates according to the principle of the pumping station, and through the overflow it is connected to chamber 4. Wastewater from chamber 3 is transported for treatment to the wastewater treatment plant (WWTP), with a capacity of 5 m^3/h, which is located within the U-C02 facility. Within the WWTP, wastewater from the general technological sewage system T2, wastewater from chamber 2 that does not meet the prescribed quality parameters and leachate from the solidificate landfill is treated. Within the WWTP, in order to remove suspended matter and organic pollution from process wastewater, a filtration process is envisaged. An organic load can be expected in excess situations when oil spills occur during intervention or servicing, or due to leaks on process equipment. Filtration is an operation where water is passed through a filter filling in order to extract suspended particles from it. Cleaning, i.e. filtration, takes place in 2 stages: first through sand, and then through a filter with activated carbon filling. Filters are connected sequentially. In order to achieve uniformity, it was chosen that the construction of these two filters be identical, whereby the filling inside the vessels will differ. After passing through the sand filter where the suspended particles are removed, the water is additionally taken to the activated carbon filter, with the aim of additional filtration and removal of organic pollution (if present). After the filtration process is completed through the sand and activated carbon filter, the wastewater is sent for treatment to the ECWWT plant for the treatment of process wastewater of the boiler plant, which is located in the W-C11 facility.

Given the selected capacity of 5 m^3/h, which represents a lower capacity of water treatment, a selection of closed filters, prefabricated, with universal plastic housings, which are generally used for capacities up to 10 l/s, was made. During filtration, the filter filling becomes muddy, which causes a decrease in the filtration velocity, i.e. the capacity of the filter itself. Process water from the U-C02 facility will be used to wash the filter. Wastewater from washing of sand and activated carbon filters will be drained from the wastewater treatment plant through the technological sewer T4 to the chamber 4 of the wastewater basin, from where it will be transported to the liquid waste storage W-C08 according to the available capacities, and then thermally treated in the boiler plant. The water consumption for washing one filter (sand or activated carbon filter) is: 5 m^3.

Wastewater generated in the event of fire extinguishing in the facility W-C11 will be delivered by the technological sewage system, line T2, to the wastewater basin U-C06 where it will be temporarily stored within chamber 4, and depending on the water quality, it will be disposed of. Contaminated water from fire extinguishing will be pumped by the pump into the liquid waste storage tanks provided for in the W-C08 facility, from where it will then be delivered for thermal treatment.
Wastewater generated in the event of fire extinguishing from W-C08 Pretreatment facilities and waste storage, comes into direct contact with waste and is contaminated with hazardous substances, therefore a dug waterproofing pool is planned for their collection within the W-C08 facility. This water will be pumped to the boiler along with the prepared waste, all in accordance with the process requirements.
In the regular operation of the Waste-to-Energy Plant, there will be no continuous (permanent) generation of technological wastewater managed by the T2 line.

Description of the technological sewage line T3
Wastewater originating from the process water preparation plant (from the facility U-C02) is brought to the wastewater basin via the technological sewer T3. The technological process of process water preparation is based on the filtration of raw water taken from the Danube water collector. The filtration process takes place through sand filters, so that during the operation of this plant there is a need to wash the filters, which leads to the generation of wastewater from washing the filters.

A chamber 1 is provided for the reception and treatment of these waters, which functions as a gravity sedimentation tank in order to remove suspended, easily precipitable matter. Bearing in mind that after precipitation, clean technical water is obtained, it will be used for wet washing of gases by transportation to scrubber in W-C11. Excess water will be discharged into the clean water collector connected to the Central Collector of the Elixir Prahovo Industrial Complex, which brings wastewater to the existing inlet structure and discharges it into the Danube River. Also, chamber 1 with overflow is also connected to chamber 3, from where water is sent to the plant wastewater treatment by filtration (sand filter column and activated carbon column), which is located within the facility U-C02 Maintenance building and auxiliary systems facility.

Description of the general technological sewage line – T4

During the operation of the wastewater treatment plant (WWTP), wastewater is generated from washing the sand filter and the activated carbon filter. These wastewaters are brought to the wastewater basin via the technological sewer T4, namely to chamber 4, from where it will be transported to the liquid waste warehouse W-C08 in accordance with the available capacities, and then thermally treated in the boiler plant.

Bearing in mind that technological wastewater and leachate from the Landfill for non-hazardous waste, of different origin and quality are separately supplied to the U-C06 basin, the pool is divided into 4 main chambers, whose capacities (volumes) are shown in Table 3.52.

Table 3.52 Review of wastewater basin division U-C06

CHAMBER	CHAMBER CAPACITY, m^3	Waste Water
1	85	T3
2	320	T1
3	100	T2
		From the solidificates landfill
4	730	T2 – fire extinguishing
		T4

Amounts of wastewater discharged from the Waste-to-Energy Plant complex

The existing collector of clean and purified water, which is drained into the Danube via the inlet structure, has a diameter of DN800 with an average drop of 0.4% and a length of 500m. **The maximum collector capacity is 870 l/s.**

From the Waste-to-Energy plant complex, the total amount of water that flows into the collector, according to the hydraulic calculation of Volume 3.3 - External hydrotechnical installations 23-WTE-IDP-0303, amounts to:

- The amount of conditionally clean (from the roofs of the facilities) and oily atmospheric water that is treated through two separators of NS10/100 ST1000 and NS15/150 ST1500 petroleum products with bypass is 233 l/s.
- The amount of sanitary and faecal wastewater that is treated through the BP ES 20 biological purifier is a maximum of 4 l/s (only in the case of peak consumption that can last only a few minutes, while in regular operation this amount is significantly less, i.e. an average of 0,035 l/s).
- The amount of purified process water is a maximum of 4 l/s (discontinuous discharge).

To the existing Central Collector of the Prahovo DN800 Chemical industry complex, which drains water to the final recipient, the Danube River, from the WtE plant complex to the waste of treated water, is brought through the DN600 canal with a total length of 385 m with a drop of 0,2%, into which the maximum discharge is made (233 + 4 + 4 = **241 l/s of water)**.

Conclusion:

According to all of the above, the maximum amount of purified water discharged from the Elixir Prahovo complex and the Waste-to-Energy Plant into the existing Central Collector of the Prahovo Chemical

Industry Complex is:
328 l/s (purified water from the Elixir Prahovo complex) + 241 l/s (purified water from the Energy Plant complex to waste) = **569 l/s**
In accordance with the above calculation, and bearing in mind the maximum capacity of the existing Central Collector of the Prahovo Chemical Industry Complex of 870 l/s, it can be concluded that the existing Central Collector DN800 is of sufficient capacity to accept, in addition to the purified waters of the Elixir Prahovo Complex, all purified waters discharged from the Waste-to-Energy Plant (WtE plant).

On all water treatment systems, devices are provided for measuring water flow, as well as measuring water quality at the inlet and outlet of the plant. It is the obligation of the Project Holder to perform regular wastewater quality minitoring provided for in Chapter 9 of the Study.

Other wastewater generated at the Waste-to-Energy Plant complex

Washing of equipment in solidification - Wastewater generated by washing the process equipment used to solidify residues from the boiler plant (ash, slag, sludge) will be collected in the collection pit located in the W-C12 Stabilization and Solidification facility. The maximum amount of water from washing is about 2-3 m^3. Water from washing the equipment will be returned to the solidification process. In this way, the consumption of process water is saved, and the required humidity of the material is also achieved, as well as the prevention of dust emission when manipulating residues from the boiler plant.

No wastewater discharge is foreseen from the stabilization and solidification plant.

The ammonia water transfer point (W-C13) for liquid waste materials is provided with a grate that will be connected to the collection pit in which any leaked contents will be collected during transfer. In this way, the possibility of possible leakage of the leaked fluid into the atmospheric sewer is avoided. The collected content will be pumped into an IBC container and taken to a temporary storage of liquid waste materials from where, together with other liquid waste, it will be sent for thermal treatment.

In addition to the transfer point (W-C13), it is also planned to **install the shower for** the purpose of rinsing hands and eyes in case of pouring on the operator when transfering liquid waste (in case of an accident). The water from the shower flows into the aforementioned manhole.

Within the facility W-C11 Waste Thermal Treatment Plant, an ammonia water storage tank is planned, which must be cooled in the summer months by spraying process water. The water from the cooling tank will be collected in the associated bundwall from where it is drained into the collection basin located in the immediate vicinity of the tank, and then reused for cooling purposes, thus achieving water recirculation. If there is a possible contamination of the cooling water with ammonia water, it will be pumped into the IBC container /tank and sent first to the liquid waste storage and then treated in the boiler plant together with other liquid waste.

Wastewater generated from washing dishes and equipment in the laboratory that will be collected and piped into a buried polypropylene tank (V=5 m^3), and then pumped into IBC containers and transported to liquid waste storage tanks by a forklift for unloading and then treated at the boiler plant in question.

The water from the washing of the wheels on trucks that deliver the waste material is drained into the collection shaft located within the bundled wheel washing unit. The wastewater is then pumped into a tank where solids are deposited by passing water through the overflow chamber. The purified water is then reused by the pump to wash the wheels and therefore no outflow of water into the recipient is foreseen.

Water reception tanks need to be periodically cleaned of precipitated substances, and the contents of the cleaning will be temporarily stored in the W-C08 facility until the treatment at the subject Waste-to-Energy Plant.

The duration of the wash cycle depends on the operating conditions and is progressively adjusted via the timer located on the front of the control cabinet.

Within the facility W-C08 Pretreatment and waste storage, two basins are planned for the collection of wastewater from fire extinguishing:

- T.4 Fire extinguishing water basin 1 – designed to collect fire extinguishing water in waste bunkers
- T.5 Fire extinguishing water basin 2– is designed to collect fire extinguishing water in the premises where the waste and water pretreatment equipment is located from the drainage of the pipeline from the fire extinguishing system valve station.

Pumps for emptying the water basin from fire extinguishing will be located in room T.3 Pumping station for water from fire extinguishing.

If there is a fire in the area where the waste is pre-treated, the contaminated water resulting from the fire extinguishing will be collected and drained through collection channels into the designed basin marked T.5 Fire extinguishing water basin 2.

If there is a fire in the waste bins, the contaminated water/foam resulting from the extinguishing will be drained into the collection pool T.4 Fire extinguishing water pool 1 through the grate openings provided at the bottom of the bin.

Bearing in mind that these wastewaters can be loaded with various pollutants whose treatment is not possible within the wastewater treatment plant in question, the project envisages that these waters will be pumped to the liquid waste storage by pumps located in the water pumping station from fire extinguishing, from where they will be dosed to the boiler plant for thermal treatment.

3.4.2.1.3 Waste generation

The activity in question will not have an impact on soil pollution, since all activities related to the manipulation, storage and treatment of hazardous and non-hazardous waste will be performed in closed facilities and on concreted watertight surfaces, under the strict control of trained workers of the operator. During the regular operation of the warehouse in question, there will be no disposal of any type of waste on the land, except for the disposal of solidificate resulting from the treatment residues from the boiler plant, at the Landfill for non-hazardous waste in question.

Residues from the boiler plant

As stated in the project description, the regular operation of the subject fluidized bed boiler plant may result in the following solid (unburned) residues:

- Slag – bottom ash (coarse fraction of unburned material separated at the bottom under the firebox);
- Boiler ash (separated between the second and third passages of flue gases through the boiler);
- Cyclone ash (fraction of fly ash from the boiler that is separated from the emitted gases when passing through two cyclone separators, T>400˚C);
- Ash from the economizer (fine fraction of fly ash separated by the passage of flue gases through the economizer, T>150˚C);
- Filter ash (fine fraction of fly ash separated by the passage of flue gases through the bag filter system; so-called fly ash);
- Activated carbon with a fraction of fine particles from the flue gas;
- Sludge/thickened sediment from the treatment of wastewater from the wet flue gas cleaning system (which is separated in the form of thickened sediment by centrifugation);

In order to manage all the aforementioned waste streams, and in order to dispose of them in accordance with the Law on Waste Management and related by-laws, the project in question envisages that all streams are collected in a controlled manner by a designed system of boiler conveyors that take solid residues to the stabilization and solidification plant (W-C12) for treatment, after which the obtained solidificate will be disposed of at the subject Landfill for non-hazardous waste designed exclusively for these purposes. A detailed description of the residue treatment process from the boiler plant is described in Chapter 3.2 of the Study.

The mean expected amount of solidificate production is 1.09 m^3/h of production, while the maximum simultaneous logistic load is 3.08 m^3/h of solidificate production. Taking into account the annual working hours of 8300 h/year, the average annual production of the storage solidificate is 8964 m^3/year, i.e. a maximum of 25564 m^3/year.

Secondary raw materials
Magnetic separation of waste intended for thermal treatment and coarse ash separates admixtures of metal that is directed to recycling as a secondary raw material, which will be temporarily stored on a concrete plateau until it is handed over to authorized operators for further disposal (recycling). Waste stretch film, metal frames/grids that are removed from IBC containers/barrels/jumbo bags and damaged wooden pallets before treatment, represent non-hazardous waste (secondary raw materials) and will be temporarily stored in designated containers (metal containers, etc.) on a concrete plateau until they are handed over to authorized operators for recycling.

The temporary storage of non-hazardous waste (separated secondary raw materials) provided in the open air is provided with a waterproof base from which all atmospheric water is collected and taken to the grease and oil separator, as stated above.

Liquid waste generated by cleaning oil and grease separators and wastewater tanks
Cleaning of the contents of the petroleum product separator and wastewater basin will be performed regularly. After cleaning, the contents from the separator and the pool will be transferred to the appropriate tank and then treated in the subject waste-to-energy plant.

Sludges generated during the wastewater treatment process (from the final settling tank) together with residues from dry flue gas cleaning in bag filters are sent in an ash suspension reactor, for the treatment of wet ash. The first step of cleaning, i.e. treatment of wet ash, takes place in the ash suspension reactor. Wastewater from HCl and SO_2 scrubbers, separated sediment (sludge) from wastewater treatment (step 1+2 and 3+4) and filter ash separated in bag filters are mixed in the reactor (I part of the activated carbon that is sent together with the filter ash for further treatment). In addition, a part of the sludge from the centrifuges, from the ash suspension settler and from the filtrate tank is introduced into the reactor. In order to accelerate and increase the efficiency of the process of separating heavy metals and soluble salts from sludge, polyelectrolytes and iron (III) sulfate (Fe(III) SO_4) are dosed into the reactor. The reactor is equipped with a stirrer, a pH meter and a local level indicator. The mixture from the ash suspension reactor is poured into the ash suspension settler where the process of settling and separation of heavy metals continues. In addition to the scraper, the settler is equipped with a level meter with a high and low alarm.

The sludge from the settler is sent to the centrifuges (two cenrifuges) by the ash suspension pump, in order to separate the solid and liquid phases. On the ash suspension pipeline, a recirculation line to the ash suspension reactor is also provided, as well as a suspension drain line to the ash suspension storage (stabilization and solidification facility W-C12). The suspension flow is regulated by pneumatic valves that are installed on the mentioned two pipelines.

Further cleaning takes place in the filtrate tank, from where the resulting suspension is sent by centrifugal pump to the acid reactor for the first stage of wastewater treatment of the boiler plant. A line of recirculation of this suspension to the ash suspension reactor is also envisaged. The ash suspension from the reactor and the ash suspension storage, together with the gypsum suspension from SO_2 scrubber is delivered to the centrifuges (where the separation of the solid and liquid phases is performed) and ends up in the equipment for the transport of combustion residues in the boiler plant (slag and ash). Namely, two centrifuges are planned from which the separated liquid phase is sent for the treatment of wet ash - into the filtrate tank, while the resulting thickened sediment is taken through the conveyor system to the stabilization and solidification facility W-C12. The SO_2 scrubber suspension constantly circulates in a closed circuit from the gypsum suspension tank via centrifuges back to the tank, as well as the ash suspension that constantly circulates from the wet ash treatment plant to the centrifuges and back again.

Packaging from chemicals to be used on the subject plant will be used as returnable packaging or, if this is not possible, it will be sent for thermal treatment on the subject plant.

Waste from maintenance of filter systems
All dust extracted in the filtration process in the bag filter of the Waste Pretreatment Filter System and the Filter System of Solidification, will be collected in the associated bins and by the PT screw conveyor, which is placed along the entire length of the bottom of the bin, will be drained to the SD sector dispenser, which further inserts the material into the designated container. The contents of the container will be emptied into one of the receiving waste bins and sent further for treatment.
Waste damaged filter bags will be treated in the boiler plant in question after replacement.

Commercial waste - will occur in small amounts, due to daily work activities in the office (paper, cardboard, staples, clamps, wood in the form of disused chairs, tables, shelves, electrical and electronic equipment (telephones, computers, fax machines, printers, and other office supplies). For more efficient management of commercial waste, sorting will be carried out at the place of origin to paper and cardboard, PET, metal, wood that can be used as secondary raw materials and as such will be handed over to authorized operators for further treatment, and special waste streams will be disposed of in accordance with legal regulations.

Municipal waste is waste generated due to the stay of employees at the complex as well as due to the temporary stay of truck/tank truck drivers who deliver waste material or auxiliary raw materials. It is estimated that on average 1 kg of municipal waste will be generated per employee per day. All municipal waste will be collected separately and handed over to an authorised operator for further disposal.

Waste from plant overhaul (EE waste, metal hazardous and non-hazardous waste, plastic waste, etc.)
Within the complex in question, only temporary storage of waste generated during operation (overhauls, cleaning of process equipment, separators, septic tanks, etc.) will be carried out until its permanent disposal, which will be carried out either within the boiler plant in question or by third parties, i.e. companies that have permits issued by the competent authority and that are registered to perform waste collection, transport, storage and/or treatment activities.

Line grates are planned at liquid transfer points (liquid waste transfer point and ammonia water transfer point), which will collect any leaked liquids during transfer and drain them to the collection pit. In this way, the possibility of possible leakage of the leaked fluid into the atmospheric sewage works and the surrounding soil is avoided.

The design does not envisage the construction of underground and pressurized tanks within the complex. Storage tanks, in addition to being in a closed facility with a waterproof base, will be located in reinforced concrete bundwalls of sufficient volume to receive the leaked liquid from one of the tanks (including the leak of the largest tank). Within the warehouse of IBC containers and barrels, the installation of a line grate for the collection of possibly leaked content is also planned. Waste from the cleaning of line grate and collecting shafts will be pumped into IBC containers and treated at the boiler plant in question.

In the event of a small-scale spillage, appropriate absorbents for the collection and dry cleaning of the leaked content (sawdust, sand, oil, base and acid absorbents) will be provided within the transfer station for the collection and dry cleaning of the leaked content. The contaminated sorbent will be disposed of in containers and subsequently treated at the plant in question.

Under the HCl scrubber, a plastic, and under the SO_2 scrubber, a concrete bundwall is provided for the reception of possibly leaked content during the normal operation of the scrubber system, i.e. due to the overhaul of some of the system components (e.g. pumps). A drain is provided in the bundwall and the water gravitationally flows into the general technological sewer works, which is connected to the wastewater basin U-C06.

The regular operation of the plant in question does not provide for the disposal or discharge of hazardous substances into the soil. In accordance with the aforementioned description of the subject Waste-to-Energy Plant, it can be seen that the project documentation envisages a whole range of measures in order to protect soil, groundwater and surface water, **so no negative impact of the plant on the quality of soil in the subject area is expected.**

3.4.2.1.4 Noise and vibration emissions

Noise at the location in question occurs as a result of traffic on the complex (vehicles that deliver waste), as well as due to the operation of process equipment. The following table shows the characteristic noise-emitting equipment and the expected noise level emitted by it.

Table 3.53 Noise-emitting equipment and noise level

Equipment name	Expected noise level, dBA
FANS	
Fluidization fan	122
Combustion air fan	116
First stage flue gas fan	125
Second stage flue gas fan	123
Recirculation gas fan	120
Wet gas reheating fan	109
Oxidation air blowers (SO2 scrubber)	74
Burners	
Auxiliary ignition and propellant burners	85
Truck wheel washing unit	75
Solid waste storage	
Bunker crane	80
Monorail crane	80
Sludge Waste storage	
Service monorail crane	80
Pretreatment of non-hazardous and hazardous waste	
Separator of ferromagnetic metal waste	75
Outlet conveyor	75
Primary shredder	80
Fine (secondary) shredder	80
80 Pretreatment of hazardous waste	
Primary shredder (S300)	80
Service monorail crane	75
U-C02	
Nitrogen generator	55

Most of the equipment emitting higher-intensity noise will be located in closed facilities. The envisaged distance between the equipment is sufficient so that the noise level does not increase. Facilities that are not part of an indivisible technological whole are separated, in order to minimize noise levels. The plant itself is not near other noise emitters.
Since the facilities in question are located in an industrial zone, noise will not have a significant impact

on the environment. If the noise level prescribed for this zone is exceeded, certain measures will be taken to reduce it.

3.4.2.1.5 Heat, radiation (ionizing and non-ionizing), and other

The Waste-to-energy plant in question is an industrial plant in which equipment is present in which heat dissipation can occur: a boiler for thermal treatment of waste, electric motors, preheaters, lighting, etc.

Energy utilization of waste implies thermal treatment of hazardous and non-hazardous liquid and solid waste (industrial, commercial and municipal) in the stationary plant in which the obtained thermal energy is used for steam production. The flue gases leaving the furnace have a high temperature (850-950˚C), they pass through the exchange part of the boiler (whose nominal power is 30 MW) where heat exchange and production of saturated water vapor are performed. The subject fluidized bed boiler is located in the facility W-C11 Waste Thermal Treatment Plant.

The design documentation adopted the heat dissipation by the boiler of 800 kW. The thermal gains of the facility itself are about 100 kW, so it was calculated with total heat gains of 900 kW. The cooling of the boiler plant facility is ensured by the introduction of external air, which is carried out through external rain blinds, and the suction of air by 24 fans (24 x 12,500 m^3/h = 300,000 m^3/h) on the east facade (at the top of the facility) is carried out by heated air outside. In this way, it is ensured that the temperature in the facility is about 10˚C higher than the temperature of the external environment.

Technological equipment that can emit heat during operation is thermally insulated with insulating materials in order to minimize heat emission into the surrounding area, reduce heat dissipation, and thus achieve high efficiency of equipment operation.

Electric motors of pumps and fans, as well as lighting, do not represent significant sources of heat from the aspect of environmental protection.

During the realization of the Project and the exploitation of the equipment, no electromagnetic, ionizing and non-ionizing radiation will be emitted, because the technology to be used does not contain sources thereof.

3.4.2.2 <u>Overview of the type and amount of emissions and generated substances during the regular operation of the Landfill for non-hazardous waste</u>

During the regular operation of the Landfill for non-hazardous waste, the following may occur:

- **Emission to Air:**
  - *emissions of gases from means of transport,*
  - *emissions of particulate matter from the landfill body*
- **Wastewater Generation:**
  - *leachate water,*
  - *atmospheric water,*
  - *wheel washing water*
- **Waste generation:**
  - *commercial waste,*
  - *municipal waste*
- **Noise emissions**

3.4.2.2.1 Emissions to air

Rolled solidified waste will not be susceptible to air pollution due to curing of its surface, but if this is observed during exploitation, the deposited material will be wetted with water. Landfill wetting water will be provided from the stormwater pool, and the water will be transported to the landfill by equipment installed in the CS_2 shaft pumping station, which is planned immediately next to the stormwater pool. For the purpose of spraying water around the landfill, the use of long-range sprinklers is envisaged, with the following characteristics with a rainfall intensity – about 10 mm/h; radius of action – about 50 m. The potential impact of emissions from the landfill was considered as part of the *Study on the impact of the waste-to-energy plant and Landfill for non-hazardous waste on the air quality of the wider location of the chemical industry complex in Prahovo, April, 2024, prepared by the expert team of the University of Belgrade Faculty of Mechanical Engineering*, which is attached to the study.

A pipeline is planned along the perimeter of the landfill to bring water to a total of 5 sprinklers of the above characteristics. On this circumferential distribution pipeline, 5 places are foreseen to which sprinklers would be connected via a flexible hose, up to 40 m long, and distributed as needed on the slopes of the landfill.

Also, it should be noted that on the south side of the landfill in question is the location of the phosphogypsum storage facility, which is leveling higher than the Landfill for non-hazardous waste, and on the east side there is a complex of waste-to-energy plants and therefore these facilities represent a physical barrier between the landfill and the surrounding land.
The existing protective greenery within the industrial part of the complex for the production of phosphate mineral fertilizers serves the purpose of the buildings and their protection from adverse effects from the production process and is positioned to form a buffer zone between the industrial complex and the state road, as well as a buffer zone between the industrial complex and housing within the workers' settlement in the immediate vicinity.

Other amendments to the Detailed Regulation Plan for the chemical industry complex in Prahovo (Official Gazette of the Municipality of Negotin, No. 350-123/2022-I/07 of 17.06.2022) also plan to form an additional protective green belt along the border of the complete industrial complex, to which, as stated above, the Landfill for non-hazardous waste and the Waste-to-Energy Plant in question also belongs. The protective green belt has the role of insulating the immediate environment from negative impacts within the economic zone. Within this part of the zone, construction is prohibited. The construction of the necessary underground installations and infrastructure routes as well as the necessary above-ground transport systems as a function of the technological process (conveyors) may be allowed, all in accordance with positive regulations in order not to diminish the importance of the protective greenery belt.

3.4.2.2.2 Wastewater generation

The Landfill for non-hazardous waste (solidificate) is designed according to the latest standards and protected by a waterproof film and a drainage channel system. At the landfill, it is planned to establish a completely closed system of water circulation from the landfill. Separate water collection systems are envisaged:

- Leachate collection system for transport of water to the wastewater pool is provided in the area of the waste-t5o-energy plant.
- The atmospheric runoff collection system from the landfill slopes to be collected and used for spraying water on the landfill slopes, thus achieving water recirculation.
- Wheel wash water collection system.

The leachate collection system will consist of collecting pipelines, with a nominal diameter of DN400, for the collection of leachate (drainage) water, which will first drain the water into a pool for the temporary reception of leachate. The leachate reception pool will be concreted and waterproofed, with a special fence for access safety purposes. The pump intended for the transport of leachate in the wastewater pool in the waste-to-energy plant has a power of Np = 1.5 kW.

From the leachate pool, an emergency overflow to the stormwater pool is planned, in case of the operation termination of the pump for transport to the wastewater collection pool in the area of the Waste-to-Energy Plant.

Amounts of leachate

For the sizing of the drainage system that collects leachate from the landfill, a critical case was considered when the thickness of the layer of landfilled waste is equal to the height of the initial embankment of 1.0 m (early stage of use), because the water then infiltrates most rapidly to the drainage system, which is why critical (maximum) values of drained runoff occur. In this case, infiltration through a horizontal plane ($\alpha = 0$) 7.5 m long (half the distance between the drains) and 1.0 m high is considered, and it is assumed that the entire volume of atmospheric water is drained through the body of the landfill to the drainage pipe (there is no surface runoff).

For the calculation of the amount of water, twenty-four-hour (tk=24h) computational rains were used for Negotin, return period T = 50 years, created by the method of alternative blocks with a duration of Δtk = 20 min.
For a maximum drain length of L=125 m, a maximum flow that one drain should accept is obtained:

Q_max_d = 6.56 l/s

Perforated drainage pipes DN160 with a slope of 5 % were adopted, whose full profile capacity is:

Q_max_drain = 13.86 l/s.

System for collecting atmospheric water: On all sides of the landfill, a channel is run in the foot of the embankment, which introduces the atmospheric water that flows from the external slopes of the landfill into the basin for receiving atmospheric water, next to which a pumping station (CS_2) of the shaft type is planned, in which the pumps intended for water recirculation by spraying around the landfill will be located. The designed channel has a trapezoidal cross-section, width at the bottom 1.0 m on the south side of the landfill and 0.75 m on all other sides. The slope of the side slopes of the channel is 1:2. The channel will be lined with a geomembrane made of high density polyethylene (HDPE), at least 1.5 mm thick. The stormwater receiving pool will also be made of concrete and waterproofed, with a special fence for access safety purposes. The estimated power of the pumping station for water spraying on landfill is about Np = 25 kW.

An emergency overflow is planned from the stormwater pool, which in the event of extreme precipitation will allow water to be evacuated into the peripheral canal of the phosphogypsum storage facility, which is located on the south side of the future Landfill for non-hazardous waste.

Amounts of atmospheric water from the landfill slope

For the dimensioning of the circumferential channel for the collection of stormwater flowing from the external slopes of the landfill, a critical case occurs at the maximum height of the landfill. Then a smaller part of the atmospheric water is infiltrated through the landfill body, and most of it is sub-surface and surface flowed down the slope of the landfill with a slope of α=21°, which is covered with a drainage layer and a layer of humus. Therefore, the calculation is performed for a two-layer medium, whereby the thickness of the drainage layer is considered to be 0.2 m, the humus layer is 0.5 m thick, and the length of the slope is 135 m. The maximum specific runoff per meter along the channel is :

Q_spec = 0.25 l/s/m

For the total length of the circumferential channel of L = 1075.00 m the maximum runoff to which the channel should be dimensioned of

Q_max_atm = 268.75 l/s

A trapezoidal cross-sectional channel was adopted, with a sides slope of 1:2 and a width at the bottom of 0.75 m, with the note that channel at the bottom extended to 1.0 m on the south side of the landfill. The maximum depth of the channel at the inflow into the stormwater basin is 0.8 m, and the minimum is 0.5 m in the northwest corner of the landfill II phase. The channel is executed with a slope of 0.5%.

<u>Wheel washing water collection system:</u> The water from washing the truck wheels, by which the waste material is delivered is discharged into the collection shaft located within the package wheel washing unit. The wastewater is then pumped into a tank where solids are deposited by passing water through the overflow chamber. The purified water is then reused by the pump to wash the wheels and therefore no outflow of water into the recipient is foreseen.

Water reception tanks need to be periodically cleaned of precipitated substances, and the contents of the cleaning will be temporarily stored in the W-C08 facility until treatment at the Waste-to-Energy Plant.

The duration of the wash cycle depends on the operating conditions and is progressively adjusted via the timer located on the front of the control cabinet.

All the above activities will have no impact on pollution of waters, surface and underground.

3.4.2.2.3 Waste generation

<u>Commercial waste</u> - will occur in very small amounts, due to daily work activities in the office (paper, cardboard, staples, clamps, wood in the form of disused chairs, tables, shelves, electrical and electronic equipment (telephones, computers, fax machines, printers ...) and other office supplies). For more efficient management of commercial waste, sorting will be carried out at the place of origin to paper and cardboard, PET, metal, wood that can be used as secondary raw materials and as such will be handed over to authorized operators for further treatment, and special waste streams will be disposed of in accordance with legal regulations.

<u>Municipal waste</u> is waste generated due to the stay of employees at the complex as well as due to the temporary stay of truck drivers by whom waste material is delivered. It is estimated that on average 1 kg of municipal waste per employee will be generated. All municipal waste will be separately collected and handed over to an authorised operator for further management.

3.4.2.2.4 Noise and vibration emissions

Noise at the location in question occurs as a result of traffic in the complex (vehicles that deliver waste) and due to the operation of the machinery when spreading waste on the landfill body. Since the facilities in question are located in an industrial zone, noise will not have a significant impact on the environment. If the noise level prescribed for this zone is exceeded, certain measures will be taken to reduce it.

For the industrial zone to which the subject complex in Prahovo belongs, noise values are not standardized, but ***"the Regulation on Noise Indicators, Limit Values, Methods for Evaluating Noise***

Indicators, Disturbance and Harmful Effects of Noise in the Environment" ("*Official Gazette of the RS*", no. 75/10) stipulates that in this case the noise at the boundary of the complex must not exceed the limit value for the zone bordered by:

Table 3.54 Limit values for noise level

INTENDED USE OF THE SPACE	Noise level in dB(A)	
	for day and evening	**for night**
Business-residential areas, commercial and residential areas and children's playgrounds	60	50

Bearing in mind the designed work technology, vibration is not expected at the location in question.

3.4.2.2.5 Heat, radiation (ionizing and non-ionizing), etc.

During the realization of the Project, no heat, electromagnetic, ionizing and non-ionizing radiation will be emitted, because the technology to be used does not contain sources thereof.

3.5 Review of treatment technology (processing, recycling, disposal, etc.) of all types of waste materials

Within the subject plant, waste gas treatment systems were designed and removal of particulate matter, unpleasant odours, wastewater treatment plants; the collection and treatment of residues from the boiler plant was organized, waste material will be stored and treated within closed facilities, concrete plateaus are envisaged for temporary storage of separated secondary raw materials until handover to authorized operators for recycling, a location for controlled disposal of previously stabilized and solidified residues within the Landfill for non-hazardous waste is provided, noise protection measures are taken, and it can therefore be concluded that the regular operation of the Waste-to- Energy Plant will not have a detrimental impact on the environment.

3.5.1 Review of waste treatment technology and prevention of air emissions during unloading, pretreatment and storage of waste

When unloading solid waste, pretreatment (mechanical treatment of hazardous and non-hazardous waste) and storage of waste materials intended for thermal treatment, particulate matter, TVOC and unpleasant odours may be emitted. The occurrence of particulate matter will be at all filling points and conveyors, as well as during the operation of the crane by which waste material (granulation <100 mm) is transferred and distributed in bunkers. In order to reduce air emissions, all the above activities will be carried out within the closed specially designed facility W-C08 *Pretreatment and waste storage* with the application of a number of designed prevention measures.

In order to prevent the emission of particulate matter and unpleasant odours outside the facility during the process of unloading waste in bulk, the project in question envisages that upon the arrival of the truck at the place of unloading waste in the designated bunker, the entrance industrial segment door is opened and the truck enters the receiving part of the W-C08 facility, after which the door is closed. The unloading points in the receiving bunker itself will also be equipped with industrial segment doors, which open only when the truck is ready to unload waste into one of the aforementioned receiving bunkers. When the unloading of the waste is completed, the bunker door closes, the truck can then leave the facility, after which the main door at the entrance to the facility closes again.

3.5.2 Waste Pretreatment Filter System and Activated Carbon Filter (W-C09)

In order to dedust and remove unpleasant odours, the air from the area where the unloading and pretreatment of non-hazardous and hazardous waste is performed will be taken by means of a fan, with a **capacity of 24,000 m^3/h**, by a system of suction hoods and pipelines to the filter unit (W-C09 *Waste Pretreatment Filter System and Activated Carbon Filter*).

Thus, the dedusting and ventilation system consists of:

- exhaust hoods,
- pipeline.
- filter units with accompanying equipment (dedusting capacity Q=24,000 $m^{3/}h$)
- activated carbon filter (dedusting capacity Q=24,000 $m^{3/}h$)
- centrifugal fan (capacity Q=24,000 m^3/h, P=75 kW)
- emitter (stack) 21.5 m high.

The design envisages that the suction hoods are placed at the connection points on the equipment itself, the position and dimensions of which are defined by the equipment manufacturer. The equipment to be dedusted is the primary shredder (dedusting capacity Q=5,000 $m^{3/}h$) in which the waste is first delivered, from the primary shredder and its associated conveyor, the shredded material falls on the belt conveyor, which is the following equipment intended for dedusting (dedusting capacity Q=2,000 m^3 /h). The metal separator is located above the belt conveyor and serves to separate all parts and particles of the metal from the scrap material, which is transported further into the secondary shredder. A suction point is provided on the metal separator (dedusting capacity Q=3,000 $m^{3/}h$), as well as on the secondary shredder (dedusting capacity Q=5,000 $m^{3/}h$). From the secondary shredder, waste material falls on the belt conveyor, where a suction point is provided on the conveyor (dedusting capacity Q=2,000 $m^{3/}h$) to collect the pulverized dust generated during this transport. Finally, the belt conveyor transports all the material it collects from the secondary shredder to the receiving bunker 3, where the last suction point is provided (dedusting capacity Q=2,000 m^3/h) for the equipment in this process.

Figure 3.26 shows the P&ID diagram of the Waste Pretreatment Filter System and the Activated Carbon Filter. The connection of the pipeline planning the ventilation of the hall or the pretreatment facility is also planned on the collection pipeline of these extraction points.

Also, a branch is installed behind the ventilation pipeline of the hall, which serves to partially transport further dirty air from the process of receiving, treating (shredding) and transporting waste to the receiving bunker 3, and the other part serves to ventilate the boiler bunker in case of shutdown of the boiler.
Namely, in cases when the boiler plant does not work (due to overhaul, downtime, etc.), the air from the waste storage facility will be directed to the bag filter system and activated carbon filter (W-C09) by means of a fan, where it is purified, and then the purified air is discharged into the atmosphere through the emitter (stack) of the filter unit.

The said pipeline is connected to a filter unit located on the plateau in the immediate vicinity of the facility.

The pipeline of the dedusting system is sized to provide the always required minimum speed for the transport of particles in the dusty air stream in order to avoid its deposition.

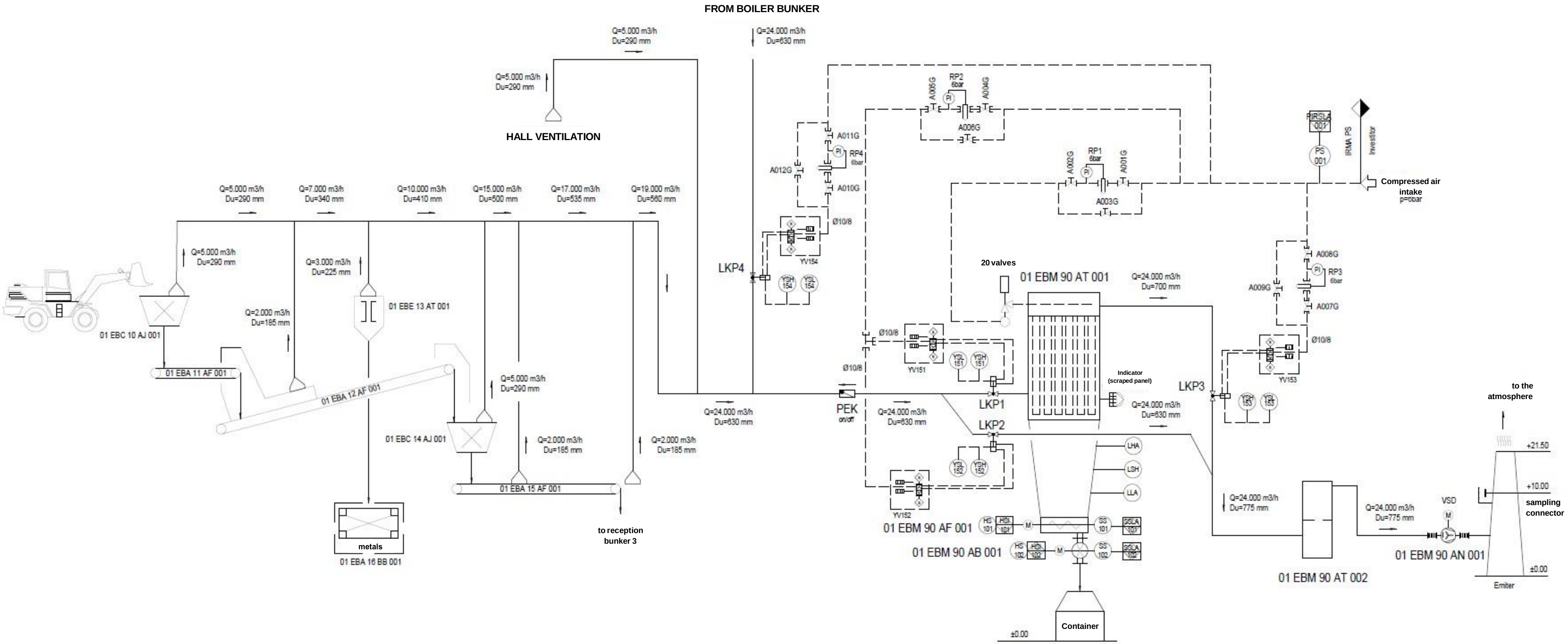


Figure 3.26 P&ID Diagram: Waste Pretreatment Filter System and Activated Carbon Filter

For the cleaning (filtration) of the exhaust dirty air, a bag filter with impulse shaking with compressed air (VF) is provided, made of a steel housing with a bunker.
Characteristics of the bag filter:

Flow	Q =	24,000	Am^3/h
Number of modules:	M=	4	pcs
Number of bags in the module	N_{vm}=	60	pcs
Total bag number	N_v=	240	pcs
Filter bag length	L_v=	4	m
Filter bag diameter	D_v=	160	mm
Filter surface	A_f =	482.55	m^2
Flow/Filter surface	A/C =	49.74	$m^3/m^2/h$
Filtration rate		0.0138	m/s @200 Pa
Filter pressure drop	ΔP =	216.48	Pa (with new bags)

The filter has an access platform in conjunction with the step irons for servicing the shaking valves and for controlling and replacing the filter bags. The entire filter unit is anti-corrosion protected. The filter is located on the plateau directly next to the waste pretreatment facility, supported by a supporting steel structure on a reinforced concrete foundation.

In case of need (servicing) of the bag filter, a bypass pipeline is provided around the filter itself, which will redirect the air flow from the filter to the activated carbon filter and the fan. The activated carbon filter (AC) is placed behind the bag filter on a reinforced concrete foundation, in which all unpleasant odours from the waste delivery process are adsorbed into the waste pretreatment facility.

All equipment of the dedusting, ventilation and adsorption system is intended to be carried out in anti-explosive protection.

The bag filter is equipped with a device for measuring the air pressure drop through the filter and bunker fill level gauges.

The elements of the pneumatically driven dedusting system use compressed air. Compressed air for shaking the filter and pneumatically driven devices is supplied by pipeline and should be of appropriate quality according to ISO 8573-1. To ensure reliable operation of the pneumatic components, preparatory groups are installed in front of each consumer.

Air purified to a quality that meets the requirements defined by the Regulation on Limit Values of Emissions of Pollutants into the Air from Stationary Pollution Sources, except for combustion plants ("Official Gazette of the RS", No. 111/2015 and 83/2021), as well as the requirements defined by the BAT conclusions for waste treatment plants (Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.), is taken to the stack after the treatment and discharged into the atmosphere.

Input data used to calculate the stack:

Q =	24000	m^3/h	capacity of gases entering the emitter
D =	1.2	m	emitter diameter
W_o =	5.9	m/s	gas velocity in the emitter

The required height of the emitter is determined from the condition that the size of the maximum concentration (C_m) of any pollutant in the ground layer of air must not exceed the mean daily maximum permissible concentration (MDK: 5mg/m^3)[44]. Based on the calculation, the **height of the emitter was adopted: H =21.5m.**

Characteristics of the emitter (smokestack):

Parameters	Value	Unit
Emitter height	21.5 m in relation to level 0	[m]
The inner diameter of the emitter at its top	1.2	[m]
Flue gas temperature at the top of the emitter	ambient	[°C]
Flue gas volume flow through the emitter	24,000	[Nm^3 /h]
Mass flow of particulate matter, PM	0.45	kg/h
Geographical coordinates of the emitter	44.285472 22.617081	[Lat/Long]

Waste storage

Removal of dust and unpleasant odours and prevention of their emission outside the waste storage facility is achieved by keeping the hall constantly under negative pressure, drawing air from the hall and burning it in the boiler plant. The amount of gases extracted from the hall and sent to the boiler is conditioned by the required amount of combustion air, which ranges between **23-47,000 Nm^3/h** depending on the current capacity of the boiler plant and the characteristics of the waste. In cases where the boiler plant does not work (due to overhaul, downtime or other), the air from the waste storage facility will, as mentioned above, be directed by means of a fan to the bag filter system and activated carbon filter (W-C09), where it is purified, and then the purified air is discharged into the atmosphere via the emitter (smokestack) of the filter unit. In order to reduce the emission of particulate matter in the facility, generated during the transfer of waste from one bunker to another bunker for the purpose of mixing waste, it is envisaged to spray with water mist when manipulating the crane.

Sludge storage

The sludge reception bunker is rectangular in shape with provided connections for the level meter, methane concentration (CH_4) and ventilation. Air from the sludge compartment will also be taken to the boiler plant (**2,000 m^3/h**) by means of combustion air fans, in order to keep the storage under negative pressure and prevent the spread of unpleasant odours outside the facility. When the boiler plant does not work, nitrogen (N_2) is automatically introduced into the reception bunker of sludge waste in order to inertise the space.

Liquid waste transfer and storage facility

Emissions of easily volatile compounds may occur during the process of transfering and storage of liquid waste materials and the emission of unpleasant odours may occur. When transferring liquid waste from tank trucks to the gas phase arm, a pressure balancing line is connected, which represents the connection with the gas space of the tank to which the transfer is carried out in the event that the discharge is carried out into one of the tanks under overpressure of nitrogen, in order to prevent the evaporation of easily volatile liquids when discharging.

In order to reduce air emissions from liquid waste storage tanks, the tanks are equipped with:

- a **nitrogen blanketing system** that maintains a constant overpressure in tanks with 0.1 barG, which ensures that there are no unpleasant odours or vapors of stored liquids in the room.
- **exhaust gas drainage system** via automatic valves on the outlet pipelines from the gas tank space. When reaching a pressure of 0.4-3 barG in the tank, the valve is opened and the gas is released, which is taken by pipeline to the intake of the combustion air fan in the boiler installation,

[44] According to DECISIONS COMMISSION IMPLEMENTING DECISION (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070)

and then to the thermal treatment. As the vessels are maintained under nitrogen overpressure, the composition of the exhaust gas is predominantly nitrogen.

If for any reason the aforementioned systems fail, the tanks are equipped with safety and vent fitting that allows pressure relief, i.e. prevents the occurrence of vacuum.

Ventilation of the space in which the storage tanks are located is provided through a duct with associated elements for inserting and sucking air from the space. The total quantity of insertion/suction is **2,500 m^3/h.** Within the area with storage tanks, the detection of hydrogen sulfide (H_2S) is envisaged, given its highly toxic properties.

Ventilation of the space in which the storage tanks for oily and bilge water are located is provided through an exhaust duct that takes air to the intake of the combustion air fan in the boiler plant, and then to the thermal treatment. In case of downtime of the boiler plant, an axial wall fan is provided for ventilation of this space for suction from the space with a suspended blind with a capacity of 4,500 m^3/h. The compensation of air is from the external roller doors from this room, as well as the rooms for unloading waste and service reception of the rake and pretreatment of non-hazardous and hazardous waste.

Ventilation of the space with IBC containers/barrels/jumbo bags, as well as the space of the transfer station from IBC containers/barrels, is provided through 3 axial wall fans for suction from the space with floating blinds with a total capacity of 17,000 m^3/h. The air compensation is from the facade of the building via 4 rain blinds. Within the area of liquid waste storage 3 and the transfer station from IBC containers/barrels, the detection of hydrogen sulfide (H_2S) is also envisaged, given its highly toxic properties.

Waste pretreatment
In order to reduce the emission of particulate matter and unpleasant odours from the premises for unloading and pre-treatment of hazardous and non-hazardous waste, in the event that the boiler plant does not work (due to overhaul, downtime, etc.), it is envisaged a dedusting and ventilation system consisting of exhaust hoods, pipelines, filter unit with accompanying equipment, activated carbon filters, fans, with a capacity of 24,000 m^3/h and emitter (smokestack) through which purified air is discharged into the atmosphere. The design envisages that the suction hoods are placed at the connection points on the equipment itself (primary shredder, belt conveyors, metal separator, secondary shredder). Also, on the collection pipeline of these extraction points, the connection of the pipeline is planned as the mean for ventilation of the hall or the pre-treatment facility.

Ventilation of the area in which the Hazardous Waste Pre-Treatment Line is located (delivered in IBC containers, barrels, etc.) within which the chamber in which the hazardous waste is pre-treated is located is provided through an axial wall fan with a floating blind with a capacity of 3,500 m^3/h. Air compensation is from the facade of the building. For the purpose of inertization into the chamber of the shredder itself, nitrogen dosing (N_2) is envisaged, so that emissions into the air will not occur in regular operation.

Central laboratory
Within the central laboratory, 4 digesters are planned to prevent the spread of unpleasant odours when performing experiments. Each digester is equipped with a ventilation system with an air cleaning filter and a roof outlet.

3.5.3 Review of the technology of waste material treatment and prevention of air emissions from the boiler plant

Solid, liquid and sludge wastes are added to the boiler via independent dosing systems according to the defined recipe. The lower part of the firebox is filled with sand that is heated to a temperature of 650-800 ^oC. In the upper part of the firebox, the flue gases are mixed with the secondary air that delivers oxygen, which helps the combustion process, whereby the gas temperature rises to 850 – 950 ^oC. For efficient destruction of dioxins and furans as well as volatile organic matter (VOC), it is necessary that the flue gases spend min. 2 s at a temperature of 850 ºC. The following processes take place in the fluidized bed:

- fuel drying
- combustion
- fuel pyrolysis
- fuel gasification
- fuel oxidation, and
- heat exchange.

The largest and most complex part of the Waste-to-Energy Plant are **the flue gas cleaning systems** generated during the combustion of waste. These systems are designed on the basis of the defined chemical composition of the recipes of different types of waste entering the incineration process:

Chemical composiition of waste recipe		
3-17t/h	**Sulfur (S)**	Max **2%**
	Chlorine (Cl)	Max **3%**
	Fluorine (F)	Max **0.02%**
	Mercury Hg)	**10 mg/kg**
	Humidity (H_2O)	Max **50%**
	Ash	Max **20%**

The defined chemical composition of the waste mixture, which is simultaneously thermally treated in the subject plant, was used for the design of key equipment, boiler and adequate design of the flue gas contamination treatment system. The mixture of waste that is simultaneously referred to thermal treatment in the boiler plant as a fuel must not contain characteristics that are outside the range defined in Table 3.10. These characteristics are used as a limit when making logistics plans and simultaneously sending waste for thermal treatment. Consequently, it is clear that there is no possibility of variation in relation to the defined restrictions on the composition of waste allowed for simultaneous thermal treatment in the plant. Table 3.10 also clearly shows that the equipment is designed for a technical maximum total chlorine content of <3% in the fuel input, while the share of branch halides is limited to <1% in accordance with the limits expressed in Article 8, paragraph 2 of the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", No. 103/2023).

Flue gas treatment systems include:

- Dry flue gas cleaning (cyclone and activated carbon reactor and bag filters)
- Wet flue gas cleaning in scrubbers
- Selective catalytic filter.

The following figure provides a simplified schematic view of the flue gas treatment streams from the boiler plant.

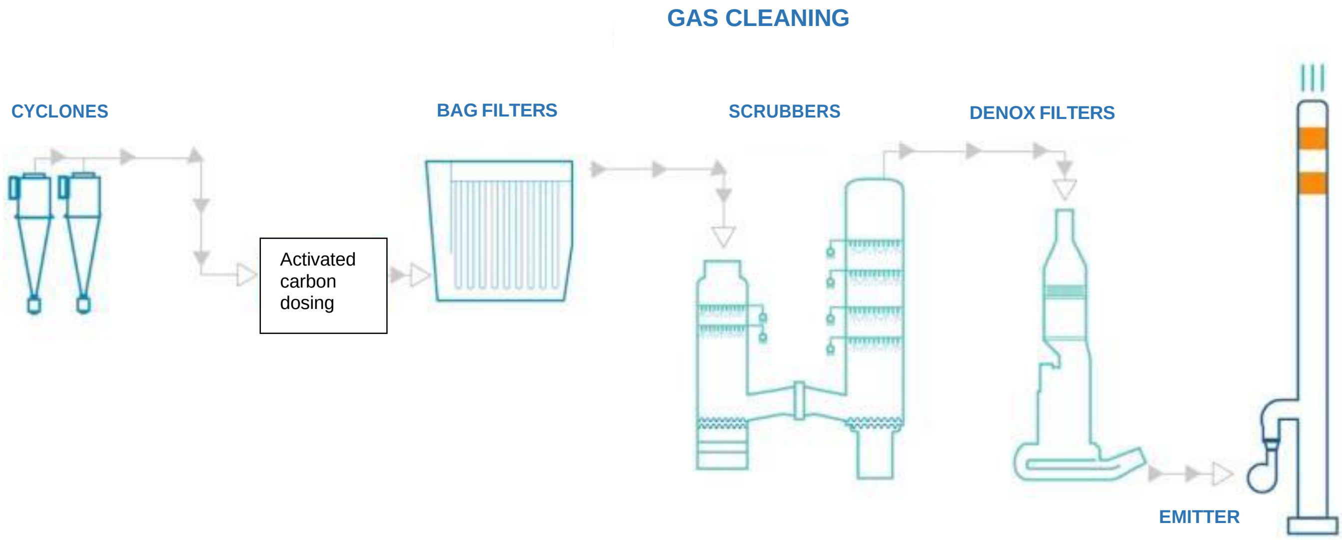


Figure 3.27 Simplified scheme of flue gas cleaning streams from the boiler plant

The flue gas cleaning plant includes a number of operations that use flue gases to:

- remove particulate matter
- absorb acidic compounds such as SO_2, HCl and HF,
- adsorb organic compounds such as PCDD/PCDF,
- adsorb heavy metals such as mercury Hg,
- reduce nitrogen oxides (NO_x).

The removal of coarse particles and fly ash, or particulate matter from flue gases, is carried out first in cyclones and then in bag filters that have high dedusting efficiency (up to 99.99%).

The adsorption of heavy metals such as Hg and organic compounds such as dioxins and furans PCDD/PCDF from the flue gas stream takes place by dosing activated carbon into the reactor (the rector is part of the equipment of the bag filter system).

The absorption of compounds such as SO_2, HCl and HF from flue gases takes place in the scrubber system (wet washing of gases).

The removal of nitrogen oxides (NO_x) is achieved by injecting an aqueous solution of ammonia (ammonia water) into the flue duct after the scrubber system, i.e. upstream of the catalyst box in which the selective catalytic reduction reaction occurs.

For the purposes of sizing and appropriate selection of flue gas cleaning equipment, two boiler operation modes were selected as relevant:

- Operation mode of boiler I: *minimum amount of fuel (prepared waste material)/maximum caloric power of fuel (shortened min/max)*. The caloric power value of such a mixture of waste materials is 20.22 MJ/kg.
- Operation mode of boiler II: *maximum amount of fuel (prepared waste material)/minimum caloric power of fuel (shortened max/min)*. The calorific power value of such a mixture of waste materials is 6.99 MJ/kg.

Table 3.55 shows the operating parameters (flow, pressure, temperature and concentration of pollutants).

Table 3.55 Input design parameters (input to the dry gas treatment system)

Parameter	**Unit**	**Flue gas**	
		Boiler outlet	
Boiler mode		I - min/max	II - max/min
Volume flow	Nm³/h	51712	89804
Temperature	°C	142	163
Pressure	mbar	995	980
Flow rate	m/s	8.74	16.18
O_2 content	%w	4.90	4.14
CO_2 content	%w	11.03	8.42
H_2O content	%w	11.77	26.44
N_2 content	%w	72.31	61.0

Parameter	Unit	Flue gas	
		Boiler outlet	
Content of pollutants			
Particulate matter	mg/Nm^3	1013	11588
HCl	mg/Nm^3	2036	2060
HF	mg/Nm^3	15	16
SO_2	mg/Nm^3	780	795
NO_x	mg/Nm^3	200	200
Heavy metals			
Cd+Tl	mg/Nm^3	<0.01	<0.01
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	mg/Nm^3	<0.18	<0.18
Hg	µg/Nm^3	605	605
CO	mg/ Nm^3	50	50
NH_3	mg/Nm^3	<20	<20
TVOC	mg/Nm^3	10	10
Dioxins and furans PCDD/F	ng I-TEQ/Nm^3	<0.04	<004

3.5.3.1 *Dry Flue gas cleaning (cyclones, activated carbon reactor and bag filters)*

Cyclones

Dry flue gas cleaning begins in **cyclones** in which the separation of coarse particles falling into the collector at the bottom is enabled through the spiral movement of gases, and the flue gases continue until the next cleaning phase. Cyclone separators are located between the 3rd and 4th pass of the boiler.

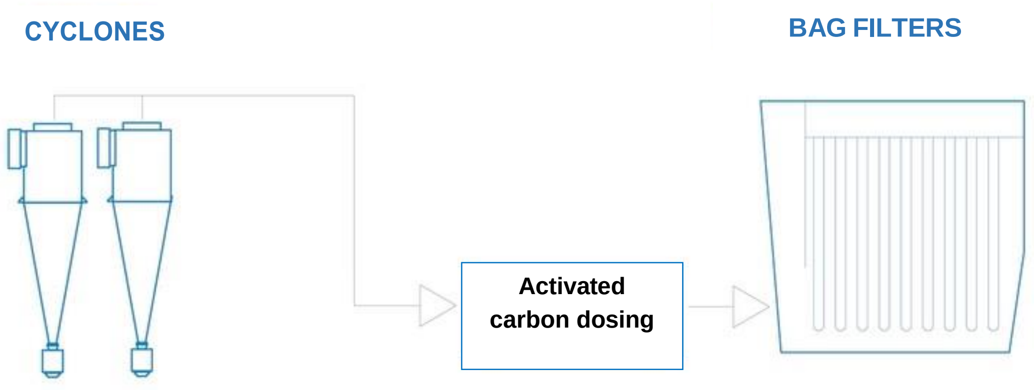


Figure 3.28 Schematic representation of the dry waste gas treatment system

Activated Carbon Reactor System

Flue gases released from coarse particles leave the 4th passage of the boiler (economizer) and then pass through **an activated carbon reactor** that absorbs heavy metals, dioxins and furans formed during flue gas cooling. The activated carbon reactor is located between the sections of the bag filter chambers adjacent to the reactor. The separation of dioxins and heavy metals is carried out in the reactor, by adsorption of the aforementioned particles into the pores of activated carbon, which are dosed into the reactor from the containers, which are placed in the immediate vicinity of the reactor. The lower container is fixed and from it the dosing of activated carbon into the reactor is performed, while the upper container is replaced if necessary and serves to supplement the lower, dosing container. When the upper container is emptied, it is replaced. Vibrating elements are installed on the activated carbon containers to allow emptying of the containers. A level meter with a high value alarm is installed on the dosing container to protect this container from overfilling. Nitrogen connections are provided on the dosing container, which enters the container if there is an increase in temperature in this device (nitrogen as an inert gas prevents the appearance of flames).

In addition to the two activated carbon storage containers, the dosing system also includes:

- air filter to which the lower, dosing container is attached. This filter prevents the emission of particulate matter during operation, a compressed air system supplied to the air filter. Compressed air is used to clean the filter, that is, to shake/regenerate the filter,
- scales for measuring activated carbon installed in the lower part of the dosing container (lower container),
- double screw conveyor for the transport of activated carbon,
- rotary activated carbon dispenser, and
- compressed air and air for pneumatic transport of activated carbon to the reactor system.

Activated carbon is discharged from the dosing container into a double screw conveyor, and then introduced into the activated carbon dosing line into the reactor via a rotary dispenser. This line uses an air fan to pneumatically transport activated carbon to the reactor.

Activated carbon with adsorbed dioxins and heavy metals is discharged from the reactor via a screw conveyor and a rotary dispenser into the screw conveyor system for particulate matter from bag filters - ash. Activated carbon with adsorbed dioxins and heavy metals is mixed with these particulate matter on screw conveyors. Part of the activated carbon mixture with adsorbed dioxins and heavy metals and ash is sent for wet ash treatment, and part is sent back to the reactor via recirculation conveyors.

Mechanical bag filter system

After removing heavy metals and dioxins from the flue gases in the activated carbon reactor, the flue gases enter the bag filters (6 filter chambers (two sections of 3 chambers each). Each of the chambers consists of 196 vertically placed fabric filter bags.
When passing gas through the filter bags, fly ash particles remain on the inner surface of the bags, forming a layer of deposited dust. Cleaned flue gases exit to the top of the filter chamber. At the inlet and outlet of the filter chambers, the pressure change is monitored using a differential pressure gauge. The increase in differential pressure is an indicator of filter fouling, i.e. that there is an increased amount of particulate matter on the filter bags.

Filter bags are periodically shaken (when there is an increase in the value of differential pressure) with compressed air (regeneration/cleaning of filter bags). Namely, after a certain period of work, compressed air is blown into the bags, which shakes off the layer of deposited solid particles from the bags. The particles fall to the bottom, from where the separated fly ash is drained by a system of screw conveyors. One part of this ash together with activated carbon with adsorbed dioxins and heavy metals is returned to the reactor, and the other part is sent for wet ash treatment, as mentioned earlier.

This completes the dry cleaning of the gases.
In the lower part of the filter chambers, heaters are installed to prevent flue gas condensation when starting the boiler. Steam supplied from the main steam distributor is used for heating.
Nitrogen supply connections are provided in the lower zone of the bag filter chambers.

Table 3.56 shows the material and energy balance of the dry flue gas cleaning system.

Table 3.56 Material and energy balance of the dry flue gas cleaning system

Fluid	**Aggreg. state: L-liquid; G-gas; S-solid**	**Thermal power Enthalpy**	**Volume flow rate**	**Temperature**	**Pressure**	**Composition by components**	
Flue gas (at the outlet of the economizer)	G	1.40/1.42kJ / Nm^3/K	51476/ 89804Nm^3/h		994.85/ 979.92 mbar		
Flue gas (at the outlet of the bag filters)	G	1.40/ 1.43 $kJ/Nm^3/K$	51476/ 89804Nm^3/h	142/163°C	986/ 956mbar	Particulate matter mg/Nm^3	< 1
						HCl mg/Nm^3	2340
						HF mg/Nm^3	13
						SO_2 mg/Nm^3	2309
						NO_x mg/Nm^3	200
						Cd+Tl mg/Nm^3	0.01
						Sb+As+Pb+Cr+Co +Cu+Mn+Ni+V mg/Nm^3	0.18
						Hg µg/ Nm^3	<20

The list of equipment of the dry flue gas cleaning system is shown in Table 3.57.

Table 3.57 List of equipment of the dry flue gas cleaning system

No.	**Equipment name**	**Number of pieces**	**Characteristics**
1.	Bag filter reactor	1	Design temperature: 166 °C Design pressure: 995 mbar Flue gas flow: 89804 Nm^3/h
2.	Filter housing with bags and heaters	6	Dimensions: 3520 x 3520 x 14015 mm Design temperature: 166 °C Design pressure: 995 mbar Flue gas flow: 15134 Nm^3/h

3.	First stage Flue gas fan	1	Fluid: Flue gas after bag filter Design temperature: 220 °C Design pressure: +/- 100 mbar Flue gas flow: 95000 Nm^3/h Power: 450 kW Rpm: 1485 rpm
4.	Screw conveyor for ash collection under bag filters	2	Diameter:400 mm Length: 8750 mm Power: 2.2 kW
5.	Screw ash conveyor under the bag filter	1	-
6.	Rotary dispenser	2	--
7.	Screw conveyor for ash transport	1	Power:2.2 kW
8.	Rotary dispenser	1	-
9.	Screw conveyor	1	Power:2.2 kW
10.	Recirculation conveyor with cooling fan	1	Conveyor power:3 kW Fan power: 0.25 kW
11.	Recirculation conveyor with cooling fan	1	Conveyor power:3 kW Fan power: 0.25 kW
12.	Rotary dispenser	1	-
13.	Air filter for bottom activated carbon container	1	-
14.	Top container of activated carbon	1	Volume: 2 m^3 Activated carbon density: 550 kg/m^3 Flow rate: 8 kg/h
15.	Vibrating element on the top container	1	-
16.	Bottom Activated Carbon Container	1	Volume: 2m^3 Activated carbon density: 550 kg/m^3 Flow rate: 8 kg/h
17.	Vibrating element on the bottom container	1	-
18.	Screw conveyor of activated carbon dosing system	1	Power : 2 kW
19	Rotary dispenser of activated carbon	1	-
20	Air fan	1	-

A description of the dry gas cleaning system is also given in Chapter 3.2.

3.5.3.2 *Wet flue gas cleaning*

After dry cleaning, the gases further reach the scrubber system where their wet cleaning begins. In **the first scrubber (HCl scrubber)**, the nozzle system flushes gases in a co-current acidic environment (pH 1), converting the acidic components from the gaseous to the liquid phase. In this way**, chlorides, fluorides and heavy metals are extracted from the gases.** In the **second scrubber**, the nozzles in the countercurrent stream shower the flue gases with a solution of lime milk (pH 7). By the process of oxidation and neutralization, **gaseous sulfur oxides are converted into solid calcium sulfate or gypsum**.

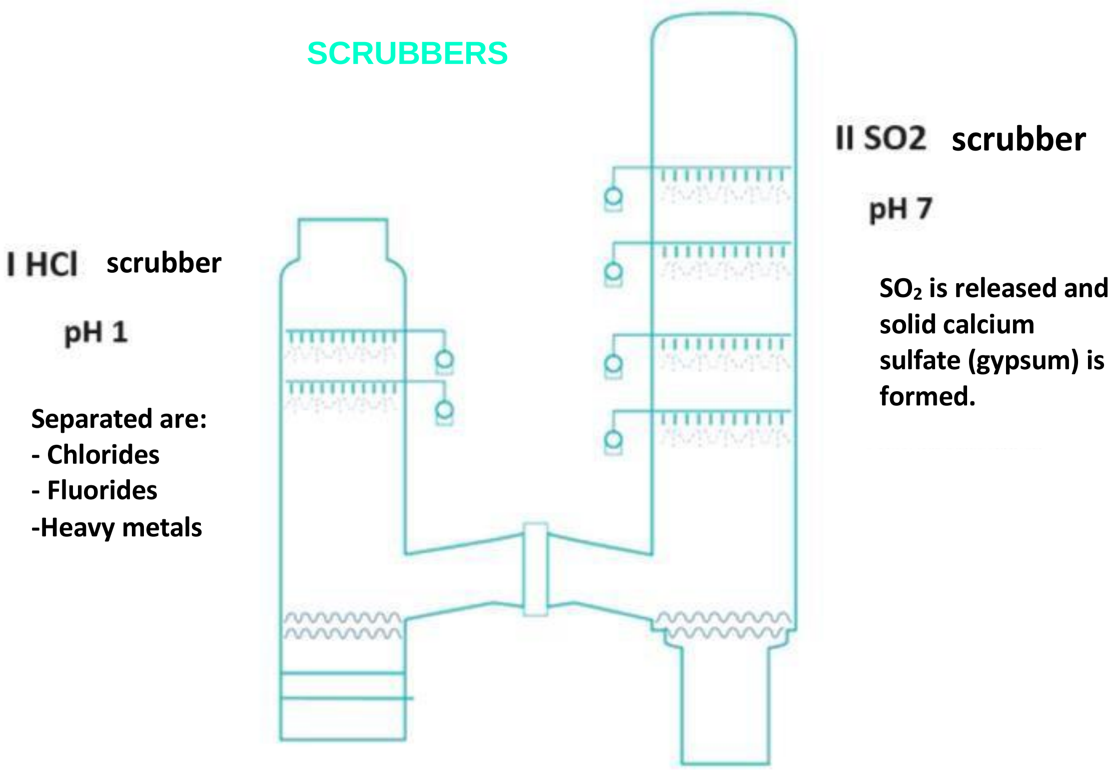


Figure 3.29 Schematic representation of the gas wet cleaning system

Thus, the first scrubber system (HCl scrubber) is designed as a system with a parallel flow of gas and liquid (co-current streams) with quenching at the top. Flue gases enter the scrubber from the top side, through the quench, at a temperature of 140-200 °C depending on the load of the boiler and the time interval in which the boiler is in operation without cleaning. In the scrubber, cooling of flue gases to saturation temperature in contact with water (flue gas is cooled from the initial 140-200 °C to 55-70 °C) and absorption of halogen compounds and SO_3 takes place.

At the flue gas outlet, i.e. the gas phase from the HCl scrubber, a droplet separator is provided from which the separated liquid phase is taken to the bottom of the scrubber (drops separated from the gas phase flow from the scrubber). At the flue gas outlet from the HCl scrubber, three independent temperature meters are installed immediately after the droplet separator. If a high flue gas temperature is detected, the bypass channel opens, all fans stop working, and the flue gases coming out of the bag filters bypass the entire wet gas cleaning system as well as the SCR system and go directly to the stack (accident situation). In Chapter 7.2 of this study, the above is elaborated through the presentation of the accident Scenario *8 - Forced flue gas discharge to the stack without cleaning in the scrubber system* and an overview of the concentrations of hazardous substances in the flue gas (HCl, HF, SO_2 and NO_x) on the emitter (stack) is given, as well as an overview of the impact of these emissions to the environment.

Second degree of cleaning – SO_2 scruber

In the previously described manner, the cleaned flue gases without extracted liquid drops enter another scrubber system – the SO_2 scrubber system.

The second (SO2) scrubber is a countercurrent scrubber in which the flue gases flow from the bottom up, while the scrubber liquid - calcium hydroxide solution ($Ca(OH)_2$) is sprayed in the nozzles that are placed at the top of the scrubber itself, and flow from the top to the bottom of the scrubber.

The removal of sulfur oxide from the flue gases is carried out by applying lime milk $Ca(OH)_2$, and according to the reaction:

$$Ca(OH)_2 + SO_2 + H_2O \rightarrow CaSO_3 \cdot 2H_2O$$

An additional oxidation and neutralization reaction takes place in the gypsum suspension tank to form calcium sulfate CaSO4, which forms a gypsum compound with water according to the reaction:

$$Ca(OH)_2 + SO_2 + ½\ O_2 + H_2O \rightarrow CaSO_4 \cdot 2H_2O$$

The formed liquid droplets (with absorbed sulfur oxides) fall countercurrent to the flue gases and are collected in the gypsum suspension tank.

At the outlet of the SO_2 scrubber, the flue gases pass through a two-stage droplet separator, thus reducing the loss of water and the corrosive effect of the outgoing gas mixture. The separated liquid phase is taken from the droplet separator to the bottom part of the HCl scrubber, as a supplement to the circulating water (HCl scrubber fluid).
The flue gases after leaving the SO_2 scrubber are heated and introduced into the SCR system.

Hydrated lime ($Ca(OH)_2$) is delivered by silo tanks, from which it is pneumatically transported to the silo located in the W-C11 facility, in the immediate vicinity of the scrubber system tank. At the top of the silo there is a filter, which is used to remove particulate matter. The silo is equipped with a safety valve to avoid overpressure in the silo when filling and a material level meter in the silo, as well as connections for air supply for fluidization and drying of lime in the silo.

A detailed description of the wet gas cleaning system is given in Chapter 3.2.

Table 3.58 shows the material and energy balance of the wet flue gas treatment system

Table 3.58 Material and energy balance of the wet flue gas cleaning system

Fluid	**Aggreg. state: L-liquid; G-gas; S-solid**	**Volume flow rate**	**Temperature**	**Pressure**	**Composition by components**	
Flue gas (at entrance to I scrubber – HCl scrubber)	G	27110/ 63291Nm^3/h	142/163^{o}C	1006/ 1005 mbar		
Flue gas (at outlet of I scrubber)	G	28625/ 67198Nm^3/h	56/68^{o}C	1005/ 998 mbar	Particulate matter mg/Nm^3	< 1
					HCl. mg/N m^3	<10
					SO_2 mg/N m^3	492/499
					CO_2 w%	10.24/7.84
					H_2O w%	16.23/30.44

					N_2 w%	68.6/57.4
Flue gas (at the outlet of the II scrubber)	G	28625/ 67198Nm^3/h	55/67^{o}C	989/978 mbar	O_2 w%	5.47/4.32
					CO_2 w%	9.90/7.73
					H_2O w%	15.68/29.99
					N_2 w%	68.95/57.96
					Particulate matter mg/Nm^3	< 1
					HCl mg/Nm^3	< 1
					SO_2 mg/Nm^3	<20
					NO_x mg/Nm^3	200
					HF mg/Nm^3	1
					Cd+Tl mg/Nm^3	0.01
					Sb+As+Pb+Cr+ Co+Cu+Mn+Ni +V mg/Nm^3	0.18
					Hg µg/ Nm^3	<20

The list of equipment of the wet flue gas cleaning system is shown in Table 3.59.

Table 3.59 Wet gas cleaning system equipment list

No.	Equipment name	Number of pieces	Characteristics
1.	HCl scrubber	1	Inner diameter: 3040 [mm] Height: 16520 mm Fluid: Flue gas at the entrance to the HCl scrubber Design gas inlet temperature: 200°C Gas inlet pressure: 1.006 bar Flue gas flow at inlet: 65000 Nm^3/h
2.	Circulation pump of HCl solution	2	Fluid: Circulating water of HCl scrubber Design temperature: 90°C Rated flow rate: 250 m^3/h Rated head: 2.2 bar Motor power: 30 [kW] Rpm: 1450 rpm
3.	Safety tank Supply	1	Volume: 20 m^3 Flow at safety supply: 21 m^3/h Operating volume: 8 m^3
4.	SO_2 scrubber	1	Inner diameter: 3540 [mm] Height: 21570 mm Fluid: Flue gas at the inlet to the SO2 scrubber Design gas inlet temperature: 70°C Gas inlet pressure: 1.006 bar Flue gas flow at inlet: 70000 Nm^3/h
5.	Air fan for oxidation	2	1 working, 1 spare Fluid: Oxidizing air Volume flow: 1000 Nm^3/h
6.	Moisturizer of oxidizing air	1	-
7.	Gypsum suspension tank	1	Volume: 140 m^3 Rated flow: 1300 m^3/h Retention time: 4.31 min
8.	Overflow tank of gypsum suspension	1	Volume: 140 m^3 Rated flow: 1300 m^3/h retention time: 4.31 min
9.	Tank mixer of gypsum suspension	2	Engine power: 5.5 kW;
10.	Tank mixer of gypsum suspension overflow	2	Engine power: 5.5 kW;
11.	Overflow return pump of gypsum suspension	1	-

12.	Circulation pump of SO_2 scrubbers	4	Fluid: Circulation water of SO_2 scrubbers Design temperature: 20°C Motor power: 90 [kW] Rated flow: 1186 m^3/h Rated head: 2.7 bar
13.	Gypsum sedimentation tank	1	Water volume flow at inlet: 4.5 m^3/h Clean water flow at outlet: 3 m^3/h Tank diameter: 2.5 m Clean water velocity: 0.39 m/s

3.5.3.3 Selective catalytic filter (SCR SYSTEM)

The last step in gas cleaning is $DeNO_x$ filters. In them, gases pass through catalytic modules where, with precise dosing of ammonia water (25% solution), nitrogen oxides (NO_x) are reduced to nitrogen (N_2) with the degradation of possibly residual dioxins and furans that were not absorbed in the previous stages of cleaning. The diluted NO_x reducing agent is injected before the SCR reactor at a temperature of 240-250 °C. There are nozzles on the spear on which drops are formed, thus ensuring the evaporation and distribution of the NOx reducing agent in the flue gas duct.

In the process of waste material incineration - fuels in the boiler, nitrogen oxides (NO_x) are formed. Nitrogen oxides that have the greatest impact on environmental pollution are nitrogen – monoxide (NO) and nitrogen – dioxide (NO_2), while other oxides occur in relatively low concentrations, and their impact is negligible.

The operation of the boiler plant may produce nitrogen oxides as follows:

- thermal – this mechanism represents the reaction of nitrogen and oxygen from the air during combustion at very high temperatures prevailing in the flame zone. At combustion temperatures above 1000 °C, the formation of NO_x increases exponentially,
- from nitrogen from fuels – their formation occurs at lower combustion temperatures (below 1000 °C),
- by radical reactions – in this way, NO_x is generated by the reaction of nitrogen with flammable (CH_n - compounds). This effect is influenced by the produced hydrocarbon radicals, which are intermediates during the combustion reaction.

The decrease of nitrogen oxide emissions at the plant in question will be affected by:

- primary measures, which affect the amount of nitrogen oxides NO_x formed and related to lowering the combustion temperature, i.e. lowering the concentration of oxygen in the flame,
- secondary measures, relating to the cleaning of flue gases.

Table 3.60 shows the material and energy balance of the SCR system.

Table 3.60 Material and energy balance of the SCR system

Fluid	**Aggreg. state: L-liquid; G-gas; S-solid**	**Thermal power Enthalpy**	**Volume flow rate**	**Temperature**	**Pressure**	**Composition by components**	
Flue gas (before separating to SCR section heater)	G	29625/ 68198Nm³/h		230°C	985/958 mbar		
Flue gas (after mixing with the stream from section SCR heater)	G	29625/ 68198 (Nm³/h)		238°C			
Flue gas (towards SCR section heater)	G	29000/ 39000 (Nm³/h)		221/209°C			
Flue gas (from section SCR heater)	G	1.40/ 1.43 kJ/Nm³/K	29000/ 39000 (Nm³/h)	234/257°C			
Flue gas (SCR heat exchanger)	G		31625/ 70198 Nm³/h	235/236°C	983/948 mbar	O_2 w%	6.46/4.80
						CO_2 w%	9.27/7.51
						H_2O w%	14.69/29.14
						N_2 w%	69.58/58.56
Air (to dilute NH_4OH)	G		2000 (Nm³/h)	180°C	987/960 mbar		
Discharge gas (flue gas after treatment in SCR)	G		31625/ 70198 (Nm³/h)	151°C	1007mbar	Particulate matter mg/Nm³	< 1
						HCl. mg/Nm³	< 1
						SO_2 mg/Nm³	<20
						NO_x mg/Nm³	< 30
						HF mg/Nm³	1
						Cd+Tl mg/Nm³	0.01

						Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V mg/Nm3	0.18
						Hg µg/ Nm^3	<20

The list of SCR system equipment is shown in Table 3.61.

Table 3.61 SCR System Equipment List

No.	Equipment name	Number of pieces	Characteristics	Remarks
1.	Ammonia water unloading pump	1	Design temperature: ~20°C (ambient temperature) Motor power: 2.9 [kW] Max. flow rate: 100 m^3/h	Common for both lines
2.	Container NH4OH	1	Fluid: Ammonia water NH_4OH Capacity: 40 m^3 Storage capacity: 86-190 days per one line.	Common for both lines
3.	Ammonia water dosing pump	2	Design temperature: ~20°C (ambient temperature) Motor power: 0.11 [kW] Max. flow rate: 63 l/h	
4.	Ammonia water reservoir sprinkler pumps	2		
5.	Vapour filter	1		
6.	Wet air preheater	2		
7.	Reheating fan for wet gas	1	Fluid: Flue gas after wet cleaning Design temperature: 120 °C Design pressure: 990 mbar Flue gas flow: 45000 Nm^3/h Power: 90 kW Rpm: 1485 rpm	
8.	SCR reheater	1		
9.	SCR reactor with catalysts	1	Fluid: Flue gas at inlet in SCR reactor Temperature: 235-238 °C Inlet pressure: 950-990 mbar Flue gas flow: 31000- 70000 Nm^3/h	
10.	Heat exchanger gas-gas	1	Fluid: Flue gas on outlet from SCR reactor Cleaned gas inlet temperature: 240-250 °C Cleaned gas outlet temperature: 140-150 °C Heat exchange surface: 5400 m^2	

11.	Flue gas fan 2nd stage	1	Fluid: Flue gas after SCR system Design temperature: 165 °C Inlet pressure: 980 mbar Flue gas flow: 75000 Nm^3/h Power: 450 kW Rpm: 1485 rpm	
12.	Air fan for sealing and cleaning	1		
13.	Smokestack	1	Fluid: Flue gas at the inlet to the stack Temperature: 140-150 °C Inlet pressure: 1007 mbar Flue gas flow: 31000-70,000 Nm^3/h	

A detailed description of the SCR SYSTEM is given in Chapter 3.2 of the Study.

After dry and wet cleaning, cleaned air is conducted to the emitter (smokestack) for release into the atmosphere. The smokestack is a steel self-suporting cylindrical structure with the following characteristics:

Parameter	**Value**	**Unit**
Emitter height	56 m relative to the level 0	[m]
The inner diameter of the emitter at its top	1.7	[m]
Flue gas temperature at the top of the emitter	147 ± 3	[°C}
Flue gas volume flow through the emitter	70,000	[Nm^3/h}

Individual mass flows of all pollutants dispersion of which is the subject of the Study

Mass flow of particulate matter	0.35	kg/h
Hydrogen fluoride mass flow, HF	0.07	kg/h
Carbon monoxide mass flow, CO	3.5]	kg/h
Mass flow of sulphur dioxide, SO_2	2.1	kg/h
Mass flow of nitrogen oxides, NOx	8.4	kg/h
Mass flow of chlorine compounds expressed as HCl	0.42	kg/h
Mass flow of ammonia, NH_3	0.7	kg/h
Mass flow of mercury Hg	0.0014	kg/h
Mass flow PCDD/F and dioxins as PCBs	0.0000000028	kg/h
Geographical coordinates of the emitter	44.284570 22.616845	[Lat/Long]

The emissions of the plant are in accordance with the highest EU standards, best available technologies and BREF documents (a comparison of the compliance of the plant in question with the BATs is given in the appendix to the study).

3.5.4 Overview of technology for waste treatment and prevention of air emissions from stabilization and solidification plant

Stabilization and solidification filter system (W-C16)

In order to dedust and ventilate the facility for stabilization and solidification of the homogenized mixture of solid residues from the boiler plant, the subject design envisages the Solidification Filter System (W-C16).

Thus, the dedusting and ventilation system consists of:

- exhaust jalousies and hoods,
- pipeline.
- filter units with accompanying equipment (dedusting capacity Q=25,000 $m^{3/}h$)
- centrifugal fan (capacity Q=25,000 $m^{3/}h$, P=37 kW)
- emitter (smokestack) 21.5 m high.

The project envisages 16 jalousies placed evenly, at the very top of the Solidification facility, so arranged that they can efficiently collect particles and vapors from the process of storage and stabilization of the homogenized mixture of solid residues from the boiler plant. The arrangement of the jalousies is such that in each field, between the two axes, two jalousies will be installed, which will cover each segment of the facility.

The design envisages that in the part of the facility where the separation of metals from coarse ash from the bottom of the boiler (slag) will be performed, the suction hoods will be placed at the connection points on the equipment itself, the position and dimensions of which have been defined by the equipment manufacturer. The equipment to be dedusted is a vibrating feeder (dedusting capacity Q=3,500 m^3/h) where waste slag is first delivered, which then reaches the magnetic strip type separator, where the primary separation of metals is performed. The separated material falls on the vibrating feeder from where the waste material is delivered to the next magnetic separator of cylindrical shape. The suction point on the vibrating feeder (dedusting capacity Q=1,500 m^3/m) is foreseen. After the separation of the metal on the second eddy current separator, the waste material is delivered by the conveyor system to the stabilization and solidification hall. Suction hoods are also provided on all conveyors (with a capacity of 2,000 m^3/h, 2,000 m^3/h, 2,000 m^3/h, respectively).

Figure 3.30 shows a P&ID diagram of the Stabilization and Solidification Filter System (W-C16).

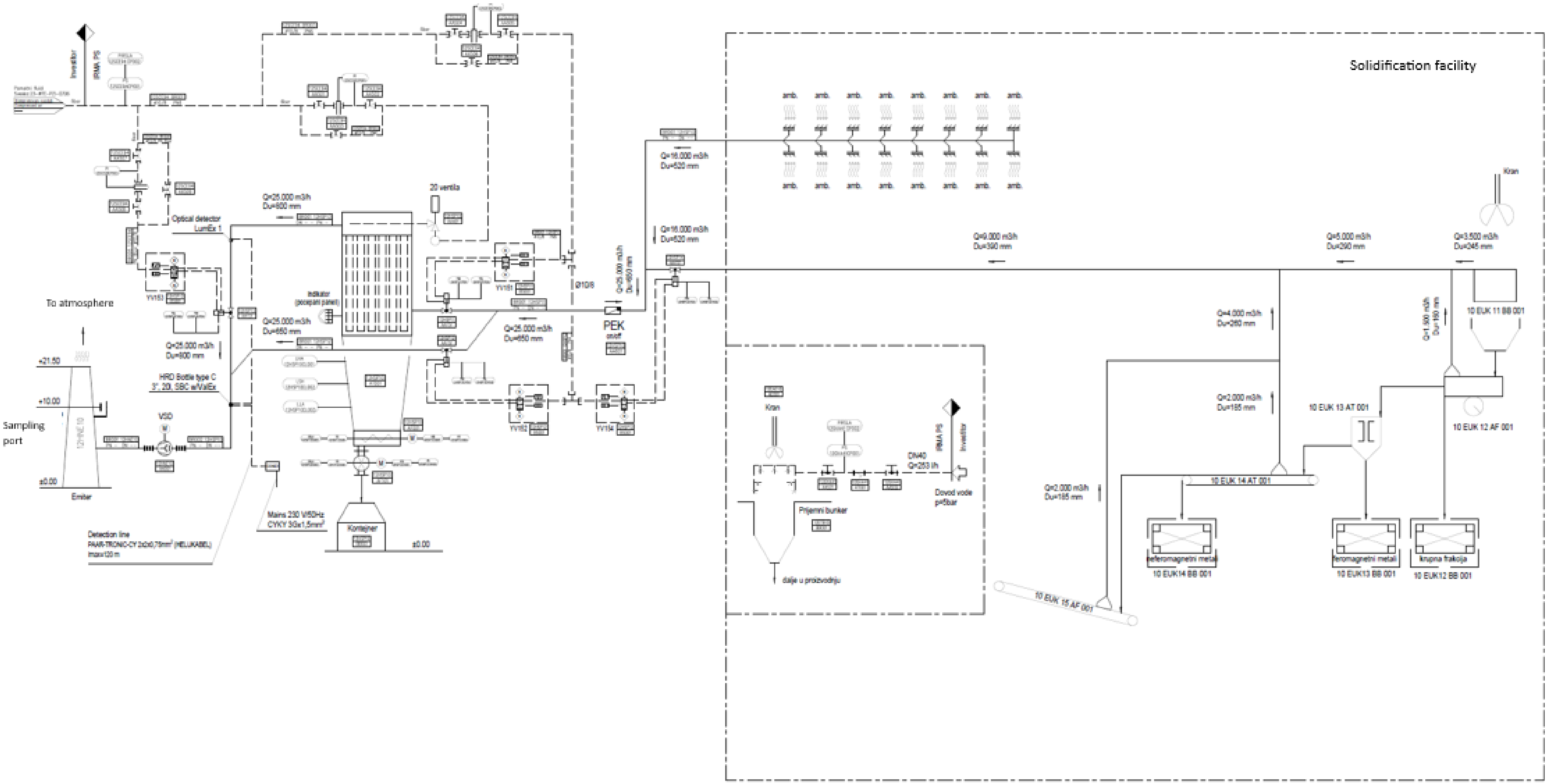


Figure 3.30 P&ID: Stabilization and solidification filter system (W-C16)

For the cleaning (filtration) of the exhaust dirty air, a bag filter with impulse shaking with compressed air (VF) is provided, made of a steel housing with a bunker.

Characteristics of the bag filter:

Flow	Q =	25 000	Am^3/h
Number of modules:	M=	4	pcs
Number of bags in the module	N_{vm}=	60	pcs
Total number of bags	N_v =	240	pcs
Filter bag length	L_v =	4	m
Filter bag diameter	D_v =	160	mm
Filter surface	A_f =	482.55	m^2
Flow/Filter surface	A /C =	51.81	$m^3/m^2/h$
Filtration rate		0.0144	m/s @200 Pa
Filter pressure drop	ΔP =	225.50	Pa (with new bags)

In case of need (servicing) of the bag filter, a bypass pipeline is provided around the filter itself. The bypass pipeline is in operation when the pneumatic butterfly valve 12HSP11 and 12HSP13 are closed, and the valve 12HSP12 is opened, which will redirect the air flow from the filter directly to the fan. The 12HNE10 centrifugal fan is placed behind the bag filter on a reinforced concrete foundation, through which the entire process of dedusting, ventilation and filtration takes place, so it is frequency regulated for easier system control. The fan also has the task of transporting the cleaned air further into the emitter and atmosphere. Compensators (flexible connections) are installed at the fan inlet and outlet.

All equipment of the dedusting, ventilation and adsorption system is intended to be carried out as explosion proof.
The bag filter is equipped with a device for measuring the air pressure drop through the filter and bunker fill level gauges.

Also, it is important to note that at the reception bunker in the Solidification facility, a water sprinkler system with a capacity of 253 l/h has been installed, which keeps fine particles from spreading outside it.

Within the stabilization and solidification facility, an H_2 detection system is also envisaged, which has executive functions at 10% and 25% of LEL. When reaching a concentration of 10% of the lower explosion limit (LEL), the switchboard switches on an intermittent siren beep, after which the executive function of switching on the ventilation is activated. As stated in the facility, there is a dedusting system that constantly works as primary ventilation, and in addition, fans on the facade of the facility are provided as a backup ventilation system that switches on in the event of a failure of the dedusting system or in the event of reaching a hydrogen concentration of 10% of the LEL. When reaching a concentration of 25% of the lower explosive limit, the switchboard includes a continuous siren sound signal and a flash, a lighted panel "GAS" and an alarm signal is forwarded to the central fire alarm system, after which the executive function is activated, the power is switched off.

Air cleaned to a quality that meets the requirements defined by the Regulation on Limit Values of Emissions of Pollutants into the Air from Stationary Pollution Sources, except for combustion plants ("Official Gazette of the RS", No. 111/2015 and 83/2021), as well as the requirements defined by the BAT conclusions for waste treatment plants (Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document

C(2018) 5070) (Text with EEA relevance.), is taken to the stack after the treatment and discharged into the atmosphere. The fan is connected to the emitter via the outlet channel, where the measuring points for measuring the emission of the outlet gas are provided, and through which the purified air is discharged into the atmosphere.

Input data used to calculate the stack:

Q =	25000	m^3/h	capacity of gases entering the emitter
D =	1.2	m	emitter diameter
W_0=	6.1	m/s	gases velocity in the emitter

The required height of the emitter is determined from the condition that the maximum concentration (C_m) of any pollutant in the ground layer of air must not exceed the mean daily maximum permissible concentration (MDK: 5 mg/m^3)[45]. Based on the calculation, the **height of the emitter was adopted: H = 21.5 m**

Characteristics of the emitter (smokestack):

Parameters	Value	Unit
Emitter height	25 m in relation to level 0	m
The inner diameter of the emitter at its top	1.2	m
Flue gas temperature at the top of the emitter	ambient	°C
Flue gas volume flow through the emitter	25,000	Nm^3/h
Mass flow of particulate matter, PM	0.125	kg/h
Geographical coordinates of the emitter	44.284418 22.616549	Lat/Long

The subject project also envisages that the mixer reactor where the process of cement mixing, ash and water, i.e. solidification takes place; cement storage silo; cement weighing scale and ash weighing scale) will be equipped with bag filters for particulate matter separation.

3.5.5 Demonstration of wastewater treatment technology

A separate sewerage system is planned within the Eco Energy complex for the needs of wastewater collection. The wastewater to be treated within the Eco Energy complex is as follows:

- Atmospheric water from the roof of the facility;
- Oily atmospheric waters;
- Sanitary foul wastewater;
- Process wastewater and leachate water
- Wastewater from extinguishing possible fires.

Atmospheric clean water from the roof of the facility - Clean rain sewage works collects atmospheric water dropped on the roofs of the facilities and carries them to the border of the complex closest to the drainage collector of all clean and treated water that can be discharged into the recipient - the Danube River.

Oily atmospheric water treatment plant - For the purpose of treating oily atmospheric water from handling surfaces, roads and parking lots, two bypass separators of petroleum products are planned, made and tested according to SRPS EN 858, rated size NS10/100 (flow through the separator 10 l/s while the max flow is 100 l/s) and rated size NS15/150 (flow through the separator 15 l/s while the max flow is 150 l/s). The efficiency of separating light petroleum products - light liquids in the separator outlet water is up to 5mg/l. Thus, the cleaned oily sewer works is connected to the conditionally clean rainwater sewer and conducted to the drainage Central collector for the entire Elixir Prahovo complex, and through it is discharged into the Danube. A sufficient number of inspection manholes necessary for the normal maintenance of the network are planned on the network.

[45] According to DECISIONS COMMISSION IMPLEMENTING DECISION (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070)

Treatment of sanitary- foul wastewater - Foul sewage works collects all sanitary- foul wastewater and conducts them to the treatment plant (mechanical and biological treatment). A dug biological purifier type ACO-INTERPLAN BIOTIP kup 20 PE with technology of continuous recirculation of activated sludge with a capacity of 20 PE (40 employees), hydraulic load 3m^3/day, biological load BOD: 1.2 kg/day, intended for biological treatment of sanitary wastewater is planned.The device will be designed and manufactured in accordance with standards: MEST EN 12255-1; 12255-6; 12566-1; 12566-3 and ATV 122 and its performance must meet the prescribed standards. The cleaned wastewater is connected to the shaft of conditionally clean rain sewage works and then discharged into the internal network of the Elixir Prahovo Industrial Complex.

Wastewater treatment from the boiler plant - Technological wastewater in the boiler plant is generated during the wet cleaning of the resulting flue gases which is necessary to remove water-soluble salts from residues from the dry flue gas treatment, and thus directly affects the prevention of salt leaching after the solidification process of this material. These wastewaters are sent to a wastewater treatment plant (licensed by Company Envirochemie (ECWWT)).

The wastewater treatment plant in the boiler plant consists of three-stage neutralization, heavy metal settlement, flocculation, sedimentation and filtration.

The maximum capacity of the plant is 10 m^3/h. This plant is part of the technological unit and is directly connected to the boiler plant and is located in the facility W-C11.

The water from the flue gas cleaning in the HCl scrubber is acidic (pH 0.5 to 1.5). The first stage of neutralization of this water takes place in the acid reactor. In addition to the acidic water from the HCl scrubber, a suspension of ash filtrate from the wet ash cleaning filtrate tank and an acid suspension from the first stage settling box (recirculation) are introduced into the reactor.

The first stage of neutralization involves increasing the pH value to 3-4 by adding lime milk. The lime milk is dosed directly into the acid reactor from the lime milk preparation tank.
Polyelectrolytes are also dosed into the acid reactor to accelerate the deposition of suspended particles in water. The deposition of suspended particles takes place in a first stage settling box. The acid reactor is equipped with a stirrer that has the role of fine mixing of all wastewater and lime milk and preventing the deposition of solids in the reactor. The reactor is also equipped with a pH meter for monitoring and controlling the pH value and a level meter with a high value alarm in the reactor.

The suspension of wastewater and sludge from the reactor is poured into a first-stage settling box where the deposition of solids occurs. The settling box is equipped with a scraper that prevents deposition and collects the deposited sludge (sediment), which is further transported by the acid suspension pump to the ash suspension reactor for further treatment. One part of the suspension is recirculated to the acid reactor. The sludge contains carbonates, fluorides, sulphates and precipitated heavy metals. The settling box is equipped with a level meter with an alarm to control the level of liquid in them.

The second stage of neutralization takes place in the neutralization reactor. Polyelectrolytes and lime milk are dosed into the reactor and the suspension becomes almost neutral (pH=6 - 8). As in the case of an acid reactor, the neutralization reactor is equipped with a stirrer, a pH meter and the associated local indication (indicator) of the level.

The mixture from the neutralization reactor is poured into a second stage settling box where solids are separated with the help of a scraper. The separated solids are sent to the ash suspension reactor for further treatment by the neutralized suspension pump. The level of the liquid in the settling box is controlled by means of a level meter with an alarm.

Further pH adjustment takes place in three reactors placed next to each other – the pH regulation reactor, the precipitation reactor and the flocculation reactor. Each of the reactors is equipped with stirrers, while the pH regulation reactor and the precipitation reactor are also equipped with pH meters.

Controlling and adjusting the pH value in these two reactors is done to achieve the required pH value in the flocculation reactor (required pH value = 10).

Heavy metals are precipitated as poorly soluble hydroxides by adding lime milk to the pH-regulating reactor. Final precipitation of heavy metals (especially mercury Hg) is achieved by adding organic sulfur complex agents (e.g., trimercapto-s-triazine – TMT15) to the precipitation reactor, which form sulfides with heavy metals that are slightly soluble. Subsequently, the sulfide metals are deposited from the water by adding iron trichlorides ($FeCl_3$) that serves as a flocculant. The purpose of wastewater flocculation (which takes place in a flocculation reactor) is to encourage suspended particles or emulsions to agglomerate into precipitates and more easily separate.

The last stage of the separation of suspended particles takes place in the final settling box. The sludges generated on this occasion are sent by the pump of the treated water suspension for further cleaning to the ash suspension reactor, while a part of them is recirculated to the pH-regulating reactor. The settling box is equipped with a scraper and a liquid level meter with an alarm.

Cleaned waters from the ECWWT plant is brought to the chamber 2 of the wastewater basin U-C06 within the Waste-to-Energy Plant complex by a separate line T1. The basic role of the basin is to accept these waters in order to perform quality testing before discharging them into the recipient.

If the water quality is not of satisfactory for discharge into the final recipient (Danube River), the water is gravitationally drained into chamber 3 of the U-C06 basin. From chamber 3 of the basin, contaminated water is sent to the wastewater treatment plant by filtration (sand filter bed and activated carbon bed located within the facility U-C02 Maintenance building and auxiliary systems facility. After the treatment in the filter plant, the water is once again sent for re-treatment to the wastewater treatment plant from the boiler plant (ECWWT).

A detailed description of the wastewater treatment from the boiler plant is given in Chapter 3.2 of the Study in question.

Wastewater Treatment Plant and Wastewater Basin - Within the unit U-C06, the positioning of the basin for the collection, management and treatment of technological wastewater generated during the operation of the Waste-to-Energy Plant is planned.

Technological wastewater of different origin and quality is separately supplied to the U-C06 basin. In this regard, the basin was also divided into chambers, so that certain flows of technological wastewater can be supplied to each chamber separately. The sizing of the chambers was performed based on the expected quantities of wastewater generation. The wastewater basin is concrete, rectangular in shape.

The basin is divided into 4 main chambers:
- Chamber 1 – 85 m^3 for T3 wastewater collection
- Chamber 2 – 320 m^3 for T1 wastewater collection
- Chamber 3 – 100 m^3 for the collection of T2 wastewater and leachate from the Landfill for Non-hazardous Waste (solidificate)
- Chamber 4 – 730 m^3 for collecting wastewater T2 (fire extinguishing water) and T4.

Figure 3.31 shows a schematic view of wastewater flows and the layout of the wastewater basin chambers.

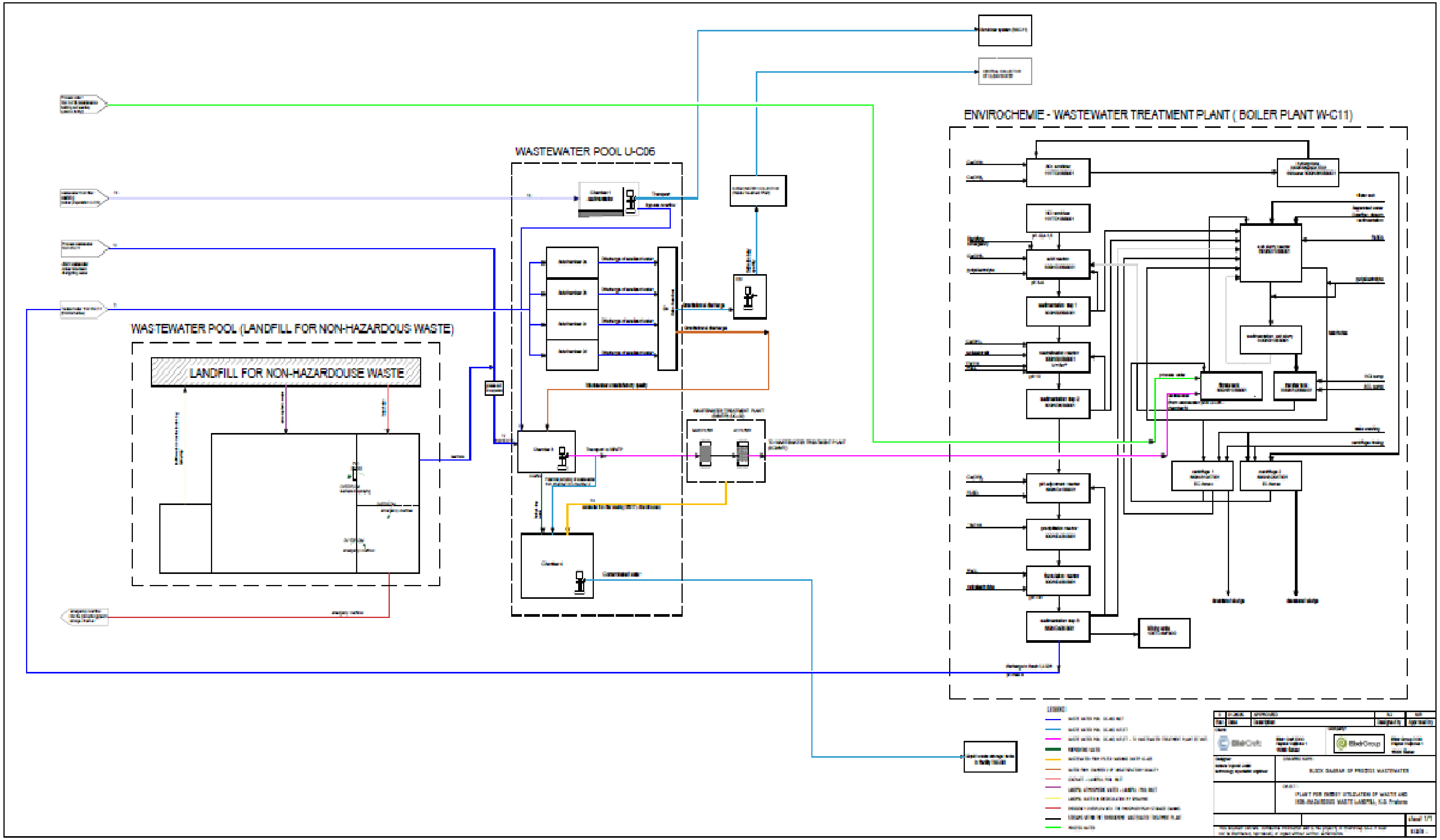


Figure 3.31 Schematic view of wastewater flows and the layout of the wastewater basin chambers U-C06

Chamber 1 – description

Process wastewater from filter washing (preparation of process water in the U-C02 facility) is supplied to chamber 1. Wastewater to chamber 1 is supplied by the sewage network marked T3.

The technological process of process water preparation is based on the raw water filtration taken from the Danube water collector. Filtration takes place through sand filters (one working and one spare) that are periodically washed. When washing one filter, 35 m^3 of wastewater is generated. Based on the technological process of process water preparation and the quality of the incoming raw water, the need to wash the filter is expected every 8 hours. In accordance with the envisaged mode of operation and capacity of this plant, the amount of wastewater from filter washing was estimated, and it is 105 m^3/day. As mentioned earlier, the wastewater from the filter washing is fed from the U-C02 facility to the chamber 1 of the U-C06 wastewater basin. The total volume of chamber 1 is 85 m^3.

Considering that the water from the filter washing is primarily loaded with suspended, easily deposited substances in terms of quality, the treatment of these waters is also envisaged within chamber 1. In order to remove suspended precipitants, chamber 1 is designed so that gravitational precipitation takes place in it.

Settling is an operation of two phases separation due to their difference in density. In the chamber, solid particles that are heavier than water and that are deposited under the influence of gravitational force are separated. Settling operation is one of the most common operations in water treatment. It is used to remove sand and other easily depositable particles, suspended particles or chemical floccules formed during chemical coagulation and flocculation. Settling can be batchwise or continuous.

Chamber 1 is divided into two parts, i.e. two subchambers – the first of which has the role of a settler and from which water overflows into the second subchamber, which has the role of a pumping station for the transport of cleared water to the flue gas cleaning system (scrubbers) in the W-C11 facility. In the event that they are not transported to the gas cleaning system, the treated wastewater is gravitationally discharged into the cleaned water collector and further into the existing collector of clean water of the Elixir Prahovo complex, and further into the recipient – the Danube River. In this case, the discharge of water from chamber 1 is carried out through a common overflow with chamber 2e, and further into the existing clean water collector. Also, chamber 1 with overflow is also connected to chamber 3, from where water is sent to the plant wastewater treatment by filtration (sand filter column and activated carbon column), which is located within the facility U-C02 Maintenance building and auxiliary systems facility.

The settling part of chamber 1 is designed according to the principle of a rectangular horizontal settler. The structure of the settling box includes the supply of wastewater with suspended matter, the drainage of the clarified filtrate and the part where the precipitate will be collected. Since process wastewater from filter washing contains a large amount of easily deposited substances, retaining it in the precipitation part of chamber 1 will release most of the suspended matter. As the critical deposition rate V0 is equal to the ratio of the wastewater flow Q and the area of the settler A, this means that all particles having a deposition rate Vs ≥ V0 will be removed (precipitated) with an efficiency of 100%. All particles with a lower deposition rate than V0 will be removed from the water in proportion to the ratio Vs/V0, (where Vs is the deposition rate of the particles).

The adopted volume of the settling part of chamber 1 is 70 m^3, which allows for a sufficiently long wastewater retention time.
Wastewater enters on one side, calms down, natural i.e. gravitational deposition of suspended matter occurs, after which it exits to the opposite side via the overflow. The following figure shows the principle of operation of the settling box.

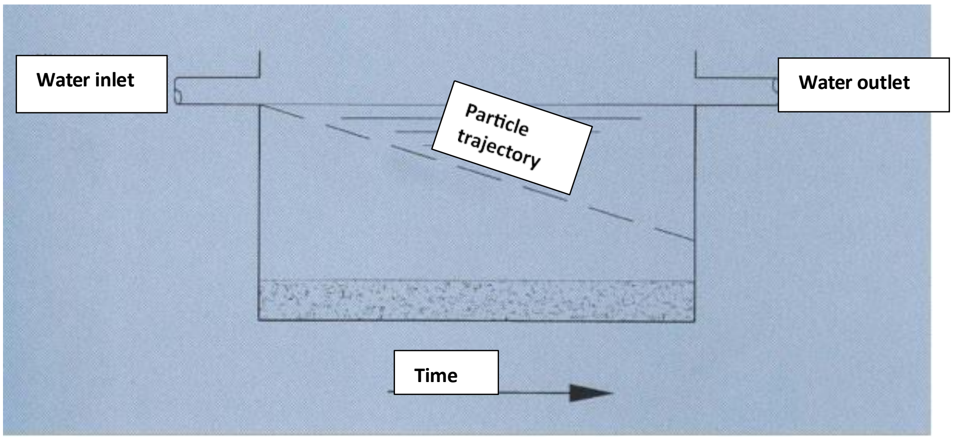


Figure 3.32 Principle of settling box operation

The bottom of the settling part of chamber 1 was made in a slope in order to lead the precipitated particles to the lowest point from where the precipitated sludge is emptied. The removal of sediment or sludge will be carried out, if necessary, by a dedicated vehicle that has its own suction pump. The sludge will be transported to the facility W-C08 Pretreatment and waste storage, temporarily stored in the part intended for sludge, after which it will be sent for incineration to the boiler plant.

After passing through the settling sub-chamber and settling, the water overflows into another sub-chamber with a volume of 15 m^3, which has the role of a pumping station. Bearing in mind that after settling, clean technical water is obtained, it will be used for wet cleaning of gases. The transport of cleaned water from chamber 1 is carried out by means of a submersible pump, capacity of 10 m^3/h.

Excess purified water is discharged through the overflow into chamber 3, from where the contaminated water is sent to the plant by filtration wastewater treatment (sand filter column and activated carbon column) located within the U-C02 facility, and then the water is sent for re-treatment, to the wastewater treatment plant from the boiler plant (ECWWT) in the W-C11 facility.

In chamber 1, continuous level monitoring is performed, whereby on the basis of level monitoring and using the switch for very high and very low level, the operation of the pumps is regulated (for the transport of cleaned water to the scrubbers).

Chamber 2 – description

Cleaned process wastewater from the process wastewater treatment plant in the boiler plant (ECWWT) is supplied to chamber 2 of the wastewater basin U-C06 via the technological sewer work T1.

Process wastewater during the process thermal treatment of waste material will be generated during wet flue gas cleaning and washing of the residue from the dry flue gas cleaning. Wastewater from the first scrubber as well as from washing of dry flue gas cleaning residues (filter ash) is sent to a process wastewater treatment plant (licensed by Envirochemie Company (ECWWT)) consisting of three-stage neutralization, heavy metal deposition, flocculation, sedimentation and filtration. The maximum capacity of the plant is 10 m^3/h. This plant is located in facility W-C11.

Cleaned water from this plant from W-C11 is supplied to chamber 2.

The basic role of chamber 2 is to accept all cleaned wastewater coming from the ECWWT plant in order to perform their testing before discharge to the recipient. In order to facilitate manipulation and possible response in the event that the water quality does not correspond to the required quality for discharge into the recipient, chamber 2 is divided into 4 identical parts (subchambers 2a, 2b, 2c, 2d). The volume of each part, i.e. each subchamber, is 80 m^3, which is enough for each subchamber to accept wastewater for a period of 8 hours. After that, the wastewater from the subchamber in question is sampled and the quality parameters are tested. In this way, it is possible for each batch of 80 m^3 to be analyzed before discharge. By dividing chamber 2 into smaller segments, a semi-batchwise method of wastewater treatment control is enabled, in order to have time to perform complete physico-chemical analyses. The maximum duration of the analysis is 8 hours, after which the water can be discharged in an appropriate manner, depending on the results of the analysis. If the analyses show that the waters have a satisfactory quality for discharge into the final recipient, they are gravitationally discharged first into subchamber 2e, which is intended to function as a common channel, i.e. the wastewater basin of cleaned water collector U-C06. From subchamber 2e, the cleaned water is gravitationally transported to the shaft (pumping station) for pumping the cleaned water to the existing Central collector of clean water of the industrial complex Elixir Prahovo, which flows into the natural recipient – the Danube River.

If the water quality is not satisfactory for discharge into the recipient (Danube River), water is transported to chamber 3 of the U-C06 basin, and this will be possible by gravity discharge through chamber 2e by closing/opening the valve. In the event that there is already a certain amount of water in chamber 3, so that it is not possible to perform the aforementioned gravity discharge, it is planned to transport wastewater of unsatisfactory quality from subchambers 2a, 2b, 2c or 2d to chamber 3 using a mobile submersible pump. From chamber 3 of the basin, contaminated water is sent to the wastewater treatment plant by filtration (sand filter column and activated carbon column) located within the facility 1U-C02 Maintenance building and auxiliary systems facility1. After the treatment at the filter plant, the water is referred for re-treatment, to the wastewater treatment plant from the boiler plant (ECWWT) in the W-C11 facility).

The filling of chamber 2 is regulated so that when one subchamber is filled, the filling of the next one begins. Continuous level monitoring is performed in each sub-chamber. On/off valves with a motor drive are installed on the supply line of each sub-chamber, so that the filling of the sub-chamber is regulated through the valve. Thus, the filling of chambers 2a, 2b, 2c and 2d is time shifted – when one chamber is filled (e.g. 2a), the water is directed to the second (2b) (at which point starts the analysis of the water in the first segment, 2a) and so on.

By analysing the operation of the basin, i.e. chamber 2, for the worst case when the subchambers are filled with a flow of 10 m^3/h, and emptied with a flow of 5 m^3/h, when the chamber 2d is filled, the chamber 2a is already emptied and ready to receive a new amount of water.

At the bottom of all sub-chambers there is a hole where a motor-driven valve is installed. The hole is used for the gravitational discharge of treated wastewater from subchambers 2a, 2b, 2c, 2d after the completed analyses. Continuous level monitoring using a level gauge is also planned in sub-chamber 2e. From this common receiving channel (subchamber 2e), wastewater is transported depending on the test results. When the analyzes show that certain treated wastewater has a satisfactory quality for discharge into the clean water collector, they are gravitationally discharged first to the manhole for pumping cleaned water (pumping stations), and then to the existing Central collector of clean water of the industrial complex Elixir Prahovo, which flows into the natural recipient – the Danube River.

Chamber 3 – Description

Through the general technological sewer T2, the chamber 3 is gravitationally supplied with technological wastewater generated within the facility W-C11 Waste Thermal Treatment Plant. Thus, the general technological sewage system T2 will collect the following types of technological wastewater: wastewater from the drains from W-C11, water from the boiler blowdown (2 m^3/h), water from the washing of equipment and maintenance, as well as water from fire extinguishing in W-C11 (maximum 600 m^3 for 2 h of fire extuinguishing). In general, wastewater collected by technological sewage works T2 is not continuously generated, but periodically during the servicing of the plant, in case of accident, fire, equipment washing and the like. In addition, the supply of leachate from the Landfill for non-hazardous waste (2-3 m^3/h) is planned to the chamber 3. Leachate from the solidificate landfill before entering chamber 3 also passes through the specified oil and grease separator. In order to monitor the quantities and quality of leachate from the solidificate landfill to the

U-C06 basin, a manhole was installed on the leachate supply line from the landfill in front of the oil and grease separator, which is the subject of the External Hydrotechnical Installations Design 23-WTE-PGD-0303. It has a flow meter, and this shaft also serves as a sampling point for leachate from the solidificate landfill.

In the event that the wastewater from chamber 2 does not meet the appropriate quality parameters, it will be gravitationally fed to chamber 3 via sub-chamber 2e or using a mobile submersible pump, as described above.

It is envisaged that chamber 3 operates according to the principle of the pumping station, and through the overflow it is connected to chamber 4.

At the bottom of chamber 3, 2 submersible pumps (1 working and 1 spare, mark) are installed, by means of which, in normal operation, wastewater is transported for treatment to the wastewater treatment plant (WWTP) located within the U-C02 facility. The pump in question is frequency regulated (VFD), so that it is possible to send water to the WWTP for treatment with a flow of 1-5 m3/h, depending on the available capacities of the wastewater treatment plant from the boiler plant (ECWWT) in the W-C11 facility. Within the WWTP, the treatment of wastewater from the general technological sewage system T2, wastewater from chamber 2 that does not meet the prescribed quality parameters and leachate from the solidificates landfill by filtration through a sand filter and an activated carbon filter is carried out, after which the water is transported to the wastewater treatment plant of the boiler plant (ECWWT) in the facility W-C11. The control method of wastewater generated during an emergency when a fire occurs in a boiler plant is described below on the framework of the operation of chamber 4 description.
In emergency situations when it is known that excessive pollution or contamination of wastewater has occurred, it is possible to pump those from chamber 3 into chamber 4.

Chamber 4 – description

Chamber 4 of the wastewater basin U-C06 is intended for the reception and temporary storage of wastewater generated during fire extinguishing in the facility W-C11. The supply of wastewater from fire extinguishing will be carried out through chamber 3. Also, wastewater from washing the sand filter and activated carbon filter from the wastewater treatment plant will be supplied to chamber 4. Wastewater from filter washing from the wastewater treatment plant (WWTP) will be supplied to chamber 4 via the T4 technological sewer line.

In the event of a fire in the boiler plant in the W-C11 facility, wastewater from fire extinguishing by technological sewage T2 gravitationally reaches chamber 3, and begins to fill it. When such an emergency occurs, the pumps are switched off, so that the chamber 3 connected to chamber 4 by the overflow begins to be filled. The volume of chamber 4 is 730 m^3. When the chamber 3 is filled, the water passes over the overflow into chamber 4, which is sized so that it can accept the entire amount of water from fire extinguishing. When the fire extinguishing is completed, all water from chamber 3 is transferred by pumps to chamber 4, so that chamber 3 can continue normal operation. The rest of the wastewater at the bottom of chamber 3 that cannot be pumped by the existing pump will be pumped by a mobile submersible pump that will be immersed in the chamber 3 discharge pit. In this way, it is possible to transport the entire amount of water from chamber 3 to chamber 4.

As already stated, in addition to water from fire extinguishing, in chamber 4 it is also possible to receive contaminated technological wastewater of unsatisfactory quality from chamber 3 (pumping from chamber 3 to chamber 4 if necessary).

At the bottom of chamber 4 there are 2 submersible pumps 10GNK03AP001 and 10GNK03AP002 (1 working, 1 spare), with a capacity of 30 m^3/h (each), by which the wastewater from chamber 4 is transported to the liquid waste storage tanks in the facility W-C08. In accordance with the available liquid waste storage capacities, wastewater will be transported from chamber 4 to facility W-C08, to liquid waste storage tanks and further to the boiler plant for thermal treatment.

<u>Wastewater treatment plant (WWTP)</u>

Waste technological water collected by technological sewage works T2, wastewater from chamber 2 that does not meet the prescribed quality parameters and leachate from the Landfill for non-hazardous waste (solidification) are transported through chamber 3 to the wastewater treatment plant. The transport of wastewater from chamber 3 is carried out using submersible pumps with a flow rate of 5 m^3/h. Thus, as described above, wastewater is supplied to the wastewater treatment plant from the gully from the W-C11 facility, wastewater from chamber 2 that does not meet the prescribed quality parameters and leachate from the solidificates landfill.
The capacity of the wastewater treatment plant is 5 m^3/h.

In the regular operation of the Waste-to-Energy Plant, there will be no continuous (permanent) generation of technological wastewater leaded by the T2 line. Accordingly, the associated wastewater treatment plant operates on an as-needed basis.

After the treatment within the subject wastewater treatment plant, water following filtration in facility U-C02), the water will be conveyed via process sewer line T5 to the process wastewater treatment plant from the boiler plant – ECWWT plant, which is located in the W-C11 facility. In this regard, wastewater treatment by filtration can be seen as pretreatment of wastewater from general technological sewage T2, wastewater from chamber 2 that does not meet the prescribed quality parameters and leachate from the Landfill for non-hazardous waste.

An organic load can be expected in excess situations when oil spills occur during intervention or servicing, or due to leaks on process equipment. In order to remove the organic load from the technological wastewater, the project envisages the installation of an upstream oil and grease separator with a built-in coalescer.

In order to remove suspended matter from the process wastewater, the filtration process was selected. Filtration is an operation in which water is passed through a filter filling in order to extract suspended particles from it.

Cleaning, i.e. filtration, takes place in 2 stages: first through sand, and then through a filter with activated carbon filling. Filters are connected in a row. In order to achieve uniformity, it was chosen that the construction of these two filters be identical, whereby the filling inside the vessels will differ. After passing through the sand filter where the suspended particles are removed, the water is additionally taken to the activated carbon filter, with the aim of additional filtration and removal of organic pollution (if present). The characteristics of the sand filter are shown in Table 3.62.

<u>Filter construction</u>
Filter diameter: D = 927 mm
Effective surface: A = 0.674 m^2
Cylinder height: H_C = 1266 mm

Total height of filter fill: H_{IS} = 889.5 mm

<u>Sand filter fill specification</u>
1. Substrate: Quartz sand with a granulation of 1.0 – 2.0 mm
   Fill weight: 200 kg
2. Quartz sand with a granulation of 0.7 – 1.2 mm
   Fill weight: 900 kg

Table 3.62 Sand filter characteristics

Flow	5 m^3/h		
Tank	D=927 mm, A=0.674m^2 H=1020 l, H=1266 mm		
Medium	0.7-1.2 mm	900 kg	70.3 %

Substrate	1.0-2.0mm	200 kg	889.5 mm
Connection	2"		
Backwash flow	20 m^3/h		
Water consumption for backwash	5 m^3/fill		

Given the selected capacity of 5 m^3/h, which represents a lower capacity of water treatment, a selection of closed filters, prefabricated, with universal plastic housings, which are generally used for capacities up to 10 l/s, was made. The control of these filters can be performed by control valves, which further simplifies the handling and the possibility of application.

Filter washing is done with air (initial blowing) and water.
Depending on the filling, the designed filtration rate is selected, as well as the time of normal operation after which the washing is carried out. In order to increase the time interval between two washes and thus reduce water losses at the plant, the application of double-layer filters is envisaged. The arrangement of the fill is such that in the upper layer there is anthracite fill, which is of less specific weight and larger grain diameter, while below there is quartz sand with lower granulation and higher specific weight. With this arrangement of the filter fill, the formation of a surface crust on the filter is prevented, which would reduce the filter's throughput. In addition, the envisaged arrangement of the fill provides 2 – 2.5 times larger space for accepting suspended substances.

Activated carbon
Activated carbon filters operate on the principle of adsorption, which as a processing phase can be included as needed in each processing line. The adsorbent is activated carbon in granular form that has the ability to remove 75-95% of the organic matter present in the water.

Activated carbon adsorbs low molecular weight organic substances, active chlorine, chloramines, organic substances and partially pyrogenic substances from water and contributes to the improvement of its odour, as well as to the clarification of water.

Activated carbon is a highly porous material, so it has a large surface area of contact with the contaminated liquid, which is crucial for the quality of adsorption. Increasing the contact time between water and activated carbon allows a larger amount of contaminant to be adsorbed. The contact time can be increased by increasing the amount of activated carbon or reducing the water flow through the filter. Characteristics of activated carbon fill filters are shown in Table 3.63.

Filter construction
Filter diameter: D = 927 mm
Effective surface: A = 0.674 m^2
Cylinder height: H_C = 1266 mm

Total height of filter fill: H_{IS} = 1008 mm

Filter Fill Specification

1. Substrate: Quartz sand with a granulation of 1.0 – 2.0 mm
   Fill weight: 200 kg
2. Activated carbon
   Filling volume: 680 l

Table 3.63 Characteristics of activated carbon filler filters

Flow	5 m^3/h		
Tank	D=927 mm, A= 0.674m^2, H=1020 l, H=1266 mm		
Activated carbon	680 l		
Substrate	Sand 1.0-2.0 mm	200 kg	

Connection	2"
Backwash flow	20 m^3/h
Water consumption for backwash:	5 m^3 /backwash

After the filtration process is completed through the sand and activated carbon filter, the wastewater is sent for treatment to the ECWWT plant for the treatment of process wastewater of the boiler plant, which is located in the W-C11 facility.

3.5.6 Treatment of solid residues from the boiler plant

Regular operation of the subject fluidized bed boiler plant may result in the following solid (unburned) residues: Bottom ash (coarse fraction of unburned material that is separated at the bottom of the boiler under the firebox); Boiler ash (separated between the second and third passage of flue gases through the boiler); Cyclonic ash (fraction of fly ash from the boiler that is separated from the emitted gases when passing through two cyclonic separators, T>400^{0}C); Ash from the economizer (fine fraction of fly ash separated by the passage of flue gases through the economizer); Filter ash (fine fraction of fly ash separated by the passage of flue gases through the bag filter system); Activated carbon with a fraction of fine particles from the flue gas; Sludge from the cleaning of wastewater from the wet cleaning of flue gases; Solid residue from the centrifuges (gypsum). In order to harmonize the characteristics of solid residues from the boiler plant and bring them to a state suitable for disposal at the Landfill for non-hazardous waste, the Project Holder has decided to treat this waste as part of the Waste-to-Energy Plant by stabilization (prevention of uncontrolled reactions) and solidification (curing). Figure 3.33 provides a schematic view of the flows of solid unburnt combustion products which are combined with sludge from waste water treatment.

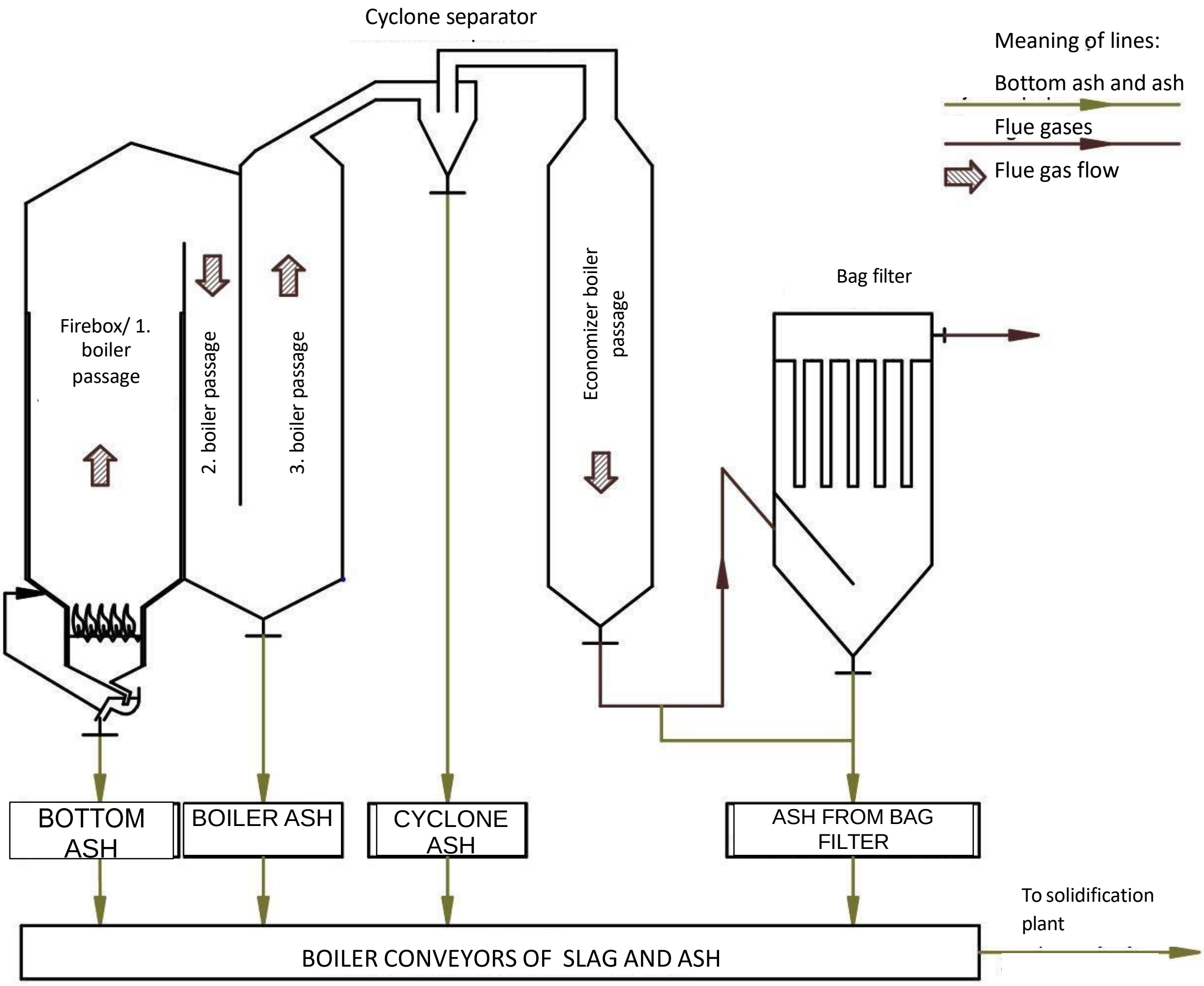


Figure 3.33 Schematic representation of the flows of solid unburned combustion products

The stabilization and solidification (S/S) procedure envisaged within the subject plant W-C12

Stabilization and solidification will include the following operations:

- Temporary storage and aging (stabilization) of solid residues from the boiler plant. Thus, in addition to the fact that the boxes within the W-C12 facility play the role of a storage, a process of stabilization of solid residues takes place in them, which lasts 7-14 days. The stabilization process allows all subsequent reactions in the material to be completed with the aim of obtaining a solidificate with as little leaching as possible.
- Mechanical pre-treatment of bottom ash (separation of metal from ash)
- Mixing of different waste fractions (residues from the boiler plant)
- Dosage and mixing of residues from the boiler plant with cement, water and additives – solidificate. The waste material is transferred by means of a crane from the boxes to the inlet hopper of the screw conveyor with a scale, from where it is dosed, according to the stipulated norm, together with other reactants, to the stationary mixer reactor, in which the final solidification process is carried out.
- Measurement and transport of solidificates to the Landfill of non-hazardous waste for permanent disposal. When the mixing process is completed, the obtained solidificate will be discharged directly from the bottom of the mixer reactor into a dump truck and transported to a non-hazardous waste landfill, the construction of which is planned at a location immediately adjacent to the waste energy recovery plant (Waste-to-Energy Plant).

Residues from the combustion process in the fluidized bed boiler are collected in the form of coarse ash or unburned pieces of metal, glass, concrete, stone, etc. By eddy current separation of coarse ash the extraction of metal admixtures that are directed to recycling as a secondary raw material is carried out. All residuals from different parts of the process are mixed, if necessary moistened with water and entered into a stabilization process that lasts two weeks. After that, they are solidified according to the defined recipe by mixing with cement and, if necessary, certain reagents and disposed of as a stabilized non-reactive solidificate at the Landfill for non-hazardous waste in the immediate vicinity of the Eco Energy plant. All sources of emission of particulate matter into the air from the stabilization/solidification process (ash mixture and thickened sediment storage bunker in which the stabilization process takes place; Mechanical treatment of slag or separation of ferrometals using magnetic separators and non-ferrous metals using eddy current separators; Mixer reactor in which the process of mixing cement, ash and water takes place or solidification; Cement storage silo; Cement weighing scale and ash weighing scale) are equipped with **bag filters** on which particulate matter is separated.

A detailed description of the residue treatment process from the boiler plant is described in Chapter 3.2 of the study in question.

3.5.7 Treatment of other types of waste

Within the complex in question, only temporary storage of waste generated during operation until its permanent disposal will be carried out, which will be carried out either within the boiler plant in question or by third parties, i.e. companies with permits issued by the competent authority and registered for the performance of waste collection, transport, storage and/or treatment activities.

Hazardous waste may not be temporarily stored at the location of the producer, owner and/or other waste holder for more than 12 months, unless the procedure of obtaining a permit is in progress, and no longer than 120 days from the expiry of the deadline, in accordance with the Law on Waste Management ("Official Gazette of the Republic of Serbia", no. 36/2009, 88/2010, 14/2016 and 95/2018 – other law and 35/2023). Therefore, after the expiration of 12 months, the waste must be treated or handed over to an authorized operator who has a permit for further treatment, i.e. disposal of hazardous waste of the appropriate index number, in accordance with the concluded contract.

A list of authorized operators holding permits from the competent authority for the collection, transport, storage, treatment and/or disposal of waste can be found on the website of the Environmental Protection Agency:
http://www.sepa.gov.rs/index.php?menu=20174&id=20055&action=ShowExternal

The generated waste at the entire location of the complex will be treated in accordance with the Waste Management Plan as well as regulations governing waste management such as the Law on Environmental Protection ("Official Gazette of the RS", no. 135/2004 and 36/2009 – other law 72/2009 - other law and 43/2011 – CC decision, 14/2016, 76/2018 and 95/2018 and 94/2024 - other law), Law on Waste Management ("Official Gazette of the RS", no. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023), Law on Packaging and Packaging Waste ("Official Gazette of the RS", no. Rulebook on waste categories, examination and classification ("Official Gazette of the RS", no. 56/2010, 93/2019 and 39/2021) and other regulations governing this area.

3.5.8 Disposal at a Landfill for non-hazardous waste

The Landfill for non-hazardous waste is designed for the disposal of solidificate resulting from the treatment of solid residues from thermal waste treatment plants generated as a product of the waste-to-energy process. The stabilization and solidification process, which will be carried out within the Waste -to-Energy Plant, the obtained non-hazardous or non-reactive hazardous waste, will be disposed of at the Landfill for non-hazardous waste if it meets all the requirements for disposal according to the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", No. 56/2010, 93/2019 and 39/2021), the Regulation on the disposal of waste at landfills ("Official Gazette of the RS", no. 92/2010), i.e. EU Landfill Directive: (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste); On the other hand, if the prescribed conditions for the disposal of the solidificate at the Landfill for non-hazardous waste are not met, the solidificate will be sent for disposal to another authorized landfill and/or hazardous waste storage operator in accordance with the aforementioned regulations.

For the formation of the **Landfill for Non-hazardous Waste**, there is an area of irregular base, gross area of about 8.5 ha, dimensions about 330 m in length, width 280 m, with triangular shortening in the northwest corner. The phased construction of the Landfill for Non-hazardous Waste is envisaged in 2 and 3 phases, respectively, as the initial phase I is divided into 2 (sub)phases:

1. PHASE I (PHASE I-A and I-B) – net area of 3.66 ha, and
2. PHASE II – additional 2.76 ha in basis,

which gives a total net utilization of space in the basis for waste disposal of 6.42 ha.

The solidificate obtained in the manner described above will be transported to the waste-to-energy facility by dump trucks and disposed of on the landfill body with the recorded disposal location. Discharging the waste from the truck will be by tipping backwards. The discharged material will be opened to achieve layers of uniform thickness of about 30 cm. After opening, the deposited material will be compacted by crossing the roller multiple times to obtain a layer up to 20 cm thick. When the level of the initial embankment is exceeded, each layer will be retracted inside the cassette so that the slope of each floor from V:H – 1:1.7 (slope 30°) is obtained towards the outside. When one cassette rises to a height of about 3 m, the working front is moved by 3 m, on all sides. In this way, it will be achieved that for each 3 m elevation of the landfill, the horizontal displacement will be about 7.8 m, i.e. a general slope of the landfill of about 21° will be obtained (V:H ~ 1:2.6). The planned total height of the landfill is 46 m (up to a level of 95.00 masl), in order to align it with the height of the phosphogypsum storage facility, which is located in the immediate vicinity and enable smooth movement of machinery on the last floor.

A detailed description of the formation of the landfill body and the technology of waste disposal at the landfill is shown in Chapter 3.2 of the Study in question.

3.6 Overview of environmental impact of selected and other considered technological solutions

Law on Waste Management ("Official Gazette of the RS", No. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023) and the waste management hierarchy define the order of waste management with the basic goal of waste generation prevention, after which it is necessary, if it is not possible to prevent waste from being generated, to provide conditions for its reuse, recycling, waste-to-energy and processing. Only in the end, when all the previous steps have been implemented, what remains should be disposed of, i.e. deposited in a safe and environmentally and human health safe manner.

In accordance with the above, the selected thermal waste treatment technology is an alternative to landfills of non-recyclable waste.

In modern waste management systems, obtaining energy from waste, i.e. incineration, is one of the significant steps towards neutralizing the harmful effects that waste can have on the environment and human health, while contributing to meeting growing energy needs. When obtaining energy from waste, the mass of waste is reduced by 75% and the volume by 90%. This significantly reduces the quantities of waste sent to landfills and helps to preserve the landfill capacities and their duration. During the process of obtaining energy from waste, the amount of greenhouse gases released, which are the causes of climate change, is far lower compared to state-of-the-art sanitary landfills. In this way, the application of thermal waste treatment technology also contributes to reducing greenhouse gas emissions and slowing climate change. Waste that causes fires at landfills, thanks to its energy potential and the creation of landfill gas, due to uncontrolled conditions and the absence of an environmental protection system, is a significant source of pollution and danger. Obtaining energy from waste in a specially designed, strictly controlled and equipped plant, with the application of the envisaged protection measures, enables the use of energy from waste without harmful consequences for human health and the environment.

There are various processes on the market that could potentially be an alternative to waste incineration (landfilling, co-incineration, mechanical-biological treatment, pyrolysis, etc.). Some of them require pretreatment of waste, others are only applicable to certain fractions of waste that would otherwise be subject to incineration, while some show insufficient overall performance and applicability.

Waste thermal treatment provides the possibility of treating fractions of waste that cannot be reused or recycled due to concentrations of harmful substances in them.
Incinerators can produce electricity, process steam for industrial consumers, hot water and energy required for district heating or district cooling. Bearing in mind the needs for thermal energy in the production facilities of Elixir Prahovo - Industrija hemijskih proizvoda d.o.o. Prahovo, the Project Holder has decided on the technology of thermal treatment of non-recyclable waste, which will use the obtained thermal energy for the production of steam (35 t/h, p=13 barg and T=207 ^oC), and further deliver and use it for the evaporation of phosphoric acid within Elixir Prahovo. In this way, cheap and sustainable local energy is obtained, the emission of GHG gases from the existing Elixir Prahovo plants is reduced.

In terms of choice of thermal treatment technology and technological equipment at the subject Waste-to-Energy Plant, for the pretreatment of waste, waste thermal treatment and treatment of residues from thermal treatment, as well as the applied technological process itself, the choice of fuel and equipment to reduce the emission of harmful and hazardous substances, wastewater treatment, waste disposal, etc., in this domain, the Project Holder considered certain alternatives, all in accordance with the best available techniques in the subject area. Attached to the study is a complete OVERVIEW OF COMPLIANCE WITH THE CONCLUSIONS OF THE BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT, as follows:

- Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C (2019) 7987)
- European Commission, Best Available Techniques (BAT) Reference Document for **Waste Incineration**, Industrial Emissions Directive 2010/75/EU, 2019;
- Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C (2018) 5070) (Text with EEA relevance.)
- European Commission, Best Available Techniques (BAT) Reference Document for **Waste Treatment**, Industrial Emissions Directive 2010/75/EU, 2018;
- European Commission, Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on **Emissions from Storage**, July 2006;

The aforementioned document provides a complete overview of the environmental impact of the selected and other considered technological solutions. Also, in Chapter 4.0, an OVERVIEW OF THE MAIN ALTERNATIVES CONSIDERED BY THE PROJECT HOLDER, the Study in question provides a comparison of the selected and other considered alternative technological solutions.

Bearing in mind all of the above, as well as the characteristics of the plant in question, it can be concluded that the implementation of the project in question also achieves the following benefits:

- Significant reduction in the amount of waste that is permanently disposed of in non-sanitary landfills and landfills, thus preventing soil and water pollution,
- Improvement of the municipal non-recyclable waste management system with the aim that waste from households, instead of disposal into the environment, is used to obtain new products and energy,
- Reducing the need to export hazardous waste, which is generated in the Republic of Serbia, in order to treat it. By reducing exports, transport activities and thus the emission of greenhouse gases are reduced,
- Educating citizens about the importance of waste selection and recycling,
- Cooperation with the local self-government on solving the problem of waste pollution,
- Reducing the use of fossil fuels,
- Reduction of greenhouse gas (GHG) emissions,
- Decarbonization of thermal energy for Elixir Prahovo,
- Support to the waste recycling system in such a way that the facility in question is able to dispose (treat) non-recyclable residues, i.e. waste for which there is no adequate recycling technology or recycling of the same is not economically viable.
- Achieving the objectives of the Waste Management Program in the Republic of Serbia for the period 2022-2031 ("Official Gazette of the RS", No. 12 of 1 February 2022),
- Creating new jobs.
- Positive economic effect on both the waste management industry and related industrial activities.

4.0. OVERVIEW OF THE MAIN ALTERNATIVES CONSIDERED BY THE PROJECT HOLDER

The overview of the main alternatives considered by the project holder with an explanation of the main reasons for the choice of a particular solution and the environmental impacts in terms of choice contains the following:

1) location or route;
2) production processes or technologies;
3) operation methods;
4) site plans and project plans;
5) type and selection of materials;
6) project execution timetable;
7) functioning and termination of functioning;
8) the date of commencement and completion of the execution;
9) production volume;
10) pollution control;
11) arrangement of waste disposal;
12) arrangement of access and traffic roads;
13) environmental management responsibility and procedure;
14) training;
15) monitoring;
16) emergency plans;
17) method of decommissioning, site regeneration and further use.

4.1 Reason for choosing a location

4.1.1 Selection of the location for the implementation of the project (proximity to larger and smaller cities and villages, population density)

When analysing the conditions and determining the environmental protection measures, the Project Holder has considered all the limitations imposed by the Project, the location as well as the mutual relations of the Project and the state of the environment before the construction of the Project.

Considering that the area planned for the construction of the Waste to Energy Plant and Landfill for non-hazardous waste in Prahovo is defined by the Second Amendment to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 17/2022) as **Zone IV - Energy and Ecological Island**, within which, among other things, the construction of facilities for the provision of thermal energy and various types of auxiliary fluids, raw materials and fuels used in the technology of the complex in question is allowed, including storage, pyrolysis and **thermal treatment of non-hazardous and hazardous industrial and non-recyclable waste with the use of thermal energy** and the production of alternative fuels and dry saturated steam for the needs of the existing complex, industrial and chemical park, as well as the construction of infrastructure systems that are in the service of temporary storage, treatment and **disposal of waste and residues from storage, pyrolysis and waste thermal treatment**, the Project Holder has chosen this location.

According to the aforementioned plan, the subject location was determined on the basis of the previous analysis of spatial possibilities, limitations and technical suitability of the space, taking into account the relevant criteria - infrastructure, traffic suitability, physical conditions, contextuality, natural conditions, cost-effectiveness of construction, landscapes and quality of public space, and their integral consideration in the area of the entire industrial zone in Prahovo.

Currently, hazardous waste generated in Serbia intended for thermal treatment is treated at plants in Austria, Switzerland, Germany or other establishments in the EU. From the point of view of emissions during transport, as well as greenhouse gas emissions, it is unfavorable. The treatment of waste generated in Serbia is favourably treated within the borders of the countries in the context of the sustainability of the waste management system and the reduction of greenhouse gas emissions emitted during transport.

Compared to other possible locations in Serbia which were considered, this location has a number of advantages. First of all, the advantages are reflected in the fact that the location in question is fully integrated into the existing industrial zone and corresponds to the planned purpose; the proximity of the Elixir Prahovo complex gives the possibility to use the thermal energy produced from the waste to energy process for the evaporation of phosphoric acid in the plants of the Elixir Prahovo complex, which reduces the use of fossil fuels currently used.

Further, the **construction of residential buildings is prohibited** within the subject area (except for possible apartment units for temporary stay of guards, on-call services, etc.);

Therefore, one of the most important positive sides of the location in question is that there are **no settlements in the immediate vicinity and that the Eco Energy complex itself is directly surrounded by industrial facilities and devastated undeveloped land planned for the expansion of the industrial zone.**

A smaller group of residential buildings, belonging to the workers' settlement, is located along the border of the expansion of the chemical industry complex in Prahovo, in the direction of the west at a distance of about 1,300 m from the planned Eco Energy complex. For the purposes of the Study, an assessment of the age structure of the workers' settlement was carried out and therefore does not represent absolute accuracy. It is estimated that the current population is 80, of which three are babies and seven children of primary school age. The age structure of adult residents is shown in the following table:

Assessment of the age structure of the workers' settlement

Years	80	75	60	55	50	45	40	30	25	20
Population	5	6	7	4	9	11	13	6	5	4

All other settlements are located at a distance of more than 2 km as shown in Table 4.1.

Table 4.1 Proximity to larger and smaller towns and villages, no. of inhabitants

Settlement name	***Distance from the Eco Energy complex, km***	***Direction in relation to the Eco Energy complex***	***No. of inhabitants***
Settlement Prahovo	2	West	799
Village Radujevac	4	East Southeast	735
Settlement Samarinovac	5	Southwest	616
Settlement Srbovo	6	South	289
Settlement Dušanovac	7	Northwest	548
Negotin Town	10	Southwest	14,647

The site in question is located at a distance of about 750 m from the border with Romania and about 9 km from the Bulgarian border, therefore, when analysing the site, the distances of the nearest cross-border settlements were taken into account (distances are shown in Table 4.2). On the other side of the Danube, on the Romanian side, there is undeveloped land.

Table 4.2 Proximity to larger and smaller towns and villages in Romania and Bulgaria, no. of inhabitants

Settlement name	Distance from the Eco Energy complex, km	Direction in relation to the Eco Energy complex	No. of inhabitants
Romania			
Settlement Izvoarele	4	North	951
Settlement Gruja	7	North (seat of the eponymous municipality of Gruja in Mehedinci and Oltenia district)	1,890
Bulgaria			
Village Balej	10.5	(In the northwest of Bulgaria in the municipality of Bregovo, Vidin district)	437
Village Kudelin	10.6	In the northwest of Bulgaria as well, in the municipality of Bregovo in the Vidin district	229

Given the characteristics of the site, the capacity and size of the project and the characteristics of the project operation, the expected scope of impact is minimized with the application, the best available techniques, prevention and protection measures, as well as compliance with the norms and standards for the activity in question in the analysed zone and at the site in question, which leads to the conclusion that the regular operation of the project in question will not have a temporary or permanent impact on the health of the population (a detailed description of the impact of the project on the population is described in Chapter 6 of this Study).

When selecting the location, the Project Holder also considered the socio-demographic characteristics of the population. The municipality of Negotin has extremely unfavourable demographic trends which are reflected in the appearance of an above-average negative natural increase, a high rate of emigration and higher average age of the population compared to the rest of the Republic of Serbia. With a population of around 28,000 inhabitants (according to the 2022 census), it is in the group of the most sparsely populated areas of Serbia. A large number of residents in origin from the municipality of Negotin live abroad. However, returnees from abroad do not represent significant demographic potential due to their unfavourable age structure and generational weakening of the returnee wave. The key preconditions for young people to stay in Negotin are secure employment and better income. The potential for the development of new jobs is reflected in the expansion of the chemical industry complex by building an industrial park, a chemical park, an energy island and an ecological island.

In order to make a decision regarding the selection of the site for the construction of the Eco Energy complex, the Project Holder also carried out field research, IN SITU tests and laboratory research at the site in question. Geotechnical studies were prepared, which were prepared by GT Soil Inženjering d.o.o., based on the existing documentation and purpose-built investigations. The geotechnical conditions for the construction of the complex facilities were analysed, from the aspect of load-bearing capacity, subsidence and safety during the execution of foundation excavations. In the conclusion of the text, geotechnical recommendations for the safe construction of the facilities of the Waste to Energy Plant and the Landfill for Non-hazardous Waste are given. An examination of the zero state of environmental parameters was also performed. Detailed data on the performed analyses are given in Chapter 5 of this Study.

Also, when choosing the location for the implementation of the project in question, meteorological, hydrological and hydrographic characteristics were considered: wind rose, frequency and wind speed with maximum, minimum and arithmetic mean and silence; mean and maximum annual temperature with the duration and number of winter days with a temperature below $0^{o}C$; number of days with snow cover, average height of snow cover, precipitation in normal and extreme conditions in millimetres, and no obstacles were identified for the implementation of the project in this area. A detailed overview of climate characteristics with appropriate meteorological indicators is given in Chapter 2.8 of the subject Study.

4.1.2 Restrictions caused by the locations of protected areas, sensitive receptors, the Danube River

In order to determine the current state of flora and fauna on the site and the existence of possible restrictions related to the construction of the complex in question, the Project Holder hired the Institute for Biological Research "Siniša Stanković", which carried out the necessary analyses and research of the area in question and prepared the Biodiversity Study. In the preparation of the study, the potential impact of the construction and operation of the Eco Energy complex on the biological diversity of the subject area, which included an area of 20 km^2 downstream of HPP Đerdap 2, the area of the former Eco Energy complex, as well as the area of nearby areas of neighbouring states of Romania and Bulgaria (in Romania: Blahnița - ROSPA0011, Gruia – Gârla Mare - ROSPA0046, Dunărea la Gârla Mare - Maglavit - ROSAC0299, Jiana-ROSAC0306 and Blahnița – ROSMS0013, and in Bulgaria: Timok – BG0000525 and Novo selo – BG0000631), was considered.

It was concluded that the presence of rare, endangered, protected species of flora and fauna was not registered at the location of the future Eco Energy complex, and that the location in question was not within the protected area for which the protection procedure was carried out or initiated, as well as within the spatial coverage of the ecological network of the Republic of Serbia. A detailed description is given in Chapter 2.9 Description of flora and fauna, natural resources of special value (protected) of rare and endangered plant and animal species and their habitats and vegetation.

When selecting the location, the presence of archaeological sites was also considered. Based on the defined boundaries of the aforementioned Detailed Regulation Plan for the subject area, and therefore the boundaries of the scope of the subject projects, it was determined that there are no recorded natural and ambient units, as well as recorded archaeological sites.

The analysed location in Prahovo is located near the bank of the Danube (at a distance of about 500m in the north direction from the plant boundary), near the port of Prahovo. The Danube River flows in a west-east direction and at the same time represents the state border with Romania. Basin – Danube; Water district - Danube according to Art. 27. of the Law on Waters, Decision on determining the boundaries of river basin districts ("Official Gazette of the RS" no. 75/2010) and the Rulebook on Determination of Sub-basins ("Official Gazette of the RS" no. 54/2011). According to the Decision on Determining the List of Waters of the First Order ("Official Gazette of the RS" No. 83/10), the Danube River is classified as 1. Interstate waters 1) natural watercourses. According to the Regulation on the Categorization of Watercourses ("Official Gazette of the RS" no. 5/1968), the river section in question belongs to Class II for the Danube section: from the Hungarian border - to the Bulgarian border. The facilities in question are located in the area of water unit number 12, "Danube and Timok – Negotin", according to the Rulebook on the determination of water units and their boundaries, ("Official Gazette of the RS", no. 8/2018).

Groundwater levels change and directly depend on the height of the Danube, with a slight increase in levels near the river banks.

Taking into account all of the above, the project documentation complies with all measures prescribed by the obtained Water Conditions (attached to the study), provides for the measure of protection and treatment of wastewater, and emissions into water from the plant will be in accordance with the highest standards of the European Union, conclusions on the best available technologies and BREF documents and regulations of the Republic of Serbia.

Therefore, based on the analyses performed, it was concluded that the proximity of the Danube River is not a limiting factor for the implementation of the project.

4.1.3 Proximity to existing and future constructed utility installations

Before deciding on the location where the project for the construction of the Waste-to-Energy plant and the

Landfill for non-hazardous waste will be implemented, the project holder considered both “Greenfield” and “Brownfield” locations.

“Greenfield” investments are characterized by the fact that the business starts from the beginning, without infrastructure, business premises and workers. These investments include the construction of new facilities and plants at the observed location with the launch of a new plant and the employment of new people.

"Brownfield" sites are sites of industrial and commercial facilities, which are not used for a long period of time, and have the potential for urban renewal. Therefore, these are unused, originally industrial, abandoned and neglected sites that the Project Holder has considered and which represent construction land, endangered by previous use, are no longer used, and can create pollution problems and require investment in order to be brought to another purpose.

Analysing these two types of locations, the Project Holder decided on the "Brownfield" location within the chemical industry complex in Prahovo, which is located in the industrial zone owned by the Elixir Group. The project implementation area is appropriate and defined by the DRP, where the expansion of the chemical industry complex is envisaged by the construction of an industrial park, a chemical park, an energy island, an ecological island, the expansion of phosphogypsum storage, as well as the provision of a buffer zone of greenery and the relocation of local roads outside the industrial complex, which ensures the isolation of the impact of the industrial complex and the production process. Within this location, **the construction of areas/facilities and infrastructure systems** that are in the service of temporary storage, treatment and disposal of waste and residues from **storage, pyrolysis and thermal treatment plants is allowed.**

The suitability of the selected location is also reflected in the existence of a complete infrastructure network (transformer station, telecommunications network, compressed natural gas installations, water supply and sewerage network, roads, etc.) within the industrial zone, and therefore it can be used to connect the planned Eco Energy complex to it.

Disadvantage of "Greenfield" locations is reflected in the need for additional investments and the construction of a completely new infrastructure.

Additional advantage of the selected location for the construction of the Waste to Energy Plant is reflected in the proximity of the production facilities of the Elixir Prahovo complex, since the thermal energy obtained from the waste thermal treatment, as stated earlier, will be used for the production of steam (35 t/h, p=13 barg and T=207 ^oC), and further supplied and used for the evaporation of phosphoric acid within Elixir Prahovo. In this way, sustainable local energy is obtained, the emission of GHG gases from the existing elixir Prahovo plants is reduced, and at the same time the amount of waste disposed of at landfills is reduced.
When determining the location for the Landfill for non-hazardous waste in question, the general conditions and criteria for determining the location for the waste landfill prescribed by *Annex 1 of the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92 of 5/2010)* were taken into account. The project holder was also guided by the main goal of the realization of the project for the construction of the Landfill for non-hazardous waste, which is the ultimate disposal of solid residues from the boiler plant that have been previously stabilized and solidified, which minimizes any potential impact on soil and groundwater. The construction of a landfill in the immediate vicinity of the Waste to Energy Plant solves the issue of residues disposal from the boiler **plant as close as possible to the place of origin, all in accordance with the principles and hierarchy of waste management**, in accordance with legal regulations in the field of environmental protection and waste management.

4.1.4 Existing waste management infrastructure in the region and the country

The strategic goals for the improvement of the waste management system and the basic principles to be guided by all actors in waste management are defined in the Waste Management Program in the Republic of Serbia for the period 2022-2031 ("Official Gazette of the RS", no. 12 of 1 February 2022). The waste management program is aimed at achieving goals that were not fully achieved by the previously adopted

Waste Management Strategy 2010-2019 ("Official Gazette of the RS", no. 29/10), which primarily include organized waste collection, degree of primary waste separation and recycling, **construction of infrastructure and plants for waste incineration**, as well as cessation of waste disposal in unsanitary landfills and illegal dumpsites.

The project holder also analysed the data on the existing waste collection, transport and disposal system, as well as the conducted analysis of the morphological composition and the generated amount of waste and information on the current state of the waste management system in the observed area, which are presented in the Regional Waste Management Plan for the cities of Zaječar and Bor and the municipalities of Boljevac, Kladovo, Majdanpek, Negotin and Knjaževac, adopted on 14 March 2023.

In accordance with the aforementioned Regional Waste Management Plan, it was noted that municipal activities in Serbia are mainly the responsibility of public utility companies, which can be seen from Table 4.3, which shows waste management in the Zaječar region, which consists of the following municipalities: Boljevac, Bor, Kladovo, Knjaževac, Majdanpek, Negotin and Zaječar.

Table 4.3 Waste management by municipalities

Municipality	Boljevac	Bor	Kladovo	Knjaževac	Majdanpek	Negotin	Zaječar
Utility company	PUC Usluga	PUC 3. Oktobar	PC Komunalac	PUC Standard	PUC Vodovod	PUC Badnjevo	PUHC Zaječar
Mechanization	2 pcs of trash compactors	1 pc rotopress trash compactor 1 pc skip loader 4 pcs tipper 3 pcs trash compactor with pressure plate	1 pc skip loader 4 pcs trash compactor	1 pc rotopress skip loader 1 pc skip loader with pressure plate 4 pcs trash compactor 1 pc multifunctional cultivator	2 pcs trash compactor	5 pcs trash compactor 1 pc skip loader 3 pcs tractor 2 pcs truck	3 pcs skip loader 13 pcs trash compactor 2 pcs tipper
Waste disposal (landfill)	"Obla"	Municipal landfill	City landfill	City landfill	City landfill	"Radujevački put"	"Halovo"
Start of operations	1994	1980	1990	/	2004	1959	1970
Landfill area	1.50 ha	3.67 ha	2.36 ha	3.86 ha	0.57 ha	10 ha	6.35 ha
Occupancy	1 ha	/	1.41 ha	100%	0.25 ha	8.3 ha	/
Landfill category *	/	/	/	K4**	K4**	K3*	K3*

*Landfills that can be used for another 5 years provided that remediation with minimum protection measures is carried out beforehand.
**Landfills that do not meet even the minimum protection measures, which have been filled, and as such should have been immediately rehabilitated, closed and reclaimed.

According to the latest surveys, the average resident in the Republic of Serbia generates 0.95 kg of waste per day, which includes Boljevac, Bor, Knjaževac and Majdanpek in the group of municipalities below the national average according to these measurements, while all other municipalities have a value higher than the national average (Figure 4.1).

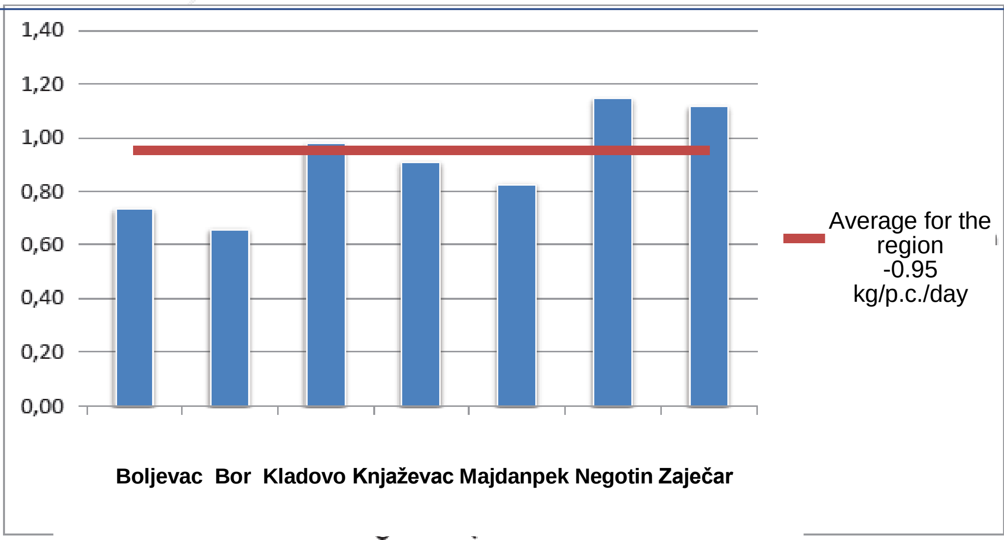


Figure 4.1 Daily generated amount of waste per capita

The generated amount of waste by municipalities according to the Regional Waste Management Plan for the cities of Zaječar and Bor and the municipalities of Boljevac, Kladovo, Majdanpek, Negotin and Knjaževac, adopted on 14 March 2023, is shown in Table 4.4.

Table 4.4 Generated quantities of waste by municipalities

Municipality	Boljevac	Bor	Kladovo	Knjaževac	Majdanpek	Negotin	Zaječar	Region
Measured t/week	26.4	162.3	126.5	149.5	73.2	190	436	1,164
Total collected t/year	1,376	8,465	6,597	7,793	3,816	9,908	22,735	60,689
Generated quantity kg/p.cap. day	0.73	0.66	0.98	0.91	0.83	1.14	1.12	0.95
Generated quantity kg/p.cap year	267.2	239.8	357.0	331.8	302.1	417.7	407.9	347.8
Total generated waste for the entire municipality t/year	3,472	11,658	7,367	10,449	5,645	15,481	24,256	78,328
Number of Service users	5,150	35,298	18,478	23,487	12,630	23,717	55,730	174,490
Coverage of residents by utility services %	39.6%	72.6%	89.5%	74.6%	67.6%	64.0%	93.7%	76.2%

The existing waste management system for the cities of Zaječar and Bor and the municipalities of Boljevac, Kaldovo Majdanpek, Negotin and Knjaževac does not meet the requirements of integrated and sustainable management. Most of the problems, when it comes to waste collection, in most municipalities in Serbia are related to the machinery necessary for the realization of this process. The basic problem in almost all municipalities is outdated, often defective machinery. Insufficient number of containers of adequate volume, non-existence or insufficient number of containers for separation of secondary raw materials is often observed. City landfills where municipal waste is now disposed of do not meet the requirements of the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010) and EU Directive 99/31/EC on landfills.

When it comes to *industrial waste*,the problem of industrial waste disposal in the Region is solved in the following ways:

- temporary storage at the places of origin of industrial types of hazardous waste;
- thermal treatment of hazardous industrial waste in cement plants or by export to plants for thermal treatment of European Union;
- sale to legal and natural persons who have obtained permits for the management of industrial

types of waste for the purpose of their final disposal in an environmentally safe and sound manner.

Waste recycling in industrial terms refers to the recycling of metals and packaging in the largest percentage, as follows:

- returning the packaging to the supplier for reuse,
- giving the packaging to collectors for further processing.

In most cases, the treatment of industrial waste is not adequate, nor does it comply with legal requirements. On the other hand, there is no landfill or permanent storage of hazardous waste in Serbia, which is declared as a permanent landfill for hazardous waste and which meets the basic criteria for safe disposal. Waste generators in the Region are forced to find the most painless solutions for them, which are not in accordance with technical norms of environmental protection, by disposal at temporary landfills mainly within the company, very often in an inadequate manner (plastic and metal barrels, plastic bags, concrete plateau and often without a canopy, various inadequate concrete or other coffers, reservoirs). There are large amounts of previously generated waste, which is not stored and secured adequately.

The aforementioned Regional Waste Management Plan states that there are only a few companies in Serbia that are able to recycle hazardous waste, as well as the fact that there are no plants built for the incineration or disposal of hazardous waste, most of the waste with the properties of hazardous substances is temporarily stored at the locations of the company or exported abroad. It was noted that the construction of a thermal treatment plant for industrial waste, as well as the option of thermal and chemical treatment of waste, would solve the problem of excessive storage of hazardous waste as well as non-hazardous waste that has no use value and cannot be recycled. It was also noted that after the construction of the waste incineration and thermochemical treatment plant, the construction of a regional landfill for waste storage after treatment is also necessary. With the construction of a regional sanitary landfill, the establishment of municipal inspections and strict supervision at the regional sanitary landfill, possible intentions of illegal landfilling of hazardous waste would be prevented.

Based on all of the above, it can be concluded that the construction of the Waste to Energy Plant and the accompanying landfill for non-hazardous waste is necessary and that it provides a solution related to the recorded problems of disposal of non-recyclable municipal waste and industrial waste in Serbia, which are recognized by the planning documents.

In the event that the project in question is not implemented, as an alternative to construction, it would lead to a negative impact on the management of non-recyclable waste, both hazardous and non-hazardous, as a result of the lack of capacity for their treatment. Consequently, there would also be a further increase in GHG emissions due to the disposal of non-recyclable non-hazardous waste to landfills and as a result of the transport of hazardous waste abroad for final disposal, since this is not possible in Serbia.

4.1.5 Proximity to traffic and transport infrastructure

In accordance with the Regulation on the Categorization of State Roads ("Official Gazette of the RS", no. 87/2023), along one border of the complex passes II B Category state road No. 400, Negotin – Radujevac – Prahovo – Samarinovac – connection with state road 168. From the aforementioned road, the location of the ICP Elixir Prahovo complex is accessed. North of the site in question are an industrial railway track and a port on the Danube River. The proximity of the port and the railway line provide the chemical industry complex in Prahovo, in addition to the road, with the possibility of river and railway transport.

Second Amendments to the Detailed Regulation Plan for the chemical industrial complex in Prahovo envisage the conversion of certain parts of the subject area, which are not systematically and comparably distributed, the formation of zones for the construction of an industrial park, chemical park, energy island, ecological island, expansion of phosphogypsum storage, **as well as the provision of a buffer zone of greenery and the relocation of routes of local roads outside the industrial complex**, thus ensuringthe isolation of the zone of agricultural activities and housing from the influence of the industrial complex and the production process.

As the existing traffic solutions on the subject area are not adequate, because there is a mixing of local roads and roads in the service of industry, Second Amendments to the Detailed Regulation Plan for the settlement of Prahovo envisage the construction of a state road in order to relocate traffic for the purpose of serving the port of Prahovo and the industrial complex Elixir Prahovo. For the corridor of the state road from the Dušanovac traffic node to the end of C.M. Prahovo, about 12.7 km long, a Detailed Regulation Plan has been developed, the adoption of which is in progress.

In accordance with the above, the selected location for the construction of the Eco Energy complex will have the issue of transport infrastructure resolved.

4.1.6 Proximity to drinking water and wastewater treatment infrastructure

The source "Barbaroš" for the drinking water supply of the Prahovo settlement and the Elixir Prahovo complex, and therefore the project in question, is located at a distance of about 7 km northwest of the complex in the area of the Dušanovac village hills and consists of capped springs and wells. A detailed description is given in Chapter 2.7 of the Study.

In order to treat wastewater from the future Eco Energy complex, all options were considered and given that these are specific wastewater from the thermal waste treatment plant, the project envisages waste treatment within the Waste to Energy Plant complex itself, in the wastewater treatment plant licensed by Envirochemie Company, which consists of three-stage neutralization, heavy metal deposition, flocculation, sedimentation and filtration. A waste treatment plant (WWTP) is also planned within the Waste to Energy Plant complex, which will consist of filtration in the sand filter column and the activated carbon column, as well as the installation of grease and oil separators for the treatment of oily atmospheric waters and a biological sanitary-foul wastewater purifier. Wastewater which, after treatment, for any reason does not meet the prescribed criteria for discharge into the final recipient (into the Danube River) will be treated in the boiler plant. A detailed description of the adopted wastewater treatment technology is given in Chapter 3 of the Study.

All treated waste that meets the prescribed criteria will be discharged collectively into the existing collector of clean water of the Elixir Prahovo complex, which takes them to the outlet structure and discharges them into the Danube.

4.1.7 Proximity to power and electric lines

In the terms of "Elektromreža Srbije" no. 130-00-UTD-003-1393/2023 of 20 October 2023 and no. 130-00-UTD-003-1399/2023 of 14 November 2022, it was stated that in the immediate vicinity of the future Eco Energy complex there is no and no planned construction of electricity infrastructure owned by "Elektromreža Srbije A.D."

Near the subject location, but outside the area where the construction of the subject facilities is planned, according to the terms of "Elektrodistribucija Srbije" ltd Belgrade, Elektrodistribucija Zaječar Branch, no. 2540400-D-10.08-452295/2-2023 dated 23 October 2023, there are overhead and underground power installations, as follows:
- underground cable line 10 kV for "Jugopetrol" (present NIS),
- overhead transmission line 10 kV "Samarinovac-Prahovo" for which relocation to a new position was contracted along the Prahovo-Radujevac road.

Figure 4.2 shows in red the underground 10 kV cable line for Jugopetrol (present NIS), and in green the existing route of the 10 kV transmission line "Samarinovac-Prahovo" (to be relocated).

Figure 4.2 Orientation routes of underground and overhead lines

The industrial complex Elixir Prahovo is powered by substation TS 110/10 kV Prahovo and it measures the delivered electricity for the entire complex. All power facilities in the industrial complex are located behind the metering point and are owned by Elixir.

The convenience of the selected location is also reflected in the fact that according to the obtained conditions, the facilities in question can be connected to the existing internal installations of the Elixir Prahovo industrial complex, which are also owned by Elixir.

4.1.8 Proximity to contaminated sites within the chemical industry complex in Prahovo and proximity to the Elixir Prahovo plant

When choosing the location for the construction of the Eco Energy complex, the so-called historical pollution at the chemical industry complex in Prahovo was also considered, which was identified in 2012 shortly after the privatization of the Elixir Prahovo complex. The report "ANALYSIS OF THE ENVIRONMENTAL FACTORS" prepared by the company for copyright protection and engineering, "Autorski biro Beograd", which is attached to the Study, presents the activities on the existing industrial complex within Phase I (from privatization in 2012 to 2014 when the first DRP was adopted), activities within Phase II (2014-2020) and Phase III (targeted environmental research for the needs of new extensions of the chemical industry complex in Prahovo).

The aforementioned Report noted that, as a result of major construction-technical and technological interventions at the chemical industry complex in Prahovo, and thus at the location in question, after privatization, including the rehabilitation of locations where hazardous waste was inadequately disposed of, but also due to the process of migration of pollutants over time, along with physico-chemical and biological processes in soil and groundwater, in the part of the complex intended for the expansion of the company's activities, only point source pollution is registered, uneven in terms of origin and type due to which special interventions are not required, except for soil and groundwater monitoring. Within the Elixir Prahovo complex, regular examinations of all environmental parameters are carried out in accordance with the applicable regulations of the Republic of Serbia (air emissions, air quality, wastewater quality and surface and groundwater quality, soil quality, noise levels).

The realization of the project in question also includes a complete monitoring of the state of the environment in the subject area, which will monitor the potential impact of the plant on the environment (for details, see Chapter 9 of this Study).

Concluding consideration of site selection

Therefore, in a broader overview and selection of the location in question, it was noted that the location in question was characterized by the following elements that determined the Project Holder for adoption of it:

- The planned location is within the industrial zone in Prahovo, with a favourable geopolitical position, has a significant development potential; the implementation of the project in question at the selected location will have a favourable impact on the development of this region.
- The site is located within the existing complex of the chemical industry in Prahovo, which was founded back in 1960, first as a superphosphate factory, and then various granulantes, as part of the technological chain of the Basen-Bor metallurgical complex; Elixir Group privatizes ICP Prahovo in August 2012 and changes the name of the company to Elixir Prahovo Industries of Chemical Products LTD Prahovo and, with the necessary investments in the reconstruction of production and storage capacities, ensures the launch of the production of phosphoric acid and products based on the phosphoric component.
- The location is covered by the adopted DRP and is an integral part of the Technological Unit C – Zone IV: Energy and Ecological Island where **there is allowed construction** of facilities for the purpose of providing thermal energy, cooling and electricity, as well as various types of auxiliary fluids, raw materials and fuels used in the technology of the chemical industry complex, including **storage, pyrolysis and thermal treatment of non-hazardous and hazardous industrial waste, non-recyclable municipal waste and residue from municipal wastewater treatment, with the use of thermal energy and electricity, and the production of alternative fuels and co-saturated steam for the needs of the existing chemical complex, industrial and chemical park**;
- Within this zone, the construction of facilities and areas that are in the service of new production facilities in the Industrial Complex is allowed, including the treatment of wastewater, transhipment railway and road terminals, parking lots for passenger and freight vehicles, a storage and logistics centre for liquid and solid (general, bulk) cargoes, as well as the construction of the necessary accompanying, technologically and functionally related facilities and warehouses;
- Within this zone, the construction of areas/facilities and infrastructure systems that are in the service of **temporary storage, treatment and disposal of waste and residues from storage, pyrolysis and thermal treatment plants is allowed**. The construction of necessary infrastructure facilities, facilities for the production and distribution of auxiliary fluids, accompanying facilities for monitoring the functioning of infrastructure networks and devices, as well as possible workshops for the maintenance of plants is also allowed;
- Within this part of the zone, the **construction of residential buildings is prohibited** (except for possible apartment units for temporary stay of guards, on-call services, etc.).
- The thermal energy obtained from the waste-to-energy process would be used to evaporate phosphoric acid in the plants of the Elixir Prahovo complex, as the largest consumer of thermal energy in the existing chemical industry complex in Prahovo, thus reducing the use of fossil fuels currently used to obtain thermal energy (mazut, coal and CNG)
- The Industrial Complex of the Chemical Industry in Prahovo, and therefore the subject plant and Landfill for non-hazardous waste, has at its disposal a complete infrastructure (transformer substations, telecommunications network, compressed natural gas installation, water supply and sewerage network, roads, etc.).

- In the event of an accident, in addition to the trained and equipped services of the Eco Energy Prahovo branch, Elixir Prahovo (environmental protection, occupational safety, fire brigade, rescue unit (within the fire brigade), physical and technical security, etc.), the Negotin Fire and Rescue Unit may also come to the rescue.
- The site is located in the centre of new investments in accordance with the Strategic Development Plan in Prahovo 2023 – 2027 (Development of internal roads 2023-2024 ICP Elixir Prahovo, Development of the Port of Prahovo and other facilities in the complex, New state road 12.7 km – bypass around the Prahovo settlement, etc.).
- Realization of the planned investments with the application of the best available techniques will improve the environment in the area in question, which has been devastated by industrial activities for many years. Also, the location will be dedicated and under constant supervision and monitoring in order to prevent further degradation.
- The realization of the project affects the reduction of GHG gas emissions and the reduction of the amount of waste disposed of in landfills, because the largest percentage of waste is treated in a thermal treatment plant, which reduces its volume and obtains cheap and sustainable local energy.
- Favourable traffic position of the site in relation to the environment.
- The location of the Landfill for non-hazardous waste is in the immediate vicinity of the WtE plant, which minimizes the transportation path of residues from the WtE plant that are disposed of at the landfill.
- The aforementioned location is sufficiently distant from residential and other buildings in the vicinity.

4.2 Production processes or technologies

4.2.1 Technological processes of different types of waste treatment and expected emissions of waste gases, wastewater, incineration process residues

Principle of waste management hierarchy, defined by the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023), clearly defines that the first and most important goal must be the prevention of waste generation, after which, if it is not possible to prevent waste from being generated, it is necessary to provide conditions for its reuse, recycling, energy utilization and processing. Only in the end, when all the previous steps have been implemented, what remains should be disposed of, i.e. deposited in a safe and environmentally and human health safe manner.

4.2.1.1 Alternative in the waste management process

Compared to municipal waste landfills, the waste-to-energy processing of non-recyclable waste by waste incineration has a lower environmental impact. One of the primary benefits of waste incineration is that it significantly reduces greenhouse gas emissions. Waste incineration can also contribute to climate change by emitting carbon dioxide into the air. Although incineration produces emissions, they are significantly lower than emissions produced by landfills. In addition, waste incineration does not contaminate soil and groundwater, which is a major environmental benefit. A significant advantage of waste incineration is that it can produce energy. As waste is incinerated, the heat generated can be used to generate electricity and thermal energy. Energy produced by waste incineration reduces the need for fossil fuels, which contributes to control of greenhouse gas emissions and climate change. Landfills, on the other hand, do not produce energy. Instead, the waste is disposed of, decomposed over time, and produces methane as a gas. This gas can be captured and used to produce energy, but the amount of energy produced is relatively small compared to the incineration of waste. In addition, the disposal of waste in unsanitary landfills leads to soil and groundwater contamination and thus endangering the environment. Also, the establishment of waste incineration technology can create jobs in the construction, operation and maintenance of plants. The economic benefits of waste incineration can be significant, contributing to local economic growth and development.

It is estimated that over a period of 20 years, which is a time frame that is increasingly considered relevant to the fight against climate change, the effect of methane emissions in landfills is 84 times stronger than carbon dioxide emissions. Diverting 1 t of solid waste to Waste to Energy Plants instead of landfill can save an average of 1 t of carbon dioxide.

The current method of waste management in the Republic of Serbia is based mainly on the disposal of waste at non-sanitary and wild landfills with minimal processing, which leads to waste being a burning problem that needs to be solved.
In modern waste management systems, obtaining energy from waste, i.e. incineration, is one of the significant steps towards neutralizing the harmful effects that waste can have on the environment and human health, while contributing to meeting growing energy needs. When obtaining energy from waste, the mass of waste is reduced by 75% and the volume by 90%. This significantly reduces the quantities of waste sent to landfills and helps to preserve the landfill capacities and duration of their use. During the process of obtaining energy from waste, the amount of greenhouse gases released, which are the causes of climate change, is far lower compared to state-of-the-art sanitary landfills. In this way, the application of thermal waste treatment technology also contributes to reducing greenhouse gas emissions and slowing climate change.

Due to the lack of waste treatment and poor conditions for its disposal, fires at landfills are a common occurrence, which further endangers public health and pollutes the environment in the long term. Waste that causes fires in landfills, thanks to its energy potential and the creation of landfill gas, due to uncontrolled conditions and the absence of an environmental protection system, is a significant source of pollution and danger. Obtaining energy from waste in a specially designed, strictly controlled and equipped plant, with the application of the envisaged protection measures, enables the use of energy from waste without harmful consequences for human health and the environment. Solid municipal waste prepared for thermal treatment has a thermal value of lignite, and residues from sorting waste that are rich in plastics can reach the thermal value of hard coal.

The technology of thermal treatment of waste represents an advantage in relation to the technologies of depositing municipal non-recyclable waste in landfills, despite the fact that, given that methods and technologies for the use of certain thermal treatment residues have not been developed, the construction of a landfill for non-hazardous waste for the disposal of S/S residues from the boiler plant are still necessary in addition to incineration.

The current situation in waste management in the Republic of Serbia is such that certain types of waste are generated in large quantities for which treatment is not provided, which creates a problem for both waste producers and operators who go through complicated and slow export procedures. On the other hand, the European Green Deal[46] has set an ambitious roadmap for transforming the European Union into a sustainable, resource-efficient and climate-neutral economy. The Circular Economy Action Plan[47] highlighted the need for action to ensure that shipments of waste for reuse and recycling in the Union are facilitated, and that the Union does not export waste to third countries. In addition to environmental and social benefits, such action may result in a reduction of the Union's strategic dependence on raw materials. By setting the priorities of the necessary activities: creating a well-functioning EU market for secondary raw materials and solving the export of waste - which is a loss of resources and economic opportunities for the recycling industry in the EU, a revision of the Regulation on the transboundary movement of waste[48] was adopted, which aims to limit the export of waste that can be treated in country, within the EU. Also,

[46] Communication from the Commission to the European Parliament, the European Council, the Council, the European economic and social committee and the committee of the regions, The European Green Deal, Brussels, 11.12.2019, COM(2019) 640 final.
[47] Communication from the Commission to the European Parliament, the European Council, the Council, the European economic and social committee and the committee of the regions A new Circular Economy Action Plan For a cleaner and more competitive Europe, Brussels, 11.3.2020.
[48] Regulation (EU) 2024/1157 of the European Parliament and of the Council of 11 April 2024 on shipments of waste, amending Regulations (EU) No 1257/2013 and (EU) 2020/1056 and repealing Regulation (EC) No 1013/2006, Official Journal of the European Union, 2024/1157.

the Basel Convention[49], which was ratified by the RS, in Article 4, which refers to the general obligations of the members, defines that each member state will take appropriate measures to ensure the availability of adequate facilities for disposal, for environmentally acceptable management of hazardous and other waste, which, as far as is possible, located within the country, regardless of the place of their disposal and to ensure that the transboundary movement of hazardous waste and other waste is reduced to a minimum in accordance with environmentally acceptable and efficient management of such waste, and that it is carried out in a way that will protect health people and the environment from the harmful effects that may be a consequence of such movement.

There are other different waste treatment processes on the market with reuse that could potentially be an alternative to waste incineration; to this group of procedures belongs co-incineration, mechanical-biological treatment, pyrolysis, gasification, etc.). Some of them require pretreatment of waste, others are only applicable to certain fractions of waste that would otherwise be subject to incineration, while some show insufficient overall performance and applicability. Few alternative processes for waste treatment have worked successfully in industrial plants, while others have shown so far a lack of economic and environmental sustainability.
The following table provides an overview of the most commonly used alternative procedures for treating waste, which cannot be reused or recycled.

Table 4.5 Overview of alternative processes, for types of waste used in incineration

	Non-recyclable flammable waste								
Treatment procedure	Solid municipal waste	Plastic waste	Old tires	Hazardous waste	Wood waste	Organic waste	Waste oil	Waste solvents	Sewage sludge
Depositing	**X**	**X**	**X**	**[X]**	**X**	**X**			**(X)**
Co-incineration	**(X)**	**(X)**	**[X]**	**X**	**(X)**	**(X)**	**X**	**X**	**(X)**
Mechan. biological treatment (MBT)	**X**				**(X)**	**X**			**(X)**
Anaerobic digestion (AD)	**X**				**(X)**	**X**			**(X)**
Aerobic digestion (Composting)					**(X)**	**X**			**(X)**
Pyrolysis	**X**	**X**	**X**	**X**	**(X)**	**X**	**X**	**X**	**(X)**
Gasification	**X**	**X**	**X**	**X**	**(X)**	**X**	**X**	**X**	**(X)**
Plasma process	**X**	**X**	**X**	**X**	**(X)**	**X**	**X**	**X**	**(X)**

X … Applied
(X) … Applied after pretreatment / with certain limitations
[X] … Applied with or without pretreatment

Waste thermal treatment provides the possibility of treating fractions of waste that cannot be used for production purpose or recycle due to concentrations of harmful substances in them.

[49] The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, revised in 2019, Secretariat of the Basel Convention (SBC), April 2020.

In the case of the existence of a system for efficient use of energy, as provided for in the subject project, thermal treatment (incineration) is classified as a reuse operation (R1 "Use of waste mainly as fuel or other means of energy production").

Incineration of waste without efficient use of energy is classified as a landfill operation (D10 "Incineration of waste on land"). Compared to treatment R1, D10 is an inferior, less sustainable operation, which should be avoided if there are technical possibilities.

Bearing in mind the need for thermal energy in the production facilities of "Elixir Prahovo - Industrija hemijskih proizvoda d.o.o. Prahovo", the Project Holder decided to introduce the technology of thermal treatment of non-recyclable waste, which will use the obtained thermal energy for the production of steam (35 t/h, p=13 barg and T=207 ºC), and further deliver and use it for the evaporation of phosphoric acid within Elixir Prahovo. In this way, cheap and sustainable local energy is obtained, the emission of GHG gases from the existing Elixir Prahovo plants is reduced. In Chapter 6, the calculation of CO_2 emission reduction is given.

Thus, the key advantages of waste thermal treatment are: sanitation of waste, reduction of its volume and mass, high level of environmental protection through emission control (especially compared to alternative treatment options), protection of human health, mitigation of climate change, preservation of natural resources, energy recovery from waste, complementarity with recycling and extraction of hazardous substances from waste.

4.2.1.2 Alternatives regarding Waste Incineration Technology

When it comes to the choice of thermal treatment technology and technological equipment at the plant in question, for the pretreatment of waste, waste thermal treatment and treatment of residues from thermal treatment, the Project Holder considered certain alternatives. The same can be concluded for the choice of fuel and equipment for reducing the emission of harmful and hazardous substances, waste water treatment, waste disposal, etc., all in accordance with the best available techniques in the field in question:

- Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C (2019) 7987)
- European Commission, Best Available Techniques (BAT) Reference Document for **Waste Incineration**, 2019;
- Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C (2018) 5070) (Text with EEA relevance.)
- European Commission, Best Available Techniques (BAT) Reference Document for **Waste Treatment**, Industrial Emissions Directive 2010/75/EU, 2018;
- European Commission, Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on **Emissions from Storage**, July 2006;
- European Commission, Integrated Pollution Prevention and Control Reference Document on **Economics and Cross-Media Effects**, July 2006;
- European Commission, Reference Document on Best Available Techniques for **Energy Efficiency**, February 2009 (corrected version as of 09/2021);
- JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations, **Industrial Emissions Directive** 2010/75/EU (Integrated Pollution Prevention and Control), 2018;
- Best Available Techniques (BAT) Reference Document for **Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector**, Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control).
- BREF Industrial **Cooling Systems** (ICS), published in December 2001;
- BREF **Monitoring of Emissions to Air and Water from IED Installations** (ROM), published in July 2018;

- BREF **Large Combustion Plants** (LCP), published in December 2021;

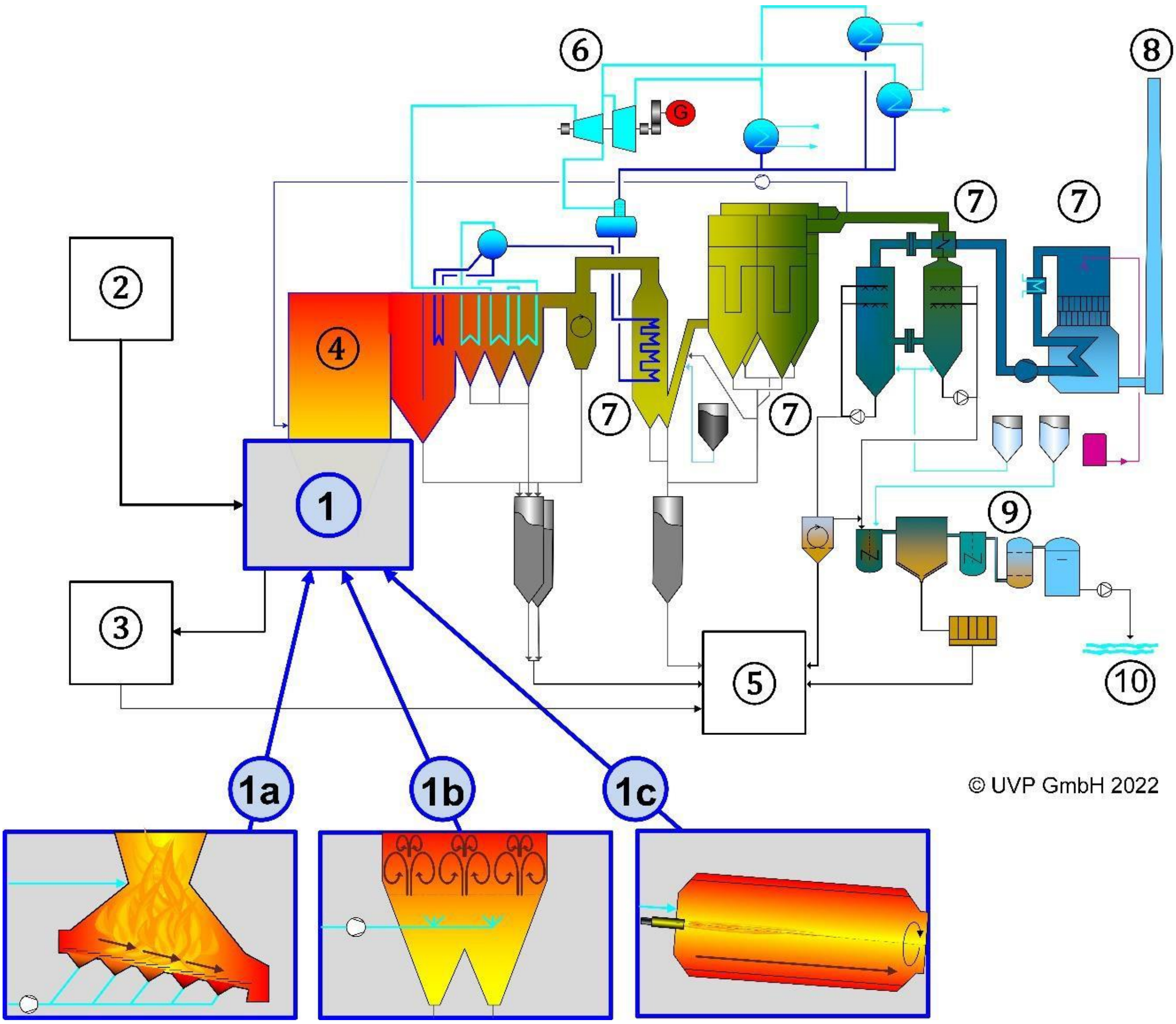
During the selection of technology and equipment for the thermal treatment of unusable and non-recyclable hazardous and non-hazardous waste and the provision of environmental protection measures, market research was carried out, numerous consultations were carried out with foreign experts in this field, and in order to better understand the plant and its operation, visits to similar plants in Europe were carried out and their experiences were taken into account.

Waste-to-energy plants are designed to use different types of waste, including solid waste, liquid waste and hazardous waste. The types of waste that can be used to obtain energy in thermal treatment plants vary depending on factors such as: technology used, environmental regulations and safety aspects.

There are certain criteria for checking the acceptability of waste for the incineration process. The minimum and maximum energy values that are suitable for incineration of waste depend on the selected incineration technology and its process parameters. Other criteria include waste size, homogeneity, water content, content of inert compounds (e.g. stones, ceramics, glass, ash) and content of hazardous substances such as heavy metals and halogenated organic compounds.

The technology of obtaining energy from waste has been applied in Europe for decades in more than 500 installed plants. The operational work of the mentioned facilities complies with the strictest legal regulations and the highest environmental standards. For industry sector obtaining energy from waste is subject to the most stringent standards compared to all other industrial sectors in the EU.

The process diagram of a typical waste-to-energy plant (Figure 4.3) shows that only the firebox is a relatively small part of the waste thermal treatment plant. Most of the plant, such as subsequent heating surfaces, flue gas cleaning units, wastewater treatment plants and plants for separate collection and treatment of solid incineration residues, is intended for energy recovery and environmental protection.



(1) Furnace/Boiler (1a. Grate Firing, 1b. Fluidized bed, 1c. Rotary Kiln)
(2) Storage and dosing of fuel and waste
(3) Collecting solid residues from the furnace
(4) Heat Recovery Boiler
(5) Various solid residues that go to processing and disposal
(6) Combined production of Heat and Power (CHP)
(7) Typical multistage (wet) flue gas cleaning system
(8) Cleaned flue gas discharge smokestack
(9) Typical multistage wastewater treatment system
(10) Discharge of cleaned wastewater

Figure 4.3 Process scheme of a typical waste incineration plant (© UVP GmbH)

As shown in Figure 4.3, waste-to-energy plants are based on three combustion technologies (Figure 4.4):

- Grate Firing,
- Rotary Kiln and
- Fluidized Bed.

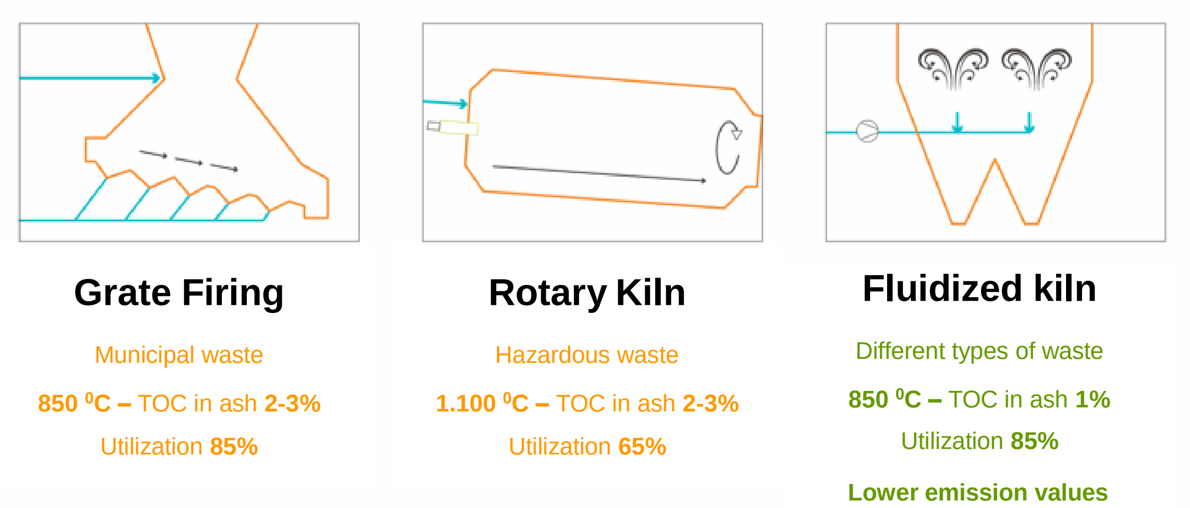


Figure 4.4 Waste incineration technologies with direct energy utilization

All three specified types of furnaces represent stable and well-proven technical solutions that have been operating for decades. A brief comparison of the considered waste incineration technologies (Table 4.6) is given below and an overview of the possibilities of processing individual types of waste by different thermal treatment processes is given (Table 4.7).

Table 4.6 Types and characteristics of waste incineration furnaces

	Grate Firing	**Rotary Kiln**	**Fluidized Bed furnaces**
Type of waste to be treated	Incineration technology commonly used for untreated municipal solid waste	Hazardous waste: – Non-recyclable – Infectious – Radioactive – Highly flammable – Explosive It is also used to incinerate slaughterhouse waste and infectious hospital waste including “sharp objects” in sealed plastic containers. Rotary furnaces are also used to incinerate other special waste fractions, such as waste solvents, waste oil, waste oil sludge, waste varnish, chemical waste, medical waste and other liquid waste and high viscosity waste.	Different types of non-recyclable waste can be treated: – Industrial – Commercial – Household waste – Railway sleepers – Sludges from wastewater treatment Cannot be treated: – Recyclable – Infectious – Radioactive – Highly flammable – Explosive
Incineration method	Incineration takes place on the grate, as part of usually slowly moving iron tubular segments	Incineration in a rotary furnace is performed in a long, cylindrical furnace that is very	The incineration process takes place in the fluidized bed itself and in the zone above it. Due to the strong,

	that must be cooled from the inside by air or water. The waste is dosed to the grate at one end and is slowly transported through the furnace using a movable grate, while incinerating. The waste retention time in the furnace is usually about one hour.	similar to the rotary furnaces used in the cement industry for the production of cement clinker.	continuous movement of the bed material, the reaction conditions (temperature profile, contact of chemical reactants) are very uniform and constant throughout the reaction zone, vertically and radially. Sand shreds waste into smaller particles and serves as a heat reservoir that can absorb and release heat. Both help to reduce emissions to air, e.g. nitrogen oxides (NOx) and volatile organic compounds (VOCs).
TOC in ash	2-3% (850 ^{0}C)	2-3% (1,100 ^{0}C)	1% (850^{0}C)
Utilization of energy from fuel	85%	65%	85%
"Fly ash" (Boiler ash and filter ash)	Hazardous waste (undergoes treatment processes: stabilization, solidification, decontamination, etc. and is disposed of at the landfill)	Hazardous waste (undergoes treatment processes: stabilization, solidification, decontamination, etc. and is disposed of at the landfill)	Hazardous waste (undergoes treatment processes: stabilization, solidification, decontamination, etc. and is disposed of at the landfill)
"Bottom Ash" (Ash from the bottom of the boiler)	Ash accounts for 80-90% by weight of the total incineration residue consists predominantly of non-combustible (inert) materials (glass, earth minerals, metals and metal alloys as part of non-combustible materials and glass, silicate minerals and oxide minerals) The mineral fraction makes up a significant proportion of ash (BA), typically about 50-75% The mineral fraction can be reused as aggregate or incorporated into building materials such	The ash from the Rotary Kiln plant is slightly sintered or melted at the end of the rotary kiln. Systems in which only sintered slag is created are designed similarly to grate furnaces Ash composition (BA) from Rotary Kiln plants, show measured values for different parameters, especially for elements of potential environmental hazards in ash In general, it can be assumed that the ash from Rotary Kiln plants is potentially more contaminated than the ash from Fluidized Bed plants.	All material fractions of aluminium, magnetic ferrous metals, weak-magnetic ferrous metals, brass, copper, glass, unburned organic matter and recovered mineral materials, except magnetic ferrous metals and mineral material, show higher concentrations in ash from Fluidized Bed plants than in ash from Grate Firing plants. In the composition of glass and weak-magnetic ferrous metals, ash from a Fluidized Bed plant contains 2.8 times more glass than ash from a Grate Firing plant. Ash from fluidized bed incinerator tends to be finer and more granular. The ash metal recovery potential from a Fluidized Bed plant is higher than the ash potential from a Grate

	as cement, concrete or asphalt. Metal fractions, including ferrous and non-ferrous metals, can be recycled as a secondary raw material in the respective metalworking industries		Firing plant or a Rotary Kiln plant. From the perspective of recycling, larger particles are preferable because metals are more easily separated from them. In addition, metals obtained from the ash of a Fluidized Bed plant are qualitatively preferred for recycling because they are generally less oxidized than metals from the ash of a Grate Firing plant, since waste particles in the fluidized bed are usually exposed to lower maximum temperatures compared to the grate
Advantages	Grate technology is a fairly simple and stable system for incineration of untreated waste. Treatment. Incineration on the grate does not require prior preparation of waste, which can be considered its main advantage.	Preferred technology for the incineration of hazardous waste with a high content of halogenated organic compounds, where a higher incineration temperature of 1,100°C is required under EU legislation (instead of 850°C). Waste incineration in Rotary Kiln incinerator is a special technology that is usually only applied for the incineration of hazardous waste or for the thermal treatment of contaminated soil.	The Fluidized Bed technology allows significantly greater flexibility of the fuel in terms of its thermal power: if the waste has a high moisture content and low thermal power (such as drained sewage sludge, which contains 75-80% water), the heat contained in the sand layer helps the water to evaporate, so that the remaining dry matter can be incinerated. If, on the contrary, waste has a very high thermal power (such as residues from sorting plastic for recycling), sand absorbs the heat of incineration of these materials. In both cases, this does not significantly affect the reaction temperature within the fluidized bed, since the sand layer acts as an energy storage device and keeps the temperature in the furnace constant. This can be a significant economic advantage. The highest degree of control at the reception and preparation of incoming fuel

			Higher incineration efficiency with lower total organic carbon (TOC) values in ash Better utilization of waste to energy and better controlled incineration
Disadvantages	Grate technology is an incineration system with less flexibility when it comes to waste types. The grate system must be cooled by air or water and can only work with waste of a fairly narrow range of energy content, that is, on the grate usually incinerates waste whose lower thermal power is between 8 and 12 MJ/kg. Waste with higher thermal power would thermally damage the grates, while waste with lower thermal value, such as mechanically dewatered sewage sludge, would extinguish the fire on the grate.	Incinerators with rotary kilns have large and heavy rotating parts, which is generally mechanically challenging, and also expensive in operation and maintenance. Due to the higher content of corrosive components in the flue gas, rotary kilns for the incineration of hazardous waste must operate at lower steam parameters, making them less energy efficient than incinerators with gratings or with a fluidized bed.	In fluidized bed furnaces, the waste must be previously mechanically prepared to a certain granulation, so that the waste particles can be fluidized together with the sand. A combination of shredding, sieving and metal removal is usually chosen to obtain particles that are suitable for fluidization in terms of material density and particle size. Incineration in the fluidized bed usually consumes more energy than incineration on the grate, since the waste must be previously mechanically treated, and part of the energy is also spent on compressing the primary combustion air that is injected into the furnace with nozzles and provides fluidization of the sand layer.

Table 4.7 Overview of the possibilities of treatment individual types of waste by different thermal treatment processes (BMLFUW, 2015)

	Incineration technology		
Waste type	**Grate Firing**	**Fluidized Bed**	**Rotary Kiln**
Residual waste (municipal waste)	**Suitable**	**Pretreatment required**	**Suitable**
Sewage sludge	**Limited in terms of quantity**	**Suitable**	**Suitable**
Sediment from the primary phase of wastewater treatment (from the mechanical wastewater treatment grate)	**Suitable**	**Pretreatment required**	**Limited suitability**
Shredded plastic	**Limited in terms of quantity**	**Suitable**	**Limited suitability**

	Incineration technology		
Waste type	**Grate Firing**	**Fluidized Bed**	**Rotary Kiln**
Whole tires	**Limited suitability**	**Unsuitable**	**Limited suitability**
Crusher waste	**Limited in terms of quantity**	**Suitable**	**Limited suitability**
Shredded waste wood	**Suitable**	**Suitable**	**Suitable**
Varnish and paint residue	**Unsuitable**	**Suitable**	**Suitable**
Hazardous waste in small containers (e.g. laboratory waste)	**Limited suitability**	**Pretreatment required**	**Suitable**

In accordance with all the above, and taking into account the advantages of the technology with a fluidization bed, as well as based on the analysis of the waste market and the availability of waste suitable for the technology with a fluidization bed, the Project Holder opted for the construction of the Waste to Energy Plant specifically with Fluidized Bed, with a capacity of 30 MW, based on the technology of the Austrian company "TBU Stubenvoll" GMBH, which has proven references with plants of a similar type. Different equipment manufacturers were consulted and the most appropriate solutions were selected in accordance with the best available techniques.

One line for waste thermal treatment is planned, with a capacity up to 100,000 t/year (waste mass flow depends on the thermal power of the waste and ranges from 3.43 to 17.24 t/h). The thermal treatment line contains an incineration chamber in the fluidized bed, to which the heating surfaces of the boiler are connected in three flue gas passages, which then pass through the evaporator and economizer. The heat treatment chamber consists of a fluidization part, the lower and upper zones.

A detailed description of the thermal treatment is given in Chapter 3 of the Study.

4.2.1.3 Alternatives regarding the Transport and Storage of Hazardous Waste

Unusable and non-recyclable hazardous waste is delivered directly from the generator or through the Eco lager warehouse in Šabac and Prahovo. Hazardous waste will be transported in ADR certified means of transportation to the Waste to Energy Plant in Prahovo. As part of the reception procedure, strict controls which include laboratory analyses before giving permission for the waste to be accepted for treatment.

The selection of transportation, storage and dosing equipment is an important part of the engineering process. It depends on several factors:

- Physical properties of waste, e.g.:
  - physical state, water content, particle size, particle size distribution, angle of repose, viscosity, pumpability and dynamic properties of the fluid, heating capacity, dust release during handling;
- Chemical properties of waste, e.g.:
  - pH value, corrosivity, chemical reactivity, liquid mixing characteristics (avoidance of chemical reactions, gas separation, gas formation, temperature rise), halogen content, heavy metal content, toxicity, flammability, explosiveness;
- Properties of the waste incineration site, e.g.:
  - logistic possibilities of access to the location, incineration technology (grate firing, fluidized bed, rotary kiln), presence of sensitive environment or surrounding;
- Specific requirements defined by licensing authorities, e.g.:
  - Restriction or prohibition of waste transport activities at certain time periods (e.g. during the night), sensitive environment (e.g. hospital, nursing home).

Transport within the complex includes:

a) Transport to the place of thermal treatment (delivery of waste materials),
b) Transport from the place of thermal treatment (shipment of residues and secondary raw materials), and
c) Transport at the place of thermal treatment (e.g. from the waste bunker to the furnace/boiler or from the furnace/boiler to the ash reception facility).

Depending on the physical and chemical properties, waste is transported by trucks in IBC containers, barrels, jumbo bags, or in the case of transport of liquid waste, by tank trucks.
For the needs of waste transport within the plant, moving floors, conveyor belts, forklifts are provided.

From the standpoint of the organization of the storage and the selection of thermal treatment equipment, several conceptual solutions were considered. Open and closed type warehouses were considered, as well as different types of equipment and all their advantages and disadvantages were analysed, as shown in the table below:

Furnace for thermal treatment with grate	**Rotary Kiln for thermal treatment**	**Fluidized Bed kiln for thermal treatment**
The delivered waste is unloaded into a bunker, which provides enough storage space for a few days. The combustion air required for the process itself is usually sucked out of the waste bunker. As a consequence, there is always a small underpressure in the bunker, so that contaminated air with an unpleasant odour cannot escape from the bunker. Instead, ambient air is sucked into the bunker, which helps reduce odours near the installation. Incineration of waste in a grate firing plant generally does not require any pretreatment of waste. In the event that the plant is also intended for bulky waste, shreders or grinders are used for its shredding. In the waste bunker, the waste is mixed using a crane that can accommodate several tons of waste. The crane grabs the waste in the bunker and disposes of it in the waste entrance channel, in which the waste slowly slides down and falls on the grate in the furnace. The waste layer in the waste channel provides air sealing between the incineration chamber and the	Solid waste delivery, dosing and storage systems used in rotary kiln incinerators are basically similar to those with grates. Dosing of waste liquids (e.g. waste oils, waste solvents) and sludge is done using separate tanks/bunkers, precipitators and dosing pumps that bring them into the incinerator via its (non-rotating) front wall. For safety reasons, steel barrels containing toxic waste, as well as small plastic containers for "sharp objects" containing infectious waste are most often directly inserted into a rotary kiln, without opening containers and exposing employees to potential risks and hazards. Steel barrels are collected at the end of the rotary kiln as secondary metal that can be recycled, while plastic containers are incinerated in the rotary kiln, and only metals (e.g. scalpels) are left in the ashes at the furnace outlet, which are also separated as secondary raw materials for recycling.	Solid waste delivery, dosing and storage systems applied in fluidized bed incinerators are essentially similar to those described for grate incinerators. But unlike a grate firing system, a fluidized bed system requires waste of a certain granulation and density. Therefore, waste delivered to fluidized bed incinerators must either be mechanically pre-treated prior to delivery to the plant, or mechanically treated at the incinerator site. Mechanical pretreatment of solid waste before incineration in the fluidized bed usually consists of the following technological operations: • shredding, • sieving, • removal of iron and iron alloys (so-called ferrous metals), • removal of non-ferrous metals. If mechanical pretreatment takes place on site, the installation must be equipped with at least two different waste bunkers, one to deliver untreated input waste and the other to store mechanically pre- treated waste. In addition, smaller bunkers

duct. At the lower end of the channel, there are dispensers (allocators) that evenly distribute the waste on the grate.		Waste cranes are used for the capture of untreated waste and its delivery to mechanical pretreatment equipment, and also for the dosing of previously treated waste to conveyors that transport the waste to the furnace kilns or boilers in which it is incinerated. Waste dosing is usually done using a rotary dispenser located at the bottom of the dosing channel and also serves as a hermetic seal that prevents the ignition of waste within the transport line. Below the rotary dispenser, there is a device or channel for the rapid transport of waste through which the waste is distributed to the surface of the hot fluidized bed, in which it incinerates. In the event that waste liquids (e.g. waste oils, waste solvents), sewage sludge or other sludge are also incinerated, they are stored in separate tanks/bunkers and dosed via separate pumps and supply lines directly into the furnace.

The selection of a closed facility (hall) for the storage of solid and liquid waste and mechanical preparation of solid waste materials was carried out by the Project Holder in order to prevent the emission of unpleasant odours and dust into the surrounding area. Concrete waterproof bunkers for solid waste storage are planned in the hall, one of which will be used for mixing waste according to predefined recipes for thermal treatment, and one for storing mixed fuel that is dosed into the boiler. Removal of dust and unpleasant odours and prevention of their emission outside the facility is achieved by keeping the hall constantly under pressure, drawing air from the hall and burning it in the boiler plant. In cases where the boiler plant does not work (due to overhaul, downtime, etc.), the air from the waste storage facility will be directed to the bag filter system and activated carbon filter by means of a fan, where it is purified, and then the purified air is discharged into the atmosphere via the emitter (smokestack) of the filter unit. A rack warehouse for IBC containers / barrels is also planned in the closed part of the facility intended for this purpose. Appropriate tanks are provided for the storage of liquid waste, which will also be located in watertight concrete tanks within the closed facility of the Waste storage. Ventilation of the space in which the storage tanks are located is provided through a duct with associated elements for inserting and sucking air from the space. Equipment for unloading, storage and dosing of sludge waste is a package unit and consists of: a reception bunker with a movable floor; a Screw conveyor and a piston pump with which the sludge waste is dosed to the boiler plant. The process of unloading, storage and pretreatment of waste materials is a fully automated process, in a closed system therefore, under regular operating conditions, there are no significant environmental impacts.
A detailed description of the storage and dosing of waste is described in Chapter 3 of the Study.

The project envisages a separate Hazardous Waste Treatment Line (IBC containers, barrels, etc.). This line is closed type. It is envisaged that the container/barrel is automatically inserted into the shredder chamber using a forklift and an IBC lift, after which the first door is closed and nitrogen (N_2) is introduced into the chamber at that moment. When the atmosphere in the chamber is inertised, a second door opens and the vessel is then inserted into the primary shredder. The primary shredded material reaches the secondary shredder, after which the shredded waste enters the mixer/ Screw conveyor and is dosed directly into the boiler. The envisaged technology achieves the avoidance of waste pumping. Namely, when pumping the liquid fraction, there is a possibility of contamination during manipulative actions, as well as toxication, therefore, the application of the designed closed system allows for unified dosing, without the possibility of cross-contamination with accompanying reactions. Also, the application of the aforementioned liquid waste dosing system delivered in IBC containers/ barrels enables the prevention of mixing of potentially reactive hazardous waste with non-reactive solid waste fractions.

4.2.1.4 Alternatives regarding Waste Gas Treatment

In addition to the positive effects of obtaining energy from waste and valuable materials ready for recycling processes, it is important to remember that this technology produces pollutants during its operation that must be adequately "captured" and safely disposed of. In accordance with the above, the Project Holder considered the best available techniques and technologies related to the treatment of waste gases, wastewater and the treatment of solid residues from the boiler plant.

Table 4.8 provides an overview of flue gas cleaning techniques considered Best Available Techniques (European Commission, Best Available Techniques (BAT) Reference Document for Waste Incineration, Industrial Emissions Directive 2010/75/EU, 2019).

In accordance with the recommendations of the best available techniques, flue gases are purified in a multi-stage system (wet cleaning, dry cleaning) and subsequently discharged via a smokestack into the atmosphere. An example is the wet flue gas cleaning system, which consists of a cyclone for pre-dust removal, a gas stream adsorption system with a bag filter for the removal of acid gases and heavy metals, two wet purifiers for the removal of acid gases, and a selective catalytic reduction system (SCR/ SNCR) for the removal of nitrogen oxides (DeNOx). The described techniques are applicable regardless of the incineration technology applied (grate firing, fluidized bed, rotary kiln) and the type of waste to be incinerated.

Table 4.8 Overview of flue gas cleaning techniques considered as Best Available Techniques (European Commission, Best Available Techniques (BAT) Reference Document for Waste Incineration, Industrial Emissions Directive 2010/75/EU, 2019).)

Best available technique	**Mitigation of the parameter**
Bag filters	Dust, heavy metals
Dry sorbent injection	Acid gases (SO_X, HCl, HF)
Bag filters with catalyst	PCDD/F, NO_X
Direct desulfurisation	SO_X
Dry sorbent injection	Acid gases (SO_X, HCl, HF), PCDD/F and Hg
Electrostatic filter (ESP)	Dust, heavy metals
Adsorption with fixed or movable layer	TOC, PCDD/F, Hg and others
Flue gas recirculation	NO_x
Selective Catalytic Reduction (SCR)	NO_x
Selective Non-catalytic Reduction (SNCR)	NO_x
Semi-moist absorber	Acid gases (SO_X, HCl, HF)
Wet scrubber	Acid gases (SO_X, HCl, HF), PCDD/F and Hg

The individual components of the flue gas cleaning system (FGC) are combined to ensure the efficient removal of pollutants contained in the flue gases. A large number of different components and ways of designing the system allows a large number of combinations.

Analysing the available techniques and technologies related to the treatment of waste gases, in order to protect the environment, the Project Holder has decided that the largest and most complex part of the Waste to Energy Plant should be flue gas cleaning systems generated during the incineration of waste. These systems are designed on the basis of the defined chemical composition of the recipes of different types of waste entering the incineration process and include:

- Dry flue gas cleaning (cyclone and activated carbon reactor and bag filters)
- Wet flue gas cleaning in scrubbers
- Selective catalytic filter (SCR)

A detailed description of the waste gas cleaning technology is given in Chapter 3 of the Study.

4.2.1.5 Alternative solutions related to NOx removal technologies

Analysis of the NO_x reduction equipment shown in the Best Available Techniques (BAT) Reference Document for Waste Incineration shows that plants equipped with SCR (Selective catalytic reduction) generally achieve significantly lower levels of NO_x emissions than plants equipped with SNCR (Selective non-catalytic reduction). The main disadvantages are its higher purchase price and the energy consumption required to support the reheating of the flue gases to the reaction temperature with the catalyst. It is additionally necessary to regenerate the catalyst after a certain time of exploitation. However, the use of a heat exchanger reduces the additional energy required to achieve the appropriate temperature. Tables 4.9, 4.10. and 4.11 show a comparison of NO_x and NH_3 emissions using SCR and SNCR taken into consideration by the Project Holder at the earliest stages of project development.

Table 4.9 Comparison of NO_x and NH_3 emissions using SCR and SNCR

Substance	SNCR					SCR			
	Achieved emission range				Note	Achieved emission range			
	Annual maximums		Annual average mg/Nm³	Specific emission (g/t of input waste)		Annual maximum		Annual average mg/Nm³	Specific emissions (g/t of input waste)
	Average half-hourly mg/Nm³	Average daily mg/Nm³				Average half-hourly mg/Nm³	Average daily mg/Nm³		
NO_x	155-300	80-180	70-180	390-1000	Depending on the dosing rate, waste and type of furnace	50-200	40-150	40-120	220-660
NH_3	5-60	3-15	1-6	6-33	Lowest where wet scrubbers are used	3-30	3-10	<3	<17

Table 4.10 Evaluation of SNCR and SCR usage criteria

Criterion	Description of the factors influencing the determination of the criteria	SNCR		SCR	
		Rank (high/medium/low)	Note	Rank (high/medium/low)	Note

Complexity	- Additional process unit required - Critical operational aspects	Medium	- Reagent injection equipment is mandatory but not separate reactors as with SCR - Temperature and optimization of reagent injection is important	High	
Flexibility	Ability of the technique to operate under a range of input conditions	Medium	- Good NOx reduction over input concentration range - Temperature critical	High	In general, high reduction rates are achieved. Sensitive to input concentrations of SO_2, SO_3 and P. Multifunctional reduction of NOx and PCDD/F.
Required skills	Additional training required	Medium	Necessary control and optimization of the injection rate	High/Medium	

Table 4.11 Consumption levels associated with the use of SNCR and SCR

Criterion	Unit	SNCR		SCR	
		Range of achieved values	Note	Range of achieved values	Note
Energy requirements	kWh/t waste input	45–50 thermal	Furnace injection cooling effect	65–100 thermal for high temperature SCR, 3–5 for low temperature SCR 10–15 electric	Thermal refers to reheating, electrical to additional pressure drop via catalyst
Reagent consumption	kg/t of waste input	1-4	Ammonia, urea or ammonia water	1-3	25% ammonia solution
Reagent stoichiometry	Scale	2-3	/	1-1.1	Refers to the inlet pollutant concentration

Based on all of the above, the Project Holder has opted for the implementation of SCR. A detailed description of the selected system is given in Chapter 3 of this Study.

4.2.1.6 *Alternatives regarding Waste Water Treatment generated by Waste to Energy Plant*

The generation and composition of wastewater in the incinerator may vary depending on the design, techniques and equipment used. Some of the known sources of wastewater in such facilities are:

- Flue gas cleaning system (scrubber),
- Ash handling system,
- Water Cooling System
- Wastewater generated during ash washing (filter ash pretreatment method),
- Atmospheric waters

When it comes to thermal waste treatment plants with a wet flue gas cleaning system that uses aqueous solutions to remove pollutants, as is the case in the plant in question, it is also necessary to design a wastewater treatment plant, which prevents water and environmental pollution. Wet cleaning is usually performed in two phases. In the first acid scrubber, hydrogen halides (mainly HCl but also HF, HBr and HI in traces) are separated from the flue gases by physical absorption in water. In another neutral scrubber, SO_2 that is less soluble in water is chemically absorbed with a sodium hydroxide solution. The acid scrubber effluent usually shows a pH well below 1 and contains small amounts of fine particles and metal compounds (e.g. Hg). Neutral scrubber effluent contains mainly sodium sulphites/sulphates. Conventionally, these effluents are mixed and then sent to the pH correction phase, where $Ca(OH)_2$ is added to the wastewater to convert HCl to $CaCl_2$ and $NaSO_4$ to $CaSO_4$ and NaCl.

Various combinations of several best available techniques, which are described in Table 4.12, have been considered to control the quality of wastewater discharged from the boiler plant.

Table 4.12 Wastewater treatment technologies which are Best Available Techniques (European Commission, Best Available Techniques (BAT) Reference Document for Waste Incineration, Industrial Emissions Directive 2010/75/EU, 2019).)

Best available technique	**Mitigated water contaminants**
Adsorption on activated carbon	Soluble substances, organic compounds, Hg
Precipitation	Sulphates, fluorides, metals
Coagulation and flocculation	Suspended Solids
Equalization	All parameters
Filtration	Suspended Solids
Flotation	Suspended Solids
Ionic exchange	Ionic pollutants
Neutralization	Adjusting pH to approx. 7
Oxidation	Sulphite SO_3^{2-}
Reverse osmosis	Pollutants dissolved in water, e.g. salts
Sedimentation	Suspended Solids
Pollutant stripping	Cleanable contaminants, e.g. NH_3

The project envisages separate sewerage for separate collection of water from the complex as well as plants for the treatment of all wastewater before their discharge first into the collection conduit and then into the final recipient.

Wastewater collection and treatment: **Sanitary – foul wastewater** (sewerage system collects waste sanitary-foul wastewater and conducts it to the treatment plant (mechanical and biological treatment). Purified wastewater is connected to the shaft of conditionally clean rainwater sewage and then discharged into the internal network of the Elixir Prahovo Industrial Complex); **Atmospheric clean water** (rainwater sewerage for the collection of clean atmospheric water from the roofs of buildings and its drainage into the existing Central collector of the Elixir Prahovo industrial complex, which brings wastewater to the existing inlet structure and discharges it into the Danube River); **Atmospheric potentially oily wastewater** (rainwater sewerage for the collection of oily wastewater from roads, manipulative surfaces and parking lots takes water for treatment into the coalescent separator of grease and oil. After the separator, the purified water is connected to the clean rainwater sewage); **Process wastewater from wastewater treatment plant of the boiler plant** – process sewage (T1); **General process wastewater** (water from the drain in W-C11, water from the drainage of the boiler, leachate from the Landfill for non-hazardous waste, etc.) – general process sewage (T2); **Wastewater from fire extinguishing** – system of collection and drainage of FP wastewater; **Wastewater from washing of sand filters from the preparation of**

process water – (T3); **Wastewater from washing of filters from the WWTP wastewater treatment plant** – (T4).

When designing the basin for the reception of waste water, it was also considered to build the basin without a chamber water collection system, but due to better control of the quality and quantity of water discharged into the common collector, it was decided to work with 4 chambers. The application of a chamber system for the collection of technological waste water from the plant enables monitoring of water quality and control of water management depending on the obtained results with, in case of need, the possibility of applying appropriate corrective measures (referring a smaller amount of water to re-treatment in the plant or, if necessary, thermal treatment).

A detailed description of all previously mentioned selected and changed wastewater treatment systems generated within the Waste to Energy Plant complex is given in Chapter 3 of this Study.

4.2.1.7 *Alternatives regarding the treatment of residues from the Boiler Plant (Stabilization and Solidification)*

After incineration, solid residues are separated. These include ash residues, fly ash and flue gas cleaning residue, each of which requires special handling procedures. The composition of the incineration residues may vary depending on the type of waste being incinerated and the technologies used. Proper management of waste incineration residues is essential to minimize environmental impact, ensure compliance with regulatory standards and, if applicable, obtain materials for recycling.

As mentioned above solid incineration residues are collected as boiler ash and cyclone ash (coarse fly ash), economizer ash and bag filter ash containing adsorbent (i.e. fine ash collected in bag filter and activated carbon), gypsum from SO_x removal in wet scrubber and filter cake (neutralizing sludge) from wastewater treatment plant. Ferromagnetic and non-ferrous metals, gypsum and mineral residues can be extracted and sent for recycling.

Effective management of waste incineration residues must prioritise minimising the environmental impact, exploring alternative disposal methods and promoting circular economy principles to derive value from these residues where possible.
In line with previous experience in the same or similar plants, solid residues from incineration of waste are usually disposed of in landfills (see table 4.13) or used in some European countries as replacement material (e.g. Denmark, Netherlands, Germany, UK).

Table 4.13 Typical method of disposal and use of solid residues from waste incineration

<table>
<tr><th>Type of solid residue</th><th>Landfill for non-hazardous waste</th><th>Landfill for Hazardous waste</th><th>Use[50]</th></tr>
<tr><td>Bottom ash from grate firing incineration</td><td rowspan="2">x
(no curing/ stabilization)</td><td rowspan="2"></td><td rowspan="2">in road construction (e.g. DK, NL, IT, P, UK, DE)
in the cement industry (e.g. IT, CH)</td></tr>
<tr><td>Bottom ash from waste incineration with fluidized bed</td></tr>
<tr><td>Bottom ash from the waste incineration in rotary kiln</td><td>x
(no curing/ stabilization)[51]</td><td></td><td></td></tr>
<tr><td>Fly ash (Boiler ash and filter ash) – (see 8.4.)</td><td>x
(with fixation/ stabilization)[52]</td><td>X</td><td></td></tr>
</table>

[50] For details, see Blasenbauer et al. (2020)
[51] In some cases, cement stabilization may be necessary, depending on waste input and ground ash leakage
[52] In some cases, cement stabilization may be necessary, depending on waste input and ground ash leakage

Flue gas cleaning residues Activated carbon	x (with fixing/ stabilization)	X	
Filter cake (neutralizing sludge)	x (with fixing/ stabilization)	X	

Regular operation of the subject fluidized bed boiler plant may result in the following solid residues:

1. Bottom ash (large fraction of unburnt material that is separated at the bottom of the boiler under the furnace);
2. Boiler ash (separated between the second and third passages of flue gases through the boiler);
3. Cyclone ash (fraction of fly ash from the boiler that is separated from the emitted gases when passing through two cyclone separators, T>400°C);
4. Ash from the economizer (fine fraction of fly ash separated during the pass of flue gases through the economizer, T>150°C);
5. Filter ash (fine fraction of fly ash separated during the pass of flue gases through the bag filter system; so-called fly ash);
6. Activated carbon with a fraction of fine particles from the flue gases;
7. Sludge/thickened sediment from the treatment of wastewater from the wet flue gas cleaning system (which is separated in the form of thickened sediment by centrifugation),

which must be disposed of in an adequate manner and in accordance with the regulations of the Republic of Serbia and the EU.

Since the Waste to Energy plant in question has not yet been built, currently there are no ash samples available that could be analysed and for which a Waste Examination Report would be prepared, in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", no. 56/2010, 93/2019 and 39/2021). Characteristics of residuals from the boiler plant were considered on the basis of the experience of Austrian and other European plants of this type. Therefore, during the design, relevant BREF documents[53] and the experience of operators at similar waste-to-energy plants were used.

Bearing in mind the variety of waste that, in accordance with the selected technology, can be treated at the plant in subject, in order to manage the operation of the plant itself in accordance with the restrictions prescribed by the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023), as well as in order to manage the composition of residues from the boiler plant, and thus the solidificate that needs to be disposed of at the subject Landfill for non-hazardous waste, the Project Holder initiated the development of software for the preparation of recipes of compatible types of waste that can be thermally treated, and a pilot project of laboratory research of the solidification process of solid residues of thermal waste treatment was launched. This is aimed at simulating and reviewing the most commonly expected types of waste that will be taken to the plant, reviewing their physical and chemical properties, quantities and defining recipes that will be formed for thermal treatment at the Waste to Energy Plant, with minimal deviations and correlations that will be required during the operational work. Based on the above, different recipes, material balances and method of process management will be defined, which will largely ensure a uniform composition of residuals for each designated recipe, and thus a uniform composition of solidificates that will be disposed of at the Landfill for non-hazardous waste.

[53] Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) and Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)

In order to define all pollutants and define the recipe for the stabilization /solidification process, solid residues from the boiler plant, which are required to obtain **non-hazardous or non-reactive hazardous waste that can be disposed of at the Landfill for non-hazardous waste**, regular analysis and testing of incineration residues from the boiler plant is planned within the Waste to Energy Plant before the very beginning of the solidification process. Analyses of physical and chemical properties will be performed on a representative sample taken, within the laboratory provided at the subject location. Based on the test results, the recipes and material balances for the solidification process will be defined.

In order to harmonize the characteristics of the aforementioned solid residues from the boiler plant and bring them to a state suitable for disposal at the subject Landfill for non-hazardous waste in accordance with the criteria defined by the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021), the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010), i.e. With the EU Landfill Directive (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste), the first step in the process of treating solid residues is the separation of bottom ash in order to separate metal, glass, stone, etc., and the second step is the process of stabilization (prevention of uncontrolled reactions) and solidification (curing).

The aim of the treatment is to process solid residues from the boiler plant and obtain material that is formed at the landfill into a material with high mechanical strength, low permeability and encapsulated pollutants, i.e. low leaching rate.

Separated metal fractions from bottom ash will be handed over to authorized operators for recycling, while the rest will be merged with other residues from the boiler plant in the stabilization and solidification facility.

One of the considered alternatives was the special separation of non-hazardous coarse ash ("bottom ash") in order to reuse it (for filling roads, as building materials, etc.). Based on the analysis of the RS market, it was concluded that the market currently does not provide the opportunity for the application and reuse of this type of waste and that even if it would be separated, it would still eventually be disposed of at one of the landfills for non-hazardous waste without prior treatment (S/S), and therefore the Project Holder abandoned the said solution.

In favour of the above decision of the Project Holder, regarding the management of coarse ash, the fact that it is recognized that non-hazardous coarse ash has excellent binding characteristics of other materials, and as such is a desirable factor in the solidification recipe, and at the same time the method of disposal and use of this type of waste is solved, for which there is currently, as stated, no commercial method of use in the RS. Such procedure settings are harmonized with the European Commission Directorate-General environment The Director-General Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste, 2012.

The use of a large fraction of unburned material that is separated at the bottom of the boiler without prior sieving and with the separation of metals and other non-metallic recyclable materials, in the process of solidification instead of the separation of large fractions and their direct disposal on the landfill body, ensures the full utilization of this material as a binder in solidificates, and thus reduces the emission of particulate matter in the event that this material is directly disposed of at the landfill.

A detailed description of the treatment of residues from the boiler plant (stabilization and solidification) is described in Chapter 3 of the Study.

4.2.1.8 Disposal of residues from the boiler plant to the landfill

As stated above, the goal of the realization of the project for the construction of the Landfill for non-hazardous waste in the immediate vicinity of the Waste to Energy Plant is the ultimate disposal of solid residues from the boiler plant that have been previously stabilized and solidified, thus minimizing any potential impact on soil and groundwater. In this way, the issue of disposal of residues from the boiler plant is resolved as close as possible to the location of origin, all in accordance with the principles and hierarchy of waste management.

The technical and technological conditions for the construction of the landfill in question are defined in accordance with the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010), Appendix 2. – *Technical and technological conditions for the design, construction and commissioning of the landfill* and they have been fully implemented in the project in question, therefore the Project Holder did not consider other alternative solutions.

A detailed description of the selected technical and technological solutions for the disposal of waste at the Landfill for non-hazardous waste is given in Chapter 3 of this Study.

4.3 Operation methods

4.3.1 Method and procedure of plant operation

Liquid and solid non-hazardous and hazardous waste will be taken over from the waste generator or authorized operators who have the permission of the relevant authority for the collection, transport and/or storage of waste. During the contracting process, all generators and operators will be provided with clear instructions and guidelines on the types of waste, the way the waste should be packaged and labelled, and the required accompanying documentation, so that the waste can be received and treated at the location of Waste to Energy Plant. Bearing in mind the above, pre-sorted and adequately packaged waste that meets all the requirements for admission to the plant will be delivered to the WtE plant in question.

In accordance with the conclusions on best available techniques[54] BAT9 (b), the Project Holder shall provide all waste suppliers with clear and precise procedures and guidelines for waste examination and characterization and submission of waste data before its delivery to the location of WtE plant, all as part of the prior waste acceptance procedure. These procedures and guidelines are intended to ensure the technical suitability of waste treatment operations for a particular waste before the waste arrives at the plant. This procedure includes procedures for collecting information on waste coming to the plant and may include waste sampling and characterization to achieve sufficient knowledge of waste composition. The previous waste acceptance procedures are also based on a risk assessment taking into account e.g. hazardous properties of the waste, risks which waste represent in terms of process safety, occupational safety and environmental impact, as well as information provided by the previous waste owner. Also, in accordance with the conclusions on the best available techniques BAT9(c) and BAT11, as well as in accordance with the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023), the Project Holder will carry out a clearly defined procedure for the reception and acceptance of waste at the subject plant when receiving waste. These procedures define the elements that are checked and verified when accepting the waste in the plant. These procedures may include sampling, inspection and analysis of waste.

The delivery of waste to the subject Waste to Energy Plant will be carried out by the operator itself and/or other operators, with their means of transportation in accordance with the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023) and the Law on the Transport of Dangerous Goods ("Official Gazette of the RS", nos. 104/2016, 83/2018, 95/2018 - other law and 10/2019 - other law). At the very entrance to the Waste to Energy Plant, before reception of waste, the radioactivity of the delivered waste will be tested. If the meter detects elevated radioactivity, the relevant republic inspection and the ministry are immediately notified, and the driver is instructed to park the vehicle in the designated truck parking lot until the inspection arrives.

[54] *Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)*

The preparation of the Plant Management and Operation Manual (Management Handbook) is in progress, which will define all activities, precise environmental protection policy, waste management quality guarantee policy, organization, work protocols, working conditions, conditions and method of treatment of residues from the thermal treatment process, reporting, EMS, work procedures in emergency situations, etc.

Monitoring of received, stored and treated types and quantities of waste will be carried out through the keeping of Daily Records on Waste and the formation of Annual Waste Reports, which will be submitted to the Environmental Protection Agency within the prescribed deadline. The first demo version of the software for optimizing the waste preparation process for thermal treatment (waste management) was also developed.

The work methods within Waste-to-Energy plant are coordinated and designed according to the valid regulations of the RS and in accordance with the conclusions on the best available techniques, therefore the Project Holder did not consider other alternative solutions.

4.3.2 Method and procedure of Landfill operation

The method and procedures of operation of the landfill, i.e. the working plan of the landfill, the designation of a qualified person for work at the landfill, the obligations of the landfill operator, the technical and technological conditions for the design, construction, operation and equipment of the landfill, the organization of waste management at the landfill, disposal operations, the issuance of a waste disposal permit, daily records, the annual report on waste, the costs of design, construction, operation, decommissioning of the landfill and its maintenance after decommissioning, are carried out in accordance with the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010), the Law on Waste Management ("Official Gazette of the RS", no. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023) and special regulations.

Procedures and mode of operation of the landfill carried out during the technological process of exploitation of the landfill in question will be carried out in accordance with *Appendix 5. – Procedures and mode of operation of the landfill of* the aforementioned regulation, therefore, the Project Holder did not consider other alternative solutions.

A detailed description of the operation of the Landfill for non-hazardous waste is given in Chapter 3 of the Study.

4.4 Site plans and project plans

On a microlocational level, the location of the project in question is within the industrial zone. The project implementation area is appropriate and defined by the DRP, where the expansion of the chemical industry complex is envisaged by the construction of an industrial park, a chemical park, an energy island, an ecological island, the expansion of phosphogypsum storage, as well as the provision of a buffer zone of greenery and the relocation of local roads outside the industrial complex, which ensures the isolation of the impact of the industrial complex and the production process. The project in question will be located on cadastral parcels that are an integral part of Technological Unit C – Zone IV: Energy and Ecological Island.

Since the beginning of the project implementation, several conceptual solutions have been considered. At the very beginning of the development of the project, the construction of two lines of a boiler plant for waste thermal treatment was considered, and therefore two lines for pretreatment of waste, the storage of liquid waste in the open air in storage tanks located in concrete bundwalls was considered, various options of delivery and unloading of waste were considered, but during the development of the project and a more detailed analysis of the waste market in RS, original plans were abandoned. The designed solution that is the subject of this study has significantly lower capacities than originally planned, i.e. it is reduced to one line of the boiler plant (100,000 t/year), and the applied technology and equipment are in accordance with BAT recommendations and BAT conclusions from the subject area.

The Preliminary Designs were used from the technical documentation, as well as the Plans, Programs, Studies and other professional literature whose content is listed in Chapter 1.6 of the Study.

4.5 Type and selection of materials

'The selection of equipment was carried out by ensuring that the equipment for performing related activity is from the latest generations used both locally and globally, that it is provided with appropriate certifications and that it meets the requirements of the recommended BAT techniques, which aim to reduce the negative impact on the environment.

When it comes to the types of waste to be treated at the plant in question, the project holder performed an analysis of the characteristics of the plant and the waste and accordingly a decision was made on which types of waste can and cannot be collected and treated at the plant in question under any circumstances. A detailed list of all types of waste to be treated at the plant in question is provided in the appendix of the Study. Chapter 3.4 of the Study defines the types of waste by groups and gives all the restrictions on the reception of waste at the plant in question.

The facades of the facilities are adapted to local climate conditions, working environment conditions and energy efficiency. All internal final floor, wall and ceiling coverings will be in accordance with the purpose of the space, the specific conditions of the working environment and the required fire resistance.

The structural system of the facilities is skeletal, made of reinforced concrete or steel elements, founded on individual reinforced concrete foundations, and with a reinforced concrete or steel intermediate floor structure.

Due to the scope of works, the use of prefabricated elements and modular construction has been planned wherever possible.

Waste storage and all places where hazardous substances may spill (transfer points, warehouses, etc.) are fully provided with a waterproof concrete base.

The problem of the type of materials and equipment is not raised, because all materials are selected from the best suppliers and the project holder will require firm guarantees from the equipment supplier on compliance with the global and European standards on the quality of materials to be installed during the construction of the project.

When choosing the technology for the construction of the Landfill for non-hazardous waste, the conditions prescribed by the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010). As a substrate on the landfill body, it is envisaged to install a geomembrane built of high-density polyethylene (HDPE), not less than 1.5 mm thick, which meets the requirements of the Geosynthetic Research Institute (GRI) Test method GM 13 “Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes” or the relevant European standards (EN 134934) and recommendations. A drainage and relief layer of gravel with a minimum thickness of 50 cm will be placed on the geomembrane. *HDPE* drainage pipes will be covered with a layer of gravel with a minimum thickness of 50 cm, which will be wrapped with a layer of geotextile.

Bearing in mind that all the selected solutions are in accordance with the regulations and standards in this field, the rules of the profession and the recommendations of the best available techniques, the Project Holder did not consider other alternative solutions.

4.6 Project execution timetable

For the purpose of realization of the project of construction of the Waste to Energy Plant, the Preliminary Design was prepared and submitted to the relevant authority for construction works. The Audit Committee for the Expert Control of Technical Documentation reviewed the designs and made a decision to accept the technical documentation (attached is the Report on the Expert Control of the Preliminary Design, Ministry of Construction, Transport and Infrastructure, no. 000186359 2024 14810 005 000 000 001 dated 26/03/2024)

For the purposes of the implementation of the subject project of the phased construction of the Landfill for non-hazardous waste, the Preliminary Design was also developed and submitted to the relevant authority for construction works. The Audit Committee for the Expert Control of Technical Documentation reviewed the designs and made a decision to accept the technical documentation (attached is the Report on the Expert Control of the Preliminary Design, by Ministry of Construction, Transport and Infrastructure, no. 000186359 2024 14810 005 000 000 001 dated 26/08/2024.)

Approval of the Environmental Impact Assessment Study, i.e. the Decision granting approval to the Study in question, is a condition for obtaining a permit for "construction", i.e. for obtaining a Building Permit in accordance with the Law on Planning and Construction ("Official Gazette of the RS", nos. 72/2009, 81/2009 - correction, 64/2010 - CC decision, 24/2011, 121/2012, 42/2013 - CC decision, 50/2013 - CC decision, 98/2013 - CC decision, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law, 9/2020 and 52/2021 and 62/2023).

Construction is expected to begin in 2025 (registration of works).
Completion of construction works is planned for 2025/2026 (technical inspection of the facility).

Bearing in mind the types of activities to be performed on the complex in question, it is the obligation of the Project Holder to:
- Obtains approval to Seveso documents: Safety Report and Accident Protection Plan
- Obtains an Integrated permit (IPPC) (in accordance with the Law on Integrated Prevention and Control of Environmental Pollution ("Official Gazette of the RS", nos. 135/2004, 25/2015 and 109/2021) and related by-laws).

Obtaining of the occupancy permit is planned for 2026/2027.

The obtaining of the IPPC permit is planned for 2026/2027 when the facility will commence operations.

4.7 Functioning and termination of functioning

With regular maintenance, the expected service life of the WtE plant is about 50 years.

The planned total height of the landfill is 46 m, in order to align it with the height of the existing phosphogypsum storage, which is located in the immediate vicinity, and enable smooth movement of machinery on the last floor. By advancing the landfill in height, reclamation of the external slope will be carried out and the landfill will be closed in accordance with the description given in Chapter 3 of this study. After the closure of the landfill until its decommissioning, the landfill operator shall take the measures provided for in this study and regulations in this area. In this way, potential air pollution will be prevented and the surface runoff slowed down, which can be significant in the case of higher landfill heights.

Based on the averaged values, the expected time of exploitation of the landfill is 126 years, while at the maximum expected load, the calculated time of exploitation is about 44 years.

4.8 The date of commencement and completion of the execution of works

The date of commencement or completion of works on the construction of the Eco Energy complex will be aligned with the work plan of the Project Holder and will be defined after obtaining the approval to the Study on the environmental impact assessment of the project in question.

Construction is expected to begin in 2025 (registration of works).
Completion of construction works is planned for 2025/2026 (technical inspection of the facility).

4.9 Production volume

During the elaboration of the Preliminary Design, the Project Holder first considered the phased construction (2 phases) of the waste-to-energy plant. During the elaboration of the Preliminary Design, the total plant capacity of 200,000 (t/g) was initially envisaged for 8,000(h) per year, with two boiler plant production lines with an individual capacity of 100,000 (t/g), i.e. a capacity of 2 x 30 MW. Two identical pretreatment plant lines were also considered.

After analysing the types and quantities of waste generated in the territory of the Republic of Serbia, and reviewing the originally adopted solution, the Project Holder decided to modify the Preliminary Design by reducing the capacity of the Waste to Energy Plant in accordance with the actual situation and market needs. In accordance with the above, one line of the boiler waste-to-energy plant with a capacity of 100,000 t/year of thermal treatment of non-recyclable hazardous and non-hazardous waste, with a total boiler capacity of 30 MW for the production of steam of 35 t/h, has been designed.

In accordance with the aforementioned changes in the capacity of the Waste to Energy Plant, corrections were also made in the Landfill for non-hazardous waste project in terms of the phase construction of the landfill for the disposal of previously stabilized and solidified solid residues from the thermal treatment process, gross area of about 8.5 ha.

4.10 Pollution control

The project in question, in addition to the production facility considered from the point of view of the smooth functioning of the process, also considers environmental protection systems and measures in order to minimize all potential impacts.

As stated before, in order to improve the overall impact from the point of environmental protection and thus pollution control, it is envisaged to establish and implement an environmental management system (EMS) through the development of procedures and guidelines for the management and operation of the plant (Management Handbook), which will define all activities, precise environmental protection policy, waste management quality guarantee policy, organization, work protocols, working conditions, conditions and method of treatment of residues from the thermal treatment process, reporting, EMS, procedures for work in emergency situations, etc.

During the operation, strict care must be taken of the waste received at the plant in accordance with a clearly defined list of waste that may/may not be accepted and treated in the plant in question. The project documentation provides all restrictions and prohibitions related to certain characteristics of waste that must not be treated. It is strictly forbidden to accept waste that is explosive, flammable, infectious, radioactive, waste materials containing or are contaminated with polychlorinated biphenyls (PCBs) and/or polybrominated triphenyls (PCTs) and/or polybrominated biphenyls (PBB), waste containing cyanides, isocyanates, thiocyanates, asbestos, peroxides, biocides, citostatics, electronic waste. Additional restrictions on reception to the plant in question are waste substances in the form of aerosols, as well as organometallic compounds (spent metal-based catalysts, or organometallic wood preservatives) and aluminized paints. The subject project does not envisage waste thermal treatment containing POPs substances. The acceptance of substances exceeding the POPs limit values of substances pursuant to Article 4 and Annex I Part A of Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 shall not be permitted. The final list of waste that can be treated at the Waste-to-Energy Plant complex is attached to this study, as well as the List of excluded index numbers from the R1 operation.

The procedures of pre-acceptance and acceptance were defined. Each delivery of waste to the plant in question must be accompanied, among other things, by a Waste Examination Report for Thermal Treatment, and additional internal controls and waste examinations are envisaged.

Within the waste storage, several reinforced concrete storage bunkers are planned for the separation of compatible and incompatible types of waste. IBC containers/barrels with waste material will also be

separately stored, in the rack or non-rack part of the storage, according to the waste groups and their compatibility. Sludge waste will be stored in a separate bunker intended for this purpose only. Different types of liquid waste will be stored in separate tanks depending on the characteristics of the waste (combustible, non-combustible, easily volatile, etc.).

All waste material will be stored within the closed facility so that there is no possibility of water and soil pollution. The floor of the building is made of waterproof concrete.

The bunker door is automatically connected to the waste crane, so the bunker door cannot be opened and unloaded as long as the crane is working, i.e. the crane cannot work while the waste is unloaded into the reception bunkers. In order to better control the process itself, the cranes will be operated by operators from the Operations Centre facility.

Liquid waste tanks will be housed in impermeable concrete bundwalls.

Within the transfer point, the installation of a line grate is planned, which will collect any leaked liquids during transfer and drain them to the collection pit. In this way, the possibility of possible leakage of the leaked fluid into the atmospheric sewerage and the surrounding soil is avoided.

In the storage room of IBC containers and barrels, catchment grates will also be installed, which will direct all possibly leaked contents or water from washing to the collection pit. A sufficient number of mobile bundwalls will be provided for the collection of any leaked contents, as well as appropriate absorbents for the collection and dry cleaning of the leaked contents (sawdust, sand, oil, alkalis and acid absorbents).

The thermal waste treatment plant is fully automated, which enables control of incineration efficiency, monitoring of parameters and prevention/reduction of emissions.

The project envisages a boiler plant with optimization of waste flow and composition, temperature, flow of primary and secondary combustion air in order to efficiently oxidize organic compounds while reducing the formation of NO_x.

The construction of the boiler allows a retention time of 2 seconds and a temperature of 850-950^{o}C in accordance with regulations.The organic carbon content of TOC in slag and bottom ash will be less than 0.5%.

The thermal waste treatment plant is based on a fluidized bed boiler plant (BFB) with precise incineration control. Consequently, the TOC content in residues is low. In order to control the composition of residues from the boiler plant, through the process of solidification, and thus the control of waste disposed of on the body of the Landfill for non-hazardous waste, regular examining of the physical and chemical characteristics of the waste to be thermally treated, was planned in the first place. Also, determination of adequate recipes for thermal treatment, and regular testing of residues from the boiler plant in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021). As stated, determining the composition and characteristics of residues from the boiler plant is also important in order to define the exact recipe for the next treatment step, which will also be carried out at the location in question, which is the stabilization and solidification process.

Residues from the incineration process in a fluidized bed boiler are collected in the form of coarse ash or unburned pieces of metal, glass, concrete, stone, etc. Magnetic separation, as well as induced magnetic (eddy current) separation of coarse ash, separates metal admixtures that are directed to recycling as a secondary raw material, and thus manages the quality of waste that is later disposed of at the landfill. All residues from different parts of the process are mixed, if necessary moistened with water and entered into a stabilization process that lasts up to two weeks. After that, they are solidified according to the defined recipe by mixing with cement and, if necessary, certain reagents and disposed of as a stabilized non-reactive solidificate at the Landfill for non-hazardous waste in the immediate vicinity of the Eco Energy plant.

The obtained solidified material, a product of physical and chemical treatment, will be examined and classified in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of RS the", nos. 56/2010, 93/2019 and 39/2021): Disposal of non-reactive hazardous waste at Landfills for non-hazardous waste. If these results meet the conditions prescribed for the disposal of non-reactive hazardous waste at Landfills for non-hazardous waste, the solidified material will be disposed of at the landfill for non-hazardous waste. On the other hand, if this is not the case, the solidified material will be sent to the authorized operator of landfills and/or hazardous waste storage. The procedure complies with the EU Landfill Directive (EU 1999/31/EC).

As part of the landfill for non-hazardous waste, it was decided to spray with water in order to prevent pollution by potential dispersion of particulate matter from the body of the landfill. For the disposal of leachate from the body of the landfill, it was decided to collect it with a system of drainage channels and take it to the leachate basin within the landfill, from where it will be pumped for treatment to the facility designed as part of Waste-to-Energy plant.

The management of all technological processes will be carried out through the DCS system through which all process parameters (energy consumption, water consumption, waste quantities...) will be monitored; BMS system is envisaged as well, through which video surveillance, operation of ventilation systems (air conditioning) will be monitored.

Bearing in mind that the alternatives to the selected solutions do not provide satisfactory pollution control, the Project holder decided to use a comprehensive approach with the application of the best available techniques and technologies based on the experiences of other operators.

A detailed description of all environmental protection systems and envisaged protection measures in order to control pollution is given in Chapter 8 of the Study in question.

4.11 Arrangement of waste disposal

Manipulation with all waste material, both solid and liquid, non-recyclable hazardous and non-hazardous, which will be received and treated at the subject plant, will be performed exclusively by trained and professional staff. Waste storage and treatment will be carried out exclusively in dedicated closed facilities with a waterproof base and protected from atmospheric influences.

Metal waste separated on ferromagnetic separators during pretreatment will be collected in metal containers provided for this purpose and temporarily stored on a concrete plateau (U-C08- Plateau for separated metal) until it is handed over to authorized operators for further disposal (treatment). Waste stretch film, metal frames that are removed from IBC containers/barrels and damaged wooden pallets before treatment, represent non-hazardous waste (secondary raw materials) and will be temporarily stored in designated containers (metal containers, etc.) on a concrete plateau (U-C07 – Plateau) until they are handed over to authorized operators for further treatment.

Homogenized solid residues from the boiler plant after stabilization will undergo a solidification process. Solidification is a technological process which reduces the potential danger of waste material by physically binding or encapsulating contaminants (such as heavy metals etc.) into a stabilised mass and converting them into solid, stable forms. A stabilized solidificate that meets all the requirements for disposal at the Landfill for non-hazardous waste will be transported by truck and disposed of at the landfill. All waste material that does not meet the prescribed criteria for disposal (S/S) and disposal at the subject Landfill for non-hazardous waste will alternatively be handed over to another authorized operator who holds a permit from the relevant authority for hazardous waste management. The export of hazardous waste, for which it is determined that there is no adequate method of disposal in Serbia, to foreign countries, also represents another alternative for the final disposal of solid residues from the boiler plant that the Project Holder has considered.

When disposing of waste, it will be necessary to comply with the defined disposal technology and apply the general rules for waste disposal:

- waste disposal begins at the lowest level of the landfill;
- ensuring that the daily, operational space is as small as possible (in accordance with the envisaged disposal technology);
- each delivered waste batch shall be distributed and compacted immediately;
- "layers" of waste are formed to the projected height;
- provide the projected inclinations of the operating area.

When disposing of waste on the landfill body, the operator is obliged to keep regular records of the location of the disposal of each batch of waste received (the amount of waste delivered to the landfill in one delivery) and to keep the **location plan of the landfill** with precisely indicated micro locations of coffers in which non-hazardous waste/solid non-reactive hazardous waste was disposed even after the closure of the landfill. Alternatively, if it is determined after the control examinations that the disposed waste does not meet the prescribed requirements, it will be removed from the landfill body and treated in accordance with the aforementioned alternatives (handover to an authorized operator in Serbia or export abroad for final disposal).

In order to protect the bottom lining of each sector, i.e. smooth HDPE foil and drainage system for leachate collection, it is necessary to carefully dispose of waste at the beginning of the exploitation of individual phases, as well as its spreading and compaction. During the initial filling of the waste in the first layer, it is necessary to take care that the roller does not move on the drainage layer in order to protect the foil and the drainage system.

4.12 Arrangement of access and traffic roads

The main access to the Waste to Energy Plant is provided from the public road as an entrance/exit, and also for access to the parking lot for buses and freight vehicles as well as the parking lot for passenger cars. For the purpose of accessing emergency vehicles at the entrance/exit, an additional traffic lane has been designed. The designed width of the entrance/exit is 7.0 m, with lanes 3.5 m wide.

Internal roads within the Waste to Energy Plant are designed to be of different widths depending on the type of vehicle intended to move in those places. Widths range from 3.5 m to 7.0 m. Radii of roads and manipulative spaces are designed on the basis of the passability of the relevant vehicle. A tractor unit with a semi-trailer (tanker) with a maximum length of 16.5 m was adopted as the authoritative vehicle. The speed of the vehicle is limited to 10 km/h. The traffic regime is predominantly one-way, except in the part of the entrance road where a two-way, but with separate directions, is envisaged. Internal roads will be marked with appropriate signalization. For the purposes of pedestrian movement, sidewalks are planned to be interconnected by marked pedestrian crossings.

Access to the Landfill for non-hazardous waste will be done directly from the internal road within the Waste to Energy Plant. One-way traffic will be organized around the landfill. The road will go along the crown of the initial embankment. The width of the traffic lane of the service road will be 3.5 m with sidewalks of 1.0 m each on both sides. The service road runs around the entire landfill and should be formed with a solid base, since it will be the basic road for the entire time of use of the landfill.

The formation of a service road is planned around each planned phase of the construction of the landfill. The service road must be solid and allow one-way traffic around the landfill. In addition to the serviceroad, each phase must have its own access road. The access road is formed on the slope of the landfill itself. The main function of this road is to enable mechanization to move around the landfill. All slopes and radii of curves must meet the minimums for safe movement of all planned machinery. The access road itself is formed on the solidificate and the upper part is specially treated with classical concrete in order to avoid destruction and dusting of the solidificate itself.

Other alternative solutions have not been considered.

4.13 Environmental Management Responsibility and Procedure

The focus of the Elixir Group business is on employee safety, environmental protection and a healthy environment. The company's comprehensive approach to environmental protection is the use of the sources of energy and raw materials with the smallest carbon footprint, effective waste management and innovation provided by state-of-the-art technologies. The established environmental management system is implemented by applying the principles of sustainable development and cleaner production in compliance with all acts of Serbian, regional, as well as European legislation.

Elixir Group is a business system that is continuously developing through numerous projects dedicated to sustainable development, the application of the circular economy model and the improvement of resource efficiency.

The focus of the future development of all elixir Group divisions is on projects to improve resource efficiency through the comprehensive application of the circular economy model. The circular economy is not just a business concept and model, but a path to sustainability. It's a powerful blend of waste management and environmental protection, technology and economy. On the one hand, this implies maximizing circularity in production processes and product life cycle, and at the same time circular synergy with other industries and different technological processes.
On the other hand, since the chemical industry is a major energy consumer, the implementation of the "Waste to Energy" concept enables the reuse of waste to obtain energy or alternative energy products, i.e. complete substitution of fossil fuels.

The Elixir Group business system has invested EUR 266 million in the past 10 years in production capacities
and new technologies, environmental protection, renewal and improvement of storage, logistics capacities and industrial infrastructure. The goal of investing in new technologies is to achieve a level of efficiency and productivity that guarantees a long-term competitive position in the domestic and global markets.

By analyzing the product life cycle using the "cradle to gate" method, it was found that about 70-80% of CO_2 emissions at the company level come from the use of fossil fuels to obtain heat and electricity.
"Waste to Chemicals" and "Waste to Energy" projects support the strategically important goal of decarbonising production in the chemical industry. Accordingly, in the period from 2023 to 2025, the elixir Group plans to invest an additional EUR 250 million in the sustainable development of its business. The Elixir Group Sustainable Development Strategy also includes investments in the development of the circular economy, resource efficiency and substitution of fossil fuels by renewable sources, in accordance with the strategy of business decarbonization and the achievement of carbon neutrality by 2030.

In Elixir Prahovo, coal and mazut are currently used as energy sources to obtain the thermal energy needed to evaporate phosphoric acid, and as the LCA (Life Cycle Analysis) has shown - it is necessary to change this, because the fossil origin of these energy sources predominantly affects the high carbon footprint of phosphoric acid and transfers on the carbon footprint of mineral fertilizers in which it participates as one of the key raw materials. Following the example of developed countries of the world, the Elixir Group implements the "Waste to Energy" concept of utilization of thermal energy obtained from alternative energy sources with the aim of decarbonizing thermal energy used in the production processes of the chemical industry. The role of thermal treatment of non-recyclable hazardous and non-hazardous waste is observed in three ways:

- Non-recyclable waste is converted into energy (but partially into secondary raw materials) in an environmentally safe way and thus prevents its disposal, and in a broader sense negative impact on the environment through inadequate management,
- Ensures the energy security of the community, i.e. reduces its energy dependence on, mainly imported, conventional (fossil) fuels,
- Reduces negative impacts on climate change, by replacing fossil fuels that would be used to produce energy in conventional power plants or heating plants.

Thus, this project represents a long-awaited solution to one of the biggest challenges facing the Republic of Serbia in the field of waste management and contributes to:

- reducing the amount of waste disposed of at the landfill and contributing to the transformation of the economy from a linear business model to a circular one, with efficient use of resources;
- improvement of the ecological and social environment while preventing negative impacts on the living environment, such as damage to the surrounding landscape due to the disposal of waste at the landfill and permanent removal of undesirable and harmful substances that would contaminate the soil, surface water and air by disposal.

Environmental management is carried out at the level of the Elixir Group Prahovo business system through the Environmental Protection and Waste Management (EHS) services. The construction of the project in question will continue environmental management at the level of the Eco Energy complex, following the example of other plants and facilities in the Elixir Prahovo complex.

In order to improve the overall performance from the point of environmental protection, it is envisaged to establish and implement an Environmental Management System (EMS). The preparation of the Plant Management and Operation Manual (Management Handbook) is in progress, which will define all activities, precise environmental protection policy, waste management quality guarantee policy, organization, work protocols, working conditions, conditions and method of treatment of residues from the thermal treatment process, reporting, EMS, work procedures in emergency situations, etc. Bearing in mind that the complex in question also represents the so-called higher-order seveso plant, a safety management system prescribed by legal regulations in this area will be established and applied on the complex.

4.14 Training

All Elixir Business System members cooperate with relevant partners in the field of education and employment. Cooperation with secondary and higher education institutions has been implied from the very beginning of the company's development. The intensity of cooperation was particularly evident in the moments of business expansion, where there was a greater need for personnel of both secondary and higher education synchronously. Universities in Niš and Kragujevac, as well as student organizations of these universities, are a valuable partners for the personnel solutions of Elixir Prahovo members. The faculties of the Universities of Novi Sad and Belgrade are the most common affiliated faculties of employees in the location of Šabac, Novi Sad, Belgrade, but also in Prahovo. Cooperation with secondary educational institutions takes place at the level of all members.

Following the example of other European countries, the state of Serbia has recognized the benefits that are achieved through the application of the dual education model and has developed the National Dual Education Model. Such a combined model of education is indicative of the interdependence between the economy and the educational system of a nation. The dual model of education enjoys the full support of the Ministry of Education, Science and Technological Development and the Serbian Chamber of Commerce. Dual education is a model where the curriculum of secondary and higher education institutions is implemented at two locations; in schools and faculties – where the theoretical part of the teaching takes place and with the employer – where the practical part of the teaching is carried out, i.e. learning through work continues.

All members of the Elixir Business System conduct regular training of employees and constantly work on personnel training in order to fully meet the needs of the work of the complex. Employees are trained for:

- working on the plant,
- maintenance,
- occupational safety with fire protection measures,
- environmental protection
- protection against chemical accidents.

The training is conducted according to a special procedure, approved plans and programs in accordance with a predefined schedule.

Persons conducting thematic trainings must be competent professionals with an appropriate level of knowledge and references in each individual field.

Alternatively, certain trainings may also be held by competent persons employed by Elixir company (e.g. trainings in the field of waste management, certified persons in the fields of occupational safety and security or fire protection, ISO standards, environmental protection, etc.) or externally engaged persons (consultants, educational institutions, etc.).

4.15 Monitoring

Monitoring is carried out by systematic monitoring of the indicators values, i.e. monitoring of negative impacts on the environment, the state of the environment, measures and activities undertaken in order to reduce negative impacts and raise the level of environmental quality.

All members of the Elixir Business System apply the best available technologies and perform continuous monitoring of the environmental impact, both independently in its scope of accreditation and through the relevant authority, an authorized organization that meets the requirements prescribed by law and performs monitoring.
The environmental monitoring program includes:

- Monitoring the emission of pollutants into the air;
- Monitoring of wastewater, surface water and groundwater;
- Monitoring of soil quality;
- Monitoring of noise;
- Monitoring of ionizing and non-ionizing radiation, vibration;
- Regular annual reporting and submission of data on the performed monitoring to the Environmental Protection Agency, by entering data through the NRIZ web portal within the prescribed deadlines.

The monitoring of received, stored, generated and treated types and quantities of waste, as well as the quantities of waste disposed of at the landfill, shall be carried out through the keeping of Daily Records on the types and quantities of waste pursuant to Article 75 of the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016 and 95/2018 - other law and 35/2023) and the Rulebook on the form of daily records and annual report on waste with instructions for its completion ("Official Gazette of the RS", nos. 7/2020 and 79/2021) andby submitting a regular annual report on the quantities of waste to the Environmental Protection Agency by 31 March of the current year for the previous year by directly entering the data into the information system of the National Register of Pollution Sources at the address of the Environmental Protection Agency:
http://www.sepa.gov.rs/index.php?menu=20170&id=20004&action=showAll

4.15.1 Selection of locations for environmental quality monitoring

The selection of measuring points, control and monitoring of environmental quality is carried out in accordance with the Law on Environmental Protection ("Official Gazette of the RS", nos. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - CC, 14/2016, 76/2018 and 95/2018 - other law and 94/2024 - other law) and the Law on Integrated Prevention and Control of Environmental Pollution ("Official Gazette of the RS", no. 135/2004, 25/2015, 109/2021), as well as other laws and by-laws from the field of environmental protection. The monitoring plan will define the number and schedule of measuring points, networks of measuring points, scope and frequency of measurements, classification of phenomena to be monitored, methodology of work and indicators of environmental pollution and their monitoring, deadlines and manner of submitting data, based on specific laws.

According to the provisions of the Law on Environmental Protection ("Official Gazette of RS", no. 135/2004, 36/2009, 36/2009 - as amended, 72/2009 - as amended, 43/2011 - Decision of the Constitutional Court, 14/2016, 76/2018, 95/2018 - as amended and 95/2018 - as amended), the obligations related to environmental monitoring are as follows:

- The Republic, the Autonomous Province and the local self-government unit, within their competencies, ensure continuous control and monitoring of the environment, as well as financial

resources for monitoring. The Government shall determine the criteria for determining the number and arrangement of measuring points, the network of measuring points, the scope and frequency of measurements, the classification of phenomena to be monitored, the methodology of work and environmental pollution indicators and their monitoring, deadlines and the manner of data submission.

- A legal and natural person who is the owner or user of an installation that is a source of emission and environmental pollution, shall, in accordance with Article 72 of the Law on Environmental Protection ("Official Gazette of the RS", nos. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - CC decision, 14/2016, 76/2018, 95/2018 - other law and 95/2018 - other law and 94/2024 - other law), through the relevant authority or authorized organization:
  - monitor emission indicators, i.e. indicators of the impact of their activities on the environment, indicators of the effectiveness of applied measures to prevent the occurrence or reduction of the pollution levels;
  - provides meteorological measurements for large industrial complexes or facilities of special interest to the Republic of Serbia, an autonomous province or a local self-government unit.
- The Government shall determine the types of emissions and other phenomena that are the subject of pollutant monitoring, the methodology of measurement, sampling method, the method of recording, the deadlines for submission and the requirements for data storage. The polluter plans and provides financial resources to perform emission monitoring, as well as other measurements and monitoring of the impact of its activity on the environment.

4.15.2 Monitoring the operation of the Waste to Energy Plant

In addition to the obligations prescribed by laws and by-laws and which are binding, related to monitoring (see Chapter 9 of this study), the Project Holder considered additional alternative solutions that it could apply in regular operation with the aim of constant monitoring of the operation and control of all emissions from the plant in question.

The method of managing the process of thermal waste treatment, waste preparation and defining appropriate recipes is one of the important issues that were considered during the preparation of the project documentation.

One of the alternative solutions emerged in order to monitor the operation of the plant is the development of the first demo version of the software for process optimization and waste preparation for thermal treatment, which would enable better logistics of waste management and the definition of appropriate waste recipes in accordance with the requirements of the process. In this way, the application of the software would reduce the impact of the human factor in making decisions on the choice of combinations of waste to be mixed and thermally treated, which will minimize potential accident situations, and at the same time provide an adequate electronic record of every waste that is received, stored and treated at the plant.

Alternative solutions considered when it comes to monitoring are reflected in the selection of persons who perform sampling, analysis and reporting on the examination conducted. Monitoring may be performed by an authorized organization, if it meets the requirements in terms of personnel, equipment, premises, accreditation for measuring a given parameter and SRPS-ISO standards in the field of sampling, measurement, analysis and reliability of data, in accordance with the law. Alternatively, the operator itself can be accredited and obtain approval from the relevant ministry to perform monitoring.

During the previous 2023, as part of the Elixir Group business system, a laboratory of *the Centre for Applied Circular Economy (CPCE) was established,* as a control accredited laboratory of the Elixir Group. In order to ensure the best possible product quality and the most accurate examination results in the field of analysis of mineral fertilizers, raw materials for the production of mineral fertilizers and raw materials of the circular economy, wastewater, waste, etc. the Laboratory was equipped the latest instruments, state-of-the-art equipment, and a team of professionals gathered in the laboratory guarantees a high level of expertise and knowledge of each analysis.

In accordance with all of the above, monitoring and control of environmental quality during the operation of the Waste to Energy Plant will be carried out in the form of:
- external controls by authorized accredited institutions
- internal controls by the authorized laboratory of *the Centre for Applied Circular Economy (CPCE)*

In order to monitor the work process and establish a secure system, the following is envisaged on the complex as an imperative:
- stationary and mobile video surveillance
- automatic gas and fire detection
- automatic fire detection
- stable fire extinguishing systems
- trained and equipped fire brigade.
-

Independent control of the operation of the Waste to Energy Plant by representatives of the local community in the form of the Civil Control is also envisaged. The Civil Control of citizens is envisaged in the form of:
- establishment of a kind of civil control that is in accordance with the best practices of similar plants in the EU, thus guaranteeing that the operation of the plant remains transparent, responsible and compliant with high environmental and social standards.
- training before the start of operation of the plant to supervise the operation of the plant and monitor the results of monitoring.
- organized study visits of interested citizens to similar facilities in Austria
- insight into the best practices and choice of solutions for organizing Civil Control in Prahovo

The impact on air quality in the subject area is based on the monitoring of ambient air quality. Currently, in accordance with the adopted environmental monitoring plan and program, the operator Elixir Prahovo performs monitoring of ambient air quality in the vicinity of the subject location through an authorized accredited laboratory of the City Institute for Public Health Belgrade. Air quality monitoring is carried out once a year for 15 days at the measuring point 1: Dragiša Brebulović-Žmiga, 11 Vuka Karadžića Street, Prahovo (N 44°17'40.6", E 22°35'9.5 "), which is about 2.5 km northwest of the location of the Elixir Prahovo complex, and therefore from the future Waste to Energy Plant and Landfill for non-hazardous waste.

In order to continuously monitor the impact on air quality, as a result of the operation of industrial facilities within the chemical industry complex in Prahovo, the need for the procurement and installation of an automatic measuring station in the municipality of Negotin has been imposed as an alternative solution. In accordance with the above, the procedure of donating an automatic measuring station to the municipality of Negotin was covered by Elixir ((attached is the Agreement on the donation of an automatic measuring station to the municipality of Negotin, concluded on June 21, 2024), which will be a part of the network of the Environmental Protection Agency on whose initiative an adequate location has been defined and relevant measurement parameters have been determined. The proposed automatic station would measure the basic pollutants: sulphur dioxide, nitrogen dioxide (nitrogen monoxide and total nitrogen oxides), carbon monoxide, suspended PM10 and PM2.5 particles, as well as meteorological parameters – temperature, pressure, relative humidity, direction and wind speed.

Bearing in mind that the monitoring of environmental quality is strictly defined by regulations, the Project Holder did not consider other alternatives in terms of monitoring.

4.15.3 Monitoring of the operation of the Landfill for non-hazardous waste

In order to put the subject Landfill for non-hazardous waste into functional and intended use, it is necessary to establish an effective system of monitoring and control of work in order to increase environmental safety and protection of human health. Mandatory and continuous monitoring of the operation of the Landfill for non-hazardous waste will be carried out in accordance with the Regulation on disposal of waste on landfills

("Official Gazette of the RS", no. 92/2010) and in accordance with the Environmental Impact Assessment Study, which will describe in detail the monitoring to be carried out.

In accordance with the above, the monitoring of the operation of the landfill will be carried out during the active and passive phase of the landfill and will include the following:

1) monitoring of meteorological parameters;
2) monitoring of surface waters;
3) monitoring of leachate;
4) monitoring of gas emissions;
5) monitoring of groundwater;
6) monitoring of the amount of rainwater;
7) monitoring of the landfill body stability;
8) monitoring of protective layers;
9) monitoring of pedological and geological characteristics.

The aforementioned monitoring will be carried out by sampling and measurement in the manner defined in *Appendix 6. – Monitoring the operation of the landfill*, the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010).

The specified sampling and measurement will be carried out:

1) in the internal laboratory provided within the plant, where particular examinations are performed on a daily basis;
2) in an accredited laboratory at specific intervals prescribed by the aforementioned regulation or more frequently, if the data in the internal laboratory show that there has been any accident situation or deviation from the zero state of specific parameters.

All data obtained from the conducted monitoring will be submitted to the Environmental Protection Agency. In addition to the aforementioned regular monitoring, daily visual control of the operation of the landfill will be carried out, maintenance of all facilities within the landfill complex, maintenance of machinery as well as control of the efficiency of the truck wheel washing unit.

4.16 Emergency plans

Pursuant to the provisions of the Seveso Directive, i.e. Article 58 of the Law on Environmental Protection ("Official Gazette of the RS", nos. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - decision of the CC, 14/2016, 76/2018 and 95/2018 and 94/2024 - other law) and the Rulebook on the list of hazardous substances and their amounts and criteria for determining the type of documents produced by the operator of seveso installation or establishment ("Official Gazette of the RS", nos. 41/2010, 51/2015 and 50/2018), taking the maximum possible amounts of hazardous substances that may be present at any time in the Eco Energy complex (Section "H" - HEALTH HAZARD, "E1" and "E2" AQUATIC ENVIRONMENTAL HAZARD...), the
status of the plant was determined. It was noted that the complex in question represents a "higher order" Seveso plant and therefore it is the obligation of the Project Holder, in terms of accident risk management obligations, to prepare a Safety Report and an Accident Protection Plan and obtain the approval of the relevant authority.
In accordance with the Rulebook on the content of the accident prevention policy and the content and methodology of the preparation of the Report on the Safety and the Accident Protection Plan ("Official Gazette of RS", No. 41/2010), the Project Holder will establish a Safety Management System that should contain internal documents in which it has determined:

(1) organization and personnel – the role and responsibilities of persons engaged in the tasks of reducing the risk of accidents at all levels of the organization, the necessary training for personnel and the implementation of training (including all employees and all external associates working in the plant);
(2) identification and assessment of hazards – adoption and application of procedures for the systematic detection and identification of hazards from chemical accidents that occur under regular and

extraordinary working conditions, as well as assessment of their probability of occurrence and the extent of possible consequences;

(3) operational control – adoption and application of operating procedures and guidelines, including plant maintenance, processes, equipment and temporary shutdown;

(4) change management – adoption and implementation of procedures for planning the modification of existing, or design of new plants, processes or storage capacities;

(5) accident protection plan – adoption and application of procedures for the identification of possible chemical accidents through systematic analysis, in order to prepare, check and improve the Accident Protection Plan on the basis of which the accident is handled and in order to organize training of relevant personnel to act according to the plan (training should be attended by all persons working in the plant, including relevant external associates);

(6) monitoring the procedures of the operator:
- adoption and implementation of procedures for continuous assessment of compliance with the objectives set by the operator within the scope of the declaration and the safety management system;
- adoption and implementation of mechanisms for examining and taking corrective measures in the event that there are deviations from the established goals;
- adoption and implementation the procedures used by the operator to report on the accident as well as on the fortunately avoided accident, especially where protective measures have failed, as well as for the investigation and subsequent measures based on the experience gained;

(7) review and evaluation:
- adoption and application of procedures for periodic systematic assessment of the declaration and the effectiveness and suitability of the safety management system;
- documented assessment of the implementation of the declaration and safety management system, as well as their updating by top management.

These documents and the establishment of the Safety Management System will include all necessary measures in order to prevent and minimize the consequences of the accident, so the effects that may be significant on the environment (accident situations) due to the operation of the plant in question will be limited by these documents.

By implementing the project in question, it is the obligation of the Project Holder to develop a Fire Protection Plan in accordance with the Law on Fire Protection ("Official Gazette of the RS", no. 111/2009, 20/2015, 87/2018 and 87/2018 - other laws) and to obtain the approval of the relevant authority.

In order to familiarize employees with preventive fire protection measures as well as with the use of fire extinguishing agents, training and testing of employees should be carried out. It is the obligation of the Project Holder to develop a Training Program of Employees for Fire Protection according to the Law on Fire Protection ("Official Gazette of the RS", no. 111/2009, 20/2015, 87/2018 and 87/2018 - other laws), and in accordance with the Rulebook on the minimum content of the general part of the training program for workers in the field of fire protection ("Official Gazette of the SRS", no. 40/1990) and to obtain the approval of the relevant authority.

For the assessment of natural disaster hazards for the chemical industries in Prahovo, the Institute for Integrated Safety Protection and Prevention LTD. Novi Sad prepared in May 2023 the Disaster Risk Assessment and the Protection and Rescue Plan in accordance with the provisions of the Law on Disaster Risk Reduction and Emergency Management, Articles 15 and 17 ("Official Gazette of RS" No. 87/2018), based on the Regulation on the content, manner of preparation and obligations of entities related to the preparation of disaster risk assessment and protection and rescue plans ("Official Gazette of the RS", no. 102/2020) and on the basis of the Instruction on the methodology for the preparation of disaster risk assessment and protection and rescue plan ("Official Gazette of the RS" no. 80/2019). Decision on granting approval to the Disaster Risk Assessment, Ministry of the Interior of the Republic of Serbia, Sector for Emergency Situations, Department for Emergency Situations in Bor - Department for Civil Protection and Risk Management, no. 217-118/2024 of 5 January 2024 is attached to the Study.

Bearing in mind all of the above and that accident protection and emergency response is strictly defined by regulations, the Project Holder did not consider other alternatives.

4.17 Method of decommissioning, site regeneration and further use

The term "decommissioning" means "withdrawal from regular use", i.e. dismantling of the plant and bringing the land to another purpose.

In the event of a decision on the termination of the operation of the plant in question, the equipment will be dismantled and, if necessary, the land will be remediated in accordance with legal regulations and the land will be able to be used for some other purpose.

When performing works on the development of the site in the event of termination of the Project, it is mandatory to organize the collection of municipal waste, construction waste, waste with the characteristics of secondary raw materials, waste with the properties of hazardous substances, with mandatory treatment and evacuation in accordance with the regulations of the Republic of Serbia.
All works on the removal and demolition of facilities shall be carried out in accordance with the Construction and Demolition Waste Management Plan prepared in accordance with the Regulation on the Method and Procedure of Construction and Demolition Waste Management ("Official Gazette of the RS", No. 93/2023 and 94/2023 - corr.) and to which the approval of the relevant authority was previously obtained.

Pursuant to Article 9 of the Law on Integrated Prevention and Control of Environmental Pollution ("Official Gazette of RS", No. 135/2004, 25/2015 and 109/2021), the Project Holder is obliged to prepare the document "Plan of Measures for Environmental Protection after the Cessation of Operation and Closure of the Plant", which is an integral part of the documentation submitted with the application for obtaining an integrated permit.

Also, it is the obligation of the Project Holder to address the relevant authority in this case with a request for decision-making on the need for environmental impact assessment of the removal of the project in question and the development of a Study on the Environmental Impact Assessment of the Closure of the Waste to Energy Plant and the Landfill for Non-Hazardous Waste in accordance with Article 3 of the Law on Environmental Impact Assessment ("Official Gazette of the RS" No. 135/04 and 36/09).

5.0. PRESENTATION OF THE ENVIRONMENT CONDITION AT THE LOCATION AND THE SURROUNDING AREA (MICRO AND MACRO LOCATION)

The state of the environment is most often assessed on the basis of an analysis of eco-capacity and environmental load. The eco-capacity of the environment is conditioned by the state of the eco-system and its ability to preserve stability through self-regulatory mechanisms.

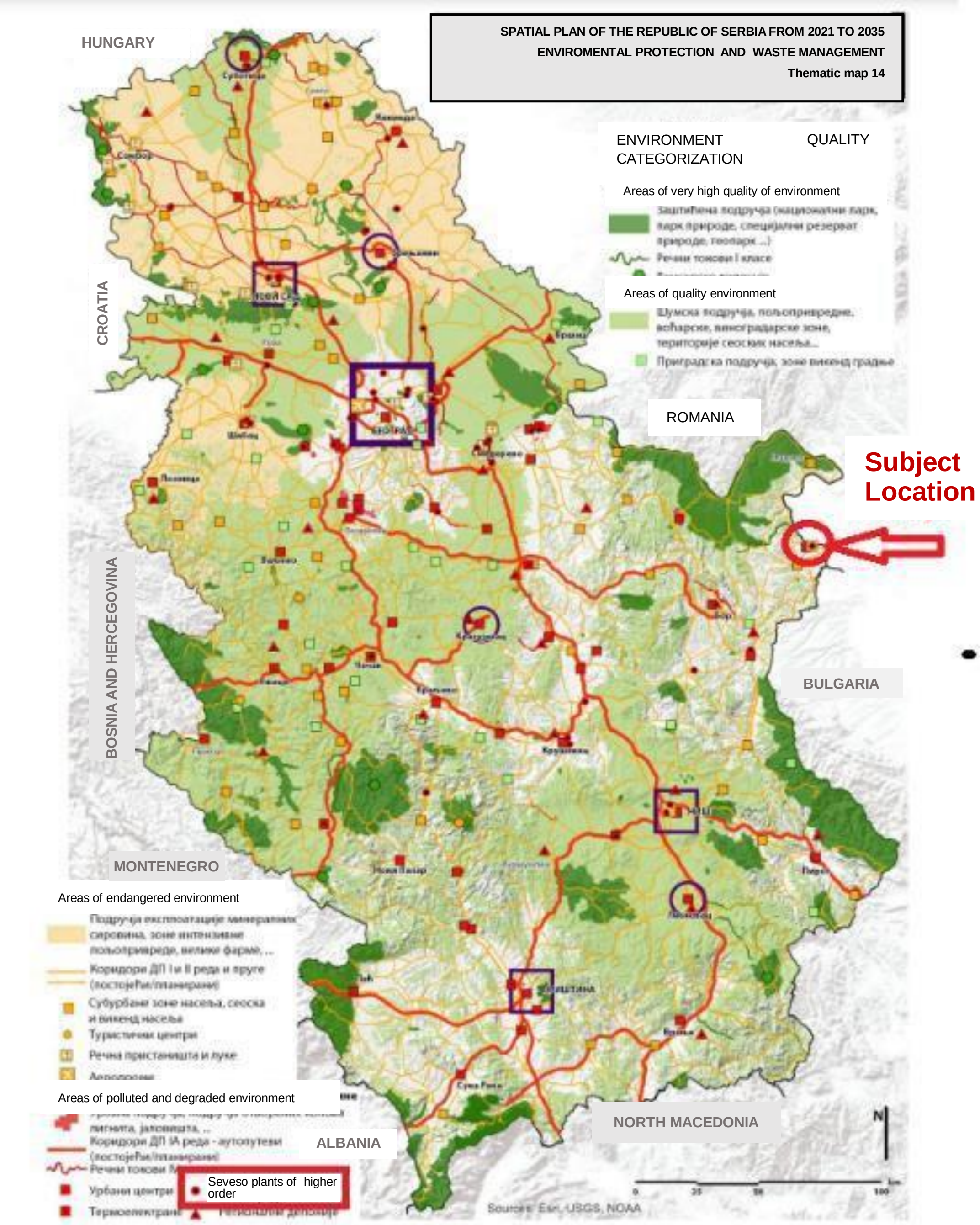


Figure 5.1 Environmental protection and waste management
(SPATIAL PLAN OF THE REPUBLIC OF SERBIA from 2021 to 2035. – Draft[55])

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55 The Decision on the development of the Spatial Plan of the Republic of Serbia for the period from 2021 to 2035 was adopted by the Government of the Republic of Serbia in 2019 ("Official Gazette of the RS", no. 48/2019). Early public review for the Spatial Plan of the Republic of Serbia was conducted from 2 to 16 March 2020, and public review of the draft Spatial Plan of the Republic of Serbia was conducted from 5 April to 5 May 2021

In accordance with Figure 5.1, it can be concluded that the location in question is within an area of polluted and degraded environment with negative impacts on human, plant and animal life and quality of life, and that this location belongs to upper-tier Seveso plants.

General quantification of environmental monitoring objectives:

- meeting the requirements defined by the legislation of the Republic of Serbia in the field of environmental monitoring;
- the degree of threat to the environment due to the emission of pollutants;
- checking the compliance of the results of environmental monitoring with the permitted limits for the emission of pollutants defined by legislation;
- providing input data for the preparation of statutory reports;
- enabling assessment of the condition of equipment and operation of process plants;
- determination of the amount of environmental pollution charges;
- providing information necessary to inform the public about the burden of pollutants on the environment due to human factor.

Regular environmental monitoring

Regular monitoring of the state of the environment consists of systematic measurement, testing, and assessment of the state and pollution of the environment, i.e. monitoring the parameters of the environmental medium: water (wastewater and groundwater), air, soil, noise, waste (hazardous and non-hazardous). A clear insight into changes in the quality and quantity of the environment and in the emission of pollutants is obtained from measurement results. The establishment of a system of regular environmental monitoring ensures timely, comprehensive and accurate collection of data on the state of the environment, and the analysis of the obtained data enables the assessment of the state of the environment and decision-making on work procedures.

Emergency environmental monitoring

Emergency environmental monitoring is carried out for each element of the environment (air, soil, water, noise, ionizing radiation) if, during the performance of regular work activities, due to accidental situations, accidents, natural disasters, environmental pollution has occurred or pollution is suspected. Emergency monitoring shall also be carried out if requested by the competent inspection authorities. The implementation of emergency monitoring is carried out in the same way as regular monitoring.

The state of the environment of the site covered by this Study can be assessed on the basis of the performed measurements of the environmental medium, as well as on the basis of the calculation of the concentration of individual pollutants in the environmental media, using various mathematical models.

The description of environmental factors that may be exposed to risk due to the execution of the project in question includes in particular:

1. Population
2. Flora and fauna
3. Soil, water, air and noise
4. Climate factors
5. Buildings, immovable cultural property, archaeological sites and ambient units
6. Landscape
7. The interrelationship of listed factors.

5.1 Population

Populousness, concentration and population migration

The municipality of Negotin, where the chemical industry in Prahovo is located, has an area of 1,090km^2. Municipality comprises 39 settlements (Aleksandrovac, Braćevac, Brestovac, Bukovače, Dupljane, Dušanovac, Jabukovac, Jasenica, Karbulovo, Kobišnica, Kovilovo, Malajnica, Mala Kamenica, Miloševo, Mihajlovac, Mokranje, Plavna, Popovica, Prahovo, Radujevac, Rajac, Rečka, Rogljevo, Samarinovac, Sikole, Slatina, Smedovac, Srbovo, Veljkovo, Vidrovac, Vratna, Štubik, Šarkamen, Tamnič, Trnjane, Urovica, Crnomasnica, and Čubra).

The municipality of Negotin has extremely unfavorable demographic trends, which are reflected in the occurrence of an above-average negative population growth, a high rate of emigration and the average age of the population compared to the rest of the Republic of Serbia. With a population of 28,261 inhabitants in 12,386 households (according to the 2022 census), it is in the group of the least populated areas of Serbia.
According to the 2011 census, there were 37,056 inhabitants in 13,906 households in the municipality of Negotin. In the city of Negotin itself, according to the 2022 census, there were 14,647 inhabitants in 6,147 households, in the settlement of Prahovo 799 inhabitants in 332 households, and in the settlement of Radujevac there were 735 inhabitants in 308 households.

Of the total population in the municipality of Negotin, according to the 2022 census, there were 13,689 men and 14,572 women, of which 393 were men and 406 women in the settlement of Prahovo. The average age of the population of the municipality of Negotin was 50.36; men 48.83 and women 51.80 years. The average age in Prahovo is 50.68 years, and the Radujevac settlement is 56.33 and both settlements have a predominantly adult population.

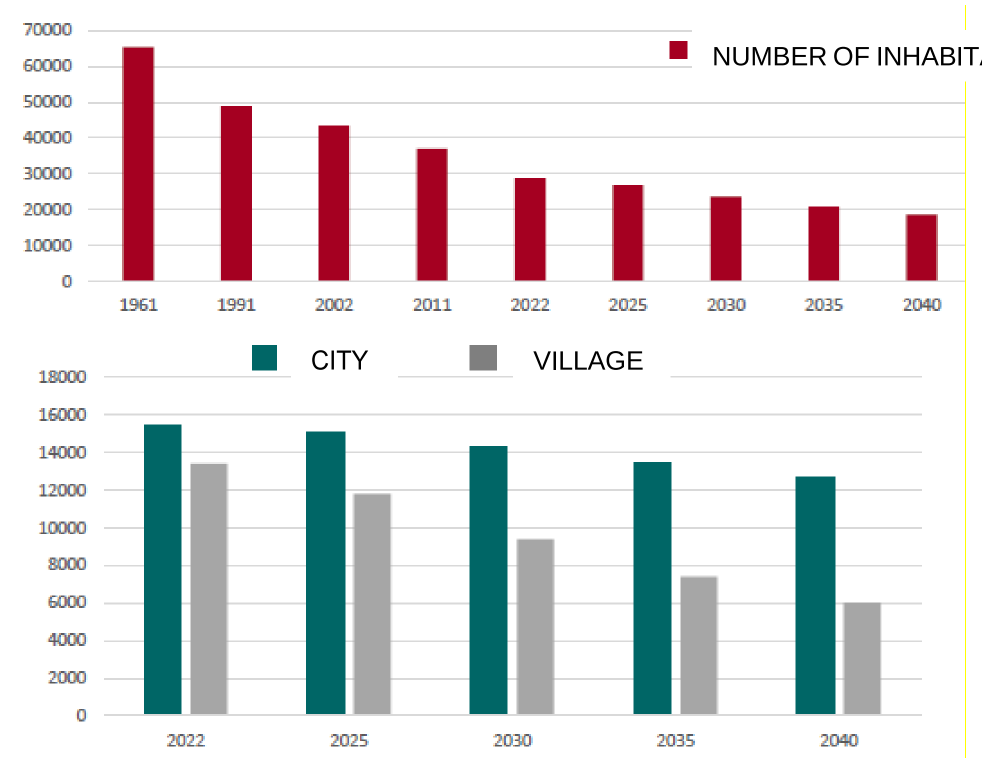


Figure 5.2 Demographic trend of Negotin municipality

A large number of inhabitants from the municipality of Negotin live abroad (12,427 people or 25% of the total population according to Census 2011). However, returnees from abroad do not represent significant demographic potential due to their unfavorable age structure and generational weakening of the returnee wave.

Below is an overview of the population according to migratory characteristics, by municipalities and cities.

Table 5.1 Population according to migratory characteristics, by municipalities and cities[56]

Region **Area** *City – Municipality*	Total	Inhabiting in the same settlement since birth	Settler population						
			Total	from the territory of RS, namely:					
				Total	from another settlement of same municipality	from another municipality in same area	from another area	Unknown municipality of immigration
Bor region	**101100**	**56578**	**44522**	**35367**	**14768**	**4496**	**15636**	**467**
Bor	*40845*	*24406*	*16439*	*13881*	*3957*	*1068*	*8663*	*193*
Kladovo	17435	9325	8110	6142	3698	859	1508	77
Majdanpek	14559	8657	5902	4898	2307	631	1912	48
Negotin	28261	14190	14071	10446	4806	1938	3553	149

According to the national affiliation, Serbs (80.88%), Vlachs (6.24%), Roma (1.14%) and other national minorities live on the territory of the municipality of Negotin.

<u>The populousness of the site in question intended for the construction of the Eco Energy complex</u>

There are no residential buildings in the immediate vicinity of the future Eco Energy complex. The settlement of Prahovo, located at a distance of about 2 km in the direction of the west, the village of Radujevac is located at a distance of about 4 km in the east-southeast direction of the project in question, the settlement of Samarinovac, at a distance of about 5 km in the southwest direction, the settlement of Srbovo, at a distance of about 6 km in the south direction, the settlement of Dušanovac, at a distance of about 7 km in the northwest direction, and the settlement of Negotin, at a distance of about 10 km in the southwest direction. Immediately along the border of the expansion of the chemical industry complex in Prahovo, in the direction of the west, at a distance of 1,300 m, there is a workers' settlement (a smaller group of residential buildings).

The location where the Eco Energy complex is planned to be built is at a distance of about 750 m from the border with Romania. On the other side of the Danube, on the Romanian side, there is undeveloped land. The Romanian settlements closest to the site in question are:

- Izvoarele is located at a distance of about 4 km, north of the location in question. According to the census, 951 inhabitants live in the settlement.
- Gruja is a settlement in Romania, the seat of the municipality of Gruja. It is located in the Mehedinci district, in Oltenia at a distance of about 7 km, east of the site in question. According to the census, there were 1,890 inhabitants in the settlement.

The location of the project in question is at a distance of about 9 km from the Bulgarian border. The nearest Bulgarian settlements are:

- Balej, a village in the northwestern Bulgarian municipality of Bregovo, in Vidin District is located at a distance of about 10.5 km from the site in question. According to 2011 estimates, Balley had a population of 437 inhabitants.
- Kudelin, a village in northwestern Bulgaria also, in the municipality of Bregovo in the Vidin District, is located at a distance of about 10.6 km from the site in question. According to the 2021 census, the village had 229 inhabitants.

<u>The assessment of the health status of the population in subject area</u>

The assessment of the health status of the population is significant for obtaining basic information about the health of the population. The objectives of the assessment of the health status of the population are:

[56] Census of population, households and apartments in 2022, Republic of Serbia, Republic Institute of Statistics, MIGRATION Data by municipalities and cities, 2023

- preservation and improvement of the health status of the population;
- monitoring changes in health status over time;
- identifying priority health problems;
- observation and analysis of differences between individual territories or population groups;
- rethinking health policy, health care strategy and health technology;
- improvement of health management.

In 2023, the Institute of Public Health "Timok" Zaječar[57] conducted an "Analysis of the health state of the population of the Bor district in the period from 2018 to 2022", which also included the subject area of Negotin. The results of the analysis for the municipality of Negotin are presented below in the Study.

The classic indicators of the health status of the population are disease indicators. In our country, officially registered morbidity (morbidity of the population) consists of data on the number and type of diseases, the basic demographic characteristics of a person, the length of treatment, the type of therapy and the outcome, but only for the part of the population that seeks help in a health institution (any level of health care) for the provision of services. Outpatient morbidity and inpatient morbidity and mortality are monitored separately.

OUTPATIENT MORBIDITY

The analysis of outpatient morbidity was performed on the basis of data taken from:
- General Medicine Services;
- Health care services for preschool children;
- Health care services for school children and youth;
- Women's Health Care Services;
- Services for the protection and treatment of oral diseases.

General Medicine Service of the Municipality of Negotin

From 18955 (2018) to 16868 (2022) diseases, conditions and injuries were registered in the general medicine service in the municipality of Negotin in the period from 2018 to 2022, so the morbidity rate in 2022 was 692.7‰.

The most common group of diseases in this period are "Special Purpose Codes (U04, U07) with the diagnosis "Emergency Use of U07 (Covid 19-U07.1, U07.2)" (37.7% in 2022). The morbidity rate in 2022 is 261.5 per 1,000 population over the age of 19. In second place in frequency are "Diseases of the respiratory system". Among them, "Acute inflammation of the pharynx and tonsils" dominates, accounting for, on average, 6.9% of all diagnoses in a five-year period. The third place belongs to the group "Diseases of the musculoskeletal system and connective tissue". The proportion of this group of diseases in total morbidity ranged from 15.7% in 2018 to 7.6% in 2022. The morbidity rate for this group of diseases in the last year of follow-up is 52.3‰. "Other back diseases" is the most common diagnosis of this group of diseases with an average prevalence of 7.6% in the analysed five-year period. "Diseases of the circulatory system" account for about 10.5% of total morbidity and are ranked fourth in frequency (the morbidity rate in 2022 is 48.3‰). The leading diagnosis in this group is “High blood pressure”. "Diseases of the Reproductive and Urinary System" occupy the fifth place (9.6% on average) in the structure of morbidity registered in the general medicine service in the municipality of Negotin in the study period.

So, in 2018-2022 period, in the territory of the municipality of Negotin, the leading five diagnoses were: emergency use of U07(Covid 19-U07.1, U07.2), acute inflammation of the pharynx and tonsils (6.9% on average), inflammation of the bladder (4.9% on average), increased blood pressure (7% on average) and other symptoms, signs and abnormal clinical and laboratory findings (3.5%).

Health Care Service for Preschool Children of the Municipality of Negotin

[57] Source: https://zavodzajecar.rs/?page_id=59

The number of identified diseases, conditions and injuries in the health care service for preschool children in the municipality of Negotin in a five-year period ranged from 7614 diseases in 2018 to 5325 in 2022. The rate of illness in 2022 is 4354/1000 children of preschool age.

The first is "Diseases of the respiratory system". The respiratory disease rate was 2254.3/1000 in 2022 for children aged 0-6 years. This group of diseases accounts for 51.8% of total morbidity in 2022. The following is the group "Symptoms, signs and pathological clinical and laboratory findings" with 14.9% in 2018.-18.0% in 2022 of the morbidity of this service (rate-785.8‰ in 2022). In third place with a share of 6.4% on average in the five-year period are "Skin and subcutaneous tissue diseases" (morbidity rate in 2022 – 282.9‰). In the fourth place in the structure of morbidity are "Diseases of the ear and mastoid extension" with a share of 5.8% in 2022 (rate -253.5‰ in 2022). In the fifth place in the structure of morbidity are "Diseases of the digestive system", which account for 4.5-6.1% of all recorded diagnoses in this service (rate -197.9‰ in 2022).

The five most common diagnoses: acute upper respiratory tract infections, fever of unknown origin, other nasal and sinus diseases, acute pharyngitis and tonsillitis, and other symptoms, signs, and abnormal clinical and laboratory findings. The first five diagnoses in the health care service for preschool children in the territory of the municipality of Negotin in 2022 accounted for 59% of the total morbidity.

Health Care Service for School Children and Youth of the Municipality of Negotin

The number of identified diseases, conditions and injuries in the health care service of school children in the municipality of Negotin in the period 2018-2022 ranged from 10861 (2018) to 5994 (2022). The rate of total illness in 2022 is 2429.7/1000 children.

The most common are "Diseases of the respiratory system" (rate – 1267.9‰ in 2022) with the most common diagnosis "Acute upper respiratory tract infections". Second and third place are "Symptoms, signs and pathological and clinical laboratory findings" (rate – 348.2‰ in 2022) and "Diseases of the digestive system" (rate -185.2‰ in 2022). In fourth place are "Diseases of the ear and mastoid continuation" with a disease rate of 107.8/1000 in 2022. "Skin and subcutaneous tissue diseases" (5.9% on average) with a disease rate of -106.6‰ in 2022 are ranked fifth in frequency among school-age children.

In the health care service for school-age children in the territory of the municipality of Negotin in 2022, the first five leading diagnoses accounted for 56.6% of registered morbidity. The diagnosis of acute upper respiratory tract infection comes first. Other diseases of the nose and sinuses of the nose, acute inflammation of the pharynx and tonsils, fever of unknown origin and other symptoms, signs and abnormal clinical and laboratory findings follow.

Women's Health Care Service of the Municipality of Negotin

In the health care service for women in the territory of the municipality of Negotin in a five-year period, the number of registered diseases, injuries and conditions ranged from 3216 (2018) to 1611 (2022). The morbidity rate in 2022, is 122.2 per 1,000 women over the age of 15.

"Diseases of the reproductive and urinary system" are most commonly present in the women's health care service (an average of 74.5%). The rate of illness in 2022 was 103.3/1000. The second group by frequency includes "Pregnancy, childbirth and midwives" with 9.3% on average of the share in total morbidity (rate in 2022 - 7.2‰). In relation to these groups of diseases, the prevalence of "Tumors" is 3.2% and "Glandular diseases with internal secretion, nutrition and metabolism" 2.8% in 2022.

In the territory of the municipality of Negotin, visits to women's health care services in 2022 were most often realised under diagnoses: other inflammation of the female pelvic organs (25.5%), breast diseases (15.5%), inflammation of the bladder (14.5%), menstrual disorders (9%) and menopause-climacteric diseases (7.6%). The first five diagnoses account for more than two thirds (71.8%) of registered diseases and conditions in the women's health care service.

Service for the Protection and Treatment of Oral Diseases of the Municipality of Negotin

In the area of the municipality of Negotin, in the period from 2018 to 2022, an average of 4120.6 diseases were registered in the dental service. The morbidity rate in 2022 was 92.4/1000 inhabitants. The most common diseases registered in this service are: other diseases of the teeth and supporting structures (an average of 54.1%), dental caries (an average of 30.2%) and other diseases of the oral cavity, salivary glands and jaws.

HOSPITAL MORBIDITY

During 2022, the population of the municipality of Negotin achieved 5434 episodes of hospital treatment at the Negotin General Hospital. The hospitalisation rate is 192.28‰.

The leading position in the structure of hospital morbidity of hospitalised residents is held by "Diseases of the urinary and genital system", accounting for 14.65% of all inpatients in 2022. Due to these diseases, there were a total of 796 episodes of hospital treatment, so the hospitalisation rate for this group of diseases is the highest at 28.17‰. The second most common cause of hospitalisation is "Diseases of the respiratory system". In 2022, 695 hospitalisations were recorded, which is 12.79% of all hospitalised patients, and 24.59 per 1,000 population. In third place is the group "Factors that affect the state of health and contact with the health service" with 659 hospitalized (12.13%) and a rate of 23.32‰. This is followed by the group "Diseases of the circulatory system" in the fourth place with 545 hospitalisations (10.03%) and a rate of 19.28/1000 inhabitants. The fifth place in the structure of the cause of hospitalization of hospitalized residents is occupied by "Injuries, poisoning and consequences of external factors" (395 or 7.27% of hospital morbidity) with a hospitalization rate of 13.98‰. "Tumors" ranks sixth in the structure of hospital morbidity with 334 hospitalizations, with a share of 6.15% and a hospitalisation rate of 11.82/1000 inhabitants. These groups of diseases make up 63.01% of hospital-treated residents in the Negotin General Hospital.

In relation to individual diagnoses, the most common causes of inpatient treatment of residents were: extracorporeal dialysis; pneumonia caused by the virus, unmarked; acute respiratory insufficiency; urinary tract infection of unmarked localisation; narrowing of the bladder, unmarked; anemia in other chronic diseases classified elsewhere; spastic (spasmodic) unilateral paralysis; hereditary factor VIII deficiency; malignant prostate tumor and pneumonia, unmarked.

The total number of fatal outcomes of stationary treated residents in the municipality of Negotin in 2022 is 265 (3,315 in total), which gives a general hospital flight rate of 7.99%.

POPULATION MORTALITY

During the observed five-year period, the largest share of mortality in the population of the municipality of Negotin is in the group "Diseases of the circulatory system", with a share ranging from 44.6% (2021) to 56% (2018). "Tumors" are at the second place of the cause of death, with slightly less than 15% of total deaths. During 2020 and 2022, the "COVID-19 Diseases" group ranked third in frequency, and in 2021 it ranked second. The following are diseases with a small share in total mortality, with a different ranking of shares by years of the observed period.

5.2 Flora and Fauna

At the location intended for the construction of the Eco Energy complex, nor in its immediate vicinity, there are no registered rare or endangered plant and animal species, which is confirmed by the decision of the Institute for Nature Conservation of Serbia no. 021-3738/2 of 10.11.2023 and no. 021-2591/2 dated 3 August 2023 (given in the attachment), which states that the location in question **is not within the protected area for which the protection procedure has been implemented or initiated, nor in the spatial scope of the ecological network of the Republic of Serbia.**

In the area of the settlement of Prahovo and its surroundings, a variety of plant life of an indigenous and introduced character was formed, which is the result of natural conditions. In the coastal part, where the settlement and industrial complex rests on the right bank of the Danube River, plant communities characteristic of the coastal belt are represented. In terms of vegetation, meadows and arable land with a variety of cereals and industrial plants are represented.

The fauna in this area has undergone changes, as a result of long-built industrial plants, the constant presence of people and means of transport, the continuous operation of equipment and the fragmentation of space by the construction of roads and industrial railway tracks. The Danube River is characterised by a diverse fish stock consisting of the following species: sturgeon, catfish, pike, carp, chub, perch and all types of white fish.

The space in the vicinity of the site in question is located within the ecological corridor - the Danube River. According to the Decree on the Ecological Network ("Official Gazette of the RS", No. 102/2010), the Danube River is part of an extremely important ecological corridor of international importance. Also, the Danube represents a habitat and migratory route for numerous species that are protected in accordance with the Rulebook on the Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi ("Official Gazette of the RS", No. 5/2010, 47/2011, 32/2016 and 98/2016). Considering that the Danube is an international river, on 29 June 1994 the Convention on Cooperation for the Protection and Sustainable Use of the River Danube was signed in Sofia (Bulgaria), which entered into force in October 1998 when it was ratified by the ninth signatory. Serbia became a contracting party by adopting the Law on Ratification of the Convention on Cooperation for the Protection and Sustainable Use of the River Danube ("Official Gazette of the Socialist Republic of Yugoslavia - International Treaties", no. 2/2003).

At a distance of about 40 km from the border of the Eco Energy complex in the northwest direction, there is the Djerdap National Park, which was established in 1974, by the Law on the Djerdap National Park ("Official Gazette of the SRS", no. 31/1974). The Djerdap National Park includes parts of three municipalities: Golubac, Majdanpek and Kladovo, i.e. an area of 63,608.45 ha.

In April 2024, *The Biodiversity Study of the industrial complex "Elixir Prahovo" – Chemical Products Industry, Prahovo doo*, was conducted by the Institute for Biological Research "Siniša Stanković", National Institute of the Republic of Serbia, University of Belgrade, in order to determine the current condition of flora and fauna at the site. An exploration of the area of 20 km^2, downstream of HPP Djerdap 2, including the area of the previous Eco Energy complex, was carried out considering the impact of the construction and operation of the plant on the biodiversity of the nearby areas of the neighboring countries of Romania and Bulgaria.

The study of biodiversity concluded that the eradication of the Mesian forest of gray pedunculate and the drainage of the floodplain of ponds and wetlands in the 1930s by the construction of HPP "Đerdap 2" permanently destroyed natural potential vegetation, and with it the accompanying fauna.The area is dominated by anthropogenic communities of arable land (pastures, fields, orchards, vineyards). Current vegetation, flora and fauna are of secondary origin and are of no interest for protection. The negative effects on the fish fauna are mainly due to the impact of the HPP "Đerdap 1 and 2" dams, which prevent migration upstream and downstream, affect the flow regime and cause large oscillations in the water level, above, between and in the part of the flow below the dams. These significant changes caused changes in the ichthyofauna of the Danube. Migratory fish species such as sterlet and barbel, which favor the faster flow, have migrated to the upstream part of the Danube, while species such as bream showed intensive growth in the newly formed reservoirs.

It was also concluded that the vegetation of the investigated area is heterogeneous in character. The following stand out: typical water, riparian, ruderal and vegetation of arable surfaces. The narrow zone where the construction is planned is located within the industrial zone, where plant communities of importance to conservation biology are not recorded. It is not expected that the operation of the project in question will have a significant residual impact on vegetation, both locally and in the wider context.

Six NATURA 2000 sites were identified in the surrounding areas, namely four in Romania (Blahnița – ROSPA0011 and Gruia - Gârla Mare – ROSPA0046, Dunărea la Gârla Mare - Maglavit – ROSAC0299 and Jiana- ROSAC0306) and two in Bulgaria (Timok – BG0000525 and Novo selo – BG0000631). One

Ramsar area (Blahnița – ROSMS0013) was also identified in Romania. In the wider area, at a distance of over 62 km, there is the "Domogle-Valea Cherni" National Park in Romania, and in Bulgaria, at a distance of about 33 km by air funnel, there is the Deleina NATURA 2000 area. Considering the distance of these areas and the type of plant that is the subject of the analysis, the mentioned protected goods have not been considered, as impacts on biological diversity are unlikely.

A detailed description of the flora and fauna in the analysed area is given in the aforementioned Study here attached, as well as in Chapter 2.9 of this Study *Description of flora and fauna, natural resources of special value (protected) of rare and endangered plant and animal species and their habitats and vegetation.*

In accordance with all the above, it can be concluded that the presence of rare, endangered, protected species of flora and fauna has not been registered at the location of the future Eco Energy complex, and that the realisation of the plant in question will not lead to additional environmental damage and that the cross-border impacts of the construction and operation of the Eco Energy complex are negligible from the aspect of biodiversity.

5.3 Soil, water, air and noise

Soil and groundwater

Bearing in mind that the construction of the Eco Energy complex is planned in the immediate vicinity of the existing Elixir Prahovo complex, which, according to the Rulebook on the list of activities that may be the cause of soil pollution and degradation, the procedure, data content, deadlines and other requirements for soil monitoring ("Official Gazette of the RS", no. 102/2020) findings in the list of activities for which sampling and soil quality testing should be performed[58], for the purpose of presenting the zero state of the site in question, the results of regular monitoring of soil quality performed by Elixir Prahovo were used, which are shown below (full Soil Test Reports are attached to the Study).

For the determination of the zero state at the site envisaged for the construction of the Eco Energy complex, the report **"Analysis of the Environmental Factors"** by the company for copyright protection and engineering, „Autorski biro Beograd“ (eng. Authors' Bureau Belgrade), here attached to the Study, was also prepared in March 2023. For the preparation of the analysis, the methodology "by research tiers" (Tiered approach) was applied, which consists of:

- Tier 1 (screening) - qualitative analysis based on general data and existing results of examinations,
- Tier 2 (scoping) - semi-quantitative analysis based on additional examinations and
- Tier 3 (modeling) - quantitative analysis based on detailed examinations, with the application of suitable models.

The report covers activities on the existing industrial complex within Phase I (from privatization 2012 to year 2014 when the first DRP was adopted) and activities within Phase II, from 2014-2020, after which targeted environmental examinations were initiated for the needs of new extensions of the chemical industry complex in Prahovo (Phase III). Based on the identification of the sources of pollution, the results of previous examinations, the characteristics of the environment (orographic, edaphic/hydrogeological and microclimatic) and the vulnerability analysis, targeted tests of the zones envisaged for expansion were performed, as well as in the surrounding area. Targeted examination were carried out in 2020, 2021 and 2022, as part of studies, detailed studies and reports for the purpose of expanding the chemical industry complex in Prahovo (Phase III of activities at the complex).

Figures 5.3 and 5.4 show the boundaries of the chemical industry complex in Prahovo within all three phases of activities at the complex, with the locations of soil and groundwater research. The figures show at which locations the samples were repeated in the period from 2012, as well as that a number of samples within Phases I and II were taken in zones belonging to Phase III of the activity at the complex, according to the second amendment to the DRP (2022).

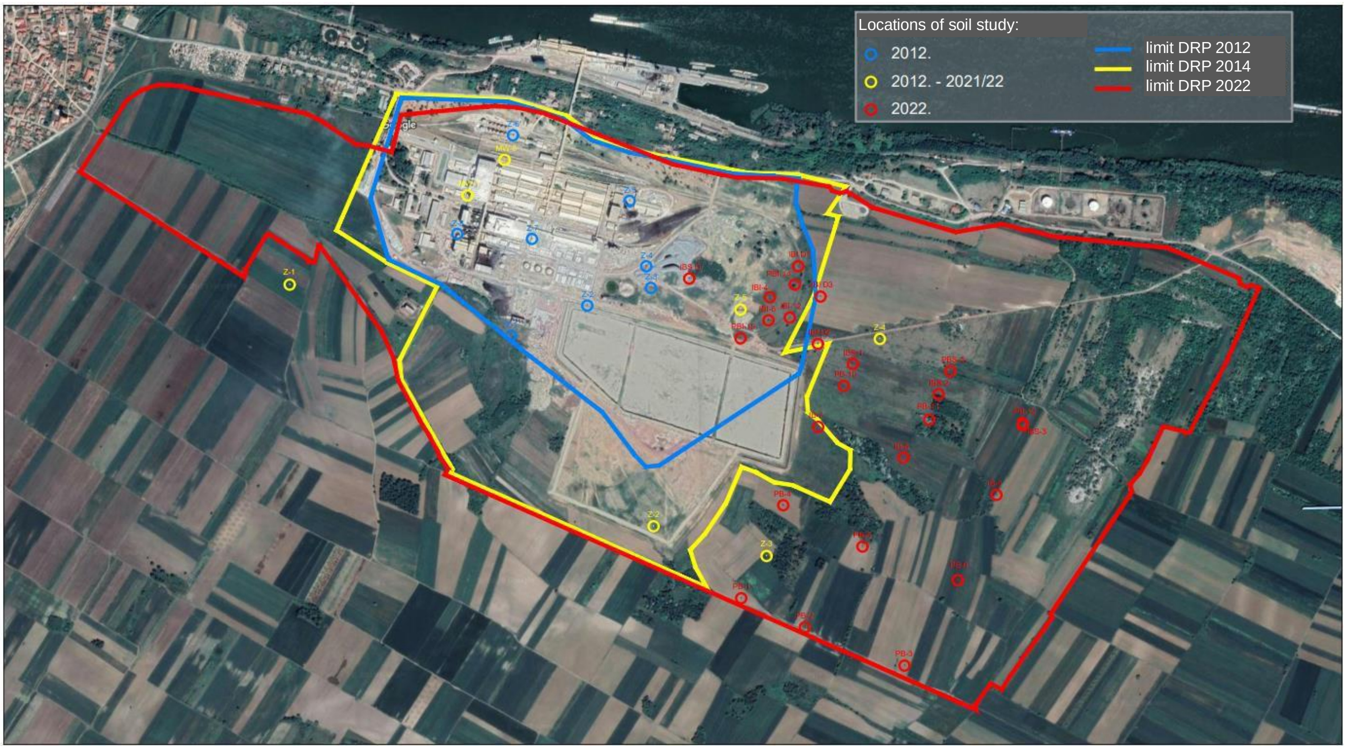


Figure 5.3 Soil study sites

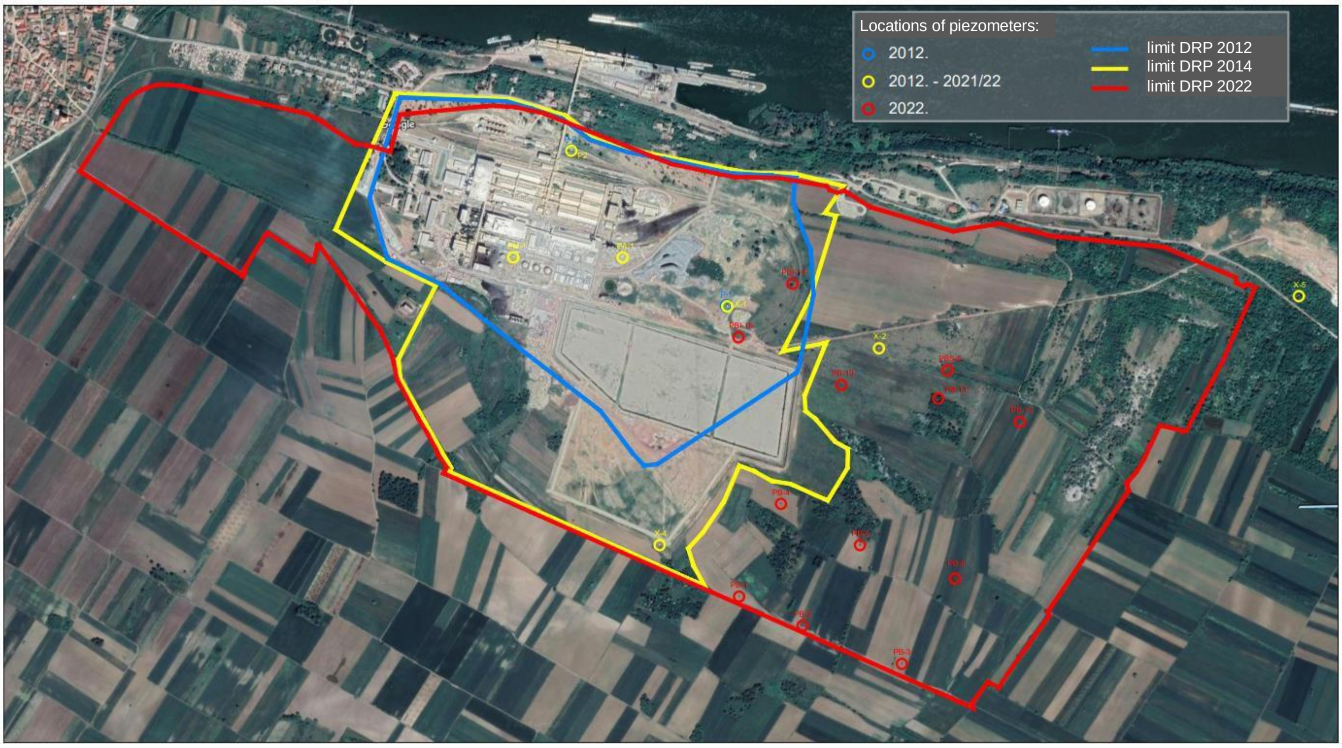


Figure 5.4 Locations of piezometers and groundwater sampling sites

As part of the research, composite samples of the surface layer of the soil were taken, as well as samples of deeper layers (from the identified geological layers), up to the groundwater level. A part of the wells was used for the installation of piezometers, from which water samples were taken for laboratory analysis. Bearing in mind the historical pollution data on the complex, the characteristics of the emitters, as well as the types of pollutants, the Initial Conceptual Location Model (ICSM) was applied, which also takes into account the potential migration pathways of pollutants.

The aforementioned Report **"Analysis of the Environmental Factors"** analysed the results presented by geotechnical studies of the Elixir Prahovo complex and other targeted laboratory tests, and it was noted that:

- pH values of the samples (water and soil), located near the former pyrite cinder landfill, are more acidic, compared to the pH values in the samples closer to the current phosphogypsum storage facility;
- Groundwater levels change and directly depend on the height of the Danube, with a slight increase in levels;
- The content of organic matter is the highest in the surface layer of soil;
- Slightly higher concentrations of pollutants are registered in the surface layer and in the higher layers of soil, up to the groundwater level;
- The marly-clay complex occurs at depths of over 15 m and has a significant thickness estimated at over 12 m. This complex is a hydrogeological insulator.
- Studies have shown that higher concentrations of Ni occur regularly in samples, but in concentrations lower than remediation values (RV). This occurrence of Ni, regardless of the location and depth of the samples taken, indicates the geological origin of this metal, which coincides with the results of soil examinations at several other locations in Serbia.
- The increased concentrations of Co are probably the result of surface contamination occurring in the period when a phosphate with a higher cobalt content was used in the phosphoric acid production plant, prior to privatisation. Concentrations of Co are not over RV in any place.
- In the surface layer of the soil, higher concentrations of pollutants were found in relation to the deeper layers, especially those of organic origin (hydrocarbons and pesticides above the limit values of LV, and below the remediation values (RV) in several samples taken in the Energy and Ecological Island Zone.
- In one sample only, taken next to the phosphogypsum storage facility, the values of As and Cu > RV (Zone II) were determined. Increased concentrations of As and Cu are likely to have occurred as a result of the deposition of pyrite cinder over a longer period. The finding of As in one sample next to the phosphogypsum storage requires additional examinations, before raising the soil layer for expanding the storage, or after moving it at the stage of preparatory works for construction.
- Slightly higher concentrations of pesticides in Zone IV are probably the result of historical pollution caused by poor waste management from the time of pesticide production, which has not been performed on the site for more than 15 years. The long half-life of these pollutants, increased concentrations of organic matter in the surface layer of the soil and probably weaker leaching of soil by atmospheres, influenced the longer retention of pesticides in the soil. Due to the observed increased concentrations of pesticides and hydrocarbons, no special interventions are required, except for soil and groundwater monitoring, especially during preparatory works for the construction of facilities.

By applying the Tier-2 procedure, the following can be concluded:

- The work of the industry on the ICP Prahovo complex until privatisation in 2012 resulted in the occurrence of "historical pollution", with negative consequences for the environment;
- As a result of major construction-technical and technological interventions at the chemical industry complex in Prahovo after the privatisation in 2012, including the rehabilitation of sites where hazardous waste was inadequately disposed of, but also due to the process of migration of pollutants over time, along with physical-chemical and biological processes in soil and groundwater, today only point source pollution, uneven in terms of origin and type, is registered in the part of the site intended for expanding the activities of the company;
- The evaluation of the results of the examinations performed in the previous period and targeted for the purpose of expanding the activities at the complex enabled the basic processes in environmental factors of importance for the assessment of the condition of the environment in the area covered by the planned expansion and beyond and the need for possible interventions to be considered;
- The implementation of general environmental protection and improvement measures should limit any new emissions of pollutants that may cumulate with existing sources and thus adversely affect the condition of the environment;

- Qualification of identified sources of pollution and migration of pollutants using the ICSM model has shown that potential sources of pollution on land where waste pesticides and mineral oils were disposed of until privatisation and on land next to phosphogypsum storage, belong to the category for which it is necessary to plan special environmental protection and improvement measures, which include the limitation of certain activities, with appropriate exposure monitoring;
- Exposure monitoring should provide relevant data in order to take preventive and/or if necessary remedial protection measures.

In order to determine the zero state, in addition to the report of the Authors' Bureau "Analysis of the Environmental Factors", a physical and chemical analysis of soil samples was conducted in December 2023 by the Institute for Prevention, Occupational Health and Safety, Fire Protection and Development LTD. Novi Sad, Branch "27. January" Niš (the report of the physical and chemical analysis is attached to the Study). One individual disturbed sample was taken from a depth of about 30 cm from 5 study locations (Table 5.2 and Figure 5.5).

Table 5.2 Soil sampling sites

Measuring point	Sample #	Sampling point	Coordinates	
			N	E
S1	0092	North of the phosphogypsum storage at a distance of about 200 m	44º17’6.1’’	22º36’53.3’’
S2	0093	Southeast of phosphogypsum storage at a distance of about 250 m	44º16’40.8’’	22º36’57.1’’
S3	0094	South of phosphogypsum storage at a distance of about 500 m	44º16’43.9’’	22º36’41.9’’
S4	0095	West of the phosphogypsum storage at a distance of about 800 m	44º17’9.4’’	22º35’54.5’’
S5	0096	Northeast of phosphogypsum storage at a distance of about 400 m	44º17’1.9’’	22º37’12.9’’

Figure 5.5 Soil sampling locations

By analysing the results of the soil sample research, it can be concluded that the results comply with the corrected limit and delimitation values prescribed by the Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of the RS", nos. 30/2018 and 64/2019), except for the following, which are not harmonised with the corrected limit values but are harmonised with the corrected remedial values:

- in the sample 0092 content:
  - cadmium 2.36 mg/kg, CLV: 0.53 mg/kg; CRV: 8.02 mg/kg
  - copper 107.97 mg/kg, CLV: 24.0 mg/kg; CRV: 126.67 mg/kg
  - nickel 33.84 mg/kg, CLV: 23.6 mg/kg; CRV: 141.6 mg/kg
  - zinc 230.40 mg/kg, CLV: 92.9 mg/kg; CRV: 477.77 mg/kg
- in the sample 0093 content:
  - copper 27.31 mg/kg, CLV: 24.0 mg/kg; CRV: 126.67 mg/kg
  - nickel 34.4 mg/kg, CLV: 23.6 mg/kg; CRV: 141.6 mg/kg
  - cobalt 7.52 mg/kg, CLV: 5.81 mg/kg; CRV: 154.88 mg/kg
- in the sample 0094 content:
  - nickel 30.46 mg/kg, CLV: 23.6 mg/kg; CRV: 141.6 mg/kg
  - cobalt 12.08 mg/kg, CLV: 5.81 mg/kg; CRV: 154.88 mg/kg
- in the sample 0095 content:
  - nickel 34.39 mg/kg, CLV: 23.6 mg/kg; CRV: 141.6 mg/kg
  - cobalt 8.19 mg/kg, CLV: 5.81 mg/kg; CRV: 154.88 mg/kg
- in the sample 0096, the content of:
  - copper 28.53 mg/kg, CLV: 24.0 mg/kg; CRV: 126.67 mg/kg
  - nickel 37.08 mg/kg, CLV: 23.6 mg/kg; CRV: 141.6 mg/kg
  - zinc 8.61 mg/kg, CLV: 92.9 mg/kg; CRV: 477.77 mg/kg

Groundwater

In order to examine the state of groundwater during engineering-geological mapping of the area envisaged for the construction of the Eco Energy complex, 3 exploration wells (PBs-4, PBi-14 and PBi-15) were constructed in which piezometric structures were installed. Piezometers have the role of continuous monitoring of groundwater levels (GWL), as well as for the purpose of sampling and analyzing groundwater chemism in order to detect changes from the initial "zero state" before the start of the project. Sampling and physical and chemical testing of groundwater quality was carried out in June 2022 by the Institute for Prevention, Occupational Safety, Fire Protection and Development Ltd. Novi Sad, Branch "27. January" Niš (the reports of physical and chemical analyses are attached). The location of the piezometers for determining the zero state is given in Table 5.3 and Figure 5.6.

Table 5.3 Groundwater Sampling Sites

Sample #	Sampling point	Coordinates	
		N	E
0570	PBs-4	44º16’59’’	22º37’22’’
0571	PBi-14	44º17’07’’	22°37’02’’
0572	PBi-15	44º17’02’’	22º36’54’’

Figure 5.6 Groundwater Sampling Locations

The results of groundwater examinations from piezometers PBs-4, PBi-14 and PBi-15 show that all values of the tested parameters are in accordance with the average annual concentrations, prescribed by the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them ("Official Gazette of the RS", no. 50/2012, Appendix 2, Table 1) and remediation values prescribed by the Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of the RS" nos. 30/2018 and 64/2019, Appendix 2).

Sampling and physical and chemical testing of groundwater quality from 8 piezometers was carried out in April 2024 by the Institute for Prevention, Occupational Safety, Fire Protection and Development DOO Novi Sad, Branch "27. January" Niš (the reports of physical and chemical analyses are attached). The sampling point is shown in Table 5.4 and in Figures 5.7 and 5.8.

Table 5.4 Groundwater Sampling Sites

Sample #	Sampling point	Coordinates	
		N	E
0572	Piezometer X-1, location in the vicinity of the new phosphogypsum storage	44º17’05.4’’	22º36’52.7’’
0570	Piezometer X-2, location in the vicinity of the new phosphogypsum storage	44º17’1.97’’	22º37’13.05’’
0569	Piezometer X-3, location in the vicinity of the old phosphogypsum landfill	44º17’11.68’’	22°38’50.0’’
0573	Piezometer X-4, location in the vicinity of the new phosphogypsum storage	44º16’41.9’’	22º36’42.9’’
0568	Piezometer X-5, location in the vicinity of the old phosphogypsum landfill	44º17’3.68’’	22º38’8.2’’
0566	Groundwater from the PA-1 piezometer	44º17’09.31’’	22°36’38.98’’
0567	Groundwater from the PM-1 piezometer	44º17’10.03’’	22º36’26.93’’
0571	Groundwater from piezometer P-2, location in vicinity of sulphuric acid storage	44º17’19.34’’	22º36’32.63’’

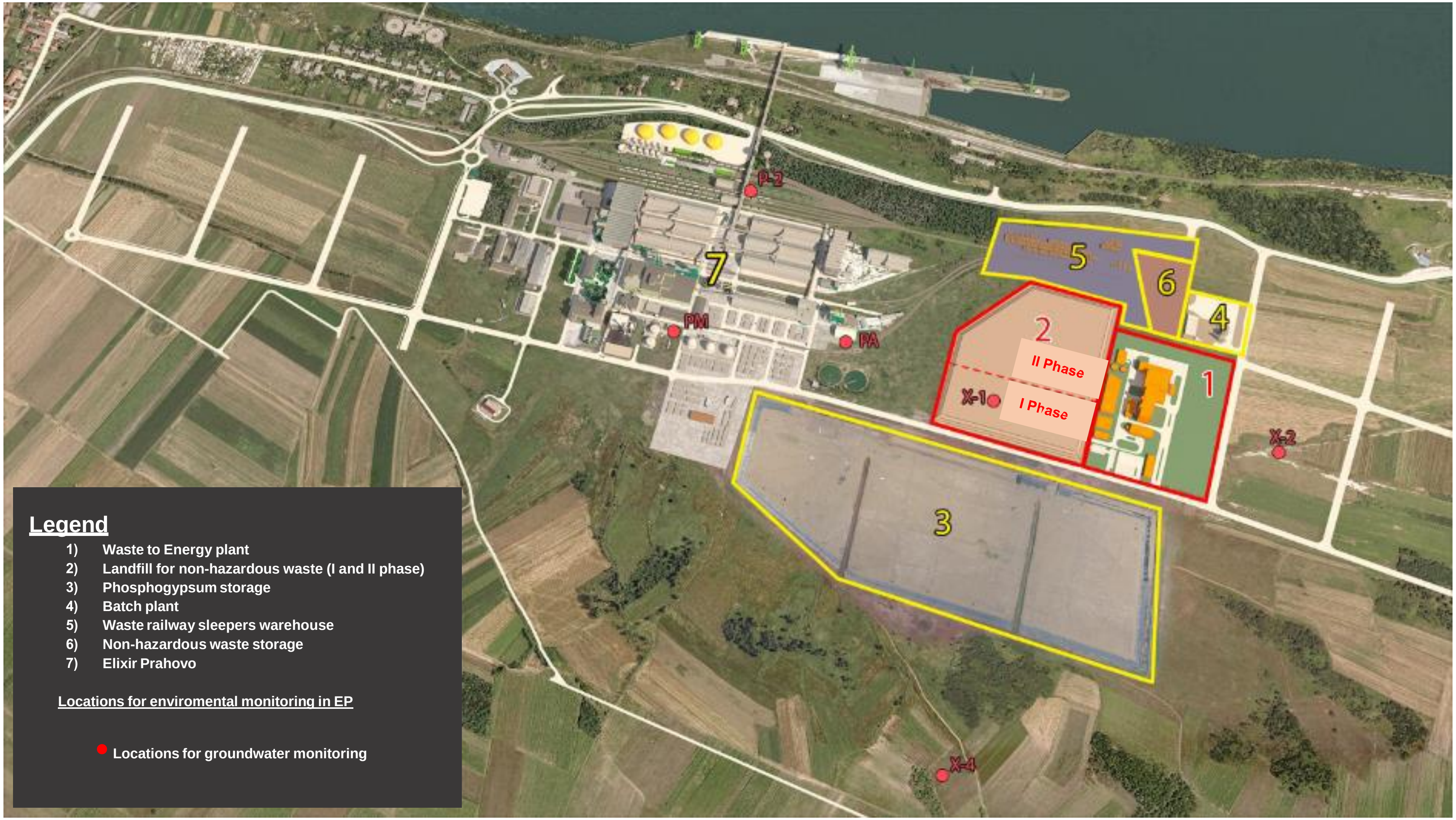


Figure 5.7 Groundwater Sampling Locations

Figure 5.8 Groundwater Sampling Locations

The results of groundwater examinations show that all values of the tested parameters are in accordance with the average annual concentrations, prescribed by the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them ("Official Gazette of the RS", No. 50/2012, Appendix 2, Table 1) and remediation values prescribed by the Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of the RS" No. 30/2018 and 64/2019, Appendix 2).

Surface and wastewater

Surface water quality can be expressed by classifying a given watercourse into one of the water quality classes. We distinguish four classes of surface water and out-of-class state:

- Class I, waters that in the natural state, with possible disinfection, can be used for drinking and in the food industry, and surface waters for breeding noble species of fish (salmonids).
- Class II, waters that can be used in the natural state for bathing and recreation of citizens, for water sports, for breeding other types of fish (cyprids), or waters that can be used for drinking and in the food industry in addition to the usual processing methods (coagulation, filtration, disinfection, etc.).
- Class III, water that can be used for irrigation, and after the usual treatment methods in industry other than food industry.
- Class IV, waters which may be used for other purposes only after proper treatment.
- OC state - out of class state

The most important watercourse in the analysed area is the Danube River. The area in question belongs to the Danube River Basin, the Danube River Basin Area, according to Article 27 of the Law on Waters and the Decision on Determining the Boundaries of Water Areas ("Official Gazette of the RS", no. 92/17). According to the Decision on Determining the List of Waters of the First Order ("Official Gazette of the RS", no. 83/10), the Danube River is classified under 1. Interstate waters 1) natural watercourses. According to the applicable regulations, the Danube near Prahovo is classified as a category II watercourse (from the Hungarian border to the Bulgarian border), which means that the water should meet the provisions of the class II of river waters.

As stated earlier in the study, since the Danube is an international river, the Convention on Cooperation on the Protection and Sustainable Use of the Danube River was signed, which entered into force in October 1998. Serbia became a contracting party by adopting the Law on Ratification of the Convention on Cooperation for the Protection and Sustainable Use of the Danube River ("Official Gazette of the SRY - International Treaties", No. 2/2003). The Convention aims to ensure that surface and groundwater in the Danube River Basin is managed and used in a sustainable and equitable manner, including:

- conservation, improvement and rational use of surface and groundwater;
- preventive measures to control hazards arising from accidents involving floods, ice or hazardous substances;
- measures to reduce the burdenof pollution entering the Black Sea from sources in the Danube River Basin.

In order to prevent, control and reduce cross-border impact, and based on the Convention, multilateral cooperation has been achieved in developing, adopting and implementing appropriate legal, administrative and technical measures and ensuring national prerequisites and the necessary basis for ensuring effective protection of water quality and sustainable development.

Data on surface water quality for the territory of the Republic of Serbia, including the quality of the Danube River, are maintained by the Environmental Protection Agency and are publicly available through the website www.sepa.gov.rs. Currently, the website contains the data "Results of Surface and Groundwater Quality Testing for 2022", which also provides an assessment of the state of surface water quality. For the control of surface water quality in the area of Prahovo for the Danube River, the relevant measuring stations are shown in the table 5.5.

Table 5.5 Basic data of surface water quality monitoring stations for the Prahovo area

Station name	Station ID	Watercourse	Name of water body	Water body ID	Type of water body
Brza Palanka	42090	The Danube	Djerdap 1 accumulation	D2	Type 1
Radujevac	42095	The Danube	Danube downstream from HPP Djerdap 2 to the mouth of Timok	D1	Type 1

The results of the physical, chemical and microbiological analyses of the samples, i.e. the relevant values of the parameters for the annual period, were compared with the limit values of the quality classes prescribed by the Regulation on limit values of pollutants in surface and groundwater and sediment and the deadlines for their reaching ("Official Gazette of the RS", no. 50/2012), while the values of priority and priority hazardous substances were compared with the values of environmental quality standards (EQS), i.e. the average annual concentration (ACC) and the maximum permissible concentration (MPL), prescribed by the Regulation on Limit Values of Priority Substances and Priority Hazardous Substances Polluting Surface Waters and the Deadlines for Their Reaching ("Official Gazette of the RS", no. 24/2014). The results of the performed analyses are shown in Table 5.6.

Table 5.6 Results of physical-chemical, chemical and microbiological analyses of samples

Parameter name	Brza Palanka Station	Radujevac Station
General		
pH	II-IV	I-IV
Suspended Solids	I-II	I-II
Oxygen mode		
Dissolved oxygen	II	II
Oxygen saturation	I	-
BOD	II	II
CODCr (dichromate method)	-	-
CODMn (permanganate method)	I	I
Total Organic Carbon (TOC)	II	III
Nutrients		
Total nitrogen	II	II
Nitrates	II	I
Nitrites	II	II
Ammonium ion	II	II
Non-ionized ammonia	-	-
Total phosphorus	II	IV
Orthophosphates	II	IV
Salinity		
Chlorides	II	I
Total chlorine residue	-	-
Sulphates	I	I
Total mineralization	I	I
Electrical conductivity	I	I
Metals		
Arsenic	I	I
Boron	I	I
Copper	I-II	I-II
Zinc	I	I
Chromium (total)	I	I

Iron (total)	II	II
Manganese (total)	I	I
Organic substances		
Phenolic compounds (as C2H5ON)	-	-
Petroleum hydrocarbons	-	-
Surfactants (as laurilsulfate)	-	-
AOH (Adsorbing Organic Halogen)	-	-
Microbiological parameters		
Faecal coliforms	I	II
Total coliforms	II	III
Intestinal enterococci	I	I
Number of aerobic heterotrophs (Kohl method)	III	III
Priority and priority hazardous substances	-	-

According to the test results, the water quality on the stretch from the dam to the border with Bulgaria occasionally does not correspond to the prescribed quality in physico-chemical and microbiological terms. Deviations from the physicochemical parameters are recorded at the concentration of TOC, total phosphorus and orthophosphate, and in microbiological terms at the total coliforms and the number of aerobic heterotrophs.

In 2024, in order to determine the zero state of waste water quality and surface water quality of the Danube River for the needs of construction of the Eco Energy complex, the Institute for Prevention, Occupational Safety, Fire Protection and Development LLC Novi Sad, Branch "27. January" Niš carried out sampling and physico-chemical testing of the quality of waste and surface water at four measuring points, as shown in Table 5.7 and Figure 5.9 (Report on physical/chemical analyses is given in the Annex of Study).

Table 5.7 Wastewater and surface water sampling points

Measuring point	Wastewater	Sampling point	Coordinates	
			N	E
OV1	Wastewater before treatment system	Sampling point manhole at inlet of neutralization pit	44º17’06.89’’	22º36’35.39’’
OV2	Wastewater after treatment system	Sampling point manhole located in an auxiliary facility at the outlet of waste water from the plant	44º17’07.78’’	22º36’37.93’’
PV1	Danube River 150 m upstream of the inlet of collective wastewater	The sampling point is located on the bank of the Danube River, 150 m upstream of the wastewater outflow	44º17’27.50’’	22°36’58.08’’
PV2	Danube River 100 m downstream of the inlet of collecting wastewater	The sampling point is located on the bank of the Danube River, 100 m upstream of the wastewater outflow	44º17’21.08’’	22º37’25.39’’

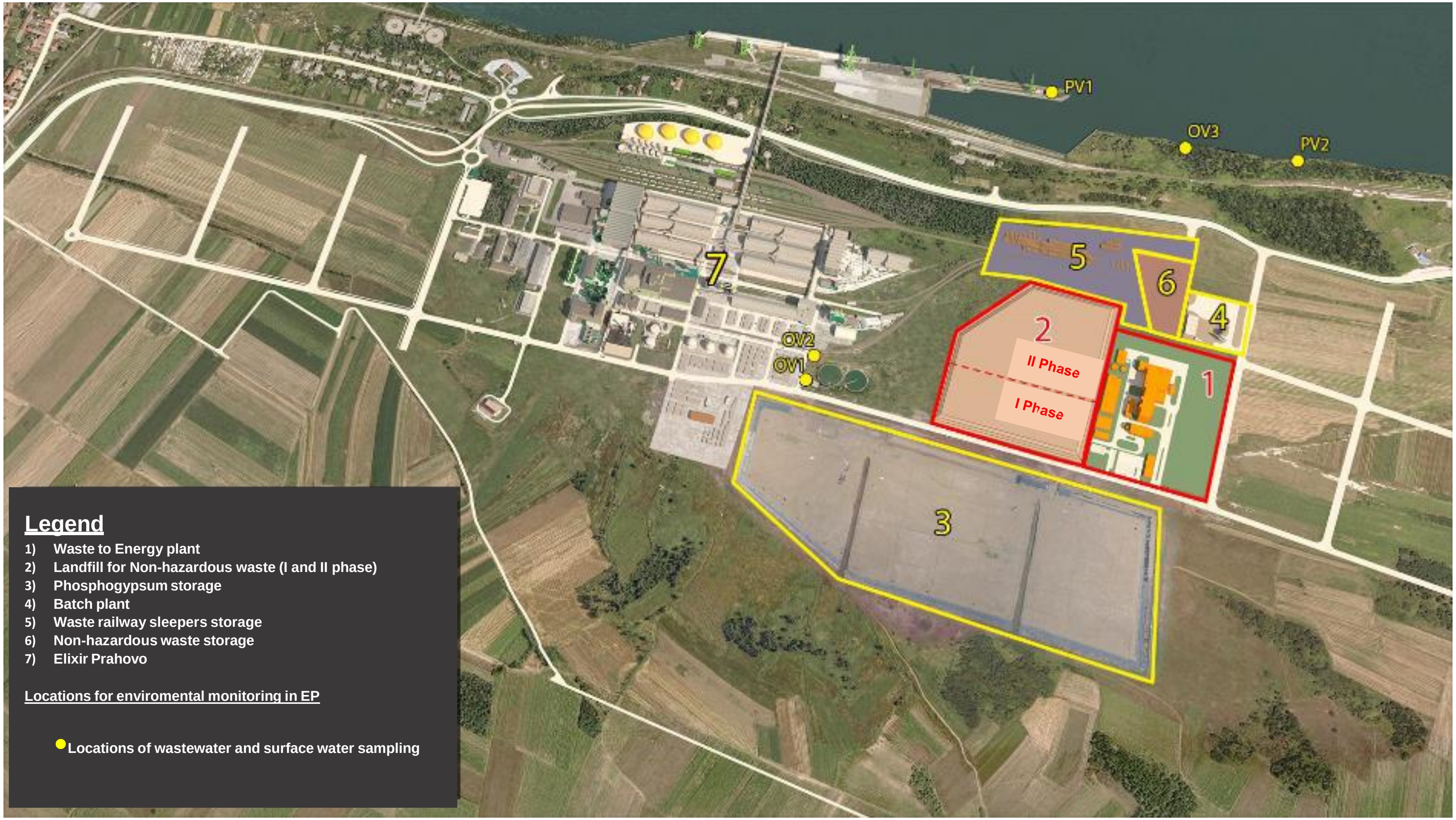


Figure 5.9 Wastewater and surface water sampling locations

The results of the examination of wastewater after the cleaning system from the Elixir Prahovo complex show that for all four quarters the concentrations of the tested parameters comply with the emission limit values prescribed by the Regulation on Limit Values of Emissions of Pollutants into Water and the Deadlines for Their Reaching ("Official Gazette of the RS", no. 67/2011, 48/2012 and 1/2016, Appendix 2, Other wastewater, 4. Limit values for emissions of wastewater containing mineral oils and with emission limit values prescribed by the Commission implementing decision EU 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliaments and the Council for waste incineration (notified under documents C(2019)7987, tables 5.9 and 5.10.
The results of the examination of surface water from the Danube River upstream of the wastewater discharge show that the concentrations of the tested parameters comply with the limit values prescribed by the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and the Deadlines for Their Reaching ("Official Gazette of the RS", no. 50/2012, Appendix 1, Table 1 and 3) and the Regulation on limit values of priority substances and priority hazardous substances polluting surface waters and the deadlines for their reaching ("Official Gazette of the RS", no. 24/2014, Appendix, Table 1).

The results of the examination of surface water from the Danube River upstream of the wastewater discharge show that the concentrations of the tested parameters comply with the limit values prescribed by the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and the Deadlines for Their Reaching ("Official Gazette of the RS", no. 50/2012, Appendix 1, Table 1 and 3) and the Regulation on limit values of priority substances and priority hazardous substances polluting surface waters and the deadlines for their reaching ("Official Gazette of the RS", no. 24/2014, Appendix, Table 1).

Air

Air quality control is carried out in order to determine the level of air pollution and assess the impact of polluted air on human health, the environment and the climate, in order to take the necessary measures to protect the environment, human health and material goods.

The Environmental Protection Agency of the Republic of Serbia (hereinafter referred to as the Agency) performs continuous monitoring of air quality in the state air quality monitoring network at the level of the Republic of Serbia. Pursuant to the Law on Air Protection ("Official Gazette of the RS", nos. 36/09, 10/13 and 26/21-other law), the Agency is obliged to prepare and publish every year the Annual Report on the State of Air Quality in the Republic of Serbia, which can be downloaded from the official website of the Agency, and in which the values of monitoring in the state and local network of monitoring and assessment of air quality are verified.

The figures 5.10 and 5.11 show the spatial distribution of sulphur and nitrogen oxides [t/year] during the year 2022[59].

[59] Data source: Annual Report on the State of Air Quality in the Republic of Serbia in 2022, Environmental Protection Agency of the Republic of Serbia

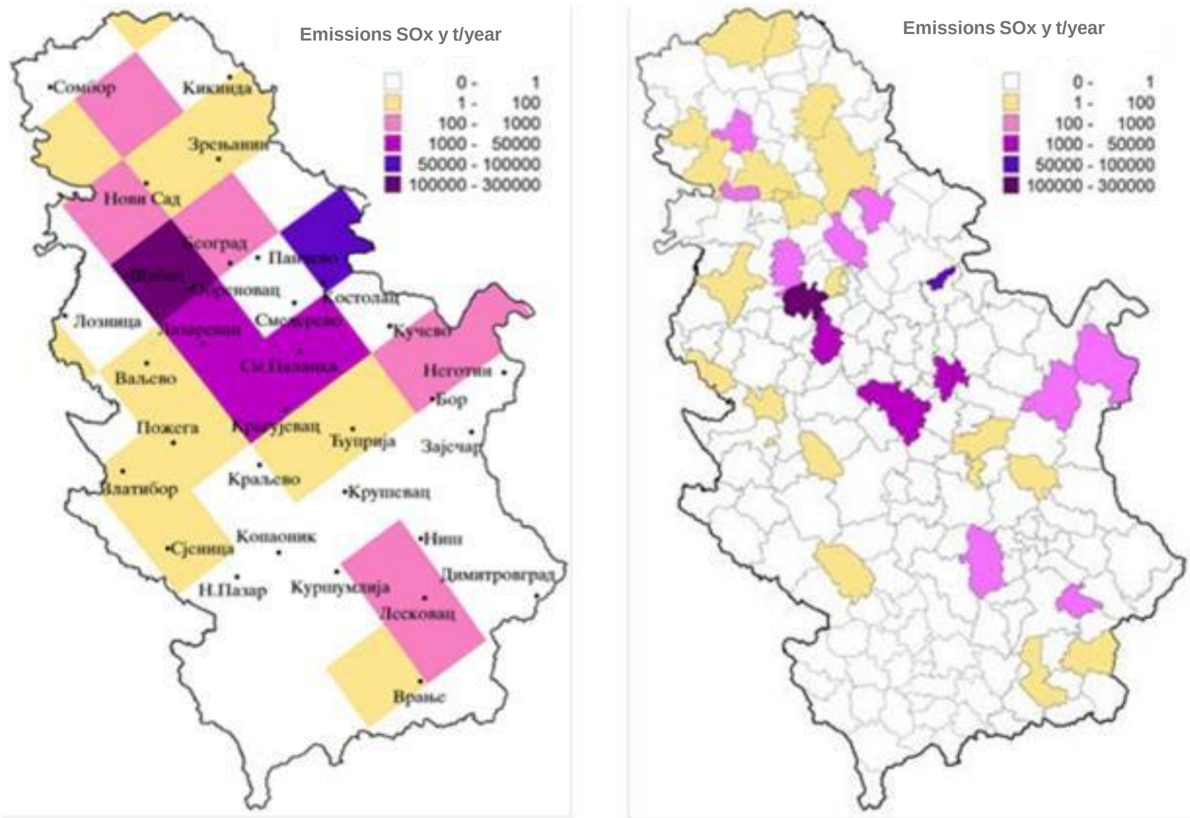


Figure 5.10 Spatial distribution of sulphur oxide emissions, in t/year, during 2022 in the 50 x 50 km quadrant network (left) and by municipalities (right)

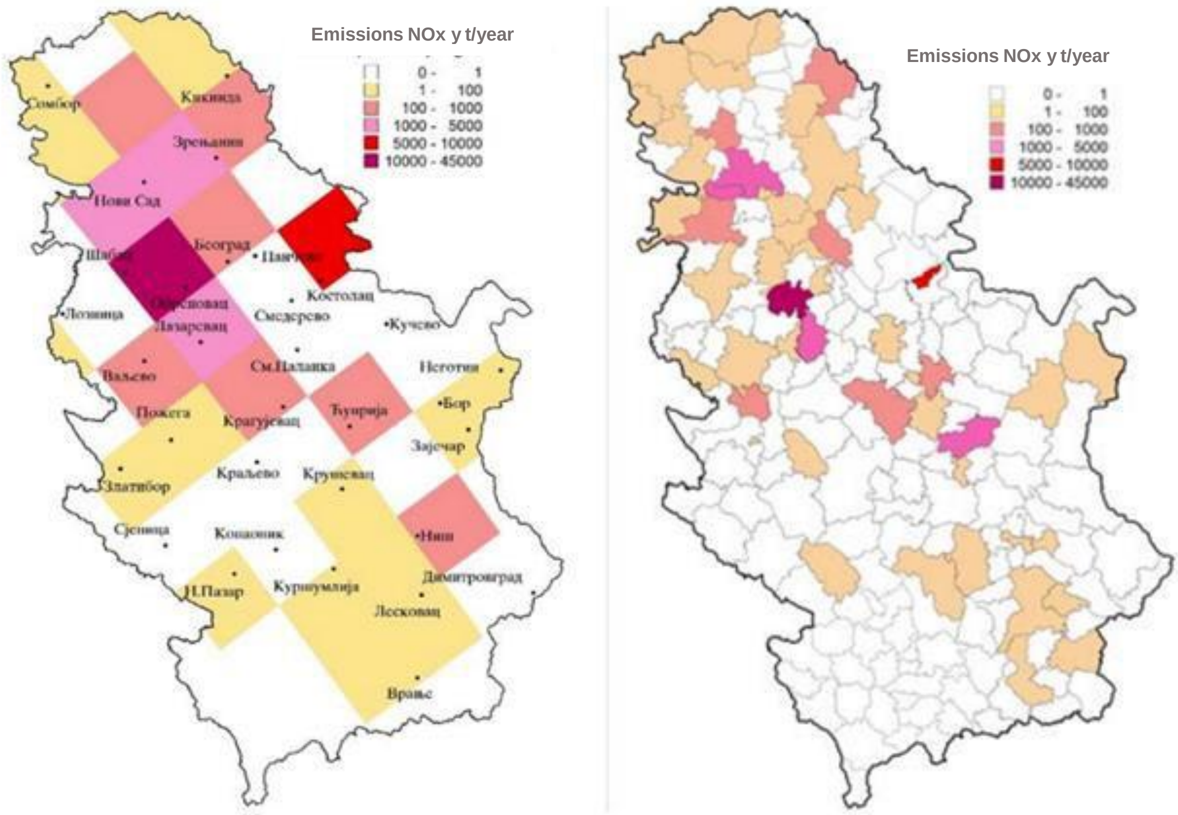


Figure 5.11 Spatial distribution of nitrogen oxides emissions, in t/year, during 2022 in the 50 x 50 km quadrant network (left) and by municipalities (right)

The air quality assessment is performed on the basis of exceeding the limit and tolerance values of pollutant concentrations. The assessment of air quality in 2022 was performed on the basis of mean annual concentrations of pollutants obtained by monitoring air quality in the state network and local air monitoring networks.

Air quality categories:
First category - clean or slightly polluted air - air in which the limit values for any pollutant are not exceeded;
Second category - moderately polluted air where the limit values of the level for one or more pollutants are exceeded, but the tolerance values of any pollutant are not exceeded;
Third category - excessively polluted air, air where limit values for one or more pollutants are exceeded.

Categorization of air quality, by stations and measuring points for 2022, is shown graphically in the figure 5.12.

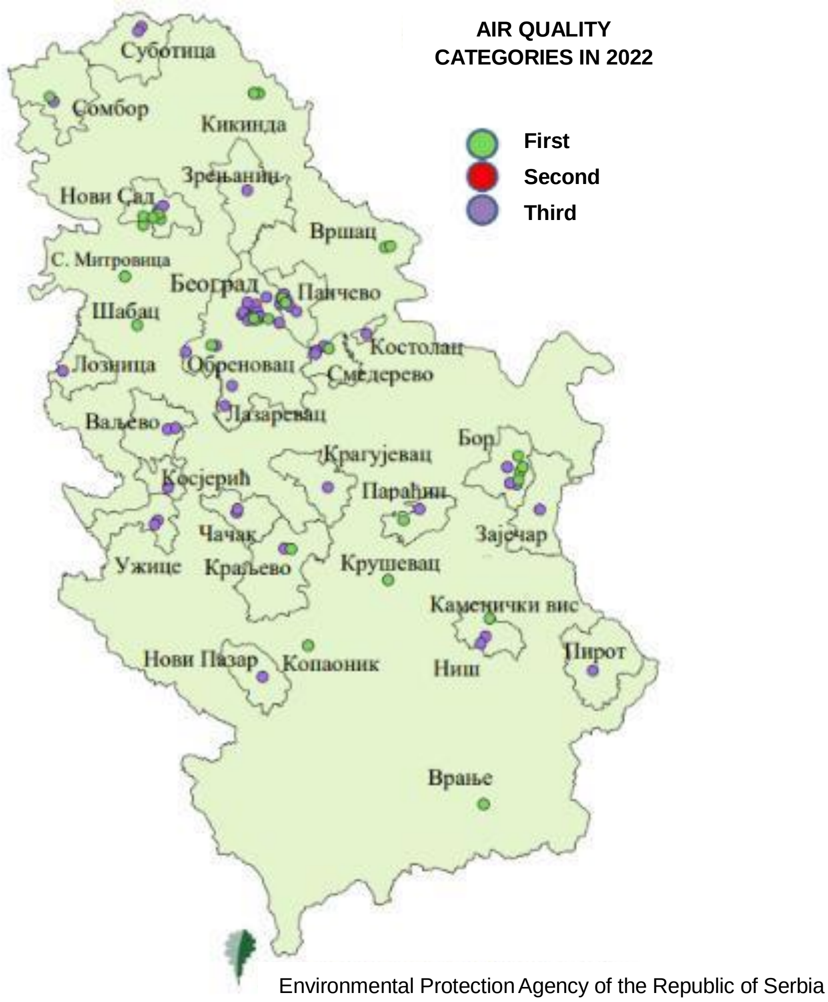


Figure 5.12 Categories of air quality in 2022 by stations

However, the municipality of Negotin, and therefore the settlement of Prahovo, is not covered by the network of automatic air quality monitoring stations (ASAQM). Figure 5.13 shows the network of the ASAQM Air Quality Monitoring Agency in the Republic of Serbia.

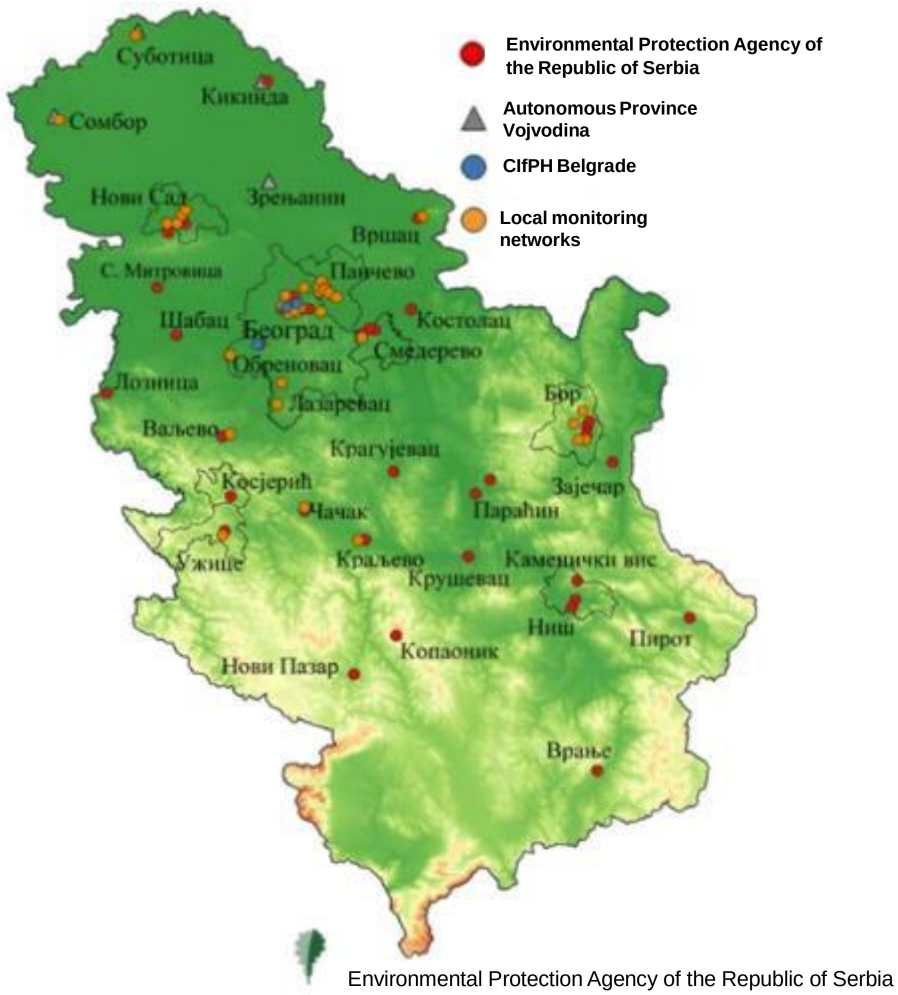


Figure 5.13 Network of stations and measuring points for air quality monitoring

The City Institute for Public Health Belgrade, at the request of Elixir Prahovo LTD, performed air quality monitoring for 15 days from April 19 - May 3 2023 at measuring point 1: Dragiša Brebulović-Žmiga, 11 Vuka Karadžića Street, Prahovo (N 44°17'40.6'', E 22°35'9.5''). The measuring point 1 (MP1) is 2.5 km northwest of the location of the project in question and is shown in Figure 5.14. During the measurement period, the following parameters were tested:

- Mass concentrations of suspended PM_{10} i $PM_{2,5}$;
- Total metal content (As, Cd, Pb, Ni, Cr) in the PM_{10} suspended particle fraction;
- Hydrogen fluoride (HF) mass concentration;
- Total phosphorus (P) content in the PM_{10} suspended particle fraction

Figure 5.14 Location of air quality measurement

The results of the measurements show that all the tested parameters are in accordance with the Regulation on monitoring states and air quality requirements ("Official Gazette of the RS", no. 11/2010, 75/2010 i 63/2013), except for one measurement (29 April, 2023) when the measured mean 24-hour value of PM_{10} suspended particles (51 $\mu g/m^3$) exceeded the limit value (50 $\mu g/m^3$, must not be exceeded more than 35 times in one calendar year).

Report for Air Quality Monitoring prepared by the City Institute for Public Health Belgrade, April 19 - May 3 2023 is attached.

In addition to regular monitoring of air quality in the subject area, in order to monitor the impact of emissions into the air, the operator Elixir Prahovo Ltd, by hiring an authorised accredited laboratory, regularly monitors emissions of pollutants on all emitters 2 times a year, all in accordance with the adopted Monitoring Plan. The stated data are available in the annex to the Study titled: Environmental Factors Analysis (with appendices), 2023.

Noise

One of the important indicators of quality of the environment is noise. In May 2024, the noise level in the open space was measured during the operation of the production facilities of ICP Elixir Prahovo, by the Institute for Prevention, Occupational Safety, Fire Protection and Development ltd, Novi Sad, Branch 27 January Niš. The report on the performed test – measurement of noise in the environment is attached.

Measurements were made in 24-hour period, day-evening-night at three measuring points:

- M1 – is located in an open area, northeast of the production complex, in the courtyard in front of a residential building of the its owner Slavica Nikolić on the left side of the Prahovo-Radujevac road. The measuring point is located across from the part of the plot on which there are halls 4, 5 and 6, which are used as storage space and the halls of the old MAP plant, which is not in use, as well as the storage tanks for sulfuric acid, which are not yet in operation;
- M2 – is located in an open space, northwest of the complex, on a green area in front of the settlement Kolonija, at a distance of about 100 m from the main gate and about 20 m from the railroad crossing;
- M3 – is located in an open area, on a green area in front of the Prahovo settlement at about 500 m from the plant and about 70 m from residential buildings.

The position of the noise measuring points is shown in Figure 5.15.

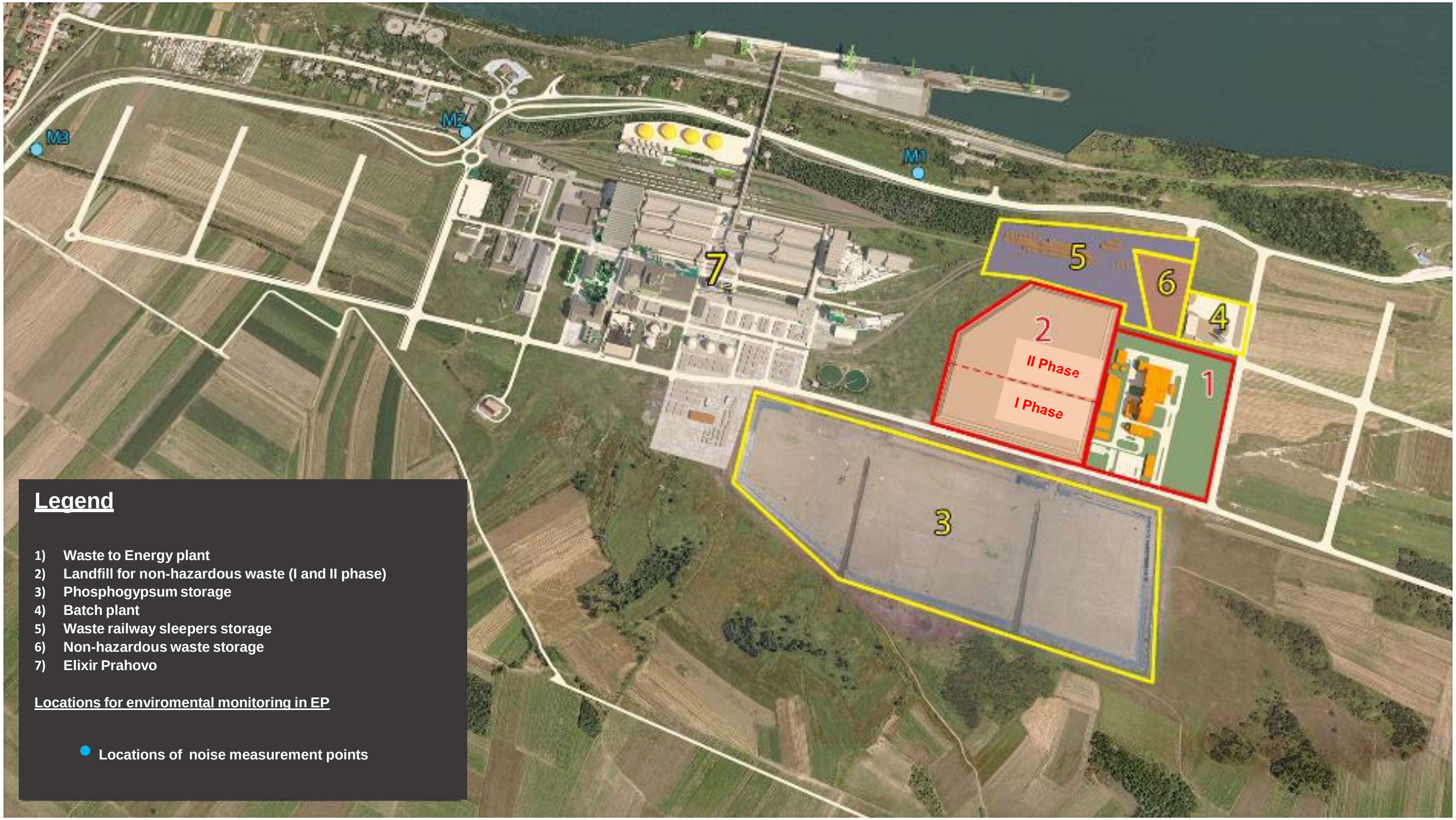


Figure 5.15 Locations of noise measurement points

In accordance to the Regulation on Noise Indicators, Limit Values, Noise Indicators Assessment Methods, Annoyance and Harmful Effects of Environmental Noise ("Official Gazette of the RS", no. 75/2010) all three measuring points belong to zone 4 (business-residential areas, commercial-residential areas) for which the permissible outdoor noise level of 60 dB(A) is prescribed for day and evening, and 50 dB(A) for night (Table 5.8).

Table 5.8 Limit values of outdoor noise indicators

Zone	**Purpose of the space**	Noise level in dB(A)	
		for day and evening	for night
1.	Rest and recreation areas, hospital zones and convalescent homes, cultural and historical sites, large parks	50	40
2.	Tourist areas, campsites and school zones	50	45
3.	Clean residential areas	55	45
4.	Business and residential areas, commercial and residential areas and children's playgrounds	60	50
5.	City center, craft, commercial, administrative zone with apartments, zone along highways, main and city roads	65	55
6.	Industrial, warehouse and service areas and transport terminals without residential buildings	At the border of this zone, noise must not exceed the limit value in the zone with which it borders	

The results of the measurements show that the relevant noise level at the measuring points M1, M2 and M3 DO NOT EXCEED the noise limit values for the day, evening and night terms, i.e. the test results comply with the requirements of the aforementioned Regulation during the regular operation of the ICP Elixir Prahovo complex.

5.4 Climate factors

Negotinska Krajina is the most continental area of eastern Serbia, due to the warmest summers and the harshest winters. In the winter months, mercury in the thermometer descends to 30˚C below zero, while, very often, measurements during the summer show up to 40˚C in the shade.

The climate factors of the Prahovo area, and therefore the locations of the project in question, are described in detail in Chapter 2.8. Overview of climatic characteristics with appropriate meteorological indicators.

5.5 Buildings, immovable cultural property, archaeological sites and ambient units

The realization of the project in question is planned on undeveloped construction land located within the industrial zone. The cadastral parcels on which the Waste Energy Plant will be built and the Landfill for non-hazardous waste are an integral part of the Technological Unit C – Zone IV - Energy and Ecological Island in accordance with the Second Amendments to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo.

The following industrial and economic complexes are also located in the environment of the Eco Energy complex:

- Elixir Prahovo complex in the direction of west and north along the plant border,
- Port of Prahovo and River Shipping Krajina, at a distance of about 700 m in the north-west direction from the plant border,
- Phosphea Danube DOO – at a distance of about 900 m west of the plant boundary,
- NIS petroleum products warehouse, at a distance of about 950 m from the plant border in the north-east direction from the plant border,
- Hydro power plant "Djerdap II", at a distance of about 4.5 km in the direction of the west.

The following existing facilities are located immediately next to the boundary of the subject location of the future Eco Energy complex:

- Phosphogypsum Warehouse – south, belonging to the Elixir Prahovo complex,
- Waste railway sleepers storage, non-hazardous waste storage and concrete batch plant – north (belongs to the Elixir Prahovo complex),
- wastewater treatment plant of the ICP Elixir Prahovo – west, (belongs to the Elixir Prahovo complex),
- Unconstructed land – west,
- Land which, by the Amendments of DRP, is designed for the expansion of the production part of the industrial complex (towards Radujevac), for the formation of a chemical park, a new production complex of the same or compatible activity, with the necessary accompanying, technologically and functionally related facilities, with several independent units, with new Investors - east.

Thus, immediately adjacent to the eastern border and south of the future Waste to Energy Plant, there is agricultural land, which has been devastated and is no longer suitable for performing agricultural activities. This land was mostly purchased by Elixir and other legal entities, and a smaller part is owned by natural persons.

There are no residential buildings in the immediate vicinity of the future Eco Energy complex. The settlement of Prahovo, located at a distance of about 2 km in the direction of the west, the village of Radujevac is located at a distance of about 4 km in the east-southeast direction of the project in question, the settlement of Samarinovac, at a distance of about 5 km in the southwest direction, the settlement of Srbovo, at a distance of about 6 km in the south direction, the settlement of Dušanovac, at a distance of about 7 km in the northwest direction, and the settlement of Negotin, at a distance of about 10 km in the southwest direction. Immediately along the border of the expansion of the chemical industry complex in Prahovo, in the direction of the west, at a distance of 1,300 m, there is a workers' settlement (a smaller group of residential buildings). The nearest Romanian settlements are: Izvoarele at a distance of about 4 km, north of the site in question and Gruja at a distance of about 7 km, east of the site in question. The nearest Bulgarian settlements are: the village of Balej at a distance of about 10.5 km from the site in question and the village of Kudelin at a distance of about 10.6 km from the site in question.

According to the submitted records of the Institute for Cultural Heritage Preservation Niš (within the Act on the Conditions for the Preservation, Maintenance and Use of Immovable Cultural Property as well as Goods that Enjoy Prior Protection and Determined Protection Measures for the DRP of the Industrial Complex in Prahovo, No. 818/2 dated August 19, 2013) **there are no identified immovable cultural property in the defined area.**

Within the defined limits of the scope of the Detailed Regulation Plan for the subject area, there are no recorded natural and ambient units, as well as archaeological sites.

5.6 Landscape

The landscape characteristics of the analyzed spatial unit are an important element for considering the overall relations between the planned project and the environment.

The construction as an element of the existing landscape includes all existing built facilities at the analyzed location, so the industrial complex itself already has an impact on the change of the existing landscape within the chemical industrial zone. Within the Zone I of the industrial complex – The existing industrial complex has formed a belt of existing protective greenery within the production part of the industrial complex and part of the complex for the production of phosphate mineral fertilizers, as well as protective greenery within the part of the industrial complex without production functions. The existing protective greenery within the industrial and part of the complex for the production of phosphate mineral fertilizers is in function of the purpose of the facilities and their protection against adverse impacts from the production process. It is positioned to form a buffer zone between the industrial complex and the state road, as well as a buffer zone between the industrial complex and housing within the workers' settlement in the immediate vicinity.

Other amendments to the Detailed Regulation Plan envisage the formation of an additional protective green belt along the border of the overall industrial complex. The protective green belt has the role of isolating the immediate environment from negative impacts within the economic zone. Within this part of the zone, construction is prohibited. The construction of the necessary underground installations and infrastructure routes as well as the necessary above-ground transport systems as a function of the technological process (conveyors) may be allowed, all in accordance with positive regulations in order not to diminish the importance of the protective greenery belt.

5.7 The interrelationship of listed factors

Taking into account all the above, it can be noted:

- Waste-to-Energy by thermal treatment of non-recyclable hazardous and non-hazardous liquid and solid waste (industrial, commercial and municipal) in order to obtain thermal energy used for the production of water vapor that will be further delivered and used for the operation of existing industrial plants within the Elixir Prahovo complex, mechanical pretreatment of waste and physical and chemical treatment of residues from the boiler plant, as well as disposal of the obtained non-reactive/non-hazardous solidificate by previous treatment to the Landfill for non-hazardous waste at the location in question is not in conflict with the Second Amendment to the Detailed Regulation Plan for the chemical industry complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 17/22), and is fully compatible with the planned purpose of the space.
- The immediate environment of the Eco Energy complex in question consists of an area with a small degree of population, since it is an existing industrial zone.
- In the environment of the project in question, there are no registered protected natural resources, as well as rare, endangered and protected representatives of flora and fauna, or their habitats.
- There are no protected cultural goods in the immediate vicinity of the project site.
- During the regular operation of the subject Waste to Energy Plant and Landfill of non-hazardous waste, there will be emissions of pollutants into the air, generation of waste water, noise emission, waste generation, but bearing in mind the location and envisaged protection measures (see Chapter 8. of the Study) on the subject project, the mutual relations of these factors, i.e. possible cumulation with the effects of others, is minimized. In order to monitor the operation of the plant and potential environmental impacts, the Project Holder is obliged to regularly monitor environmental parameters in accordance with the monitoring plan prescribed in Chapter 9 of the Study in question.
- By applying preventive measures in terms of treatment of air, wastewater, unpleasant odors, methods of organization and operation of the plant, it has been achieved that emissions from the plant are in accordance with the highest standards of the European Union, conclusions on the best available technologies and BREF documents:
    - Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, **for waste incineration** (notified under document C(2019) 7987)
    - Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions **for waste treatment**, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.)
    - European Commission, Reference Document on Best Available Techniques on **Emissions from Storage**, July 2006
- Regular operation of the plant will not adversely affect climatic conditions. The implementation of the project achieves a positive effect in terms of reducing the use of fossil fuels, reducing greenhouse gas (GHG) emissions and decarbonization of thermal energy for the ICP Elixir Prahovo complex.
- The positive effect due to the implementation of the project is also reflected in the reduction of the amount of waste that is permanently disposed of at non-sanitary garbage dumps and landfills and the improvement of the municipal waste management system.

6.0. DESCRIPTION OF POSSIBLE SIGNIFICANT IMPACTS OF THE PROJECT ON THE ENVIRONMENT

The environment is an organized entity that is composed of several subsystems (air, water, soil, noise level, climatic conditions, population density, utility infrastructure, ecosystems, etc.) which is reflected through their interaction, and the pollution process can develop in space and time in each subsystem separately with an indirect effect on other subsystems.

One of the important features of the pollution process is that any harmfulness that occurs during the construction and exploitation of the facility leads to pollution in a shorter or longer period of time, which obliges the analysis of the impact of all possible pollutants.
The impacts that can occur are divided into three groups:

- impacts during the construction of the Eco Energy complex in question
- impacts under regular conditions of exploitation and
- impacts due to accidents.

In all cases, the impact of the project on facilities and other elements of living and non-living nature in the environment that may be affected by the given facility and process is considered.

By analysing the planned activities on the construction and during the regular operation of the future Eco Energy complex, the environmental impact was identified, assuming that the protective measures envisaged by the project documentation are applied during the construction and regular operation of the project.

6.1 Overview of possible changes in the environment during the execution of the project

The execution of construction works and landscaping lead to changes in the environment that are mainly limited to the immediate environment of the site where the works are performed. Environmental impacts that may occur during the execution of works are of temporary nature, i.e. for a limited period of time, and their impact would be limited only to the location of the construction site. These impacts can be manifested by increased noise levels, exhaust emissions resulting from the operation of machinery on the construction site, as well as the dispersal of dust particles during earthworks and other construction works.

Environmental protection at this stage of work is carried out by appropriate organization of work on the construction site as well as by careful handling of machines.

6.1.1 Air, water, soil quality, noise level, vibration intensity, heat and radiation

6.1.1.1 Impact on air quality

During the construction of the Eco Energy complex, air pollution is possible due to the operation of construction machines and during the execution of intensive works, when the elevated concentration of suspended particles is expected, mostly of inorganic origin (sand, cement, lime, etc.), but there is also dust of organic origin (wood, soil, resin, etc.) in this case on a very small scale.

The accompanying emission of pollutants occurs in the process of welding metal parts of equipment structures, painting, the use of protective and anti-corrosive agents, as well as the presence of working machines and is of a temporary nature.
The use of machines that use diesel fuel for operation leads to the pollution of the lower layers of the atmosphere with exhaust gases. In the exhaust gases, diesel fuel combustion products, so-called flue gases and gaseous harmful substances are present as pollutants: carbon dioxide, carbon monoxide, nitrogen oxides, hydrocarbons, PM particles, soot, halogen elements, etc. Especially dangerous are polycyclic aromatic hydrocarbons (PAHs) that have proven carcinogenic properties.

By engaging construction machines, there is a different intensity of exhaust emissions, depending on the type and amount of machinery presence, fuel quality, operating mode and engine load.

The amount and type of flue gases, harmful substances and emissions are given in Tables 6.1, 6.2 and 6.3. Table 6.4 provides data on the types of vehicles (machinery) that will be engaged in the construction of the Eco Energy complex and the estimated number of working hours thereof.

Table 6.1 Harmful substances during combustion of diesel fuel[60]

Concentrations kg/1000 lit diesel fuel	**CO**	**CH**	**NO_x**	**Solid matter**
Diesel engine	7.1	1.2	26.4	13.2

Table 6.2 Emission value at diesel consumption of 15-20 litres /h[61]

	CO	**CH**	**NO_x**	**Solid matter**
Emission (g/s)	0.04	0.007	0.15	0.073

Table 6.3 Emissions of pollutants into the air by vehicle type in the EU[62]

Passenger car				
displacement	CO (g/km)	CH (g/km)	NO_x (g/km)	PM (g/km)
Below 2000 cc	1.0	0.306	0.7	0.362
Above 2000 cc	1.0	0.306	1.0	0.362
Lighter trucks				
	CO (g/km)	CH (g/km)	NO_x (g/km)	PM (g/km)
	2.4	0.506	1.7	0.333
Freight vehicles				
load capacity	CO (g/km)	CH (g/km)	NO_x (g/km)	PM (g/km)
3.6 – 16.0 t	18.8	2.79	8.7	0.95
Over 16.0 t	18.8	5.78	16.2	1.60

Table 6.4 Types of vehicles (machinery) that will be engaged in the construction of the Eco Energy complex and the forecast of number of operating hours of the said machinery

Vehicle type	Number of working hours of machinery on the construction site
Excavator 22 t	925
Truck single 15m^3	1850
Bulldozer D-7	170
Road roller	170
Grader	60
Tanker truck	60
Crane 30 t	950
Crane 60 t	430
Crane 90 t	140
Men lifting basket	2450
Telehandler	330

[60] CRC Handbook of Environmental Control, Volume 1 – Air pollution, section 3. Emission sources, 3.6. Transportation emission, page 323
[61] CRC Handbook of Environmental Control, Volume 1 – Air pollution, section 3. Emission sources, 3.7. traffic emissions study, page 349
[62] Air Pollution from Motor Vehicles, Asif Faiz, Christopher S. Weaver, Michael P. Walsh

Given the fact that the project in question is implemented within the existing industrial zone at the location of the existing chemical industry complex in Prahovo and that this impact is of **temporary nature and limited only to the duration of construction and mechanical works, it can be concluded that no significant negative impact on the environment is expected.**

The amount of pollutants decreases with distance from the emission source, so a temporary, **short-term negative impact can only be expected on the site and the immediate environment.**

Based on all of the above, it can be concluded that there will be no significant impairment of environmental quality and air quality.

6.1.1.2 <u>Impact on water and soil quality</u>

Having in mind the distance of the location envisaged for the construction of facilities from the nearest watercourse – the Danube River of about 500 m in the north direction, with the application of all envisaged preventive protection measures, the execution of the project in question cannot have a negative impact on the quality of surface waters, since there is no discharge of wastewater into surface waters during the execution of works.

For the purpose of performing construction works of the planned facilities at the subject location, a construction site will be formed, within which prefabricated facilities will be installed, ground floor (office containers) in which there are working and auxiliary premises of common purpose (sanitary facilities, café kitchen, meeting room and warehouse space). Internal roads and plateaus for the movement of vehicles and employees will be formed within the construction site itself. Plateaus for parking freight vehicles, passenger vehicles and work machines will also be foreseen within the construction site. The construction site will be fenced with a wire fence to prevent unauthorized persons from entering the construction site. All hazardous substances (various chemicals such as machine oils, anti-corrosion protection coatings, resins, PP protection coatings, etc.), gas welding gases and burners (oxygen, nitrogen cylinders, etc.) will be stored in construction containers, on appropriate portable bundwalls and standard cylinder cages and under the strict control of the contractor and in accordance with the work plan of the construction site.

Despite all the aforementioned measures envisaged within the construction site, damage to construction machinery may occur during construction, i.e. the release of hazardous substances on the ground. Such discharges cannot significantly endanger the soil, as these are small quantities, and can be prevented by careful handling by trained workers, loading fuel into the machinery outside the construction site and regular maintenance of construction machinery, by rapid response of taking relevant measures in case of accident, for which the contractor is responsible. If hazardous substances are released to the ground, it is necessary to immediately perform remediation by sprinkling the spill site with sorbent (e.g. sand, zeolite, wood sawdust, neutralizing agents, etc., which will be provided at the construction site) in order to collect spilled substances. The contaminated absorbent will be disposed of in the designated containers until it is handed over to authorized operators for further disposal.

With the application of all measures, the quality of groundwater can also not be endangered by the execution of the project.

In order to prevent the impact of construction works on the quality of soil and groundwater, it is necessary to store all construction waste in an organized manner at the designated places and timely transport from the location of the construction site, as well as material that may contaminate the environment on the construction site, packaging waste, etc., store it in closed facilities with a waterproof base that can be cleaned, install devices for evacuation of used water. All containers with liquid waste materials will be placed on bundwalls and protected from atmospheric influences.

<u>Waste generation</u>

Construction and craft works lead to the generation of different types of waste. The Contractor is obliged to dispose of all waste material generated at the site in accordance with the Construction and

Demolition Waste Management Plan and to hand it over to authorized operators who hold a permit for the treatment or disposal of these types of waste.
During the construction of facilities in subject, waste generation is expected on the construction site itself. Expected types of waste are:

- construction waste (hazardous and non-hazardous)
- secondary raw materials
- packaging waste (hazardous and non-hazardous)
- municipal waste.

Chapter 3 provides an overview of the expected types of waste that can be generated on the construction site.

Construction waste should be continuously removed from the construction site during construction, so as not to accumulate, and an authorized company should be hired in accordance with the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016 and 95/2018 - other law and 35/2023) and the applicable by-laws governing this area.

All waste generated on the construction site will be classified as hazardous (packaging made of various chemicals, etc.) and non-hazardous (municipal, metal, etc.) and will be placed in adequate separate containers/vessels until the moment of removal from the construction site. The transport of waste will be carried out by an operator authorized for the transport of specific waste type.

Earthworks include the execution of excavation according to detailed drawings, elevations and dimensions that will be defined by the Detailed Design.

In accordance with the planned works, it is necessary to provide an appropriate space for the reception of the total amount of excavated soil in accordance with the dynamics of the delivery. The space provided for the reception and temporary storage of soil must be organized in such a way as to allow access for sampling and analysis by an accredited laboratory. If, on the basis of the performed analyses, it turns out that soil is contaminated and has the characteristics of hazardous waste, it is necessary to hire an authorized operator who possesses the appropriate permit of the relevant Ministry of Environmental Protection, which will treat waste soil IN situ or by EX situ methods. The list of authorized operators holding waste management permits can be found on the website of the Environmental Protection Agency:

http://www.sepa.gov.rs/index.php?menu=20174&id=20055&action=ShowExternal

Excavated soil that has the characteristics of non-hazardous waste can be used to fill the terrain where necessary or can be disposed of at the nearest landfill (covering proposal).

The generation of hazardous waste is expected in smaller quantities, as follows:

- residues of various artificial resins and synthetic building materials,
- residues of paints, varnishes and solvents,
- packaging waste from hazardous substances.

This impact is also characterized as the impact of the short duration of the temporary character, and given the fact that the environmental protection measures given in Chapter 8 of this study will be applied during construction, it can be concluded that no significant negative impact on human health and the environment of the generated waste originating from the construction site is expected during the construction of the project.

6.1.1.3 Impact on noise levels in the environment

Noise at the subject location will occur during the construction of facilities within the Eco Energy complex as a result of the operation of construction machinery. Noise-generating activities during the construction phase of the facilities in question are as follows:

- Site preparation and clearing;
- Backfilling of soil, gravel and concreting;
- Execution of prefabricated reinforcement works:
- Construction of the facilities in question and installation and mounting of process equipment;

- Transportation and manipulation of material, equipment and machinery.

Noise is a necessary consequence of the execution of works and is temporary in nature and only for the duration of the works. Construction machines and trucks that will be engaged during construction works represent a source of noise that reaches from 80 dB(A) to 90 dB(A), depending on the type of machine, degree of load, technical condition and method of operation.

Table 6.5 shows the values of the noise levels generated by construction machines.

Table 6.5 Noise level generated by construction machinery

Noise source	Maximum noise level dB (A)
Drilling the soil with drill bits	94 (3 m)
Backhoe	87 -99 (10 m)
Backhoe idle	74 (10 m)
Concrete mixer	77 -85 (3 m)
Chainsaw	89 -95 (3 m)
Circular saw for concrete	91 (10 m)
Compressor	91 (10 m)
Loader	79 -93 (15 m)
Impact hammer with movable arm	100 (1 m)

The noise level decreases with the square of distance, the soil and the vegetation both absorb and reflect the sound waves, so an increased noise level should not be expected at a distance of more than 50 m from the worksite.

For noise emission from the execution of works, it is important that it is time-conditioned, in accordance with the planned working hours of the construction site. This means that the increased noise level from this source will only be present during the scheduled working hours, during the morning and afternoon hours. In the evening and night hours, when the suspension of works on the construction site is in force, the noise level will not exceed the usual noise levels prevailing at the site in question.

There are no residential buildings or structures in the immediate vicinity of the site except those belonging to the Elixir Prahovo industrial complex. The nearest residential buildings workers' settlement (a smaller group of residential buildings) is located directly along the border of the expansion of the chemical industry complex in Prahovo, in the west direction, at a distance of 1,300 m from the site in question, while the distance of other larger settlements is more than 2 km. Taking into account that all facilities are sufficiently far from the location in question, and that the duration of noise will be time limited, no negative consequences for human health and the environment are expected.

In accordance with the Study of Biodiversity of the Industrial Complex "Elixir Prahovo" – Industry of Chemical Products LTD Prahovo, prepared in April 2024 by the Institute for Biological Research "Siniša Stanković", National Institute of the Republic of Serbia, University of Belgrade, it can be concluded that the species of animals that inhabit the area in question, due to their centuries-old and numerous anthropogenic presence, are precisely synanthropic, those that are adapted to human activities and that are very little sensitive to noise. With all of the above in mind, this aspect of the impact on fauna is negligible.

During the execution of works on the site, **there will be no emission of ionizing and non-ionizing radiation, heat and vibrations.**

6.1.2 Population health

The environmental impacts that may occur during the execution of works on the construction of the Eco Energy complex are of a temporary nature. These impacts can be manifested by increased noise levels, exhaust emissions resulting from the operation of machinery on the construction site, as well as the dispersal of dust particles during earthworks and other construction works. Environmental protection at this stage of work is carried out by appropriate organization of work on the construction site as well as by careful handling of machines. The accompanying emission of pollutants occurs in the process of welding metal parts of equipment structures, painting, the use of protective and anti-corrosive agents, as well as the presence of working machines and is of a temporary nature.

The causes of possible negative impacts and the occurrence of health problems are primarily untimely and inadequate monitoring and control of air pollution and noise levels, the absence or inadequate application of protection measures against these harmful effects, inadequate maintenance of equipment and devices, as well as lack of awareness of possible dangers to human health.

The amount of pollutants decreases with distance from the emission source, so a temporary, short-term negative impact can only be expected on the site and the nearest environment.
Given that there are no residential buildings in the non-hazardous vicinity of the construction site, based on all the above, it can be concluded that there will be no significant impairment of the quality of the environment and human health during the implementation of the project.

All workers engaged in the execution of works must wear personal protective equipment and clothing and footwear prescribed for the performance of certain works (protective masks, goggles, gloves, appropriate footwear, protective suits, etc.). All equipment must be certified and tested in accordance with the applicable standards and regulations in this field.

6.1.3 Meteorological parameters and climatic characteristics

The basic microclimate indicators that can be registered at the analysed location (temperature, humidity, evaporation, radiation, air pollution) will not be disturbed in specific spatial relationships.
The impact of the project execution is temporary and of local character. All microclimate changes are spatially limited to the narrowest band of project execution and do not have spatially widespread negative effects.

Given the spatial scale of these phenomena as well as the characteristics of the analysed location, it can be concluded with certainty that these phenomena will not have significant negative consequences on the wider environment**.**

The implementation of the project will not have any impact on the change of local meteorological and climatic characteristics.

6.1.4 Ecosystems

Possible impacts on fauna during construction works that need to be considered may relate to habitat removal, disturbance of individuals, or death of individuals.

Chapters 2.9 and 5.2 of this study state that there is no plant and animal life of importance at the close location according to the data given in the Biodiversity Study of the industrial complex "Elixir Prahovo" – Industry of Chemical Products LTD Prahovo, April 2024, prepared by the Institute for Biological Research "Siniša Stanković", National Institute of the Republic of Serbia, University of Belgrade, as well as on the basis of the decision of the Institute for Nature Protection of Serbia no. 021-3738/2 of 10.11.2023 and no. 021-2591/2 of 3.8.2023. Therefore, the Study concluded that there are no registered rare, endangered, protected species of flora and fauna on the site itself that would be affected by the project, and that the impacts on the wider site are negligible.

The expected intensity of works on the construction of the plant does not include activities that cause impacts over a longer distance, as well as in the downstream sector of the Danube, i.e. impacts are expected locally, in the industrial zone, so that there is no impact of the construction of the plant in question on the Djerdap National Park.

Bearing in mind the position of the location where the construction of the plant in question is planned, the said Biodiversity Study also considered the potential of negative impacts of the construction and operation of the plant on the biodiversity of nearby areas of neighbouring countries (Romania and Bulgaria) and found that the transboundary impacts of the construction and operation of the plant in question are negligible, i.e. almost impossible from the aspect of biodiversity.

Removal of fauna habitat during construction includes areas where facilities and accompanying infrastructure are installed in the Eco Energy complex. Since this is not an area of significant biodiversity, but an anthropogenic habitat populated by synanthropic, widespread species, **this aspect of the impact on fauna is negligible.**

Disturbance due to the movement of workers, machines and the installation of designed facilities and structures, both above the ground and below, does not exceed the already existing disturbance due to the intensive movement of people, vehicles throughout the area of project. This is especially negligible if we take into account that the location in question is one of the largest industrial complexes in the region, as well as the fact that the species of animals that live here due to the centuries-old and numerous anthropogenic presence are precisely synanthropic, those that are adapted to human activities and that are very little sensitive to disturbance. At the subject location of the industrial zone, the movement of workers (pedestrians) is numerous and frequent, which will not significantly be increased by subject works through the presence of construction workers, engineers, etc. Noise and movement of machines have a significantly lower effect on birds than the already regular and numerous presence of people. With all of the above in mind, **this aspect of the impact on fauna is negligible.**

The impact on the ecosystem through habitat destruction during construction is very small and includes the areas where the facilities within the Eco Energy complex are installed.

In order to examine in details the potential impact of the construction of the complex in question on biodiversity in the wider environment of the plant, as well as the potential impact in the transboundarycontext of the impact on biodiversity in Romania and Bulgaria, the Biodiversity **Study of the impact zone of the Industrial Complex "Elixir Prahovo"** – Industry of Chemical Products LTD Prahovo"was prepared by the Institute for Biological Research "Siniša Stanković" (attached to the study).

In accordance with the analysis given as part of the above-mentioned biodiversity study, the following was concluded:

- The vegetation of the study area is heterogeneous. The following stand out: typical water, riparian, ruderal and vegetation of arable surfaces. The narrower zone where the construction is planned is located within the industrial zone, where **plant communities of importance to conservation biology are not recorded.** In the case of the application of the best available technologies in the work procedures during the construction of the complex in question, which the Project Holder has planned, **no significant residual impact during the construction works is expected on the vegetation, both locally and in the wider context.**
- The analysed area between Kusjak, Prahovo, Radujevac and in the south to Negotin represents a depression that is shaped by the meander of the Danube. By eradicating the Mesian forest of grey pedunculate and draining the floodplain of the pond and wetlands, natural potential vegetation was permanently destroyed, and with it the accompanying fauna. The area is dominated by anthropogenic communities of arable land (pastures, fields, orchards, vineyards) and communities of grey pedunculate are reduced to minor "islands". **Current vegetation, flora and fauna are of secondary origin and are of no interest for protection. The planned works on the construction of the complex will not lead to additional environmental damage, including butterfly fauna.**
- Considering the location and scope of the construction of the plant in question, no significant negative impact on the Odonata fauna is expected. Construction activities will be carried out in an industrial zone where no habitats of importance to this group of organisms are detected.
- As stated in the BUTTERFLIES section (LEPIDOPTERA Linnaeus, 1758), the space between Kusjak, Prahovo, Radujevac and in the south to Negotin represents a depression that is shaped by the meander of the Danube. This depression is dominated by arable land, while sometimes lush forests of grey pedunculate, as well as other natural vegetation, are almost completely degraded. In this way, the primary habitats of many insect species have been destroyed, including the shear beetle species listed in the text. **Additional impacts on these insects as a result of the construction of the facilities in question are not expected.**

- The results of the identification of silicate algae in the examined part of the course of the Danube indicate the presence of a total of 136 taxa within 48 genera. **No significant impacts of plant construction activities on benthic algae are expected.**

- A total of 109 taxa were recorded at the examined sites of the Danube in the zone of planned construction. **No significant impacts of plant construction activities on macroinvertebrate fauna are expected.**
- The negative effects on the fish fauna are mainly due to the impact of the HPP "Djerdap 1 and 2" dams, which prevent migration upstream and downstream, affect the flow regime and cause large oscillations in the water level, above, between and in the part of the flow below the dams. These significant changes caused changes in the ichthyofauna of the Danube. Migratory fish species such as sterlet and barbel, which favour the faster flow, have migrated to the upstream part of the Danube, while species such as bream showed intensive growth in the newly formed reservoirs. It is known that in this region at the end of the 20th century, roe of the moruna was used to produce one of the most prized caviars. Although until recently the morunas were being fished, their presence has not been confirmed with certainty in the lower Danube for a long time. Overfishing, as well as the impact of the Djerdap hydroaccumulation on spawning, has caused a decreasing number of these species in the Danube. The Danube sector under the dams has a rich fish fauna, with a large share of indigenous species (84%). During field research, 21 species were not recorded, but their presence can be expected in this part of the Danube based on literature data. However, the literature states that these waters are inhabited by species from the families Acipenseridae (sturgeon, six species) and Anguillidae (eel, one species), all of which are under protection, and whose safe finding has not been confirmed for a long period of time. Out of a total of 74 species listed in the text, which are expected to be found in this sector of the Danube, 21 species are protected and 25 are strictly protected. **The construction of the facility in question in the littoral zone, within the industrial zone, should not have a significant negative impact on the fish fauna.**
- Within the wider zone of planned works, 22 species of amphibians and 26 species of reptiles were recorded. The impact of the construction works of the facility on the fauna of amphibians and reptiles can be assessed as minimal, given that the works will be carried out in an industrial zone where **no significant habitats for these groups of organisms are recorded,** and that no significant infrastructure works on access roads are envisaged.
- Bearing in mind the investor's commitment to use the best available technologies in the operational phase of the plant, which includes the application of all measures to prevent air, soil and water pollution, the application of advanced material disposal technologies, as well as measures to prevent accidents, **no significant residual impacts on amphibians and reptiles are expected.**
- The diversity of bird species and their habitats in the area of the lower course of the Danube basin is significant and a large number of endangered and protected species (43 species) are recorded, as well as habitats, primarily wet, which are significant from the aspect of biodiversity protection. The fauna of birds in the wider area of the subject works has historically been negatively affected by all forms of habitat degradation, followed by disturbance and pollution. First of all, the impact refers to the nesting period. Birds are also susceptible to disturbance during other times of the year. Smaller species of birds, primarily songbirds and woodpeckers, may lose part of their habitat during works carrying out in the area in question. **Considering the impacts during construction works, and bearing in mind that no significant infrastructure works are required on access roads, as well as that the facility is being built in the already existing industrial zone, potential additional pressures can be characterized as low intensity, and the impact as negligible.**
- The area of interest and its immediate surroundings is inhabited by 38 species of mammals, of which, according to national legislation ("Official Gazette of the RS", no. 5/2010, "Official Gazette of the RS" no. 9/2012) 5 species are strictly protected and 21 species are protected. As in the cases of the previous components of biological diversity, and considering the impacts during construction carrying out, and bearing in mind that no significant infrastructure works are required on access roads, as well as that the facility is built in the already existing industrial zone, **potential additional pressures can be characterized as low intensity, and the impact as negligible.**
- The research of the Prahovo zone recorded a small number of bat species and low activity, although

the wider region is one of the most diverse in Serbia in terms of overall wealth of bat fauna (Paunović et al 2020, personal data).

Conclusions reached regarding potential transboundaryimpacts on biological diversity in the territory of Romania (Natura 2000 area Blahnița, Gruia - Gârla Mare, Dunărea la Gârla Mare – Maglavit and Natura 2000 area Jiana, Ramsar area Blahnița and the National Park "Domogle-Valea Cherni") and Bulgaria (Natura 2000 area Timiok, Natura 2000 area Novo selo and Deleina NATURA 2000 area) are as follows:

- **Residual (after the application of the best available technologies and measures) transboundaryimpacts of the construction works and operation of the plant in question can be characterized as negligible.** This applies to areas protected from the aspect of biodiversity conservation to new species and significant habitats, as well as the preservation of ecological connectivity – ecological corridors. The expected intensity of works on the construction of the plant does not include activities that cause impacts over a longer distance, as well as in the downstream sector of the Danube, i.e. impacts are expected locally, in an industrial zone that is not significant from the aspect of biological diversity.
- Regarding the impacts on habitat connectivity, i.e. the establishment and functionality of ecological corridors, it was pointed out that the construction is carried out within the spatial scope on areas that are not under indigenous vegetation, **do not represent significant habitats, and no additional impacts on ecological corridors are expected.**

Bearing in mind all the envisaged measures to reduce emissions of pollutants into the environment, it can be said that the implementation of this project **will not affect the plant and animal species that inhabit this area and its environment.**

6.1.5 Populousness, concentration and migration of the population

Considering that the place of execution of works is planned within the industrial zone in Prahovo and that the location is intended precisely for such types of activities, the settlement and concentration of the population at the location for the execution of the project in question cannot be discussed.

The impact of the stage of execution of works on the population, concentration and migration of the population is not expected, since it does not include the relocation of the population on the site itself. Also, no activities are envisaged that would lead to the need to relocate parts of the surrounding settlements or population migration.

6.1.6 Purpose and use of areas (built and unbuilt areas, use of agricultural, forest and water land, etc.)

The subject site envisaged for the construction of the Eco Energy complex is located on undeveloped construction land belonging to the part of the Technological Unit C – Zone IV - Energy and Ecological Island in accordance with the Second Amendments to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo, therefore it completely fits into the defined purpose and use of the land.

Today, at the location of the chemical industry complex in Prahovo, Elixir Prahovo, a member company of the Elixir Group Business System, operates as a large existing chemical complex for the production of basic chemical products, known for the production and processing of phosphorus components and the production of mineral fertilizers. In addition to the chemical part, a transportation part was developed, based on port, railway and road infrastructure.

Thus, immediately adjacent to the eastern border and south of the future Waste-to-Energy Plant, there is agricultural land, which has been devastated and is no longer suitable for performing agricultural activities. This land was mostly purchased by Elixir and other legal entities, and a smaller part is owned by natural persons. North and west of the Waste-to-Energy Plant and Landfill for non-hazardous waste are the production and storage facilities of the Elixir Prahovo complex.

6.1.7 Utility infrastructure

In accordance with the obtained Terms of Elektrodistribucija Srbije (eng. Electrodistribution of Serbia) (attached) in the vicinity of the given location, **but outside the area where the construction of the**

facilities in question is planned, according to the information from the competent plant, there is an above-ground and underground electroenergetic installation under the jurisdiction of Electrodistribution of Serbia ltd. Belgrade, while Electrodistribution of Serbia ltd. Belgrade, Electrodistribution Zaječar Branch, does not own data on the existing electroenergetic installations (internal installations) owned by Elixir on the cadastral parcels in question.

The construction of facilities will not affect the electricity network facilities, since the obtained conditions of "Elektromreža Srbije" JSC (attached) state that there are no facilities owned by "Elektromreža Srbije" JSC in the immediate vicinity of the facilities in question.

PUC "Badnjevo", in accordance with the submitted conditions, noted that there is no data on the foul or atmospheric sewage network present in the subject area. All transport infrastructure will be aligned with the planning documentation and the resulting conditions attached hereto.
In accordance with the obtained conditions of "PE Srbijagas" (given in the prologue), it was
noted that there is no constructed gas pipeline network or facilities within the scope of the planned works, so there is no impact on them.

The conditions of Telekom Srbija also stated that there is no infrastructure of Telekom Srbija in the vicinity of the aforementioned facility, and therefore there is no impact on them.

There are no buildings at the location in question, therefore they are not endangered by the execution of the Project.

6.1.8 Natural goods of special values and immovable cultural goods and their surroundings, etc.

According to the submitted records of the Institute for Cultural Heritage Preservation Niš (within the Act on the Conditions for the Preservation, Maintenance and Use of Immovable Cultural Heritage as well as Goods that Enjoy Prior Protection and Determined Protection Measures for the DRP of the Industrial Complex in Prahovo, no. 818/2 of 19 August 2013), **there are no identified immovable cultural goods in the defined area.**

Within the defined limits of the scope of the Detailed Regulation Plan for the subject area, there are no recorded natural and ambient units, as well as archaeological sites. Based on archaeological research, conducted in 1975 (Archaeological Review no. 17 for 1976 - "PRAHOVO - FACTORY multilayer site" M. and Dj. Janković, p. 51-55), the existence of a multi-layered archaeological site was established, which is in the status of previous protection, so that it can be concluded that no additional protection measures are necessary from the point of view of the protection of immovable cultural goods.

In accordance with the above, it can be concluded that immovable cultural goods and archaeological sites cannot be endangered during the construction of this project, because the implementation of the project is planned within the existing chemical industry complex in Prahovo, Negotin municipality, where they do not exist.

In accordance with the Decision of the Institute for Nature Conservation of Serbia (attached), the subject location where the construction of the Waste-to-Energy Plant and Landfill for non-hazardous waste is planned is not within the protected area for which the protection procedure has been implemented or initiated, as well as within the spatial scope of the ecological network of the Republic of Serbia, and therefore has no impact on them.

6.1.9 Landscape characteristics of the area, etc.

The construction as an element of the existing landscape includes all existing built facilities at the analysed location, so the industrial complex itself already has an impact on the change of the existing landscape within the chemical industrial zone.

Within the industrial complex in Zone *I – The existing industrial complex* has formed a belt of existing protective greenery within the production part of the industrial complex and part of the complex for the production of phosphate mineral fertilizers, as well as protective greenery within the part of the industrial complex without production functions. The existing protective greenery within the industrial and part of the complex for the production of phosphate mineral fertilizers are in function of the purpose of the

facilities and their protection against adverse impacts from the production process and is positioned to form a buffer zone between the industrial complex and the state road, as well as a buffer zone between the industrial complex and housing within the workers' settlement in the immediate vicinity.
By Second Amendments to the Detailed Regulation Plan (SADRP) it is also planned to form an additional protective green belt along the limits of the complete industrial complex. The protective green belt has the role of isolating the immediate environment from negative impacts within the economic zone. Within this part of the zone, construction is prohibited. The construction of the necessary underground installations and infrastructure routes as well as the necessary above-ground transport systems as a function of the technological process (conveyors) may be allowed, all in accordance with positive regulations in order not to diminish the importance of the protective greenery belt.

The impact on the landscape during construction works is temporary and after the completion of the construction of facilities within the Waste-to-Energy Plant they will affect the change of the existing landscape within the industrial zones due to its visual characteristics (appearance of new facilities).

6.2 Overview of possible changes in the environment during the regular operation of the project

The hazards that can occur can be of those that occur under normal conditions of technological processes and hazards that can occur due to accidents or accidental situations. In both cases, the impact of the facility, i.e. the technological process and the activities performed, on the facilities and other elements of living and non-living nature in the environment is discussed below, and a qualitative and quantitative overview of possible changes in the environment is given.

The technology of obtaining energy from waste has been applied in Europe for decades, and more than 500 such plants are currently in operation. The applied thermal waste treatment technology complies with the most stringent legal regulations and the highest environmental protection standards. It is also important to note that obtaining energy from waste is subject to the most stringent standards compared to all other industrial sectors in the EU.

The project in question, in addition to the production facility considered from the point of view of the smooth functioning of the production process, also considers environmental protection, occupational safety and health and fire protection, so that the possibility of adverse impact on the environment or human health is minimal.

By analysing the activities planned at the Eco Energy complex, a preliminary identification of the environmental impact was carried out (see Table 6.6), assuming that all protective measures envisaged by the project documentation are applied during the regular operation of the project, as well as additional measures (mainly of an organizational character) and monitoring measures envisaged by this Study.

Table 6.6 Description of the impacts that define their overall character

Character of impact	Description of impact
Direct	Impact caused by a specific activity, which occurs at the same time and place as the specific activity (primary impact).
Indirect	Impact caused by specific activity, which occurs later over time and at a place different from the place where the specific activity took place (secondary impact).
Cumulative	The impact of one activity that, in combination with the same impact of another activity, leads to their cumulative increase (due to, for example, the existence of pollution sources in the immediate vicinity, which leads to an cumulative effect).
Synergetic	An impact that, along with some other impact, produces a third, completely new, effect.
Potential	An impact that does not currently exist, but for which the possibility of occurrence can be determined with a certain probability (low, medium or high).
Short-term	Impact caused by a specific activity, which lasts for a short period of time after the end of that activity.
Long-term	Impact caused by a specific activity, which persists for a long period of time after the end of that activity.

Character of impact	Description of impact
Intermittent	The impact caused by the specific activity, which has a limited duration in time, ceases after the end of the activity, and the object of impact returns to its original state.
Permanent	The impact caused by a specific activity, which persists even after the end of that activity, and the subject of the impact no longer returns to its original state.

The identified environmental impacts are classified into several basic types of impacts, which, thus defined, determine the character of the impact. The impact characteristics, listed in Table 6.7. are taken from the Rulebook on the Content of the Request on the Need for Impact Assessment and the Content of the Request for Determining the Scope and Content of the Environmental Impact Assessment Study ("Official Gazette of RS", No. 69/05), and a description of the impact in relation to the character is given in Table 6.6.

Table 6.7 "Leopold matrix" for preliminary identification of the environmental impact of the operation of the Eco Energy complex in question

	Type and character of impact										Required measures	
	Direct (Primary)	Indirect (secondary)	Cumulative	Synergetic	Permanent	Intermittent	Potential	Short-term	Medium-term	Long-term	Yes	No
Air quality	–	+	–		–		–			–/+	*	
Surface water quality		–	–		–		–			–	*	
Groundwater quality	–	–					–	–			*	
Soil quality	–						–	–			*	
Noise and vibration	–					–		–		–	*	
Heat and Radiation												*
Population health		–					–	–			*	
Population, concentration and migration of the population		+					+			+	*	
Meteorological parameters and climate		+								+		*
Ecosystem												*
Utility Infrastructure												*
Natural and cultural goods												*
Landscape												*
Waste generation	–	+		+	–/+					–/+	*	

+ positive impact;
– negative impact

6.2.1 Air, groundwater and surface water quality, soil, noise levels, vibration intensity, heat and radiation;

6.2.1.1 Impact on air quality

During the regular operation of the Waste-to-Energy Plant, the emission of pollutants will occur:

- **From the emitter of the waste pretreatment and waste storage plant: particulate matter and unpleasant odours**
- **From boiler plant emitters: particulate matters, heavy metals, HCl, HF, SO_2, NO_x, CO, NH_3, TVOC, PCDD/F, CDD/F+ dioxins as PCBs, Hg)**
- **From the emitter of the stabilization/solidification plant: particulate matter**

6.2.1.1.1 Air emissions from waste storage and pretreatment rooms

During the activities of unloading, temporary storage and pretreatment of bulk hazardous and non-hazardous waste, there will be occasional emission of unpleasant odours, particulate matter and TVOC. The occurrence of particulate matter will occur at all filling points and conveyors, as well as during the operation of the crane by which waste material (granulation <100 mm) is transferred and distributed in bunkers.

In order to reduce the impact on air quality, dedusting and removal of unpleasant odors from the unloading and pre-treatment of non-hazardous and hazardous waste is planned. The removal of pollutants will be carried out through a filter unit (W-C09 Waste pretreatment filter system and activated carbon filter) whose description is given in chapter 3.5.2 of this Study.

In order to quantify the impact, Table 6.8 provides an overview of the expected emission values on the emitter of the Waste Pre-treatment Filter System and activated carbon filters in accordance with the project documentation.

Table 6.8 Display of expected emission values on the emitter of the Waste Pretreatment Filter System and Activated Carbon Filters in accordance with the project documentation

Emitter	Pollutants	Expected mass flow value
Smokestack after bag filter and activated carbon filter	Particulate matter	< 5 mg/Nm^3
	TVOC	<30 mg/Nm^3

During the process of storing solid waste materials inside the bunkers located in the *facility W-C08 Pretreatment and waste storage*, the emission of unpleasant odours and dust may occur.

Preventing the emission of particles and unpleasant odors outside the hall with solid waste storage bunkers is achieved by keeping the hall constantly under pressure, drawing air from the hall and burning it in the boiler plant (air is extracted by a fan with a capacity of 23-47,000 Nm^3/h) or in the case when the boiler plant does not work (due to overhaul, downtime, etc.) by pulling out a special channel and treating this air through a bag filter and activated carbon filter system (W-C09).

It is also envisaged that during the operation of the crane, i.e. when transferring solid waste material to another bunker, water misting is also performed in order to reduce the emission of dusty substances into the air.

Air from the sludge compartment will also be taken to the boiler plant (2,000 m^3/h) by means of combustion air fans, in order to keep the storage under pressure and prevent the spread of unpleasant odours outside the facility. When the boiler plant does not work, nitrogen is automatically introduced into the sludge reception bunker in order to inertise the space. In this way, the impact of sludge waste storage on the air is minimized.

The line for the treatment of hazardous waste (delivered in IBC containers, barrels, etc.) is of a closed type, and for the purpose of inertisation into the shredder chamber itself, nitrogen (N_2) is dispensed, so that emissions into the air will not occur in regular operation.

In order to reduce the impact of evaporation of easily volatile liquids when discharging on air quality, when transferring liquid waste from tank trucks to the gas phase arm, a pressure balancing line is connected, which represents the connection with the gas space of the tank to which the transfer is carried out in the event that the discharge is carried out into one of the tanks under overpressure of nitrogen.

In order to reduce air emissions from storage tanks, the tanks are equipped with:
- **a nitrogen blanketing system** that maintains a constant overpressure in the tanks
- **exhaust gas drainage system** via automatic valves on the outlet pipelines from the gas tank space. When reaching a pressure of 0.4 barG in the tank, the valve is opened and the gas is discharged, which is taken by pipeline to the intake of the combustion air fan in the boiler installation, and then to the thermal treatment. As the vessels are maintained under nitrogen overpressure, the composition of the exhaust gas is predominantly nitrogen.

By applying these systems, the impact of evaporation of easily volatile liquids on air quality, which can occur during the discharge and storage of liquid waste, is minimized.

6.2.1.1.2 Emissions to air from the boiler plant

The waste combustion process takes place in the fluidized bed itself and in the zone above it. Due to the strong, continuous movement of the bed material, the reaction conditions (temperature profile, contact of chemical reactants) are very uniform and constant throughout the reaction zone, vertically and radially. Sand shreds waste into smaller particles and serves as a heat reservoir that can absorb and release heat. Both help to reduce emissions to air, e.g. nitrogen oxides (NO_x) and volatile organic compounds (VOCs).

When waste is incinerated, it behaves in the furnace like any other fuel: it is heated, and then decomposed into smaller molecules, which leads to volatilization (evaporation) of the gas phase. These combustible gaseous components completely oxidize in the gas phase in the furnace and form **flue gas** (which include: particulate matter, heavy metals, HCl, HF, SO_2, NO_x, CO, NH_3, TVOCs, PCDD/F, CDD/F + dioxins such as PCBs, and Hg) and which in the manner described above is discharged via a smokestack into the atmosphere.

For the treatment of flue gases generated during the incineration of waste, the project in question envisages a complex gas treatment system consisting of:
- Dry flue gas cleaning (cyclone and activated carbon reactor and bag filters)
- Wet flue gas cleaning in scrubbers
- Selective catalytic filter

A detailed description of the flue gas treatment system from the boiler plant is given in Chapter 3.5.3 of this study.

In order to quantify the impact of flue gases on air quality, Table 6.9 provides an overview of the expected emission values on the boiler plant emitter, which were the starting point for the impact modeling shown below.

Table 6.9 shows the expected emission values on the boiler plant emitter.

Table 6.9 Expected emission values from the boiler plant emitter (W-C14) in accordance with the project documentation

Pollutant	**Unit**	**Expected range of mean daily emission values**	
		min	**max**
Total Particulate matter	mg/Nm^3	< 1	5
Cd+Tl	mg/Nm^3	0.005	0.02
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	mg/Nm^3	0.01	0.3
HCl	mg/Nm^3	< 1	6
HF	mg/Nm^3	0.05	1
SO_2	mg/Nm^3	5	30
NOx	mg/Nm^3	1	120
CO	mg/Nm^3	10	50
NH_3	mg/Nm^3	2	10
TVOC	mg/Nm^3	1	10
PCDD/F	ng I-TEQ/Nm^3	0.01	0.04
Hg	µg/Nm^3	5	20

In order to make a representative assessment of the impact of the waste energy recovery plant on the concentration of certain heavy metals (Pb, As, Ni and Cd) in the ambient air of the wider location of the chemical industry complex in Prahovo, a Study on the impact of the Waste-to-Eenergy plant on the concentration of selected heavy metals in the air of the wider location of the chemical industry complex in Prahovo was prepared (attached to the Study) by a team of experts of the University of Belgrade, Faculty of Mechanical Engineering Belgrade, July 2024. The assessment is based on the use of a computer-based dispersion model to calculate ground-level concentrations of pollutants in the area under consideration. In order to obtain a qualitative assessment of the contribution to the existing air quality condition, the results obtained by the model were compared with the Regulation on monitoring conditions and air quality requirements ("Official Gazette of the RS", nos. 11/10, 75/10 i 63/13) i Directive (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe (recast).

Figures 6.1 and 6.2 show the isopleths of ground concentrations for different groups of heavy metals, with maximum annual concentrations recorded in the highest load zone, along the eastern part of the factory property limit.

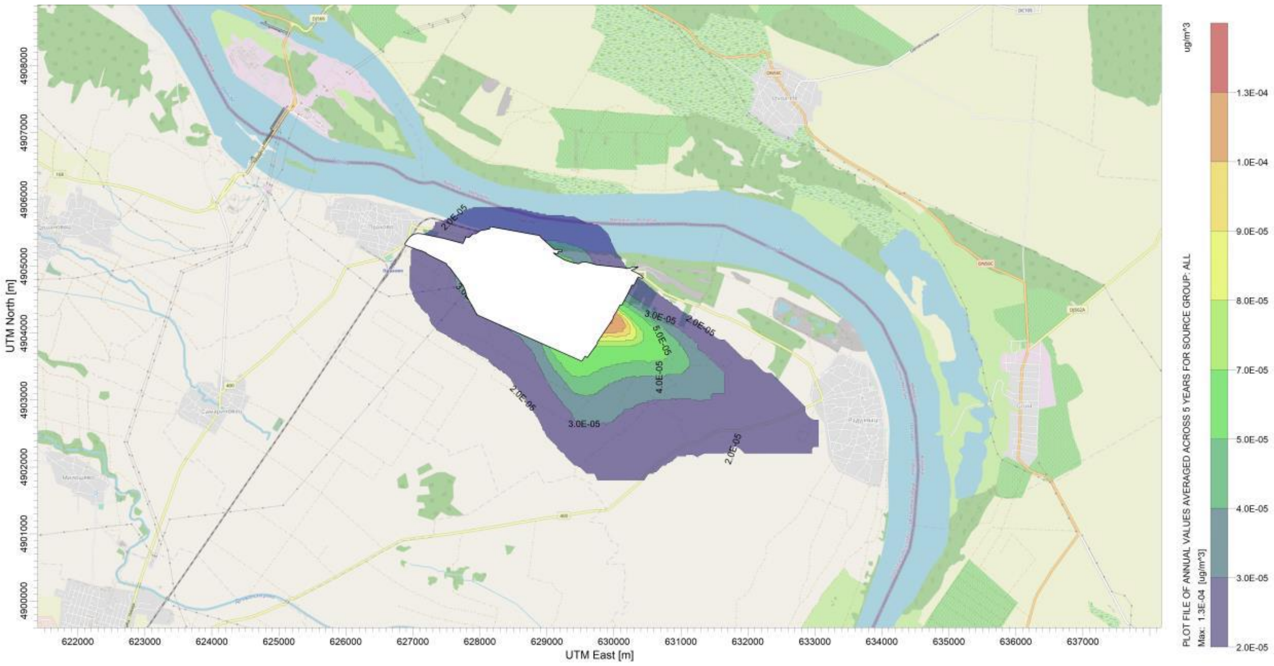


Figure 0.1 Maximum ground level concentrations (Cd+Tl) – annual average [μg/^{m3}]

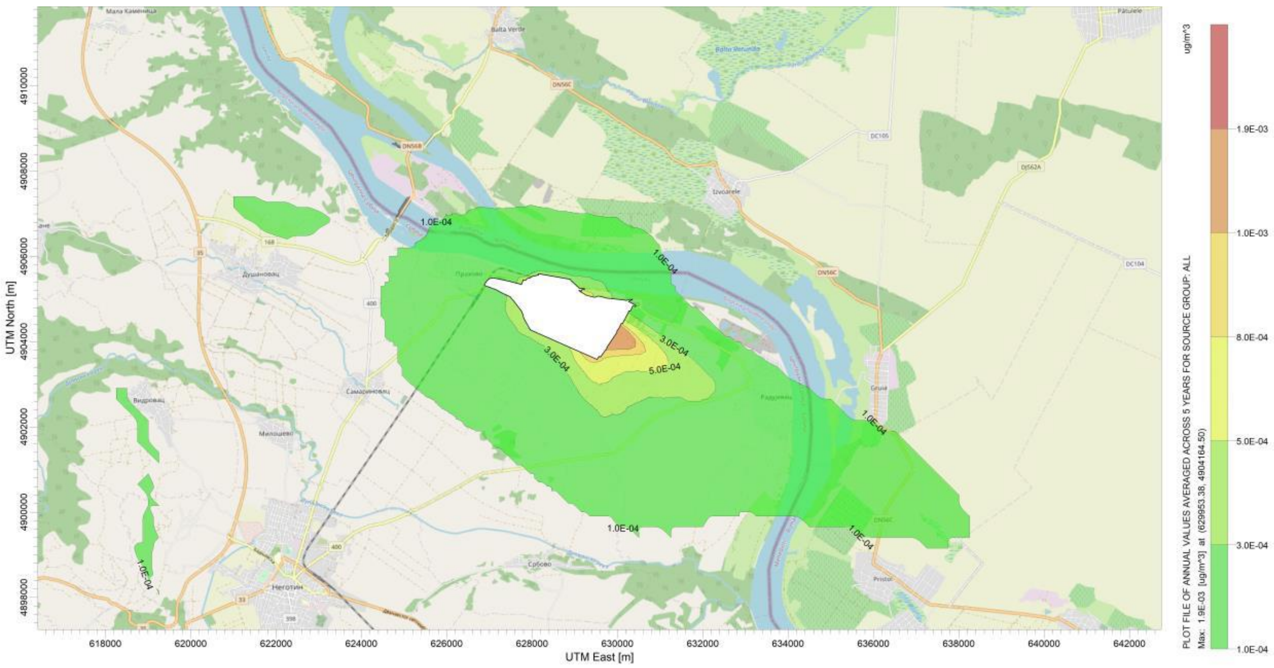


Figure 0.2 Maximum ground level concentrations (Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V) – annual average [μg/m^3]

For the cadmium and thallium group, the maximum annual concentration is 0.13 ng/m³, which is multiple times below the cadmium limit of 5 ng/m³. Similarly, for the metal group to which arsenic belongs, the maximum annual concentration is 1.9 ng/m³, while the strictest limit value for arsenic is 6 ng/m³. These results indicate that future emissions from the considered emitter will not be a problem in terms of long-term air quality, given that even in the most unfavorable scenarios, emissions do not reach the prescribed regulatory thresholds.**The modeling analyzed the contribution of heavy metal emissions from the point emitter of the boiler for energy utilization of waste, whereby the results showed that at no time did the concentrations exceed the prescribed air quality targets defined by European and national regulations.**

6.2.1.1.3 Emissions of pollutants from the process of stabilization and solidification of residues from the boiler plant

All sources of emission of particulate matter into the air from the stabilisation/solidification process are equipped with bag filters on which particulate matter is separated (ash mixture and thickened sediment storage bunker in which the stabilisation process takes place; mechanical treatment of slag or separation of ferrous metals using magnetic separators and non-ferrous metals using eddy current separators; mixer reactor in which the process of mixing cement, ash and water takes place, i.e. the solidification; cement storage silo; cement weighing scale and ash weighing scale) in order to reduce the impact of dust emissions into the air equipped with **bag filters**.

A detailed description of the Stabilization and Solidification Process Filter System is given in chapter 3.5.4 of this study.

In order to quantify the impact on air quality as a result of the emission of particulate matter from the stabilization and solidification process, Table 6.10 shows the expected emission values on the emitter of the Filter System of the stabilization and solidification process.

Table 6.10 shows the expected emission values on the emitter of the Filter System of the stabilization and solidification process.

Table 6.13 Expected emission values from the emitters of the Filter System of the stabilization and solidification process

Emitter	**Pollutants**	**Expected mass flow value**
Smokestack after bag filter	Particulate matter	< 5 mg/Nm^3

6.2.1.1.4 Emissions from means of transportation

Air pollution at the site in question may also occur due to the emission of gases from the internal combustion engine of the means of transportation, during the delivery/shipment of waste material and other substances/auxiliary raw materials. The amount and type of flue gases, harmful substances and emissions by type of fuel and type of means of transportation are given in Tables 6.1, 6. 2 and 6.3.

The project envisages unloading of about 10 trucks/h with solid and sludge waste material. When it comes to liquid waste, the project envisages unloading of about 10 trucks/day with waste material delivered in IBC containers/barrels/jumbo bags and unloading of 6 tank trucks/day with liquid waste. Unloading will take place during two shifts per day. This pronounced dynamics has been exaggerated for the purpose of demonstrating a negligible pollution load in the most unfavorable conditions, which are not expected or possible in practice. In the maximum operating mode, the boiler plant can treat 17 t/h of waste, which is the most relevant indicator of the maximum possible hourly load. Therefore, the maximum acceptance of waste at the plant can be 3 trucks per hour, in the circumstances of the least possible bulk weight of waste and/or ADR restrictions when transporting trucks.

In accordance with the projected capacity of the plant for stabilization and solidification of residues from the boiler plant, it is envisaged that a maximum of 111 m^3 of solidified material per day will be transported to the landfill using tipper trucks, which corresponds to a maximum of 8 trucks per day.
When it comes to other auxiliary raw materials and chemicals, the project envisages the delivery of:

- 2 tank trucks/day of cement
- 1 truck/day of polyelectrolytes for wastewater treatment,

-all other auxiliary raw materials/chemicals will be delivered as needed once every couple of months (one tank of ammonia water every 2.5 months, one tank of sand for fluidization every 3 months, etc.).

In order to reduce air emissions, unloading of bulk solid waste material and sludge will be carried out by entering the vehicle inside the W-C08 facility, after which the door of the facility is closed and only then unloading begins. When transfering liquid waste and liquid raw materials, as well as when unloading trucks, the engines of the means of transportation must be switched off. **Bearing in mind abovementioned, it can be concluded that the emissions of gases, which occur as a result of the combustion of diesel fuel, are of a local character and negligible.**

6.2.1.1.5 Emissions from Landfill for non-hazardous waste

Regular operation of the Landfill for non-hazardous waste may lead to occasional, short-term occurrence of air pollution as a result of the spreading of the deposited material, during its sealing from the truck, due to the cracking of the surface layer of the solidificate, as well as due to the movement of the truck over the body of the landfill, and the blowing of strong winds.

Precisely in order to reduce emissions from disposed material, the project envisages that residues from the boiler plant before disposal at the landfill will be treated with the process of stabilization and solidification.

Rolled stabilized and solidified waste will not be subject to air pollution due to curing of its surface, but if this is observed during exploitation, the deposited material will be moistened with water.

By the landfill increase in height, the external slope will be rehabilitated, and potential air pollution will be prevented and the surface runoff slowed down, which can be significant in the case of higher landfill heights.

6.2.1.1.6 Analysis of the cumulative impact of emissions on air quality

In order to determine the impact of emissions to air from the emitters of the Waste-to-Energy Plant and Landfill for non-hazardous waste, as well as the potential cumulative impact with existing emissions from emitters within the chemical industry complex in Prahovo and phosphogypsum storage (existing and planned expansion of the subject), both in the wider environment of the complex and in the transboundarycontext of the potential impact of emissions on air quality in neighbouring Romania and Bulgaria, the following studies were prepared by the expert team of the University of Belgrade Faculty of Mechanical Engineering:

- **Study of the impact of the Waste-to-Energy Plant and Landfill for non-hazardous waste on air quality of the wider location of the chemical industry complex in Prahovo, April, 2024.**
- **Study of the impact of the Waste Pretreatment Filter System and Activated Carbon Filters within the Waste-to-Energy plant on the air quality of the wider location of the chemical industry complex in Prahovo, June, 2024,**

which are attached to the environmental impact assessment study in question.

The air quality impact assessment is based on the use of a computer-based dispersion model for the calculation of ground-level concentrations of pollutants in the considered area (AERMOD software package). In order to give a qualitative assessment of the contribution to the existing air quality condition, the results obtained by the model were compared with *the relevant national ones (Regulation on* *monitoring conditions and air quality requirements* "*Official Gazette of the Republic of Serbia"*, nos. 11/10, 75/10 and 63/13) and international air quality objectives.

As stated, the modelling was performed with the AERMOD software package using the appropriate input parameters for the existing and future state of the plant. AERMOD is a model based on the Gaussian distribution and recommended by the EPA (U.S. Environmental Protection Agency) and it includes a wide range of opportunities to model the impact of pollutants on air pollution. This model gives the possibility to model a number of pollution sources including point, line, surface and volumetric. The model contains algorithms for analysing aerodynamic flow in vicinity and around buildings (building downwash).

These studies considered the identified point and surface emission sources and within them, depending on the scenario, the following pollutants: CO, SO_2, NO_2, PM10, PM2.5, HF, HCl, NH_3, Hg, PCDD/F, from the boiler plant emitter, TVOC and PM10 from the emitter of the Waste Pretreatment Filter System and Activated Carbon Filters, as well as PM10 from the emitter of the filter system of stabilization and solidification.

Also, it is important to note that the scenario when the boiler plant is not in operation and therefore it is not possible to provide a slight underpressure and extraction and incineration of air from the waste storage, has also been modelled. In this case, the air from the warehouse is directed to the Waste Pretreatment Filter and Activated Carbon Filters System so that on this emitter, in addition to the aforementioned emissions, additional emissions of TVOC originating from the storage area can be expected. TVOC also occurs from the emitter of the boiler plant during regular operation. When modelling and determining the spread of pollutants and determining the cumulative effect in the subject area, the maximum permissible concentrations of pollutants prescribed by the Best Available Techniques Conclusions (BATC)[69] were taken as initial concentrations on emitters.

Considering that the purpose of air quality modelling, within this Study, is to provide a representative assessment of the impact of the Project on air quality in the considered model domain, other sources that do not belong to the chemical industry complex have not been taken into account, nor is background pollution included in the presented modelling results. It should also be noted that within the chemical industry complex in Prahovo there are emitters of two companies, i.e. Elixir Prahovo and Phosphea, and that for the purposes of this study all point and surface emitters of both companies were considered, in order to give a more representative assessment since they represent the dominant sources of emissions to air in the domain under consideration. This approach provides an opportunity to clearly see the future impact of a specific Project on air quality, as well as the cumulative effect of emissions at the site.

The results of the modelling, for all identified and modelled pollutants, are presented graphically through spatial distributions of ground concentrations (isopleths) as the maximum obtained value in accordance with the respective time periods of averaging.

Description of the model used

The results presented in the *Study of the impact of the Waste-to-Energy plant and the Landfill for non-hazardous waste on air quality of the wider location of the chemical industry complex in Prahovo, April, 2024 were achieved by* using a model that included emissions of particulate matter (PM10 and PM2.5), SO_2, NO_2, CO, HF, HCl, NH_3, Hg, PCDD/F. These pollutants, depending on the scenario, are emitted from various point and surface sources, from both companies operating within the chemical industry in

[69] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, **for waste incineration** and Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions **for waste treatment**, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.)

Prahovo, i.e. Elixir Prahovo and Phosphea, both for the current situation and after the construction of the plant in question.
The results presented in the *Study of the impact of the Waste Pretreatment Filter System and Activated Carbon Filters within the Waste-to-Energy Plant on the air quality of the wider location of the chemical industry complex in Prahovo, June, 2024* were achieved byusing a model that included particulate matter emissions (shown as PM10) and TVOC. As stated above, this study considers the case when the boiler plant ceases to operate, and the waste pretreatment system, with the associated emitter and filter system, continues to operate for a shorter period of time, which is not longer than a couple of hours.

The modelling for the subject Studies included an impact zone of 50 km x 50 km, i.e. an area of 2500 km^2 (see Figure 6.1). When creating the model, the Cartesian coordinate system with variable distance (Multi-Tier Grid) between adjacent points (receptors) was used, as follows:

- 20 mat a distance of up to 3000 m from the emitter,
- 100 mat a distance of up to 5000 m from the emitter,
- 250 mat a distance of up to 10000 m from the emitter
- 1000 m at a distance of up to 25000 m from the emitter,

which makes a total of 104121 receptors, which are defined by x and y coordinates expressed in meters and in the Cartesian coordinate system, shown in Figure 6.3.

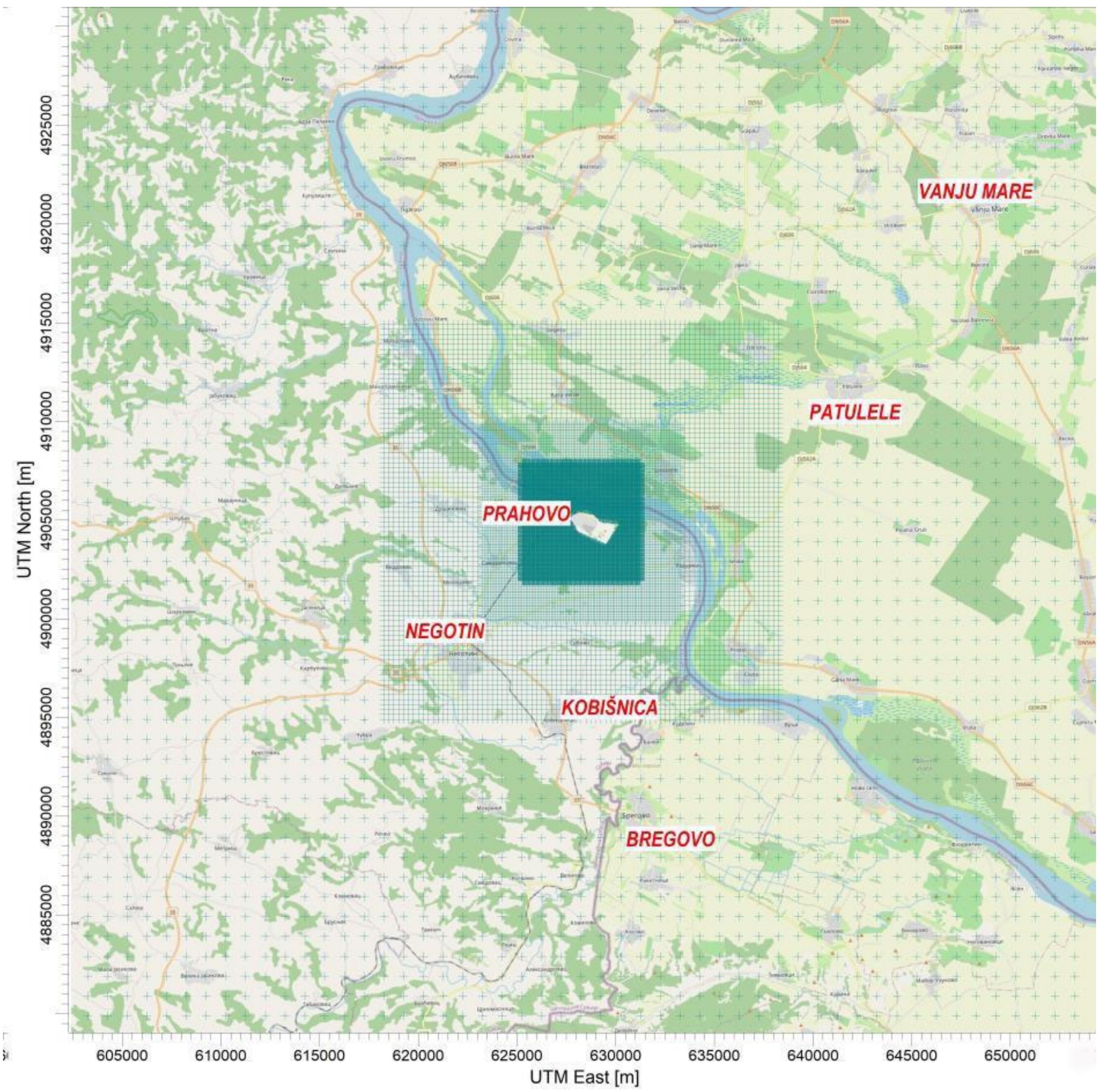


Figure 6.3 Display of 2D terrain of model domains and UTM coordinate system

In order to model the most unfavourable conditions, during the development of the model, the assumption was introduced that all point sources emit 24 hours, 365 days a year at full capacity, which is certainly not the case. Therefore, the results obtained by the model, i.e. the expected ground-level concentration of pollutants in the observed area, are higher than real values.

When it comes to surface emission sources, i.e. phosphogypsum storage and Landfill for non-hazardous waste, they depend on the wind speed (Table 6.11, Table 6.12, Table 6.13).

Emissions of particulate matter from surface sources are defined in accordance with the recommendations of US EPA AP42, Air Emissions Database:

E_{PM10}=1.8·u·0.5 (1-η) [g/(m^2·s)]
$E_{PM2.5}$= 1.8·u·0.075 (1-η) [g/(m^2·s)]

where:
u – wind speed [m/s],
η – the degree of spreading out decay.

Table 6.11 Emissions of particulate matter from existing surface sources (phosphogypsum storage) depending on the wind speed and the degree of spreading out decay of 75%:

u	**PM10**	**PM2.5**
[m/s]	[g/(m^2·s)]	[g/(m^2·s)]
< 5.14	-	-
5.14 – 8.23	0.00004181	0.000006272
8.23 – 10.8	0.00005950	0.000008925
> 10.8	0.00008925	0.000013387

Table 6.12 Emissions of particulate matter from the future phosphogypsum storage depending on the wind speed and the degree of spreading out decay of 90%:

u	**PM10**	**PM2.5**
[m/s]	[g/(m^2·s)]	[g/(m^2·s)]
< 5.14	-	-
5.14 – 8.23	0.000016725	0.000002509
8.23 – 10.8	0.0000238	0.00000357
> 10.8	0.0000357	0.000005355

Table 6.13 Emissions of particulate matter from the future solidification landfill (at the moment as defined in point 2.6 of this Study) depending on the wind speed and the degree of spreading out decay of 95%:

u	**PM10**	**PM2.5**
[m/s]	[g/(m^2·s)]	[g/(m^2·s)]
< 5.14	-	-
5.14 – 8.23	8.3625E-06	1.25438E-06
8.23 – 10.8	0.0000119	1.785 E-06
> 10.8	0.00001785	2.6775E-06

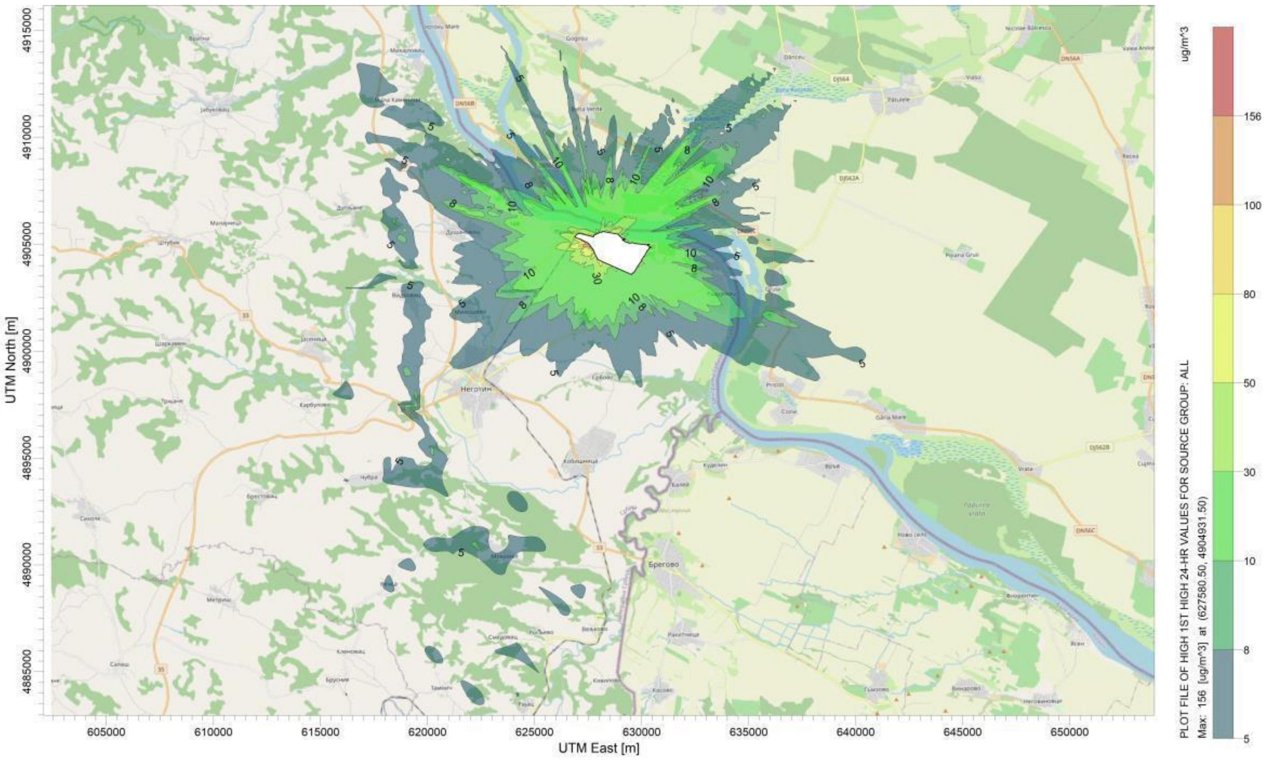
As previously stated, considering the characteristics of the solidificates to be deposited, the expected emissions of particulate matter from the Landfill for non-hazardous waste **will be practically negligible**, and they may possibly occur from limited areas in combination with cracking of the surface layer of the solidificates, due to the movement of the truck over the landfill body, and strong winds blowing.

For modelling purposes, a very conservative case was considered, that is, a 95% reduction of spreading out decay and that aeolian erosion occurs from the entire surface of the landfill where the machinery can move at the time of opening Phase 2 of the landfill (the largest active landfill area). Given the introduced assumptions, the results of modelling the dispersion of particulate matter from the Landfill for non-hazardous waste will certainly be higher than real ones.

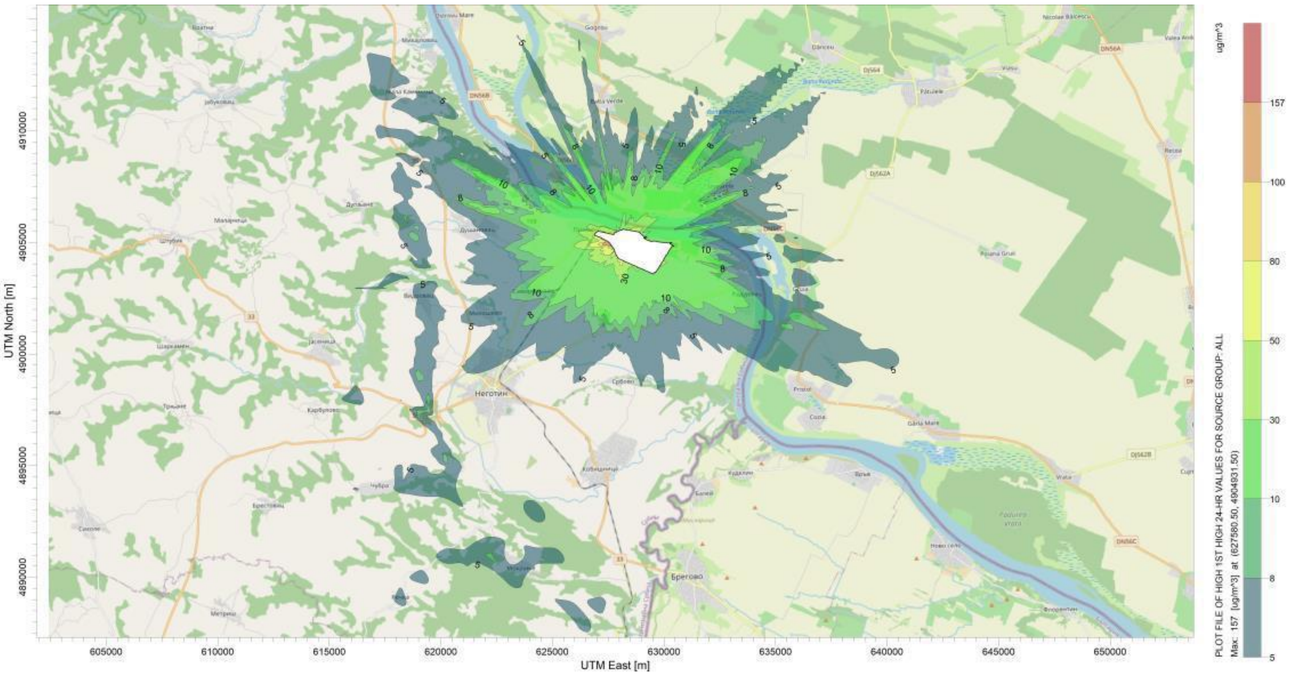
Conclusion

Bearing in mind that the models, within the framework of this Study, do not take into account background pollution, the results obtained by this modelling do not represent air quality in the area of the model domain, but only the contribution of the presented emitters of the plant in question to the overall air quality. The results, in the form of a graphical presentation of ground-level concentrations of pollutants (isopleths), are presented in accordance with the aforementioned legal legislation and the defined method of presentation and averaging periods. In order to assess the impact of the plant on air quality, the results obtained by modelling were compared with the appropriate air quality requirements, prescribed by national legislation, i.e. Regulation on monitoring conditions and air quality requirements ("Official Gazette of the RS", nos. 11/10, 75/10 and 63/13). Figures 6.2-6.11 provide a graphical representation of maximum ground-level concentrations (the first maximum) of pollutants for the averaging period of one day for the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage), as well as the cumulative impact of all emissions after the construction of the Waste-to-Energy Plant and Landfill for non-hazardous waste (solidificates). A detailed graphical representation of ground-level concentrations of pollutants for all other averaging periods is given in the aforementioned studies attached to this document.

Figure 6.4 shows the results for the first maximum possible SO_2 values for the averaging period of one day for the current state 6.2a) and for the case of the future state, i.e. for the case involving all current and future emitters (Figure 6.2b). In both cases, the maximum possible value of the first maximum exceeds the prescribed limit value in a narrow area along the south-western limit of possession while all other receptors in the model domain remain far below the limit value (125 μg/m^3). These results indicate that the existing emitters have a dominant impact and that periodical high concentrations may occur in the case of extremely unfavorable, from the point of view of dispersion, meteorological conditions. The number of hours/days with those concentrations is extremely low, that is, there is a low probability that it will happen at all. Also, potential zones with exceeding limit values occur on uninhabited areas in the immediate vicinity of the property boundary of the chemical industry complex in Prahovo.



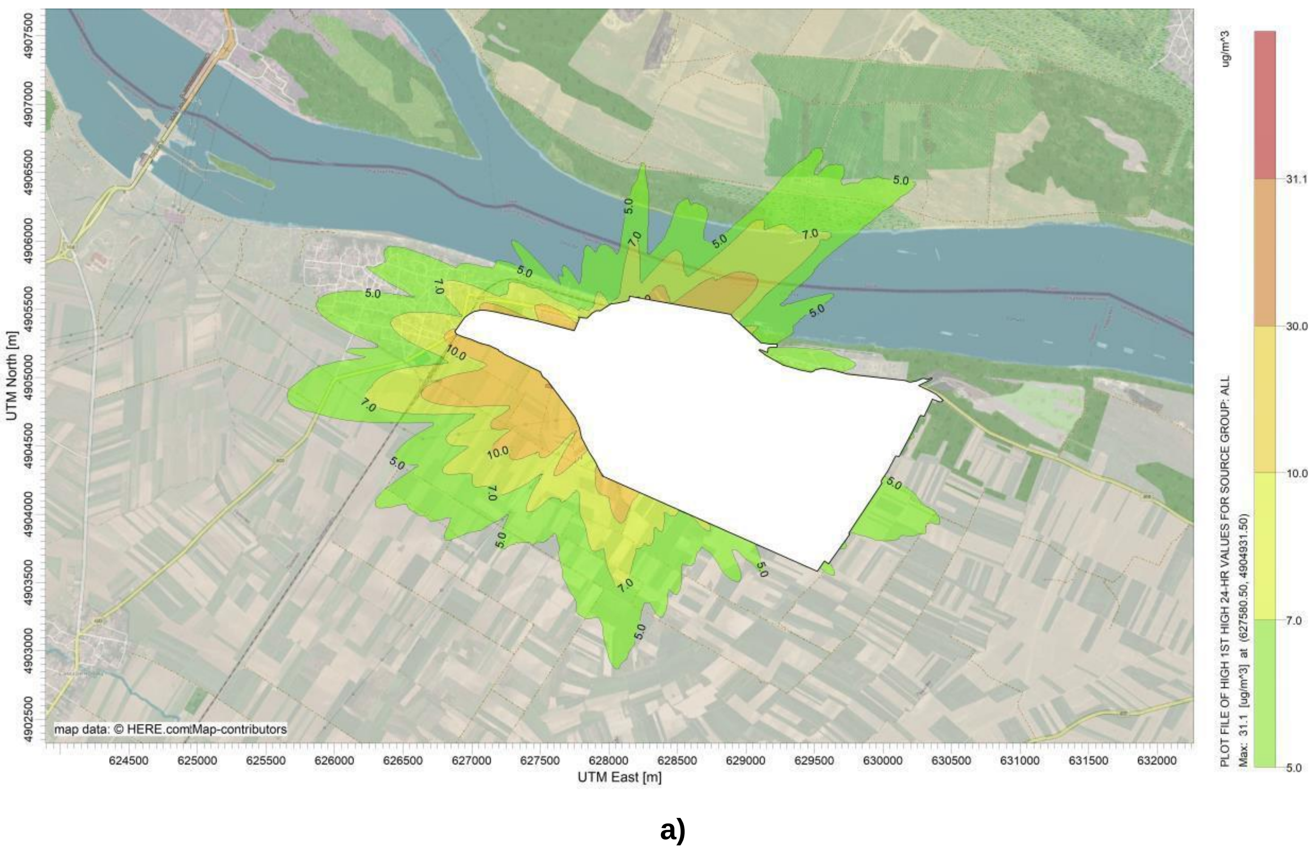
a)



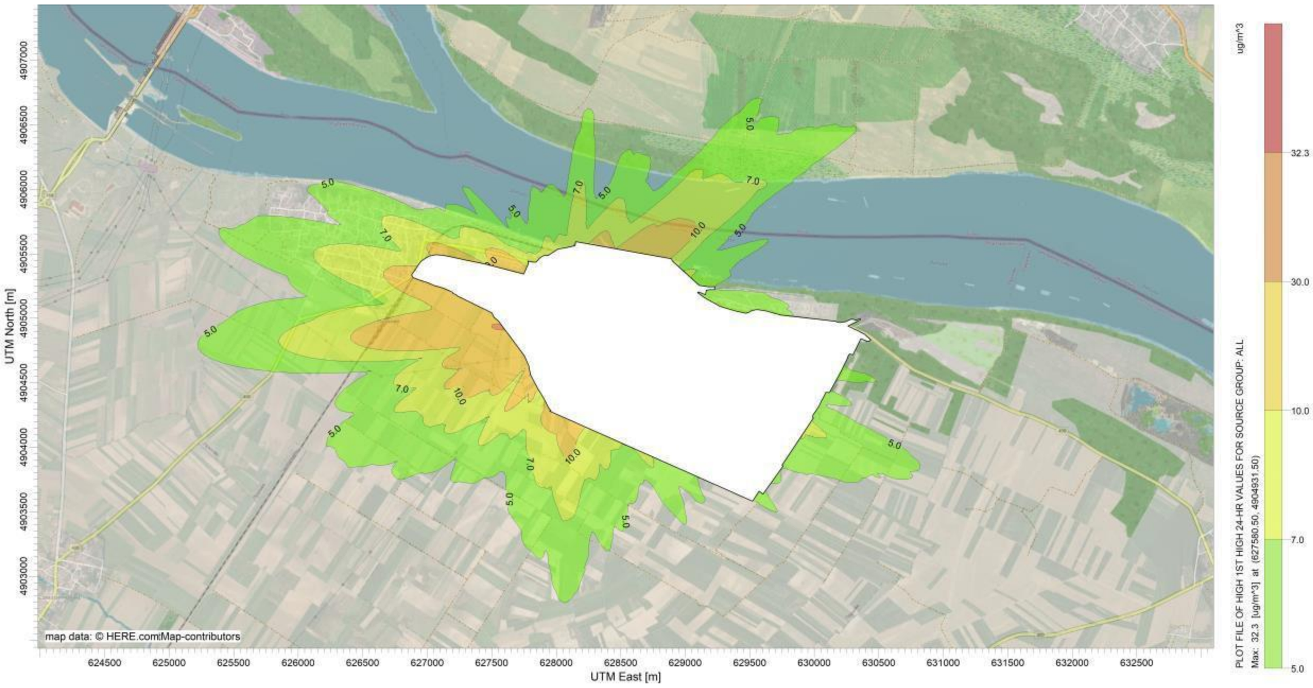
b)

Figure 6.4 Maximum ground concentration of SO_2 for the averaging period of one day [μg/m^3]: a) Case of the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage); b) Case of the future state, i.e. for the case involving all current and future emitters after the construction of the Eco Energy complex

Figure 6.5 shows the isopleths of ground-level concentrations, which refer to the first maximum daily average for the existing and future state. For all averaging periods and all parts of the NO_2 concentration model domain, they are far below the prescribed limit values. These results indicate that, as in the case of SO_2, existing emitters have the dominant influence.



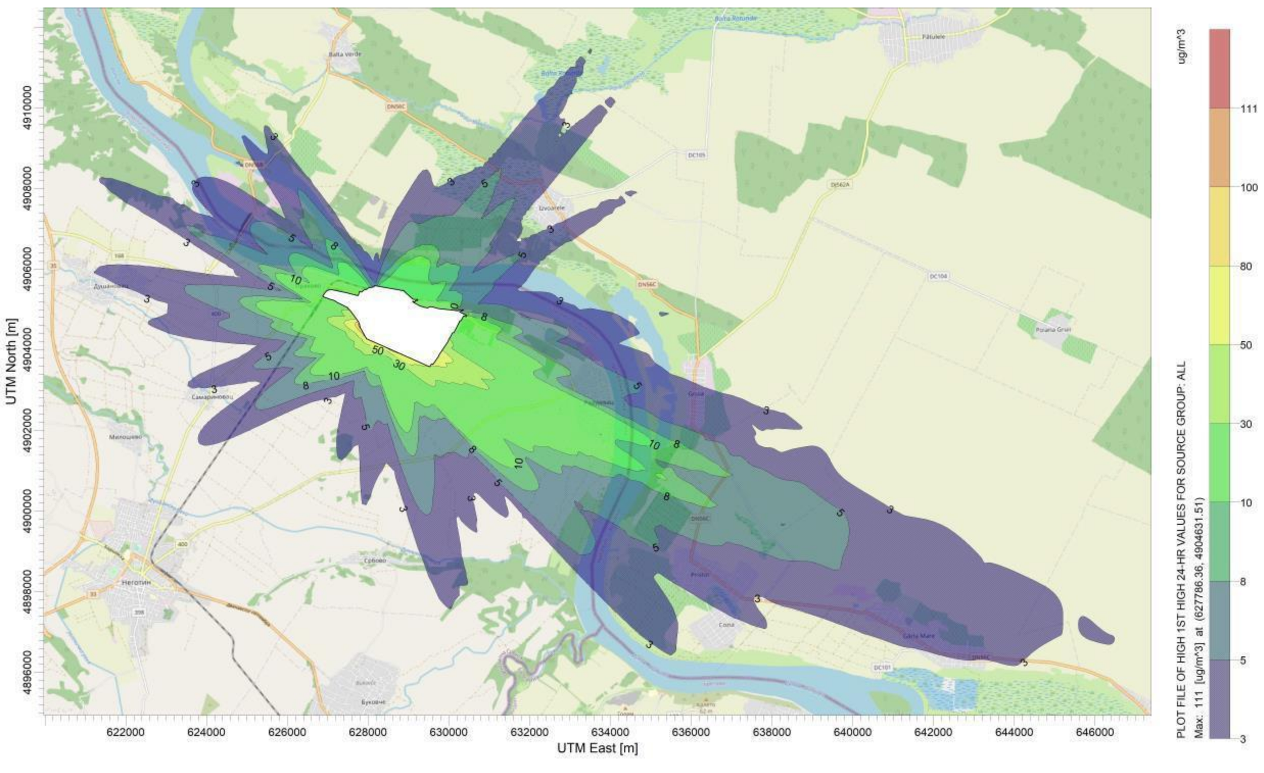
a)



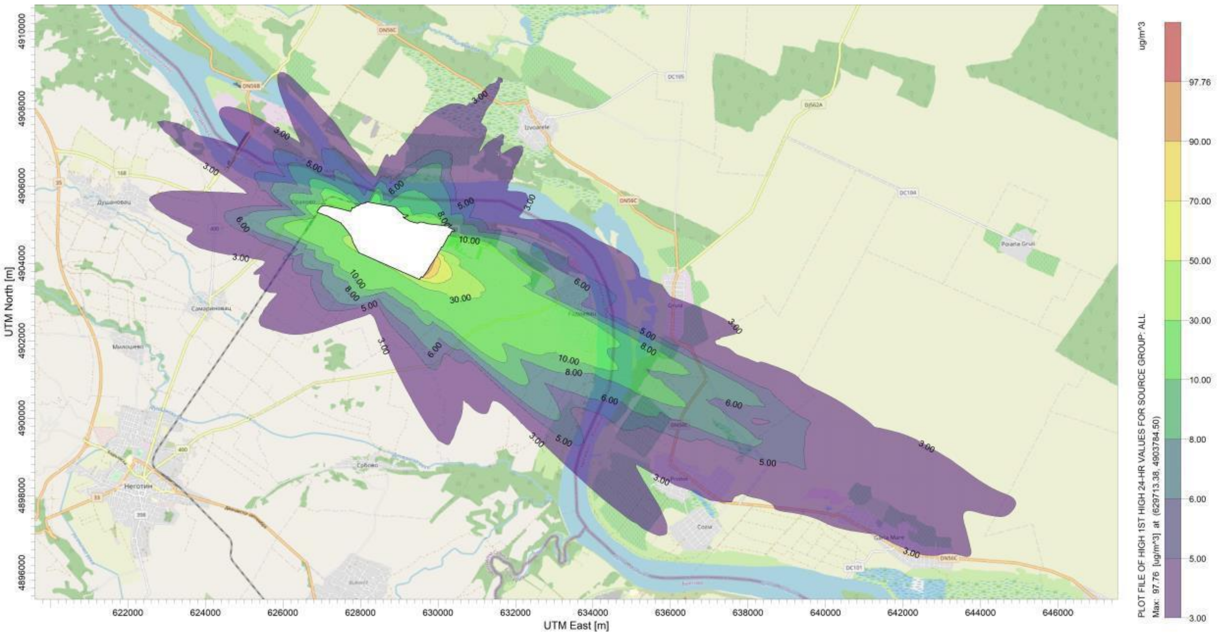
b)

Figure 6.5 Maximum ground level NO_2 concentrations for averaging period of one day [µg/m^3] a) Case of the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage); b) Case of the future state, i.e. for a case involving all current and future emitters after the construction of the Eco Energy complex

Figure 6.6 shows the isopleths of ground-level concentrations, which refer to the first maximum of possible PM10 values for the averaging period of one day for the existing state and the future state.



a)

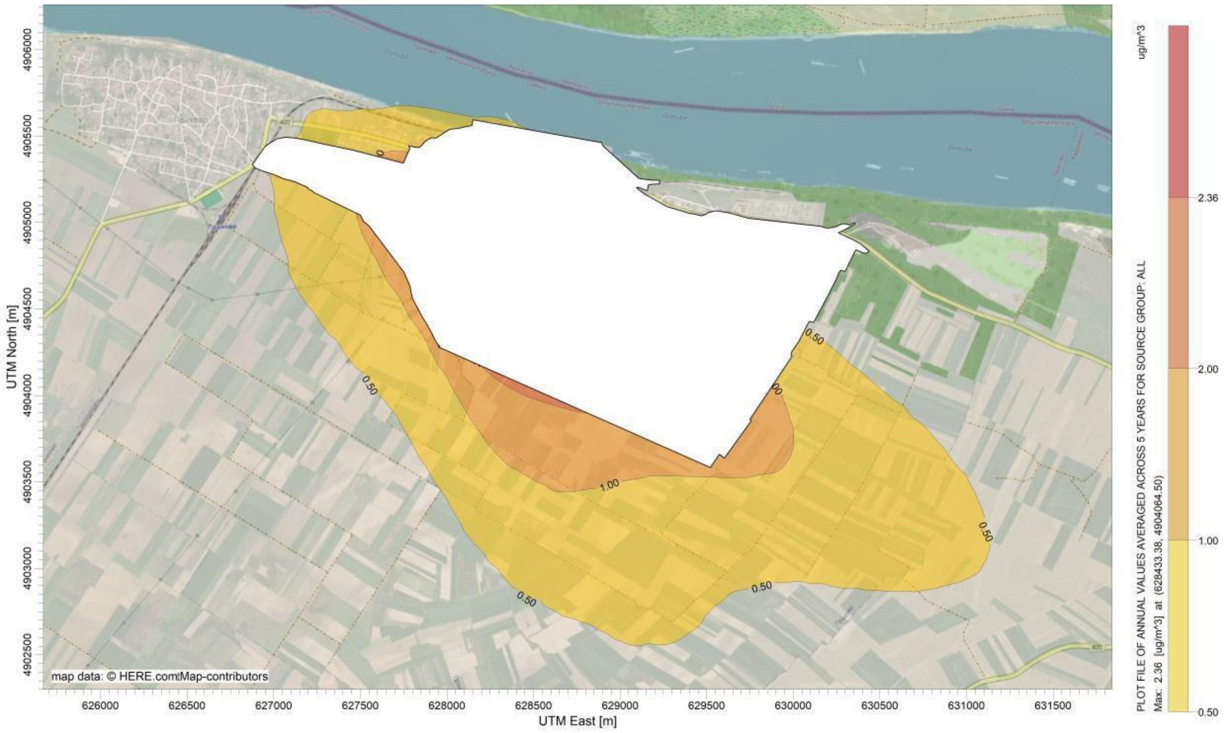


b)

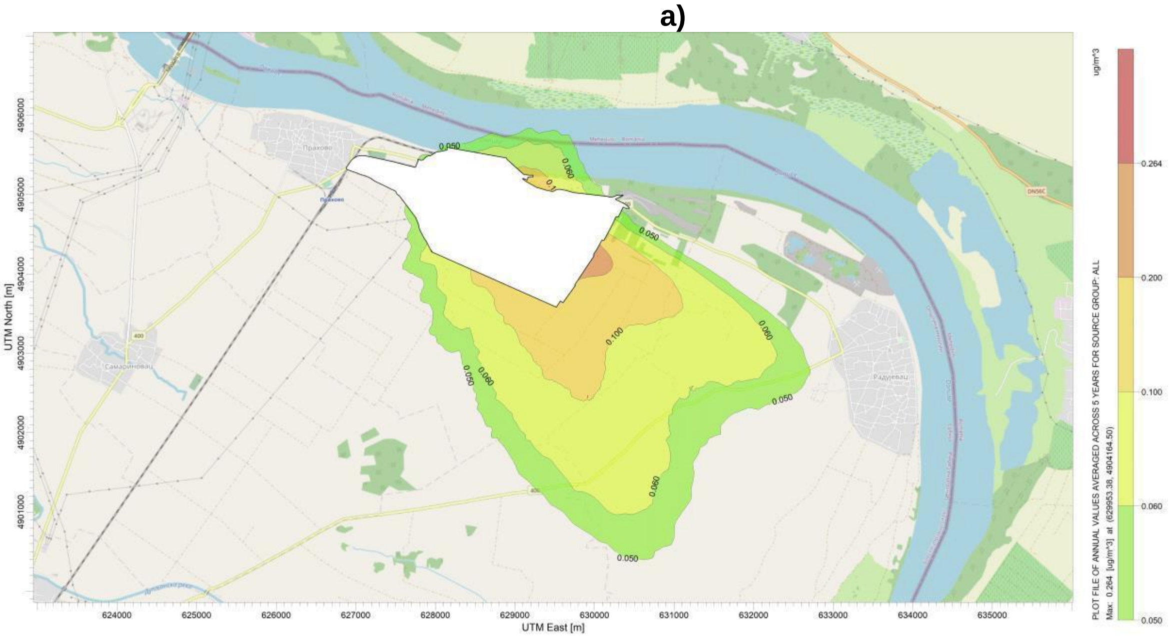
Figure 6.6 Maximum ground-level concentrations of PM10 for an averaging period of one day [μg/m³] a) Case of the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage); b) Case of the future state, i.e. for the case involving all current and future emitters after the construction of the Eco Energy complex

Considering that the first maximum for the averaging period of one day for the current situation is higher than the first maximum for the future situation involving the Landfill for non-hazardous waste (non-reactive solidificates) and an additional three point sources of particle matter emissions (boiler plant emitter, emitter of the Solidification Filter System and emitter of the Waste Pretreatment Filter System and Activated Carbon Filters) as well as a significant expansion of the phosphogypsum storage, it is necessary to provide additional explanation. In this case, the dominant source of particulate matter is the phosphogypsum storage for both the current and future state. The characteristics of surface sources that are important from the aspect of dispersion are primarily the value of emissions from them, their height and, of course, their total surface area, which is taken into account here. Due to its characteristics, as well as its position within the complex itself, the loading of the solidificates landfill, as a surface source of particulate matter emissions, is very low, i.e. practically negligible.

Figure 6.7 shows the isopleths of ground-level concentrations, which refer to the annual average PM2.5. For the aforementioned averaging period, which is also uniquely prescribed by the Regulation on monitoring conditions and air quality requirements ("Official Gazette of the RS", nos. 11/10, 75/10 and 63/13), the highest concentration obtained by the model and observed along the southern limit of estate, is far below the prescribed LV (25 μg/m³).



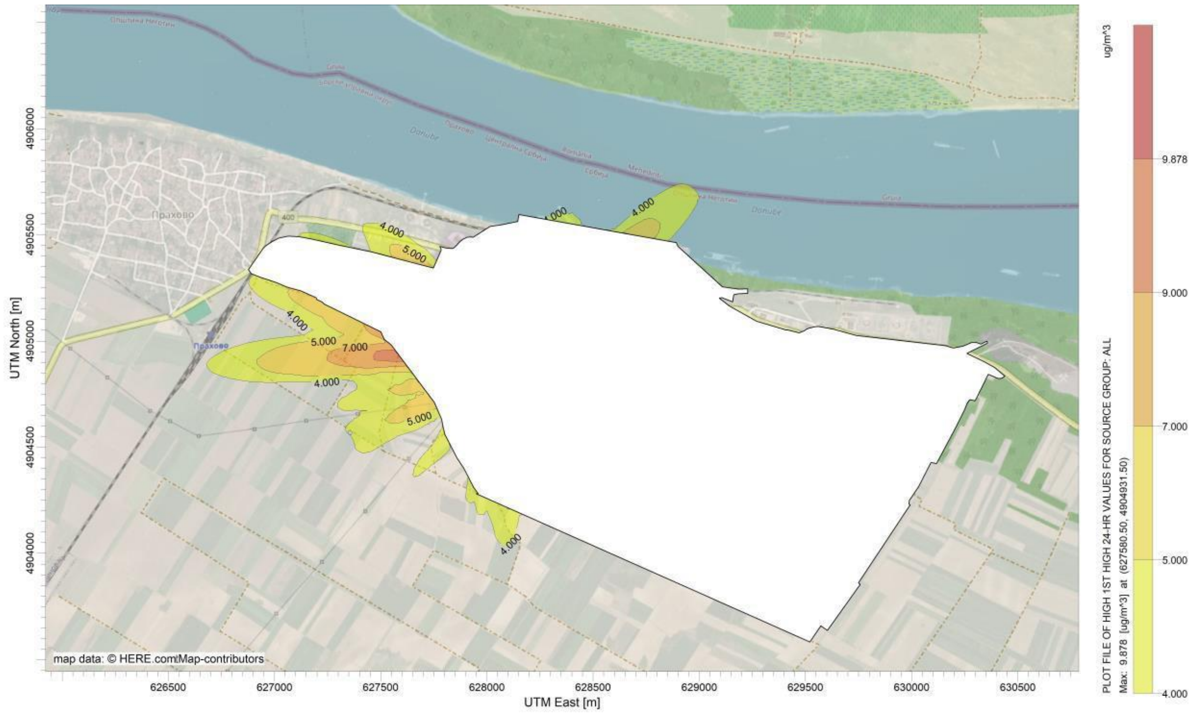
a)



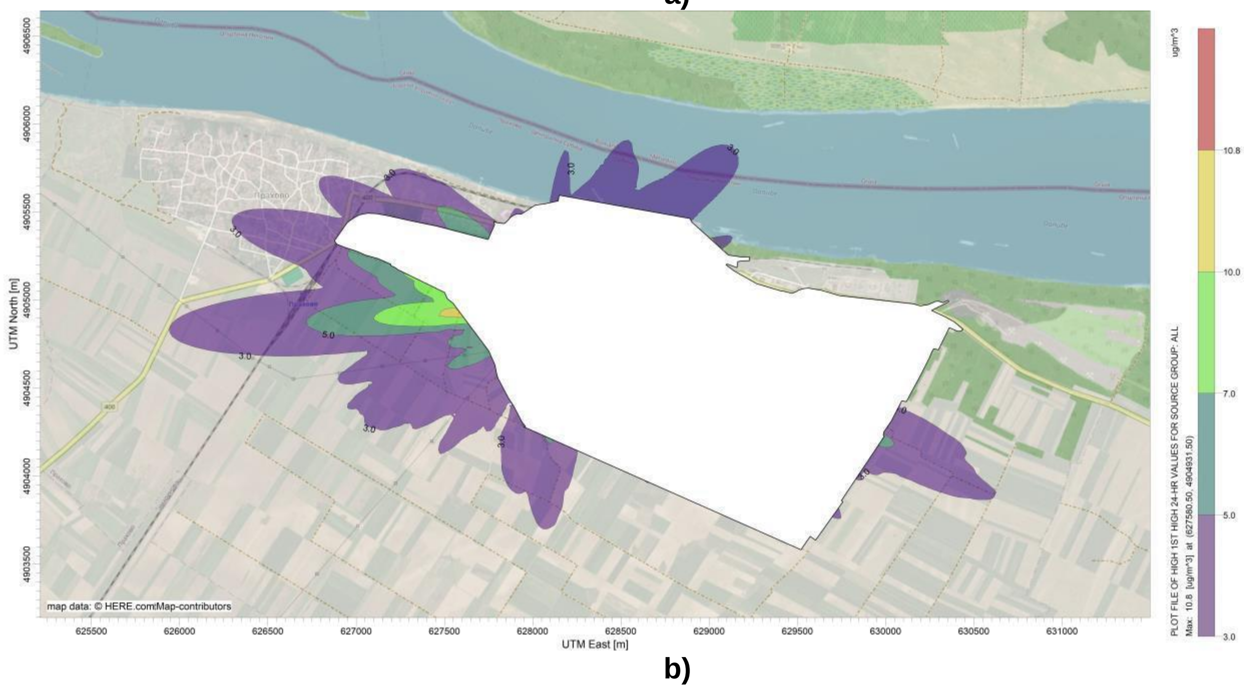
b)

Figure 6.7 Maximum ground-level concentrations of PM2.5 for the averaging period calendar year [µg/m^3] a) Case of the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage); b) Case of the future state, i.e. for a case involving all current and future emitters after the construction of the Eco Energy complex

The modelling results show that the expected ground concentrations of CO, are very low for all averaging periods considered and expressed in µg/m³ while the prescribed LV is 10 mg/m³. When it comes to averaging periods for one day the differences between the corresponding expected values and the limit values are also significant (see Figure 6.8).



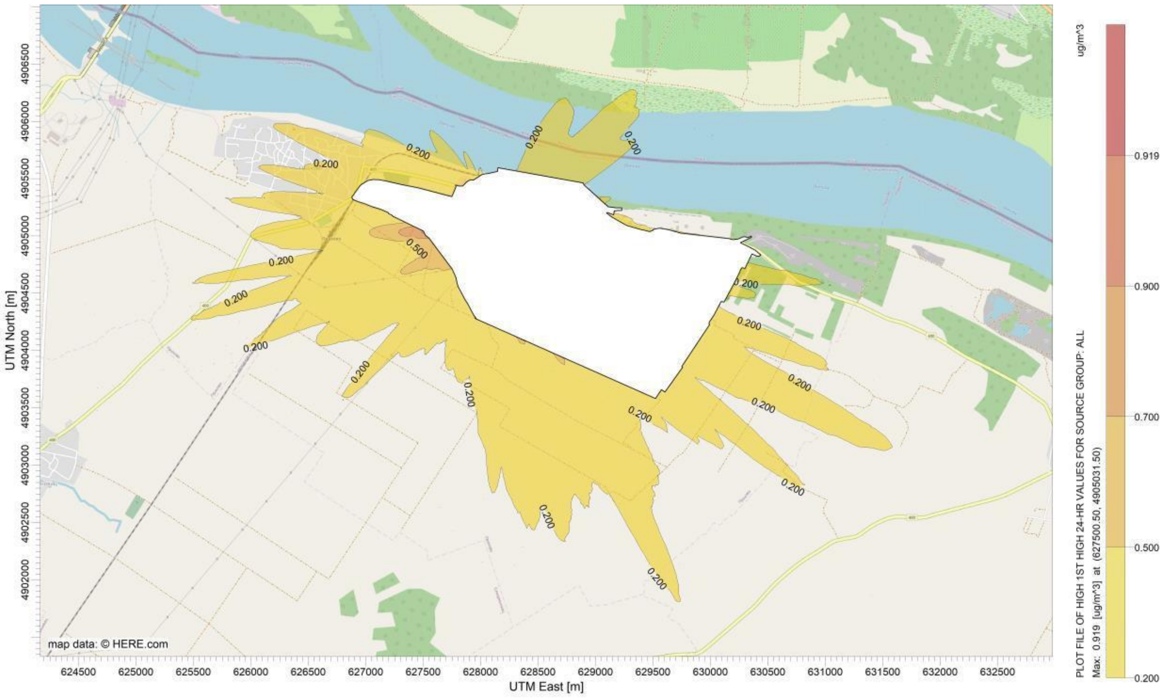
a)



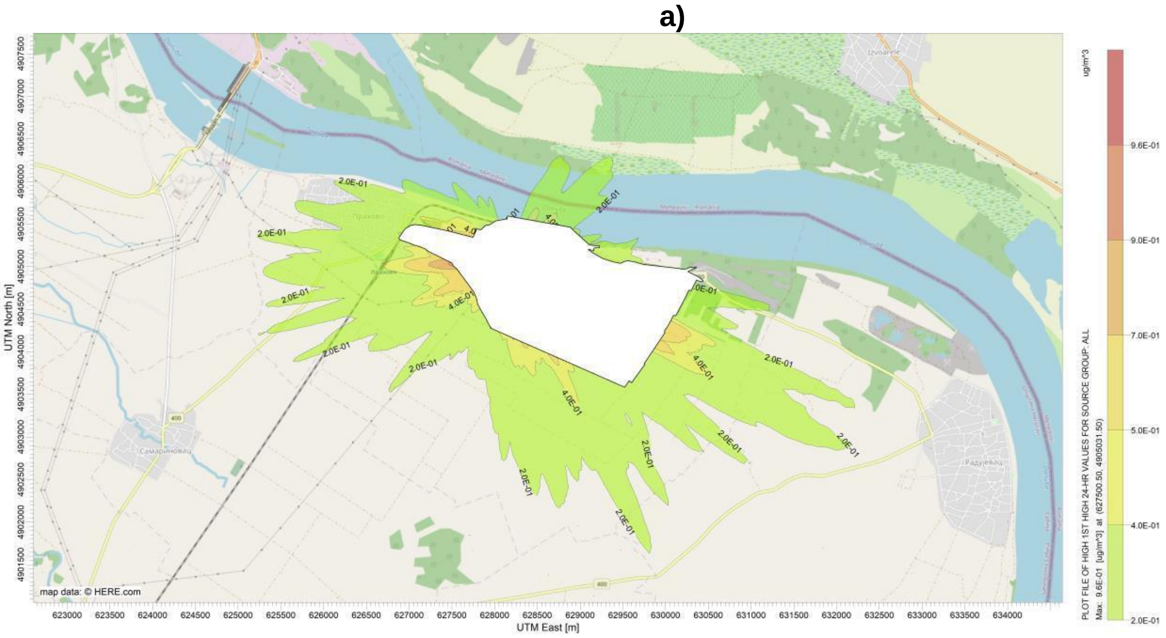
b)

Figure 6.8 Maximum ground-level CO concentrations for averaging period of one day [μg/m^3] a) Case of the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage); b) Case of the future state, i.e. for a case involving all current and future emitters after the construction of the Eco Energy complex

Currently, HCl is emitted from only one-point source, namely the emitter of the Final Scrubber. Based on the modelling results, it can be concluded that the prescribed maximum daily values will not be exceeded in any part of the model domain (see Figure 6.9). After the construction of the plant for the incineration of waste materials, HCl will be emitted from the existing emitter of the Final Scrubber as well as from the emitter of the boiler plant (future plant for the waste thermal treatment materials). Based on the modelling results, it can be concluded that the prescribed maximum limit values will not be exceeded in any part of the model domain.



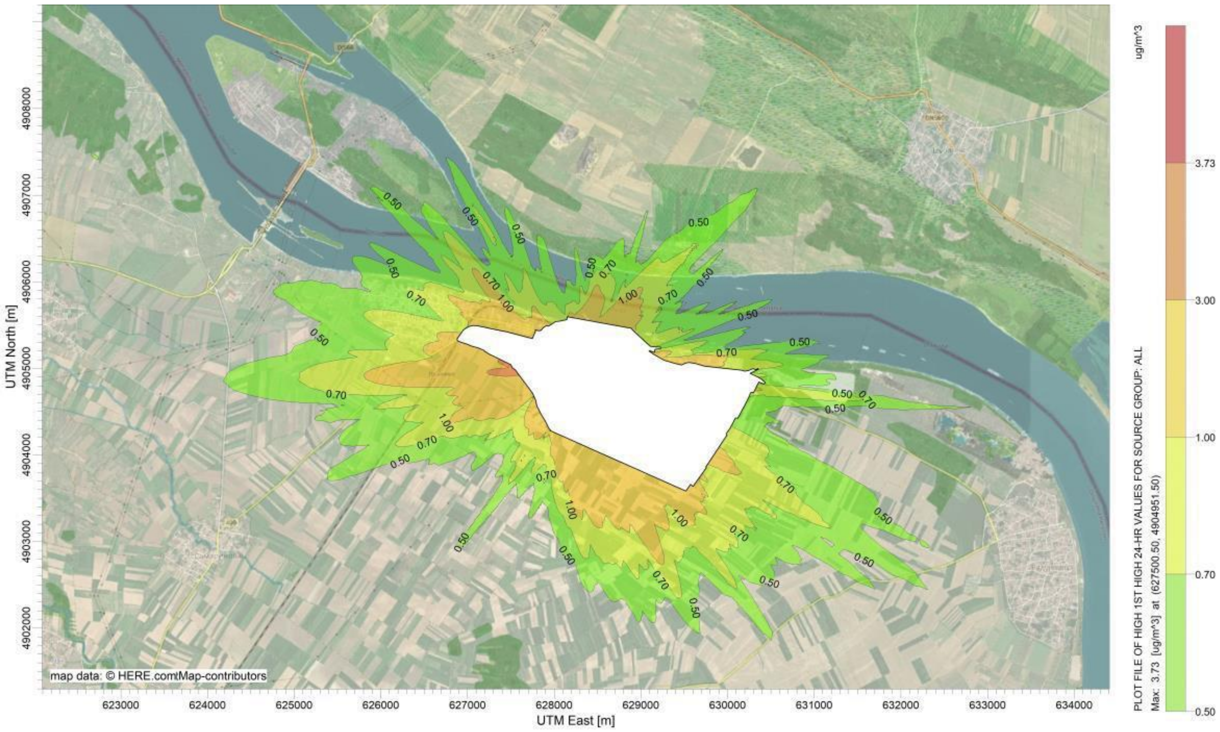
a)



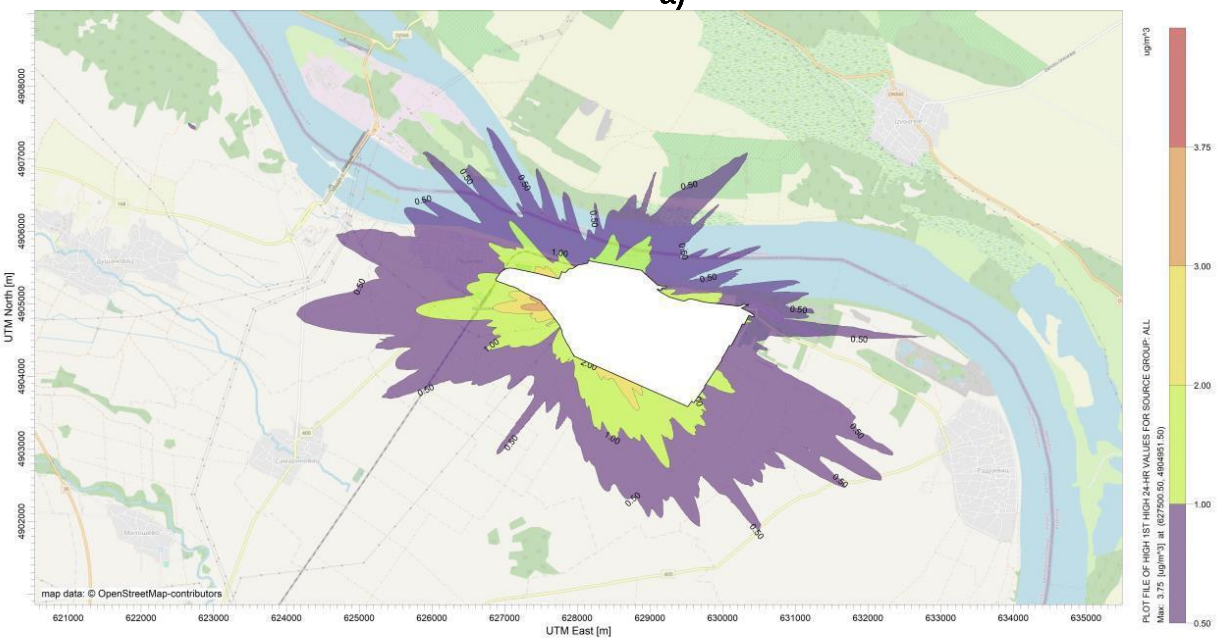
b)

Figure 6.9 Maximum ground level HCl concentrations for averaging period of one day [μg/m^3] a) Case of the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage); b) Case of the future state, i.e. for a case involving all current and future emitters after the construction of the Eco Energy complex

Based on the modelling results for HF (see Figure 6.10), it can be concluded that the highest potential impact for the averaging period of one day is almost at the limit of the prescribed limit value of 3 μg/m3. A narrow zone with concentrations that are slightly above the limit value is observed only immediately to the southeast border of the factory property. Bearing in mind the results of the current situation and the position of the zone with the maximum expected situation, it can be concluded that the contribution of the Waste-to-Energy Plant will be practically negligible.



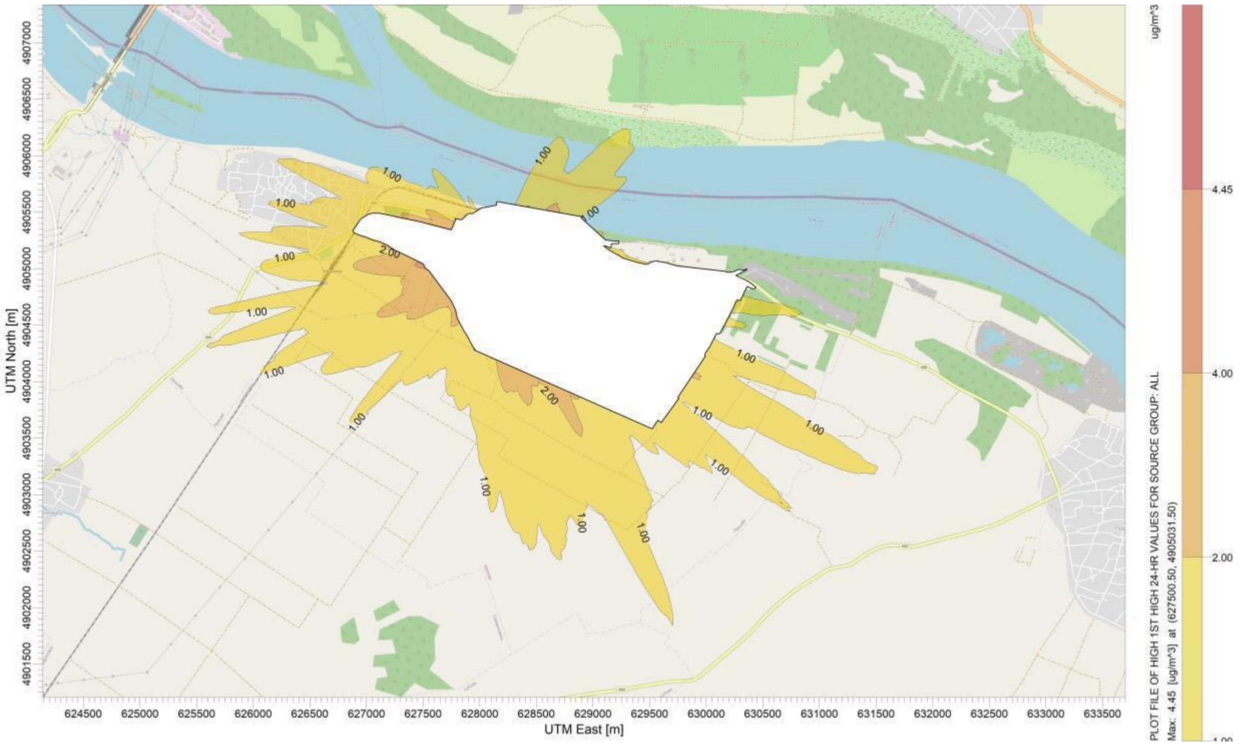
a)



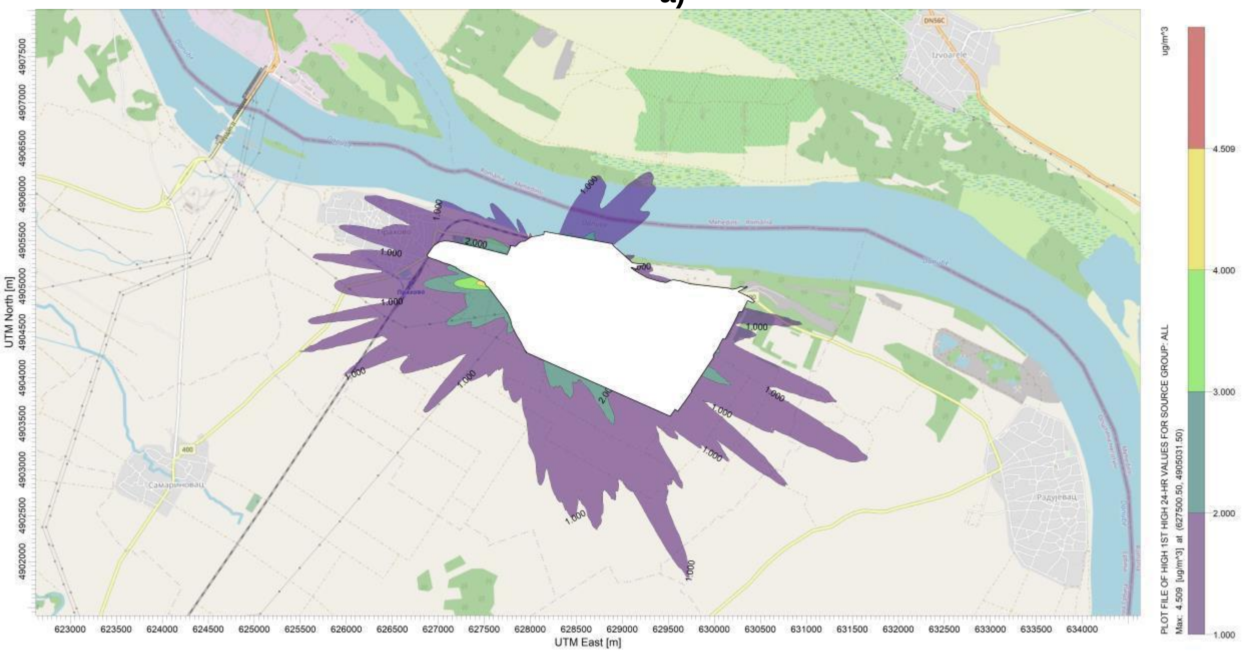
b)

Figure 6.10 Maximum ground-level concentrations of HF for an averaging period of one day [µg/m^3] a) Case of the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage); b) Case of the future state, i.e. for the case involving all current and future emitters after the construction of the Eco Energy complex

Currently, NH_3 is emitted from only one-point source, namely the emitter of the Final Scrubber. Based on the modelling results, it can be concluded that the highest obtained values, for an averaging period of one day, are far below the prescribed maximum values of 100 µg/m³. After the construction of the Eco Energy complex, NH3 will be emitted from the existing emitter of the Final Scrubber as well as from the emitter of the boiler plant (future Waste-to-Energy Plant). Based on the modelling results, it can be concluded that the maximum obtained values for both averaging periods are far below the prescribed values (see Figure 6.11).



a)



b)

Figure 6.11 Maximum ground level concentrations of ammonia for averaging period of one day [μg/m³]
a) Case of the current state (existing emitters in the industrial zone) and for the future state (expansion of phosphogypsum storage); b) Case of the future state, i.e. for a case involving all current and future emitters after the construction of the Eco Energy complex

Mercury is currently not emitted from the existing emitters of the chemical industry complex in Prahovo, but after the construction of the Waste-to-Energy Plant, it will be potentially emitted only from the emitters of the boiler plant. Based on the modelling results, for the highest emission values, it can be concluded that the highest value obtained for the prescribed daily average is far below the limit value (see Figure 6.12).

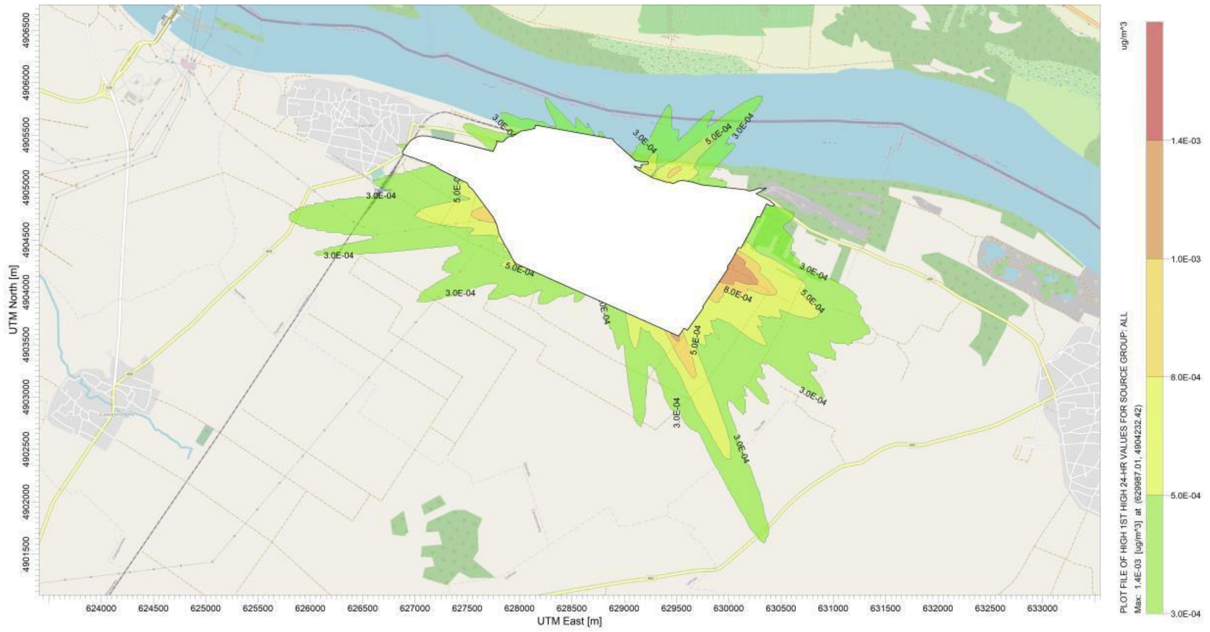


Figure 6.12 Maximum ground-level concentrations of Hg for the averaging period of one day [µg/ m³] - A case of the future state, i.e. for a case involving all current and future emitters after the construction of the Eco Energy complex

PCDD/F is currently not emitted from the existing emitters of the chemical industry complex in Prahovo, but after the construction of the Waste-to-Energy Plant, it will be potentially emitted only from the emitters of the boiler plant. Based on the modelling results, for the highest emission values, it can be concluded that the highest value obtained for the prescribed daily average is far below the limit value (see Figure 6.13).

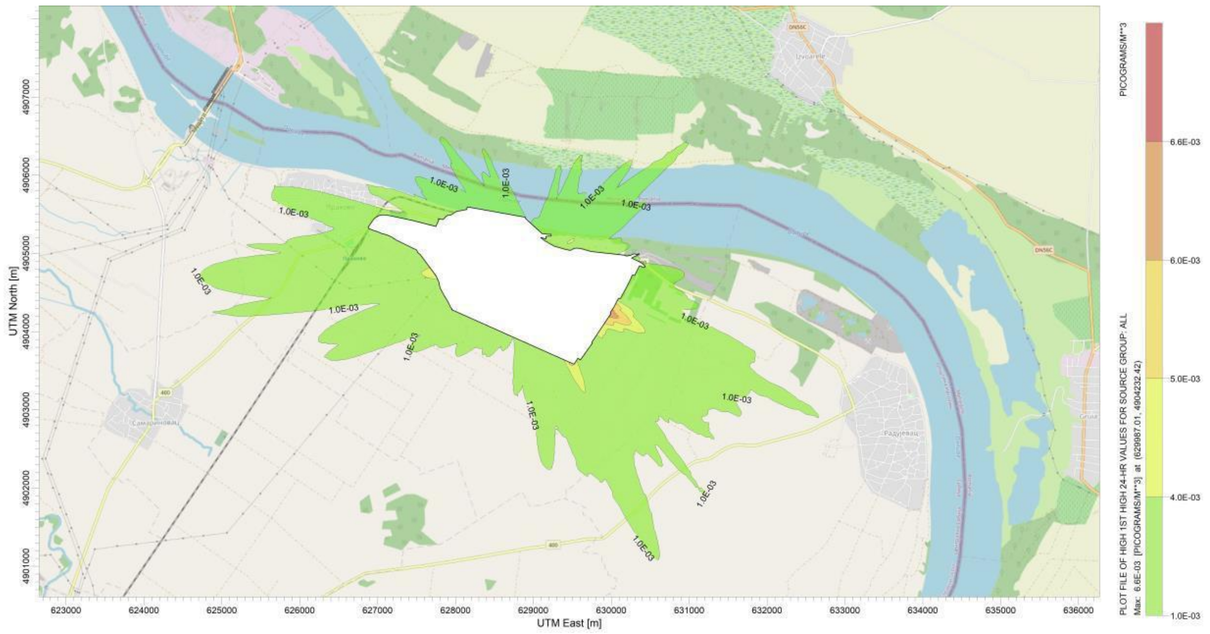


Figure 6.13 Maximum ground-level concentrations of PCDD/F and dioxins as PCBs for the averaging period of one day [µg/ m³] - A case of the future state, i.e. for a case involving all current and future emitters after the construction of the Eco Energy complex

As stated above, the Study of the impact of the Waste Pretreatment Filter System and Activated Carbon Filters within the Waste-to-Energy Plant on the air quality of the wider location of the chemical industry

complex in Prahovo, prepared by a team of experts of the University of Belgrade, Faculty of Mechanical Engineering
Belgrade, July 2024, modelling was performed in the case when the Waste-to-Energy plant operates according to the design parameters of normal operation, as well as in the case when the boiler plant ceases to operate and when the Waste Pretreatment Filter System and Activated Carbon Filters take over the role of air treatment from the storage space and continue to operate for a shorter period of time, which is not longer than a couple of hours, which may lead to additional TVOC emissions on this emitter. In accordance with the above, the results were obtained using a model that included particulate matter emissions (shown as PM10) and TVOC.

Figure 6.14 shows the isopleths of ground-level concentrations, in the case when the boiler does not work, related to the first maximum of possible PM10 values for the averaging period of one day, where the maximum observed concentration is 97.76 μg/m³, which is far above the limit value of 50 μg/m³. This concentration, as well as the zone with the highest impact for this period of averaging, is located along the eastern part of the future phosphogypsum landfill, i.e. the south-eastern border of the factory property. Zones with high concentrations over 50 μg/m³ are a direct consequence of a combination of certain meteorological conditions and primarily surface emission sources or phosphogypsum landfills. Other parts of the model domain are also in this case far below the limit values.

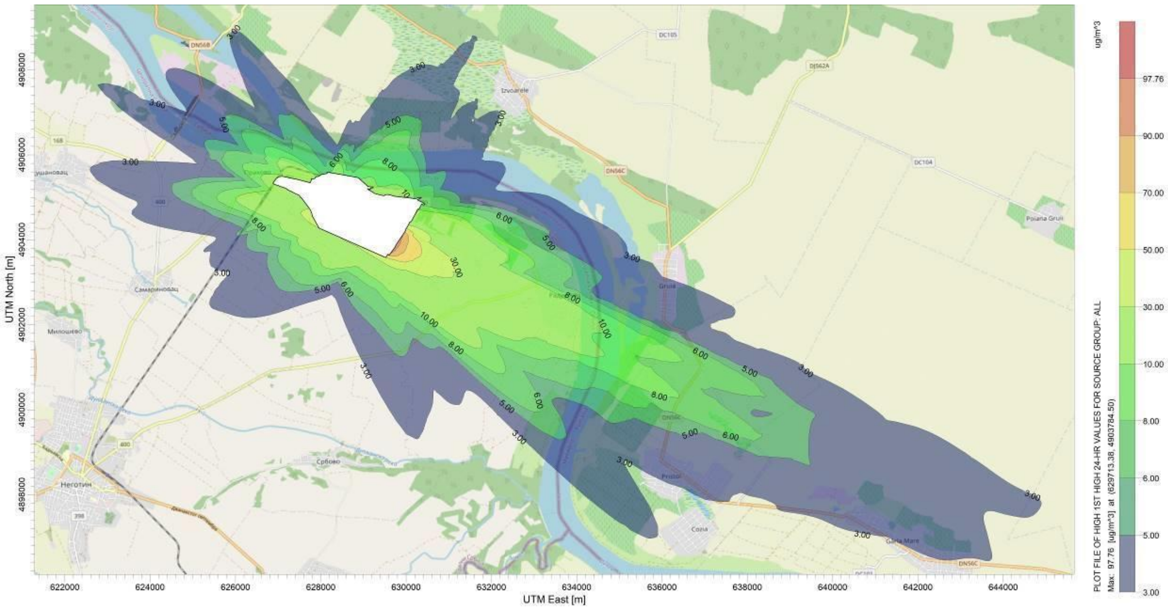


Figure 6.14 Maximum ground-level concentrations of PM10 for an averaging period of one day [μg/m³]

In order to furtherly demonstrate the effect of the future Waste-to-Energy Plant on the ground concentration of PM10, modelling was carried out in case that only sources related to this plant were considered, i.e. the case when the boiler plant is not in operation, which includes emitters of waste pretreatment and solidification as well as the solidificates landfill. The modelling results, shown in Figure 6.13, indicate that in this case the total impact of the thermal treatment plant will be almost negligible (the maximum value obtained is 4.12 μg/m³).

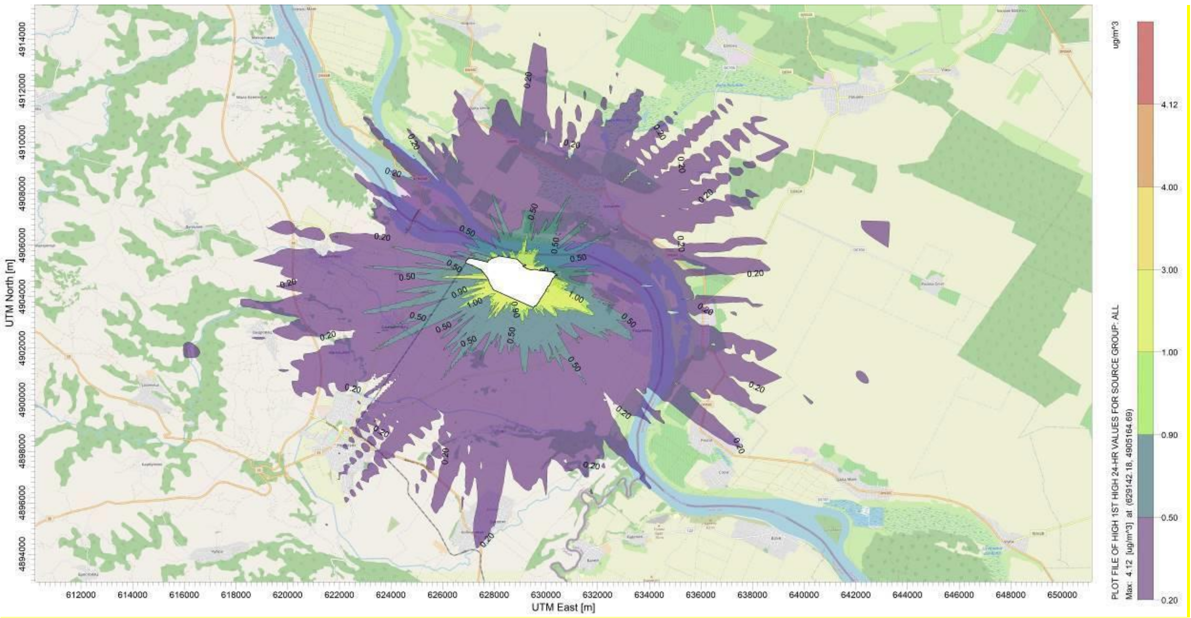


Figure 6.15 Maximum ground-level concentrations of PM10 for an averaging period of one day [μg/m³]

Figure 6.16 shows the modelling results for TVOC in the case when the boiler plant is not in operation, i.e. when this pollutant is emitted from the emitter of the waste preparation plant. The highest concentrations obtained by modelling, for the averaging period of one day, can be observed immediately next to the northern limit of the property in amount of 5.59 μg/m³. Bearing in mind the stated indicative limit value (400 μg/m³) for the concentration of TVOC indoors, it can be concluded that the model gives values far below this threshold.

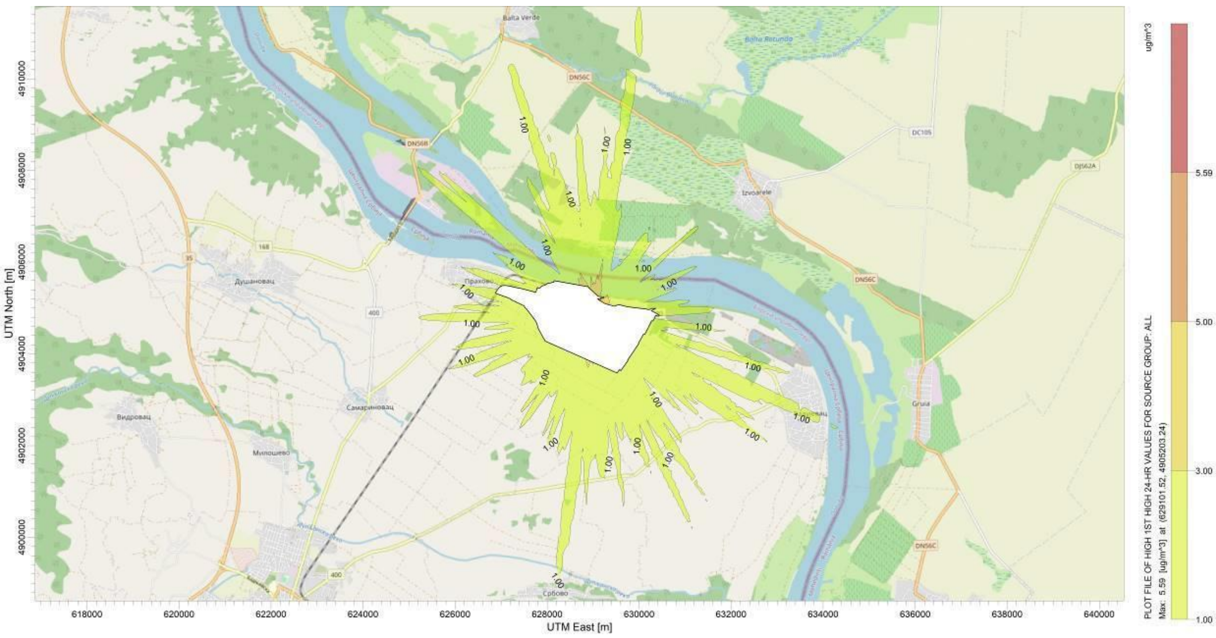


Figure 6.16 Maximum ground level TVOC concentrations for averaging period of one day [μg/m³]

It should be kept in mind that the results presented in this Study represent the highest possible ground concentrations of the considered pollutants, which are due to the most unfavourable operating parameters and the most unfavourable meteorological conditions during a given averaging period (1/3/8/24 hours) during five consecutive years (from 2017 to 2021). Namely, for each of the receptors, potentially the highest concentration for the corresponding averaging period over a period of five years is shown. Annual concentrations are shown based on the average for the total number of hours.

In accordance with all of the above, the following **conclusions** were made:

- By analysing the obtained results, it can be concluded that when it comes to components that are currently emitted (CO, SO_2, NO_2, PM_{10}, $PM_{2.5}$, HF, HCl, NH_3) and that will also be emitted from the emitters of the future plant, including the Landfill for non-hazardous waste, it was concluded that **the dominant influence has the existing emitters (within the complex of Elixir Prahovo and Phosphea) or in the case of particulate matter, surface sources for both the current and the future state (phosphogypsum warehouses), while the impact of the future Waste-to-Energy Plant and Landfill for non-hazardous waste (solidificates) is practically negligible.**
- It was found that in the case of some components **(SO_2, PM_{10} and HF), there is a possibility of episodic high concentrations** in the case of extremely unfavourable, from the point of view of dispersion, meteorological conditions, **but that the number of hours/days with these concentrations is extremely small, i.e. there is low probability of this happening at all.**
- It has been established that the cause of these potential episodic elevated concentrations are the existing SO_2 and HF emitters within the Elixir Prahovo business, i.e. phosphogypsum landfills in the case of PM_{10}, both for the current and future situation. **Therefore, these episodic emissions are not a potential consequence of the operation of the future Waste-to-Energy Plant and Landfill for non-hazardous waste.**
- Also, potential zones with exceedances of the limit values of these components **occur on uninhabited areas in the immediate vicinity of the property limit of the chemical industry complex in Prahovo.**
- When it comes to components that are currently not emitted and that will be emitted only from the emitters of the thermal treatment plant for waste materials **(Hg and PCDD/F) in the future, the modelling results indicate that the concentrations of these pollutants will be far below the prescribed limit values.**
- By analysing the obtained results, it can be concluded that the impact of the Waste Pretreatment Filter System and Activated Carbon Filters within the Waste-to-Energy plant on the air quality of the wider location of the chemical industry complex in Prahovo is **practically negligible from the aspect of PM_{10} and TVOC.**
- Also, the presented results clearly show that within the aforementioned plant, **the dominant impact on air quality** in both cases, both when the boiler plant is in operation and when it is not, **existing emission sources of the Prahovo industrial complex.**
- It should be additionally noted that there is no prescribed maximum permissible concentration in ambient air for TVOC, and only the indicative value for internal air quality is shown in the aforementioned study.

  With regard to the potential transboundaryimpact of subject plants on air quality in neighbouring **Romania and Bulgaria**, the following was concluded:

- **Considering that due to the location of the chemical industry complex in Prahovo, there is a potential transboundaryimpact on air quality, it should be mentioned that <u>the modelling results indicate that for both the current and future conditions, this impact is generally negligible.</u>**

6.2.1.2 Impact on groundwater and surface water quality

The nearest watercourse is the River Danube. Basin – Danube; Water area - Danube according to Art. 27. of the Law on Waters, Decision on determining the boundaries of river basin districts ("Official Gazette of the RS" no. 75/2010) and the Rulebook on Determination of Sub-basins ("Official Gazette of the RS" no. 54/2011). According to the Decision on Determining the List of Waters of the First Order ("Official Gazette of the RS" No. 83/10), the Danube River is classified as 1. Interstate waters 1) natural watercourses. According to the Regulation on the Categorization of Watercourses ("Official Gazette of the RS" no. 5/1968), the river section in question belongs to Class II for the Danube section: from the Hungarian border - to the Bulgarian border. The facilities in question are located in the area of water unit number 12, "Danube and Timok – Negotin", according to the Rulebook on the determination of water units and their boundaries, ("Official Gazette of the RS", no. 8/2018).

Groundwater levels change and directly depend on the height of the Danube, with a slight increase in levels near the river banks.

Hydrotechnical installations of the planned Waste-to-Energy Plant (incineration) of non-recyclable waste, provide solutions for: sanitary water, fire (hydrant water), foul sewage, clean rain sewage from the roofs of facilities, oily rain sewage from roads and plateaus and process sewage. The project envisages **separate sewage** with separate collection of water from the complex **as well as plants for the treatment of all wastewater** before their discharge first into the collection conduit and then into the final recipient.

Wastewater collection and treatment: **Sanitary – foul wastewater** (sewage system collects waste sanitary-foul wastewater and conducts it to the treatment plant (mechanical and biological treatment). Purified wastewater is connected to the shaft of conditionally clean rainwater sewerage and then discharged into the internal network of the Elixir Prahovo Industrial Complex); **Atmospheric clean water** (rainwater sewerage for the collection of clean atmospheric water from the roofs of buildings and its drainage into the existing Central collector of the Elixir Prahovo industrial complex, which brings wastewater to the existing inlet structure and discharges it into the Danube River); **Atmospheric potentially oily wastewater** (rainwater sewerage for the collection of oily wastewater from roads, manipulative surfaces and parking lots takes water for treatment into the coalescent separator of grease and oil. After the separator, the purified water is connected to the clean rainwater sewage); **Process wastewater from wastewater treatment plant of the boiler plant** – process sewage (T1); **General process wastewater** (water from the drain in W-C11, water from the drainage of the boiler, leachate from the Landfill for non-hazardous waste, etc.) – general process sewage (T2); **Wastewater from fire extinguishing** – system of collection and drainage of FP wastewater; **Wastewater from washing of sand filters from the preparation of process water** – (T3); **Wastewater from washing of filters from the WWTP wastewater treatment plant** – (T4).

Note: The project also envisages pumping leachate from the body of the Landfill for Non-hazardous Waste (solidificates) into the wastewater pool U-C06 within the Waste-to-Energy Plant. Leachate waters may contain heavy metals from ash, alkaline oxides, organic substances, sulfates and chlorides, therefore these leachate waters within the Waste-to-Energy plant complex will be treated first through a grease and oil separator, after which they are discharged into the U-C06 wastewater basin (chamber 3), from where they are taken through a sand filter and activated carbon filter to the boiler plant wastewater treatment plant for final treatment (under the license of Envirochemie (ECWWT), after which the quality of treated water is achieved, which is in accordance with domestic and EU regulations. Cleaned water is supplied from this plant to chamber 2 of the wastewater tank U-C06 whose main role is to accept them in order to perform their testing before discharge to the recipient.

The project envisages internal monitoring of the quality of leachate on a representative number of samples, which are taken at the controlled drainage of water from the landfill site, and before admission to the appropriate wastewater basin U-C06 within the Energy Waste Plant complex (see Chapter 9.2.2 of the study).

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With the application of all envisaged measures for the protection and treatment of wastewater, the emissions into water from the plant will be in accordance with the highest standards of the European Union, the conclusions on the best available technologies and BREF documents from 2019[70] and are therefore lower than for the most of European plants built before 2019 (see Annex - OVERVIEW OF COMPLIANCE WITH THE CONCLUSIONS OF THE BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT).

Table 6.14 provides an overview of the type and quantity of pollutants emitted in wastewater after treatment at the boiler plant wastewater treatment plant.

Table 6.14 Display of the type and amount of pollutants emitted in the wastewater after treatment at the boiler plant wastewater treatment plant:

Parameter		Process	Unit of measure	Expected emission range to waters	
				min	max
Total suspended solids (TSS)		FGC Treatment of bottom ash	mg/l	-	30
Total organic carbon (TOC)		FGC Treatment of bottom ash		-	40
Metals and metalloids	As	FGC		0.002	0.05
	Cd	FGC		0.003	0.03
	Cr	FGC		0.001	0.1
	Cu	FGC		0.002	0.15
	Hg	FGC		0.001	0.01
	Ni	FGC		0.03	0.15
	Pb	FGC		0.02	0.06
	Sb	Treatment of bottom ash		0.02	0,9
	Tl	FGC		0.005	0.03
	Zn	FGC		0.006	0.5
Dioxins and furans PCDD/F		FGC	ng I-TEQ/l	0.004	0.05

On all water treatment systems, devices for water flow measuring are provided, as well as water quality measuring at the inlet and outlet of the plant before entering the recipient, i.e. collector, as corrective measures necessary in the event that some of the parameters do not meet the conditions for water discharging from the complex.

For continuous control and monitoring of possible groundwater pollution at the Elixir Prahovo complex, piezometers have been installed from which groundwater quality examinations are performed periodically according to the defined dynamics. The operator also regularly monitors the quality of wastewater and the quality of the recipient (Danube River), which will continue even after the construction of the project in question.

6.2.1.2.1 Analysis of the impact of wastewater on water quality in the Danube River

For the purpose of determining the impact of the discharge of wastewater from the Eco Energy complex into the collective collector of the Elixir Prahovo complex, and then into the Danube River, modelling of the effects of the emission of hazardous substances from the existing Elixir Prahovo complex and the Waste-to-Energy Plant on the possible pollution of the Danube was performed.

The effect of pollution of the river flow of the Danube downstream from the location of the Elixir Prahovo complex and the Eco Energy complex depends on the inflow of wastewater, which will represent the integral value of the flow of wastewater of the already operational-functional part of the Elixir Prahovo complex and the inflow of wastewater from the subject Waste-to-Energy Plant, which is in the design phase.

The quantities of emitted pollutants in wastewater after treatment at the wastewater treatment plant of the boiler plant within the Waste-to-Energy Plant are in accordance with the applicable regulations of the Republic of Serbia, i.e. Regulation on technical and technological conditions for the design, construction, equipment and operation of plants and types of waste for thermal treatment of waste, limit concentrations of emissions and their monitoring (Official Gazette of RS, no. 103/2023), the highest EU standards, conclusions on the best available technologies and BREF documents from 2019. (*Commission implementing decision* (EU) 2019/2010 of 12 Nov. 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration).

The examination of the wastewater impact on the Danube was considered through the analysis of the **cumulative contribution** of wastewater discharged from the existing Elixir Prahovo complex and wastewater that will be discharged from the future Waste-to-Energy plant (**technological wastewater** from the boiler plant wastewater treatment plant and **atmospheric wastewater**). The impact of wastewater from the Wsaste-to-Energy plant complex is **expressed through specific contaminations that are characteristic of the technological process of processing wastewater and water from the separation of oils and fats and conditionally clean atmospheric water.**

In accordance with the methodology previously set, the following flows were taken for the calculation of the integral flow of wastewater that will be collectively discharged into the Danube River:

- The amount of conditionally clean (from the roofs of the facilities) and oily atmospheric water that is treated through two separators of NS10/100 ST1000 and NS15/150 ST1500 petroleum products with BYPASS is 233 l/s.
- The amount of sanitary and faecal wastewater that is treated through the BP ES 20 biological purifier is a maximum of 4 l/s (only in the case of peak consumption that can last only a few minutes, while in regular operation this amount is significantly less, i.e. an average of 0,035 l/s).
- The amount of purified process water is a maximum of 4 l/s (discontinuous discharge).

To the existing Central Collector of the Prahovo DN800 chemical industry complex, which drains water to the final recipient, the Danube River, from the WtE Plant complex to the waste of treated water, is brought through the DN600 canal with a total length of 385 m with a drop of 0,2%, into which the maximum discharge is made (233 + 4 + 4 = **241 l/s of water)**.

The concentrations modeled are: BOD_5, COD, TSS, TOC, As, Cd, Sb, Tl, Pb, Cr, Cu, Hg, Ni, Zn, PCDD/F (pH is not an additive parameter, so it is not possible to do it by additive methodology, while the temperature is below 30 °C everywhere, so it can be considered not a relevant parameter for consideration).

The input data for the calculation are the maximum allowed values of polluting substances in wastewater, that is, ELV emissions, which are prescribed by RS regulations and the best available techniques (BAT) and as such were taken as input values for the calculation.
The input values of water concentrations from the separator used for the calculation are given in table 6.15.

Table 6.15 Emission values at the point of discharge into surface waters

Parameter	Measuring unit	Input values of separator water concentrations used for the calculation

Temperature	°C	30
pH		6,5-9
Biological oxygen demand (BPK_5)	mg O_2/l	40
Chemical oxygen demand (COD)	mg O_2/l	150
Hydrocarbon index	mg/l	10

The input concentration values of pollutants in process water from the Waste-to-Energy Plant used for the calculation are provided in Table 6.16.

Table 6.16 Limit values of polluting substances emissions in technological wastewater after the water cleaning system from the treatment of waste gases of the boiler plant as part of Waste-to-Energy plant

Parameter		Process	Unit of measure	Input values of water concentrations used for the calculation	Averaging time
Total suspended solids (TSS)		FGC Treatment of bottom ash	mg/l	10-30	Random sampling
Total organic carbon (TOC)		FGC Treatment of bottom ash		15 – 40	Daily average value or 24 h flow proportional composite samples Composite sampling may be applied in proportion to the time provided that sufficient flow stability has been demonstrated
Metals and metalloids	As	FGC		0.01-0.05	
	Cd	FGC		0.005-0.03	
	Cr	FGC		0.01-0.1	
	Cu	FGC		0.03-0.15	
	Hg	FGC		0.001-0.01	
	Ni	FGC		0.03-0.15	
	Pb	FGC		0.02–0.06	
	Sb	Treatment of bottom ash		0.02–0.9	
	Tl	FGC		0.005-0.03	
	Zn	FGC		0.01–0.5	

Dioxins and furans PCDD/F	FGC	ng I-TEQ/l	0.01-0.05	

From the report on the examination of the "zero" state "Physico-chemical analysis of samples of waste and surface water at the location of the production part of the industrial complex Elixir Prahovo", Institute for preventive protection at work, fire protection and development doo Novi Sad, no. 786/24 of July 16, 2024, the following values were taken from the current water discharge of the Elixir Prahovo complex cleaning system to the collector:

- TSS – 10 mg/L
- TOC = Hydrocarbon index = 0,05 mg/L (it was assumed that the amounts for TOC are same as Hydrocarbon index)
- PCDD/F – 0 (there is no source in earlier technological procedures, nor measurement)
- Tl – 10 µg/L
- BOD_5 – 0,76 mg/L
- COD – 26 mgO_2/L
- Zn – 10 µgL
- Pb – 5 µg/L
- Cu – 20 µg/L
- Hg – 0.3 µg/L
- Ni – 40 µg/L
- Sb – 10 µg/L
- As – 5 µg/L
- Cd – 5 µg/L
- Cr – 50 µg/L

<u>Notes:</u> For the concentration of each measured (determined) parameter with a value below the detection limit of the method, the limit taken is the detection limit of the method, although the real concentration values are probably lower in most cases.

In order to model the pollution of the Danube river course from pollutants originating from waste water from the Waste-to-Energy plant complex and the existing Elixir Prahovo complex, which are collectively discharged into the Danube river, a model was applied, which implies that the outflow of waste water disperses through the Danube river course in in the form of a developed plume and in accordance with the hydrodynamic parameters of the Danube River (J. Rutherford *Handbook on mixing in rivers*, Water & soil miscellaneous publication, No. 26/1981, Wellington):

$$C = \frac{\Sigma E}{4 \cdot \pi \cdot x \cdot \sqrt{D_y \cdot D_z}} e^{-\frac{y^2 \cdot v_x}{4 \cdot D_y \cdot x} - \frac{z^2 \cdot v_x}{4 \cdot D_z \cdot x}}$$

Where:

- ΣE - integral values of pollutant emissions in wastewater, mg/s

- D_y and D_z – transverse and vertical coefficient of turbulent diffusion of pollutants in the river flow, respectively, m^2/s.

Based on the flow of waste materials and the concentration of pollutants, the **integral emission values** of pollutants discharged into the Danube River were calculated:

- $E_{BOD5} \approx 9508$ mg/s
- $E_{COD} \approx 39436$ mg/s
- $E_{TOC} \approx 2777$ mg/s
- $E_{TSS} \approx 1708$ mg/s
- $E_{As} \approx 1.21$ mg/s
- $E_{Cd} \approx 0.86$ mg/s
- $E_{Cr} \approx 1.21$ mg/s
- $E_{Cu} \approx 3.59$ mg/s
- $E_{Hg} \approx 0.093$ mg/s
- $E_{Ni} \approx 6.42$ mg/s
- $E_{Pb} \approx 1.01$ mg/s
- $E_{Sb} \approx 5.92$ mg/s
- $E_{Tl} \approx 1.57$ mg/s
- $E_{Zn} \approx 3.92$ mg/s
- $E_{PCDD/F} \approx 0.25$ ng/s

The values of the parameters used in the turbulent diffusion equation for the calculation of pollution down the river course of the Danube are as follows:

- the average flow rate of the Danube (at the Prahovo site) is: $Q \approx 4.9 \cdot 10^3\ m^3/s$
- the average speed of the river flow of the Danube, in this part is: $\boldsymbol{v_x} \approx 4.6 \pm 0.94$ km/h (1.28 m/s)
- the average depth of the Danube, in this part is: H ≈ 7 m
- the average width of the Danube, in this part is: B ≈ 680 m.

The values of the turbulent diffusion coefficients $\boldsymbol{D_y}$ and $\boldsymbol{D_z}$ were calculated based on the recommended correlation equations.

For the river flow condition, *B*/*H* > 100, the following correlation equation is recommended for the $\boldsymbol{D_y}$ coefficient [S.Lau et al., Longitudinal and lateral diffusion of solute transport in flow with rigid vegetation, *Environ Sci Eur, 32:40, 2020.*]:

$$D_y \approx 0.16 \cdot H \cdot v_*$$

where:

- v_* – dynamic speed (friction speed) , m/s.

For vertical dispersion coefficient $\boldsymbol{E_z}$: [J.Nelson et al., New methods for predicting and measuring dispersion in rivers, E3S Web of Conferences – *River Flow 2018,* **40**, 05052, 2018.]:

$$D_z \approx 0.067 \cdot H \cdot v_*$$

Table 6.17 shows the calculated values of the listed pollutants concentrations at 100 m and 200 m downstream of the collective wastewater discharge point, along the axis of the pollution plume in the river course of the Danube.

Table 6.17 Maximum concentration values of pollutants at 100 m and 200 m downstream of the collective wastewater discharge point along the axis of the pollution plume in the river course of the Danube.

Pollutant/Parameter	**Pollutant concentration, mg/L**		**LV for pollutants for Class II of surface waters quality*, mg/L**
	at 100 m	at 200 m	
BOD_5	0.106	0.053	5
COD	0.441	0.220	10
TOC	0.031	0.016	5
TSS	0.02	0.01	25

As	0.000014	0.000007	0.005
Cd	0.00001	0.000005	-
Cr	0.000014	0.000007	0.025
Cu	0.00004	0.00002	0.04
Hg	0.00000093	0.00000047	-
Ni	0.000072	0.000036	-
Pb	0.000011	0.0000056	-
Sb	0.000066	0.000033	-
Tl	0.000018	0.000009	-
Zn	0.000044	0.000022	0.3
PCDD/F	0.0000028 ng/L	0.0000014 ng/L	-

* Regulation on limit values of pollutants in surface and underground waters and sediment and deadlines for their reach (Official Gazette of RS, No. 50/2012)

By comparing the results of the Danube River pollution modeling due to the discharge of collective waste water from the Elixir Prahovo complex and the future Eco Energy complex, it can be observed that no parameters exceed the concentration limit values of the tested parameters.
Also, it should be borne in mind that based on the results of the "zero state" of the Danube River water quality, it can be stated that in the tested water in its current state there is no load of any of the polluting substances listed in table 6.20, which are expected in wastewater which will be discharged from the future Waste-to-Energy plant complex. Bearing in mind the above, as well as the fact that all pollutants in wastewater from WtE will be below the ELV prescribed by the conclusions on the best available technologies and BREF documents from 2019. (Commission implementing decision (EU) 2019/2010 of 12 Nov. 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration), it can be stated that after putting the plant in question into operation, there will be no cumulatively higher values of the concentration of polluting substances in the collective wastewater discharged into the Danube River. Flow modeling additionally shows that concentrations already 100 m downstream from the wastewater outlet are negligible. At 100 m from the outlet is the relatively highest load (in relation to the limit value) of COD, which is 22 times less than defined by the Regulation on limit values of polluting substances in surface and underground waters and sediment and deadlines for reaching them. On the other hand, among the parameters not regulated by the Regulation, the highest relative load (in relation to the limit value) is Tl, which is 1667 times less than the concentration prescribed by the conclusions on the best available technologies and BREF documents from 2019.

Since the initial concentrations of pollutants in the wastewater originating from the WtE plant were taken based on the projected maximum allowable values, in this Study, as part of the planning of all emission streams monitoring, the monitoring of the wastewater quality from both the Eco Energy complex and monitoring the quality of the Danube River even after the realization of the project in the phase of operational functioning of the future complex are defined.

6.2.1.2.2 Modelling the effects of the emission of hazardous substances into the air from the Waste-to-Energy (WtE) plant on the pollution of the river course of the Danube

Concentrations of emission discharges of pollutants in the regular operation of the Waste-to-Energy Plant must be within the limits of the projected values, in accordance with the proven waste treatment technology.

In the conditions of regular operation of the plant and in the conditions of emergency situations, when there is an uncontrolled discharge of hazardous substances into the surrounding environment, in accordance with the presented in the previous part of the text, the modelling of these situations was performed from the aspect of the expansion of endangered zones, both in the area of the operator and in the near and distant environment.

Under the conditions of regular operation of the Waste-to-Energy Plant, the projected (expected) emission ranges (with minimum and maximum values) are lower than the prescribed emission limit values (ELV in accordance with RS regulations; ELV BAT-AELs, i.e. according to BREF WI).

The calculated emission values of these pollutants included in the turbulent diffusion equations, with the aim of calculating the "wet" (precipitation) fractions of the disperse stream (similar to the effect of "acid rain") give low values, so that they have almost no impact on the pollution of the Danube flow even under the most unfavourable weather conditions.

6.2.1.3 Potential impact of Landfill for non-hazardous waste on water and soil

The subject project envisaged landfill development measures taken for the purpose of soil protection will also contribute to the protection of groundwater at the site in question. In order to protect soil and groundwater, the Landfill for non-hazardous waste was designed in full compliance with the provisions of the Regulation on the disposal of waste at landfills ("Official Gazette of the RS", no. 92/2010).
In accordance with the results of geotechnical tests of the subject area, which are presented in the Geotechnical Study for the purpose of forming a Landfill for non-hazardous waste in the ICP Elixir complex in Prahovo ("GT Soil inženjering d.o.o.", January 2023), where it was determined that the groundwater level is 7-10 m below the level of the landfill area, the space, i.e. the bottom of the landfill body will be formed in such a way that the subject area is first well rolled by multiple passage of rollers and compactors, which will provide sufficient compaction that mimics the mineral barrier. A geomembrane made of high-density polyethylene (HDPE), with a thickness of not less than 1.5 mm, will be placed on the rolled surface, on which a protective layer of geotextile, with a minimum mass of 200 g/m2, will be placed. Above the geotextile protective layer, a drainage and relief layer of gravel with a minimum thickness of 50 cm will be laid, and corrugated perforated drainage pipes will be laid on the gravel.

It is planned to establish on the landfill **a completely closed system of water circulation from the landfill**. Two separate water collection systems are envisaged: Leachate collection system by which water is transported to the wastewater pool provided in the space of the Waste-to-Energy plant and Atmospheric runoff collection system for collecting wastewater from the landfill slopes and usage for water spraying on the landfill slopes, thus achieving water recirculation. A detailed description of the collection and treatment of landfill water is given in Chapter 3 of this Study.

In addition to the above, it is important to point out that stabilized and solidified waste is disposed of at the landfill, which, according to its characteristics, must meet the requirements regarding the leaching of harmful substances. Leaching tests of stabilized and solidified waste prove that there is no danger of discharging harmful substances from landfilled waste into water and soil.

In accordance with all of the above, it is not expected that the operation of the landfill will affect the quality of water and soil.

6.2.1.4 Impact on noise levels in the environment

Noise can be one of the significant factors endangering the environment and human health. Excessive noise, when it comes to harmful effects on humans, is any noise whose sound pressure level exceeds 90 dB(A).

The negative impact of noise on human health depends on the intensity of the noise, the duration of noise exposure, the character of the noise and individual sensitivity to noise.

Regulation on Noise Indicators, Limit Values, Noise Indicators Assessment Methods, Annoyance and Harmful Effects of Environmental Noise ("Official Gazette of the RS", no. 75/10), the maximum permissible external noise levels are defined as shown in Table 6.18.

Table 6.18 Limit values of outdoor noise indicators

Zone	Purpose of the space	Noise level in dB(A)	
		for day and evening	for night

1.	Rest and recreation areas, hospital zones and convalescent homes, cultural and historical sites, large parks	50	40
2.	Tourist areas, campsites and school zones	50	45
3.	Clean residential areas	55	45
4.	**Business and residential areas, commercial and residential areas and children's playgrounds**	**60**	**50**
5.	City centre, craft, commercial, administrative zone with apartments, zone along highways, main and city roads	65	55
6.	Industrial, warehouse and service areas and transport terminals without residential buildings	At the border of this zone, noise must not exceed the limit value in the zone with which it borders	

During the exploitation of the complex in subject, noise is expected from traffic on the complex (freight vehicles that deliver waste and passenger cars with which employees and visitors come), as well as due to the operation of process equipment (pumps, shredders, cranes, mixer, fans, etc.). Noise protection must comply with the equipment manufacturer's instructions. Most of the equipment that emits higher-intensity noise will be located in closed facilities. The envisaged distance between the equipment is sufficient so that the noise level does not increase. Facilities that are not part of an indivisible technological whole are separated, in order to minimize noise levels. The plant itself is not near other noise emitters.

Noise due to the performance of transportation activities on the complex is of a temporary nature. The transportation vehicles (trucks and tank trucks, etc.) that will be engaged represent a source of noise that reaches from 80 dB(A) to 90 dB(A), depending on the type of machine, degree of load, technical condition and method of handling. The noise level decreases with the square of distance, the soil and the vegetation both absorb and reflect the sound waves, so an increased noise level should not be expected at a distance of more than 50 m from the worksite. In order to reduce air emissions, unloading of bulk solid waste material and sludge will be carried out by entering the vehicle inside the W-C08 facility, after which the door of the facility is closed and only then unloading begins. When transfering liquid waste and liquid raw materials, as well as when unloading trucks, the engines of the means of transportation must be switched off.

Since the facilities in question are located in an industrial zone, noise will not have a significant impact on the environment. If the noise level prescribed for this zone is exceeded, certain measures will be taken to reduce it.

6.2.1.5 Impact on intensities of vibration, heat and radiation

The equipment to be used will be placed on the appropriate substrate, which is why it is not expected to create vibrations, nor the impact of them on the environment. If new equipment is procured in the future, it will be taken into account that measures have been applied to prevent or reduce vibration.

If the characteristics of the project are taken into account, no increased level of heat or radiation emissions is expected during the exploitation of the Eco Energy complex, and there will be no impact of heat on the environment. At the location in question, devices that emit or produce ionizing radiation and non-ionizing radiation will not be used.

At the request of the commission from Romania, the Project Promoter provided information from the company Elixir Prahovo, which is a phosphogypsum storage operator, from the aspect of ionizing radiation. Considering that phosphate minerals and phosphate rocks may contain traces of natural radioactive elements, which are naturally present in geological formations, in accordance with the Law on Ionizing Radiation Protection and Nuclear Safety (Official Gazette of RS, no. 95/2018 and 10/2019), soil and stored phosphogypsum were tested. In order to assess the exposure to radon and external gamma radiation of Elixir Prahovo personnel working in the phosphogypsum storage, measurements of the radon concentration (^{222}Rn) in the air immediately

above and in the matrix of phosphogypsum material and the ambient dose strength of ionizing radiation equivalent in the phosphogypsum storage were performed. Phase I and O gamma spectrometric analysis of phosphogypsum samples to assess exposure to ionizing radiation. Measurements were made at a total of 18 positions within the phosphogypsum storage. According to the Rulebook on the Limits of Radioactive Contamination of Persons, Work and Environment and the Method of Decontamination ("Official Gazette of RS", No. 38/2011), the limit for the disposal of materials in the environment for natural radionuclides is not exceeded for phosphogypsum. Also, the assessment of the radon equivalent dose for Elixir Prahovo employees who spent most of their working time in the phosphogypsum storage facility was in line with the recommendations of international organizations. According to the Rulebook on the Limits of Radioactive Contamination of Persons, Work and Environment and the Method of Decontamination ("Official Gazette of RS", No. 38/2011), the soil was also tested by sampling at five locations. The results of radionuclide activity in all five samples confirm that neither natural nor artificial radionuclides were detected at concentrations above the maximum allowed values.

6.2.2 Population health

Communities within the potential impact zone of the project include those settlements located in the immediate or wider vicinity of the plant, which may be under potential impact of the project. Also, people living in these settlements can harbour the highest degree of concern about potential environmental pollution and the impact on their and the health of their families, animals and crops, the jobs and activities they perform or their hobbies.

In determining these communities, the parameters of distance and position in relation to the course of the Danube were taken. Table 6.19 presents communities that may be impacted by the project.

Table 6.19 Stakeholder communities by project location (blue – impact zone, white – vicinity)

No.	Settlement	Type of settlement	Population	Approximate distance from the project in km
1	Prahovo	Village	799	2
2	Radujevac	Village	735	4
3	Samarinovac	Village	616	5
4	Srbovo	Village	289	6
5	Dušanovac	Village	548	7
6	Negotin	Municipality	14,647	10
7	Bukovo	Monastery	10	13
Cross-border settlements				
8	Izvoarele	Settlement in Romania	951	4
9	Gruja	The seat of the municipality of Gruja in Romania	1,890	7
10	Balej	A village in northwestern Bulgaria in the municipality of Bregovo	437	10.5
11	Kudelin	A village in northwestern Bulgaria as well, in the municipality of Bregovo	229	10.6

Settlements marked in blue are defined as zones where citizens' interest is expected due to the possible impact of the project, where Prahovo stands out as the settlement closest to the location of the plant.

6.2.2.1 Impact of plant emissions for obtaining energy from waste on public health

The incineration of waste (obtaining energy from waste) in the plant in question will have negligible negative impacts on health, since all preventive protection measures and proper management of the plant are envisaged, and the Preliminary Design designed technical and technological solutions that comply with the regulations and standards of the Republic of Serbia, the highest EU standards and very strict BAT requirements.

The fact that the use of waste as a resource for energy production reduces the amount of waste disposed of in landfills, which directly reduces the negative impact of landfills on the environment, and the separated secondary raw materials (black and non-ferrous metals, plastics, etc.) are handed over to operators for recycling, speaks in favour of the environmental benefits, which are achieved through the implementation of the project in question. The project also contributes to the diversification of energy sources and the improvement of the energy efficiency of the Elixir Prahovo complex, which is of particular importance for long-term energy security, the preservation of natural resources and the reduction of the use of fossil fuels. In accordance with the EU principle of not burdening the CO_2 emissions of hazardous waste WtE plants, it can be concluded that the project reduces the emission of gases with a greenhouse effect per ton of phosphoric acid produced by as much as 28% by 2027 in accordance with the data given below. Globally reducing the use of fossil fuels reduces air pollution and reduces the emission of gases with the greenhouse effect, which also achieves a reduction of negative impacts on human health.

The Elixir Sustainability Team conducted an LCA (Life Cycle Assessment) analysis in accordance with ISO 14067, relying on data from internal operating systems, strategic plans and publicly available sources such as the Rulebook on Final Energy Conversion Factors into Primary and Carbon Dioxide Emission Factors ("Official Gazette of RS", No. 111/2021, 6/2023), the International Energy Agency (IEA) and guidelines for the calculation of greenhouse gas (GHG) emissions in waste management and energy recovery projects.

These data were obtained by calculating based on emission factors for fossil fuels currently used and comparing them with emission factors for operations within the WtE plant. During the calculation, the following were considered:

- Requirements for thermal energy required for the production of water vapor in the existing plant of the Elixir Prahovo complex.
- Expected efficiency of the WtE plant in question.
- Emission factors for fossil fuels and alternative energy sources, which are publicly available and based on data obtained from the operational operation of the plant.

The focus is on reducing emissions quantified through Scope 1 (direct emissions from fuel combustion, Table 6.20) and Scope 2 (indirect emissions from purchased energy, Table 6.21).

Table 0.1 Energy mix of the existing energy plant within the Elixir Prahovo complex

Fossil fuels 2023	Emission Factor tCO2 / t of energy product	Energy product t normative/ t st.	Emission Factor tCO2/ t st.	% in source structure st.
Coal	1.27	0.164	0.209	48%
Lignite dried (36%)	1.74			
Brown coal (64%)	1.01			
Mazout	3.17	0.071	0.226	38%
LPG	3.02	0.064	0.194	2%
CNG	1.85	0.058	0.108	12%
			0.203	tCO2e per ton of steam WEIGHTED

Table 6.20 emphasizes the current significant reliance on the use of fossil fuels for water vapor production, which leads to significant carbon dioxide emissions. The total emission of greenhouse gases as a result of the consumption of fossil fuels in the existing energy plant is 0.203 tCO_2 per ton of steam(st). This value reflects the cumulative impact of emissions from various fossil fuels, such as coal, fuel oil and natural gas. The reliance on these fuels emphasizes the significant carbon footprint of water vapor production within the Elixir Prahovo energy complex.

Table 6.21 provides a comparative view of electricity consumption, which is related to greenhouse gas emissions, between the WtE plant and the existing power plant Elixir Prahovo.

Table 0.2 Electricity consumption in the WtE plant and in the existing power plant Elixir Prahovo

Electricity of both power plants	Unit	WtE plant	Existing power plant at Elixir Prahovo
Electricity norm for st. production	MWh/t st.	0.11	0.02
Electricity EF (Serbia)	$t\ CO_{2e}$ / MWh	0.71	0.71
GHG emission for 1 t st. production	$t\ CO_{2e}$ / t st.	0.076	0.013

Based on the presented analysis, it can be seen that the WtE plant consumes significantly more electricity per ton of water vapor produced, of 0.11 MWh compared to 0.02 MWh consumed within the existing power plant. Higher electricity consumption is converted into higher greenhouse gas emissions than the use of electricity, with WtE emitting 0.076 tCO_2 per ton of steam compared to only 0.013 tCO_2 which in this way emits from the existing power plant Elix Prahovo. Despite the increased reliance on electricity in the WtE plant, this operational difference must be taken into account in terms of a broader view of emission reductions achieved by reducing the use of fossil fuels shown under Scope 1.

Table 6.22 integrates data from Scope 1 and Scope 2 emissions, offering a comprehensive overview of total greenhouse gas emissions per ton of water vapor produced for both the EtE plant and the existing power plant of the Elixir Prahovo complex.

Table 0.3 Overview of the Carbon Footprint (CFP) for Scope 1 and Scope 2 within the WtE plant and the existing power plant Elixir Prahovo

Steam CFP from WtE vs. Fosil fuel				
	Unit	WtE	Exisitng PP Elixir Prahovo	WtE vs. existing PP Elixir Prahovo
Fuel for steam production	tCO_{2e}/t st.	0,000	0,203	-0,203
Electricity for steam production	tCO_{2e}/t vp	0,076	0,013	0,063
TOTAL (Scope 1+2)	tCO_{2e}/t st.	0,076	0,216	Savings per ton of steam: -0.140 tCO_{2e} in emissions achieved in WtE plant in relation to existing PP
Annual production of steam:	280,000 t in WtE plant			
Annual saving of emission:	-39,282 tCO_{2e} total emission reduction on an annual basis			

Total emissions for the WtE plant are calculated at 0.076 tCO2e per ton of steam produced, which is a significant reduction compared to 0.216 tCO2e per ton in the existing power plant within the Elixir Prahovo complex. A reduction of 0.140 tCO2e per ton of steam produced highlights the benefits of switching from fossil fuel systems to steam production using WtE technology. As indicated in the previous table, with the production of 280,000 tons of steam in the WtE plant, a total emission reduction of 39,282 tCO2e will be ensured on an annual basis. This outcome highlights the effectiveness of the WtE technology approach in significantly reducing the carbon footprint of industrial operations within the Elixir Prahovo complex.

The global reduction in the use of fossil fuels reduces air pollution and the reduction of greenhouse gas emissions, which also achieves a reduction in negative impacts on human health.

6.2.2.2 Impact of emissions to air on health

As stated above, the regular operation of the plant in question can lead to the emission of pollutants into the air (particulate matter, heavy metals, HCl, HF, SO_2, NOx, CO, NH_3, TVOC, PCDD/F, CDD/F+ dioxins as PCBs, Hg).
The results of the modelled impact of the subject plant on the air quality of the wider location of the chemical industry complex in Prahovo, which are presented in the studies prepared by the expert team of the Faculty of Mechanical Engineering in Belgrade, attached to this study, as well as on the basis of all of the above in Chapter 6.2.1.1, it was noted that the impact on the air quality of the subject plant is negligible, while the hazards that may arise from the release of hazardous substances due to accident situations are more significant and are described in detail in Chapter 7 of this study.

Exposure to these contaminants can lead to respiratory problems such as aggravated asthma, bronchitis, and other lung diseases. The results of a study conducted by Cole-Hunter and the authors (2020), showed that living near an incinerator is not associated with higher exposure to heavy metals. In contrast, fine particles (PM) can penetrate deep into the lungs, causing health problems. Even exposure to low levels of PM particles can increase the risk of mortality, cardiovascular morbidity, lung cancer, and other diseases. However, gaseous mixtures and PM particles are standard air pollutants and represent a lower health risk compared to the toxic emissions discussed below.

In order to reduce any potential impact of the subject plant on air quality, the project documentation precisely defines the waste gas treatment systems as well as the levels of permissible concentrations on emitters in accordance with RS regulations and BAT conclusions. Modelling has proven that the emitted concentrations of PM particles from the plant in question will not adversely affect the air quality at the site, much less the wider impact of the project, including the transboundaryimpact.

Toxic and persistent organic pollutants, known as dioxins (polychlorinated dibenzo-p-dioxins) and furans (polychlorinated dibenzofurans), which can be formed during high temperature thermal combustion processes due to incomplete combustion and the presence of precursors, are hazardous to human health. Short-term exposure to high levels of dioxin can cause skin changes such as chloracne, changes in liver function, and skin darkening (WHO, 2016). Prolonged exposure to these substances can lead to a variety of health problems, including cancer, developmental problems, immune system disorders, and neurological disorders. Incineration of plastic municipal waste is the most significant health problem highlighted in a review of studies conducted by Cole-Hunter and the authors (2020). In order to minimize exposure, it is crucial to ensure appropriate incineration conditions in order to reduce dioxin emissions and integrate sensitive and critical emission control systems, as required by European Union and RS legislation, as envisaged by the project in question. Another important aspect important for controlling emissions is the composition and variation in raw materials, which affects the concentration of pollutants in emissions. Therefore, the project in question envisages strict control of incoming waste materials, examining of its composition and defining the appropriate working protocols and recipes, all in accordance with the defined conditions for thermal treatment in the subject fluidized bed boiler plant. A detailed description of the composition of the waste that can be thermally treated and the conditions of incineration and treatment of waste gases is given in Chapter 3 of this Study.

Thus, by applying complex systems for the treatment of waste gases, it has been achieved that all emissions from the plant comply with the BAT requirements and ELV prescribed by the applicable regulations of the Republic of Serbia. Also, considering that the systems for removing unpleasant odors have been designed as part of the facility in question, they will not have an impact.

Within the industrial complex within Zone I – The existing industrial complex has formed a belt of existing protective greenery within the production part of the industrial complex and part of the complex for the production of phosphate mineral fertilizers, as well as protective greenery within the part of the industrial

complex without production functions. The existing protective greenery is positioned so that forms a buffer zone between the industrial complex and the state road, as well as a buffer zone between the industrial complex and housing within the workers' settlement in the immediate vicinity.
Second Amendments to the Detailed Regulation Plan envisage the formation of an additional protective green belt along the border of the complete industrial complex, the role is to isolate the immediate environment from negative impacts within the economic zone.

One of the main aspects of improving the project of the Waste-to-Energy Plant in Prahovo will be the establishment of civilian control of its operation. This practice will ensure that the operation of the plant remains transparent and accountable, while giving citizens the opportunity to actively participate in the monitoring and supervision of the environmental aspects of the project.

The plans for the implementation of the real-time air quality monitoring system, i.e. the donation of an automatic measuring station to the municipality of Negotin, represent steps towards enabling civil control and general improvement of the environmental transparency of this project.

The Project Holder has reached an agreement with the representatives of the municipality of Negotin and the Environmental Protection Agency on the donation of the Automatic Measuring Station, which will be part of the state network of the Environmental Protection Agency, which will also perform expert control of the work, reception and processing of data and their publication, and the results will be publicly available to citizens in real time on the website of the *Unified Overview of Automatic Air Quality Monitoring in the Republic of Serbia*.[71]. Also, in accordance with the Report on consultations with the public in the implementation of projects for the construction of a waste-to-energy plant in Prahovo, Elixir Craft doo, the Project Holder wants to participate in solving the problem of inadequate municipal waste management and thereby contribute to the reduction of the number of uncontrolled landfills fires that have a major negative impact on air quality.

6.2.2.3 Water and soil contamination and impact on human health

Residues from waste incineration can lead to water and soil pollution in case of inadequate disposal and management of this type of waste. If these pollutants enter the food chain, they can represent a health risk through the consumption of contaminated food. The increased potential for health risk is highlighted for lead and other heavy metals in bottom ash and fly ash in the post-incineration phase if residues are not adequately deposited (Cole-Hunter et al., 2020).

In order to minimize this risk with the possibility of preventive measures, the investor decided to use a stabilization and solidification process (S/S) where contaminants are trapped in a matrix without the possibility of environmental pollution (for more details, see the description given in Chapter 3 of this study).
The potential impact can only occur in the accident situations detailed in Chapter 7 of this Study.

Given the characteristics of the site, the capacity and size of the project and the characteristics of the project operation, the expected scope of impact is minimized with the application of the best available techniques, prevention and protection measures, as well as compliance with the norms and standards for the activity in question in the analysed zone and at the location in question.

Therefore, having in mind the above, the regular operation of the project in question will not have a temporary or permanent impact on the health of the population.

The impacts on the population also have positive impacts. This project opens the possibility of direct and indirect job creation, solving the problem of inadequate waste disposal in wild and unsanitary landfills, reducing greenhouse gas emissions.

6.2.2.4 Occupational hazards

Workers at the incinerator site may be exposed to polluting and hazardous substances, which may lead to potential occupational health risks. Proper safety measures and protective equipment are essential to minimize these risks.
During the design of the plant in question, the Project Holder opted for maximum automation of the work process, which also reduces the contact of employees with potential hazardous substances. It is envisaged that waste materials are transported by means of cranes, which can operate in manual, semi-automatic and fully automatic mode. Manual mode is usually considered for maintenance purposes only. In order to protect the health of employees working in workplaces with increased emissions of particulate matter (unloading of waste, handling slag in the stabilization and solidification facility, etc.), the use of certified and attested airway protection masks is mandatory.

The introduction of appropriate emission controls and legal regulations guarantees the maintenance of high standards of environmental protection and human health.

6.2.3 Meteorological parameters and climatic characteristics;

Negotin is located in a plain surrounded by mountain ranges (Miroč, Crni Vrh and Deli Jovan) and open space on the east and south sides, which all conditions a very specific climate of Negotin. Due to the warmest summers and the harshest winters, Negotinska Krajina is the most continental area of eastern Serbia. A detailed description of the meteorological parameters and climatic characteristics of the subject area is given in Chapter 2.8 of this Study.

The Waste-to-Energy plant will play a significant role in waste management in accordance with the EU principles of the treatment hierarchy, since it converts non-recyclable waste into locally available energy and usable value products in an environmentally friendly manner and using modern technical and technological solutions, substitutes the use of fossil fuels, reduces greenhouse gas (GHG) emissions in relation to the disposal of waste in landfills, reduces the amount of waste disposed of in the environment and permanently removes hazardous and harmful substances that would contaminate soil, surface and groundwater and air by disposing of on a landfill. See Chapter 6.2.2.1 for the calculation of the impact on the amount of gases with the greenhouse effect.

The operation of the Eco Energy complex will not have a negative impact on the change of climate factors.

The projects in question considered the potential impact of atmospheric precipitation on the operation of the plant, and in accordance with the data taken from the Republic Hydrometeorological Institute (RHMS), the sizing of the stormwater treatment plant from manipulative surfaces, roads and parking lots was carried out, as well as the sizing of the system for collecting stormwater and leachate from landfill bodies. In the event of extreme rainfall, the project of the landfill for non-hazardous waste envisages an emergency overflow from the storm water basin, which will enable the evacuation of water into the perimeter channel of the phosphogypsum storage, which is located on the south side of the future landfill for non-hazardous waste. In order to protect against air pollution and prevent the spreading of fine-grained material from the landfill due to the effect of wind, the project envisages wetting with water.

6.2.4 State of the ecosystem

In accordance with the Decision of the Institute for Nature Conservation of Serbia (attached), the location in question, where the construction of the Eco Energy complex is planned, is not within the protected area for which the protection procedure has been implemented or initiated, as well as within the spatial scope of the ecological network of the Republic of Serbia.

The location of the Eco Energy complex in question is within the chemical industrial complex, so there are no habitats and species that live on the site. Also, some of the established movements in this area have long since undergone changes, as a result of long-built industrial plants, three-shift-operation of equipment, constant presence of people and means of transport and fragmentation of the area by the construction of roads and railway tracks.

It is only relevant, since the site is located directly on the right bank of the Danube River, to analyse the ichthyofauna.

No animal species that may be important for the protection of fauna lives on the territory of the settlement of Prahovo.

In the area of the settlement of Prahovo and its surroundings, a variety of plant life of an indigenous and introduced character was formed, which is the result of natural conditions. In the settlement itself, the settlement's plant species are represented, while in the vicinity there are agricultural areas, which is understandable given the traditional character of this area. Meadows and arable land with a variety of cereals and industrial plants are represented in terms of vegetation.

In the littoral part, where the settlement and industrial complex rests on the right bank of the Danube River, plant communities' characteristic of the littoral belt are represented. In addition to the above, there are a number of species of ground flora as well as fragmented groves. In the narrower and wider environment of the location of the Project in question, there are no protected plant species or habitats of protected flora.

The residual impacts of the operation of the plant in question on the Djerdap National Park can be characterized as negligible given the distance of the park itself from the complex in question, as well as the application of the best available techniques, which ensures: planning and application of measures to prevent air, soil and water pollution, application of advanced material disposal technologies, as well as measures to prevent accidents. Accordingly, no residual impacts on the biological diversity of the Djerdap National Park are expected.

In addition to the impacts during the construction of the subject complex listed above, the **Study of Biodiversity of the Impact Zone of the Industrial Complex "Elixir Prahovo" – Industrija hemijskih proizvoda d.o.o. Prahovo"**by the Institute for Biological Research "Siniša Stanković", also deals with potential impacts on biodiversity during the regular operation of the complex. Based on the analysis of the narrower and wider area in accordance with the aforementioned Study, the following conclusions were made:

- In the case of the application of the best available technologies in the operation procedures of the plant in question, as planned by the Project Holder, **no significant residual impact of the operational phase on the vegetation is expected, both locally and in the wider context.**
- Current vegetation, flora and fauna are of secondary origin and are of no interest for protection. **The planned works will not lead to additional environmental damage, including the fauna of butterflies.**
- In the case of the application of the best available technologies in the operation procedures of the plant in question, which the investor planned, **no significant residual impact of the operational phase on the Odonata fauna is expected.**
- Considering that the subject area of the plant itself is dominated by arable land, while the once lush forests of grey pedunculate, as well as other natural vegetation, are almost completely degraded and that in this way the primary habitats of many insect species, including shear beetles, are destroyed, **additional impacts on these insects as a result of the operation of the subject facilities are not expected.**
- The results of the identification of silicate algae in the examined part of the course of the Danube indicate the presence of a total of 136 taxa within 48 genera. **No significant impacts of plant construction activities on benthic algae are expected.**
- A total of 109 taxa were recorded at the examined sites of the Danube in the zone of planned construction. **No significant impacts of plant construction activities on macroinvertebrate fauna are expected.**
- The negative effects on the fish fauna are mainly due to the impact of the HPP "Djerdap 1 and 2" dams, which prevent migration upstream and downstream, affect the flow regime and cause large oscillations in the water level, above, between and in the part of the flow below the dams. These significant changes have caused changes in the ichthyofauna of the Danube, **the operation of the subject facility in the littoral zone, within the industrial zone, should not have a significant negative impact on the fish fauna.**

- Within the wider zone of planned works, 22 species of amphibians and 26 species of reptiles were recorded. **The impact of the operation of the facility on the fauna of amphibians and reptiles can be assessed as minimal,** since the works will be carried out in an industrial zone where no significant habitats for these groups of organisms are recorded. Bearing in mind the decision of the Project Holder to use the best available technologies in the operational phase of the plant, which includes the application of all measures to prevent air, soil and water pollution, the application of advanced material disposal technologies, as well as measures to prevent accidents, **no significant residual impacts on amphibians and reptiles are expected.**
- The fauna of birds in the wider area of the subject works has historically been negatively affected by all forms of habitat degradation, followed by disturbance and pollution. First of all, the impact refers to the nesting period. Birds are also susceptible to disturbance during other times of the year. Smaller species of birds, primarily songbirds and woodpeckers, may lose part of their habitat during works carrying out in the area in question. The microlocation envisaged for construction works is not recognized as the habitat of these species. Bearing in mind the decision of the Project Holder to use the best available technologies in the operational phase of the plant, which includes the application of all measures to prevent air, soil and water pollution, the application of advanced material disposal technologies, as well as measures to prevent accidents, **no significant residual impacts are expected.**
- The decision of the Project Holder is to use the best available technologies in the operational phase of the plant, which includes the application of all measures to prevent air, soil and water pollution, the application of advanced material disposal technologies, as well as measures to prevent accidents, **no significant residual impacts on mammalian fauna are expected.**
- The research of the Prahovo zone recorded a small number of bat species and low activity, although the wider region is one of the most diverse in Serbia in terms of overall wealth of bat fauna (Paunović et al 2020, personal data).

The conclusions reached regarding potential transboundaryimpacts on biodiversity on the territory of Romania (Natura 2000 area Blahnița, Gruia - Gârla Mare, Dunărea la Gârla Mare – Maglavit and Natura 2000 area Jiana, Ramsar area Blahnița and National park „Domogle-Valea Černi“) and Bulgaria (Natura 2000 area Timiok, Natura 2000 area Novo selo and Deleina NATURA 2000 area) are as follows:

- Residual (after the application of the best available technologies and measures) transboundary impacts of the construction works and operation of the plant in question **can be characterized as negligible.** This applies to areas protected from the aspect of biodiversity conservation to new species and significant habitats, as well as the preservation of ecological connectivity – ecological corridors. As previously noted, the investor's commitment is to use the best available technologies in the operational phase of the plant. This approach encompasses the planning and implementation of measures to prevent air, soil and water pollution, the application of advanced material disposal technologies, as well as measures to prevent accidents. Accordingly, **transboundaryresidual impacts on biodiversity are not expected.**

Bearing in mind all the above, as well as the envisaged measures to reduce the emissions of pollutants into the environment, it can be concluded that the implementation of this project **will not affect the plant and animal species that inhabit this area and its environment.**

6.2.5 Populousness, concentration and migration of the population

As previously stated, the municipality of Negotin has extremely unfavourable demographic trends, which are reflected in the appearance of an above-average negative natural increase, a high rate of emigration and the average age of the population compared to the rest of the Republic of Serbia. With a population of 28,261 inhabitants (according to the 2022 census), it is in the group of the most sparsely populated areas of Serbia. The city settlement of Negotin has 14,647 inhabitants, the settlement of Prahovo has 799 inhabitants, while the settlement of Radujevac has 735 inhabitants. A detailed description of the population in the subject area is given in Chapter 5.1 of this Study.

The purposefulness of the construction of the Eco Energy Waste-to-Energy Plant in Prahovo is multiple and includes, among other things, **significant economic and social benefits that can have a positive,**

long-term impact on the population, concentration and migration of the population.

6.2.5.1 *Job creation and development of small and medium-sized enterprises - waste management operators*

Eco Energy Waste-to-Energy Plant in Prahovo is an economically sustainable solution that enables more efficient waste management and job creation. The estimation of the Project Holder is that the Waste-to-Energy Plant in Prahovo will **employ between 80 and 90 people, mostly highly educated staff of the engineering profession, while indirectly the energy plant will employ over 300 people and contribute to the development of small and medium enterprises – waste management operators.**

In the context of the implementation of the project for the construction of the Eco Energy complex in Prahovo, the Project Holder conducted consultations with the local community from the earliest phase of the project implementation. The consultations included a continuous and systematic process of informing and consulting citizens through various channels of communication, through which the opinions and suggestions of citizens were first collected, which were then systematized and taken into account when planning the project (attached to the study is the Report on the conducted public consultations in the implementation of projects for the construction of waste-to-energy plant – Waste-to-Energy Plant in Prahovo, Elixir craft doo). The aim was to ensure a high degree of transparency in the work of investors, affirm the importance of participatory decision-making and overall lay the foundations for the successful and sustainable implementation of a project that complies with environmental, social and economic standards. By two-way communication with the local community, the Project Holder has ensured that the implementation of the project is not only accepted by the local community, but also reflects its expectations and needs.

The results of the survey of habits and attitudes of citizens of Negotin regarding waste management, conducted in August 2022 by the Faculty of Geography, University of Belgrade, Green Loop Expert Network and Elixir , showed that 90% of respondents believe that the key preconditions for keeping young people in Negotin are:

- Secure employment and above-average income.
- 7% of respondents believe that there is no way to stop departure of young people from Negotin.

Almost all respondents see the only potential for the development of new jobs in the Negotin area in the development of Elixir and the chemical park.

6.2.5.2 *Improving the quality of life in the municipality of Negotin*

The planned investments in infrastructure, primarily transportation infrastructure, job creation, more education opportunities, etc. will certainly contribute to the improvement of the quality of life in the municipality of Negotin, as a result of the implementation of the project in question.

Based on the conducted consultations with the local community, it was noted that the majority of respondents see Elixir as the only development opportunity of the Negotin region.

Improving the quality of life in the municipality of Negotin will certainly contribute to solving the long-standing problem related to waste management and disposal, both municipal and industrial (hazardous and non-hazardous).

Inadequate waste management, especially hazardous waste and uncontrolled disposal of non-recyclable waste in municipal landfills, leads to pollution of resources, the environment, and especially sources of water, air, soil, and may also have direct implications for human health.
The implementation of the project in question will enable the establishment of a long-term sustainable system for regional waste management in a way that has a minimal adverse impact on the environment and the health of present and future generations, with rational use of resources and respect for modern waste management principles. Waste thermal treatment is an essential part of an integrated approach to

waste management and affects the reduction of the quantities of waste disposed of in landfills, reuse and recycling of waste, as well as for using waste as an energy source instead of fossil fuels for the production of steam.

6.2.5.3 *Identification of potentially vulnerable groups and stakeholders and the concerns and attitudes that most often arise within these groups*

Based on the information collected through the interview, potential vulnerable groups and stakeholders were identified and the concerns and attitudes that most often arise within these groups (see Table 6.23).

Table 6.23 Overview of vulnerable groups and the most prevalent attitudes regarding the project

Vulnerable group	***Risk***
Farmers /beekeepers / fishermen	Concerns about the impact of the project on soil, water, air and biodiversity and possible pollution that may affect their products or catches.
Recreationals (fishermen, hunters, cyclists, motorcyclists)	As people who gladly and often stay in nature, use the river and the environment for the realization of their hobbies, they show a significant level of environmental awareness, and the concern that is observed is not necessarily stemming from personal interest, but from concern for the preservation of the environment.
Women / Mothers	Women are generally more sensitive to environmental issues, especially from the aspect of the impact of pollution on the health of family members and especially children, as confirmed by field research.
Representatives of associations / Environmental activists / Informal groups of citizens	Representatives of the association, informal groups of citizens and environmental activists were recognized as an interested public, what stood out as the impression of the researchers that the Association of Bikers was recognized by the respondents as a stakeholder who would represent the interests of the community. Negotin and Prahovo have a traditionally strong community of motor enthusiasts who also engage in philanthropic work, it is made up of prominent citizens of the municipality, and respondents belonging to this group have shown a high level of information on the topic of waste-to-energy process.

The conducted research has also shown that there is an awareness of the economic and environmental benefits that the construction of the Waste-to-Energy Plant can bring to the Negotin municipality, but it is necessary to work on developing community trust in technology, technology management, monitoring and control (Figure 6.17).

Figure 6.17 Recommendations for the implementation of the communication campaign proving the justification and safety of the project

In accordance with the conducted consultations, certain measures have also emerged to enable the project to be better adapted to the real needs and expectations of the local population, as citizens have valuable knowledge of local specificities and challenges, which can significantly contribute to the success and sustainability of the project. Some of the planned measures are:

- constant informing of the local community (the site has been designed to provide easy and quick access to all information about the Waste-to-Energy Project: www.elixirecoenergy.rs);
- direct involvement of citizens in planning, it was enabled to citizens to directly ask questions or make their suggestions via e-mail address ukljucise@elixirecoenergy.rs or through the Office for Local Community Relations (Trg Stevana Mokranjca 1 in Negotin, the Office is open every working day from 7.30 am to 3.30 pm);
- environmental monitoring was enabled by introducing a model of civil control and an automatic measuring station was donated to the municipality of Negotin, which will be part of the network of the Environmental Protection Agency.

A detailed description of the envisaged measures is given in Chapter 9 of this study.

6.2.5.4 Concluding Considerations

Taking into account all the above facts from the aspect of demographic characteristics, **the project in question is an environmentally friendly and sustainable solution**, while respecting the prescribed conditions and measures of protection, minimization and prevention of potentially harmful impacts on the environment and the health of the population.

The implementation and regular operation of the project can lead to the **immigration of residents** (the workforce that will be engaged in the complex in question), and it can be concluded that the project in question will **have an immediate, cumulative, permanent and long-term positive impact on the demography of the immediate environment**, given that according to statistical data (according to the 2022 census), currently the municipality of Negotin has unfavourable demographic trends that are reflected in the occurrence of an above-average negative natural increase, a high rate of emigration and the average age of the population compared to the rest of the Republic.

Creating new jobs by building an Eco Energy complex and the possibility of working in one of the fastest growing companies in its industry in the region of Southeast Europe, the opportunity to achieve professional goals, benefits and good earnings can attract many, especially young people, to move to these parts and settle there.

The realization of the project will also enable **a positive and long-term impact on the quality of life in the municipality of Negotin** through the development of infrastructure and solving the problem of hazardous and non-hazardous industrial waste disposal, reducing the disposal of non-recyclable municipal waste at landfills, which will overall lead to a reduction in greenhouse gas (GHG) emissions.

6.2.6 Change of use and use of areas (built and unbuilt areas, use of agricultural, forest and water land, change of use from agricultural, forest and water land to construction land)

The cadastral parcels in question, on which the construction of the Waste-to-Energy Plant and the Landfill for non-hazardous waste is planned, **represent the construction land** located within the existing chemical industry complex in Prahovo, Negotin municipality, which is the property of Elixir. According to the Spatial Plan of the Municipality of Negotin ("Official Gazette of the Municipality of Negotin", no. 16/2011), the subject area is defined as an industrial zone or an industrial-port centre of significant development potential. The development of the chemical industry complex in Prahovo, consisting of "Elixir Prahovo – Chemical Products Industry LLC Prahovo" and "Phosphea Danube" LLC is defined by the Second Amendment to the Detailed Regulation Plan for the chemical industry complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 17/2022), by building an industrial park, chemical park, energy island, ecological island, expanding phosphogypsum storage, as well as by providing a buffer zone of greenery and relocating the routes of local roads outside the industrial complex, thus ensuring the isolation of the impact of the industrial complex and the production process. The existing Industrial Complex occupies an area of about 148 ha, and it is planned to expand in the direction of east and west, so that the planned Industrial Complex occupies about 594.41 ha.

In accordance with the location conditions, the Ministry of Construction, Transport and Infrastructure, for the construction project of the Waste-to-Energy plant no. ROP-MSGI-32562-LOC-1/2023, register no. 000262083 2023 1481 005 001 000 001 of 22.11.2023 and for the phased construction of the Landfill for non-hazardous waste no. ROP-MSGI-27919-LOCA-7/2023, registration no. 350-02-01642/2023-07 of 18 August 2023, as well as the Second Amendments to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo ("Official Gazette of the Municipality of Negotin", no. 17/2022), the cadastral parcels in question are an integral **part of Technological Unit C – Zone IV: Energy and Ecological Island**.

Within zone IV - Energy and Ecological Island, the construction of facilities for the purpose of providing thermal, cooling and electricity, as well as various types of auxiliary fluids, raw materials and fuels used in the technology of the chemical industry complex, including storage, pyrolysis and thermal treatment of non-hazardous and hazardous industrial waste, non-recyclable municipal waste and residue from municipal wastewater treatment, with the use of thermal energy and electricity, and the production of alternative fuels and co-saturated steam for the needs of the existing chemical complex, industrial and chemical park, is allowed. Within this zone, the construction of facilities and areas that are in the service of new production facilities in the Industrial Complex is allowed, including the treatment of wastewater, transhipment railway and road terminals, parking lots for passenger and freight vehicles, a storage and logistics center for liquid and solid (general, bulk) cargoes, as well as the construction of the necessary accompanying, technologically and functionally related facilities and warehouses. Within this zone, the construction of areas/facilities and infrastructure systems that are in the service of temporary storage, treatment and disposal of waste and residues from storage, pyrolysis and thermal treatment plants is allowed. The construction of necessary infrastructure facilities, facilities for the production and distribution of auxiliary fluids, accompanying facilities for monitoring the functioning of infrastructure networks and devices, as well as possible workshops for the maintenance of plants is also allowed.

If this is borne in mind, as all of the above, it can be concluded that the execution of the project in question **does not require the occupation and loss of quality agricultural land, and will not have an impact on the purpose and use of areas**.

6.2.7 Construction of utility infrastructure

The location where the construction of the Eco Energy complex is planned is equipped with all the necessary infrastructure utility facilities and amenities. With the construction, existence and operation of the project in question, with the application of environmental protection measures, the negative direct, cumulative and long-term impact on the utility infrastructure (water supply network, electricity network, gas pipeline, public roads, etc.) will be minimized. The conditions of the relevant institutions for the construction of the Waste-to-Energy Plant and the phased construction of the landfill of unwanted waste are attached to the Study.

6.2.8 Protection of natural goods of special values and immovable cultural goods and their surroundings

According to the submitted records of the Institute for Cultural Heritage Preservation Niš (within the Act on the Conditions for the Preservation, Maintenance and Use of Immovable Cultural Heritage as well as Goods that Enjoy Prior Protection and Determined Protection Measures for the DRP of the Industrial Complex in Prahovo, no. 818/2 of 19.08.2013), there are no identified immovable cultural goods in the defined area.

Within the defined limits of the scope of the Detailed Regulation Plan for the subject area, there are no recorded natural and ambient units, as well as archaeological sites. Based on archaeological research, conducted in 1975 (Archaeological Review no. 17 for 1976 - "PRAHOVO - FACTORY multilayer site" M. and Dj. Janković, p. 51-55), the existence of a multi-layered archaeological site was established, which is in the status of previous protection, so that it can be concluded that no additional protection measures are necessary from the point of view of the protection of immovable cultural goods.

6.2.9 Planned changes to the landscape characteristics of the area;

Landscape characteristics, as a criterion for the relationship between facilities and the environment, are important, because the features of the landscape image represent a qualitative factor, which significantly contributes to the quality of the design solution or occurs as an element of the degradation of ordered and established relations.

The construction as an element of the existing landscape includes all existing built facilities at the analysed location, so the industrial complex itself already has an impact on the change of the existing landscape within the chemical industrial zone.

Within the industrial complex within Zone I – The existing industrial complex has formed a belt of existing protective greenery within the production part of the industrial complex and part of the complex for the production of phosphate mineral fertilizers, as well as protective greenery within the part of the industrial complex without production functions. The existing protective greenery within the industrial and part of the complex for the production of phosphate mineral fertilizers are in function of the purpose of the facilities and their protection against adverse impacts from the production process and is positioned to form a buffer zone between the industrial complex and the state road, as well as a buffer zone between the industrial complex and housing within the workers' settlement in the immediate vicinity.

By Second Amendments to the Detailed Regulation Plan (SADRP) it is also planned to form an additional protective green belt along the limits of the complete industrial complex. The protective green belt has the role of isolating the immediate environment from negative impacts within the economic zone. Within this part of the zone, construction is prohibited. The construction of the necessary underground installations and infrastructure routes as well as the necessary above-ground transport systems as a function of the technological process (conveyors) may be allowed, all in accordance with positive regulations in order not to diminish the importance of the protective greenery belt.

Therefore, as the realization of the project in question takes place at the location located within the industrial zone of Prahovo, there will be no change in the landscape image at the location in question.

6.3 Overview of possible changes in the environment in the event of an accident

A significant impact on the environment and human health, as a result of the operation of the Eco energy complex, is possible in the event of an accident, which refers to the possibility of a fire, which can lead to air pollution. The treatment of waste materials shall be carried out in such a way that it does not endanger human life and health, does not pollute the environment, provides and takes measures of protection against accidents and other measures determined by law. Accident protection includes planning, organizing and taking preventive measures for the management of hazardous substances and remedial measures in the event of an accident based on a risk assessment or analysis of the risk of an accident.

The possible levels of accidents and the width of injured zones in the event of accidents within the Eco Energy complex are determined on the basis of the calculated sizes and limits of the spread of energy or pollutant (concentration of importance) for certain types of accidents.

In the event of an accident at the Eco Energy complex, the limits of the toxic effect of combustion products were analysed, after fires and explosions of explosive mixtures, raw materials and finished products, as hazardous substances, spills of hazardous substances, pollution of groundwater, which can lead to accidents with the worst consequences. It was noted that the worst case scenario of an accident level was **level III:** the level of the municipality or city – the consequences of the accident were extended to the municipality or the entire city.

In accordance with the above, the accident situations at the Eco Energy complex **will not lead to a transboundaryimpact.**

A detailed description of accident scenarios and environmental impact assessment in the event of an accident is given in Chapter 7 of this study.

SUMMARY OF POSSIBLE IMPACTS:

To evaluate possible impacts on individual environmental factors and acceptability of environmental loads, the most important components of the impact have been taken into account, as follows:

- the intensity of the impact,
- duration and frequency of impact and
- prevalence of the impact.

The scales for evaluating the environmental impact assessment are shown below.

Based on the changes they cause in the environment, according to the methodology of the Environmental Management System (ISO 14001), impacts can have one of the following levels:

Impact level				
1. negligible	**2.** low	**3.** moderate	**4.** significant	**5.** catastrophic

During regular work, there is inevitably an impact on the environment, so the main task is to determine the level of identified impacts. After identifying the impacts and analysing them, their evaluation was carried out, on the basis of which we conclude that the environmental impacts during the regular operation of the facility are negligible.

Also, the identification of accidents that may occur, analysis and evaluation of the impact on the environment during the accident was carried out. An overview of the evaluated environmental impacts during regular operation and during an accident is given in Table 6.24.

Table 6.24 Evaluation of environmental impact in regular operation and during an accident

IMPACT	**In regular operation**	**During an accident**	
		fire	**spillage**
Impact on air quality – emission of pollutants	**1**	**4**	**3**

Impact on surface water quality	**1**	**2**	**1**
Impact on groundwater quality	**1**	**1**	**2**
Impact on soil quality	**1**	**3**	**2**
Impact on noise level quality	**2**	**1**	**1**
Impact on vibration intensity quality	**1**	**1**	**1**
Impact on radiation intensity	**1**	**1**	**1**
Impact on population health	**1**	**2**	**1**
Impact of meteorological parameters and climatic characteristics	**3**	**1**	**1**
Impact on the ecosystem	**1**	**1**	**1**
Impact on population, concentration and migration	**3**	**1**	**1**
Impact on the purpose and use of surfaces	**1**	**1**	**1**
Impact on utility infrastructure	**1**	**1**	**1**
Impact on natural and cultural goods of special values	**1**	**1**	**1**
Impact on landscape characteristics of the area	**1**	**1**	**1**

6.4 Assessment of the potential impact of Waste-to-Energy plant and landfills of non-hazardous waste on public health in cross-border areas

This chapter covers the assessment of the potential impact of Waste-to-Energy (WtE) plant and landfills of non-hazardous waste on the health of the population in cross-border areas.
The planned site for the construction of the Eco Energy complex is located at a distance of about 750 m from the border with Romania. On the other side of the Danube bank, on the Romanian side, there is undeveloped land. The Romanian settlements closest to the site in question are:

- Izvoarele – are located at a distance of about 4 km, north of the subject location. According to the census, 951 inhabitants live in the settlement.
- Gruia - is a settlement in Romania, the seat of the municipality of Gruia. It is located in the Mehedinci district, in Oltenia at a distance of about 7 km, east of the site in question. According to the census, there were 1890 inhabitants in the settlement.

The location of the project in question is at a distance of about 9 km from the Bulgarian border. The nearest Bulgarian settlements are:

- Balej, a village in the northwestern Bulgarian municipality of Bregovo, in Vidin District is located at a distance of about 10.5 km from the site in question. According to 2011 estimates, Balley had a population of 437 inhabitants.
- The village of Kudelin - is also located in northwestern Bulgaria in the Vidin Oblast, at a distance of about 10.6 km from the site in question. According to the 2021 census, the village had 229 inhabitants.
  Health Impact Assessment (HIA) is a multidisciplinary methodological framework that enables the identification and quantification of possible positive and negative effects of the project on public health. This assessment takes into account a variety of health determinants, including air, water and soil quality, noise levels, as well as specific vulnerable population groups.

Given the nature of the installation and its location near the state border, it is important to analyze the impacts that may have a transboundary character, especially in the context of atmospheric emissions, potential pollution of watercourses, dispersion of heavy metals and other harmful compounds into the environment. In this regard, this chapter provides an overview of the assessment methodology, key pollutants, their potential health impacts, as well as proposed measures to reduce risks and protect populations in affected areas.

Objectives of the cross-border impact assessment

The primary objective of this chapter is to analyze the potential risks to the health of the population that may arise from emissions and other environmental factors associated with the operation of a non-hazardous waste facility and landfill. The assessment includes:

- Identification of key pollutants that may have a negative impact on human health.
- Analysis of possible population exposure pathways, including direct inhalation, water and soil contamination, as well as direct exposure via the food chain.
- Consideration of specific vulnerable groups of the population and their degree of sensitivity to the risk factors analyzed.
- Comparison of pollution levels with relevant regulatory standards, including EU directives, World Health Organization (WHO) recommendations and European Environment Agency (EEA) standards.
- Proposing measures to reduce risks, improve the environmental performance of the plant, and ensure continuous monitoring of the environment (The mentioned protocols, measures and monitoring programs are presented in Chapters 8 and 9 of this document).

The cross-border impact assessment process includes the following steps:

- Hazards identification – identification of pollutants present and assessment of their potential impact on human health.
- Exposure assessment – analysing concentrations of air, water and soil pollutants in the affected areas, as well as the frequency and duration of population exposure.
- Determining the dose-response relationship – using well-founded data to determine the exposure threshold above which negative health effects are expected.
- Risk characterization – integration of all previous steps to determine the actual level of health risk to the population and develop appropriate mechanisms to reduce and manage these risks.

Importance of cross-border health impact assessment

Waste combustion processes and landfilling can have a significant impact on the environment and the health of the population, not only in the immediate vicinity of the plant, but also in a wider geographical context. Air pollution can spread through atmospheric currents over long distances, while water and soil pollution can spread through surface and underground water flows.

6.4.1 Key pollutants and Related Health Risks

The health risk assessment examines the impact of key pollutants on human health and the environment, focusing, both on their sources and on mitigation measures. The primary pollutants and the associated health risks are highlighted below.

- Suspended particles (PM10, PM2.5)
  - Health risks: Respiratory and cardiovascular diseases, increased number of hospitalizations and premature mortality.
  - Mitigation measures: Advanced filtration system and regular air quality monitoring.
- Oxides of nitrogen ($NO(_2)$)
  - Health risks: Respiratory infections and impairment of lung function.
  - Mitigation measures: Application of Selective Catalytic Reduction (SCR) technology to reduce emissions and implementation of measures for regular air quality monitoring.
- Sulfur dioxide (SO_2)
  - Health risks: Respiratory irritation and worsening of asthma symptoms.
  - Mitigation measures: Installation of scrubbers and implementation of real-time emission control systems.
- Dioxins and furans

    - Health risks: Long-term exposure can lead to cancer and developmental disorders.
    - Mitigation measures: Injection of activated carbon, control of input material, flue gas cleaning, application of SCR technology and combustion at high temperatures to minimize the formation of pollutants. In addition, combustion residues are stabilized and solidified before disposal at the landfill. Regular emission monitoring procedures shall be implemented.
- Volatile organic compounds (VOCs)
    - Health risks: Neurological and respiratory problems.
    - Mitigation measures: Use of activated carbon filters, complete combustion using advanced combustion technology in a bubbling fluidized bed. Conducting regular monitoring of emissions.
- Heavy metals (Lead, mercury, cadmium,…)
    - Health risks: Chronic exposure can lead to neurological and kidney damage.
    - Mitigation measures: Proper waste management, bag filter system, activated carbon injection, particle separation by gravity, flue gas purification and continuous monitoring. In addition, combustion residues are stabilized and solidified before disposal at the landfill.

When assessing health risks, it is very important to take into account the vulnerability of certain population groups. These groups often have disproportionate exposure or are sensitive to the effects of pollution due to physiological, age or health factors:

- **Children**: Due to the development of the respiratory system and a higher rate of air intake in relation to body weight, children are particularly sensitive to air pollutants. Long-term exposure can lead to reduced lung development and cognitive impairment.
- **Older people**: Older people are at higher risk of cardiovascular and respiratory complications because they are more sensitive to the cumulative effects of prolonged exposure to pollutants.
- **People with pre-existing medical conditions**: People with asthma, chronic obstructive pulmonary disease, and cardiovascular disease may experience worsening symptoms and more frequent health crises due to exposure to pollution.

In order to reduce the potential health and environmental impacts identified in the exposure assessment, the following measures have been proposed:

- Air quality control
    - Verification of the operation of advanced filtration systems implemented by the project holder to reduce PM10 and PM2.5 levels. More detailed information on the monitoring plan is available in Chapter 9.
    - Continuous monitoring of air quality at key locations. More detailed information on the monitoring plan is available in Chapter 9.
- Water quality management
    - Verification of the operation of advanced wastewater treatment technologies implemented by the project holder. More detailed information on the monitoring plan is available in Chapter 9.
    - Regular water sampling and analysis. More detailed information on the monitoring plan is available in Chapter 9.
- Soil Protection
    - Use of protective barriers and proper waste management to prevent soil contamination. More detailed information on preventive measures is available in Chapter 8.
    - Periodic assessments of soil quality. More detailed information on the monitoring plan is available in Chapter 9.
- Noise control
    - Installation of sound barriers and planning of construction activities in daylight hours.
    - Periodic noise level estimates. More detailed information on the monitoring plan is available in Chapter 9.

According to scientific report P6-011/1/SR1[42], the general population may be exposed to contaminants from waste incineration plants via various routes, with direct inhalation and indirect uptake through the food chain

[80]Environmental Protection Agency, Health Impact Assessment of Waste Management: Methodological Aspects and Information Sources

being particularly significant. For many pollutants from waste incineration plants, including traces of heavy metals and carcinogenic organic compounds (such as dioxins and furans), the main route of exposure is through the food chain.

6.4.2 Assessment of potential cross-border spread of odours

Maximum odor evaporation can be expected when the boiler is not in operation, given that ambient air from the interior spaces of the pre-treatment and waste storage plant is used as secondary air for the combustion process during regular operation. In case of emissions during irregular operation, when the boiler would not be in operation, odours would be suppressed by means of a carbon filter.

For this scenario, an air quality study was conducted, developed by the Faculty of Mechanical Engineering of the University of Belgrade[43], which used state-of-the-art diffusion models of volatile organic compounds (TVOC) as a substitute for odor emission. The highest TVOC concentrations obtained by modelling, for mean values in periods of 1h, 3h and 24h, were recorded immediately adjacent to the northern boundary of the complex and were 109 µg/m ^{3}, 36.9 µg/m^3 and 5.59 µg/m^3, respectively. Given the prescribed limit value (400 µg/m^3) for the TVOC concentration indoors, it can be concluded that the obtained values are far below the prescribed limit.

During regular operation, i.e. when the boiler is in operation, the results clearly show that the concentrations of TVOC (as an indicator of odor emission) obtained by modeling are approximately 200 times lower in the most unfavorable circumstances compared to the extremely strict prescribed limit value of 400 µg/m^3 for indoor air quality. Therefore, emissions and potential odors are considered negligible on the industrial complex.

In addition, given the location of the chemical industrial complex in Prahovo and the potential effect of transboundary pollution, as well as the tendency to reduce soil pollutant concentrations for all average time periods, where already after a few hundred meters from the boundary of the complex the concentrations become extremely low, it can be concluded that the potential transboundary impact is practically negligible.

In practice, according to the data from the above study (Figures 3.15 – 3.22), the values predicted in the territory of Bulgaria and Romania are below the measuring scale of the predicted concentrations (less than 0.5 µg/m^3 for an average one-day period).

6.4.3 Assessment of cross-border impact of air pollutants and identification of new risk factors

The assessment of the cross-border impact of emissions from the Eco Energy complex is carried out with the aim of determining the potential impact of pollutants on air quality in neighboring countries, Romania and Bulgaria. This analysis is part of a comprehensive environmental impact assessment, to ensure that emissions remain within acceptable standards and do not pose a risk to human health and ecosystems beyond Serbia's borders.

The main objective of modelling is to quantify the impact of these emissions and assess their dispersion in the atmosphere. Given the proximity of the borders with Romania and Bulgaria, special attention was paid to the possibility of transporting pollutants outside the territory of the Republic of Serbia. Meteorological conditions, directions of dominant winds and atmospheric stability were taken into account, in order to identify possible zones of increased concentration of pollutants.

Detailed information on modelled emissions, limit values and expected concentrations is available in chapter

[81]Study of the impact of the filter system of pre-treatment of waste and activated carbon filters within the plant for energy utilization of waste on the air quality of the wider location of the chemical industry complex in Prahovo, July, 2024,

6.2.1.1.5 and accompanying studies[44]. The modelling results make it possible to assess potential risks and determine compliance with national and international environmental standards, as well as to define recommendations for further monitoring of emissions and reduction of cross-border impact.

The modelled emission sources include three stacks: the boiler stack, the stack of the solidification system and the stack of the pretreatment system with an activated carbon filter, as well as surface sources – a non-hazardous waste landfill and a phosphogypsum landfill.

Arsenic

Arsenic is emitted into the atmosphere from the trace waste thermal treatment plant, along with other heavy metals. The main sources of emissions are thermal treatment of waste containing arsenic compounds and ash dispersion generated during thermal treatment. Arsenic enters the human body by inhaling suspended particles that are in the air. Arsenic inhalation can cause acute health problems such as coughing, shortness of breath, chest pain, and airway damage. With prolonged exposure, more serious damage such as lung and skin cancer is possible.

Arsenic emission limit values are not individually regulated, but within the total emissions of heavy metals (Sb+As + Pb + Cr + Co + Cu + Mn + Ni+V), where the values range from 0.01 to 0.3 mg/Nm^3 according to BAT-AEL[45] standards (Best Available Techniques – Emission Limit Values).

In the Study prepared by the Faculty of Mechanical Engineering of the University of Belgrade[46], dispersion modeling was conducted for the entire group of heavy metals regulated by BAT-AEL standards (Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V), whereby the assumed emission is at the maximum allowed value of 0.3 mg/Nm^3 for this group, for the boiler stack. In order to assess the potential concentrations of individual metals in ambient air, a conservative approach was applied, whereby the entire emission limit was attributed exclusively to one metal at a given time. In the case of arsenic, it has been assumed that the entire emission of 0.3 mg/Nm^3 comes exclusively from arsenic, although actual emissions would be distributed to all metals in the group. Under this most unfavorable assumption, the maximum modelled annual average ground concentration was 1.9 ng/m^3. This value is significantly below the air quality target value for arsenic of 6 ng/m^3, defined by the relevant regulations[47].

Given that the modelled concentrations remain well below the regulatory limits even under the most unfavorable emission scenario and adverse meteorological conditions, it was concluded that arsenic emissions from waste energy utilization plants do not pose a health risk to the local population. **In addition, the dispersion model shows a localized distribution of pollutants, predominantly to the southeast, with a significant reduction in concentrations at a distance from the source. Consequently, no cross-border impact is expected on neighbouring countries Romania and Bulgaria.**

Cadmium

Cadmium is released into the atmosphere during the combustion of waste materials containing cadmium and its compounds. It enters the human body mainly by inhalation of fine particles that are in the air. Acute exposure to cadmium can cause serious irritation of the lungs and gastroithelial tract, with symptoms such as cough, chest pain, penumonitis, and pulmonary edema. Prolonged exposure can lead to kidney damage and osteoporosis.

[82] Study of the impact of the plant for Waste-to-energy plant and landfill of non-hazardous waste on air quality of the wider location of the chemical industry complex in Prahovo, April, 2024., Faculty of Mechanical Engineering, , University of Belgrade
[83]Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[84]Study of the impact of Waste-to-energy plant on the concentration of selected heavy metals in the air of the wider location of the chemical industry complex in Prahovo, March 2025, Belgrade
[85]Directive (EU) 2024/2881 - ambient air quality and cleaner air for Europe

According to the Integrated Risk Information System (IRIS) database of the[48] US Environmental Protection Agency (EPA), the risk of cancer due to inhalation of cadmium is 1.8 x 10^{-3}µg/m^3. This value represents an estimated additional cancer risk per unit airborne concentration.

In the Study prepared by the Faculty of Mechanical Engineering of the University of Belgrade[49], dispersion modelling was carried out using a conservative scenario, in which total cadmium and thallium emissions were assumed at a maximum BAT-AEL [50] value of 0.02 mg/Nm^3 from the boiler stack. In order to assess possible concentrations of cadmium in ambient air, it has been assumed that the entire emission limit value of 0.02 mg/Nm^3 comes exclusively from cadmium, which represents the worst emission scenario. Based on this assumption, the maximum modeled annual average cadmium concentration at ground level was 0.13 ng/m^3. This value is significantly below the target value of air quality for cadmium of 5 ng/m^3, prescribed by the applicable regulations[51]. Bearing in mind that the modelled concentration remains far below regulatory limits even at maximum emissions and adverse meteorological conditions, it is concluded that cadmium emissions from waste energy recovery plants do not pose a risk to the health of the local population.

The spatial distribution of concentrations shows that cadmium remains highly localized, with dispersion according to the dominant wind directions to the southeast, with concentrations decreasing significantly with distance from the emission source. Consequently, no cross-border impact is expected on neighbouring countries Romania and Bulgaria.

Chromium

Chromium is emitted into the atmosphere by combustion of waste containing chromium compounds. It enters the human body by inhalation of aerosols and fine particles containing chromium compounds. Hexavalent chromium can cause respiratory tract irritation, allergic reactions and bronchitis. Long-term exposure is associated with chronic respiratory disease, nasal ulceration, and increased risk of lung cancer.

The World Health Organization (WHO) does not recommend a safe inhalation exposure level for chromium, but estimates that the risk of cancer at a concentration of 1 µg/m^3 is as high as 4 x 10^{-2}(WHO,2000a)[52]. The U.S. Environmental Protection Agency (EPA) has set a reference concentration for chronic inhalation of 0.008 µg/m^3 for chromic acid aerosols and 0.1 µg/m^3 for hexavalent chromium particles (IRIS, 2002)[53].

According to BAT-AEL[54] standards, chromium emissions are included in the total emissions of heavy metals (Sb+As + Pb + Cr+Co+Cu+Mn+Ni+V), where the allowed emission range is 0.01-0.3 mg/Nm^3. In the Study prepared by the Faculty of Mechanical Engineering, University of Belgrade[55], a conservative modeling approach was applied, assuming that the entire group of heavy metals, including chromium, is emitted with a maximum value according to BAT-AEL[56] standards of 0.3 mg/Nm^3 from the boiler. The results of the dispersion model showed that, assuming that the overall emission limit value for the heavy metal group is attributed exclusively to chromium, the maximum annual average ground-level chromium concentration was 1.9 ng/m^3. This value is well below the health-based reference concentrations for chronic inhalation

[86] U.S. Environmental Protection Agency - Integrated Risk Information Sytem, IRIS (2002)
[87] Study of the impact of Waste-to-energy plant on the concentration of selected heavy metals in the air of the wider location of the chemical industry complex in Prahovo, March 2025, Belgrade
[88] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[89] Directive (EU) 2024/2881 - ambient air quality and cleaner air for Europe
[90] Air Quality Guidelines for Europe, 2nd ed, WHO Regional Office for Europe
[91] U.S. Environmental Protection Agency - Integrated Risk Information Sytem, IRIS (2002)
[92] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[93] Study of the impact of Waste-to-energy plant on the concentration of selected heavy metals in the air of the wider location of the chemical industry complex in Prahovo, March 2025, Belgrade
[94] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)

exposure, indicating that even in the worst case, chromium emissions do not pose a risk to human health.

The spatial distribution of chromium indicates localized concentrations, primarily within the industrial zone, with pollutant levels significantly decreasing with distance and following dominant wind directions to the southeast. Based on these results, no cross-border impact on neighbouring countries Romania and Bulgaria is expected.

Lead

Lead is emitted into the atmosphere from trace waste thermal treatment plants, mainly in the form of lead oxides and metal particles. The main source of emissions is the combustion of waste containing lead and its compounds.

Lead enters the human body by inhaling suspended particles (PM10 and PM2.5) containing traces of lead. Acute inhalation may cause symptoms of poisoning, including abdominal pain, vomiting, headache, and respiratory tract irritation. Prolonged exposure to lead poses a serious health risk, as it can lead to damage to the nervous system, anemia, cardiovascular problems and reproductive disorders. Children are particularly vulnerable to chronic exposure to lead, which can cause neurological impairments and developmental problems.

The World Health Organization (WHO) has set a temporary tolerable weekly intake of lead at 25 mg/kg body weight for newborns and children[57]. This value was determined based on studies showing that at this level of exposure, lead does not accumulate in the body.

Limit values for lead emissions are regulated through total emissions of heavy metals (Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V), with a permissible range of 0.01-0.3 mg/Nm^3 according to BAT-AEL[58] standards.

In a study prepared by the Faculty of Mechanical Engineering, University of Belgrade[59], a conservative approach was used, assuming that the overall emission limit of 0.3 mg/Nm^3 is emitted exclusively as lead. Under this assumption, the maximum modelled average annual ground concentration of lead was 1.9 ng/m^3. Ova vrednost je znatno ispod granice kvaliteta vazduha za olovo, koja iznosi 0.5 mg/m^3 (ili 500 ng/m^3)[60].

The spatial distribution of lead shows that lead concentrations remain localized within the industrial zone, are predominantly dispersed to the southeast and decline significantly with distance from the source. Based on these results, no cross-border impact on neighbouring countries Romania and Bulgaria is expected.

Mercury

The main source of mercury emissions to air is the combustion of mercury-containing waste and its compounds in a waste thermal treatment plant. Mercury enters the human body by inhaling vapors, and acute exposure can potentially cause coughing, respiratory tract irritation, chest pain, nausea, and vomiting. Prolonged exposure can lead to kidney and nervous system damage, including behavioral changes, depression, insomnia, and memory loss.

Mercury emission limit values are regulated as part of total emissions, whereby according to BAT-AEL[61]

[95]Preventing disease through healthy environments, World Health Organization
[96]Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[97]Study of the impact of Waste-to-energy plant on the concentration of selected heavy metals in the air of the wider location of the chemical industry complex in Prahovo, March 2025, Belgrade
[98]Directive (EU) 2024/2881 - ambient air quality and cleaner air for Europe

[99]Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)

standards the maximum value is < 5 – 20 µg/Nm^3.

The U.S. Environmental Protection Agency (EPA) has established a reference concentration for chronic inhalation exposure to mercury[62] of 0.3 mg/m^3. In contrast, the highest modeled atmospheric mercury concentration associated with the planned thermal waste treatment plant was determined at 0.0014 mg/m^3. This modelled value is well below the regulatory limit of 2 mg/m^3, which confirms that the expected emissions are within safe levels.

The detailed modelling results show that mercury is not currently emitted from existing emission sources within the chemical industry complex in Prahovo. After the construction of the thermal waste treatment plant, mercury emissions can potentially arise exclusively from the boiler stack.

Given the very low expected mercury emissions and modelling results, no cross-border impact is expected on neighbouring countries Romania and Bulgaria.

Nickel

Nickel is emitted into the atmosphere from a trace waste thermal treatment plant. It enters the human body by inhaling suspended particles. Acute inhalation can cause respiratory tract irritation, cough, dizziness and nausea, while prolonged exposure can lead to kidney damage, pulmonary fibrosis and increased risk of lung cancer.

Nickel emission limit values are regulated as part of the total emissions of heavy metals (Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V), with a permissible range of 0.01-0.3 mg/Nm^3 according to BAT-AEL63 standards.

In a study prepared by[64] the Faculty of Mechanical Engineering, University of Belgrade, dispersion modelling was done with a conservative approach, assuming that the overall emission limit of 0.3 mg/Nm^3 for the heavy metal group is emitted exclusively as nickel on the boiler stack. The results showed that the highest modelled annual average ground concentration is 1.9 ng/m^3, which is significantly below the target air quality value for nickel[65] of 20 ng/m^3.

The spatial distribution of modelled nickel concentrations shows that nickel concentrations remain localized within the industrial zone, declining significantly with the distance from the emission source, predominantly in the southeast direction. Based on these results, no cross-border impact on neighbouring countries Romania and Bulgaria is expected.

Suspended Particles

Suspended PM10 and PM2.5 particles are emitted into the atmosphere as a result of waste combustion and ash dispersion from the stack. PM10 and PM2.5 reach the human body by inhalation, whereby smaller particles can penetrate deeper into the lungs and cause respiratory problems, inflammation and an increased risk of cardiovascular disease.

According to BAT-AEL[66] standards, the maximum allowed emission of suspended particles is <2–5 mg/Nm^3. The modelled data, presented in chapter 6.2.1.1.5, show that PM10 emissions remain limited to the local industrial complex, without cross-border impact. Graphical data (Figure 6.4b) show that the maximum modelled PM10 concentration is 97.76 mg/m^3, located along the eastern boundary of the phosphogypsum landfill.

[100] U.S. EPA, Integrated Risk Information System (IRIS) - Reference Concentration for Inhalation Exposure to Mercury
[101] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[102] Study of the impact of Waste-to-energy plant on the concentration of selected heavy metals in the air of the wider location of the chemical industry complex in Prahovo, March 2025, Belgrade
[103] Directive (EU) 2024/2881 - ambient air quality and cleaner air for Europe
[104] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)

The regulatory limit for PM10 is 50 mg/m^3, while the modelled values showed a maximum concentration of 97.76 mg/m^3. These higher values are a direct consequence of surface emissions from the phosphogypsum landfill and as such are a local phenomenon.

Given the modelling results and the localised nature of emissions, no cross-border impact is expected on neighbouring countries Romania and Bulgaria. Figure 6.4b also shows that PM10 concentrations in the direction of Romania and Bulgaria remain below 10 mg/m^3, significantly lower than the regulatory limit of 50 mg/m^3, confirming the absence of cross-border impact.

Sulfur dioxide

Sulfur dioxide (SO_2) is emitted into the atmosphere as a by-product of the combustion of sulfur-containing waste. SO_2 enters the human body by inhalation, whereby short-term exposure can cause irritation of the respiratory tract, damage to the bronchi, cough and exacerbation of asthma, while long-term exposure can lead to an increased risk of chronic respiratory diseases and cardiovascular problems. People with asthma, children and the elderly are particularly sensitive to SO_2 emissions.

Prema BAT-AEL[67] standardima, granične vrednosti emisija za SO_2 kreću se od 5 do 30 mg/Nm^3.

Modeling of sulphur dioxide emissions showed that the maximum modeled SO_2 concentration per hour reached 592 mg/m^3, exceeding the regulatory limit of 350 mg/m^3. However, the analysis of modelling results indicates that these short-term emission maximums are sparsely and spatially limited, while the average annual concentration of SO_2 is 8.57 mg/m^3, which is well below the regulatory limit of 50 mg/m^3. Graphical data (Figure 6.2b) show the distribution of maximum daily ground concentrations of SO_2, which remain below 10 mg/m^3 in the direction of Romania and Bulgaria, confirming that even under the worst daily conditions concentrations in cross-border areas are well below the relevant limit of 125 mg/m^3.

Given the predominantly localized nature of SO2 emissions and the fact that short-term maximums occur only under certain meteorological conditions, no cross-border impact is expected on neighbouring countries Romania and Bulgaria.

Nitrogen oxides

Nitrogen oxides (NO_x) are a group of gases that include nitrogen monoxide (NO) and nitrogen dioxide (NO_2), primarily emitted by combustion at high temperatures. It enters the human body by inhalation, where acute exposure can cause irritation of the respiratory tract, damage to the bronchi and reduced lung function, while long-term exposure can contribute to chronic respiratory diseases and anincreased risk of heart disease.

According to the BAT-AEL[68] standards, the emission limit values of NOx range from 50 to 120 mg/Nm^3.

Modeling of nitrogen oxide emissions showed that all modeled NO_wconcentrations remained below regulatory limits. The maximum modeled emission values were:

- 127 µg/m^3 for hourly maximum concentration (Figure 3.9 in the Study prepared by the Faculty of Mechanical Engineering[69]) - below the limit of 200 µg/m^3,
- 44.8 µg/m^3 for the 99.79th percentile of the hourly maximum concentration (Figure 3.11 in the Study prepared by the Faculty of Mechanical Engineering[70]),

[105]Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[106]Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[107]Study of the impact of the plant for Waste-to-energy plant and landfill of non-hazardous waste on air quality of the wider location of the chemical industry complex in Prahovo, April, 2024., Faculty of Mechanical Engineering, , University of Belgrade
[108] Study of the impact of the plant for Waste-to-energy plant and landfill of non-hazardous waste on air quality of the wider location of the chemical industry complex in Prahovo, April, 2024., Faculty of Mechanical Engineering, , University of Belgrade

- 31.1 µg/m^3 for the daily average (Figure 3.12 in the Study prepared by the Faculty of Mechanical Engineering[71]),
- 1.8 µg/m^3 for the annual average concentration (Figure 3.13 in the Study prepared by the Faculty of Mechanical Engineering[72]) - below the limit of 40 µg/m^3.

The analysis of the modelling results presented in chapter 6.2.1.1.5 shows that the modelled maximum daily ground concentrations of NO_2 remain well below the regulatory limits. Graphical data (Figure 6.3b) show that in a wider area, including cross-border regions, NO_2 concentrations in the direction of Romania and Bulgaria remain below 10 mg/m^3, which is well below the daily limit of 85 mg/m^3.

Taking into account the modelling results, nitrogen oxide emissions are well controlled and do not pose a significant risk to air quality over long distances. Consequently, no cross-border impact is expected on neighbouring countries Romania and Bulgaria.

Dioxins and furans

Dioxins and furans (PCDD/F) are toxic organic contaminants formed as by-products of the combustion of chlorinated organic compounds at high temperatures. Their emissions depend on the combustion efficiency and the technology used to purify the flue gases.

Dioxins enter the human body by inhaling particles and deposition on plants that form part of the food chain. Acute exposure rarely causes serious consequences, but chronic exposure can lead to liver damage, immune system dysfunction, and increased cancer risk.

Modern waste incineration plants are specifically designed to destroy dioxins and furans (PCDD/F) through optimized combustion at high temperatures and the use of advanced flue gas treatment technologies. The emissions of dioxin-like PCDD/Fs and PCBs are thus reduced to negligible levels, in full compliance with EU and national environmental standards, and do not present any adverse impact on health or the environment beyond the immediate vicinity of the facility.

Dioxin and furans emission limit values are regulated by total PCDD/F emissions, where BAT-AEL standards[73] set a maximum value of <0.01-0.04 ng I-TEK/Nm^3.

Modeling showed that the highest value obtained for the daily average is 6.6 × 10-3 pg/m^{3}which is far below the regulatory limit of 2 mg/m^3, which confirms a negligible level of emissions. These results are given in chapter 6.2.1.1.5 and are graphically shown in Figure 6.11.

Based on the dispersion results shown in Figure 6.11, ground PCDD/F concentrations in Romania and Bulgaria remain below 0.001 pg/m^3, a value well below the environmental relevance thresholds, further confirming the absence of transboundary effects.

Given the low emissions and the way dioxins are deposited in ecosystems, no cross-border impact is expected on neighbouring countries Romania and Bulgaria.

Polychlorinated Biphenyls – PCBs

PCBs are present in trace amounts in emissions from waste thermal treatment plants, although their levels are strictly controlled through the prohibition of treatment of waste containing PCBs or more than 1% of halogenated organic ingestion expressed as chlorine (see measures taken as prevention protocol expressed in Chapter 8).

PCBs can enterthe human body by inhaling suspended particles and indirectly through contaminated food.

[109]Study of the impact of the plant for Waste-to-energy plant and landfill of non-hazardous waste on air quality of the wider location of the chemical industry complex in Prahovo, April, 2024., Faculty of Mechanical Engineering, , University of Belgrade
[110]Study of the impact of the plant for Waste-to-energy plant and landfill of non-hazardous waste on air quality of the wider location of the chemical industry complex in Prahovo, April, 2024., Faculty of Mechanical Engineering, , University of Belgrade
[111]Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)

Prolonged exposure to PCB compounds can cause liver damage, hormonal imbalance, suppression of the immune system, and increased risk of cancer.

The emission limit values for PCBs are regulated in accordance with total PCDD/F and dioxin-like PCB emissions, with BAT-AEL standards setting a maximum value of <0.01-0.06 ng WHO-TEQ/Nm^3.

The highest modelled air concentration was 6.6×10^{-3} pg/m^3, which is well below the regulatory limit, confirming negligible emissions. These results are given in chapter 6.2.1.1.5 and are graphically shown in Figure 6.11.

Based on the dispersion patterns shown in chapter 6.2.1.1.5 (Figure 6.11), the concentrations of PCBs in the air over Romania and Bulgaria are below 0.001 pg/m^3, which is too low to have any environmental impact, confirming that there is no cross-border effect.

Conclusion on the cross-border impact of airborne contaminants

The analysis of pollutant emissions from the thermal waste treatment plant indicates that the overall risks to health and the environment are minimal or negligible. Particular emphasis was placed on cross-border impact, with modelling results showing that the risk to neighbouring populations in Romania and Bulgaria is almost undetectable due to low dispersion values, remoteness of populated areas and applied pollution control systems.

The nearest Romanian settlement of Izvoarele is 4 km to the north and Gruja 7 km to the east. On the Bulgarian side, the nearest settlements are Balej (10.5 km) and Kudelin (10.6 km). Given the distance of the power plant from the border (750 m to Romania and 9 km to Bulgaria) and the high capacity of atmospheric dilution of pollutants, no significant impact on air quality outside the industrial zone is expected. For most substances, including mercury, nickel, dioxins, and furans, modelled air concentrations are thousands of times below internationally recognized air quality standards, such as those set by the World Health Organization (WHO). This confirms the effectiveness of the flue gas treatment system and compliance with best available techniques (BAT)[74].

Localized exceedances of suspended particles (PM10) and sulfur dioxide (SO_2) were recorded only in the immediate industrial zone and only for short periods under specific meteorological conditions. The highest modelled PM10 concentration of 97.76 mg/m^3 occurs exclusively in the vicinity of the industrial complex, while the annual average value is well below the regulatory limits. The highest concentrations of SO_2 are localized and intermittent, and the annual emission average remains within safe limits.

Based on the presented modelling results and the distance of neighbouring settlements, there is no significant cross-border impact of emissions from the facility on air quality in Romania and Bulgaria. Emission control, air quality monitoring and compliance with BAT standards ensure that potential impacts remain within safe limits, do not pose a risk to public health or the environment in neighbouring countries.

6.4.4 Assessment of cross-border impact of air pollutants and identification of new risk factors

The industrial processes within the Eco Energy complex include several steps of wastewater treatment to minimize the discharge of pollutants into the Danube. Planning involves the placement of facilities on water retention surfaces. Similarly, leachate collected at a non-hazardous waste landfill is directed to wastewater treatment (More detailed information is available in Chapter 3). Preventing water from penetrating the soil surface prevents soil contamination associated with the spread of biogenic pollution and groundwater pollution. Key potential sources of pollution are the flue gas treatment system, chemical neutralization in gas treatment, leaching of solid residues after combustion and additional treatment of landfill leachate wastewater. The dominant source of hazardous material is wastewater discharge, while atmospheric and

[74] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)

bio-treatment (sanitary treatment system) are considered less pronounced sources of danger. All emission parameters in the water discharge are in accordance with BAT-AEL standards, while modeling indicates that the impact on water quality will be minimal, even close to controlled locations 100 and 200 meters downstream of the facility.

The Danube as a recipient of wastewater is an international river relevant to the population of Romania and Bulgaria, so the key question in the impact assessment is whether wastewater emissions will expand and affect water quality in neighboring countries. This chapter presents an overview of all relevant pollutants characteristic of the waste energy recovery plant and their potential effects. Chapters 8 and 9 contain details regarding the requirements for the protection and monitoringof the environmental impact of the project, developed to reduce the impact on water and soil pollution.

Arsenic

Arsenic gets into wastewater by purifying flue gases, washing away solid combustion residues, or as a result of washing away solids. According to BAT-AEL[75] standards, the limit values for arsenic emissionsin wastewater range from 0.01 to 0.05 mg/l, while the estimated emissions are expected to remain at the lower end of this range.

Modelled values at 100 and 200 meters downstream of the discharge site show maximum concentrations of 1.4×10^{-5} mg/l and 7×10^{-6} mg/l, as shown in chapter 6.2.1.2.1, which are 7,000 to 14,000 times below the concentrations associated with health risks. According to WHO standards, 10 mg/l is considered a threshold for increased risk of skin and bladder cancer, while modelled values are far below.

Arsenic can enter the human body by consuming contaminated water or food prepared with such water, as well as indirectly through bioaccumulation in fish and crops irrigated with contaminated water. The intake of arsenic (primarily inorganic) from water, based on modelled concentrations in the Danube downstream of the proposed facilities, is extremely low and cannot affect water-using populations.

Due to the high capacity of the Danube to dilute pollutants and extremely low modelled concentrations, the cross-border impact of arsenic on Romania or Bulgaria is not expected.

Cadmium

Cadmium could potentially reach wastewater through flushing of gas, washing of solid combustion residues or as a result of flushing of solids. According to BAT-AEL[76] standards, the emission limit values in water range from 0.005 to 0.03 mg/l, while the projected emissions are expected to be close to the lowest values of this range.

Modeled values in the Danube at 100 and 200 meters downstream of the discharge point are 1×10^{-5} mg/l and 5×10^{-6} mg/l maximum, as shown in chapter 6.2.1.2.1, which is 600 to 1,200 times lower than the average daily food intake. The WHO sets a safe intake limit at 5 ng/m^3 to prevent bioaccumulation in soil and food, but modelled emission values are far below this threshold[77].

Cadmium gets into the human body by consuming contaminated water or food prepared with such water. In addition, bioaccumulation in fish and crops irrigated with contaminated water is an indirect route of exposure.

The uptake of cadmium (primarily inorganic) from water, as shown in concentrations in the Danube downstream of the proposed facilities, is very low and therefore cannot affect water-using populations.

[75] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[76] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[77] WHO Regional Office for Europe (2000). Air Quality Guidelines for Europe. Second edition. Copenhagen: World Health Organization.

Cadmium is not expected to enter the food chain due to limited concentration.

Although chronic exposure to cadmium can cause kidney damage, osteoporosis and cardiovascular problems, with such low model values, the risk of contamination of drinking water is negligible. **Due to these low concentrations, no cross-border impact on neighbouring countries is expected.**

Chromium

Chromium could potentially appear in water as a byproduct of gas cleaning, washing away solid combustion residues, or as a result of washing away solids. Its emissions are controlled through multi-phase chemical neutralization and sedimentation treatments. The[78] BAT-AEL standards set maximum chromium emissions between 0.01 and 0.1 mg/l, while the emissions in this project are expected to be at the lower end of this range.

The modelled maximum chromium concentrations in the Danube at 100 and 200 meters downstream range from 1.4×10^{-5} mg/l to 7×10^{-6} mg/l, according to Chapter 6.2.1.2.1, which is well below the regulatory limits. For hexavalent chromium, which is considered particularly toxic, WHO does not specify a safe level of inhalation intake, but sets a water threshold of 0.1 mg/l[79], which is more than 10,000 times the modelled values.

Chromium can be ingested via contaminated drinking water, but due to its strong binding to soil and low concentration in water, exposure to water intake is negligible and entry into the food chain is unlikely.

The predicted water concentrations downstream of the facility are negligible in terms of exposure risk. Due to the fact that chromium is bound to the soil in case of deposition, it is not considered a threat to the food chain.

Based on these data, no cross-border impact on water quality in neighbouring countries can be expected.

Lead

Lead enters water through flushing of gases and wastewater treatment, while its emissions are reduced by chemical precipitation and neutralization. The BAT-AEL standards provide for limit values for lead in water between 0.02 and 0.06 mg/l, while the projected emissions are below these limits.

Lead could potentially get into water by flue gas purification, wastewater treatment and solid leaching, reducing its emissions through chemical precipitation and neutralization. BAT-AEL[80] standards set limit values for lead emissions in water between 0.02 and 0.06 mg/l, while projected emissions remain below these thresholds.

The modelled maximum concentrations of lead in the Danube at 100 and 200 meters downstream of the discharge site are 1.1×10^{-5} mg/l and 5.6×10^{-6} mg/l, as shown in chapter 6.2.1.2.1, which is more than 1,600 times below the safe intake level (25 μg/kg) for children[81].

Exposure to lead can occur by consuming contaminated water or food prepared with such water. However, due to the characteristics of the area where precipitation may occur, it is not possible to enter the food chain.

The predicted water concentrations downstream of the facility are negligible in terms of exposure risk. It is not expected to have lead in the food chain due to the characteristics of the area where precipitation may

[78] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[79] US EPA IRIS (2002). Toxicological Review of Hexavalent Chromium
[80] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[81] WHO (2011). Guidelines for Drinking-water Quality, 4th ed.

occur.

Prolonged exposure to lead can cause neurological disorders and developmental problems in children, but given these modelled values, the health risk is negligible or even non-existent. **Due to low modelled concentrations, no transboundary impact on water resources is expected in Romania and Bulgaria.**

Mercury

Mercury that can potentially be found in wastewater can be the result of flue gas purification, treatment of solid combustion residues and leaching of solids, but its concentration is significantly reduced through multi-phase chemical purification, including neutralization and precipitation of heavy metals.

BAT-AEL[82] standards set the limit values for mercury emissions in wastewater at <0.005-0.02 mg/l. The model concentrations of mercury in the Danube at 100 and 200 meters downstream of the discharge 9.3 x ,10^{-7} mg/l and 4.7 x 10^{-7} mg/l, as shown in chapter 6.2.1.2.1, which is more than 1,000 to 2,000 times below the WHO standard for drinking water (1 μg/l)[83]. The highest modelled mercury concentration in water is significantly below any threshold that could pose a risk to humans or aquatic ecosystems.

Mercury can pose a long-term risk through bioaccumulation in the aquatic food chain, but given the extremely low modelled emissions and natural dilution capacity of the Danube, no significant impact on the ecosystem is expected, even in the immediate vicinity of the facility, let alone in a cross-border context.

Mercury can be absorbed by consumption of contaminated water, but the main route is bioaccumulation in aquatic organisms, especially fish. Given the very low modelled concentrations, exposure through water is negligible, even topically.

Given the adopted solution for wastewater treatment, the cross-border impact of mercury emissions into water is not expected. Based on the predicted concentrations, the risk of exposure is negligible, and due to ongoingmonitoring and strict regulatory emission limits, it is extremely unlikely that the general population would be exposed to mercury concentrations high enough to cause any acute effects. Finally, the treatment of waste with mercury content is prohibited, which reduces these risks even less (see Chapter 8 for protocols on prior acceptance and verification of acceptance of waste).

Nickel

Nickel could potentially be found in wastewater as a result of flue gas purification, treatment of solid combustion residues, and leaching of solids. BAT-AEL[84] standardi postavljaju granice emisije nikla u otpadnim vodama na 0.03–0.05 mg/l, dok su očekivane emisije na donjem kraju ovog opsega.
Modelled nickel concentrations in the Danube at 100 and 200 meters downstream of the discharge point are 7.2 × 10^{-5} mg/l and 3.6 × 10^{-5} mg/l, as shown in chapter 6.2.1.2.1, which is more than 250 to 500 times below the WHO limit for drinking water (20 μg/l)[85].

Nickel can be ingested by ingesting contaminated water, but based on modelled concentrations, the risk of exposure is minimal or non-existent. There is no significant contribution of exposure across the food chain in the estimated scenario.

The predicted water concentrations downstream of the facility are negligible in terms of exposure risk. Due to low concentrations in the environment, a negligible risk is expected and no transboundary impact on water resources is expected in Romania and Bulgaria.

[82] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[83] The Water Supply (Water Quality) Regulations 2000. UK Statutory Instrument
[123] Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[124] WHO (2011). Guidelines for Drinking-water Quality, 4th ed.

Dioxins and furans PCDD/F

Dioxins and furans could potentially be found in the aquatic environment through flue gas cleaning and treatment of solid combustion residues. However, their low water solubility and strong tendency to bind to organic particles and sediments significantly reduce their presence in free water.
According to[86] BAT-AEL standards, the emission limits of dioxins and furans in wastewater are set at <0.01-0.06 ng WHO-TEQ/Nm^3. Modelled concentrations in the Danube at 100 and 200 meters downstream of the discharge point are maximum 2.8 × 10^{-6} ng/l and 1.4 × 10^{-6} ng/l, as presented in chapter 6.2.1.2.1, which is 3,500 to 7,000 times below the recommended daily intake tolerance of WHO (2 pg TEQ/kg body weight)[87].

Exposure to dioxins through water is negligible due to their low solubility and strong binding to sediments. The main route of exposure is through food, especially through animal fats and animal products. Given the low concentrations, water intake does not pose a risk.

The predicted water concentrations downstream of the facility are negligible in terms of exposure risk. Due to extremely low emissions and their strong binding to sediments, no cross-border impact on water quality is expected in Romania and Bulgaria.

Conclusion on the cross-border impact of airborne contaminants

Based on the modelling of pollutant emissions to water, all analysed substances are expected to remain well below regulatory limits, minimising any potential impact on human health and the ecosystem.

The pollutants are completely diluted in the Danube within 100 to 200 meters downstream of the discharge point, which poses no danger to Romanian and Bulgarian water bodies. The adopted technical solutions (as described in chapter 3) provide a sufficient amount of protection to exclude the risk of impact on human health at local and cross-border level. Moreover, the preventive measures listed in Chapter 8 and the monitoringof wastewater discharge quality as presented in Chapter 9, provide sufficient levels of prevention, control and response mechanisms to minimize any operational risk to the environment of the facility.
Finally, all modelled concentrations are several thousand times lower than international health and environmental standards (WHO, EPA, BAT-AEL).

Based on these data, no cross-border impact of water emissions on Romania and Bulgaria is expected.

6.4.5 Assessment of potential cross-border noise propagation

Noise can be a significant problem for the environment and human health, with its negative effects depending on the intensity, duration of exposure and distance between noise sources and residential areas. However, given the location of the Eco Energy complex, located 750 meters from the Romanian border and 9 km from the Bulgarian border, as well as the specific noise emission characteristics, no cross-border impact is expected either in the construction phase or in the exploitation phase of the facility.

Effect on noise level during plant construction

Noise in the construction phase primarily originates from construction activities and material transport. Machines and trucks generate noise in the range of 80 dB(A) to 90 dB(A), with sound pressure levels decreasing with distance, while terrain and vegetation additionally absorb sound waves.

Since there are no residential buildings in the immediate vicinity, and the nearest cross-border settlements (Izvoarele, Gruja, Balej, Kudelin) are at least 4 km away, there is no risk of cross-border noise impact. Construction activities will be limited in time and will only take place during the day, further minimizing potential effects.

[125]Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) Available at Implementing decision - 2019/2010 - EN - EUR-Lex (europa.eu)
[126] FAO/WHO Joint Expert Committee on Food Additives (JECFA), 57th Meeting, 2001

Effect on noise level during plant operation

During the operational phase, noise sources will include truck traffic and industrial process equipment. However, key noise-emitting machines (fans, cranes, crushers) will be housed inside closed buildings, which will significantly reduce ambient noise emissions.

Transport activities will be intermittent, and as the noise level from transport vehicles decreases with distance and is further mitigated by vegetation and terrain, no cross-border impact is expected. In addition, special mitigation measures, such as unloading materials inside the closed W-C08 facility and shutting down the vehicle engine during waste transfer, will further reduce noise emissions. Moreover, process emission sources are strategically distributed as much as technically possible, minimizing the risk of acoustic resonance and cumulative noise effects.

Based on the distance of the building from residential settlements, natural barriers and controlled working conditions, it can be concluded that there is no significant cross-border impact of noise on settlements in Romania and Bulgaria. All noise sources are localized within the industrial zone, and the implementation of protective measures further minimizes potential environmental impacts.

6.4.6 Assessment of the cross-border impact of accident situations on human health

Technical details relating to the accident situations are provided in Chapter 7 providing detailed modelling of the risks associated with the Waste Energy Utilisation Facility and non-hazardous waste landfill, including ecosystem exposure analysis and assessment of possible transboundary impacts. The imposed prevention requirements are further elaborated in Chapter 8, Section 8.2, where protective measures are defined, taking into account specific ecosystem exposure factors and potential transboundary pollution.

Theoretically the most damaging scenarios are modelled and presented in Chapter 7 (Tables 7.18 and 7.15), with additional assessments conducted to determine the extent to which potential incidents could affect transboundary watercourses, in particular the Danube River and groundwater flows moving towards the borders of neighbouring countries.

The most common events are accidents classified as relevant to the facility without implications for the industrial complex, relevant in size to the entire industrial complex and the effect of size important from the perspective of the municipality. There are no accident scenarios classified as regional or international, ensuring full compliance from a distance from the cross-border municipalities of Bulgaria and Romania.

The accident with the longest range extending beyond the boundaries of the design complex is associated with accidents with ammonia water, as the longest range of toxic concentrations is 680 m. The effects of subsequent combustion remain within 11 m of the spill site, within the boundaries of the project complex.

From an additional precautionary perspective during the modelling phase, a specific scenario has been defined that takes into account the right situation in the waste-to-energy plant to assess the impact of a potential accident on the Danube River. A mathematical model for a continuous source of pollution was applied (see scenario 12 in Chapter 7 for details). In this scenario, the focus was on the uncontrolled release of particles (PM) from the boiler system, after a failure resulting in the release of PM into the surrounding environment through the roof structure. This simulation aimed to assess the potential for transport of harmful material to the Danube in emergency conditions.
The results of the modelling showed that the levels of pollutants (PM and recalculated values of NH_3, HCl, HF, SO2 and NOx) are well below acceptable values, which means that accident situations in the waste-to-energy plant would not lead to pollution of the Danube River even in the worst case.

Based on the conducted analyses and modelling, it was concluded that even in the worst-case scenario, there is no cross-border impact on the territories of the neighboring countries of Bulgaria and Romania, as well as on the Danube water body.

All measures identified as necessary within the project impact assessment, regulations and required technologies are presented in Chapter 8 of this Study. These include measures that must be taken to protect all environmental and human health factors (plans and technical solutions for environmental protection), related to the construction, regular operation, decommissioning or removal of the project, as well as measures to prevent accidents during construction and exploitation, measures to respond in the event of an accident and mitigate the consequences of potential accidents.

7.0. ENVIRONMENTAL IMPACT ASSESSMENT IN AN ACCIDENT EVENT

A chemical accident is a sudden and uncontrolled event resulting from the release, spillage or dissipation of hazardous substances, the performance of activities during production, use, processing, storage, disposal or long-term inadequate storage.

In the event of an accident at an industrial complex, depending on the type of production process, the chemicals used and the type of pollutant emitted, certain risks to human life and health and the environment are possible.

Significant negative impacts on the environment, as well as human life and health, can occur in the event of accidental situations such as fire outbreaks and spills or the release of hazardous substances. All accident situations will be minimized by the prescribed accident prevention measures, adequate risk management and limiting the impact of that accident on human life and health and the environment.

This Study identified and selected the most critical places of potential accidents at the Eco Energy complex and gave an overview of the impact they can have on the environment and human health. A complete and detailed analysis of all potential accident situations that may occur within the Eco Energy complex, as well as a detailed assessment of the consequences and risks, defining the safety system, prevention and response measures in emergency situations, will be carried out through the development of Documents for operators of Seveso plants according to the provisions of the Law on Environmental Protection ("Official Gazette of the RS", nos. 135/2004, 36/09 and 36/2009 - other law, 72/2009 - other law and 43/2011 – CC decision, 14/2016 and 95/2018 and 94/2024 - other law), Art. 38, 58, 60 and 60a and according to the relevant provisions of the following rulebooks: Rulebook on the list of hazardous substances and their quantities and criteria for determining the type of document prepared by the operator of the Seveso plant or complex ("Official Gazette of the RS" nos. 41/2010, 51/2015 and 50/2018), Rulebook on the content of the Notice on the new Seveso plant or complex, the existing Seveso plant or complex and on the permanent termination of the operation of the Seveso plant or complex ("Official Gazette of the RS" no. 41/2010) and the Rulebook on the Content of the Accident Prevention Policy and the Content and Methodology of the Preparation of the Safety Report and the Accident Protection Plan ("Official Gazette of the RS" no. 41/2010);

Also, the recently adopted Law on Control of Major Accident Hazards involving Hazardous Substances ("Official Gazette of RS", No. 94/2024) stipulates that it applies, inter alia, to the locations of thermal waste processing and storage procedures related to these procedures, which include hazardous substances (Art. 3), in accordance with Article 56, this Law shall enter into force on the eighth day from the date of its publication in the "Official Gazette of the Republic of Serbia", and shall apply after the expiration of one year from the date of entry into force of this Law, except for the provisions of this Law relating to the obligations of the Republic of Serbia towards the European Union that shall apply from the date of accession of the Republic of Serbia to the European Union (Article 56). It is the obligation of the Project Holder to harmonize the documentation within the prescribed deadline and start applying the provisions of the Law in question.

Pursuant to all the above and the provisions of the Seveso III Directive (2012/18/EU) on the control of major accident hazards involving dangerous substances, i.e. Article 58 The Law on Environmental Protection and the Rulebook on the list of hazardous substances and their quantities and criteria for determining the type of documents prepared by the operator of the Seveso plant or complex, taking into account the maximum possible quantities of hazardous substances that may be present at any time in the Eco Energy complex, as in Table 1 - List of dangerous substances and limit values thereof (ordinal number 11, 33, 34, 40 and 45), as well as in Table 2 – List of dangerous substances category and limit values thereof (Section "H" - HEALTH HAZARD, Section "P" – PHYSICAL HAZARDS, Section "E1" and "E2" HAZARD for the AQUATIC ENVIRONMENT), the status of the complex was determined (see Analysis of the subject plant from the aspect of regulations in the field of protection against chemical accidents, the so-called Seveso plant, which is attached to the study). It was noted that the complex in question represents a "higher order" Seveso plant and therefore it is the obligation of the Project Holder, in terms of accident risk management obligations, to prepare a **Safety Report and an Accident Protection Plan** and obtain the consent of the competent authority. Considering that these documents as well as the project documentation will envisage all necessary measures in order to prevent and minimize the consequences of the accident, we believe that the only impacts that can be significant for the environment (accident situations) due to the operation of the complex in question will be limited by these documents.

It is the obligation of the Project Holder to prepare both **the Final Fire Protection Design** and the **Fire Protection Plan** in accordance with the Law on Fire Protection ("Official Gazette of the RS", Nos. 111/2009, 20/2015, 87/2018 and 87/2018 – other laws) and to obtain the consent of the competent Ministry of the Interior.

Fire protection measures are implemented in order to protect the safety of property, the safe operation of employees and the prevention of environmental hazards. Training of employees in the field of fire protection is also a legal obligation and will be carried out on the basis of the Program of basic training of workers in the field of fire protection, to which the consent of the competent authority will also be obtained.

The treatment of waste materials shall be carried out in such a way that it does not endanger human life and health, does not pollute the environment, provides and takes measures of protection against accidents and other measures determined by law. Accident protection includes planning, organizing and taking preventive measures for the management of hazardous substances and remedial measures in the event of an accident based on a risk assessment or analysis of the risk of an accident.

The environmental and human health risk assessment in an accident event shall contain the following:

- accident hazard analysis – hazard identification
- analysis of the consequences of the accident:
    - effect modelling
    - vulnerability analysis
    - determining the possible level of accidents
    - an assessment of the risk of accidents.

7.1 Accident Hazard Analysis - Identification of Waste-to-Energy Plant Hazards

Identification of possible sources of hazards includes recording of all critical activities, processes and points on plants and equipment, especially the risk of accidents within installations, between individual installations and facilities, warehouses as a whole, including the risk of accidents during production activities, transport at the location of the plant, etc.

The main objectives of hazard identification and assessment were as follows:

- determining the causes that could lead to major accidents at the complex,
- analysing scenarios for the development of such accidents,
- for each scenario assessing the consequences, probability of events and risks and
- where appropriate, proposing risk mitigation measures.

The identification and assessment of hazards was carried out by a multidisciplinary expert team formed for the preparation of the Environmental Impact Assessment Study in question. For the purpose of identifying and assessing hazards, a multidisciplinary expert team checked all procedures of the technological process and all parts of the plant, devices, means of transport and equipment. The definition of critical places on the plant, devices and equipment was carried out through the analysis of causes that can cause disturbances or failures and that can lead to a chemical accident, as follows:

- technical and technological specificities and deficiencies in transport, storage and production processes,
- specifics of the physico-chemical properties of the substances being stored (non-recyclable hazardous and non-hazardous waste, ammonia water, natural gas, activated carbon, etc.)
- failure of components and materials due to equipment deterioration (breakage, leakage)
- human errors during the performance of work on the subject plant, warehouse and manipulation of hazardous substances, etc.

- existence of external sources of danger (extreme temperatures, wind, precipitation, floods, fire)
- analysis of accidents at similar plants.

7.1.1 Technical and technological specificities and deficiencies in transport, storage and production processes

The subject project within the Waste-to-Energy Plant envisages various technical and technological activities related to waste management, which relate to the reception and temporary storage, liquid waste transfer, mechanical and thermal treatment of non-recyclable non-hazardous and hazardous waste, physico-chemical treatment of residues from the boiler plant, as well as a whole range of other technical and technological accompanying activities necessary for the proper functioning of the plant (reception and storage of raw materials and auxiliary materials, water preparation, wastewater and waste gas treatment, fluid distribution, etc.), transport manipulative activities, fire protection, laboratory tests, administrative activities, etc.

The total capacity of the Waste-to-Energy Plant is designed for the thermal treatment of 100,000 t/g of non-recyclable non-hazardous and hazardous waste for 8,000 h/year of operation. The capacity of the boiler is 30 MW, with a steam production of 35 t/h (P=13 barg, T= 207°C).

All activities related to waste management, as the main activity, will be carried out in the manner and under the conditions prescribed by the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016 and 95/2018 - other law and 35/2023), the Law on Packaging and Packaging Waste ("Official Gazette of the RS", nos. 36/2009 and 95/2018 - other law), Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023), as well as in accordance with the recommendations of the best available techniques (BATs) and all other applicable by-laws and standards in this field.

Operations that the Project Holder ELIXIR CRAFT DOO, of the Eco Energy branch, plans to apply during the performance of the subject activity within Waste-to-Energy Plant are waste utilization operations from the R list and disposal operations from the D list in accordance with the Rulebook on the waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021).
R waste management operations at the Eco Energy complex

R1	Use of waste primarily as a fuel or other means of energy production	Thermal treatment and energy recovery of waste
R12	Changes to subject waste to any of the operations from R1 to R11****	Pre-treatment and preparation of waste destined for R1 (shredding, grinding)
		Extraction of metal for recycling (intended for R4)
R13	Storage of waste designed for any operation from R1 to R12 (excluding temporary storage of waste at its generation site)	Storage of waste destined for R1, in closed warehouses (bunkers, tanks, racks)
		Storage of waste intended for shipment to recycling (R4), in an open warehouse (plateaus)

(****) If there is no other appropriate R designation, this may include preparatory operations preceding reuse operations, including pre-processing such as, but not limited to, dismantling, sorting, crushing, compacting, baling, drying, cutting, preparing, repacking, separating or mixing prior to reporting for any operation specified from R1 to R11.

D waste management operations in the Eco Energy complex

D5	Disposal of waste in specially designed landfills (e.g. disposal of waste in linearly arranged covered compartments, mutually isolated and isolated from the environment)	Solidificate NHWL disposal (non-hazardous or hazardous non-reactive waste)
D9	A physico-chemical treatment not specified elsewhere in this list, the final products of which are compounds or mixtures which are disposed of by any process from D1 to D12 (e.g. evaporation, drying, calcination)	Stabilization and Solidification (prior to D5)
D13	Mixing waste before subjecting it to any of the operations from D1 to D12	Mixing of residues for stabilization (preceded to D9)
D15	Waste storage preceding any of the operations from D1 to D14 (excluding temporary storage, during collection, at the place where the waste was produced	Storage in S/S facility (preceded to D13 and D9)

A detailed description of the plant with all the envisaged technical and technological units and specifics, a description of the warehouse and production processes, methods of delivery and shipment of waste and raw materials, inter-process fluid transport, etc. is given in Chapter 3 of this Study.

Based on the analysis of the technical and technological specifics of the process, transport manipulative activities, storage and accompanying activities on the complex, the identification and selection of the most critical potential accident sites for which the modelling of the accident scenario was performed was shown below.

7.1.2 Specifics of physico-chemical properties of hazardous substances (non-recyclable hazardous waste, natural gas, ammonia water, activated carbon used in the production process, etc.) whose handling can lead to the occurrence of accidental situations

The presentation of hazardous substances properties, which is given below, highlights the important characteristics from the point of view of possible consequences for human life and health and the environment for hazardous substances whose handling may lead to the occurrence of accidents at the Waste-to-Energy Plant.

7.1.2.1 Characteristics of the waste to be treated at the plant in question

As stated above, the waste management of non-recyclable non-hazardous and hazardous waste, classified in one of the waste groups from 02 to 20, will be carried out in the facilities in question at the Waste-to-Energy Plant site (a complete list of index no. of waste and planned amounts, is given in the appendix to the study), in accordance with the Waste Catalogue, i.e. the provisions of the subject Rulebook on waste categories, examination and classification ("Official Gazette of the RS", Nos. 56/2010, 93/2019 and 39/2021);

In accordance with the procedures of waste **pre-acceptance and waste reception and acceptance**, a clear and precisely defined control of the types of waste that can be received at the plant will be provided. Within the reception control, the radioactivity of the delivered waste will be tested and if elevated radioactivity is detected, since the reception of this type of waste is strictly prohibited, the competent republic inspection and the ministry are immediately notified, and the driver is instructed to park the vehicle in the intended truck parking lot until the inspection arrives.

The project documentation defines that waste containing more than 1% of halogen organic substances expressed as chlorine **cannot be treated** in the boiler. It is strictly forbidden to receive waste that is explosive, flammable, infectious, radioactive, waste materials containing or contaminated with polychlorinated biphenyls (PCBs) and/or polybrominated triphenyls (PCTs) and/or polybrominated biphenyls (PBB), waste containing cyanides, isocyanates, thiocyanates, asbestos, peroxides, biocides, cytostatics.

HP 1:	"Explosive": waste in which, due to chemical reactions, gas can be generated at such temperatures, pressures and rates that it can cause destruction in the environment. This includes self-igniting waste, explosive organic peroxide waste and explosive self-reactive waste.
HP 3	"Flammable": waste which, according to its properties, is easily ignited or which, due to friction, can cause a flame or contribute to the creation of a fire:
	- flammable liquid waste: liquid waste whose ignition point is below 60 °C or waste gas oil, diesel and light fuel oil whose ignition point is in the temperature interval between > 55 °C and ≤ 75 °C;
	- self-igniting liquid and solid waste: solid or liquid waste that, even in small quantities, can ignite within five minutes after coming into contact with air;
	- flammable solid waste: solid waste that is easily flammable or can cause or promote fire by friction;
	- flammable gaseous waste: gaseous waste that can ignite after coming into contact with air at a temperature of 20 °C and a standard pressure of 101.3 kPa;
	- waste that reacts with water: waste that in contact with water releases flammable gases in dangerous quantities; - other flammable waste: flammable aerosols, flammable self-heating waste, flammable organic peroxides and flammable self-reactive waste.
HP 9	"Infectious": waste containing active microorganisms or their toxins believed or known to cause disease in humans and other living organisms.
HP 12	"Release of acutely toxic gases": waste that in contact with water or acid releases toxic gases (classified as acutely toxic cat. 1, 2 or 3).

The acceptance of substances exceeding the POPs limit values of substances pursuant to Article 4 and Annex I Part A of Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 shall not be permitted.

Additional restrictions of reception to the plant in question are waste substances in the form of aerosols, as well as organometallic compounds (spent metal-based catalysts, or organometallic wood preservatives) and aluminized paints.

The complete List of waste to **be managed by the Project Holder** at the location in question, given by waste groups (hazardous and non-hazardous), index numbers and hazardous waste characteristics according to the Waste Catalogue, as well as planned capacities, is shown in the appendix to the Study. The List is determined on the basis of the thermal treatment plant characteristics, the identification of types of waste that can be thermally treated (in terms of e.g. physical condition, chemical characteristics, hazardous properties and acceptable ranges of calorific value, humidity, ash content, etc.), as well as in accordance with the provisions of the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021) and the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023). The annex to the Study also includes a list of excluded waste index numbers from the R1 operation, i.e., waste codes that cannot be treated at the facility in question.

Hazardous characteristics of waste to be managed within the Waste-to-Energy Plant, in accordance with the H list of the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", Nos. 56/2010, 93/2019, 39/2021 and 65/2024) are as follows:

<table>
<tr>
<td>HP 2</td>
<td>“Oxidizing”: waste that can, mainly by releasing oxygen, cause the combustion of other materials or contribute to the combustion of other materials.</td>
<td>Waste containing one or more substances classified in the hazard classes and hazard categories and hazard notification codes in Table 1, waste shall be assessed, as appropriate and proportionate, with regard to the HP 2 waste label in accordance with the test methods set out in the regulations governing the methods of testing hazardous properties of chemicals. If the presence of any of these substances in the waste indicates that the waste is oxidizing, the waste is classified as hazardous and is assigned HP 2.
Table 1: Hazard classes, category codes and hazard statements for waste constituents regarding its classification as hazardous under HP 2
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th></tr>
<tr><td>Oxidizing gases, category 1</td><td>H 270</td></tr>
<tr><td>Oxidizing liquids, category 1</td><td>H 271</td></tr>
<tr><td>Oxidizing solids and mixtures, category 1</td><td></td></tr>
<tr><td>Oxidizing liquids, category 2 or 3</td><td>H 272</td></tr>
<tr><td>Oxidizing solids or mixtures, categories 2 and 3</td><td></td></tr>
</table>
</td>
</tr>
<tr>
<td>HP 4</td>
<td>“Irritant – skin irritation and eye damage”: waste that may cause skin irritation or eye damage when handled.</td>
<td>Wastes containing one or more substances in concentrations above the limit value to be taken into account in the hazard assessment, which are classified in one of the following classes, categories and hazard notices, and whose concentrations are equal to or higher than the threshold concentration, are classified as hazardous by HP 4.
The limit value to be considered in the hazard assessment for hazard classes “Skin corrosion” category 1A (H314), “Skin irritation” category 2 (H315), “Serious eye damage” category 1 (H318) and “Eye irritation” category 2 (H319) is 1%.</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>When the sum of the concentrations of all substances present in the waste and also classified as “Skin Corrosion” category 1A (H314) is equal to or greater than the 1% concentration limit, the waste is classified as hazardous by HP 4.
When the sum of the concentrations of all substances present in the waste and also classified as “Serious eye damage” category 1 (H318) is equal to or greater than the 10% concentration limit, the waste is classified as hazardous by HP 4.
When the sum of the concentrations of all substances present in the waste and also classified as “Skin Irritation” category 2 (H315) and “Eye Irritation” category 2 (H319) is equal to or greater than the 20% concentration limit, the waste is classified as hazardous by HP 4.
Wastes containing substances classified as “Skin Corrosion” category 1A, 1B or 1C (H314) in a concentration equal to or greater than 5% are classified as hazardous by HP 8. In this case, HP 4 does not apply to waste already classified as HP 8.</td></tr>
<tr><td>HP 5</td><td>'Specific target organ toxicity/Aspiration hazard': waste which may cause specific target organ toxicity due to single (SE) or repeated exposure (RE) or which may cause acute toxic effects after aspiration.</td><td>Waste containing one or more substances that are cladified into one or more of the hazard category classes in Table 2, while reaching or exceeding the values of one or more concentration limits in Table 2, is classified as hazardous by HP 5. Where substances classified in the “Specific target organ toxicity” class are present in the waste, the individual concentrations of these substances must be equal to or greater than the values of the concentration limits for the waste to be classified as hazardous by HP 5.
Waste containing one or more substances classified as “Aspiration Hazard”, category 1, and the sum of the concentrations of these substances reaches or exceeds the concentration limit value for that hazard class, is classified as hazardous by HP 5 only if the total kinematic viscosity (at a temperature of 40 °C) does not exceed the value of 20.5mm2/s. Note: Kinematic viscosity is determined exclusively for fluids.

Table 2. Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 5
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Specific target organ toxicity – SE, category 1</td><td>H370</td><td>1%</td></tr>
</table></td></tr>
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<table>
<tr><td>Specific target organ toxicity – SE, category 1</td><td>H371</td><td>10%</td></tr>
<tr><td>Specific target organ toxicity – SE, category 1</td><td>H335</td><td>20%</td></tr>
<tr><td>Specific target organ toxicity – RE, category 1</td><td>H372</td><td>1%</td></tr>
<tr><td>Specific target organ toxicity – RE, category 1</td><td>H373</td><td>10%</td></tr>
<tr><td>Aspiration hazard category 1</td><td>H304</td><td>10%</td></tr>
</table>
</td>
</tr>
<tr>
<td>HP 6</td>
<td>“Acute toxicity”: waste which may cause acute toxic effects after oral administration, dermal contact or after exposure by inhalation.</td>
<td>
When the sum of the concentrations of all substances present in the waste classified in the acute toxicity hazard class and according to the hazard notification categories and codes in Table 3 reaches or exceeds the concentration limit value specified in Table 3 for that hazard class and category, the waste is classified as hazardous by HP 6. When more than one substance classified as acutely toxic is present in the waste, the sum of the concentrations refers exclusively to substances belonging to the same hazard category.
The following substance limit values are taken into account in the hazard assessment:
– For substances classified as acutely toxic category 1, 2 or 3 (H300, H310, H330, H301, H311, H331): 0.1%
– For substances classified as acutely toxic, category 4 (H302, H312, H332): 1%.

Table 3 Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 5
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Acute oral toxicity, category 1</td><td>H300</td><td>0.1%</td></tr>
<tr><td>Acute oral toxicity, category 2</td><td>H300</td><td>0,25%</td></tr>
<tr><td>Acute oral toxicity, category 3</td><td>H301</td><td>5%</td></tr>
<tr><td>Acute oral toxicity, category 4</td><td>H302</td><td>25%</td></tr>
<tr><td>Acute dermal toxicity, category 1</td><td>H310</td><td>0,25%</td></tr>
<tr><td>Acute dermal toxicity, category 2</td><td>H310</td><td>2,5%</td></tr>
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<td>
<table>
<tr><td>Acute dermal toxicity, category 3</td><td>H311</td><td>15%</td></tr>
<tr><td>Acute dermal toxicity, category 4</td><td>H312</td><td>55%</td></tr>
<tr><td>Acute inhalation toxicity, category 1</td><td>H330</td><td>0.1%</td></tr>
<tr><td>Acute inhalation toxicity, category 2</td><td>H330</td><td>0.5%</td></tr>
<tr><td>Acute inhalation toxicity, category 3</td><td>H331</td><td>3,5%</td></tr>
<tr><td>Acute inhalation toxicity, category 4</td><td>H332</td><td>22.5%</td></tr>
</table>
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</tr>
<tr>
<td>HP 7</td>
<td>“Carcinogenic”: waste that causes or increases the incidence of cancer.</td>
<td>Waste containing a substance classified as "Carcinogenicity", category 1A, 1B or 2 and which reaches or exceeds the value of the concentration limits in Table 4 for that hazard category, is classified as hazardous by HP 7. When more than one substance classified as carcinogenic is present in the waste, the individual substance must be present at a concentration equal to or greater than the concentration limit for the waste to be classified as hazardous by HP 7.

Table 4 Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 7
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Carcinogenicity, category 1A</td><td>H350</td><td>0.1%</td></tr>
<tr><td>Carcinogenicity, category 1B</td><td></td><td></td></tr>
<tr><td>Carcinogenicity, category 2</td><td>H351</td><td>1.0%</td></tr>
</table>
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</tr>
<tr>
<td>HP 8</td>
<td>“Corrosive”: waste in contact with which skin corrosion may occur.</td>
<td>Waste containing one or more substances that are classified as “Skin Corrosion” category 1A, 1B or 1C (H314), and the sum of their concentrations reaches or exceeds 5%, waste is classified as hazardous by HP 8.
The limit value to be taken into account when assessing the hazard of waste with regard to the hazard class “Skin Corrosive” of categories 1A, 1B and 1C (H314) is 1.0%.</td>
</tr>
<tr>
<td>HP 10</td>
<td>“Toxic to reproduction”: waste that adversely affects the sexual function and fertility of men and</td>
<td>Waste containing a substance classified as "Toxic to reproduction", category 1A, 1B or 2 and which reaches or exceeds the value of the concentration limits in Table 5 for</td>
</tr>
</table>

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<td></td>
<td>women, as well as the development of the fetus.</td>
<td>that hazard category, is classified as hazardous by HP 10. When more than one substance classified as toxic to reproduction is present in the waste, the individual substance must be present at a concentration equal to or greater than the concentration limit for the waste to be classified as hazardous by HP 10.

Table 5 Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 5
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Reproductive toxicity, category 1A</td><td>H360</td><td>0.3%</td></tr>
<tr><td>Reproductive toxicity, category 1B</td><td></td><td></td></tr>
<tr><td>Reproductive toxicity, category 2</td><td>H361</td><td>3.0%</td></tr>
</table>
</td>
</tr>
<tr>
<td>HP 11</td>
<td>“Mutagenicity”: Waste that may cause a mutation that is a permanent change in the amount or structure of genetic material in a cell.</td>
<td>Waste containing a substance classified as " Mutagenicity of germ cells ", category 1A, 1B or 2 and which reaches or exceeds the value of the concentration limits in Table 6 for that hazard category, is classified as hazardous by HP 11. When more than one substance classified as mutagenic is present in the waste, the individual substance must be present at a concentration equal to or greater than the concentration limit for the waste to be classified as hazardous by HP 11.

Table 6 Hazard classes and category, hazard notices for waste constituents and corresponding concentration limits values regarding its classification as hazardous under HP 5
<table>
<tr><th>Hazard class and category</th><th>Hazard statements</th><th>Concentration limit</th></tr>
<tr><td>Germ cell mutagenicity, category 1A</td><td>H340</td><td>0.1%</td></tr>
<tr><td>Germ cell mutagenicity, category 1B</td><td></td><td></td></tr>
<tr><td>Germ cell mutagenicity, category 2</td><td>H341</td><td>1.0%</td></tr>
</table>
</td>
</tr>
<tr>
<td>HP 13</td>
<td>“Sensitising”: waste containing one or more substances that are known to have the ability to cause a skin or respiratory sensitisation (hypersensitivity) reaction.</td>
<td>When a waste contains a substance that has been classified as sensitizing and to which hazard statements H317 or H334 have been assigned, and whose individual concentration reaches or exceeds the 10% concentration limit value, the waste is classified as hazardous by HP 13.</td>
</tr>
</table>

HP 14	HP 14 “Ecotoxic”: waste that poses or may pose short- or long-term risks to one or more environmental media.	Waste that meets any of the following conditions listed below is classified as hazardous by HP 14: – waste containing a substance classified as hazardous to the ozone layer and to which Hazard statement H420 has been assigned in accordance with the regulations governing the classification, packaging and labelling of chemicals and certain products, the concentration of which reaches or exceeds the concentration limit value of 0.1%. **[c (H420) ≥ 0.1%]** – waste containing one or more substances classified as acutely toxic to the aquatic environment and assigned a hazard notification N400 in accordance with the regulations governing the classification, packaging and labelling of chemicals and certain products, and the sum of their concentrations reaches or exceeds a concentration limit value of 25%. These substances are subject to a limit value taken into account in the hazard assessment for acute aquatic toxicity hazard classes of 0.1%. **[Σ c (H400) ≥ 25%]** – waste containing one or more substances classified as chronically toxic to the aquatic environment of categories 1, 2 or 3 and assigned one or more of the following hazard notices: H410, H411 or H412 in accordance with the regulations governing the classification, packaging and labelling of chemicals and certain products, the sum of the concentrations of all substances classified as chronically hazardous to the aquatic environment, category 1 (H410) multiplied by 100, added to the sum of the concentrations of all substances classified as chronically hazardous to the aquatic environment, category 2 (H411) multiplied by 10 and added to the sum of the concentrations of all substances classified as chronically hazardous to the aquatic environment, category 1 (H410) equal to or greater than the limit concentration value of 25%. The limit value applicable to substances to which the H410 hazard statement has been assigned is 0.1%, while the limit value of 1% applies to substances to which the H411 or H412 hazard statements have been assigned. **[100 × Σc (H410) + 10 × Σc (H411) + Σc (H412) ≥ 25%]** – waste containing one or more substances classified as chronically toxic to the aquatic environment of categories 1, 2 or 3 and assigned one or more of the following hazard notices: H410, H411 or H412 in accordance with the regulations governing the classification, packaging and labelling of chemicals and certain products, and the sum of the concentrations of all substances classified as

		chronically toxic to the aquatic environment is equal to or greater than the limit concentration value of 25%. The limit value applicable to substances to which the H410 hazard statement has been assigned is 0.1%, while the limit value of 1% applies to substances to which the H411 or H412 hazard statements have been assigned. **[Σ c (H410) + Σ c (H411) + Σ c (H412) + Σ c (H413) ≥ 25%]** Where: Σ = sum and s = individual concentration of the substance in the waste.
HP 15	"Waste that may exhibit some of the hazardous properties from the HP markings (HP 1 – 14) and that it did not originally exhibit".	Waste containing one or more substances that has been assigned one of the hazard statements or additional hazard statements (H205, EUH001, EUH019 or EUH044) listed in Table 7 is classified as hazardous by HP 15 unless the waste is in such a form that under no circumstances can it exhibit explosive or potentially explosive properties. Table 7: Hazard statement and additional hazard statement for waste constituents regarding its classification as hazardous by HP 15 **Hazard Statement/ Additional Hazard Notification** May explode en masse in a fire — H205 Explosive when dry — EUH001 Can form explosive peroxides — EUH019 Risk of explosion if heated indoors — EUH044

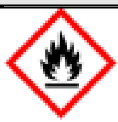
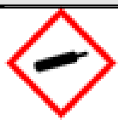
In order to examine the types and amounts of hazardous substances and obligations of the Project Holder from the aspect of protection from a chemical accident and determine the type of documentation that is required to be prepared, the identification of all hazardous substances and their amounts was carried out, which will be used and stored on the subject complex, all in accordance with the Rulebook on the list of hazardous substances and their quantities and criteria for determining the type of document prepared by the operator of the seveso plant or complex ("Official Gazette of the RS", Nos. 41/2010, 51/2015 and 50/2018), the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", Nos. 56/2010, 93/2019 and 39/2021) and the Rulebook on the Classification, Packaging, Labelling and Advertising of Chemicals and Certain Products in accordance with the Globally Harmonized System for Classification and Labelling of the UN ("Official Gazette of the RS", Nos. 105/2013, 52/2017, 21/2019, 40/2023). A complete list of waste is attached to this Study. The annex to the Study includes an ANALYSIS OF THE FACILITY IN QUESTION FROM THE PERSPECTIVE OF REGULATIONS ON THE PREVENTION OF CHEMICAL ACCIDENTS, AS APPLICABLE TO SO-CALLED SEVESO ESTABLISHMENTS.

7.1.2.2 Characteristics of natural gas

Natural gas is used to operate the boiler burner as an ignition and auxiliary fuel. Table 7.1 shows the classification of natural gas and the status from the aspect of the seveso plant.

Table 7.1 Classification of natural gas

INDEX number: 601-001-00-4	EC number: 200-812-7	CAS Number: 74-82-8	UN Number: /
Classification			

Flam. gas. cat. 1; H220 Pressurized gas; H280	
Label elements	
GHS hazard pictogram	 GHS02  GHS04
Signal word	Danger
Hazard statements: **H-labels**	H220: Extremely flammable gas H280: Contains gas under pressure, may explode if exposed to heat
Precautionary statements **P-labels**	**Prevention** P210: Keep away from heat/ sparks/ open flames/ hot surfaces. **Reacting** P377: Leaking gas fire: Do not extinguish unless leak can be stopped safely. P381: Eliminate all ignition sources, if safe to do so. P410 + P403 – Protect from sunlight. Store in a well-ventilated place.

Seveso data		
Seveso substance	**Main seveso category / Other seveso categories (Hazard classes from Table II of the Rulebook on the list of hazardous substances)**	**Table I and II Limit amounts (t) Column1 (1. Accident prevention policy)/ Column 2 (1. Safety Report; 2. Accident Protection Plan)**
Yes	Table I - no.18: named substances ''P2''- flammable gases category 1	50/200 10/50

Information on the physical and chemical properties of the chemical

Aggregate state:	Gas
Chemical colour:	Colourless
Odour:	Odour threshold is subjective and inadequate for early warning
chemical pH:	Not applicable to gases and gas mixtures
Odour threshold	The data is not relevant, because it is an odourless gas
Melting point / freezing point.	-182.5°C
Initial boiling point and boiling range	-161.5°C
Flash point	Not applicable to gases and gas mixtures
Evaporation rate:	Not applicable to gases and gas mixtures
Flammability:	Extremely flammable gas
Explosion limits :	5 - 15% (literature data)
Lower explosion limit (LEL) :	4.4
Upper explosion limit (UEL) :	17
Vapour pressure:	Not applicable
Vapour density	0.555 kg/m^3 (for pure methane, at 15°C)
Relative density liquid (water=1) :	0.42
Relative density, gas (air=1) :	0.6

Water solubility :	26 mg/l
Partition coefficient in	11.2 μPa at 27°C
n-octanol/water system (Log Kow):	1.09
Auto-ignition temperature	595°C
Decomposition temperature	1000-1200 °C
Critical temperature:	-82°C
Molar mass	16 g/mol

Stability and Reactivity

Reactivity:	Gas in air can create explosive mixtures.
Chemical Stability:	Stable under normal conditions
Possibility of hazardous reactions:	With air, it can create an explosive mixture. Reacts violently with oxidants
Conditions to avoid:	P210: Keep away from heat sources/ sparks/ open flames/ hot surfaces. - No smoking. Avoid moisture in installation systems.
Incompatible Materials:	Air, oxidizing. For further compatibility information see SRPS ISO 11114
Hazardous decomposition products:	Under normal conditions of use and storage, there are no hazardous decomposition products

Acute Toxicity

Toxicological effects of this product are not expected unless the limit values for the working environment are exceeded.

LD50/ Oral	The study is not technically feasible
LD50/ Dermal	The study is not technically feasible
LC100/inhalation (87%)/1.5h/cat	606687 mg/m^3, - induces anesthesia
LC100 inhalation (90%)/1.5h/cat	627607 mg/m^3, - causes respiratory toxicity and death

Local effect

Skin corrosion/irritation:	The study is not technically feasible
Severe eye damage/irritation:	The study is not technically feasible
Respiratory/skin sensitisation:	That information is not available.
Carcinogenicity :	No known effects from this product
Sex cells mutagenicity:	No known effects from this product
Toxicity to reproduction	No known effects from this product
Specific susceptible organs – toxicity	No known effects from this product
(single exposure):	No known effects from this product
Specific susceptible organs – toxicity	No known effects from this product

Ecotoxicological data

Ecotoxic properties: Toxic to aquatic organisms, may cause long-term adverse effects to the aquatic environment

EC50 48h - Daphnia magna [mg/l] : 69.4 mg/l
EC50 72h - Algae [mg/l] : 19.4 mg/l
LC50 96 h - Fish [mg/l] : 147.5 mg/l

Persistence And Degradability

The substance is biodegradable. They are unlikely to stick around.

Bioaccumulation potential

Due to low log Kow (log Kow <4), bioaccumulation is not expected.

Mobility in soil

Due to its high volatility, the product will not cause soil or water pollution.

Soil retention is unlikely
Greenhouse effect potential [CO2=1]: 25

7.1.2.3 Characteristics of ammonia water

Ammonia water (25% solution) is delivered to the site by tank trucks. The characteristics of ammonia water are given below.

CAS number: 1336-21-6
EC number: 215-21-6
UN-No.: 2672

An aqueous solution of ammonia has corrosive properties. Large application is in the production of artificial fertilizers, chemical industry, nitrogen compounds, in the chemical industry to obtain solutions used in medicine and pharmaceutical industry. It is also used in the rubber industry and in thermal power plants.

Within the subject plant, ammonia water will be used as a reagent for the process of selective catalytic reduction of NO_x from the flue gases of the boiler plant.

Table 7.2 Classification of Ammonium hydroxide 25%

	CPL-GHS
Hazard pictogram; Signal word	**GHS05** **GHS09**   **Danger**
Hazard Labels Hazard Statement:	**H314 -** Causes severe skin burns and eye damage. **H335 -** May cause respiratory irritation. **H400 -** Very toxic to aquatic life.
Precautionary statements:	**P260-** Do not breathe fumes. **P264** - Wash hands thoroughly after handling **P271-** Use only outdoors or in a well-ventilated area **P273 –** Avoid release to the environment **P280** - Wear protective gloves/protective clothing/eye protection/face protection. **P301+330**+**331**-If SWALLOWED: Rinse mouth. Do not induce vomiting. **P303+361+353-** IF ON SKIN/ HAIR: urgently remove/take off all contaminated clothing. Rinse skin/hair with water. **P363** - Wash contaminated clothing before reuse. **P304+340-** IF INHALED: Remove person to fresh air and place in a position that facilitates breathing. **P305 + P351 + P338 -** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if they exist and if possible. Continue rinsing. **P310 -** Immediately call a POISON CONTROL CENTER /doctor. The Poison Control Center (VMA) every day 24/7: 011/36-08-440. **P391** - Collect spillage **P403+233** Store in a well-ventilated room. Packaging close tightly. **P405** Store locked up. **P501:** Dispose of contents/packaging in accordance with national regulations

Information on the physical and chemical properties of the chemical

Aggregate state	Liquid
Appearance / Odour	Colourless / strong, sharp, stuffy
pH	13-14 (1N solution)
Odour threshold	2 - 5 ppm
Melting point / freezing point.	-60°C
Initial boiling point and boiling range	38°C
Flash point, (°C)	not specified
Evaporation rate	not specified
Flammability	Non-flammable liquid
Upper flammability or explosive limit	27%vol.
Lower flammability or explosive limit	15.4%vol.
Vapour pressure at 20°C	153 hPa
at 25°C	48 hPa
Vapour density (air=1) (kg/m^3)	1.21
Relative density	0.91 g/cm^3 (25% w/w)
Solubility in water	complete
Partition coefficient in the n-octanol/water system:	Not determined.
Auto-ignition temperature	651
Decomposition temperature	no data
Dynamic viscosity	1.1 mPa·s
Explosive properties	no
Oxidizing properties:	yes

Reactivity and stability
Stable under conditions recommended for transport and storage.
It decomposes upon heating, in contact with acids, under the influence of light. Strong oxidizer and reacts violently with reducing and flammable substances. The solution in water is a strong base and is corrosive.

Conditions to avoid: Light, heat, contact with acids.
Incompatible materials: Strong mineral acids, strong bases, metals, metal oxides, hydroxides, amines and other alkalic materials. Cyanides, sulphides, sulphites, and formaldehydes are also incompatible.

Hazardous decomposition products: toxic ammonia, nitrogen oxides.

Exposure controls & personal protection
Exposure limit values were checked based on CAS number from the summary ACGIH list of chemicals. The maximum permissible concentration for the Republic of Serbia is defined in the SRPS Z.BO.001/1:2007 standard.

Exposure control parameters

DNEL: Exposure limit value (employees)	WEL TWA: 25 ppm TWA (anhydrous); 18 mg/m^3	OSHA: 50 ppm TWA, 35 mg/m^3 TWA	MAC: 20 ppm VLAED (indicative limit value); 14 mg/m^3
	OSHA 50 ppm, 35 mg/m^3 PEL 8 hour TWA	NIOSH 35 ppm, 27 mg/m^3 STEL 15 minutes 25 ppm, 18 mg/m^3 REL 10 hour TWA 300ppm, IDLH	ACGIH 25 ppm, 18 mg/m^3 TLV 8 hour TWA 35 ppm, 27 mg/m^3 STEL 15 minutes

7.1.2.4 Characteristics of activated carbon

At the plant in question, activated carbon will be used in filtration systems for the treatment of waste gases in order to remove heavy metals such as Hg, and organic components such as dioxins and furans (PCDD/PCDF), elimination of unpleasant odours. Activated carbon is delivered and stored in containers in close proximity to the dosing site itself. Table 7.3 shows the characteristics of activated carbon.

Table 7.3 Physical and chemical characteristics of activated carbon

Composition	Moisture - 0.5% (mass)	
	Ash - 9 % (mass)	
	Volatile Components – 3% (mass)	
	Carbon 87.5% (mass)	
Granulation	>0.315mm	5% (mass)
	0.200-0.315 mm	8% (mass)
	0.125-0.200mm	12% (mass)
	0.090-0.125mm	15% (mass)
	0.063 – 0.090mm	10% (mass)
	<0.063 mm	50% (mass)
	d50	63 µm
Bulk density:	0.55 g/cm^3	
Specific Surface Area	300(+/− 30) m^2/g	

Activated carbon explosion parameters (*Source: Abgasreinigung Risikobeurteilung Teil 2 – Explosionsgefahren Stand: Dezember 2021)* are:

	LIGNIT-coke AU	
Pmax (bar)	**7.6**	**8.6**
Kstmax (m·bar/s)*	**83**	**96**
LEL (g/m3)	**50**	**70**
Tcl (^{0}C)	**470**	**560**
T5mm (^{0}C)	**390**	**450**
MIE (mJ)	**200<Wmin**	

*St 0: Kst=0 (non-explosive); St1: Kst ≤ 200 bar m/s (weakly/moderately explosive); St2: 200< Kst ≤ 300 bar m/s; St3: Kst > 300 bar m/s

- Pmax – maximum explosion overpressure;
- Kstmax – maximum deflagration index;
- LEL – lower explosive limit
- Tcl – Dust cloud ignition temperature
- T5mm – Layer ignition temperature, 5mm layer
- MIE – Minimum Ignition Energy;
- St0; St1, St2 and St3 dust explosion classes.

The minimum ignition energy is usually greater than 1 joule for activated carbon, but definitely more than 200 mJ. Activated carbon has a low electrical resistance of about 12 ohm.

7.1.3 Hazard sources

7.1.3.1 Leakage of hazardous substances

Small-scale leaks may occur during storage of hazardous and non-hazardous waste. Waste storage will take place in the premises of facilities that have an impermeable substrate, equipped with equipment for the collection of unintentional spills, a fire protection system, adequate ventilation, physical security and protected from atmospheric influences. Mobile bundwalls will be installed under the IBC containers and barrels containing liquid waste to prevent leakage due to accidental situations. Since only certified packaging is used for the packaging, transport and storage of hazardous waste, the classic cracking of the packaging cannot occur, but only its partial damage and leakage of small quantities of liquid down the packaging itself, and not leakage in stream and in large amounts. A sufficient number of mobile bundwalls will be provided for the collection of any leaked contents, as well as appropriate absorbents for the collection and dry cleaning of the leaked contents (sawdust, sand, oil, base and acid absorbents). The operator will periodically check the structural integrity of the vessels (mechanical cracks) and the occurrence of leaks. In case of need, certain measures will be taken such as replacing the packaging (container), repairing accidentally spilled contents, etc. In order to carry out the aforementioned control smoothly, access to the hazardous waste warehouse should be easy and free for easy repackaging, measurement, sampling, transport, etc.

The temporary storage of non-hazardous waste (separated secondary raw materials) envisaged in the open air is provided with a waterproof substrate from which all atmospheric water is collected and taken to the grease and oil separator.

Storage tanks for liquid waste substances, in addition to being located in a closed facility with a waterproof base, will be located in reinforced concrete tanks of sufficient volume to receive the leaked liquid from one of the tanks (including the leak of the largest tank). All potentially leaked contents will be pumped into the appropriate tank using pumps and then treated in the boiler plant in question. For the storage of ammonia water (25% solution), a tank with a double wall is provided, which will be placed in a concrete waterproof bundwall. During the summer months when the outdoor temperature is higher than 25°C, it is necessary to cool the ammonia water storage tank. The reservoir is cooled with water from the dew basin (water recirculates). Two pumps (operating and spare) are provided for the tank dewing. The floor of the building is made of waterproof concrete. Storage of all liquid raw materials (additives and other chemicals) will be carried out in appropriate containers placed on portable bundwalls of sufficient volume to accept the complete content of the containers.

Line grates are planned at liquid transfer points (liquid waste transfer point and ammonia water transfer point), which will collect any leaked liquids during transfer and drain them to the collection pit. In this way, the possibility of possible leakage of the leaked fluid into the atmospheric sewage and the surrounding soil is avoided.

All water from extinguishing possible fires within the Waste-to-Energy Plant will be collected in concrete pools and subsequently treated at the boiler plant.

Storage areas are designed to prevent the release of hazardous substances into the environment in any way.

In order to protect groundwater, surface water and soil, it is envisaged that atmospheric potentially polluted water from manipulative surfaces, roads and plateaus for the storage of non-hazardous waste is taken through channels and flumes by internal atmospheric sewage of the complex to the grease and oil separator, from where the treated water will be discharged, first to the collection collector within the Elixir Prahovo complex, and then to the final recipient (Danube River).

Due to a potential accident situation at the boiler plant, an uncontrolled flue gas outlet may occur from which it may contain the following pollutants: HCl, PM, HF, NO_x, SO_2.
Also, in the accidental event, uncontrolled discharge of ammonia water from a tank truck or storage tank may lead to emissions of ammonia vapour NH_4.

7.1.3.2 Fire and explosion

An accident at the location in question may occur in the event of a fire and explosion. The biggest source of risk is the waste itself, which can contain components that can cause a spark (e.g. batteries). The process of mechanical pretreatment of different types of heterogeneous waste in shredders also represents a potential place of fires and explosions occurrence. Fire and explosion can also occur due to the human factor, i.e. the use of open flames (cigarettes, etc.), malfunction of electrical installations, short circuit, natural disaster, etc. The greatest air pollution can occur in the event of a fire in which large quantities of toxic gases are generated during the combustion of waste materials: CO, NOx (expressed as NO2), SO_2, HCl and soot.

Considering that the project technical documentation envisages all preventive and precautionary measures required by regulations and laws for this type of facilities (for more details, see Chapter 8 of this Study), accidents caused by: equipment and installation malfunction, human factor, negligence due to poor technological discipline or non-compliance with the operating instructions can occur most often.

From the aspect of fire protection, the facilities are designed as separate facilities and facilities in a row. Separate facilities are designed to be located at a distance from other facilities in the complex at a minimum of 4m, which prevents the transfer of fire from one facility to another.
Measures to prevent fire transmission, such as safe distances on the facade and roof, are envisaged in the facilities designed as buildings in a row.
Facilities W-C08 (Pretreatment and Waste Storage) and W-C11 (Waste Thermal Treatment Plant) are facilities in a row. These two facilities are functionally and fire-connected due to the requirements of the technological process taking place in the plant, but the possibility of fire transmission between them is provided by construction and technological measures.
When it comes to fire protection for the implementation of the project in question, the following have been obtained:

- **Requirements regarding fire and explosion protection measures**, Ministry of the Interior, Sector for Emergency Situations, Department for Emergency Situations in Bor, nos. 217-8864/23 of 11/04/2023
  With these conditions, the competent authority stated that THERE ARE NO special conditions regarding fire protection measures, and that during the design and construction phase of the facility with all associated installations, equipment and devices, it is necessary to apply fire protection measures determined by applicable laws, technical regulations, standards and other acts that determine the area of fire protection.
- **Requirements for safe placement in terms of fire and explosion protection measures with a certified site plan**, Ministry of the Interior, Sector for Emergency Situations, Department for Emergency Situations in Bor, nos. 217-8865/23 of 13 October 2023, which approves the safe installation of tanks and containers with combustible liquids within the W-C08 facility, in which a room was formed for the storage of liquid waste tanks at an level of +8.6 (2 tanks with a total maximum volume of combustible liquids of 48 m^3), as well as a room on the ground floor for the storage of liquid waste in containers (IBC containers with a maximum volume of combustible liquids of 48 m^3) and a transfer station, within the construction of an non-recyclable Waste-to-Energy Plant in Prahovo.

As an integral part of the preliminary design of the Waste-to-Energy Plant, the following were developed:

- Design of Telecommunication and Signal Installations - **Automatic Fire Detection and Alarm System, Natural Smoke and Heat Exhaust System and Explosive Gas and Vapor Detection System**, no. 3-WTE-IDP-0540
- Design of Mechanical Installations, **Fire Water Tank**, 23-WTE-IDP-0611
- Design of Mechanical Installations, **Stable Fire Extinguishing Installation**, no. 23-WTE-IDP-0613
- **FIRE PROTECTION STUDY,** Petnaesti korpus d.o.o., No. 23-WTE-IDP-E
- **ANALYSIS OF HAZARD ZONES**, Petnaesti korpus d.o.o., No.23-WTE-3P-E1

Data on the facilities that are the subject of this Study and their planned condition (materialization, surfaces, infrastructure equipment, etc.), as well as the manner of handling each type of waste, planned methods of waste treatment and all other activities related to the operation of the plant are described in detail in Chapter 3.2 of this Study.

For each planned facility at the Waste-to-Energy Plant, the basic requirements from the aspect of fire protection are defined in accordance with the applicable regulations in this area. The requirements from the aspect of fire protection are defined based on the list of facilities and rulebooks is given in Table 7.4.

Table 7.4 List of facilities and rulebooks as the basis for definition of the requirements from the aspect of fire protection

Facility designation	**Facility name**	**Name of the regulation that defines the requirements from the aspect of fire protection**
W-C01	*W-C01 Reception guardhouse and administrative building*	Rulebook on Technical Norms for Fire Protection of Residential and Commercial Buildings and Public Facilities ("Official Gazette of the RS". No. 22/2019)
W-C02	*Operations centre*	
W-C03	*Fire water tank*	No fire safety requirements
W-C04	*Pumping station and fire station*	Rulebook on Technical Norms for Fire Protection of Residential and Commercial Buildings and Public Facilities ("Official Gazette of the RS", No. 22/2019)
W-C06	*Pipeline bridges*	No fire safety requirements
W-C08	*Pretreatment and waste storage*	Rulebook on Technical Norms for the Protection of Warehouses from Fire and Explosions ("Official Gazette of SFRY", no. 24/87)
W-C09	*Waste Pretreatment Filter System and Activated Carbon Filter*	No fire safety requirements
W-C10	*Cargo Scales*	No fire safety requirements
W-C11	*Waste thermal treatment plant*	Rulebook on Technical Norms for Fire Protection of Industrial Facilities ("Official Gazette of the RS", nos. 1/2018 and 81/2023)
W-C12	*Stabilization and solidification*	Rulebook on Technical Norms for Fire Protection of Industrial Facilities ("Official Gazette of the RS", no. 1/2018 and 81/2023)
W-C13	*Transfer point*	Rulebook on Technical Standards for Fire and Explosion Safety of Plants and Facilities for Flammable and Combustible Liquids and on Storage and Transfer of Flammable and Combustible Liquids ("Official Gazette of the RS", Nos. 114/2017, 85/2021)
W-C14	*Smokestack*	No fire safety requirements
W-C15	*Ammonia water tank with bundwall*	No fire safety requirements
W-C16	*Solidification filter system*	No fire safety requirements
U-C01	*Bus stop*	No fire safety requirements
U-C02	*Maintenance building and Auxiliary systems facility*	Rulebook on Technical Norms for Fire Protection of Industrial Facilities ("Official Gazette of the RS", Nos. 1/2018 and 81/2023)
U-C03	*Wheel Washing Unit*	No fire safety requirements
U-C06	*Wastewater Receiving and Treatment System*	No fire safety requirements

Facility designation	Facility name	Name of the regulation that defines the requirements from the aspect of fire protection
U-C07	*Plateau*	No fire safety requirements
U-C08	*Plateau for separated metal*	No fire safety requirements
U-C09	*Natural gas reducing station*	Rulebook on conditions for uninterrupted and safe distribution of natural gas through gas pipelines with a pressure of up to 16 bar ("Official Gazette of the RS", No. 86/2015

Based on the results of the fire risk assessment and the aforementioned regulations for the facilities, the following safety systems were adopted:

A. **It is envisaged to protect the entire complex with an external hydrant network**
B. **Facility: W-C01 Reception guardhouse and administrative building**
   a. Internal hydrant network
   b. Fire detection system
   c. Ventilation of the evacuation staircase via a window on the facade
C. **Facility W-C02 Operations centre**
   a. Internal hydrant network
   b. Fire detection system
   c. Ventilation of the evacuation staircase via a window on the facade
   d. Gas extinguishing of certain technical rooms
D. **Facility W-C04 Pumping station and fire station**
   a. Internal hydrant network
   b. Fire detection system
   c. Stable extinguishing system in the pumping station part
E. **Facility W-C08 Pretreatment and waste storage**
   a. Internal hydrant network (in persons accessing area)
   b. Fire detection system
   c. Methane detection system in the sludge bunker area
   d. Stable extinguishing system
   e. Natural smoke extraction system
F. **Facility W-C11 Waste thermal treatment plant**
   a. Internal hydrant network
   b. Fire detection system
   c. Stable extinguishing system in the zone around the burner
   d. Natural smoke extraction
G. **Facility W-C12 Stabilization and solidification**
   a. Internal hydrant network
   b. Fire detection system (only in a space accessed by people)

   c. Hydrogen detection system

H. Facility U-C02 Maintenance building and auxiliary systems facility

   a. Internal hydrant network
   b. Fire detection system
   c. Natural smoke extraction

7.1.4 Hazard analysis of chemical accidents based on the analysis of defined hazard zones

The explosive vapor atmosphere zone width is defined as the distance in any direction from the release/discharge source to the point where the hazard associated with that zone is present. The width of the zone is mainly influenced by physico-chemical parameters, some of which represent the intrinsic properties of the flammable material, while others are specificities of the technological process.
In accordance with the technological process in the complex in question, the possibility of the existence of hazard zones and their classifications was also considered. Dust and gas hazard zones were analysed in the complex in question.

7.1.4.1 Dust-Related Hazard Zones

The facilities in which the occurrence **of dust hazard zones** was analysed are:

- W-C09 Waste pre-treatment filter system and activated carbon filter
- Activated carbon dosing system within the boiler plant W-C11.

WC-09 system for dedusting pre-treatment of non-hazardous waste in the facility W-C08 – Dust in this facility arises from the process of acceptance, treatment (shredding) and transport of waste to the receiving bunker, and in case of shutdown of the boiler. Sva oprema sistema otprašivanja je predviđena da bude izvedena u protiveksplozivnoj zaštiti, klase IIIC T165 ˚C.

Activated carbon dosing system – In the activated carbon dosing system, hazard zones are defined based on the recommendation of the equipment manufacturer. Activated carbon dispensers are mechanically in anti-explosive protection, while there is no requirement for the motors that start them, because the system is closed and dust is not expected to occur outside the transport system. Only electrical equipment that must be Ex-built in the storage bunker area (level gauge).

Figure 7.1 shows the hazard zones created by activated carbon dust.

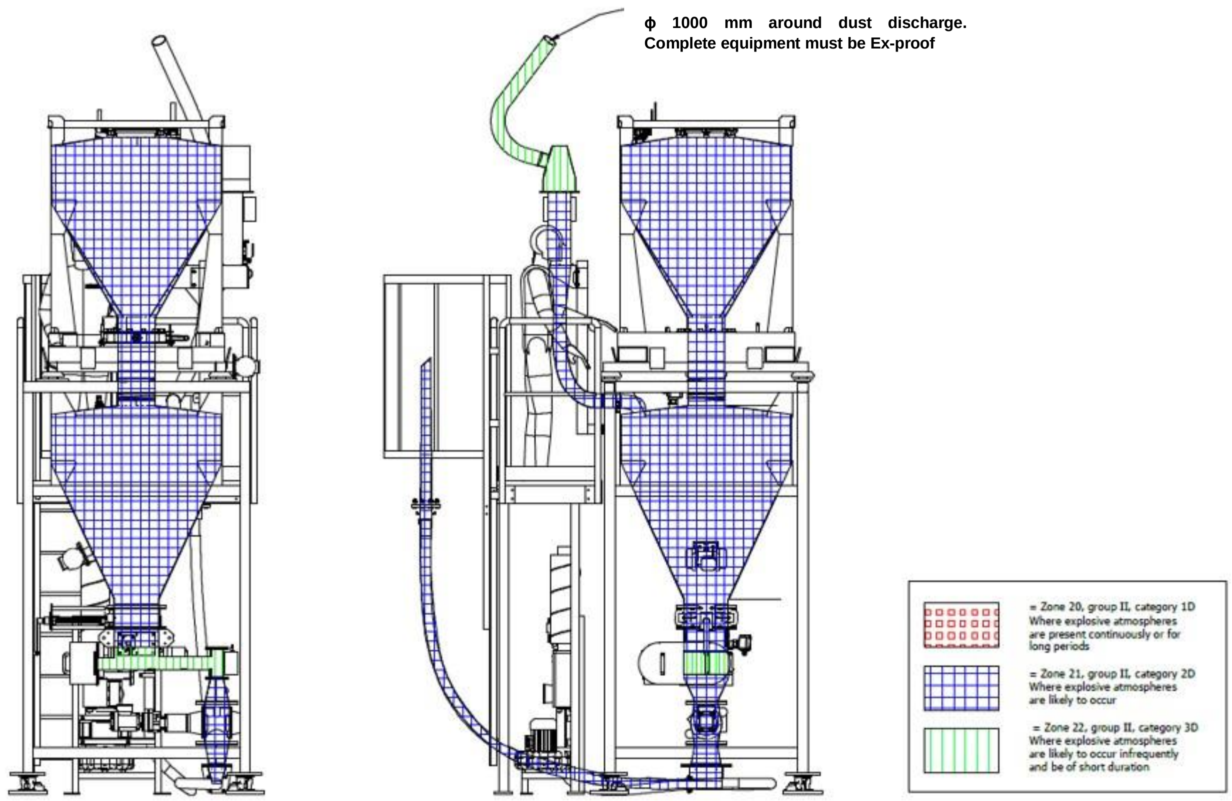


Figure 7.1 Hazard zones caused by activated carbon dust

Below is a table 7.5 showing the hazard zones by facilities.

Table 7.5 Hazard zones by facilities

Facility	Position	Zones	Equipment class
W-C16	Dedusting system	Hazard zone 2 (NE) The formation of hydrogen from the stabilization and solidification process.	There are no requirements for equipment other than the ventilation fan of the space that has the IIC T1 requirement
W-C09	Dedusting system	Zone 21 inside the hopper Zone 22 after filter Zone 22 inside the filter, around the leakage site, sphere radius 1.5m	IIIc T165°C
Activated carbon	/	Zone 21 inside the activated carbon container, inside the transport devices and the activated carbon dispenser and inside the ventilation system of the activated carbon container Zone 22 zone 1m around the final opening for ventilation of activated carbon containers	IIIc T165°C

7.1.4.2 Hazard zones related to the possibility of explosive gases occurrence

Facilities in which the **occurrence of zones resulting from explosive gases** was analysed are:

- Facility W-C08 (sludge from methane)
- Facility W-C11 (natural gas)
- Facility W-C12 (hydrogen)
- Facility W-C13 loading point for tank trucks
- Facility U-C09 reducing station (natural gas)
- W-C16 Solidification Filter System

In the facility W-C08, an area with a bunker (capacity 65 m^3) is foreseen for the reception of sludge, which is transported from there further to the incineration process. As for dusts, there is no possibility for sludge to accurately determine its composition or the possibility of separating methane from it. In the subject area, a ventilation system and methane detection are planned. Since the amount of methane discharge from the sludge is unknown, the calculations cannot define the required number of air changes in the enclosure in order to keep the methane level below the LEL level. Accordingly, a methane detection system is provided in this space.

At 10% of the LEL (Lower Explosive Limit), the space will be inertized, that is, nitrogen will be let in and an intermittent tone will be activated via an alarm siren with a flasher.

At 40% of the LEL (Lower Explosive Limit), the power supply to the sludge bunker will be turned off and a continuous signal will be activated via an alarm siren with a flasher, as well as an alarm flasher will be activated via an alarm siren with a flasher and light warning panels with the inscription "Gas - does not enter", i.e. "Gas - leave the area". Executive functions are defined in the explosive gas detection project.

In this way, the possibility of the occurrence of the explosive mixture ignition sources is excluded in the endangered area.

Air from the sludge compartment will also be taken to the boiler plant (2,000 m^3/h) by means of combustion air fans, in order to keep the storage under pressure and prevent the spread of unpleasant odours outside the facility. Air compensation is from the facade of the building. When the boiler plant does not work, nitrogen is automatically introduced into the sludge receiving hopper in order to inertise the space.

The line for the treatment of hazardous waste (IBC containers, barrels, etc.) is provided in a separate room of the facility W-C08, code 0.8 (00 EBC 02 EB 001). During waste dosing, nitrogen (N2) is injected into the shredder chamber, which inerts the atmosphere in the chamber.

According to the calculation around the equipment for the pretreatment of hazardous waste, ZONE 2 is defined in a width of 1m from the equipment. The equipment in the subject area must meet class IIC T3. In the facility in question, the composition of hazardous waste will be variable, and for this reason, a system for detecting explosive gases is not provided.
The haazard zones for this facility are shown on drawings 23-WTE-PZI-E3-WC08-1001-R00.

The line for the pretreatment of bulk solid hazardous and non-hazardous waste consists of a primary and secondary shredder that are not high-speed shredders, therefore the possibility of sparks and fires is reduced.

In the W-C11 area, natural gas is used for the primary ignition of the boiler and as a supplementary fuel. Gas leaks at secondary sources such as valves and flanges can potentially be expected in this area. Based on the envisaged number of openings in the upper and lower zone, the analysis of the hazard zones concluded that natural ventilation in that area is sufficient to achieve zone 2NE (non-endangered space) in the area in question. In zone 2NE, it is possible to apply equipment that is not in Ex-protection.

The natural gas exhaust pipeline is constructed above the roof of the facility and zones 1 and 2 are defined on it. Zone one extends 1 m from the source in all directions while zone 2 extends 2 m in all directions from the source.
Zones in the U-C09 natural gas reducing station are defined by the *Rulebook on the conditions for uninterrupted and safe distribution of natural gas by gas pipelines with a pressure of up to 16 bar* ("Official Gazette of the RS", No. 86/2015.

Internal area:
Hazard zone 0 (NE) - IIA T1
It does not exist in all directions, during regular operation.
Hazard zone 1 (NE) - IIA T1
It does not exist in all directions, during regular operation.
Hazard Zone 2 (NE)
Secondary discharge at valve or piping flange. In the area where ZONE 2NE is defined, it is possible to use equipment that is not in the Ex version.

External Area:
Hazard zone 1 - IIa T1
Exists in all directions, primary discharge when operating safety valve/ relief valve.
Hazard zone 2 - IIa T1
Secondary discharge on valve or pipeline flange.
Exists in all directions, primary discharge when operating safety valve/ relief valve.

A graphical representation of the zones referred to in this Rulebook is given in Figure 7.2, and it is also shown on the subject plant in drawing 23-WTE-IDP-E3-UC09-1001-R00.

Graphic representations of hazard

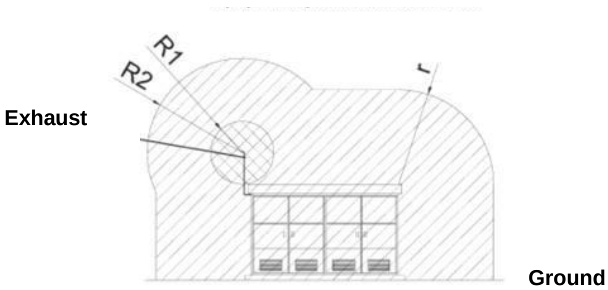


Figure 1: MPC: front view – station capacity > 160

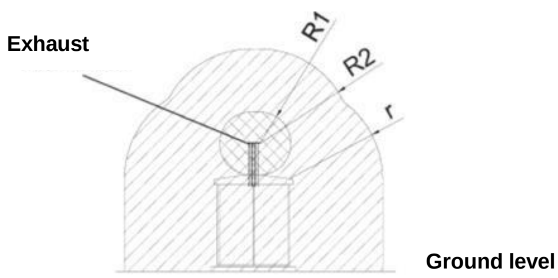


Figure 2: MPC: side view – station capacity > 160

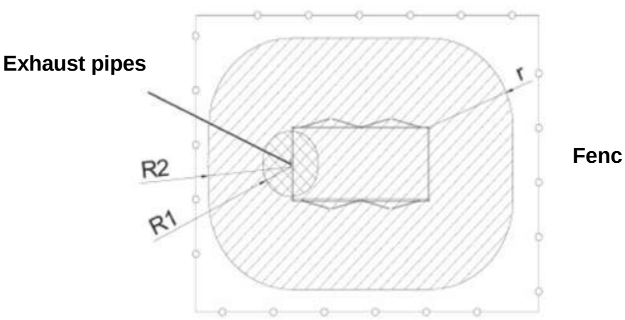


Figure 3: MPC: base – station capacity > 160 m^3/h

Table 1:

Capacity of the measuring and regulating station (m^3/h)	MOP at inlet								
	MOP ≤ 4 bar			4 bar < MOP ≤ 10 bar			10 bar < MOP ≤ 16 bar		
	R1 (m)	R2 (m)	r (m)	R1 (m)	R2 (m)	r (m)	R1 (m)	R2 (m)	r (m)
To 160	*	*	*	1	2	1	1	2	1,5
From 161 to 6000	1	2	1	1	3	1,5	1	3	2
Over 6001	1	3	3	1	3	3	1	3	3

* - See Table 2

Figure 7.2 Graphic representation of hazard zones

A stabilization and solidification procedure is envisaged in W-C12. During this process, chemical reactions may result in the separation of hydrogen (see Chapter 3.2.1.12) which is an explosive gas.

According to the data obtained from the technology holder, the maximum possible flow of hydrogen separation is 12 m^3/h.

Based on the volume of the space in question and the planned ventilation in the facility, the calculation determined the hazard zone in the facility.

According to the calculations, ZONE 2NE is defined in the interior of the building. This zone allows equipment that is not Ex to be used in the space except for the fan that must be Ex-proof and be class IIC T1.

In the subject facility, a hydrogen detection system is also envisaged, which has executive functions at 10% and 25% of the LEL.

When reaching a concentration of 10% of the lower explosion limit, the switchboard switches on an intermittent siren beep, after which the executive function of switching on the ventilation is activated. As stated in the facility, there is a dedusting system that constantly works as primary ventilation, and in addition, fans on the facade of the facility are provided as a backup ventilation system that switches on in the event of a failure of the dedusting system or in the event of reaching a hydrogen concentration of 10% of the LEL.
When reaching a concentration of 25% of the lower explosive limit, the switchboard switches on a continuous siren sound signal and a flash, a lighted panel "GAS" and an alarm signal is forwarded to the central fire alarm system, after which the executive function is activated, the power is switched off.

The hazard zones for this facility are shown in Drawings 23-WTE-IDP-E3-WC12-1001-R00 and 23-WTE-IDP-E3-WC12-1002-R00.

In the W-13 facility, the zones at the tank truck transfer point are defined by the *Rulebook on Technical Norms for Fire and Explosion Safety of Plants and Facilities for Flammable and Combustible Liquids and on Storage and Transfer of Flammable and Combustible Liquids* ("Official Gazette of the RS", Nos. 114/2017, 85/2021).

In accordance with Article 113 of the Rulebook on Technical Norms for Fire and Explosion Safety of Plants and Facilities for Flammable and Combustible Liquids and on the Storage and Transfer of Flammable and Combustible Liquids ("Official Gazette of the RS", Nos. 114/2017, 85/2021):

- Zone 0 includes: the interior of the pipeline, fittings and parts of the transfer point plant that are not constantly filled with liquid or that are not inertised.
- Zone 1 includes:
    - Space of 1.5 m measured in all directions around the transfer device, the connection point at the transfer point and the connection on the transport tank to the ground level;
    - Space around the transfer pump 0.5 m measured from the pump dimensions in all directions to the ground level;
    - The interior of all recesses and channels below the terrain level.
- Zone 2 includes:
    - Space around the transfer device, the connection point at the transfer point and the connection on the transport tank, 3 m wide from Zone 1 measured horizontally and 1 m high measured from the ground level;
    - Space around the transfer pump, 3 m wide from Zone 1 measured horizontally and 1 m high from ground level
    - The space around the joints of pipelines, fittings and similar parts of the transfer plant 3 m wide measured horizontally and up to ground level.

A graphical representation of the zones referred to in this Rulebook is given in Figure 7.3, and it is also shown on the subject plant in drawing 23-WTE-IDP-E3-WC13-1001-R00.

Within the subject Waste-to-Energy Plant, one transfer point is planned, where truck tanks will be discharged (Vmax=30 m^3), from where liquid waste is transported by pipeline to the designated storage tanks within the liquid waste storage facility in the W-C08 facility. The emptying of the vehicle can be done with a pump on the vehicle itself, or with unloading screw pumps 2x30 m^3/h (working and spare), equipped with frequency regulation, which will be located at the transfer point itself. The transfer station consists of one lower discharge arm for the liquid phase and one lower discharge arm for the gas phase.

Given that the permanent composition of the liquid waste arriving at the plant for the equipment class located in the hazard zones is not known, the highest rating class IIC T5 has been adopted.

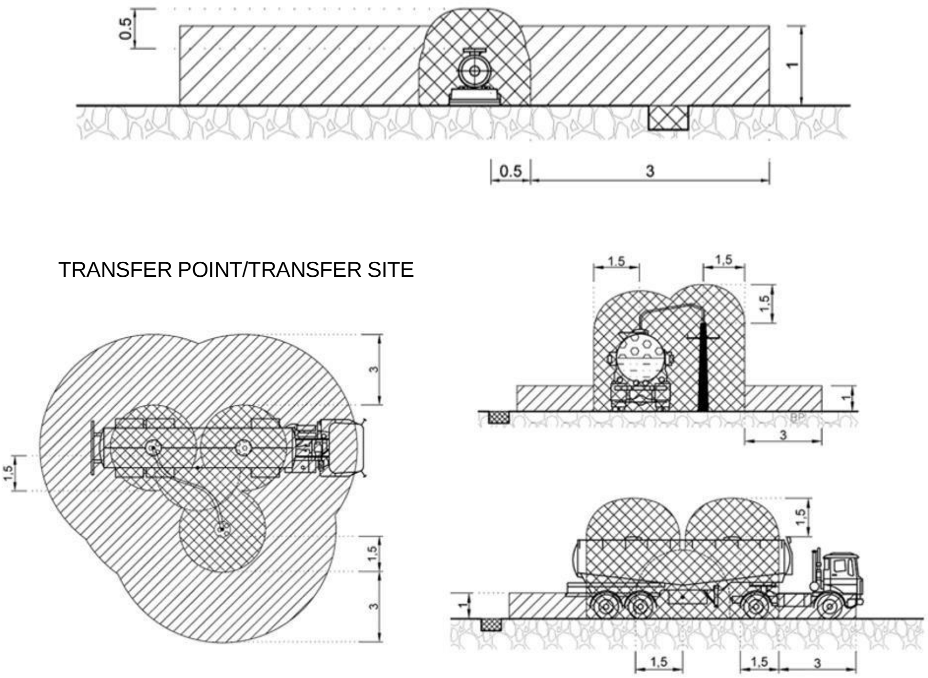


Figure 7.3 Hazard zones at the liquid waste transfer point

Table 7.6 an overview of hazard zones by facilities is given.

Table 7.6 Overview of hazard zones by facilities

Facility	**Position**	**Zone**	**Equipment class**
W-C11	Inner compartment	**Hazard zone 2 (NE)** Secondary discharge on valve or pipeline flange.	There are no equipment requirements.
	Outdoor area around the vent valve	**Hazard zone 1** It exists in all directions from the discharge source, the venting pipeline - safety/relief valve, to the limit of 1.0 m. **Hazard zone 2** It exists in all directions from the discharge source, the venting pipeline - safety/relief valve, to the limit of 2.0 m.	IIa T1 (methane).
W-C13		**Zone 0 includes:** the pipeline interior, fittings and parts of the transfer plant that are not constantly filled with liquid or that are not inertised. **Zone 1 includes:**	IIC T5 (liquid waste, the highest rating class adopted for safety).

		• Space of 1.5 m measured in all directions around the transfer device, the connection point at the transfer point and the connection on the transport tank to the ground level; • Space around the transfer pump 0.5 m measured from the pump dimensions in all directions to the ground level; • The interior of all recesses and channels below the terrain level. **Zone 2 includes:** • Space around the transfer device, the connection point at the transfer point and the connection on the transport tank, 3 m wide from Zone 1 measured horizontally and 1 m high measured from the ground level; • Space around the transfer pump, 3 m wide from Zone 1 measured horizontally and 1 m high from ground level • The space around the joints of pipelines, fittings and similar parts of the transfer plant 3 m wide measured horizontally and up to ground level.	
U-C09		**Hazard zone 1** Exists in all directions, primary discharge when operating safety valve/ relief valve to limit of 1 m. Hazard zone 2 Secondary discharge on the valve or pipeline flange at a distance of 1 m Exists in all directions, primary discharge when operating safety valve/ relief valve to limit of 2 m.	IIa T1 (methane).
W-C08	Inner compartment – hazardous waste pretreatment	**Hazard zone 2** Secondary discharge on joints, valve, flange at a distance of 1m in all directions	IIC T3 (n-dodecane ($C_{12}H_{16}$))
W-C12	Inner compartment	**Hazard zone 2 (NE)** The formation of hydrogen from the stabilization and solidification process.	There are no requirements for equipment other than ventilation fan of the space that has the IIC T1 requirement
W-C16	Dedusting system	**Hazard zone 2 (NE)** The formation of hydrogen from the stabilization and solidification process.	There are no requirements for equipment other than ventilation fan

			of the space that has the IIC T1 requirement

7.1.5 Analysis of the facility micro-location from the aspect of fire transmission to adjacent facilities and from adjacent facilities, as well as the possibility of fire and rescue units coming to the intervention and accessing the facilities with a fire intervention vehicle

A safe distance is the minimum distance between adjacent facilities, which in the event of an explosion or ignition of the maximum allowable amount of hazardous substances in one facility does not allow the transfer of an explosion or fire to an adjacent facility, and limits damage to adjacent facilities.

Access to the facilities by a fire intervention vehicle is provided by access public roads, existing roads within the Elixir Prahovo complex and internal roads within the Eco Energy complex.

Internal roads can be accessed by at least one facade of all facilities. In accordance with Article 5 of the Rulebook on Technical Norms for the Protection of Warehouses from Fire and Explosions (Official Gazette of the SFRY no. 24/87), and by classifying the warehouse, the access of the fire vehicle to this warehouse is provided from a minimum of 3 sides. The boiler plant can be accessed from 3 sides.

Access roads, since they are public roads, have characteristics that meet the requirements of the Rulebook on Technical Norms for Access Roads, Turntables, and Arranged Plateaus for Firefighting Vehicles in the vicinity of the facility of increased fire risk ("Official Gazette of FRY" no. 8/95):

- load-bearing capacity of carriageway of 10 kN axle pressure,
- the minimum width of the roads for one-way movement of the vehicle is 3.5 meters, and for two-way movement 6 meters,
- height passability 4.5 meters.
- the inner radius of the curve is 7 meters, and the external 10.5 meters,
- maximum gradient of 6%,

Within the Waste-to-Energy Plant, a Pumping Station and a fire station (facility W-C04) are planned for rapid intervention at the site. The Elixir Prahovo complex has a trained and equipped environmental protection service, occupational safety, fire brigade (about 1200 m away from the Waste-to-Power Plant as shown in Figure 7.4), rescue unit (within the fire brigade), physical and technical security, etc.

The fire brigade within the Elixir Prahovo complex is located about 3 km from the WtE plant. From the moment of receiving the call for intervention and the departure of the fire truck from the garage, the vehicle will arrive at the location of WtE plant in 4-5 minutes. The fire brigade is on call at the Elixir Prahovo complex and is on standby to respond continuously for 24 hours. 4 firefighters are deployed in each shift. On-call duty is organized in three shifts. The firefighting unit of the operator Elixir Prahovo has means and equipment that are more extensive than defined by the Rulebook on the organization of fire protection according to the category of fire risk ("Official Gazette of the RS", no. 6/2021), all in order to respond more adequately to possible accidents. The fire brigade at the Elixir Prahovo complex has one firefighting vehicle, one tank truck and one off- road/van vehicle for the transport of equipment and other prescribed equipment. Each member of the fire brigade has a set of emergency uniforms.

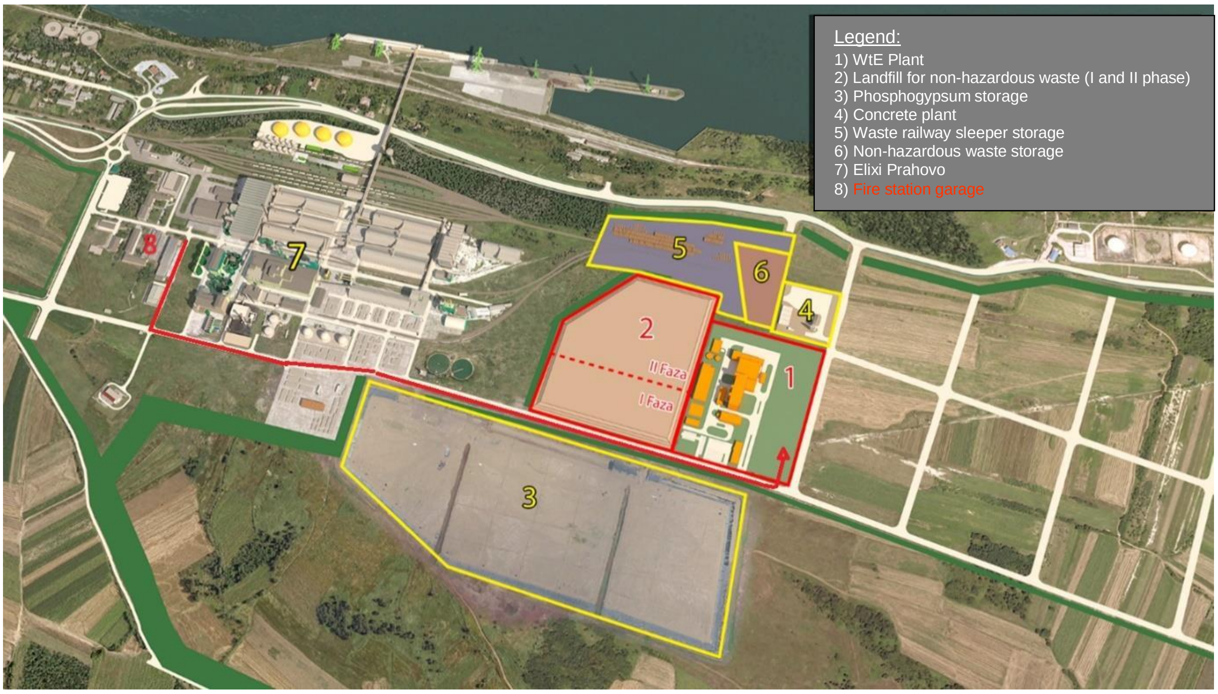


Figure 7.4 Representation of the firefighting garage position within the Elixir Prahovo complex in relation to the location of the Waste-to-Energy Plant

In addition to the aforementioned services at the location in question for firefighting intervention, as well as for the rescue of people and property endangered by fire or other natural disasters, the firefighters of the Fire Department in Negotin will intervene, at Ljube Nešić 3 street, as the nearest fire brigade, and, if necessary, other fire brigades from the surrounding area. Figure 7.5 shows the position of the firefighting units.

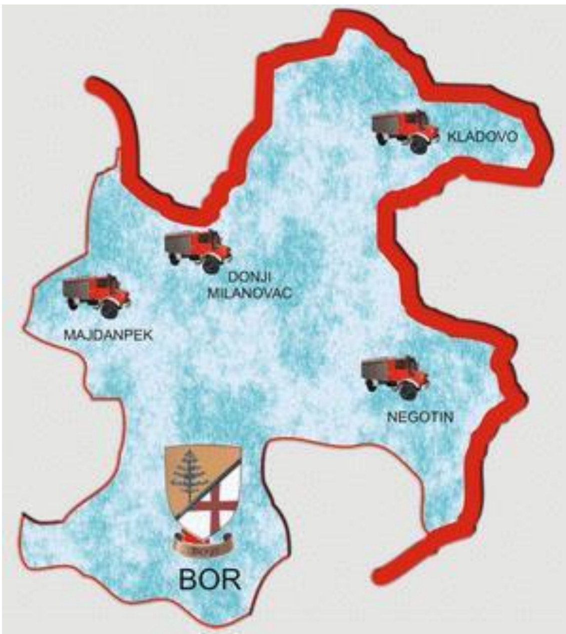


Figure 7.5 Position of fire brigades

Given the distance of the Negotin fire brigade of about 10.5 km and the speed of movement of the fire engine of about 50 km/h, the waiting time for the arrival of firefighters is approximately:

time on call	2 min
departure preparation time	1 min
vehicle travel time around	15 min
total	18 mins

Figure 7.6. shows the route of movement of the fire engine.

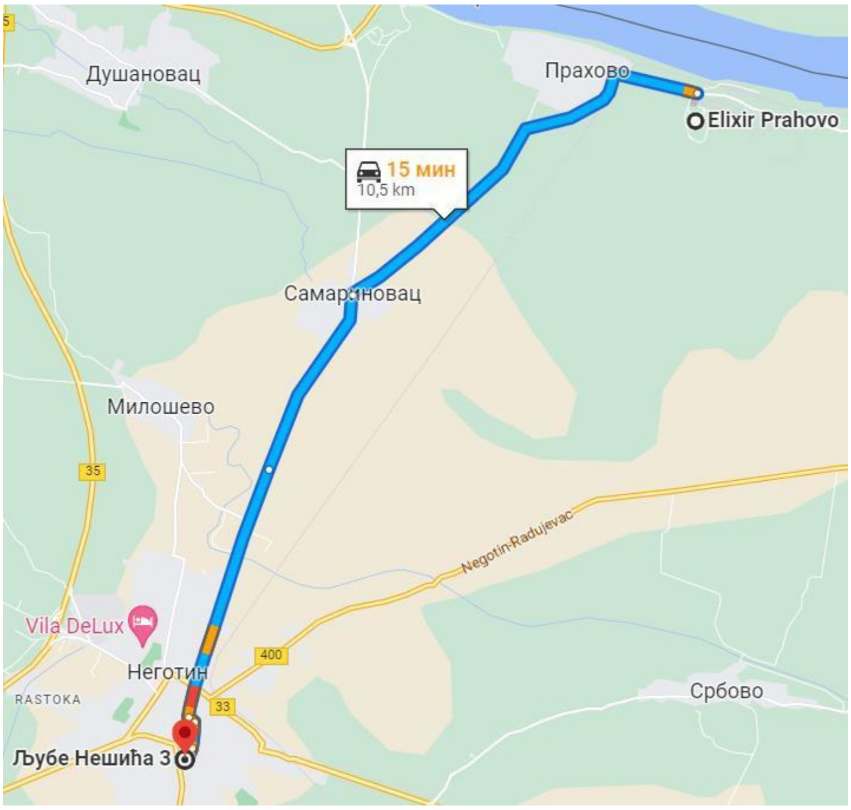


Figure 7.6 Route of movement of the fire vehicle

The time of 18 minutes to start the intervention is considered favourable and provides effective protection in the event of a fire of higher intensity.

7.2 Analysis of an accident consequences at the Waste-to-Energy Plant

To determine the impact and assess the risks of potential accident situations at the Waste-to-Energy Plant on human health and the environment, as well as to evaluate the possibility of accidents with potential cross-border impacts, an identification of hazards was performed, followed by a scenario analysis of possible event developments. Based on these scenarios, the consequences of chemical accidents and modelling of accident effects were analysed. The risk of potential accidents was assessed based on the scenario modelling and consequences.

The risk of individual undesirable scenarios was assessed using the so-called risk matrix defined by the Regulation on the Content and Methodology for Developing the Accident Prevention Policy, Safety Report, and Accident Protection Plan (Official Gazette of the RS No. 41/2010). The matrix contains five categories of accident consequences, three categories of frequency or probability of occurrence, and five risk categories.

In presenting the event development - scenarios, the possible scope of the accident and its potential consequences on human health, the environment, and material assets were considered. The scenarios correspond to the complexity of the plant, the hazard assessment of the process, the level of dangerous activities by the operator, and possible consequences.

The scenarios were selected based on identified critical points and the properties of hazardous substances and effects that may occur (fire, release and spread of vapours and gases, equipment failure, etc.) in accident situations.

During the identification and hazard assessment, a total of 12 scenarios of major, medium, and minor accidents that could, with greater or lesser probability, occur in the facilities of the Waste-to-Energy Plant were analysed. The modelled scenarios are presented below and relate to accidents involving the release of hazardous substances and fire, explosion:

Scenario 1 - Accidents at the liquid waste transfer station

- Minor accident, uncontrolled release of liquid waste accompanied only by the burning of the spilled liquid waste, and
  - Pool fire: the effect of thermal flux
  - Toxic effect of combustion products
- Major accident, a tank truck involved in a fire for about 30 minutes (worst-case chemical accident at the incinerator site), leading to BLEVE (Boiling Liquid Expanding Vapor Explosion) effect
  - Thermal effect from the fireball
  - Destructive effect from the resulting shockwave
  - Fragmentation effect from the explosion of the tank truck's reservoir.

Scenario 2 - Accident (waste fire throughout the bunker area) in the waste storage, i.e., in reception bunkers or mixing bunkers for solid hazardous waste

- Toxic effect of combustion products
- Direct effect of flame and thermal radiation

Scenario 3 - Fire with fuel storage tanks (on the floor)

- Direct impact of fire and thermal radiation on other equipment in the same room
- Toxic effect of combustion products

Scenario 4 - Uncontrolled releases of liquid waste from IBC containers
- **Accident scenario (release, emission, and dispersion of pollution) with toxic substances**
  - Toxic effect of combustion products
- **Accident scenario (release, burning, dispersion of pollution) with flammable substances**
  - Toxic effect of combustion products
  - Effect of thermal radiation

Scenario 5 - Accidents with waste sludges (methane emission from stored sludge with simulation of concentration change dynamics for different system operating regimes)
- Change in methane concentration in the sludge reception bunker space

Scenario 6 - Accidents at the boiler plant and natural gas installation
- <u>Accidents on the boiler</u>
  - Continuous release of flue gas from the boiler, following the dehermetization of a connection point
  - Damage to the boiler, with complete release of present steam and a mixture of liquid and solid phases from the current boiler fill
- <u>Accidents on the natural gas installation</u>
  - Gas ignition upon forming an outlet stream – resulting in a flame jet,

  - Initial gas dispersion, followed by gas cloud explosion or
  - Initial gas dispersion, followed by gas cloud ignition.

Scenario 7 - Uncontrolled release of particulate matter from bag filters in the boiler plant

- Uncontrolled release of particulate matter (PM)
- Uncontrolled release of other pollutants (HCl, HF, SO_2, NO_2).

Scenario 8 - Forced release of flue gases to the stack without scrubbing in the scrubber system

- Concentrations of hazardous substances in the flue gas (HCl, HF, SO_2, and NOx)

Scenario 9 - Accidents at activated carbon dosers

- Accumulation of carbon dust and fire occurrence
- Detonation wave zone formed during the explosion of the carbon dust cloud

Scenario 10 - Accidents with ammonia water

- Accident at the ammonia water transfer station
  - Toxic effect of hazardous substances
  - Subsequent ignition of the cloud (Flash Fire)
- Accident in the ammonia water storage system
  - Toxic effect of hazardous substances
  - Subsequent ignition of the cloud (Flash Fire)

Scenario 11 - Accidents in the waste stabilization and solidification facility W-C12

- Increase in hydrogen concentration and fire occurrence

Scenario 12 - Modelling effects of hazardous substance emissions in accident situations at the Waste-to-Energy plant on the Danube river

- Ammonia vapour emission, during ammonia water release from the tank truck (Scenario 10 accident)
- Ammonia vapour emission, during ammonia water release from the storage tank (Scenario 10 accident)
- PM particle emission, during particulate matter release from the boiler plant, following PM particle release through the roof to the surrounding environment (Scenario 7 accident)

7.2.1 Modelling accidents in hazardous and non-hazardous waste storage facilities

Accident effects were modelled using appropriate mathematical models and the ALOHA^R (Areal Locations of Hazardous Atmospheres) software program, designed for professionals dealing with chemical accident issues to ensure quality assessment of vulnerable zones in case of chemical accidents and to enable quick responses to minimize consequences. The program, developed by US EPA ALOHA, successfully models three types of risks: toxic gas dispersion, fires, and explosions.

For gas dispersion modelling (release of toxic substances), ALOHA^R uses the Gaussian dispersion model. According to this model, wind and atmospheric turbulence are forces that move the released gas molecules through the air, and turbulent mixing and lateral wind allow the cloud to spread in multiple directions. At the moment of hazardous gas release, the concentration of the pollutant is very high, but as it moves away from the accident site, the concentration decreases. ALOHA^R models three levels of hazard for toxic gas dispersion.

In assessing vulnerable zones in case of fires and explosions, ALOHA^R differentiates between five models: jet fire, pool fire, boiling liquid expanding vapor explosion (BLEVE), gas cloud explosion, and estimation of the extent and concentration of flammable areas. Depending on the observed model, based on the settings, the ALOHA^R software package displays the obtained results by drawing iso-lines of individual vapor and gas concentrations (border concentration), the same thermal radiation, or shockwave.

Graphical representations show the most probable concentrations of hazardous substances in the space according to the Gaussian model. When it comes to fire, thermal radiation is the primary risk from fire. The threshold of thermal radiation usually represents the level above which the represented danger may exist. By applying the ALOHA^R software package, we will model vulnerable zones defined by thermal radiation.

ALOHA^R models the flammable surface of the cloud of flammable vapours. The flammable zone is bounded by the lower explosive limit (LEL) and the upper explosive limit (UEL). These limits are percentages representing the concentration of hazardous substances, i.e., chemical vapours in the air.

If the vapour comes into contact with an ignition source, it will burn only if the vapor concentration in the air is between LEL and UEL because part of the cloud has already mixed with the air in concentrations sufficient for ignition. If the concentration of the hazardous substance in the air is below the LEL, it means there is not enough hazardous substance in the air for a fire or explosion. If the concentration of the hazardous substance-air mixture is above the UEL, it means there is not enough oxygen to sustain a fire or explosion because there is too much fuel in the mixture. If the cloud vapor ignites later, the part of the cloud where the concentration of the hazardous substance in the air is above the UEL may continue to burn slowly as the air mixes with the cloud. Since the concentration of the hazardous substance in the vapor cloud changes over time, the LEL can be used as a danger level to determine areas where a fire may occur. Therefore, the actual vapor cloud will be the area where the concentration is greater than average in areas where the concentration is lower than average.

Below is a representation of the modelled accidental scenarios.

Scenario 1 - Accidents at the liquid waste transfer station

Due to the characteristics of the stored groups of hazardous and non-hazardous waste, considering that they often include flammable materials, there is a possibility of uncontrolled release of liquid waste and possible uncontrolled burning of the spilled liquid. Two variants of accidents with the resulting fire of the spilled hazardous substance are considered here:

- Minor accident, accompanied only by the burning of the spilled liquid waste, and
- Major accident, a tank truck involved in a fire for about 30 minutes.

<u>Sub-scenario 1.1 – Description of a minor accident</u>

After inadequate connection of the discharge pipeline to the waste oil tank truck (heavy fuel oil known as fuel oil, TP≥60°C) (classification of waste oil is given in Table 7.7.), with the discharge pump switched on, there is an uncontrolled spill of waste oil on the concrete base of the discharge area, where due to friction with metal shavings, a fire occurs in the puddle.

It is realistic to stop such a release within 2 – 10 minutes.

Table 7.7 Classification of waste containing oil (16 07 08)*

A. General data	
1.	Waste name[1]: Waste containing oil
2.	Waste producer[1]: Ikarbus a.d. Beograd - Zemun
3.	Waste owner[1]: Ikarbus a.d. Beograd - Zemun
4.	Description of the waste generation process[1]: Historical waste – liquid from metal drums. Waste generated from the production process

B. Waste classification	
1	Waste category according to List of waste category (Q list): Q1
2	Index number of waste according to Waste catalogue: 16 07 08*
3	Waste characteristic hazardous/non-hazardous/inert: hazardous
4	Y label according to List of categories or related types of hazardous waste according to their nature or the activity by which they are generated (Y list): Y 9
5	C label according to List of waste components that make it hazardous (C list): C 51
6	H label according to List of waste components that make it hazardous (H list): H15
7	Notes: Waste is hazardous due to increased values of Total hydrocarbons in relation to reference value according to Rulebook on categories, testing and classification of waste (Official Gazette of the RS No. 56/2010, 93/2019 and 39/2021). Waste treatment method: Collection by a person authorized to collect/treat the waste in question.

Results of Physico-Chemical Testing of Waste

Sample description	Red liquid of slight odor		
Parameter	Determined value	Reference value	Method label
Ignition point (°C)	> 66.5	(21/55)[2]	SRPS EN ISO 13736:2014
Total hydrocarbons (C10-C40 (mg/kg)	171025.41	(20000)[1]	Q5-04-421
Polychlorinated biphenyls PCB (mg/kg)	< 0.01	(100)[1]	Q5-04-432
Polycyclic aromatic hydrocarbons PAH (mg/kg)	< 0.1	(100)[1]	Q5-04-426
Volatile aromatic hydrocarbons (mg/kg)	66.37	(500)[1]	Q5-04-398
Halogen content (%)			
Chlorine, Cl	0.449	(0.5)[4]	Q5-04-434
Fluorine, F	< 0.013	(0.5)[4]	Q5-04-434
Bromine, Br	< 0.0005	(0.5)[4]	Q5-04-573
Metal content (mg/kg)			
Arsenic, As	< 2.5	(5000)[1](50)[3]	EPA 6010C: 2000

Input Data:
- Pump flow rate: 30 m³/h (0.5 m³/min)
- Duration of uncontrolled discharge of hazardous material: 2 min (assumed)
- Assumed thickness of the spilled waste oil layer: ~ 10 mm
- Surface area of the spilled waste oil/puddle burning: 100 m² (puddle diameter: ~ 11.3 m)
- Characteristics of hazardous waste: Hazardous Waste Examination Report (see Table 7.10).

1) Pool fire: Effect of thermal flux

For simulating a pool fire of spilled waste oil, tridecane was used (as a model substance) since the ALOHA[R] software package cannot be applied to mixtures (in this specific case, the waste oil's organic phase content is about 67.5 mass%, a mixture of various higher hydrocarbons).

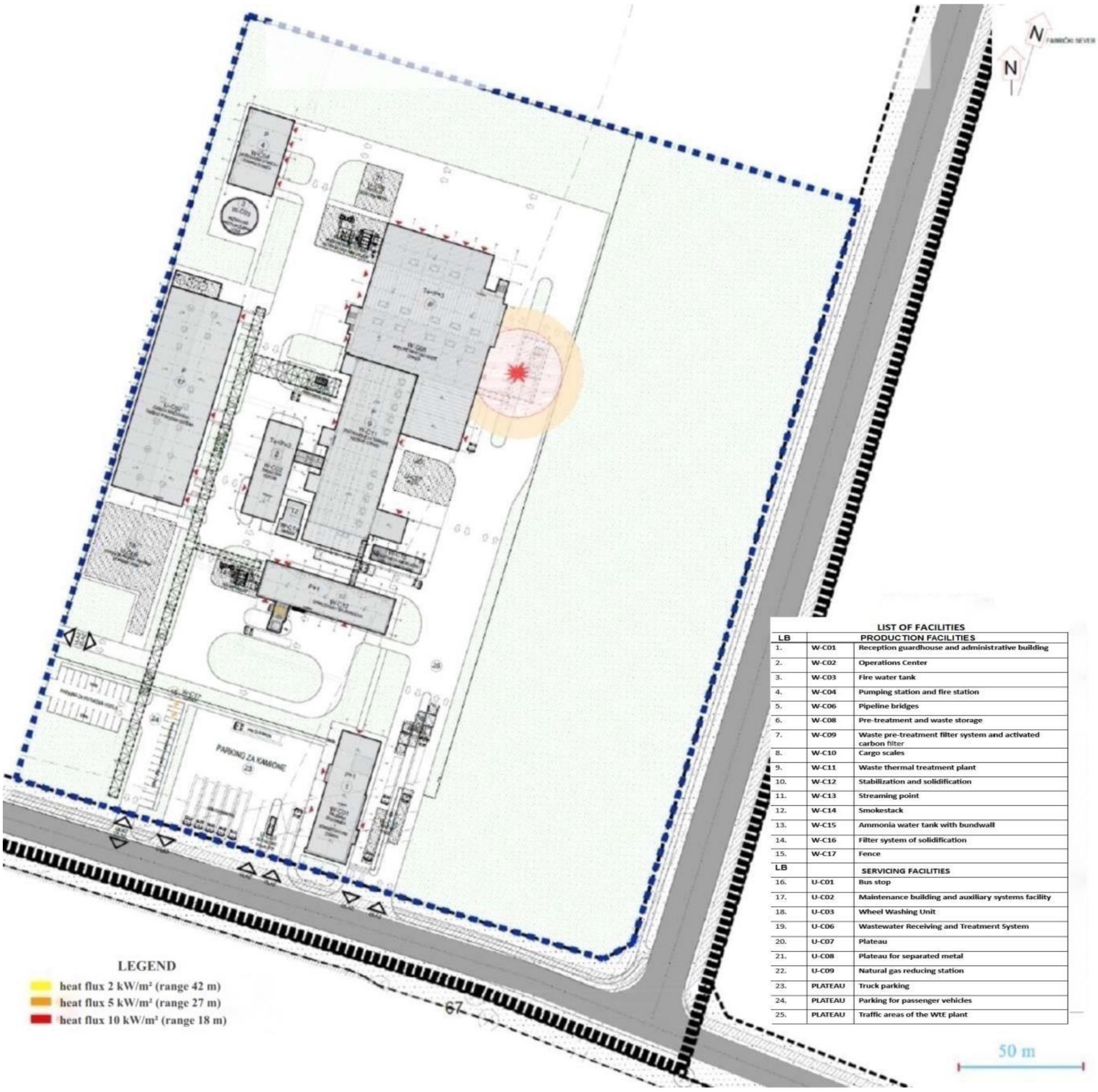


Figure 7.7 Zones of thermal radiation spread after a pool fire over a surface of 1.0 m³ spilled waste oil, for exposure to thermal effects from the moment of accident onset for 60 s (software package recommendation)

According to the simulation results in Figure 7.7, the consequences of the fire can be severe, but this applies to conditions of exposure of unprotected people for more than 60 seconds. During the transfer operations within the transfer station, a maximum of 2 employees (operator and tanker truck driver) can be present.

However, if the contact time of people with the thermal radiation effect is shorter, the consequences will be less. For such assessments (analyses), the Probit function is applied. To estimate the probability of the effect of thermal radiation in the event of a "pool fire," different equations describing the Probit function for various consequences of the effect are used:

- For fatal outcome: $\Pr = -14.9 + 2.56 \cdot \ln\left(t \cdot q^{4/3}\right)$ q, kW/m²; t, s

- For second-degree burns: $\Pr = -43.14 + 3.0186 \cdot \ln\left(t \cdot q^{4/3}\right)$ q, W/m²; t, s

- For first-degree burns: $\Pr = -39.83 + 3.0186 \cdot \ln\left(t \cdot q^{4/3}\right)$ q, W/m²; t, s

The contact time of the receptor (person leaving the zone with characteristic thermal radiation flux) is calculated using the following equation:

$t = t_0 + x/v$

where:

- t_o - time for human reaction to fire effects, taken as \(t_0 = 5 \) s
- x - distance between the pool fire and the zone with characteristic thermal flux
- v - speed of movement of people to the safe zone, taken as 5 m/s.

For the given accident scenario, if people react quickly (according to the stated criteria) to promptly leave the fire hotspot if unprotected, after calculating the Probit function, the total time to reach a distance with characteristic thermal flux is:

- 18/5 + 5 ≈ 8,6 s (time to leave the zone with a flux of 10 kW/m²)
- 45/5 + 5 ≈ 14 s (time to leave the zone with a flux of 5 kW/m²)
- 87/5 + 5 ≈ 22,4 s (time to leave the zone with a flux of 2 kW/m²) – for a safe distance.

By applying the above expressions for Probit functions, for different effects of thermal radiation, it is calculated that for the computed contact times, personnel leaving the thermal radiation zone of the burning waste oil pool **will not suffer health consequences.**

For the effect of thermal radiation on process equipment, the criteria are as follows:

- Zone of direct flame effect
- Zone of thermal radiation effect with a thermal flux value of 37.5 kW/m².

2) Pool Fire: Toxic effects of combustion products from heavy waste oil

In the case of heavy waste oil combustion, since it involves higher hydrocarbons (a hydrocarbon mixture ranging from C_{10} to C_{40}), heavy fuel oil (commonly known as mazut, with a flash point ≥ 60 °C) was selected to simulate this accident effect. When heavy fuel oil burns under uncontrolled conditions (as in a pool fire, where complete contact between the fuel and air is not achieved), the combustion rate of heavy fuel oil is considered to be approximately 0.015 kg/(m²•s), [A.Korol´čenko et al., Fire and Explosion Hazards of Substances and Materials and Means of Extinguishing Them, Vol. II, "Fire Science", M.2004.], with a correction factor of 0.675 (corresponding to the organic phase content in the waste oil composition from the waste classification report).

The fact that spontaneous combustion of spilled fuel oil generates the following products: CO (8.4%); NOx (0.7%); SO_2 (2.8%); soot (17%) allows calculating the emissions of these pollutants into the air according to the following mass flow rates:

- $\dot{m}_{CO} \approx$ 57,4 g/s
- $\dot{m}_{NO_2} \approx$ 4,78 g/s
- $\dot{m}_{SO_2} \approx$ 19, 1 g/s
- $\dot{m}_{C} \approx$ 116,2 g/s.

To determine the zones of hazardous concentrations of toxic combustion products of waste oil, the following characteristic concentrations were used for CO, NO_2, SO_2, and soot (carbon, C):

<u>CO:</u>

- LC50 = 3760 ppm (1 ppm = 1.15 mg/m³)
- IDLH = 1200 ppm [NIOSH, 1994]
- 0.1 IDLH = 120 ppm

<u>NO_2:</u>

- LC50 = 327 ppm (1 ppm = 1.88 mg/m³)
- IDLH = 20 ppm [NIOSH, 1994]
- 0.1 IDLH = 2 ppm

SO_2:

- LC50 = 1260 ppm/4 h - rat (1 ppm = 2.62 mg/m³)
- IDLH = 100 ppm [NIOSH, 1994]
- 0.1 IDLH = 10 ppm

Soot (C):

- LC50 = no data
- IDLH = 1750 mg/m³ [NIOSH, 1994]
- 0.1 IDLH = 175 mg/m³

Simulation of the described accident scenario was performed using the ALOHA[R] software package, with preliminary recalculations of the initial characteristics of the pollution source, concerning the elevation of the emission plume of combustion products due to the fire effect, as described in the literature [Open Burn/Open Detonation Dispersion Model (OBODM), Vol. II, Technical Description, DPG-TR-96-008b April 1998.].

For the previously mentioned accident scenario conditions, with a pool fire area of 67.5 m² and a combustion of heavy fuel oil of 0.015•0.675 kg/m²•s for fuel oil, the calculated height of the smoke plume (combustion products) is ΔH ≈ 12.7 m.

Meteorological conditions (recommended for modelling accident situations):

- Air temperature: 20 °C
- Wind speed: 1.5 m/s
- Relative humidity: 70%
- Cloudiness: 50%
- Stability class: F
- Dispersion conditions (terrain appearance): urban
- Pollution source height (including emission plume rise): 12.7 m.

*Meteorological conditions were selected according to the recommendations of the Regulation on the Content of Accident Prevention Policy and the Content and Methodology of Developing Safety Reports and Accident Protection Plans ("Official Gazette of the RS", No. 41/2010) for the unfavourable case.

It is essential to note that although NO_2 and SO_2 are classified as "heavy" gases (for such cases, a special methodology for dispersion prediction is applied), when they occur as combustion products in a mixture with ambient air, the Gaussian dispersion model is used for their dispersion under these conditions.

Application of the mentioned software package showed that under the given accident scenario, a fire after the spill of waste oil (Transterm 2000) during unloading from a tanker truck, with the dispersion of combustion products, **forms concentrations of LC50, IDLH, and 0.1 IDLH levels** for CO, NO_x (as NO_2), SO_2**, and soot in the immediate vicinity of the Waste-to-Energy Plant** at ground level and at a height of 1.5 m from the ground (breathing organ height).

This observation is illustrated in the case of NO_x dispersion simulation using the ALOHA[R] software package, according to the Gaussian dispersion model:

NO_2-Toxic cloud

Atmospheric data:
Wind: 1.5 m/s, east-southeast at 2 m
Terrain appearance: urban or forest
Cloud cover: 5 tenths
Air temperature: 20 °C
Stability class: F
No inversion

Relative humidity: 70%

Source Strength:
Direct source: 4.78 g/s
Source height: 12.7 m
Release duration: 30 min
Release rate: 287 g
Total released quantity: 8.60 kg

Danger Zones:
Model: Gaussian
Red: LOC not exceeded (327 ppm)
Orange: LOC not exceeded (20 ppm=IDLH)
Yellow: LOC not exceeded (2 ppm)

Note: The danger zones are not drawn due to lower reliability of dispersion width estimation for short distances.

Alongside the place for liquid transfer, a shower is planned for rinsing hands and eyes in case the operator is splashed during the transfer of liquid waste (in case of an accident). The water from the shower flows into the aforementioned shaft.

Sub-scenario 1.2 – Description of a major accident (Worst-case chemical accident at the Waste-to-Energy Plant site)

A fire occurring during the unloading of liquid waste from a tanker truck, in a scenario where the fire lasts longer than 20 minutes, can lead to a BLEVE (Boiling Liquid Expanding Vapor Explosion) effect, resulting in a fireball from the portion of the liquid waste forming a vapor phase and a secondary fire in the puddle of spilled liquid waste.

Input data:
- Total volume of the tanker truck reservoir: 30 m^3 (maximum capacity)
- Proportion of liquid waste in the tanker truck reservoir: 0.8 m^3/m^3
- Ambient temperature: 20 °C
- Relative humidity: 70%

To choose an appropriate hazardous material as a typical substance for simulating the described accident, an analysis was conducted based on the Hazardous Waste Characteristics Examination Report (Table 7.8).

Table 7.8 Overview of characteristics of potential waste found at the Waste-to-Energy Plant

Waste Name	Index No.	Hazardous/ Non-hazardous	O list	Y list	C list	H list	Packaging Type	Odour	Flash Point 0°C
Wastes from liquid fuels - other fuels (including mixtures)	13 07 03*	Yes	Q1	Y8	C51	HP14/ HP15	IBC	intense odour	>66,5
Waste catalyst	16 05 08*	Yes	Q7	Y40	C51	HP14/ HP15	Barrel	-	88
Wastes from liquid fuels - other fuels (including mixtures)	13 07 03*	Yes	Q1	Y8	C51	HP14/ HP15	IBC	intense odour	>66,5

Wastes from liquid fuels - other fuels (including mixtures)	13 07 03*	Yes	Q1	Y8	C51	HP14/ HP15	IBC	intense odour	>66,5
Wastes from liquid fuels - other fuels (including mixtures)	13 07 03*	Yes	Q1	Y8	C51	HP14/ HP15	IBC	intense odour	>66,5
Wastes from liquid fuels - other fuels (including mixtures)	13 07 03*	Yes	Q1	Y8	C51	HP14/ HP15	IBC	intense odour	>66,5
Wastes from liquid fuels - other fuels (including mixtures)	13 07 03*	Yes	Q1	Y8	C51	HP14/ HP15	IBC	intense odour	>66,5
Wastes from liquid fuels - other fuels (including mixtures)	13 07 03*	Yes	Q1	Y8	C51	HP14/ HP15	IBC containers	intense	>66,5

*Waste with the listed index numbers that does not meet the prescribed criteria for classification under hazard class HP3, in accordance with the provisions of the Rulebook on Waste Categories, Testing and Classification ("Official Gazette of the RS", Nos. 56/2010, 93/2019, 39/2021, and 65/2024).

Considering the expected effect of this type of accident (BLEVE effect), the choice of hazardous material for simulating this effect was based on the flash point. Since one of the requirements for the incoming liquid waste is that the flash point must not be lower than 60°C, **n-dodecane** was selected for accident simulation, with the following physicochemical characteristics [R.Reid et al., *The Properties of Gases and Liquids,* McGraw-Hill, 1977.]:

- Molecular weight (MW): 170.34 g/mol
- Flash point (Tk): 71 °C
- Critical temperature (Tcr): 658.3 K
- Saturated vapor pressure at required temperatures (Δp*): calculation based on Antoine coefficients.

The BLEVE effect parameters in this case were calculated based on the methodology related to process sizes when reaching the so-called superheat temperature T_{sh} *[M. Roberts, Analysis of Boiling Liquid Expanding Vapor Explosion (BLEVE) event at DOE sites*. Safety Analysis Working Group (SAWG) Workshop. Knoxville: EQE International Inc., 2000.]:

$T_{sh} \approx 0,895 \cdot T_{cr}$

The calculated mass of hazardous material in the vapor phase of the tanker truck reservoir at temperature Tsh is about 144 kg, and the mass of hazardous material forming the fireball is:

$$\sim 3 \cdot 144 \approx 432 \text{ kg}$$

Based on this, the BLEVE effect parameters were calculated as follows:

- Maximum fireball diameter: ~ 44 m
- Fireball duration: 7.1 s
- Maximum diameter of the fireball on the ground: 57 m.

The accompanying effects of BLEVE are:

- Thermal effects from the fireball
- Destructive effects from the resulting shock wave
- Fragmentation effects from the explosion of the tanker truck reservoir.

In Table 7.9, the average values of heat flux (from the impact on horizontal and vertical objects) are shown, depending on the distance from the centre of the fireball.

Table 7.9 Average values of thermal flux at different distances during a BLEVE effect on a tanker truck with hazardous liquid waste

Distance, m	10	20	30	40	50	60
Heat flux, kW/m²	29.2±15.6	25.0±6.1	18.8±0.9	13.4±1.3	9.7±2.0	7.1±2.1

The consequences for people present in the zone of direct fireball effect and thermal radiation from the fireball are as follows:

- Fatal outcomes: in the zone of the fireball's half-sphere, at a distance of 28.5 m
- Second-degree burns: at a distance of 32 m, with a probability of 20%
- First-degree burns: at a distance of 40 m, with a probability of 25%, from the centre of the fireball.

Effects on surrounding objects primarily relate to the propagation of the fireball's half-sphere (ignition) of easily flammable materials if found; softening of plastics and charring of wooden materials.
The consequences of the fireball effect after the BLEVE effect are shown in Figure 7.8.

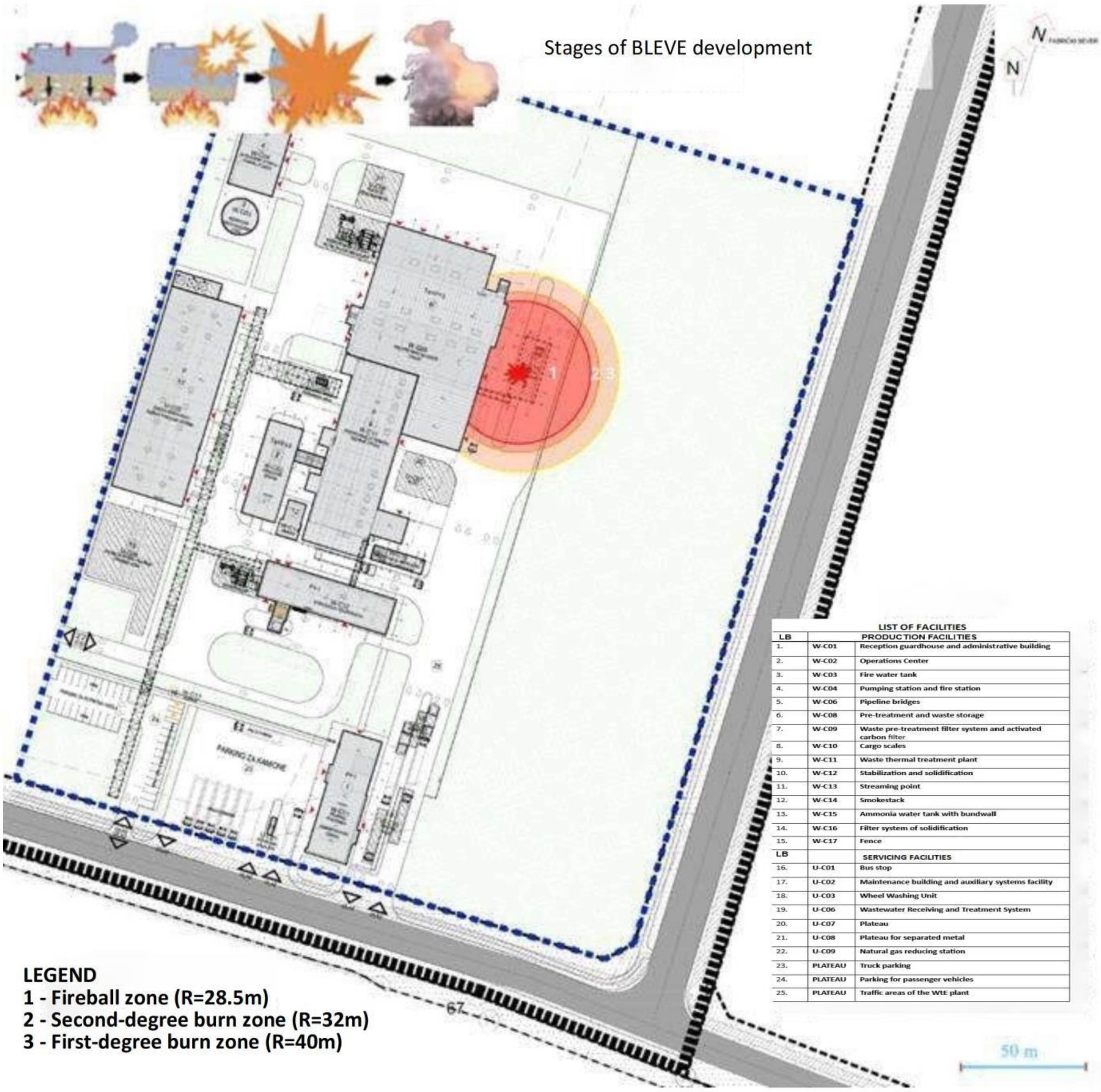


Figure 7.8 Zones of thermal impact propagation after the BLEVE effect, occurring at the transfer station due to the explosion of a tanker truck carrying liquid waste

Besides the thermal impact, the BLEVE effect can also result in a shock wave due to the generated overpressure and the scattering of fragments from the tanker's shell due to the explosion. The propagation zones of these accompanying effects may extend beyond the Waste-to-Energy (WtE) Plant area.

Scenario 2 - Accidents at the waste storage facility, i.e., in the reception bunkers or bunkers for mixing solid hazardous waste

Analysis of the possibility of a chemical accident in the reception bunkers and waste mixing bunkers, due to the very heterogeneous composition of the input waste and the possible presence of various undesirable impurities and foreign objects, indicates that under conditions of intensive waste mixing and friction between waste particles (during manipulation), a local fire could occur in one of the bunkers, which has been considered in the project documentation.

To prevent further development (spread) of the fire in the bunkers, the project documentation, as part of the developed fire protection system, includes thermal imaging cameras in each bunker that identify the initial fire. Afterward, automatic activation of fire suppression foam cannons occurs to quickly extinguish the fire.

Although the probability of fire development in the reception bunkers and solid waste mixing bunkers is very low, implying the failure of the thermal imaging cameras monitoring the situation in the bunkers and the untimely activation of the fire protection system, the worst-case scenario has been considered: <u>the development of a fire in one of the reception or waste mixing bunkers.</u>

<u>*Description of the accident scenario:*</u>
In one of the reception bunkers or waste mixing bunkers, the waste ignited initially (possibly due to inadequate sampling of the incoming waste material, where some reactive impurity was the initiator of the initial burning, or a small amount of hydrogen or methane was generated). Due to the failure of the monitoring system in the bunkers (thermal imaging cameras) and the fire suppression system, the waste in the entire bunker space caught fire.
<u>Input data:</u>

- The volume of space above the waste in the waste bunker is 29,520 m^3
- Heterogeneous solid waste composition, where the assumed proportion of the mixture of polyethylene (PE) and relatively inert solid waste in the waste material composition is: 20%, m/m (assumed proportion)
- Assumed surface area of the dispersed material: 10 m^2
- Number of air changes in the facility:
    - Under forced ventilation conditions: ~ two changes/hour
    - Under natural ventilation conditions: 0.5 changes/hour (forced ventilation off).

This accident situation entails several undesirable effects, where the dominant impact is the fire in the bunker. The consequences of the fire on the bunker, surrounding process equipment, and the production process flow depend on the response speed of the plant personnel, potentially causing damage to the bunker and halting the waste transformation process in the plant.

Besides the direct impact of the flames and thermal radiation, the danger from the combustion products of the combustible materials must also be considered, given the enclosed space.

According to literature data [C. Chivas, J-P. Bertrand, Ch. Malvaux, G. Marlair, K. Tack, *Smoke toxicity from combustion products based on polymers containing flame retardant additives*, HAL Id: ineris-00976169, Submitted on 9 Apr 2014; Fire Dynamics Tools (FDTs) Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program/NUREG-1805, Supplement 1, Volumes 1 & 2 – Chapter 3. *Estimating burning characteristics of liquid pool fire, heat* *release rate, burning duration, and flame height*, Prepared by: D. Stroup, G. Taylor, G. Hausman, Washington, DC 20555-0001, Manuscript Completed: June 2013, Published: July 2013.]:

- the mean mass rate of combustion of plastic materials PE, is 0.0044 $kg/m^2 \cdot s$.
- the mean experimental values of the mass fractions of the main combustion products in relation to the mass of PE are as follows:
    - carbon dioxide (CO_2): 656 mg/g
    - carbon monoxide (CO): 71 mg/g
    - hydrocarbons (H_nC_m): 82 mg/g
    - nitrogen oxides (NO_x): 10 mg/g.

Based on the provided data, the emissions of specific toxic combustion products of the plastic components in the waste were calculated:

- carbon monoxide emission: 624 mg/s (PE)
- nitrogen oxides emission: 88 mg/s (PE and PVC).

Characteristic hazardous concentration values of toxic combustion products that may form in the airspace of the facility after a fire are:

1. Carbon monoxide (CO):
    - concentrations of IDLH level: 1200 ppm (1380 mg/m^3)
    - 0.1 IDLH level concentrations: 138 mg/m^3
2. nitrogen oxides (for NO_2):
    - concentrations of IDLH level: 20 ppm (38 mg/m^3)
    - 0.1 IDLH level concentrations: 3.8 mg/m^3

The calculation of the change in the concentration of toxic combustion products of PE in the zone of receiving bunkers was performed both for the conditions of regular operation (ventilation system switched on) and in the conditions when the ventilation system may be switched off (or fail) due to the accident.

Figure 7.9 shows the changes in the concentrations of toxic combustion products of the PE mixture present in the composition of the waste material in the proportion of 20%, m/m, under the conditions of forced ventilation and natural ventilation.

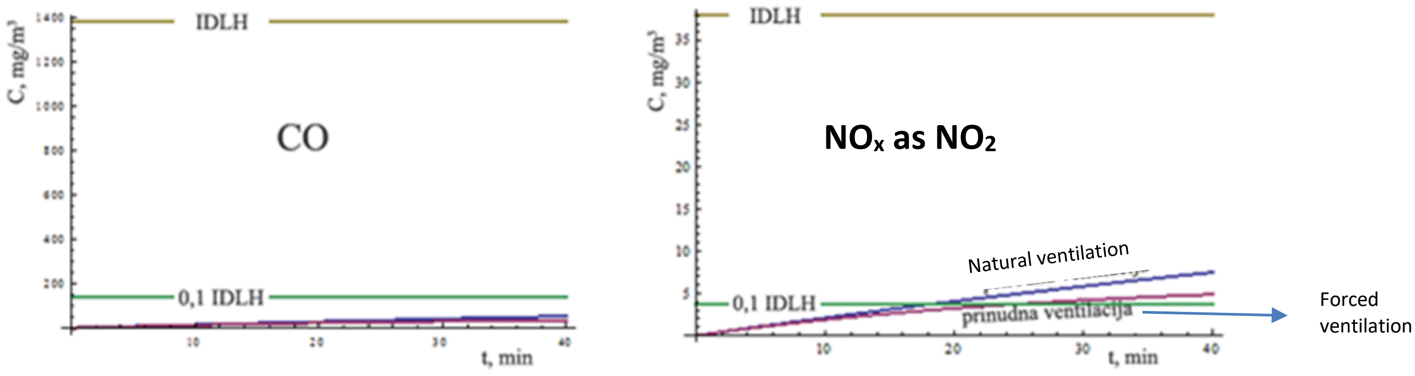


Figure 0.1 Changes in concentrations of toxic products of burning plastic waste during the time of fire in a temporary bunker or a waste mixing bunker, under conditions of natural or forced ventilation

Considering that this is a closed space and in this case hazardous (toxic) concentrations of solid waste combustion products are formed, and adequate protective measures must be taken during the repair of the accident, which primarily refers to the use of complete personal protective equipment.

Scenario 3 - Fire with combustible material tanks (on the floor)

Although all measures have been taken in the storage tanks with liquid combustible waste (2 tanks) to prevent any accident, the heterogeneity of the waste arriving for temporary storage and treatment makes such situations possible.

The accident scenario is designed, according to the project storage capacities for liquid waste, as a discharge of waste from one of the two storage tanks with combustible waste into the common bundwall, accompanied by a fire in the bundwall itself.

Input data:

- Room volume: 198.28 m^2 × 6.1 m ≈ 1210 m^3
- Ventilation flow rate: 2,500 m^3/h
- Common bundwall dimensions: 27.65 m × 7.7 m × 0.35 m.

Assuming the liquid waste composition represents processed oil with an organic phase content of 65% (mainly higher hydrocarbon fractions; selected from the Waste Examination Report), tridecane was chosen as the model material (selected as a high boiling point hydrocarbon from the "chemical information" software package ALOHA^R), and Figure 7.10 shows the zones of thermal radiation impact propagation after a fire in the spilled liquid waste pool in the common bundwall.

Atmospheric data:
Wind: 0.5 m/s

Terrain type: urban or forest
Cloud cover: 5 tenths
Air temperature: 20 °C

Source intensity:
Model: Pool Fire
Pool area: 25.5 m²; Pool volume: 19.2 m³
Initial pool temperature: 20 °C
Flame length: 11 m
Burn duration: 1 hour
Burn rate: 93.1 kg/min
Total amount burned: 5586 kg

Hazard Zones:
Model: Thermal Radiation from Pool Fire
Red: 11 m [greater than 10.0 kW/m² (potentially lethal within 60 s)]
Orange: 16 m [greater than 5.0 kW/m² (second-degree burns within 60 s)]
Yellow: 27 m [greater than 2.0 kW/m² (pain within 60 s)]

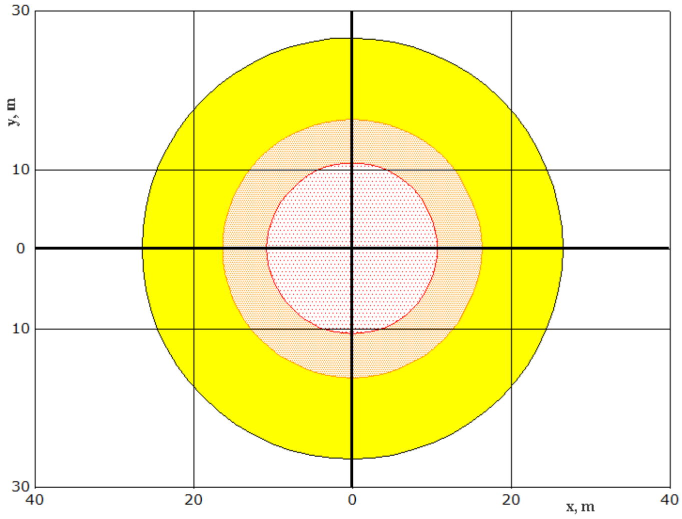


Figure 7.10 Thermal radiation zones after pool fire from liquid waste spill in a common bundwall

A fire occurring in the common bundwall, if not controlled in the initial stages, can create a very serious situation in room W-C08:

- Direct impact of fire and thermal radiation on other equipment in the same room
- Toxic effects of combustion products on people (both nearby and further away).

Thermal effects are particularly dangerous if prolonged (more than 20 minutes), which could lead to the escalation of the accident, i.e., the spread of fire to another tank containing flammable waste, resulting in a BLEVE (***B**oiling **l**iquid **e**xpansion **v**apour **e**xplosion*), followed by a new fire from the newly spilled liquid waste.

Figure 7.11 shows the changes in concentrations of major toxic combustion products resulting from burning in a pool of spilled liquid waste in the common bundwall.

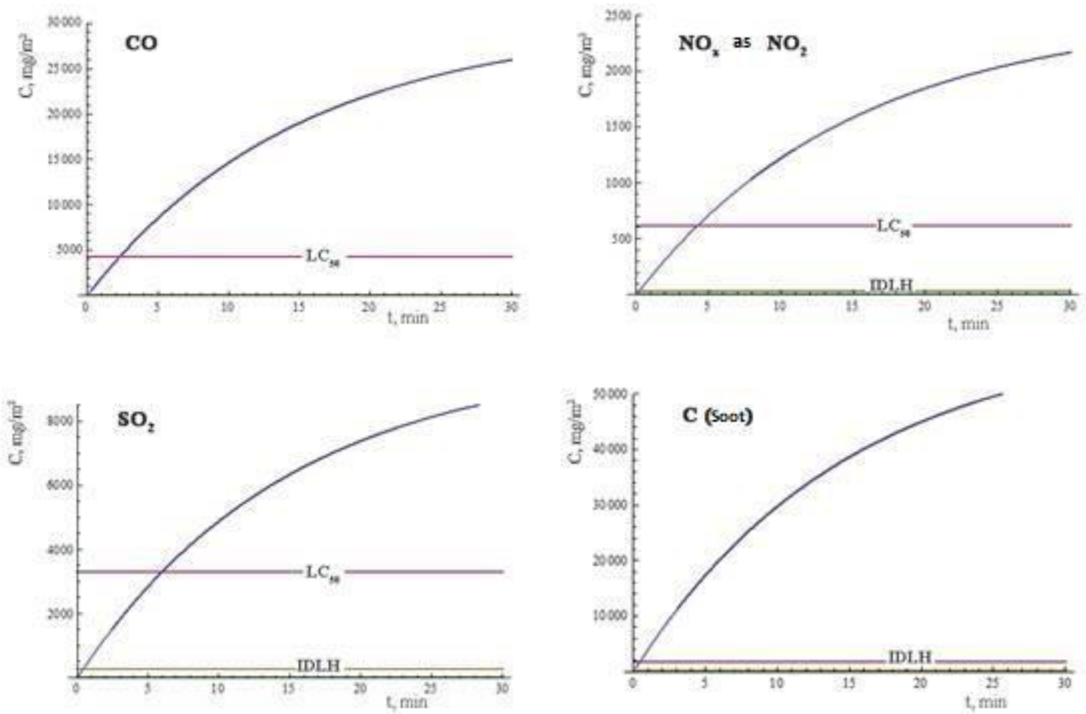


Figure 7.11 Simulation of changes in combustion product concentrations from spilled liquid waste in storage tank common bundwall in building W-C08

Analysis of the data from Figure 7.11 shows that, under the proposed accident scenario, in the combustion zone of the spilled and ignited liquid waste from one of the two storage tanks, lethal concentrations of several combustion products form.

Since the concentration in the mentioned system, as in most others, changes over time, a more realistic picture of the danger is obtained when instead of specific concentration values, doses to which an object at a certain point is subjected are used. This is defined as the product of concentration and exposure time, described in integral form by the equation:

$$D = \int_0^{t_1} C \cdot dt$$

The mentioned methodology was applied to the combustion products CO, NOx (as NO_2), and SO_2, with the following reference concentration values taken [M. Braznikov et al., Evaluation of Chemical Conditions in Emergency Situations, Methodological Guide, Minsk BGUIR, 2010]:

- for **CO**: PCt50 = 10,000 mg·min/m³; LCt_{50} = 37,500 mg·min/m³
- for **NO_2**: PCt50 = 1,500 mg·min/m³
- for **SO_2**: PCt50 = 1,800 mg·min/m³; LCt_{50} = 70,000 mg·min/m³

The following results were obtained for doses during 15 minutes of exposure:

- $D_{CO} \approx 1.66 \times 10^5$ mg·min/m³ → $D_{CO} > LCt_{50}$
- $D_{NOx} \approx 1.38 \times 10^4$ mg·min/m³ → $D_{NOx} >> PCt_{50}$
- $D_{SO_2} \approx 5.54 \times 10^4$ mg·min/m³ → $D_{SO_2} >> PCt_{50}$

From the hazard assessment results, it is concluded that in room W-C08, lethal concentrations of combustion products from spilled liquid waste are formed with exposure longer than 15 minutes.

Personnel involved in accident mitigation/firefighting must use breathing apparatus and fire protection equipment!

In the event of an initial fire in any of the tank system or in the zone of spilled waste in the common bundwall, the response involves three independent fire protection systems:

- The installed sprinkler system, or
- Application of nozzles from the hydrant network system
- Use of mobile fire extinguishing devices located in the room.

To prevent accident scenarios, all accompanying installation networks are executed outside the common bundwall, which is made of waterproof concrete.

Scenario 4 - Uncontrolled spills of liquid waste from IBC containers

From the perspective of hazard from accident scenarios with hazardous materials that could potentially be in IBC containers, a selection was made of characteristic groups of hazardous materials, categorized by their properties to represent specific types of hazards. These are divided into several characteristic groups with a higher content of hazardous materials:

- Toxic materials
- Flammable materials.

<u>Input data:</u>

- Forced ventilation applies to air removal from two storage rooms with capacities of 48 m³ and 112 m³ respectively, with a total volume of: 2860 m³.
- Air change rate: ~ 10/h (estimated space filling by process equipment: 40%)

a) Accident Scenario with Toxic Materials: *Damage or rupture of IBC containers with waste tetrachloroethylene (waste characterization given in Figure 7.12), spilling of liquid waste on the floor, and emission and dispersion of pollutants on the floor of the rack storage for flammable waste liquids.*

N°1
ANAHEM LABORATORIES
REPORT ON WASTE TESTING No. 2812030103/1

A. General Information:

1. Waste name[2]: WASTE TETRACHLOROETHYLENE
2. Waste producer[2]: FALKE SERBIA LLC, Tekstilna 71, Leskovac
3. Waste origin[2]: FALKE SERBIA LLC, Tekstilna 71, Leskovac
4. Description of waste generation process[2]: The subject waste was generated in the process of chemical cleaning of parts in production.
5. Sample identification number: 2812030103
6. Quantity of waste sampled[2]: 200 kg
7. Physical properties of the waste:
    1. powder
    2. solid matter
    3. viscous matter
    4. sludge
    5. **liquid matter**
    6. gaseous matter
    7. other (specify)

B. Waste Classification:

1. Waste classification according to the List of Waste Categories (Q list): Q16
2. Index number of waste according to the Waste Catalogue: 07 01 03*/16 03 05*
3. Waste nature: hazardous
4. Y designation according to the List of Waste Categories or related types of hazardous waste by their nature or the activity by which they are generated (Y list): Y40
5. C designation according to the List of waste components that make it hazardous (C list): C51
6. H designation according to the List of characteristics of waste that make it hazardous (H list): H14/H15
7. Notes: According to the Regulation on categorization, testing, and classification of waste, Official Gazette of the RS, 56/2010, and based on the conducted testing, the subject waste is hazardous due to its harmful and dangerous properties of chemicals (toxic, irritative, ecotoxic).

Table 1: Results of Physical-Chemical Waste Testing

No.	Parameter	Found Value	Reference Value	Method Code
Description of sample: liquid sample, dark color, glue-like odor				
1.	pH value	6.1	2-11.5*	EN16192:2011
Content of metals, mg/kg				
2.	Arsenic (As)	<0.9	20**;5000*	EPA 3051A/EPA 6010c:2007
3.	Barium (Ba)	<0.07		EPA 3051A/EPA 6010c:2007
4.	Cadmium (Cd)	<0.1	10**;5000*	EPA 3051A/EPA 6010c:2007
5.	Chromium (Cr)	2.7	300**	EPA 3051A/EPA 6010c:2007
6.	Copper (Cu)	4.9	500**	EPA 3051A/EPA 6010c:2007
7.	Mercury (Hg)	<0.05	2**;20*	EPA 3051A/EPA 6010c:2007
8.	Nickel (Ni)	<0.1	100**	EPA 3051A/EPA 6010c:2007
9.	Lead (Pb)	<0.2	800**;10000*	EPA 3051A/EPA 6010c:2007
10.	Antimony (Sb)	<1.2	100**	EPA 3051A/EPA 6010c:2007
11.	Zinc (Zn)	8.2	-	EPA 3051A/EPA 6010c:2007
Content of halogen elements and sulfur, mg/kg				
12.	Fluorine	<1.0	-	DML 5.6.2014
13.	Chlorine	1289	20000*	DML 5.6.2014
14.	Bromine	<1.0	-	DML 5.6.2014
15.	Sulfur	495	-	DML 5.6.2014
Volatile hydrocarbons, mg/kg				
16.	Benzene	<0.5	-	EPA 5021A:2014
17.	Toluene	<0.01	-	EPA 5021A:2014
18.	Xylene	<0.1	-	EPA 5021A:2014
19.	Ethylbenzene	<0.03	-	EPA 5021A:2014
20.	Styrene	<0.3	-	EPA 5021A:2014
21.	BTEX (total)	<1.0	500	EPA 5021A:2014
Flash point, °C	>110	<55*	SRPS EN ISO 2719:2008	
Tetrachloroethylene (C_2,Cl_1) %	4.1	-	EPA 5021A:2014	

According to the Regulation on Categorization, Testing, and Classification of Waste, Official Gazette RS, 56/2010
* - Values refer to hazardous H15 characteristic
** - Values refer to limit values of components in waste for co-incineration

Figure 7.12 Characterization of waste tetrachloroethylene

Assuming that a relatively thick liquid layer of 10 mm forms quickly, in accordance with EPA recommendations, the evaporation area can be calculated as:
A ≈ 1/ 0,01 ≈ 100 m^2

Note: The calculation of the spread of tetrachloroethylene concentration zones does not consider the presence of a drainage grate, and if the accident occurs near the grate, the emission of hazardous substances into the air is lower.

This means that a pool of hazardous substance (radius \(r = 5.6 \, \text{m} \)) forms, slowly evaporating into the facility's space. Considering that the mass fraction of tetrachloroethylene in the liquid waste is 4.1% (according to the waste examination report, a value of 5%, w/w, was taken for the accident simulation), the evaporation rate or emission of tetrachloroethylene in a calm atmosphere is:

$\boldsymbol{E} \approx 8{,}1 \cdot 10^{-4}$ kg/s

In accordance with the calculated emission from the liquid pool, there is a constant "influx" of contaminant vapor into the facility space. Since it is an enclosed space, it is realistic to assume that a dynamic equilibrium is established between the inflow of the evaporating contaminant and the flux of contaminant vapours being removed from the facility through existing natural or forced ventilation.
From the aspect of hazard assessment for significant concentrations of tetrachloroethylene, the following values are taken in the event of an accident:

- **IDLH = 150 ppm** (1027 mg/m³
- **STEL = 40 ppm** (276 mg/m³), *Regulation on preventive measures for safe and healthy work when exposed to chemical substances*, [Official Gazette of the RS, Nos. 106/2009, 117/2017, 107/2021]
- **EL = 20 ppm** (138 mg/m³)
- **0.1 IDLH = 15 ppm** (103 mg/m³).

Figure 7.13 shows the change in tetrachloroethylene concentration in the facility, when the contents of one IBC container with liquid waste are spilled on the facility floor (liquid waste with 5% tetrachloroethylene), under forced ventilation conditions (number of changes: ~ 10/h).

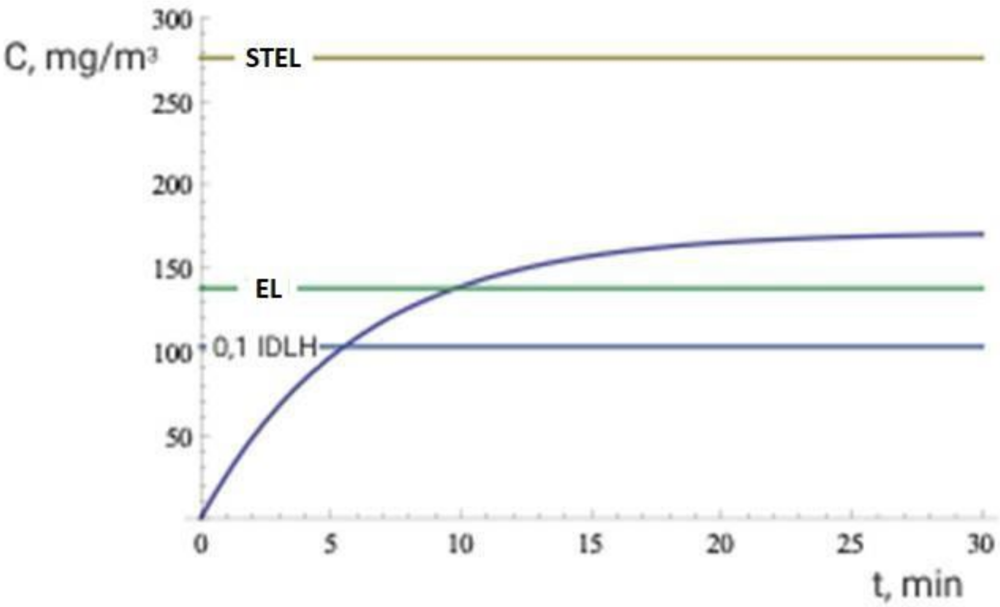


Figure 7.13 Change in tetrachloroethylene concentration over time in the room for storing IBC containers, after spilling a 1,000 L IBC container with 5% tetrachloroethylene liquid waste, under forced ventilation conditions (about 10 changes/h)

According to the data from Figure 7.13, the concentrations of type 0.1 IDLH, EL, and STEL do not form within the facility (within 40 minutes from the moment of liquid waste spillage), so the formed concentrations **cannot have a particularly harmful effect on the health of people in the hall** who are distant from the pool of spilled liquid).

The potential impact of vapours generated by the evaporation of spilled liquid waste within the facility on the space outside the facility is assessed after determining the maximum vapor emission into the surrounding space through the building's louvers as follows:

$$\boldsymbol{E_2} \approx C_{max} \cdot k \cdot Q_1 \approx 200 \cdot 1{,}7 \cdot 10^4/3600 \approx 9{,}44 \cdot 10^2 \text{ mg/s}$$

- C_{max} – maximum initial concentration of hazardous substance, mg/m³
- k – air change rate/h
- Q1 – volumetric flow rate of exhaust gas, m³/s

The building is ventilated through 10 roof domes (each dimension: 2.1 m × 1.8 m). Air supply is through external rainproof louvers.

For this vapor emission value of tetrachloroethylene, using the ALOHA^R software package, for stable atmospheric conditions (stability class: F) and a wind speed of 1.5 m/s, according to the "heavy" gas model, significant concentration zones outside the facility were determined.

Under these conditions, **tetrachloroethylene concentrations higher than the threshold values do not form** in the area around the facility: IDLH (150 ppm), but concentrations of the STEL level (40 ppm) form at a distance of 11 m, and concentrations of the 0.1 IDLH level (15 ppm) form at a distance of 19 m from the ventilation outlet at the top of the room (H ≈ 7.6 m).

Based on the analysis of the obtained results from modelling accident scenarios accompanied by the spillage of liquid hazardous (toxic) waste, and according to the characteristics and requirements for hazard classification for the received types of waste, given in the previous part of the report, we conclude the following:

- In the event of a spill of hazardous liquid waste, a pool of spilled liquid forms, whose evaporation leads to the formation of toxic vapours, which can only be hazardous to personnel in the facility (present or engaged in mitigating the accident consequences) in the pool area.
- In the area immediately around the building, at the location of vapor discharge through ventilation openings, at the operator's location (Elixir Craft), toxic vapor concentrations cannot form that would be hazardous to unprotected people during prolonged exposure.
- In the area outside the operator's location, concentrations that could significantly affect the health of the population do not form, according to the criteria for hazard assessment in the event of an accident, because STEL level concentrations form up to 11 m from the room, and 0.1 IDLH level concentrations form up to 19 m from the room for storing IBC containers.

Personnel engaged in mitigating the consequences of an accident accompanied by the spillage of liquid waste in the facility space must use personal protective equipment (protective mask with combined filter, protective gloves, protective boots).

b) Accident scenario with combustible materials: *Damage or rupture of an IBC tank with waste oil, spillage of liquid waste on the surface, burning of liquid waste in the pool, dispersion of pollutants (combustion products) in the facility space, and thermal (heat) effect on surrounding objects (process equipment and present people).*

b.1) Toxic effects of combustion products from spilled liquid waste

It is assumed that the conditions for the spread of liquid waste are such that in this case, it is assumed that the surface of the spilled liquid pool is 25 m² (pool diameter: ≈ 5.6 m). Since it is classified as a combustible, not flammable material, the second assumption is based on the thesis that this liquid waste represents a mixture of flammable liquid (high boiling point), amounting to 50% (w/w), and some non-combustible substance, amounting to 50% (w/w). Such liquid waste integrally represents combustible material (waste oil).

As a model for the flammable component of the liquid, fuel oil was taken, which, during free burning, has a combustion rate of 0.02 kg/m²·s, with the formation of the following main combustion products (kg/kg of fuel) [*Method for calculating emissions of harmful substances into the atmosphere during free burning of oil and oil products*, Ministry of Environmental Protection and Natural Resources of the Russian Federation, Samara, 1996.]:

- CO – 0.084
- NOx (as NO_2) – 0.0069
- SOx (as SO_2) – 0.0278
- C (soot) – 0.17.

Based on the above conditions, the emission rates of toxic combustion products from spilled liquid waste are calculated as follows:

- CO: $\boldsymbol{E_{CO}} \approx 25 \cdot 0{,}5 \cdot 0{,}02 \cdot 10^6 \cdot 0{,}084 \approx 2{,}1 \cdot 10^4$ mg/s
- NO_2: $\boldsymbol{E_{NO_2}} \approx 25 \cdot 0{,}5 \cdot 0{,}02 \cdot 10^6 \cdot 0{,}0069 \approx 1{,}7 \cdot 10^3$ mg/s
- SO_2: $\boldsymbol{E_{SO_2}} \approx 25 \cdot 0{,}5 \cdot 0{,}02 \cdot 10^6 \cdot 0{,}0278 \approx 7{,}0 \cdot 10^3$ mg/s
- C: $\boldsymbol{E_C} \approx 25 \cdot 0{,}5 \cdot 0{,}02 \cdot 10^6 \cdot 0{,}17 \approx 4{,}2 \cdot 10^4$ mg/s.

Figure 7.14 shows the simulated changes in concentrations of the main toxic combustion products of waste oil in the facility, after spilling the contents of one IBC container with liquid waste on the facility floor and subsequent burning of the liquid pool, under forced ventilation conditions with a flow rate of 17,000 m³/h.

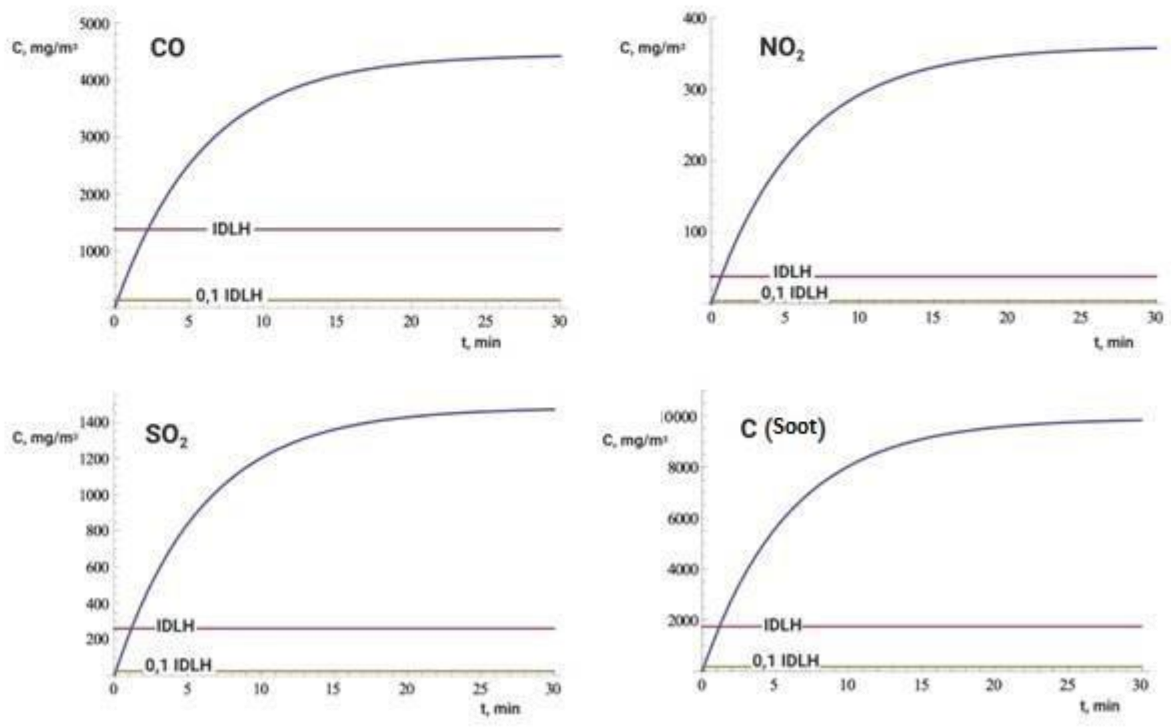


Figure 7.14 Changes in concentrations of toxic combustion products over time in the plant, after spillage of IBC container with 1,000 L of liquid waste and burning of liquid waste in a pool, under forced ventilation conditions: a) CO; b) NOx as NO_2; c) SO_2 d) C (soot)

According to the obtained modelling results of an accident involving the spillage of liquid waste and its subsequent burning in a pool of spilled liquid in the IBC container storage area, toxic products accumulate in the plant's air space to levels (concentrations equal to or higher than IDLH) that can seriously endanger the health of unprotected personnel present.

In accordance with the above, the primary task of the personnel present is to manage the burning of the spilled waste in the initial phase of the resulting fire to prevent it from escalating into a large-scale fire (where the fire would engulf the entire surface of the spilled liquid waste). If the fire threatens to escalate into a larger fire, all personnel engaged in accident mitigation (firefighting) must be equipped with personal protective equipment, with an emphasis **on the mandatory use of breathing apparatus.**

b.2) Thermal effect of the resulting fire in the liquid waste pool

The thermal effect of the resulting fire in the liquid waste pool after the spillage and ignition of liquid waste from the IBC container was estimated based on the assumed spillage of a model substance (tridecane was selected as a higher hydrocarbon), as the *ALOHA*^{R} package cannot use mixtures for simulation. The selected quantity of 0.5 m³ approximately reflects the applied waste oil with a 50%, w/w, content of flammable organic phase, which integrally gives the liquid waste an approximate characteristic of flammable material to assess the effect of the thermal impact during the resulting burning in the pool of spilled liquid.

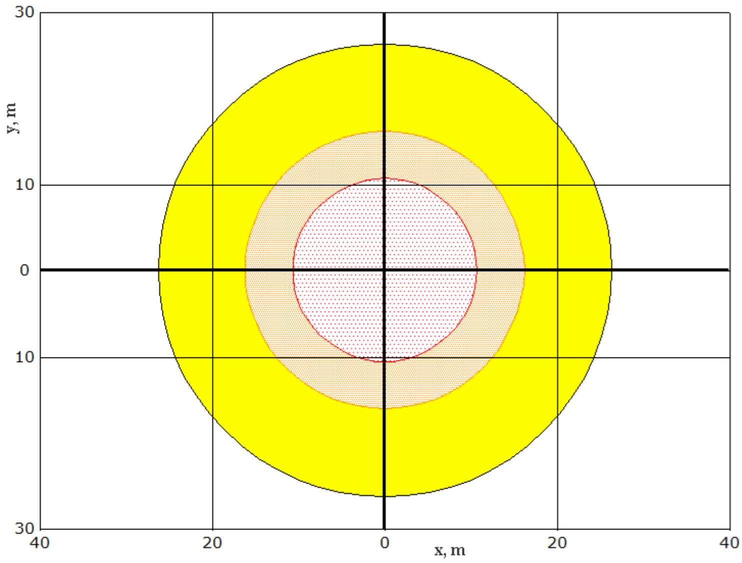
According to the *ALOHA*^{R} software package, the following distances are considered hazardous zones from the burning pool, for at least 1 minute of exposure, for unprotected personnel:

- Up to 11 m from the pool can be life-threatening,
- Up to 16 m from the pool can cause second-degree burns.

Damage to process equipment can occur if it is located within the burning pool zone (direct flame impact) or a few meters from it due to the effect of thermal radiation.

Atmospheric data:
Wind: 0.5 m/s
Terrain appearance: urban or forest
Air temperature: 20°C
Relative humidity: 70%

Source strength:
Model: Pool fire
Pool area: 25.5 m²
Pool volume: 0.5 m³
Initial pool temperature: 20°C
Flame length: 11 m
Burning duration: 4 min
Burning rate: 91.3 kg/min
Total burned quantity: 377 kg



Danger zones:
Model: Thermal radiation from pool fire
Red: 11 m [greater than 10.0 kW/m² (potentially fatal within 60 s)]
Orange: 16 m [greater than 5.0 kW/m² (second-degree burns within 60 s)]
Yellow: 26 m [greater than 2.0 kW/m² (pain within 60 s)]

Figure 7.15 Radiation flux spread zones after pool fire of spilled waste oil from IBC container in the room

Scenario 5 - Accident situations with waste sludges

The system for receiving and dosing sludge waste is automated for process control and monitoring from sludge reception to dosing into the thermal treatment furnace. Therefore, the identification of hazards from accident situations primarily concerns predicting the dynamics of methane generation (emission) in the delivered sludges, its detection, and the response of the forced ventilation system in terms of its removal from the system. Such a safety system should prevent any occurrence of flames, fires, and potential gas explosions in this part of the plant.

When the boiler plant is not operational, nitrogen is automatically introduced into the sludge waste reception bunker to inert the space.

The major unknown in this case is predicting the initial methane emission from the delivered sludges in the reception bunkers due to their heterogeneity as input raw materials for further treatment. Therefore, a comparative analysis was conducted for multiple methane emission values with simulation of the concentration change dynamics for different system operating modes.

Input data:

- Volume of sludge reception bunker: 65 m^3
- Assumed sludge quantity in reception bunker: 10 m^3 (variable size)
- Forced ventilation capacity: 2,000 m^3/h
- Natural ventilation capacity, assumed value: 0.5 exchanges/h
- Methane emission, assumed values: 100 mg/s; 1,000 mg/s; 16,000 mg/s
- Significant methane concentrations: IDLH = 29,270 mg/m^3 (~50,000 ppm); 0.25 IDLH = 5,854 mg/m^3 (~10,000 ppm).

Figure 7.16 shows simulated methane concentration changes in the sludge reception bunker for different methane emission values under natural ventilation conditions (exchange rate: 0.5/h).

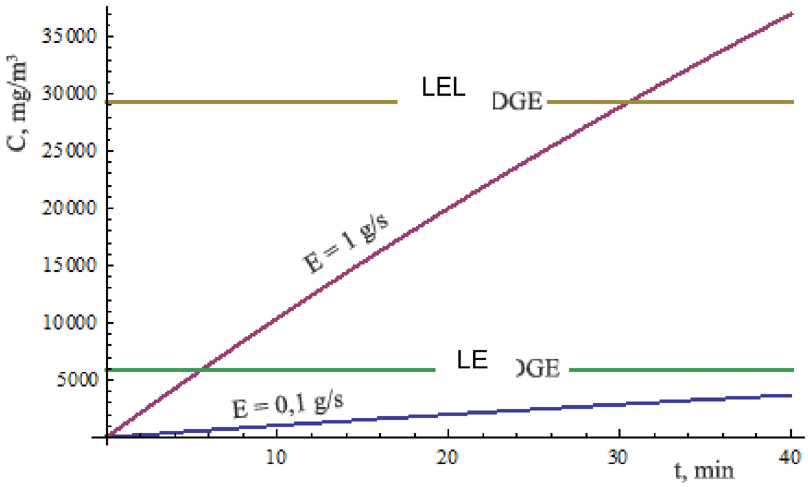


Figure 7.16 Methane concentration change in the sludge reception bunker for different methane emission values, under natural ventilation conditions (Forced ventilation off)

According to Figure 7.16, under natural ventilation conditions with a methane emission of 1 g/s, dangerous methane concentrations form in the sludge reception bunker, and within approximately 40 minutes, the methane concentration reaches the first level methane detection alarm, even at low methane emission values (100 mg/s).

Figure 7.17 shows simulated methane concentration changes in the sludge reception bunker for different methane emission values under forced ventilation conditions (2,000 m^3/h).

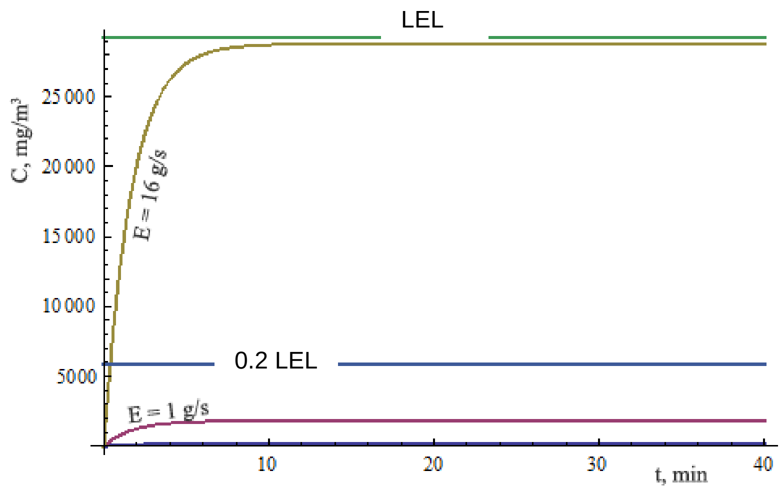


Figure 7.17 Methane concentration change in the sludge reception bunker for different methane emission values, under forced ventilation conditions (2,000 m³/h)

According to Figure 7.17, under forced ventilation conditions, forced ventilation with the designed flow rates effectively dilutes the formed methane concentrations. The threshold methane emission rate that the existing forced ventilation can remove is about 16 g/s, indicating that under proper ventilation and methane detection system operation, the risk of methane ignition is low.

Scenario 6 - Accident situations at the boiler plant and natural gas installation

Analysing the functioning and operating regimes of all subsystems at the boiler plant, considering the operational parameters and the presence of various hazardous materials in conditions characterized by high temperatures and pressures in the reaction medium, with numerous predictable and unpredictable chemical reactions, the potential development of accident events at this plant could occur in two boundary cases: on the structural **skeleton of the boiler itself** (a) and on **the natural gas installation** (b).

a) <u>Boiler accidents</u>

Two scenarios were analysed as **characteristic accidental situations for the boiler**:

- continuous release of flue gas from the boiler after the dehermetization of a connection point, and
- a catastrophic boiler failure with a complete release of the present steam and a mixture of liquid and solid phases from the boiler's current load (this situation is considered based on the requirements of the *SEVESO convention*, on one hand, and based on the requirements for the preparation of Chapter 7 from the *Environmental Impact Study* of a plant, on the other hand, where in both cases it is defined as the obligation of the preparer to analyse the so-called "worst-case scenario," regardless of the low probability of its occurrence).

Of the two accident scenarios at the boiler itself, it is evident that the second scenario is the "worse" case and is thus further considered. The physical model of the accident assumes that the boiler is damaged in the lower zone, leading to a complete release of both the entire reaction content and the present filling (fluidized bed).

The portion of the content related to liquid and solid components will spill around the boiler structure on the concrete base without significant impacts on the surrounding environment.

According to the assumption presented here, the released steam phase (flue gas mixture) from the boiler will transition into the surrounding space within the boiler plant building, and then, in accordance with current aerodynamic conditions, diffusion of the components into the area outside the boiler plant will occur. Three different regimes of further development of the accident situation were considered, which follow the diffusion of the components of the flue gas mixture:

- natural ventilation operation (Natural ventilation assumes that there is some minimal air flow (movement) in the system due to system non-hermeticity (smaller openings near doors, windows, roof, etc.), and its capacity is taken as approximately 0.5 air changes/hour [https://www.eevrbas.org/korisni-saveti/ventilacija/86-prirodna-ventilacija]).
- forced ventilation operation with two pairs of fans running (regular plant operation), with an air flow capacity of 50,000 m³/h (The forced ventilation capacity is calculated based on the total air flow of constantly running fans of 50,000 m³ air/hour, the volume of the boiler plant of about 47,700 m³, and the assumption that the hall space is filled with process equipment to about 50%; based on these data, an approximate forced ventilation capacity of about 2 air changes/hour was calculated.)
- forced ventilation operation with 24 fans running (engaged in extreme conditions, such as when the ambient temperature is 40 °C), with an air flow capacity of 300,000 m³/h.

The simulation of the accident situation assumes that the initial concentrations of the components of the flue gas mixture in the boiler, after transitioning into the boiler plant space, dilute in accordance with the increase in volume for the same mass of pollutants, and this concentration represents the "new initial" concentration of each pollutant (Co), which changes over time depending on the current ventilation regime of the space.

Input data:

- Volume of the boiler plant (including annex, without external stairs): 47,700 m³
- Occupancy of the boiler plant with process equipment: 50% mass load (assumption)
- Volume of the boiler, with three boiler passes (excluding channels and flue gas cleaning systems): 22 m x 13.5 m x 5.45 m ≈ 1619 m³
- Occupancy of the internal space of the boiler with waste and reaction filling: 50% mass load (assumption).

Based on the stated data, a simulation of the change in pollutant concentrations in the boiler plant space was performed using the equation for the change in concentration over time in the form:

$$C = C_0 \cdot e^{-k \cdot t}$$

- where k is the dilution constant due to ventilation operation, in min⁻¹.

For relevant concentrations for assessing the spread of hazardous zones for people present, the following values were taken:

- HCl (LC_{50} ≈ 3124 ppm; IDLH = 50 ppm; LVE = 10 mg/m³)
- PM (LVE = 10 mg/m³; 5 mg/m³)
- HF (LC_{50} ≈ 342 ppm; IDLH = 30 ppm; LVE = 1 mg/m³)
- NOx (LC_{50} ≈ 327 ppm; IDLH = 20 ppm; 0.1 IDLH = 2 ppm)
- SO_2 (LC_{50} ≈ 1640 ppm; IDLH = 100 ppm; 0.1 IDLH = 10 ppm)

Figure 7.18 shows the changes in concentration over time of the main pollutants from the composition of flue gas after the boiler content is released into the boiler plant space under natural or forced ventilation conditions, calculated in accordance with the aforementioned equation.

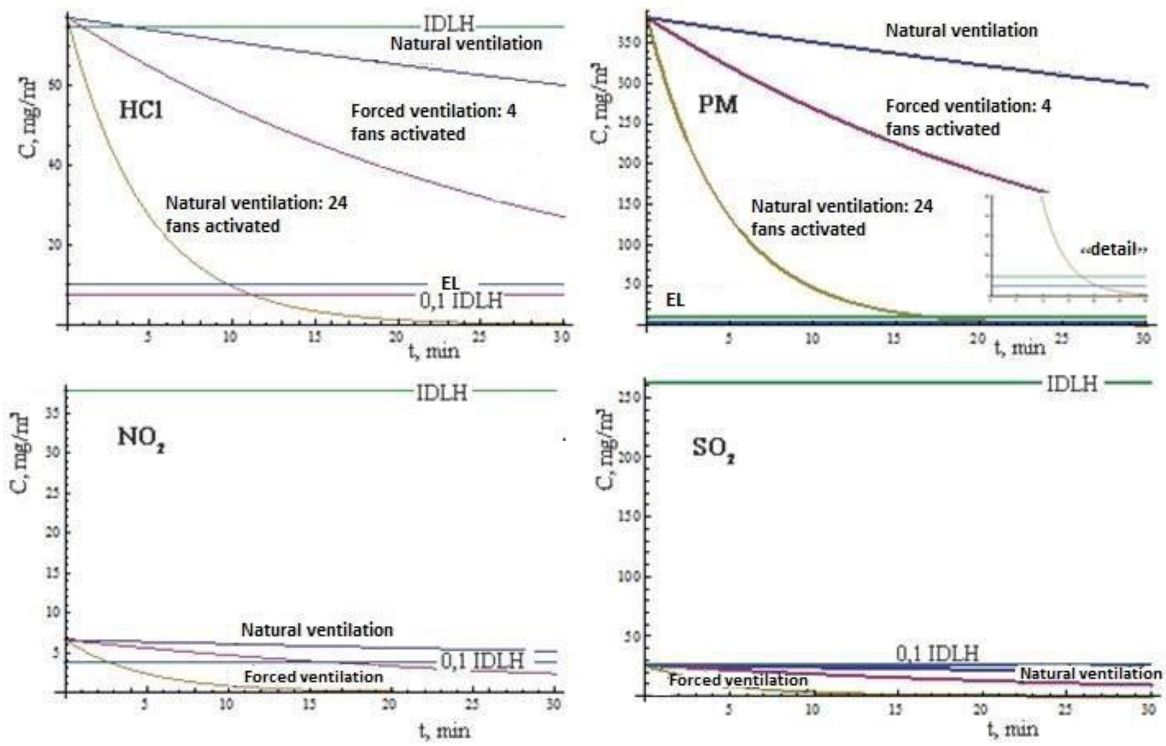


Figure 7.18 Changes in concentration of pollutants over time from the composition of flue gas after boiler content discharge in the boiler plant area for different ventilation modes

According to the data from the graphical representations in Figure 7.18, following an accident at the boiler plant accompanied by the release of content from inside the boiler (emergency situation at the boiler itself), dangerous concentrations of some pollutants (primarily HCl and PM) form in the boiler plant area. An effective way to mitigate the resulting emergency situation is to activate all fans (24 units), which will reduce the concentrations of all present pollutants in the boiler plant area to acceptable levels within 20 minutes.

To verify the concentration of pollutants outside the boiler plant area, the initial emission of pollutants (maximum value) that forms on the roof of the plant and then diffuses into the surrounding space was calculated. For this purpose, PM was selected as the pollutant due to its high concentration:
$E_{PM} \approx C_{PM} \cdot V \approx 382 \cdot 300.000/3600 \approx 3,2 \cdot 10^4$ mg/s

where:
E_{PM} - emission of PM particles
C_{PM} - concentration of PM particles
V – velocity

Zones of characteristic PM concentrations in the area outside the boiler plant, under unfavourable meteorological conditions (wind speed of 1.5 m/s and F class stability of the ground-level atmospheric layer), in accordance with the recommendations of the Regulation on the Content of Accident Prevention Policy and the Content and Methodology for Preparing Safety Reports and Accident Protection Plans ("Official Gazette of the RS," No. 41/2010), are shown in Figure 7.19.

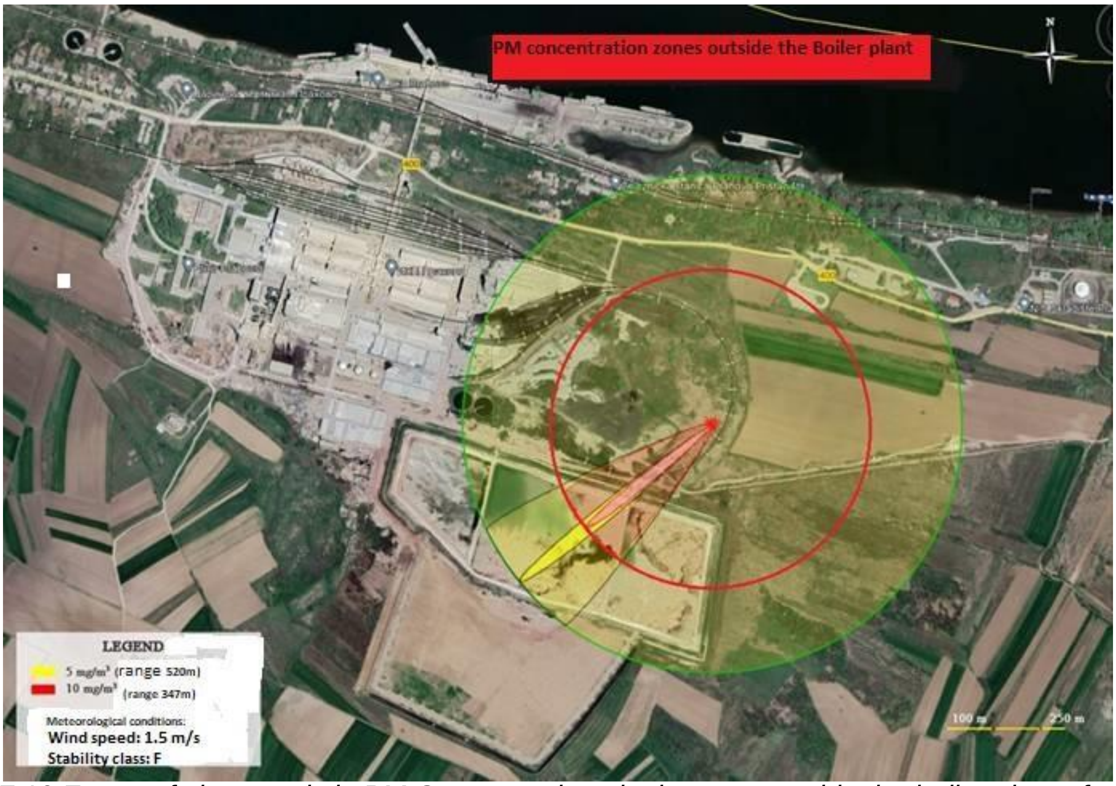


Figure 7.19 Zones of characteristic PM Concentrations in the area outside the boiler plant after boiler content discharge for waste incineration in stable atmospheric conditions

b) <u>Accidents on the natural gas installation</u>

When it comes to the presence of flammable materials, the critical points are the natural gas installations from the MRS (measurement and regulation station) to the boiler plant (Table 7.10).

Table 7.10 Overview of causes, failures, and consequences related to emergency situations on the natural gas installation

Ord. No.	Cause	Failure or Disturbance	Consequences
1.	Mechanical damage to the gas pipeline, flanges, or valves at the entry and in the facility.	Material fatigue of sealing parts, human factor due to non-compliance with warnings or during the execution of repair works.	Formation of a flame jet, leakage of natural gas into the atmosphere, potential subsequent explosion or ignition of the gas cloud and occurrence of secondary fires (escalation of the accident).
2.	Damage to the pipeline due to a force of greater intensity.	Corrosion or material fatigue, land slippage, damage during land excavation.	Formation of a flame jet, leakage of natural gas into the atmosphere, potential subsequent ignition of the gas cloud.

At the points of damage to the gas pipeline, gas escapes under pressure into the surrounding environment. By mixing with air, natural gas forms a cloud of explosive mixture. Statistics show that about 80% of gas pipeline accidents are accompanied by fires. Sparks occur due to the action of gas particles with metal and other solid particles in the soil. Ordinary burning can transform into an explosion due to the self-acceleration of the flame as it spreads to surrounding objects.

Accordingly, following the dehermetization of the gas pipeline, various effects of emergency situations are possible:

1) Ignition of the gas upon formation of the exit stream - formation of **a flame jet,**
2) Initial gas dispersion, with subsequent **explosion of the gas cloud**, or

3) Initial gas dispersion, with subsequent **ignition of the gas cloud.**

Ignition of gas upon formation of exit stream

A **flame jet** represents a typical result of the combustion of flammable material upon its release from a gas pipeline, which is under pressure.

Accident description: *At the natural gas burner, an opening with an equivalent diameter of Ø10 mm has formed, through which gas is released under pressure and immediately ignites, forming a flame jet.*

Input data:
- Gas pressure at the burner: 0.5 bar
- Ambient temperature: 20°C

Under these conditions, the mass flow rate of gas release is calculated as: E ≈ 0.017 kg/, whereby, after ignition of the gas stream, a flame jet can form with a length up to 1.2 m and a maximum width of about 1.3 m.

A flame jet (vertical or horizontal) affects surrounding objects with its thermal effects in two ways:
- Directly with open flame (on objects in the path of the flame propagation),
- By thermal radiation (on objects not directly in the path of the flame jet but in close proximity to the flame).

If the gas stream does not ignite immediately, the possibility of forming critical concentrations that may lead to subsequent ignition or explosion of gas in the boiler plant space is considered. Figure 7.20 shows the change in the concentration of natural gas in the boiler plant under the conditions of only natural ventilation, for the given conditions of uncontrolled gas release.

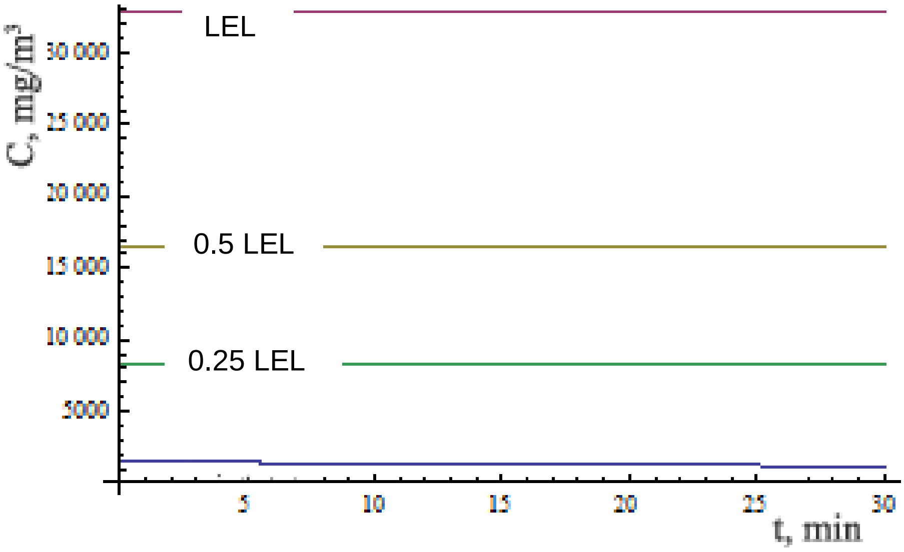


Figure 7.20 Change in the concentration of natural gas after release from the gas pipeline through an opening with a diameter of 10 mm under conditions of only natural ventilation (~ 0.5 air changes per hour)

Analysing the simulation results of the change in natural gas concentration in the boiler plant space, it is easy to see that under the given accident conditions, there are no conditions for subsequent ignition or explosion of the released gas, nor conditions for activating the methane detection system to perform the following functions:
- Detection at 10% of the lower explosive limit (first alarm threshold) – concentration level of 3,280 mg/m³
- Detection at 25% of the lower explosive limit (second alarm threshold) – concentration level of 8,200 mg/m³.

Scenario 7 - Uncontrolled release of particulate matter from bag filters in the boiler plant

Considering all process parameters that are monitored and prone to dynamic changes, which can lead to system failures, a potential hazard in the event of an accident is primarily the uncontrolled increase in pressure and possibly temperature in the system, due to increased resistance to the flow of the flue gas mixture through clogged fabric on the filter bags, which can lead to the rupture of one or more filter bags. To comprehensively understand the situation, two accident scenarios of unwanted events are considered:

- The rupture of one filter bag,
- The simultaneous rupture of two filter bags.

In accordance with the given physical model of the failures, the description of the accompanying accidents affecting the surrounding space (the hall space) can be formulated, considering the proportion of the uncontrolled release of the flue gas stream:

- Uncontrolled release of particulate matter (PM)
- Uncontrolled release of other pollutants (HCl, HF, SO_2, NO_2).

a) Accident with the rupture of one filter bag

The emission of particulate matter in this accident scenario is calculated based on the proportion of the total flue gas flow that corresponds to one filter bag.

Input Data:

- Average volumetric flow rate of flue gas: 70.640 ± 19.164 m3/h ≈19,6 ± 5,3 m3/s
- Maximum PM content in flue gas, at the entry to the bag filters: ≈$1,2 \cdot 10^4$ mg/m^3
- Total number of filter bags: 6×196=1176
- Volume of the boiler plant housing the bag filters (Building W-C11): 47.700 m^3 (excluding external staircases, including annex)
- 24 fans are planned on the eastern side of the building facade, with a total capacity of 300.000 m^3/h: 4 fans operate continuously (total capacity: 50.000 m^3/h, and the remaining fans activate in pairs depending on air temperature, up to a maximum of 40 °C when all fans are operational.

Based on the input data, the emission of particulate matter from one damaged filter bag is calculated as:

$E_1 \approx Q_{sr} * C = 19,6 * 1,2/10^4/1176 \approx 200$ mg/s

- Q_{sr} - average volumetric flow rate of flue gas, m^3/s
- C - concentration of particulate matter, mg/m^3

As the characteristic concentration of particulate matter for assessing the endangered zone, a recommended value of 5 mg/m^3 is taken as the emission limit for waste thermal treatment plants (*Regulation on Technical and Technological Conditions for Design, Construction, Equipment, and Operation of Plants and Types of Waste for Thermal Waste Treatment, Emission Limit Values and Their Monitoring, "Official Gazette RS", No. 103/2023*).

For modelling the dispersion of particulate matter after the rupture of one filter bag in the dust treatment filter plant, a mathematical model for estimating pollution in a room with continuous contaminant input and continuous contaminant removal due to ventilation (natural or forced) is applied.

Particulate matter produced as waste dust in the described purification system represents aerosol particles of very fine granulation, with an approximate mean diameter of about 2.5 μm\mu mμm (representative particles for contamination of upper and lower respiratory tracts in humans). Since the main component in the chemical composition of particulate matter is carbon with traces of some inorganic components and heavy metals, an assumed approximate density of PM of 2,500 kg/m^3 is used to calculate the settling velocity (V_g) of these particles in the air, according to Stokes' law [EPA, *Compilation of Air Pollutant Factors*, Vol.I: *Stationary Point and Area Sources*, Research Triangle Park, NC 27711].

The calculated settling velocity of these particles in a still atmosphere is $V_g \approx 8.5 \times 10^{-4}$ m/s, indicating a very low speed, which can be almost neglected, and the behavior of PM2.5 can be considered similar to gas/vapor in the boiler plant space.

This accident scenario is simulated in two sub-variants:
- Without activated forced ventilation (with natural ventilation)
- With activated forced ventilation.

Natural ventilation assumes that there is minimal air movement in the system due to the non-hermetic nature of the system (smaller openings next to doors, windows, roofs, etc.) and its capacity is considered to be around 0.5 changes/hour.

The capacity of forced ventilation during regular operation is calculated based on the total volumetric flow of continuously operating fans of 50,000 m^3 of air/h, the boiler plant volume of about 47,700 m^3, and the assumption that the hall space is filled with process equipment at a rate of about 50%. Based on the mentioned data, an approximate forced ventilation capacity of about 2 changes/hour is calculated. In case of an accident, all 24 fans will be activated.

Figure 7.21 shows the changes in particulate matter concentrations in the boiler plant space over time after the rupture of one filter bag under different operating conditions of the plant.

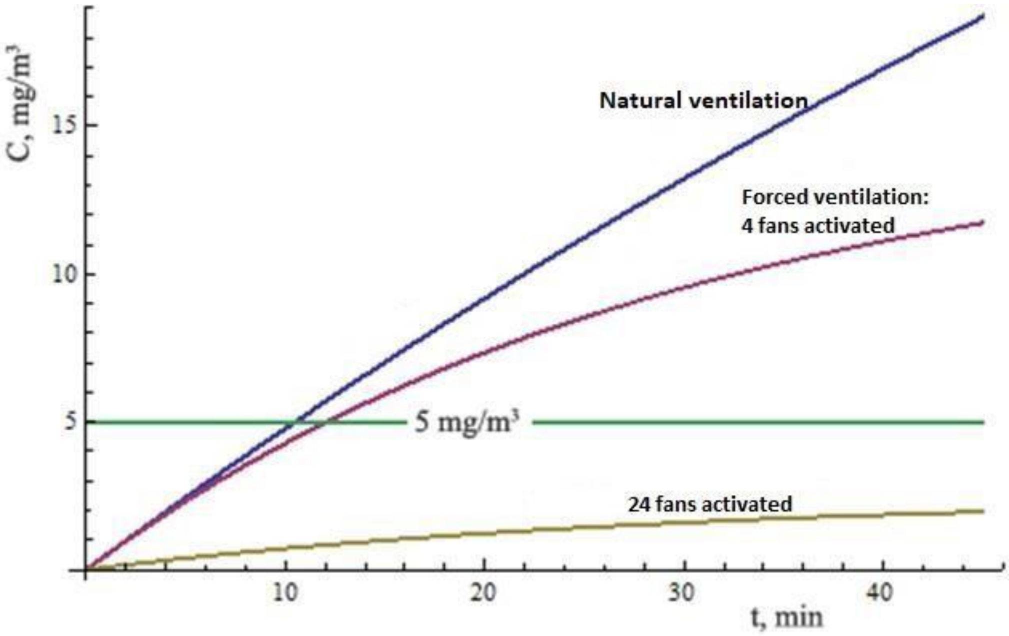


Figure 7.21 Dynamics of changes in particulate matter concentration in the boiler plant after the rupture of one filter bag under natural and forced ventilation conditions

Based on the illustration in Figure 7.20, it is evident that in the event of an accident due to the rupture of one filter bag in the boiler plant, within 10 minutes of the emission, PM concentrations exceeding the allowed 5 mg/m^3 are formed, both under natural and forced ventilation conditions (with four continuously operating fans). However, when all 24 fans are activated, dangerous PM concentrations do not form.

The results of the accident modelling lead to **certain response measures:**

- Immediately activate all fans in the plant upon the occurrence of an accident
- The plant must be taken out of operation and maintenance mode initiated
- The work personnel should replace the damaged filter bag as quickly as possible

- The work personnel should perform the above activities using personal protective equipment (mandatory use of respiratory protection).

When a filter bag is damaged, uncontrolled emissions of not only PM but also other pollutants present in the flue gas (primarily HCl, HF, SO_2, and NO_2) occur, based on the volume flow rate corresponding to one filter bag. Similar to the case of PM, emissions of these pollutants are calculated for the rupture of one filter bag:
- $E_{HCl} \approx 39$ mg/s
- $E_{HF} \approx 0{,}22$ mg/s
- $E_{SO_2} \approx 13{,}2$ mg/s
- $E_{NO_2} \approx 3{,}33$ mg/s

Figure 7.22 shows the changes in HCl concentrations in the boiler plant space over time after the rupture of one filter bag under different operating conditions of the plant.

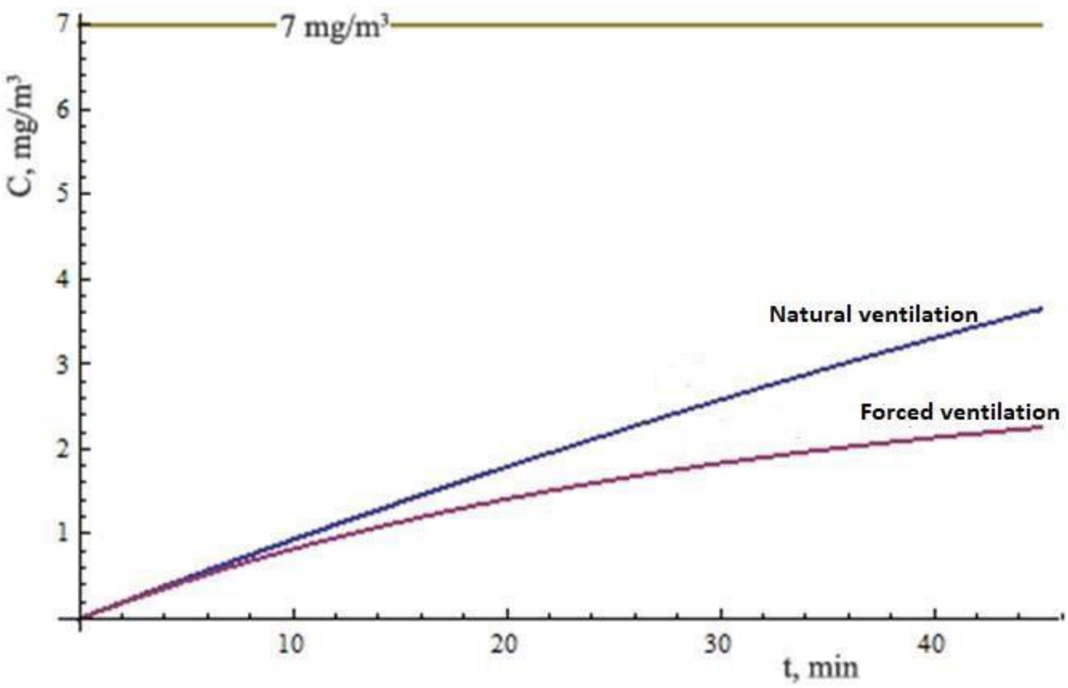


Figure 7.22 Dynamics of HCl concentration change in the boiler plant after a single filter bag rupture under natural and forced ventilation conditions with display of the HCl concentration limit value (0.1 IDLH of 7 mg/m^3)

According to the data in Figure 7.22, when a single filter bag ruptures in the filter plant within the boiler plant, **dangerous concentrations of HCl, HF, SO_2, and NOx do not form**. However, **due to the formation of elevated concentrations of particulate matter (PM)**, protective measures should be taken (primarily the use of respiratory protective equipment), as these substances (additive properties when there are multiple pollutants) contribute to the harmful effects of PM on the workforce.

b) Accident with two filter bag ruptures

By applying an identical methodology as in the case of a single filter bag rupture, the simulation of the dynamics of particulate matter concentration changes over time was carried out in the case of two filter bag ruptures in the bag filter chamber (Figure 7.23).

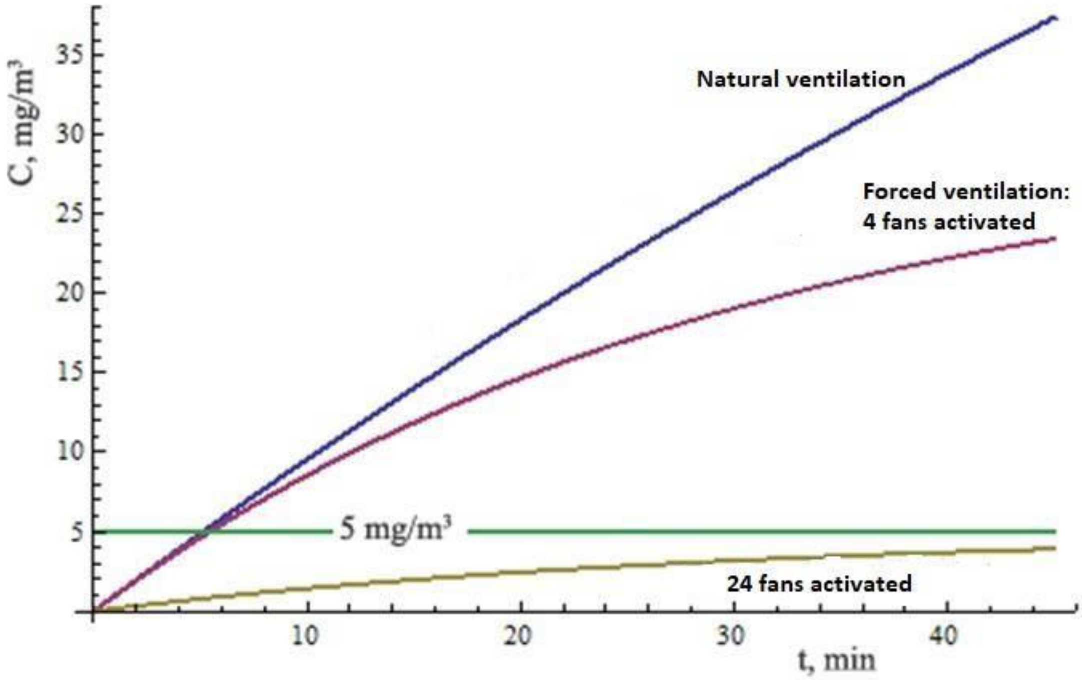


Figure 7.23 Dynamics of Particulate Matter (PM) concentration change in the boiler plant after two filter bag ruptures under natural and forced ventilation conditions

In the mentioned case, similar results were obtained as in the case of a single filter bag rupture, with the difference being that the PM concentration limit is reached earlier (in the case of natural ventilation and forced ventilation with only four fans operating). In this case, when all fans (24) are operating, PM concentrations exceeding the limit value (5 mg/m^3) do not form, even if the accident lasts for more than 40 minutes.

The potential impact of vapours resulting from the PM release from two filter bags outside the plant space was assessed after determining the maximum PM emission into the surrounding space (for a duration of 30 minutes, forced ventilation) through the building's jalousies as follows:

$\boldsymbol{E_2} \approx C_{max} \cdot k \cdot V_1 \approx 20 \cdot (2/3600) \cdot 0{,}5 \cdot 4{,}77{\cdot}10^4 \approx 2{,}65 \cdot 10^2$ mg/s

- C_{max} – maximum particulate matter concentration, mg/m3
- k – air exchange rate/h
- V_1 – volumetric flow, m3/s

Smoke ventilation of the building is carried out through 10 roof domes (each dimension: 2.1 m × 1.8 m). Air replacement is provided through external rainproof jalousies. Under these conditions, **PM concentrations exceeding the limit values of 5 mg/m^3 do not form** in the area around the plant.

Nitrogen is used in bag filters for inertization of the environment if the temperature rises.

Scenario 8 - Forced flue gas discharge to the stack without scrubber system treatment

In the lower part of the bag filter chambers, heaters (using steam) are installed to prevent flue gas condensation during boiler startup. The lower zone of the bag filter chambers is equipped with nitrogen inlet connections, which are introduced as needed to prevent the occurrence of flames.

If the temperature rises in the bag filter chambers, a valve on the connection opens, and nitrogen is released.

After the bag filters, the flue gases are sent by fans for further purification in the HCl scrubber, while a smaller portion of the flue gases recirculate back to the combustion system in the boiler.

At the exit of the bag filters, a bypass channel is provided, which, in the event of uncontrolled temperature rise in the system, redirects the flue gases from the bag filters directly to the stack. That is, if high flue gas temperature is detected, the bypass channel opens, all fans stop operating, and the flue gases exiting the bag filters bypass the entire wet gas cleaning system and the SCR system, going directly to the stack. This **situation is defined as an accidental**, so it is necessary to anticipate and simulate the consequences of such an extraordinary event on humans, process equipment, and the surrounding environment.

Input Data:

- Average volumetric flow rate of flue gases: 70,640 ± 19,164 $m^3/h \approx 19.6 \pm 5.3\ m^3/s$
- Concentrations of hazardous substances in flue gas, at the outlet of bag filters:
  - HCl: 2340 mg/m^3
  - HF: 13 mg/m^3
  - SO_2: 795 mg/m^3
  - NO_x: 200 mg/m^3
- Characteristics of the stack:
- Stack height (from the ground): 56 m
- Inner diameter of the stack: Ø1700 mm
- Average temperature in the stack: 161 °C

Based on the given input data, the following were calculated:

- Average velocity of flue gas flow in the stack: 8.64 m/s
- Mass rates (emissions) of hazardous substances in the flue gas:
  - $mHCl = 4.6 \cdot 10^4$ mg/s
  - $mHF = 2.5 \cdot 10^2$ mg/s
  - $mSO_2 = 1.6 \cdot 10^4$ mg/s
  - $mNO_x = 3.9 \cdot 10^3$ mg/s

To create zones of hazardous concentration dispersal of flue gas components, the calculation of flue gas plume rise above the geometric height of the stack was carried out, accounting for the buoyancy force and the effect of the temperature difference inside and outside the stack. The methodology proposed by Briggs [G. Briggs, Plume rise prediction, American Meteorological Society, Boston, 1975.] and supplemented by Bowers [J. Bowers et al., *Industrial source complex dispersion model user's guide*, Vol. II, EPA-450/4-79-031, US EPA, Research Triangle Park, 1971.] was applied for these calculations.

Using the mentioned methodology for the given input data, a plume rise value of 41.8 m was calculated, which means that the initial value (calculated value) of the dispersion point of the flue gas plume is at a height (relative to the ground): 56 + 41.8 ≈ 91.8 m.

The software package *ALOHA*[R] was used to determine the hazardous zones during the dispersion of flue gas components, taking into account the assumed meteorological conditions for the pollution simulation.

Specifically, of the four hazardous substances (HCl, HF, SO_2, and NO_x), under dispersion conditions at ambient temperature, the "heavy" gas model would apply to HCl, SO_2, and NO_x, while the "neutral" gas model would apply to HF. However, following Briggs's suggestions, in conditions of high flue gas temperatures in the stack (161 °C) and assuming an ambient temperature of around 20 °C, it is recommended to use Gaussian models for predicting the dispersion of gases from the flue gas mixture (due to the high temperature in the stack, the gas densities are approximately equal to the density of the surrounding air).

The simulation of the assumed situation using the mentioned software package shows that under the given conditions at ground level and at a height of 1.5 m from the ground (approximate height of human respiratory organs), during a 30-minute emergency situation, **concentrations do not form in values previously stated in scenario 6 as significant** for endangering the health of people present. As an illustration of this assessment, the case of NO_x dispersion from the flue gas mixture, shown as NO_2, is given.

Excerpt from the simulation of the emergency situation using the ALOHA^R package followed by NO_x dispersion as NO_2 from the flue gas mixture after release from the stack into the surrounding environment
NO_2-Toxic Cloud
Chemical Data:
Chemical name: Nitrogen Dioxide
CAS Number: 10102-44-0
Molar mass: 46.01 g/mol
AEGL-1 (60 min): 0.5 ppm
AEGL-2 (60 min): 12 ppm
AEGL-3 (60 min): 20 ppm
IDLH: 20 ppm
Boiling point at ambient pressure: 20.9 °C
Vapour pressure at ambient temperature: 0.95 atm
Ambient saturation: 955227 ppm or 95.5%

Atmospheric data:
Wind: 1.5 m/s east-southeast at 2 m
Terrain appearance: urban or forest
Cloud cover: 5 tenths
Air temperature: 20 °C
Stability class: F
No inversion
Relative humidity: 70%

Source strength:
Direct source: 3.9 g/s
Source height: 89.3 m
Release duration: 30 min
Release rate: 234 g/min
Total released amount: 7.02 kg

Hazard zones:
Model: Gaussian
Red: LOC not exceeded (327 ppm)
Orange: LOC not exceeded (20 ppm=IDLH)
Yellow: LOC not exceeded (2 ppm)

Note: Hazard zones are not drawn due to the lower reliability of dispersion width estimation for short distances

The question arises as to what happens when the ambient air temperature is low (e.g., 0 °C or lower) and an inversion layer is formed in the ground-level atmosphere, i.e., whether the mentioned pollutants can then be considered "heavy" gases and whether they "fall" into the human occupancy zone (then *ALOHA*^{R} uses the "heavy" gas model)?

A well-designed stack height ensures that the virtual height of the stack (after the flue gas plume rise, the initial dispersion point of the gases is significantly above the geometric height of the stack) is well above the potentially formed inversion layer of the air mass in the atmosphere.

The approximate height (thickness) value of the surface mixing layer in the case of a full inversion in the ground-level atmosphere is around 30 m (*Methodology for chemical hazard prediction*, Department of defence explosives safety board USA, Technical report, June 1980., pp.17), which means that above this layer, spontaneous dispersion of pollutants occurs according to the Gaussian model, and even in such a meteorological situation, **no dangerous concentrations will form** in the human occupancy zone.

Scenario 9 - Accidental situations with activated carbon dozers

Storing activated carbon in two containers and transporting it to the reactor are fire-hazardous operations where accidental situations, such as fires, can occur and potentially spread under unfavourable conditions. Additionally, when packed activated carbon burns in a pile (due to limited air access necessary for combustion), a large amount of carbon monoxide is released, posing a significant risk of poisoning to people at the fire's epicentre.

Although nitrogen is used for inertization in the activated carbon dosing system, there is a possibility that inadequate system operation could lead to the ignition of activated carbon and a fire in the system. As with most fire situations, the primary activity in mitigating such an accident is **extinguishing the fire in its initial phase** before it spreads or escalates, i.e., before it spreads to adjacent objects.

Besides the previously mentioned danger, the technological process of storing and transporting activated carbon is also rife with sources of **carbon dust**, with varying intensities producing different concentrations of airborne dust that settles on the floor and surrounding areas.

Separated carbon dust, whether airborne or settled, poses a potential danger to the installed technological equipment, especially when conditions conducive to explosion or self-ignition are created.

The primary sources of danger for the formation of carbon dust in this plant are the following phases:
- filling containers with activated carbon and
- dosing the carbon.

Secondary dust sources arise from the stirring up of already settled carbon dust. Causes of the stirring up of settled carbon dust can vary, most often resulting from increased air flow, various types of vibrations from moving parts, and especially from cleaning the carbon dust without collecting and removing it from the facility. Stirring up settled carbon dust can occur due to accidental situations, with explosions being the most dangerous, as they stir up dust from all surfaces, potentially reaching critical concentrations sufficient for an explosion.

Measurements have determined that there is a significant dust deposition rate, which over a certain period can create an amount of dust that, if stirred up, could reach an explosive concentration.
The degree of room dustiness with carbon dust can be approximately calculated using the equation:

$$C = \frac{\delta \cdot A \cdot \rho_{nas}}{V}$$

where:
- C – concentration of carbon dust, g/m^3
- δ – thickness of the carbon dust layer on the surface, cm
- A – effective surface area in the room covered with carbon dust, cm^2
- ρ_{nas} – bulk density of carbon dust, g/cm^3
- V – room volume, m^3.

It has also been determined that in a carbon dust explosion, only "fine" dust participates, i.e., 70% of the total dust particle mass must have an average diameter smaller than 70 µm. Knowing the lower explosion limit for carbon dust (for activated carbon: LEL = 60 g/m^3; R. Eckhoff, *Dust Explosions in the Process Industries*, Oxford, 1997), the possibility of an explosion occurring in the room, potentially damaging process equipment, can be determined based on the obtained calculation data.

The **detonation wave zone** from a carbon dust explosion is limited by the radius (R_0), which is calculated using the equation:

$$R_0 = \frac{1}{24}\sqrt{m \cdot \Delta H_S}$$

where:

- m – mass of carbon dust after being stirred up in the room, kg
- ΔH_S – specific heat of combustion of carbon dust, kJ/kg.

A carbon dust explosion in the zone with activated carbon dozers can lead to damage to process equipment. Therefore, dust accumulation should not be allowed, and even settled dust poses a significant danger because it can easily become airborne.

Scenario 10 - Accidents with ammonia water

Based on the description of the state at the W-C13 transfer point, where the transfer of hazardous materials is performed, and according to the methodology described in the "Technology Project" (parts: 23-WTE-IDP-0701-R01, 23-WTE-IDP-0702-R01, 23-WTE-IDP-0703, 23-WTE-IDP-0704-R01, 23-WTE-IDP-0705, 23-WTE-IDP-0706, 23-WTE-IDP-0707-R01, December 2023), as one of the primary documents from the accompanying project documentation for *the Waste-to-Energy Plant Elixir Craft* DOO, the aim of predicting possible accidental situations at this site includes two specific types of accidents to provide a complete picture of the risks to the plant (including associated objects and personnel) and the nearby and further environment:

- chemical accident with a tank truck carrying ammonia water, primarily to assess the risks from the toxic effects of hazardous substances,
- chemical accident at the ammonia water storage tank.

a) Modelling Chemical Accidents at the ammonia water transfer point

During the unloading of ammonia water at the truck-transfer site, any leaked content is transferred by a mobile pump from the shaft to an IBC container and sent to the liquid waste storage for further proper disposal.

However, during the handling of ammonia water unloading (ammonia concentration 25%, w/w) into the ammonia water tank, significant failures and malfunctions, such as:

- rupture of the unloading hose connection with the tank truck,
- damage to the tank truck, or
- inadequate handling actions, which can result in the spillage of ammonia water from the installation onto the surrounding terrain, cannot be ruled out.

Physical model of the accident: During handling during the unloading of ammonia water, a rupture of the unloading hose connection with the tank truck or damage to the tank truck can occur, resulting in the spillage of ammonia water from the installation and rapid spreading of the pool on the surrounding terrain. The dynamics of how ammonia water leakage (or spillage) from the tank truck in the transfer zone at the waste-to-energy plant site would occur depends on the size of the opening created during the tank truck's dehermetization in the event of an accident.

Accidents during the unloading of ammonia water from the tank truck can be divided into two groups:

- major continuous release of ammonia water from the tank truck **– major accidents**
- **minor accidents** accompanied by releases from the installation during transfer: for example, the **release of liquid content from the unloading hose.**

<u>a.1)**Discharge of ammonia water from a tank truck as a continuous liquid phase discharge**</u>

The design criterion for the ammonia water discharge system includes the installation of an automatic system to stop the discharge in case of an accident. However, if the system fails or there is human error during the transfer, uncontrolled discharge of the liquid phase may occur, creating a continuous source of pollution. Thus, it is essential to consider such situations and analyse response options to accidents and their potential environmental consequences.

Considering that the worst-case scenario needs to be modelled, it is assumed that the system did not respond and that ammonia water is discharging at a rate of 5 L/s. The mass of discharged ammonia water depends on the time required to manually stop the discharge. A realistic assumption is that this time would be several minutes, up to a maximum of 10 minutes.

Since the area where the ammonia water is discharged from the tank truck contains a reception reservoir (bundwall) made of impermeable concrete, it is realistic to expect, and the complete system for handling the transfer of ammonia water is designed so that in the event of an accident, the ammonia water will spill into the concrete bundwall.

During the 10-minute discharge, the maximum volume of spilled liquid is **3 m³,** which will temporarily be in the bundwall beneath the tank truck. Until the evacuation of ammonia water from the bundwall, the pool of spilled liquid represents an active source of ammonia vapor emission, which disperses into the surrounding area according to current meteorological data.

<u>Input data:</u>

- Tank truck capacity: 17 m³
- Bundwall dimensions: 17 m × 3.35 m × 0.2 m
- Ammonia concentration in ammonia water: 25%, w/w
- Air temperature: 20 °C
- Atmospheric stability class: stable, class F
- Wind speed: 1.5 m/s

Relevant concentrations for evaluating ammonia vapor toxicity, for different conditions/criteria of exposure:

- LC_{50} – **5,000 - 10,000 ppm** (median lethal concentration of ammonia upon inhalation, in 50% of cases)
- LC_5 – **1,700 ppm** (median lethal concentration of ammonia upon inhalation, in 5% of cases)
- AEGL-3 – life-threatening health effects that may lead to death: **1,100 ppm** (ALOHA^R)
- IDLH – concentration that may be *immediately dangerous to life and health* for exposures longer than 30 minutes: **300 ppm** (210 mg/m³) (NIOSH, <u>https://www.cdc.gov/niosh/idlh/7664417.html</u>)
- AEGL-1 – noticeable discomfort, irritation, or certain asymptomatic non-sensory effects, which are non-disabling and transient and reversible upon cessation of exposure: **30 ppm** (ALOHA^R)
- 0.1 IDLH – concentration that may be immediately dangerous to life for sensitive populations, for exposures longer than 30 minutes: **30 ppm** (21 mg/m³)

For the simulation of ammonia vapor dispersion from ammonia solution, the ALOHA^R software package was used, with a module for the "light" gas variant (based on the Gaussian distribution law of random variables). Figure 7.24 on the GIS map shows the zones of significant ammonia concentrations in the event of a discharge of 3 m³ of ammonia water, with subsequent pooling in the bundwall.

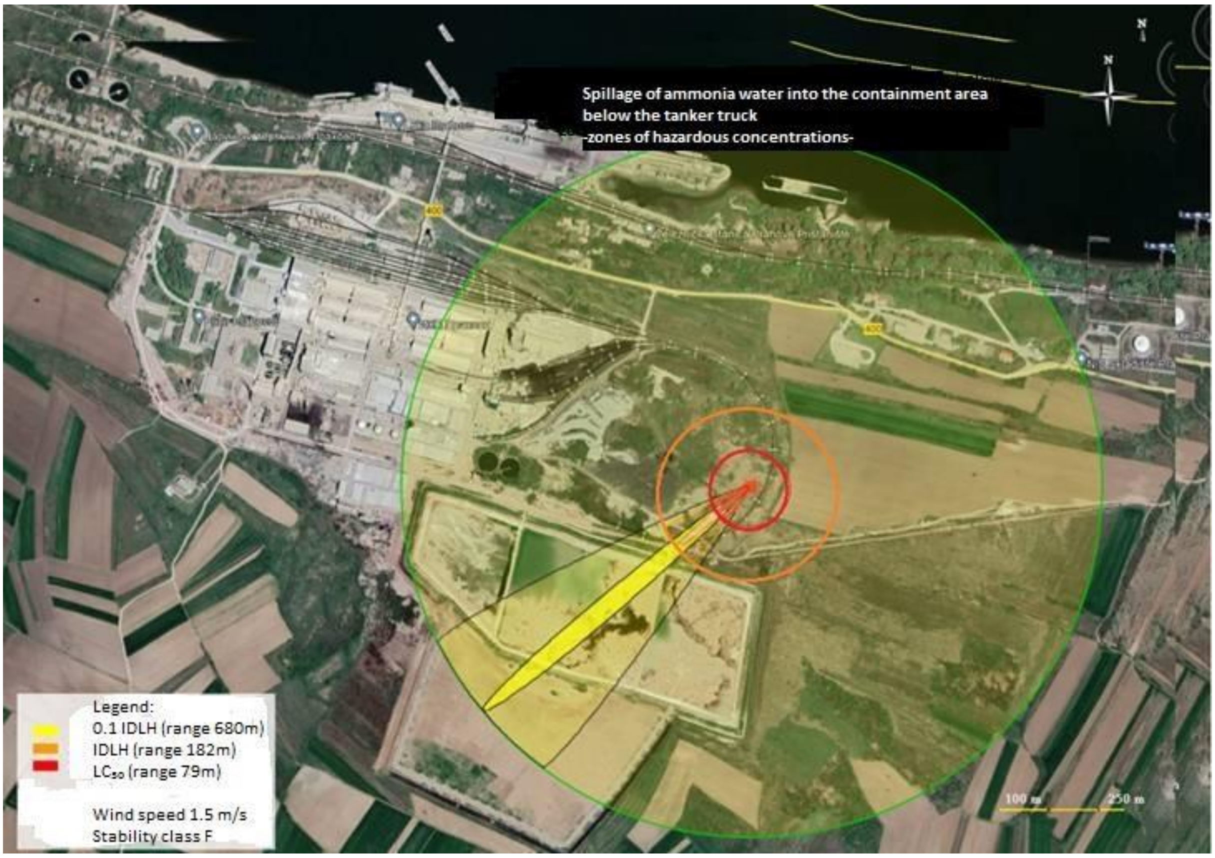


Figure 7.24 Zones of toxic ammonia vapor concentrations on the GIS map, for a discharge of 3 m³ from a tank truck into a bundwall with dimensions of 17 m × 3.35 m, under stable atmospheric conditions.

In cases where a toxic substance is released into the environment, the effects are primarily determined by the achieved concentrations of the hazardous material and the duration of exposure. The functional dependence of the probability of fatal outcomes on concentration and exposure time is specific to each toxic substance and is mathematically described by the so-called ***Probit function***, which provides a more realistic estimate of the consequences compared to simple toxicity estimates.

In the case of human exposure to an atmosphere with a constant ammonia concentration, the Probit function can be expressed by the following equation [*U.S. Coast Guard*, 1980]:

$$Pr = -35{,}9 + 1{,}85 \cdot \ln (C^{2} \cdot t)$$

where:

- C – ammonia concentration, ppm
- t – duration of exposure, min

For ammonia, the *Probit* function values for the probabilities of fatal outcomes of 1%, 10%, 50%, and 90% are: 2.67; 3.72; 5.0, and 6.28, respectively.

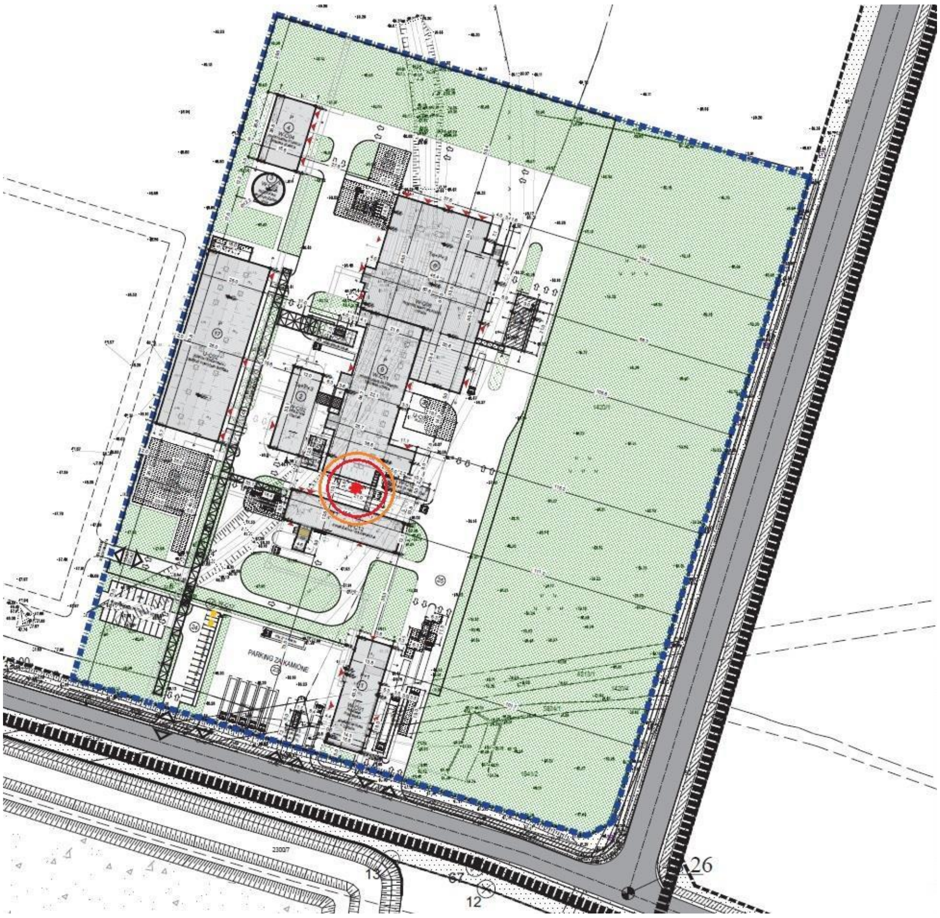
Table 7.11 shows the distances at which dangerous ammonia vapor concentrations that could be fatal are formed, depending on the exposure time and probability of such outcomes, for an uncontrolled discharge of ammonia water (25% w/w) into a bundwall with dimensions of 17 m × 3.35 m × 0.2 m, under stable atmospheric conditions.

Table 7.11 Overview of distances at which lethal ammonia vapor concentrations are formed, depending on exposure time and probability of such outcomes, for an uncontrolled discharge of ammonia water (25% w/w) into a bundwall with dimensions of 17 m × 3.35 m, under stable atmospheric conditions

Exposure Time, min	Distances from the accident site where lethal concentrations occur with a given probability, m			
	1%	10%	50%	90%
1	-	-	-	-
5	< 10	-	-	-
15	12	10	< 10	-
30	14	12	10	< 10

Note: Affected zones for short distances (< 10 m) are not included due to the lower reliability of the software package (ALOHA[R] limitations).

Figure 7.25: The site plan of the facility shows the affected zones after a discharge of 3 m³ of ammonia water from a tank truck into a bundwall with dimensions of 17 m × 3.5 m × 0.2 m, where there is a 10% probability (using the Probit function) of fatal outcomes depending on the exposure time.



Legend:

Exposure time 15 min (R=10 m)

Exposure time 30 min (R=12 m)

Figure 7.25 Endangered zones with a 10% probability of human fatality after the release of 3 m³ of ammonia water from a tanker into a bundwall around the tanker at the Waste-to-Energy plant, depending on the exposure time

For the assessment of the risk of the **Flash fire effect**, the following ammonia concentration values were considered:

- 0.25 LEL – 37,500 ppm – II alarm threshold of the gas detection device
- 0.5 LEL – 75,000 ppm (the concentration considered as the limit with a 50% safety factor relative to the LEL) – indication of the risk of a flash fire, and
- LEL – 150,000 ppm – the concentration for the occurrence of a *Flash fire* effect.

Modelling results for the flash fire effect of ammonia vapor after the release of 3 m³ of ammonia water, obtained by simulating the accident using the ALOHA package, show that even the zone with 0.25 LEL concentration levels (II alarm threshold of the gas detection device) is located at a distance of less than 10 m from the spill site, which does not pose a significant risk to the environment and present people.

<u>a.2)</u> **Minor accident – Ammonia release from a reinforced metal hose**

When transferring ammonia from tankers to storage tanks, a reinforced flexible hose of Ø80 mm × 4 m is used to connect the tanker to the fixed installations at the plant. Failure to achieve a completely reliable connection at the joint points can lead to uncontrolled release of liquid ammonia into the surrounding environment. Therefore, an accident scenario with a complete release of the contents of the flexible hose into the surrounding environment under unfavourable weather conditions was considered.

For the given conditions, the total amount of ammonia water that is uncontrollably released in such a case is calculated to be about 20 L, which will form a small pool of leaked liquid of 2 m².

In Figure 7.26 on the situational plan of the plant, the zones of the spread of toxic concentrations of ammonia are shown in the case of a spillage of ammonia water from a flexible hose, in the amount of 20 L, freely on the surrounding ground, under unfavourable meteorological conditions (wind speed: 1.5 m/s; stable atmospheric condition: stability class F).

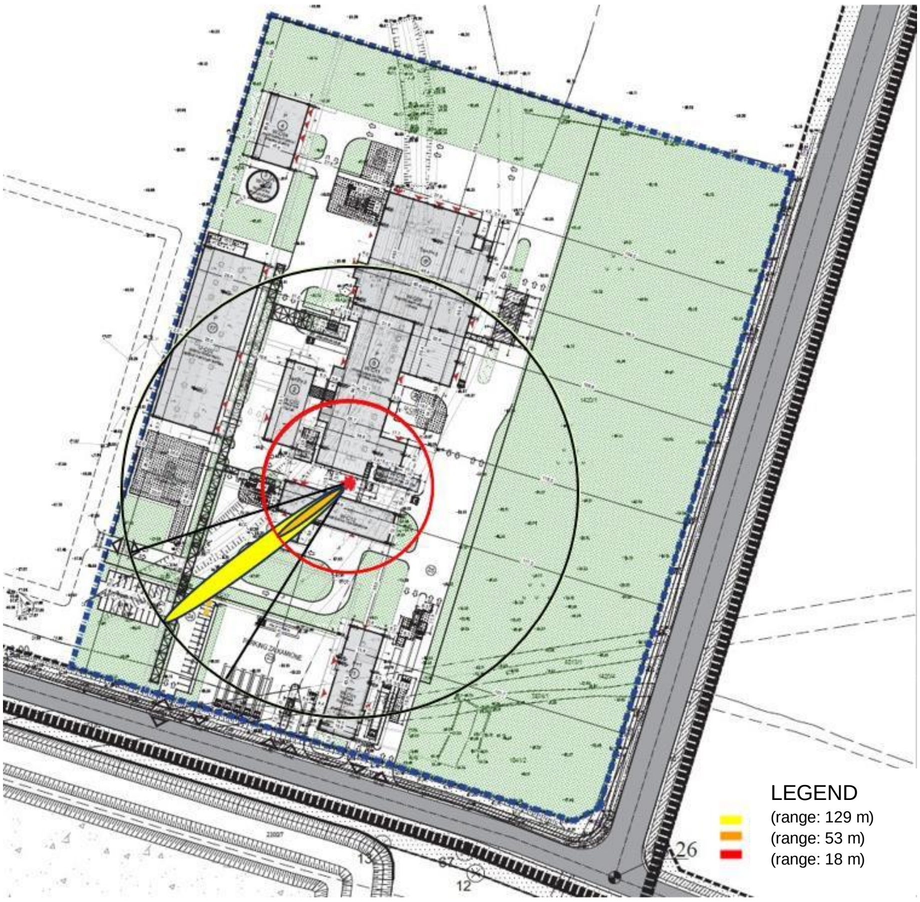


Figure 7.26 Zones of toxic ammonia vapor concentrations on the situational plan of the plant in the event of a 20 L release from a flexible hose during ammonia water transfer under stable atmospheric conditions

As in the case of a major accident, the hazards of forming hazardous zones of lethal ammonia concentrations were analysed using the Probit function, showing that in this accident, no concentrations form that lead to lethal outcomes for affected people after a 30-minute exposure.

b) Modelling chemical accidents in the ammonia water storage system

According to the project documentation, a potential accident scenario on the ammonia water storage system involves the leakage of the storage tank under certain conditions, for which a bundwall is designed to accommodate the complete contents of the tank.

The bundwall around the storage tank has three functions:
- It provides temporary collection of leaked liquid from the tank so that it can be further used after transport.
- Its geometric characteristics ensure a smaller evaporation surface for ammonia vapours (less emission) compared to, for example, complete spillage of the liquid over the surrounding surface.
- It prevents contamination of the surrounding terrain (the bundwall is made of waterproof concrete).

Input data:
- Capacity of the storage tank: 40 m^3
- Dimensions of the bundwall: 4.5 m × 4.5 m × 0.5 m
- Other data as in the previous case.

Figure 7.27 on the GIS map shows the area of significant concentrations of ammonia when the contents of the 40 m^3 ammonia water storage tank were poured into the tank bundwall.

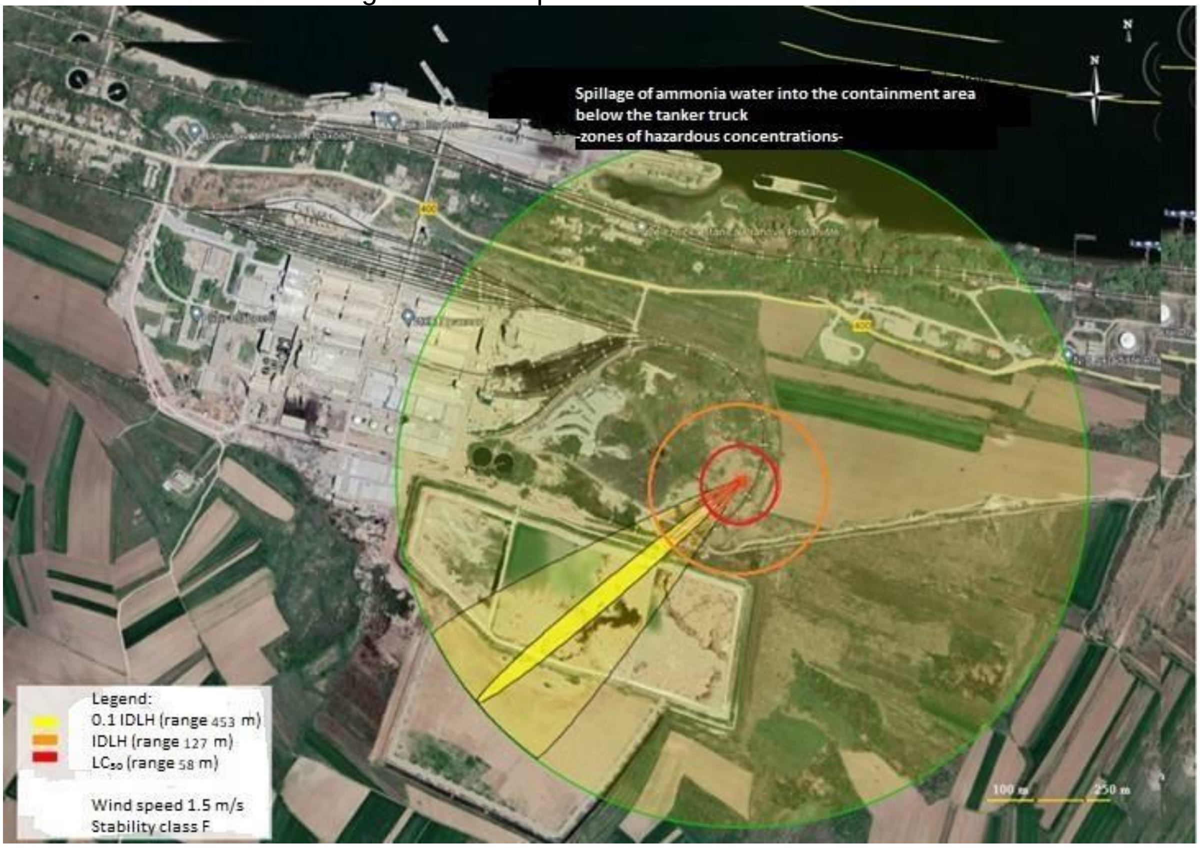


Figure 7.27 Zones of significant ammonia toxic concentration spread on a GIS map during the release of ammonia water (25%, w/w) from a storage tank of 40 m³ into a bundwall of dimensions 4.5 m × 4.5 m × 0.5 m under stable atmospheric conditions

Table 7.12 shows the distances at which the formation of dangerous concentrations with a fatal outcome is probable during the release of ammonia water (25%, w/w) from the storage tank into the bundwall of dimensions 4.5 m × 4.5 m × 0.5 m under stable atmospheric conditions.

Table 7.12 Overview of the distances at which the formation of lethal concentrations of ammonia vapor occurs, depending on the exposure time and the probability of such an outcome, in the case of an uncontrolled discharge of ammonia water in a bundwall with dimensions of 4.5 m × 4.5 m, in conditions of a stable atmosphere

Exposure Time, min	Distances from the accident site where lethal concentrations occur with a given probability, m			
	1%	10%	50%	90%
1	< 10	-	-	-
5	11	10	< 10	-
15	15	13	11	< 10
30	18	16	13	11

Note: Hazard zones for short distances (< 10 m) are not included due to the lower reliability of the software package (ALOHA^R limitations).

The modelling results for the **effect of subsequent ignition of the ammonia vapor cloud** following the release of ammonia water from the storage tank are as follows:

- The LEL and 0.5 LEL concentration zones are located at distances less than 10 m from the spill site.
- The 0.25 LEL concentration zone (II alarm threshold of the gas detection device) is located at a distance of less than 11 m from the spill site.

NH_3-Flammable region of ammonia vapor cloud

Chemical Data:
Chemical Name: AMMONIA WATER SOLUTION
Solution Concentration: 25%
Ambient Boiling Point: 36.2°C
Vapor Pressure at Ambient Temperature: 0.22 atm
Ambient Saturation: 219242 ppm or 21.9%
Hazardous Component: AMMONIA
CAS Number: 7664-41-7 Molar Mass: 17.03 g/mol
AEGL-1 (60 min): 30 ppm AEGL-2 (60 min): 160 ppm AEGL-3 (60 min): 1100 ppm
IDLH: 300 ppm LEL: 150000 ppm UEL: 280000 ppm

Atmospheric Data:
Wind: 1.5 m/s East-southeast at 2 m
Terrain Appearance: Urban or Forest Cloud Cover: 5 tenths
Air Temperature: 2°C
Stability Class: F
No Inversion Relative Humidity: 70%

Source Strength:
Evaporating Pool (Note: Flammable Chemical)
Pool Surface Area: 50 m² Pool Volume: 5 m³
Floor Type: Concrete Floor Temperature: 20°C
Initial Pool Temperature: Floor Temperature
Release Duration: 1h
Max Release Rate: 8 kg/min
Total Released Quantity: 256 kg

Hazard Zones:
Model: Gaussian
Red: less than 10 m (150000 ppm = LEL)
Orange: less than 10 m (75000 ppm)

Yellow: 11 m (30000 ppm)

- Note: Hazard zones are not drawn due to the lower reliability of dispersion width estimation at short distances.

Note: Within the Selective Catalytic Reduction (SCR) System for nitrogen oxides, a device for ammonia detection with an alarm is provided in the ammonia water mixing and distribution unit, due to potential uncontrolled ammonia vapor releases with estimated dispersion widths at very short distances. Such a situation is considered a minor accident compared to the release of ammonia water from the storage tank and is therefore not specifically addressed here.

Scenario 11 - Accidental Situations in the stabilization and solidification facility W-C12

During the stabilization and solidification process, the release of hydrogen gas may occur, which, due to its low combustion heat value, easily ignites in the air, potentially leading to a fire in this part of the facility. For this reason (identified hazard), forced ventilation is installed to **prevent hydrogen concentrations from reaching levels** that could lead to a fire in this part of the facility. Therefore, the task is to determine the critical hydrogen emission from the process that could lead to the formation of critical hydrogen concentrations in the waste stabilization and solidification system area.

Input data:
- Total capacity of forced ventilation (three fans): 15,000 m³/h
- Room volume: 6,780 m³
- Air changes per hour in the room: ~ 6/h (estimated space filling with process equipment: 60%)
- Significant hydrogen concentrations:
  - LEL: 40,000 ppm (3,305 mg/m³)
  - 0.5 LEL: 20,000 ppm (1652.5 mg/m³)
  - 0.25 LEL: 10,000 ppm (826.25 mg/m³) – II alarm threshold
  - 0.10 LEL: 4,000 ppm (330.5 mg/m³) – I alarm threshold.

Figure 7.28 shows the changes in hydrogen concentration in the waste stabilization and solidification space under forced ventilation conditions, for different hydrogen emission values.

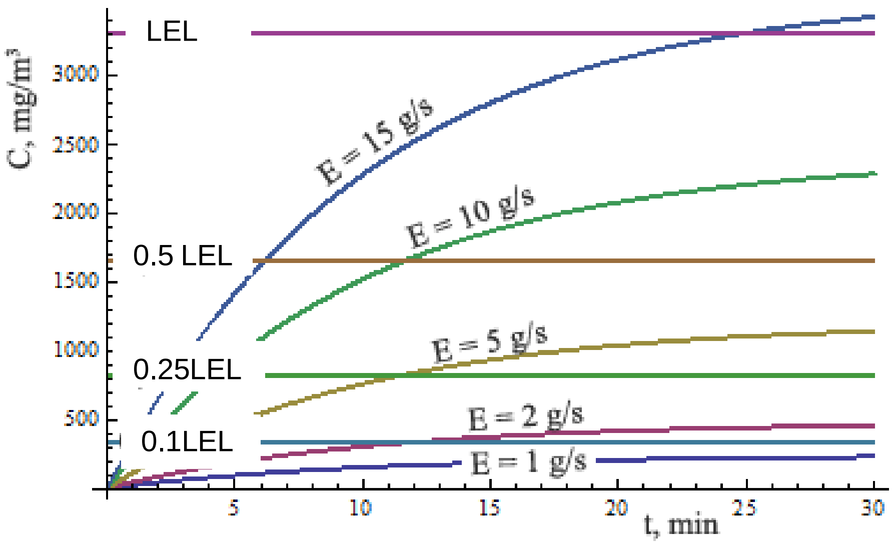


Figure 7.28 Changes in hydrogen concentration in the waste stabilization and solidification space, for different hydrogen emission values under forced ventilation conditions (15,000 m³/h)

Analysing the simulation results from Figure 7.28, it is observed that hydrogen emissions of 15 g/s and higher, which could potentially form, are responsible for forming critical concentration values leading to a fire in the system.

Scenario 12 - Modelling the effects of hazardous substance emissions in accident situations at the Waste-to-Energy facility on the Danube River

In emergency situations, when uncontrolled releases of hazardous substances into the surrounding environment occur, modelling of these situations was performed with regard to the spread of hazard zones, both within the Waste-to-Energy Plant and in the immediate and wider surroundings.
To investigate the impact of uncontrolled releases of hazardous substances during **accident situations** at the Waste-to-Energy Plant on the Danube River flow, and in accordance with the modelling results from point 7.1.3, the following emission values of hazardous substances **released into the air** were selected:

- Ammonia vapor emission during the release of ammonia water from a tanker truck (accident scenario described in point 7.1.3.1): **E ≈ 0.17 kg/s**
- Ammonia vapor emission during the release of ammonia water from the storage tank (accident scenario described in point 7.1.3.1): **E ≈ 0.13 kg/s**
- PM particle emission during the release of particulate matter from the boiler plant, following the release of PM particles through the roof into the surrounding environment (accident scenario described in point 7.1.3.7): **E ≈ 32 g/s.**
- HCl vapor emission **(E ≈ 46 g/s,** SO_2 (***E ≈ 16 g/s***) and NO_x (***E ≈ 3,9 g/s***), at forced release of flue gases from stack, without cleaning in scruber system.

For modelling pollution of the Danube River flow, a mathematical model for a continuous pollution source in rivers was applied, based on which the FATE software [Faculty of Civil Engineering, Podgorica, https://www.ucg.ac.me.objava_130961]] was developed, in the form of:

$$C(x)=\frac{E}{Q\cdot\sqrt{1+\frac{4\cdot k\cdot D_x}{v_x^2}}}e^{\frac{-v_x\cdot x}{2\cdot D_x}\left(1\pm\sqrt{1+\frac{4\cdot k\cdot D_x}{v_x^2}}\right)}$$

where:

- Q – volumetric flow rate of the river, m³/s
- D_x – coefficient of turbulent diffusion of the pollutant along the river (in the direction of the x-axis), m²/s
- v_x – average river flow velocity, m/s
- k – first-order rate constant (spontaneous degradation of the hazardous substance) during pollutant dispersion along the river, s^{-1}.

In the case of ammonia vapours, the fractions of ammonia, HCl, SO_2 and NO_x dissolving in the river surface was calculated based on the deposition velocity, whose value in this case is taken as 0.01 m/s (S.Hanna et al., *Handbook on Atmospheric Diffusion*, Oak Ridge, 1982.) – the effect of "acid rain".

In the case of particulate matter, the portion of PM reaching the Danube River was calculated based on the deposition fraction flux from the turbulent diffusion equation, based on the calculated deposition velocity of the mean PM particle diameter.

The parameter values used in the turbulent diffusion equation for calculating pollution downstream of the Danube River are as follows:

- Average Danube flow (at the Prahovo location) is approximately $4.9 \cdot 10^3$ m³/s
- Average Danube river flow velocity at this location: $\boldsymbol{v_x} \approx$ 4,6±0,94 km/h (1.28 m/s)
- The value for the turbulent diffusion coefficient $\mathbf{D_x}$ was calculated based on recommended correlation equations (Z.Ahmad, Prediction of Longitudinal Dispersion Coefficient Using Laboratory and Field Data: Relationship Comparisons, *Hydrology Research*, p.362-376, 2013.)

- The constant **k** was not considered in the calculation, assuming no degradation (chemical reaction) of the pollutant during dispersion.

Limit values (reference values) for pollutant levels in surface waters are (*Regulation on Limit Values in Surface and Ground Waters and Sediment and Deadlines for reaching them*, Official Gazette of the RS, No. 50/2012.):

- Suspended solids: 6.5 – 8.5 mg/L (for Class I and Class II); not defined for Classes II, IV, and V.
- Ammonium ion (NH4+): 0.6 mg N/L (for Class III); 1.5 mg N/L (for Class IV); >1.5 mg N/L (for Class V).
- Chlorides (Cl^-): 150 mg Cl^-/L (for Class III); 250 mg Cl^-/L (for Class V)
- NO_x (as total N): 6 mg N/L (for Class III); 15 mg N/L (for Class IV); >15 mg N/L (for Class V).

Applying the above equation to the input parameters, it is concluded that the calculated pollutant levels (PM and recalculated values of NH_3, HCl, HF, SO_2 i NO_x) are **far below the previously stated values,** meaning that **accident situations at the Waste-to-Energy Plant do not lead to pollution of the Danube River from pollutants released into the air.**

7.2.2 Vulnerability analysis - Vulnerable zones

In the vulnerability analysis in the vicinity of the Waste-to-Energy Plant and in the surrounding, vulnerable facilities in the environment within the vulnerable zones - hazard boundary, were identified.

Table 7.13 provides an overview of endangered zones for all specified accident scenarios at the location of the operator of the Waste-to-Energy Plant.

Table 7.13 Endangered zones in accident scenarios at the location of the Waste-to-Energy Plant

Number of scenario	Accident Scenario	Endangered zones
1.	Accidents at the liquid waste transfer point.	**Pool Fire:** - **heat radiation 2 kW/m2** (range: 42 m), for exposure to heat exposure of 60 s - if people react quickly with the aim of quickly leaving the fire hotspot if they are unprotected, by applying the Probit function, for the various effects of thermal radiation, it is obtained so that for the calculated contact times, the people who leave the zone of thermal action of the burning pool of waste oil **will have no consequences for their health.** **- toxic effect:** in the immediate vicinity of the Waste-to-Energy Plant, **no concentrations of LC50, IDLH and 0.1IDLH levels are formed,** for CO, NOx (as NO2), SO2 and soot, at ground level and at a height of 1.5 m from the ground (height of respiratory organs). **BLEVE tank trucks**: - maximum diameter of the fireball: ~ 44 m; maximum diameter of the fireball on the ground: 57 m - fatal casualties in the fireball zone: **radius 28.5 m**; heat radiation 2 kW/ m2 (40 m) - second-degree burns: **at a distance of 32 m**, with a probability of 20% - formation of burns of the 1st degree: at **a distance of 40 m**, with a probability of 25%, from the centre of the fireball. In addition to the thermal effect of the BLEVE effect, a shock wave may occur from the resulting overpressure as well as the blowing up of the fragments of the tank truck shell due to the resulting explosion. The spreading zones of these accompanying effects may also be outside the Waste-to-Energy Plant's area. During the transfer, a maximum of 2 employees (manipulator and tank truck driver) may be present at the transfer point.

2.	Accidents at the waste storage, i.e. in receiving bunkers or bunkers for mixing solid hazardous waste.	Concentrations of **IDLH** levels from combustion products occur in the room.
3.	Fire with fuel tanks (upstairs).	Concentrations of **LC_{50}** levels from combustion products occur in the room, i.e. the formation and lethal concentrations of several combustion products occur. during a 15 min exposure: - $D_{CO} \approx 1.66{\cdot}105 mg\,min/m^3 \rightarrow D_{CO} > LCt_{50}$ - $D_{NOx} \approx 1.38{\cdot}10^4$ mg min/m$^3 \rightarrow D_{NOx} >> Ct_{50}$ - $D_{SO2} \approx 5.54{\cdot}10^4$ mg min/m$^3 \rightarrow D_{SOx} >> PCt_{50}$
4.	Uncontrolled discharges of liquid waste from IBC containers.	***Accident scenario with toxic substances*** - Concentrations levels of **150 ppm IDLH (1027 mg/m3)** from combustion products are formed in the room in the interior of the plant, there is no formation of concentrations of type 0.1 IDLH, PEL and STEL and 40 min from the moment of liquid waste spillage), so the formed concentrations **cannot** have a **particularly harmful effect on human health in the hall**, which are away from the puddle of spilled liquid) in the zone around the plant**, there is no formation of tetrachloroethylene concentrations** that are higher than the limit values: IDLH (150 ppm), **but there is a formation of STEL level concentrations** (40 ppm), **at a distance of 11 m**, i.e. a concentration of 0.1 IDLH level (15 ppm), at a **distance of 19 m** from the ventilation discharge point at the top of the room (H≈7.6 m). ***Fuel Accident Scenario*** - **Toxic effect of combustion products:** toxic products are formed whose concentrations accumulate in the airspace of the plant to the level (concentration and higher than IDLH) and which can seriously endanger the health of present unprotected people. **- Burning pool: level 2 kW/m^2 heat radiation:** 26 m – At an exposure of at least 1 min, the following distances are considered as unprotected people: - up to 11 m from the pool may be life-threatening, - up to 16 m from the pool, they can get second-degree burns.
5.	Accident situations with waste sludge.	- Under conditions **of forced ventilation**, the concentration of CH_4 below the LEL - Under conditions of **natural ventilation**, the concentration of CH_4 above the LEL - Under conditions of proper functioning of the ventilation and methane detection system, the risk of ignition of the resulting methane is small.
6.	Accident situations on the boiler plant and natural gas installation.	**- Boiler accident:** hazardous concentrations of some contaminants (primarily HCl and PM) are formed. release of PM level 10 mg/m^3 in zone pd 347 m; **- Natural gas accidents:** - natural gas outlet: **flame jet** (1 m length) - for the stated accident conditions, there are **no conditions for subsequent ignition or explosion** of the released gas.
7.	Uncontrolled discharge of particulate matter from bag filters in the boiler plant.	When cracking two filter bags, **PM concentrations of more than 5 mg/m^3 are formed** (when operating 2 pairs of fans), and lower values of concentrations when operating 24 fans (intensive ventilation operation) even at the duration of the accident and more than 40 min. The possible impact of the pair of PM discharges from two filter-bags outside the plant area was estimated after determining the maximum PM emission into the surrounding area (during 30 min, forced ventilation) through the grille of the facility. The smoke extraction of

		the facility is carried out through 10 roof domes**. For the stated conditions in the zone around the plant, there is no formation of PM concentrations that are higher than the limit values of 5 mg/m3.**
8.	Forced flue gas discharge to the stack without cleaning in the scrubber system.	For the stated conditions at ground level and at a height of 1.5 m from the ground (approximate height of the respiratory organs in humans), at the duration of the accident situation 30 min, **no concentrations of hazardous substances of the IDLH level are formed**, when discharged via a stack
9.	Accidental situations on activated carbon dozers.	**Possibility of fire** and **accumulation of coal dust** The zone of the detonation wave caused by the explosion of the coal dust cloud – explosion can lead to damage to the process equipment inside the boiler plant.
10.	Accidents with ammonia water.	- Accident at the truck transfer station: Propagation zones for toxic concentrations of ammonia vapours: **- range 182 m (IDLH: 300 ppm (210 mg/m3))** **- range 680 m (0.1IDLH: 30 ppm (21 mg/m3)** **- subsequent ignition of cloud (Flash Fire):** the concentration zone of the level 0.25 LEL (II gas detection device alarm threshold) is located at a distance of less than 10 m from the spill site - Accident on storage tank: - **range 127 m (IDLH concentration)** For ammonia based on the Probit-function, for the probabilities of death, the following distances were calculated during the 30 min exposure: 1% at a distance of 18m 10% at a distance of 16 m 50% at a distance of 13 m 90% at a distance of 11 m **- effect of subsequent ignition of ammonia vapor clouds** concentration zones level LEL and 0.5 LEL – **10 m from the spill site** concentration zone 0.25 LEL (II gas detection device alarm threshold) – **11 m from the spill site**
11.	Accidental situations in the stabilization and solidification facility W-C12.	Possible formation **of hazardous H_2 concentrations** (LEL level) only **under conditions of high emission values** (more than 15 g/s).
12.	Modelling the effects of the emission of hazardous substances in accidental situations at the waste-to-energy plant on the watercourse of the Danube.	The calculated values of pollutants (PM and recalculated values of NH_3) are **far lower than the Limit Values (reference values) for the level of pollutants in surface waters**, which means that **in accidental situations at the waste-to-energy plant, there is no pollution of the river course of the Danube from pollutants released into the air.**

As can be seen from the presentation of the spread of endangered zones in Table 7.13, in the case of Scenario 2 and Scenario 10, the endangered zones exceed the boundaries of the Waste-to-Energy Plant, but do not reach the zones with cross-border impact on the neighboring republics of Romania and Bulgaria.

7.2.3 Assessment of consequences

The assessment is expressed in accordance with the Rulebook on the Content and Methodology of the Accident Prevention Policy, Safety Report and Accident Protection Plan (Official Gazette of the RS, no. 41/2010);

Table 7.14 Overview of possible consequences based on the Rulebook on the content and methodology of the Accident Prevention Policy, Safety Report and Accident Protection Plan (Official Gazette of the RS, no. 41/2010)

Consequence indicators	Consequences				
	of little importance	**significant**	**serious**	**high**	**catastrophic**
Number of people with fatal outcome	none	none	1-2	3-5	more than 5
Seriously injured	none	1-2	3 - 6	7-10	more than 10
Slightly injured	none	1-5	6 - 15	16-30	more than 30
A dead animals	≤0.5 t	0.5-5 t	5-10 t	10-30 t	more than 30 t
Contaminated soil	≤0.1 ha	0.1-1 ha	1-10 ha	10-30 ha	more than 30 ha
Material damage in thousands of dinars	≤100	100 - 1 000	1 000 - 10 000	10 000 - 100 000	more than 100 000

The risk of a chemical accident is determined according to the criteria *of the Rulebook on the Content of the Accident Prevention Policy and the Content and Methodology of the Safety Report and Accident Protection Plan ("Official Gazette of the RS", No. 41/2010);*

7.2.4 Determination of possible level of accident

Possible accident levels and the width of vulnerable zones for the *Elixir Craft* Waste-to-Energy Plant have been determined based on the calculated magnitudes and limits of spread of energy or pollutant (concentration of importance) for certain types of accidents.
In the event of an accident in the Waste-to-Energy plant, the limits of the toxic effect of combustion products, after fires and explosions of explosive mixtures, raw materials and finished products, as hazardous substances that can lead to accidents with the worst consequences, were analysed.
The zones of distances reached by toxic and explosive substances or the products of matter combustion in the form of vapours, gases, and aerosols, were calculated.

Possible levels of accidents are expressed in five levels, as follows:

- **Level I of the accident:** level of hazardous installations - consequences of the accident limited to a part of the plant – there are no consequences for the entire complex,
- **Level II of the accident:** level of the complex – consequences of the accident limited to the entire complex - there are no consequences outside the boundaries of the complex,
- **Level III of the accident:** the level of the municipality or city – the consequences of the accident are extended to the municipality or the entire city,
- **IV level of the accident:** regional level – the consequences have spread to the territory of several municipalities or cities;
- **Level V:** international level – the consequences have spread beyond the boundaries of the RS.

Table 7.15 Estimation of the level of accidents at the Waste-to-Energy Plant according to defined accident scenarios

Number of scenario	Accident Scenario	Accident level
1	Accidents at the liquid waste transfer point.	II
2	Accidents at the waste storage, i.e. in reception bunkers or bunkers for mixing solid hazardous waste.	I
3	Fire with fuel tanks (upstairs).	I
4	Uncontrolled discharges of liquid waste from IBC containers.	I
5	Accident situations with waste sludge.	I
6	Accident situations on the boiler plant and natural gas installation.	I
7	Uncontrolled discharge of particulate matter from bag filters in boiler plant	II
8	Forced flue gas discharge to the stack without cleaning in the scrubber system.	II
9	Accidental situations on activated carbon dozers.	I
10	Accidents with ammonia water.	III
11	Accidental situations in the stabilization and solidification facility W-C12.	II
12	Modelling the effects of the hazardous substances emission in accidental situations at the Waste-to-Energy plant on the watercourse of the Danube.	III

7.2.5 Risk assessment

The risk of an accident is determined on the basis of the occurrence and consequences probability in accordance with the Rulebook on the Content of the Accident Prevention Policy and the Content and Methodology of the Preparation of the Safety Report and the Accident Protection Plan ("Official Gazette of the RS", No. 41/10).
Thus, risk (**R**) is a function of the occurrence probability of an accident (**V**) and possible consequences (P) and can be presented as follows:

$$\mathbf{R = \mathit{f}[V,P]}$$

The risk of certain undesirable scenarios was assessed using the so-called risk matrix defined by the Rulebook on the Content of the Accident Prevention Policy and the Content and Methodology of the Safety Report and the Accident Protection Plan (Official Gazette of the RS, No. 41/2010); The matrix contains five categories of accident consequences, three categories of frequency or probability of accident occurrence and five categories of risk.
For all events in recognized facilities or activities, for which the identification of a chemical accident hazard was systematically observed, the possibility of this event and its consequences are analysed, in order to determine the risk and determine the possibility of accepting the risk.
Based on the established risk acceptability, the need for further analysis of possible consequences for the plant and the immediate environment is determined. For events where it has been determined that the risk is acceptable, it is not necessary to carry out further analyses since measures to reduce the level of risk have been taken and are being applied. Acceptable risks are in the risk matrix all those risks that are not very high risks.

The assessment of the **probability** of an accident was carried out in several ways for a large number of elements of installations, parts of installations as well as technical and technological units of the plant:

1. a historical approach was applied: statistical data on failures of individual elements of the system and assemblies of the plant system were used.
2. hazard identification and analysis of the event tree was performed in order to gain insight into possible developments of events and possible consequences of events;
3. a combined method (historical, analytical, analysis of previous events) was also used.

The assessment of the likelihood of an accident occurrence is obtained by the likelihood of the initial event occurrence by the probability of possible development of the event.

Criteria for assessing the likelihood of an accident according to the Rulebook on the Content and Methodology of the Accident Prevention Policy, Safety Report and Accident Protection Plan (Official Gazette of the RS, no. 41/2010) are shown in Table 7.16.

Table 7.16 Criteria for assessing the probability of an accident

High probability (10^0 - 10^{-1} event frequency/yr)	***Medium probability (10^{-1}- 10^{-2} event frequency/yr)***	***Low probability ($<10^{-2}$ event frequency/yr)***
• leakage of hazardous substances at pipeline joints, valves, etc. • spillage during liquid transfer and spillage of solids during manipulation • damage to unit packing of packaging and spillage of contents • leakage of liquids and spillage of solids in internal transport • leakage of gases under pressure from pipelines and other pressurized systems • created conditions for causing a fire or explosion in the hazard ZONE 2 • initial fires on installations	• cracking of the liquid material pipeline • cracking of the pressure gas pipeline • spilling of the entire contents from the liquid tank • spilling of auto and railway tanks in the complex after an accident • created conditions for fire and explosion in the hazard ZONE 1 • fire and explosion of a part of the plant • two or more high probability accidents at one location at the same time	• cracking of the transport vessels • cracking of the storage vessel • fire of the entire plant • fire of the entire storage • explosion of the entire plant • explosion of the entire storage • created conditions for fire and explosion in the hazard ZONE 0 • two or more medium probability accidents in one location at the same time

Table 7.17 Estimated risk based on the criteria of probability of accident and possible consequences for the seveso plant.

Probability of accident	**Consequences**				
	of minor importance	**significant**	**serious**	**high**	**catastrophic**
low	negligible risk	low risk	Medium risk	high risk	**very high risk***
medium	low risk	medium risk	big risk	**very high risk***	**very high risk***
strong	medium risk	big risk	**very high risk***	**very high risk***	**very high risk***

* risk is not acceptable

When assessing the acceptability of the risk of an accident for the said Waste-to-Energy Plant it was started from the probability of occurrence of the accident situations themselves as well as from the possible consequences, and the largest possible number of vulnerable facilities that may be present in vulnerable zone during the accident for each of the model scenarios was taken into account.

If the risk is not acceptable, the operation of the plant with this level of risk is not acceptable, and the plant operator is obliged to introduce additional technical and technological and other protection measures on the facilities, technological process, equipment and in the organization of the safety and work system, in order to reduce it to the limits of acceptability. Additional protection measures must be defined and designed by amendments to the technical documentation of the plant in question, after a reasoned analysis of the application and incorporated into the *Accident Protection Plan*. Based on the defined and designed additional measures, it is necessary to reassess the risk of a chemical accident.

The following table provides an overview of the risk assessment at the Waste-to-Energy Plant for the defined accident scenarios and in accordance with the criteria shown in Table 7.18.

Table 7.18 Assessment of the risk of accidents at the waste-to-energy plant according to defined accident scenarios

Overview of accident scenarios	Probability	Consequences	Risk
1. Accidents at the liquid waste transfer point.	low	serious	medium risk
2. Accidents at the waste storage, i.e. in reception bunkers or bunkers for mixing solid hazardous waste.	low	significant	low risk
3. Fire with fuel tanks (upstairs).	low	significant	low risk
4. Uncontrolled discharges of liquid waste from IBC containers.	medium	significant	medium risk
5. Accident situations with waste sludge.	low	significant	low risk
6. Accident situations on the boiler plant and natural gas installation.	medium	significant	medium risk
7. Uncontrolled discharge of particulate matter from bag filters in the boiler plant.	medium	of little importance	low risk
8. Forced flue gas discharge to the stack without cleaning in the scrubber system.	medium	of little importance	low risk
9. Accidental situations on activated carbon dozers.	low	significant	low risk
10. Accidents with ammonia water.	medium	significant	medium risk
11. Accident situations in the stabilization and solidification facility W-C12.	low	significant	low risk
12. Modelling the effects of the hazardous substances emission in accidental situations at the waste-to-energy plant to the watercourse of the Danube.	medium	of little importance	low risk

The risk of a chemical accident, which according to the criteria of the reference Rulebook on the content and methodology of the development of Accident Prevention Policy, Safety Report and

Accident Protection Plan (Official Gazette of the RS, no. 41/2010) expressed as: negligible, low, medium, high and very high risk, for the *W*aste-to-Energy plant was assessed as MEDIUM RISK.

7.3 Accident Hazard Analysis - Identification of Hazards at the Landfill for Non-hazardous Waste (solidificate)

The Landfill for non-hazardous waste is designed for the disposal of previously stabilized and solidified residues from thermal waste treatment plants that are generated as a product of the waste-to-energy process. The description of solid residues formation and the stabilization and solidification process to be carried out within the Waste-to-Energy Plant and the method of obtaining non-hazardous or non-reactive hazardous waste that can be disposed of as such at the Landfill for non-hazardous waste in question are described in detail in Chapter 3 of this Study.

As part of the Landfill for non-hazardous waste, the Project Holder ELIXIR CRAFT DOO, the Eco Energy branch, will perform the operation of waste disposal from the D list in accordance with the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", No. 56/2010, 93/2019 and 39/2021).

D5 Disposal of waste in specially designed landfills (e.g. disposal of waste in linearly arranged covered cassettes, mutually isolated and isolated from the environment)	Disposal of solid residues in the form of a stabilized solidificate at the Landfill for non-hazardous waste

The characteristics of the solidificate to be disposed of at the Landfill for non-hazardous waste, which is generated as a product of physical and chemical treatment within the Waste-to- Energy Plant, must be in accordance with the criteria defined by the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", Nos. 56/2010, 93/2019 and 39/2021): Disposal of non-reactive hazardous waste at Landfills for non-hazardous waste, by Regulation on waste disposal at landfills ("Official Gazette of the RS", no. 92/2010) and EU Landfill Directive: (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste); In order to achieve this, the first step in the solid residue treatment process is the magnetic separation process, followed by the induced magnetic (eddy current) separation of bottom ash, and the second step is the stabilization (prevention of uncontrolled reactions) and solidification (curing) process. The aim of the treatment is to process solid residues from the boiler plant and obtain material that is formed at the landfill into a material with high mechanical strength, low permeability and encapsulated pollutants, i.e. low leaching rate. The separated solid fraction of concrete and stone is combined with other residues from the boiler plant in the stabilization and solidification facility, since it is recognized that non-hazardous bottom-ash has excellent binding characteristics of other materials by having an adequate specific surface area, and as such is a desirable factor in the solidification recipe. During the process of stabilization of solid residues, which lasts 7-14 days, reactions occur in which hydrogen is separated, the reaction of chromium reduction (Cr(VI)), etc. When sprinkling waste material, aluminium, possibly present in solid residues from the boiler plant, reacts with H_2O catalysed by carbonates, whereby hydrogen (H_2) is separated. Precisely because of the above, it is envisaged that in the first step of the treatment of bottom-ash, the separation and segregation of aluminium on the eddy-current separator is performed. In the described manner, the possibility of forming an explosive hydrogen mixture at the Landfill for non-hazardous waste is also reduced. This method makes it possible to bring all reactions to an end under controlled conditions and thus protect the integrity of the later formed solidificate, which would otherwise be susceptible to cracking due to the release of gases in residual reactions. The preservation of the crystal lattice of the material achieved in this way is an important factor to prevent leaching of water contaminants in contact with the solidificate.
In accordance with the above, it can be concluded that the conditions for the separation of flammable and explosive gases such as H_2 and CH_4 will not be created at the Landfill for non-hazardous waste in question.

Within the subject Landfill for non-hazardous waste, as described in Chapter 6 of the Study environmental impacts may occur, of a temporary nature, in the form of raising dust from the landfill surface and the occurrence of leachate and stormwater. By applying the designed protection measures, all potential impacts of the regular operation of the landfill are minimized and will be practically negligible.

Environmental pollution can occur in the event of an accidental situation of contaminants migration from the Landfill for non-hazardous waste and leakage of contaminated water from the Landfill for non-hazardous waste into the aquifer, which can lead to pollution primarily of groundwater and secondary of surface waters of the Danube River.

In order to show the possible consequences of the aforementioned accident scenario and risk assessment, a modelling of the accident scenario of contaminants migration from the Landfill for non-hazardous waste was performed, the results of which are presented below.

7.4 Analysis of accident consequences at the Landfill for non-hazardous waste

Scenario 1 - Migration of contaminants from Landfill for non-hazardous waste

Scenario description:
Cracking of the HDPE film and direct contact of the contaminant with the soil.

At the Landfill for non-hazardous waste, molecular diffusion of two saturated layers occurs, in conditions where there is no flow, so that the transport of the contaminant occurs due to flux from the higher concentration zone to the lower concentration zone. The first layer contains high concentrations of internal/non-reactive ions (with a geological environment), and the second layer is a clay layer, saturated with water, just below solid waste. The arrival of leachate with a high concentration of internal substance in contact with steam water in the clay leads to diffusion in the clay layer.

Diffusion takes place according to the expression:

$$C_i(x,t) = C_0 erfc\left(\frac{x}{2\sqrt{D^* t}}\right)$$

where: Ci – concentration at distance x from the source at time t from the start of diffusion (mg/l),
C_0 - initial concentration, which remains constant,
D – diffusion coefficient (m^2/s)

The diffusion coefficient for most macrocomponents ranges from $1x10^{-10}$ to $2x10^{-9}$ m^2/s (according to Robinson, Stokes,). By adopting values:
- Diffusion coefficient $1x10^{-9}$ m^2/s,
- Coefficient of streamline curvature – 0.5
- Distance 5, 10, 15 and 20 m
- Periods 10, 20, 50 and 100 years

The calculation of the C/C_0 ratio was performed for different time periods and distance. The results are shown in the table 7.19.

Table 7.19 C/C_0 Calculation Results [in %]

C/C_0 [%]	Time [years]			
Distance [m]	10	20	50	100
5	5.40E-17	3.06E-08	0.0068	0.49
10	6.21E-69	2.34E-34	1.60E-13	1.79E-06
15	6.80E-155	1.45E-77	6.85E-31	2.99E-15
20	8.36E-276	6.11E-138	4.09E-55	2.01E-27

Based on the above, it can be concluded that it takes more than 100 years for the concentrations at a distance of 5 m to be 0.5 percent of the initial value. By increasing the distance, as well as the time, this value becomes negligibly small. In the presented case, it is clearly evident that diffusion is not a rapid process and is the prevailing mechanism of transport of contaminants in conditions of poorly permeable to watertight formations.

Scenario 2 - Leakage of contaminated leachate from the Landfill for non-hazardous waste into the aquifer, causing groundwater contamination

The scenario of leakage of contaminated water from the Landfill for non-hazardous waste into the aquifer, causing contamination of groundwater, and consequently their drainage into the Danube watercourse, represents the most unfavourable possible accident scenario of the movement of contaminated groundwater, which has reached the groundwater level and is still transported by advective transport.

The degree of discharge of the contaminant is constant, and the mass of the pollutant released in the aquifer is proportional to the duration of the discharge. The initial concentration of the dissolved pollutant at the initial moment is zero, and the concentration of the dissolved pollutant is C_0. In such a case, the second type of boundary condition (Fetter 1999) applies:

$$C(x,t) = \frac{C_0}{2}\left[erfc\left(\frac{x-vt}{2\sqrt{D_L t}}\right)\right]$$

By adopting values:
-internal contaminant (chloride - Cl) at a concentration of 15000 mg/l (what is the permissible limit value of the leachate at the Landfill for non-hazardous waste),
- gravel filtration coefficient Kf= $5x10^{-4}$ m/s,
- hydraulic gradient towards the Danube i=0.007,
- effective porosity of 0.3, and
- estimated effective diffusion coefficient of $1x10^{-9}$ m^2/s.

The calculation was carried out for distances of 125, 250 and 500 m (which is the limit of the contaminant reach to the Danube) in the direction of the watercourse. The time section is set aside for periods of ½ year, 1 year and 2 years. The results of the chloride transport concentration are shown in Table 7.20.

Table 7.20 Chloride transport concentrations at given distances compared to the elapsed time.

Conc. (Cl) [mg/l]	Time [years]		
Distance [m]	0.5	1	2
125	13744.0	14999.6	15000
250	1413.8	14273.6	14999.9
500	0	801.7	14686.5

The obtained results shown in Table 7.20 refer to the hydrodynamic dispersion of the inert tracer (chloride) so that the processes of sorption, i.e. retardation are not included, which is common when metals are involved, which have a high sorption capacity, and thus there is a significant attenuation of the pollutant.

In the case of transport of cadmium (Cd) with a value of 1 mg/l (1000 ppb) which corresponds to the concentration limit value in the leachate for the disposal of non-reactive hazardous waste. The distribution coefficient
Kd = 75 ml/g, at pH=6.8 the value of the retardation coefficient is R=539.5 (USEPA 1996c) for soil bulk density 2.65 g/ cm^3 and porosity 0.3.

By applying the analytical solution of the differential equation of hydrodynamic dispersion with retardation, it is stated, without degradation:

$$C(x,t) = \frac{C_0}{2}\left[erfc\left(\frac{R_a x - vt}{2\sqrt{R_a D_L t}}\right)\right]$$

The heavy metal migration values shown in Table 7.21 are obtained, which have incomparably lower migration values.

Table 7.21 Cadmium transport concentrations at pH 6.8 with a retardation of 1 mg/l (1000 ppb) at given distances compared to the elapsed time

Conc. (Cd) [ppb]	Time [years]		
Distance	0.5	1	2
5	0	2.02E-7	9.85E-2
10	0	0	4.76E-6
20	0	0	0

The results obtained reflect the high affinity of cadmium and other heavy metals to be sorbed for solid particles of the geological environment (especially clay), which causes a significant slowdown (retardation) of the contaminant. In the event of a change in pH, the retardation coefficient would decrease and thus there would be some acceleration of cadmium transport. Thus, for example, for pH=4.9, the retardation coefficient is R=108.7, so for the above scenario, the values shown in Table 7.22 would be obtained, which are higher than in the previous case, with a value that is almost 500 times lower than the initial one at 20 m after 2 years.

Table 7.22 Cadmium transport concentrations at pH 4.9 with a retardation of 1 mg/l (1000 ppb) at given distances compared to the elapsed time

Conc. (Cd) [ppb]	Time [years]		
Distance [m]	0.5	1	2
5	1.18	146.9	791.95
10	3,59E-4	2.63	167.61
20	0	1,68E-4	2.03

In order to understand more clearly the extent to which the retardation of heavy metals, i.e. cadmium – Cd, occurs, a hypothetical case of transport of cadmium (Cd) with a value of 10 mg/l (1000 ppb) was considered, which is 10 times higher than the allowed value for leachate from the Landfill for non-reactive hazardous waste. The distribution coefficient Kd = 75 ml/g, at pH=4.9 the value of the retardation coefficient is R=108.7 for a soil bulk density of 2.65 g/cm^3 and a porosity of 0.3. Table 7.23 shows the results of cadmium transport concentrations.

Table 7.23 Cadmium transport concentrations at pH 4.9 with a retardation of 10 mg/l (1000 ppb) at given distances compared to the elapsed time

Conc. (Cd) [ppb]	Time [years]		
Distance [m]	0.5	1	2
5	11.82	146.9	791.95
10	3,59E-3	2.63	167.61
20	0	1,68E-4	2.03

Based on the conducted calculation, with hypothetically very high concentrations, as well as the pH of the environment, significantly less favourable than the real one, it can be concluded that the migration of Cd at a concentration of 10 mg/l, will reach a concentration of 0.012 mg/l, at a distance of 5 m, after half a year, while in two years it will reach a concentration of 0.792 mg/l at the same distance of 5 m. Based on the above, it can be concluded that high concentrations of cadmium will not significantly affect the migratory ability, given its high sorption affinity.

CONCLUSION:

Analysing the above, the likelihood of an accident occurring at the location of the Waste-to- Energy Plant is LOW and MEDIUM.
Analysing the magnitude of the possible consequences of accidents within the Waste-to-Energy Plant, they can be OF LOW SIGNIFICANCE, SIGNIFICANT OR SERIOUS.
The risk of an accident at the Waste-to-Energy Plant was assessed as a MEDIUM RISK, and taking into account the designed prevention measures, as well as the accident response measures that will be implemented and the overall work in the safety management system at the location in question, this risk is ACCEPTABLE, i.e. it is possible to manage this risk.

Analysing the above, the likelihood of an accident occurring at the location of the Landfill for non-hazardous waste was assessed as LOW. Analysing the magnitude of possible consequences due to accidents within the Landfill for non-hazardous waste, they may be OF LOW SIGNIFICANCE. The risk of an accident at the Landfill for non-hazardous waste was assessed as A LOW RISK, and taking into account the designed prevention measures to be implemented and the overall work in the safety management system at the site in question, this risk is ACCEPTABLE, i.e. it is possible to manage this risk.
A complete description of all designed prevention measures, as well as accident response measures that will be implemented and the overall work in the safety management system at the subject location of the Waste-to-Energy Plant and Landfill for non-hazardous waste is given in Chapter 8.2 of this Study.

8.0. DESCRIPTION OF THE MEASURES ENVISAGED TO PREVENT, REDUCE AND, WHERE POSSIBLE, ELIMINATE ANY SIGNIFICANT ADVERSE IMPACT ON THE ENVIRONMENT

Protection measures to prevent the possible negative impact of the planned projects on the environment represent one of the most important parts of the Study, since they enable the competent inspection authority to control the implementation of the project and possible intervention in case of non-compliance with the defined legal obligations and environmental protection measures by the Project Holder.

By analysing the possible adverse effects of the planned Eco Energy complex construction project on the environment, certain measures and procedures can be identified that have been taken and that will provide the necessary conditions, which enable the impact of the project in question to be reduced to the limits of acceptability. For the project in question, the characteristics of the natural environment and the existing state of the environment were considered, along with the technical and technological characteristics of the planned activities, thus reducing environmental degradation and preventing possible adverse impacts on the environment.

The necessary measures to reduce or prevent adverse impacts can be systematized into the following categories:

1. Measures provided for by law and other regulations, norms and standards and deadlines for their achievement;
2. Measures to be taken in the event of an accident;
3. Environmental protection plans and technical solutions (recycling, treatment and disposition of waste materials, reclamation, remediation, etc.);
4. Other measures that may affect the prevention or reduction of harmful effects on the environment:
   - Protection measures during the construction of the project
   - Protection measures during the regular operation of the project
   - Protection measures in case of termination of use or removal of the project.

8.1 Measures provided for by law and other regulations, norms and standards and deadlines for their implementation

To reduce possible negative impacts during the construction and operation of the plant in question, and to ensure environmental protection within acceptable limits, all the usual protection measures provided by law will be applied. The measures envisaged by laws and other regulations include the application of norms and standards in the design, selection, and procurement of equipment for the proposed technological process. Additionally, technical measures will be implemented for the planned activities of waste-to-energy process, mechanical pretreatment of waste to be thermally treated, physical and chemical treatment of residues from the boiler plant, disposal of S/S waste at the Landfill for non-hazardous waste, as well as all accompanying activities.

In accordance with the requirements of the Law on Planning and Construction ("Official Gazette of the RS", no. 72/2009, 81/2009 - corr., 64/2010 - CC, 24/2011, 121/2012, 42/2013 - CC, 50/2013 - CC, 98/2013 - CC, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law, 9/2020, 52/2021, 62/2023) and the Rulebook on the content, manner and procedure of preparation and manner of control of technical documentation according to the class and purpose of facilities ("Official Gazette of the RS", 96/2023):

- The Project Holder prepared the Preliminary Design and obtained **the Reports on the performed expert control of the Preliminary Design of the Construction of the Waste-to-Energy Plant and the Preliminary Design of the phase construction of the Landfill for non-hazardous**

waste[72]. In accordance with the aforementioned Reports, the Audit Committee of the Ministry of Construction, Transport and Infrastructure assessed that the technical documentation was complete and that it was accepted.

- The Project Holder is obliged to develop the Construction Permit Design (CPD) and its development is in progress, provide technical control of the project and, after obtaining the consent for the environmental impact assessment study, submit an application to the Ministry of Construction, Transport and Infrastructure for the issuance of a Construction Permit **for the construction of a waste-to-energy plant.** This is all in accordance with the Location Requirements issued by the Ministry of Construction, Transport, and Infrastructure, no. ROP-MSGI-32562-LOC-1/2023 of 22 November 2023, and the conditions of other competent authorities:
- Copy of the plot plan no. 952-04-155-21149/2023 of 12 October 2023, Republic Geodetic Authority, Real Estate Cadastre Service Negotin;
- Copy of the cadastral plan of lines no. 956-309-25298/202 of 11 October 2023, Republic Geodetic Authority Real Estate Cadastre Sector, Department for Lines Cadastre Niš;
- Water conditions of the Ministry of Agriculture, Forestry and Water Management no. 325-05-1/210/2022-07 of 14 November 2022 and notice no. 285878 2023 14843 000 000 000 001 of 7 November 2023;
- Requirements regarding fire and explosion protection measures no. 217-8864/23 of 11/04/2023 217-8865/23 of 13 October 2023, Ministry of the Interior, Emergency Situations Sector, Emergency Situations Department in Bor;
- Certified certificate, September 2023, MoI;
- Conditions of the public utility company "Badnjevo" Negotin no. 2962-06/2023-1 of 20 October 2023;
- Conditions of the Institute for Nature Protection no. 03 br. 021-3738/2 of 10 November 2023;
- Conditions of the Civil Aviation Directorate of the Republic of Serbia no. 4/3-09-0222/2022-0002 of 03.11.2022 and no. 4/3-09-0322/2023-0002 of 17 October 2023;
- Terms of Elektrodistribucija Srbije d.o.o. Belgrade, Branch Office Elektrodistribucija Zaječar, no. 2540400-D-10.08-452295/2-2023 dated 23 October 2023;
- Terms of Elektromreža Srbije no. 130-00-UTD-003-1393/2023 of 20 October 2023;
- Terms of Srbijagas no. 06-07-11/3213-1 of 31 October 2023;
- Terms of Telekom Srbija no. D211–442574/2–2023 of 13 October 2023.

- The Project Holder is obliged to develop the Construction Permit Design (CPD), which is currently in progress, provide technical control of the project, and, after obtaining consent for the environmental impact assessment study, submit an application to the Ministry of Construction, Transport, and Infrastructure for the issuance of a Construction Permit for the construction of the **Landfill for non-hazardous waste**. This must be done in accordance with the Location Requirements issued by the Ministry of Construction, Transport, and Infrastructure, No. ROP-MSGI-27919-LOCA-7/2023 of 18 August 2023, as well as the conditions set by other competent authorities:
  - Copy of the plot plan no. 952-04-155-21149/2023 of 12 October 2023, Republic Geodetic Authority, Real Estate Cadastre Service Negotin;
  - Water conditions of the Ministry of Agriculture, Forestry and Water Management no. 325-05-13/125/2023-07 of 17 August 2023;
  - Opinion of the Public Water Management Company Srbijavode 7615/1 of 25 July 2023;
  - Opinion of the Environmental Protection Agency no. 325-00-00001/252/2023-02 of 25 July 2023;

[72] Report on the Expert Review of the Peliminary Design for the Construction of a Waste-to-Energy Facility, Ministry of Construction, Transport, and Infrastructure, No. 000186359 2024 14810 005 000 000 001 of March 26, 2024, and Report on the Expert Review of the Preliminary Design for the Phase Construction of the Landfill for non-hazardous waste, Ministry of Construction, Transport and Infrastructure, no. 000186359 2024 14810 005 000 000 001 of August 06, 2024

- Opinion of the Republic Hydrometeorological Institute no. 922-1-223/2022 of 1 November 2022 and no. 922-1-130/2023 of 21 July 2023;
- Conditions of the Institute for Nature Protection no. 03 br. 021-2591/2 of 3 August 2023;
- Terms of Elektromreža Srbije no. 130-00-UTD-003-1399/2023 of 14 November 2022;
- Conditions of the public utility company "Badnjevo" Negotin no. 3296-06/2022-1 of 04.11.2022 and no. 953-06/2023-1 of 13 April 2023;
- Notice No. 217-6494/23 of 27 July 2023, Ministry of the Interior, Emergency Situations Sector, Emergency Situations Department in Bor, Preventive Protection Department;
- Notification of Srbijagas no. 06-07-11/3321 of 27 October 2022;
- Terms of Telekom Srbija no. D211–430019/2–2022 of 20 October 2022.

- To determine the suitability of facilities for use, preliminary tests and inspections shall be conducted on installations, devices, plants, stability or safety of the facility, devices and facilities for environmental protection, fire protection devices or other tests, in the manner provided for in the technical documentation, during the previously approved trial operation and shall inform the competent authority thereof without delay. The probationary period may last a maximum of one year. It is the obligation of the Project Holder to monitor the results of the trial operation.

- When performing the trial operation of the plant, perform warranty measurements and prove energy efficiency according to the project documentation and according to the requirements of BATC WI (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration), BAT 20, Table 2.

- Upon completion of all the aforementioned works, the Project Holder shall obtain the **Certificate of occupation** for the subject facilities no later than five years from the date the building permit decision becomes final.

In accordance with the provisions of the Law on Integrated Prevention and Control of Environmental Pollution ("Official Gazette of the RS", No. 135/2004, 25/2015, and 109/2021) and the Regulation on the types of activities and facilities for which an integrated permit is issued ("Official Gazette of the RS", No. 84/2005), it is the obligation of the Project Holder, after the probationary period and obtaining the Operating Permit, and before the commencement of operations, to submit an application for the issuance of an integrated (IPPC) permit for the following activities:

"*5. Waste management*

5.1. Installations intended for the disposal or reuse of hazardous waste with a capacity exceeding 10 tons per day[2]

5.2. Municipal waste incineration plants with a capacity exceeding 3 t/h[3]

5.3. Non-hazardous waste disposal facilities with a capacity of over 50 tons per day[4]

[2] As defined in the list referred to in Article 1 (4) of Directive 91/689/EEC and as defined in Annex IIA and Annex IIB (operations R1, R5, R6, R8 and R9) to Directive 75/442/EEC and in Council Directive 75/439/EEC of 16 June 1975 on the disposal of waste oils.

[3] As defined in the Council Directive 89/369/EEC of 8 June 1989 on the prevention of air pollution from new municipal waste incineration plants, as well as in Council Directive 89/429/EEC of 21 June 1989 on the reduction of air pollution from existing municipal waste incineration plants.

[4] As defined in Annex IIA to Directive 75/442/EEC, under headings D8 and D9."

In addition to the above, the Integrated Permit for the plant in question will be obtained in accordance with the following regulations:

- Law on Environmental Protection ("Official Gazette of the RS", No. 135/2004, 36/09 and 36/2009 - other law, 72/2009 - other law and 43/2011 – CC decision, 14/2016 and 95/2018 and 94/2024 – other law);
  - Regulation on criteria for determining the best available techniques, for applying quality standards, as well as for determining emission limit values in an Integrated Permit ("Official Gazette of the RS", No. 84 of 4 October 2005);

- Rulebook on the content, appearance and manner of filling in the application for the issuance of an integrated permit ("Official Gazette of the RS", no. 30 of 11 April 2006, 32 of 30 March 2016, 44 of 8 June 2018 - other law, 4 of 19 January 2024);
- and other relevant environmental regulations.

8.1.1 Measures envisaged within the Waste-to-Energy Plant

- Waste treatment is carried out using the best available techniques and technologies (Article 37 of the Law on Waste Management):

- The Waste-to-energy plant was designed based on the technology of the Austrian company "TBU Stubenvoll" GMBH, which has proven references with plants of a similar type throughout Europe. The applied technology **complies with the highest EU standards and BAT**:
    - Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C (2019) 7987) – **Conclusions on the best available techniques for waste incineration**
    - Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C (2018) 5070) (Text with EEA relevance.) – **Conclusions on best available techniques for waste treatment**
    - European Commission, Reference Document on Best Available Techniques on Emissions from Storage, July 2006 – **Best available techniques on Emissions from Storage**
    - JRC Reference Report on **Monitoring of Emissions to Air and Water from IED Installations**, Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control), 2018.

The treatment of waste materials (hazardous and non-hazardous waste) will be carried out in accordance with the following legal acts:

- Law on Waste Management (Official Gazette of the RS, No. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023);
- Law on Packaging and Packaging Waste (Official Gazette of the RS, No. 36/09, 95/18);
    - Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021);
    - Rulebook on the form of the document on the movement of hazardous waste, the form of prior notification, the manner of its delivery and the instructions for their completion ("Official Gazette of the RS", No. 17/2017);
    - Rulebook on the Form of Documents for Waste Movement and Instructions for Completion ("Official Gazette of the RS", No. 114/13);
    - Rulebook on the form of Daily Records and Annual Report on waste with instructions for its completion ("Official Gazette of the RS", No. 7/2020 and 79/2021);
    - Rulebook on the Conditions, Methods, and Procedures for Waste Oil Management ("Official Gazette of the RS", No. 71/2010);
    - Regulation on the Method and Procedure for Managing Sludge from Municipal Wastewater Treatment Plants ("Official Gazette of the RS", No. 103/2023);
    - Regulation on the Manner and Procedure for Managing Construction and Demolition Waste ("Official Gazette of the RS", No. 93/2023, 94/2023 - Corr.).

In accordance with Article 26 of the Law on Waste Management, the waste producer (defined as an entity whose activity generates waste or whose prior treatment, mixing, or other procedures result in a change in the composition or nature of the waste), in this case, the Elixir Craft Project Holder, Eco Lager Branch, is also required to undertake the following activities:

- Develop a **Waste Management Plan** in accordance with Article 15 of the Law and organize its implementation if the annual production exceeds 100 tons of non-hazardous waste or 200 kilograms of hazardous waste;
- Obtain a report on the testing of waste from authorized and accredited laboratories, renew it

in the event of a change in technology, a change in the origin of raw materials, or other activities that might affect the characteristics of the waste, and retain the report for five years. After this period, the obligation is to obtain a new waste testing report;
- Ensure the application of the principles of the Waste Management hierarchy;
- Collect the generated waste separately and sort it according to the need for future treatment;
- Temporarily store waste in a way that does not affect human health and the environment and provide conditions to avoid mixing of different types of waste, as well as mixing of waste with water;
- Perform start-up/shut-down operations in such a way that the first/last waste introduced into the boiler contains a minimum amount of organic halogens;
- Hand over the waste to a person authorized to manage it if waste management cannot be organized in accordance with the Law;
- Keep records of waste generated, handed over or disposed of;
- Designate a person responsible for waste management;
- Enable the competent inspector to control the locations, facilities, plants and documentation.
- The waste producer may either manage waste treatment independently or must transfer it to another legal entity or entrepreneur engaged in waste treatment activities. Alternatively, waste may be handled through an intermediary, waste trader, public utility company, public-private partnership, or exported if there is no facility for treating the specific waste in the Republic of Serbia.

In accordance with Article 29 of the Law on Waste Management, the operator of the waste treatment plant (mechanical, waste thermal treatment and physical and chemical treatment of waste), in this case the Project Holder is obliged to:
- Draw up the **Plant Working Plan** as specified in Article 16 of the Law, and ensure its implementation and updating (every three years, as well as in the event of significant operational changes to the plant);
- Develop an accident protection plan in accordance with the Law;
- Obtain a waste treatment permit and perform waste treatment activities in accordance with that permit;
- Publish a list of waste for the treatment of which it is authorized;
- Operate the waste treatment equipment and plant in accordance with the relevant technical instructions;
- Secures waste and protects it from scattering and leakage;
- In the event of an accident, notify the competent authority without delay in accordance with the Law;
- Keep records of waste in accordance with the Law;
- Designate a qualified person responsible for professional work in the waste treatment plant;
- Charges for waste treatment services in the plant;
- Enable the competent inspector to supervise the locations, facilities, plant and documentation.

In accordance with Article 41 of the Law on Waste Management ("Official Gazette of RS", no. 36/2009, 88/2010, 14/2016, 95/2018 - other law and 35/2023) and Article 7 of the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", no. 103/2023) Until obtaining an integrated IPPC permit, the Project holder is obliged to obtain from the competent Ministry of Environmental Protection, Waste Management Department, a permit for thermal treatment of waste by incineration, which, in addition to the prescribed working conditions, also contains the following:

1) types of waste that can be treated in accordance with a special regulation on categories, testing and classification of waste, if possible with data on the amount of each type of waste;
2) the total capacity of the incineration or co-incineration plant;
3) emission limit values;

4) data on pH values, temperature and discharge of wastewater discharge, flow and all other wastewater quality parameters, required water conditions by the competent authorities;
5) the method of measurement and the sampling and measurement deadlines to be followed in order to comply with the conditions for monitoring emission limit values;
6) maximum allowed operating time in periods of technical interruptions of work or failure of pollution control and monitoring devices, i.e. transitional periods for the operation of the plant and its parts, as well as measures for interruption of work in accidental situations;
7) data on the highest and lowest ignition points of waste to be thermally treated, the highest and lowest calorific values of waste, the maximum content of polychlorinated biphenyls, chlorine, sulfur, heavy metals and other substances emitted by the plant;
8) data on the method of measuring the release of emissions into the air;
9) average composition of mixed municipal waste intended for incineration.

- The project defines that waste cannot be temporarily stored at the location of the waste producer /owner for more than 36 months, after the expiration of which the waste must be handed over for treatment, i.e. reuse or disposal (Article 36 of the Law on Waste Management).

- It is envisaged that non-hazardous and hazardous waste whose storage and treatment is planned at the location in question must be stored and treated in the prescribed manner and treated in accordance with the following provisions ***of the Rulebook on the conditions and manner of collection, transport, storage and treatment of waste used as secondary raw material or for obtaining energy ("Official Gazette of the RS", No. 98/2010):***

  - The storage of waste to be used for a secondary raw material or to obtain energy shall be carried out in such a way as to ensure the protection of the environment and human health.
  - Person collecting waste used for secondary raw material or to obtain energy:
    1) take over waste used for secondary raw material or to obtain energy from the waste owner;
    2) keep records of the collected and handed over quantities of waste used as secondary raw material or to obtain energy.
  - The waste storage used for secondary raw material is designed as a closed type storage, fenced and under constant supervision.

  - Waste cannot be stored in the area or on surfaces not intended for storage.
  - A waste storage facility used for secondary raw material or to obtain energy is designed as a storage specifically to include:
    1) a stable and impermeable substrate with adequate protection against atmospheric influences;
    2) an accident prevention system;
    3) a system for the complete controlled reception of atmospheric water from all manipulative surfaces;
    4) fire protection system in accordance with special regulations.

Hazardous waste is classified according to the origin, characteristics and composition that make it hazardous, in accordance with the regulation governing the category, testing and classification of waste. Hazardous waste whose storage is planned at the location in question must be stored in the prescribed manner and treated in accordance with the following provisions ***of the Rulebook on the Method of Storage, Packaging and Labelling of Hazardous Waste ("Official Gazette of the RS", No. 92/2010 and 77/2021):***

- Storage of hazardous waste will be carried out in a way that ensures the lowest risk of endangering human life and health and the environment;
- Hazardous waste will be stored in tanks, containers and other vessels within the storage facility;
- Wood waste containing hazardous substances will be stored in a closed storage facility, on a

solid stable substrate with spillage collection equipment and degreasing agents;

- The qualified person responsible for professional work is responsible for handling hazardous waste during storage, in accordance with the governing Law Waste Management;
- Hazardous waste will be stored in a way that provides easy and free access to stored hazardous waste for control, repackaging, measurement, sampling, transport, etc.;
- The storage will be fenced according to the design in order to prevent access to unauthorized persons, physically secured, locked and under constant supervision;
- Records shall be kept of all activities related to the storage of hazardous waste, in accordance with the governing Law Waste Management and special regulations;
- The hazardous waste storage container should be closed and made of material that ensures the stability of storage according to the chemical impact of the waste itself, impermeability with adequate protection against atmospheric influences.
- Hazardous waste storage containers, with all their components, should be chemically resistant to the impact of hazardous waste contained in them.
- Liquid storage of waste is carried out in a storage container provided with an impermeable bundwall that can accommodate the entire amount of waste in the event of an accident (leak).
- Hazardous waste storage containers, with all their components, should be chemically resistant to the impact of hazardous waste contained in them.
- Hazardous waste storage containers are regularly maintained, cleaned and not used after the expiration of the established shelf life.
- Storage containers are regularly inspected through regular checks of containers and their components for damage, leakage, corrosion, or other form of damage.
- If the hazardous waste storage container or any of its components is technically defective, corroded, or visibly damaged, the hazardous waste must be transferred to a technically sound container in a safe and prescribed manner.
- During storage, hazardous waste is packaged and labelled in a way that ensures safety for human health and the environment.
- Hazardous waste is classified according to the origin, characteristics and composition that make it hazardous, in accordance with the regulation governing the category, testing and classification of waste.
- If hazardous waste consists of several types of waste, its classification is based on the most common component.

- Hazardous waste management will be carried out in accordance with the conclusions on best available techniques (Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) – **Conclusions on best available techniques for waste treatment** and European Commission, Reference Document on Best Available Techniques on Emissions from Storage, July 2006 – **The Best Available Techniques on Emissions from Storage**).

In addition to the measures specified by the Regulation on Technical and Technological Conditions for the Design, Construction, Equipment, and Operation of Facilities and Types of Waste for Waste Thermal Treatment, Emission Limit Values, and Their Monitoring ("Official Gazette of the RS", No. 103/2023), air protection will also be implemented in accordance with the following regulations:

- Law on Air Protection ("Official Gazette of the RS", No. 36/2009, 10/2013 and 26/2021 - other Law);
  - Regulation on Conditions for Monitoring and Air Quality Requirements ("Official Gazette of the RS", No. 11/2010, 75/2010, and 63/2013);
  - Regulation on the Measurement of Emissions of Pollutants into the Air from Stationary Sources of Pollution ("Official Gazette of the RS", No. 5/2016 and 10/2024);
  - Regulation on the Limit Values of Emissions of Pollutants into the Air from Stationary Pollution Sources, except for Combustion Plants ("Official Gazette of the RS", No. 111/2015, 83/2021); as well as Commission implementing decision (EU) 2019/2010 of 12 November 2019

establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987) – **Conclusions on best available techniques for waste incineration** and Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) – **Conclusions on best available techniques for waste treatment**.

In accordance with Article 58 of the Law on Air Protection, the Project Holder is obliged to:

- Submit data on the stationary source of pollution and any change (reconstruction) to the Ministry of Environmental Protection, i.e. the Environmental Protection Agency and the competent authority of the local self-government unit;
- Ensure regular monitoring of emissions in accordance with the monitoring plan, Chapter 9 of this study and the integrated permit, and to keep records thereof;
- Provide continuous emission measurements when prescribed for certain pollutants and/or sources of pollution, either independently or through automatic continuous measurement devices, with the consent of the Ministry;
- Provide emission control measurements through an authorized legal entity, if it performs emission measurements independently;
- Provide the prescribed periodic emission measurements, through an authorized legal entity, twice a year, if it does not perform continuous emission measurements;
- Ensure air quality monitoring at the order of the competent inspection authority, independently or through an authorized legal entity;
- Keep records of the performed measurements with data on measuring points, results and frequency of measurements and submit the data in the form of a prescribed report to the Ministry or the Agency within the prescribed deadline.
- Keep records of the type and quality of raw materials, fuels and waste in the incineration process;
- Keep records of the operation of devices for the prevention or reduction of emissions of pollutants, as well as measuring devices for measuring emissions.

Regulation on Technical and Technological Conditions for the Design, Construction, Equipping, and Operation of Plants and Types of Waste for Waste Thermal Treatment, Emission Limit Values, and Their Monitoring ("Official Gazette of the RS", No. 103/2023), water protection will also be implemented in accordance with the following legal acts:

- ➢ Law on Waters ("Official Gazette of the RS", No. 30/2010, 93/2012, 101/2016, 95/2018 and 95/2018 - other Law);
  - Rulebook on Hazardous Substances in Waters ("Official Gazette of SRS", No. 31/1982);
  - Rulebook on Parameters of Ecological and Chemical Status of Surface Waters and Parameters of Chemical and Quantitative Status of Groundwater ("Official Gazette of the RS", No. 74/2011);
  - Rulebook on the Manner and Conditions for Quantity Measurement and Wastewater Quality Testing and the Content of the Report on Measures Performed ("Official Gazette of the RS", No. 18/2024);
  - Regulation on Water Classification ("Official Gazette of SRS", no. 5/1968);
  - Regulation on the Categorization of Watercourses ("Official Gazette of the SRS", no. 5/1968 - other law);
  - Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Achieving Them ("Official Gazette of the RS", No. 50/2012);
  - Regulation on Limit Values of Priority and Priority Hazardous Substances Polluting Surface Waters and Deadlines for Achieving Them ("Official Gazette of the RS", No. 24/2014
  - Regulation on Limit Values of Emissions of Pollutants into Water and Deadlines for Achieving Them ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016);
  - Regulation on the Ecological Network ("Official Gazette of the RS", no. 102/2010).
  - Water Management Strategy on the Territory of the Republic of Serbia until 2034 ("Official

Gazette of the RS", No. 3/2017).

- In accordance with the Law on Waters ("Official Gazette of the RS", No. 30/2010, 93/2012, 101/2016, 95/2018, and 95/2018 - other Law), as well as the by-laws and obtained Water Conditions, it is the obligation of the Project Holder to obtain water consent and a water permit.
- It is the obligation of the Project Holder to partially or completely remove pollutants in water as well as to treat wastewater, in accordance with the aforementioned law and special laws governing the field of environmental protection, i.e. regulations adopted based on those laws.
- Wastewater treatment will be carried out to a level that corresponds to the emission limit values or to a level that does not violate the environmental quality standards of the recipient, in accordance with the regulations of the Republic of Serbia governing the limit values of pollutants in surface and groundwater, the limit values of priority, hazardous and other pollutants and the regulation governing the limit values for the emission of pollutants into water, as well as the values defined by the conclusions on the best available techniques (BATC)[73], taking a more stringent criterion, which in this case represent the BAT values.
- The project holder is obliged to set up devices for measuring and continuously measure the quantities of wastewater, to examine the parameters of wastewater quality and their impact on the recipient, to keep the reports on the performed measurements for at least five years and to submit them to the public water management company, the ministry responsible for environmental protection and the Environmental Protection Agency once a year.
- The Project Holder is obliged to measure the quantities and test the quality of wastewater before and after treatment, to ensure the regular functioning of devices, facilities, i.e. wastewater treatment plants and to keep a log of their operation.
- If there is an imminent danger of pollution, i.e. pollution of surface and groundwater, the Project Holder is obliged to take measures to prevent, i.e. to reduce and remediate water pollution and to plan the means and deadlines for their realization.
- Wastewater, surface and groundwater quality testing may be performed by a legal entity authorized by the Ministry to perform these activities.

Soil protection will be carried out in accordance with the following legal acts:

- ➢ Law on Soil Protection ("Official Gazette of the RS", No. 112/2015);
  - Rulebook on the List of Activities That May Be the Cause of Soil Pollution and Degradation, Procedure, Data Content, Deadlines, and Other Requirements for Soil Monitoring ("Official Gazette of the RS", No. 102/2020);
  - Rulebook on the Methodology for the Development of Rehabilitation and Remediation Projects ("Official Gazette of the RS", No. 74/2015);
  - Rulebook on the Content and Form of Soil Monitoring Reports ("Official Gazette of the RS", No. 126/2021);
  - Regulation on Systematic Monitoring of Soil Condition and Quality ("Official Gazette of the RS", No. 88/2020);
  - Regulation on Limit Values of Pollutants, Harmful Substances, and Hazardous Materials in Soil ("Official Gazette of the RS", No. 30/2018 and 64/2019).

- In accordance with Article 30 of the Law on Land Protection, the owner or user of the land or plant, whose activity may be or is the cause of soil pollution and degradation, in this case Elixir Craft, the Eco Energy branch shall monitor the land in accordance with this Law, in such a way that:
  - presents data on the quality of the soil before the start and after the completion of the activity;
  - monitors changes of the soil and in the soil in the prescribed manner in the zone of impact of its
  - submit data on changes in the soil and in the soil to the Ministry and the Environmental Protection Agency.
- Soil sampling and analysis of soil quality parameters shall be performed by an authorized organization in accordance with the Law on Soil Protection.

Noise protection will be carried out in accordance with the following legal acts:

- ➢ Law on Environmental Noise Protection ("Official Gazette of the RS", No. 96/2021);
  - Rulebook on the Content and Methods for Creating a Strategic Noise Map and Action Plan, the Procedure for Presenting Them to the Public, and Their Formats ("Official Gazette of the RS", No. 90/2023);
  - Rulebook on Noise Measurement Methods, the Content and Scope of Environmental Noise Measurement Report ("Official Gazette of the RS", No. 139/2022);
  - Regulation on Noise Indicators, Limit Values, Noise Indicators Assessment Methods, Annoyance and Harmful Effects of Environmental Noise ("Official Gazette of the RS", no. 75/2010.
- In accordance with Article 10 of the Law on Environmental Noise Protection, legal entities that, through their activities, affect or may affect noise levels exceeding the limit values are obliged to ensure the following: participation in the costs of environmental noise protection, including investment, operational, and production costs; monitoring the impact of their activities on noise; and the implementation of appropriate noise control measures and sound protection in accordance with this Law and the applicable environmental protection legislation.
- In accordance with Article 23 of the Law on Environmental Noise Protection, the Project Holder is obligated to measure environmental noise levels periodically, at least once every three years.
- Noise measurements from individual sources shall be conducted in accordance with the regulations specified in Article 18, paragraph 3 of the aforementioned Law.
- Noise monitoring is conducted through systematic observation of noise indicators and the assessment of the impact of noise on the environment.

It is the obligation of Project Holder, in accordance with the Rulebook on the Methodology for Developing the National and Local Register of Pollution Sources, as well as the Methodology for Types, Methods, and Deadlines for Data Collection ("Official Gazette of the RS", Nos. 91/2010, 10/2013, 98/2016, 72/2023, 53/2024), data for the National Register of Pollution Sources must be submitted to the Environmental Protection Agency by March 31 of the current year for the previous year's data. Reports for the National Register are to be submitted electronically by entering data into the National Register's information system, in accordance with regulations governing electronic documents, electronic identification, and trusted services in electronic business. Reports on measurements of emitted pollutants into the air and water should be submitted in electronic form (pdf format) to the relevant email address published on the Agency's website.

In addition to the aforementioned legal acts, during the work, comply with the following regulations:

- ➢ Law on Nature Protection (Official Gazette of the RS, No. 36/2009, 88/2010, 91/2010 - corr., 14/2016, 95/2018 - other Law and 71/2021);

Accident/fire protection will be carried out in accordance with the following legal acts:

- ➢ Law on Fire Protection ("Official Gazette of the RS", No. 111/2009, 20/2015, 87/2018 and 87/2018 - other Laws);
  - Rulebook on the Organization of Fire Protection According to the Category of Fire Risk („Official Gazette of the RS", No. 6/2021);
  - Rulebook on Technical Norms for the Protection of Storages from Fire and Explosions ("Official Gazette of SFRY", No. 24/1987);
  - Rulebook on Technical Norms for Fire Protection of Industrial Facilities ("Official Gazette of the RS", No. 1/2018, 81/2023);
  - Rulebook on Technical Norms for Installations for the Hydrant Fire Extinguishing Network ("Official Gazette of the RS", No. 3/2018);
  - Rulebook on Technical Norms for the Protection of Facilities from Atmospheric Discharge ("Official Gazette of SRY" No. 11/1996)
  - Rulebook on the Minimum Content of the General Part of the Training Program for Workers in the Field of Fire Protection ("Official Gazette of the SRS", No. 40/1990).
  - Rulebook on Technical Norms for the Protection of Electric Power Plants and Devices from Fire ("Official Gazette of SFRY", No. 74/90)
  - Rulebook on Technical Norms for Fire Protection of Residential and Commercial Buildings and Public Facilities ("Official Gazette of the RS", No. 22/2019)

- Rulebook on Technical Norms for Access Roads, Turnpikes, and Arranged Plateaus for Firefighting Vehicles in the Vicinity of a Facility with an Increased Risk of Fire ("Official Gazette of FRY" No. 8/95);
- Rulebook on Technical Requirements for Fire Safety of External Walls of Buildings ("Official Gazette of the RS", No. 103/2018)
- Regulation on the Classification of Buildings, Activities, and Land into Fire Hazard Categories ("Official Gazette of the RS", No. 76/2010);

- It is the obligation of the Project Holder to prepare the Main Fire Protection Design as part of the design and technical documentation along with the Construction Design and to obtain the approvals from the Ministry of the Interior.

- The Project Holder is obligated to contact the relevant Ministry of the Interior to assess the categorization of facilities, activities, and land based on fire risk. This assessment should consider the technological processes occurring within the facilities; the type and quantity of materials produced, processed, or stored; the materials used in the construction of the facility; the facility's importance and size; and the type of plant cover. This is necessary to establish the appropriate organization and implement the measures needed for effective fire protection.

- Entities in the first and second fire risk categories are required to develop a Fire Protection Plan, obtain approval from the relevant authority, and follow the procedures outlined in the Fire Protection Plan. The Fire Protection Plan should, among other things, provide detailed information on the number of firefighters, the technical equipment and training of the fire brigade, the organization of fire protection preventive measures, continuous duty, and the number of trained personnel for fire protection implementation. Facilities classified in the third fire risk category must establish Fire Protection Rules.

- For individual units of the facility for which fire protection is determined by special regulations, standards and other acts governing the field of fire and explosion protection, fire protection measures provided for by these regulations have been applied as follows:

  - For equipment and installations related to ventilation and air conditioning, the necessary fire protection measures required to meet the basic fire protection standards are prescribed in the Rulebook on Technical Norms for Ventilation and Air Conditioning Systems ("Official Gazette of SFRY", No. 38/89 and "Official Gazette of the RS", No. 118/2014).
  - The standard SRPS EN 12845 was applied for the design of the automatic fire extinguishing system (sprinkler installation);
  - For the design of a stable system for automatic fire detection and alarm, the Rulebook on Technical Standards for Stable Fire Alarm Installations and the standard SRPS EN 54 were applied.

- The Project Holder is obligated to obtain a decision from the competent Ministry of the Interior of the Republic of Serbia, determining the facility's suitability for use in terms of implementing the fire protection measures specified in the technical documentation, in accordance with Article 36, Paragraph 2, Item 4 of the Law on Fire Protection.

➢ Law on Explosive Substances, Flammable Liquids and Gases ("Official Gazette of SRS", No. 44/1977, 45/1985 and 18/1989 and "Official Gazette of the RS", No. 53/1993 – other Law, 67/1993 - other Law, 48/1994 - other Law, 101/2005 - other Law, 54/2015 - other Law) and according to the above, Ex zones were determined where the Ex-equipment will be installed;

➢ Law on Flammable and Combustible Liquids and Flammable Gases ("Official Gazette of the RS", No. 54/2015).

  - Rulebook on Technical Standards for Fire and Explosion Safety of Facilities and Structures for Flammable and Combustible Liquids and for the Storage and Transfer of Flammable and Combustible Liquids („Official Gazette of the RS”, nos. 114/2017 and 85/2021);

- Law on Disaster Risk Reduction and Emergency Management ("Official Gazette of the RS", No. 87/2018
  - Rulebook on the Content of Information on Hazards, Measures, and Procedures in Case of Accidents („Official Gazette of the RS", No.18/2012);
  - Regulation on Compulsory Means and Equipment for Personal, Mutual and Collective Protection Against Natural and Other Disasters ("Official Gazette of the RS", No. 3/2011 and 37/2015).
  - Regulation on the Content, Manner of Preparation and Obligations of Entities Related to the Preparation of Disaster Risk Assessment and Protection and Rescue Plans ("Official Gazette of the RS", No. 102/2020).
  - Rulebook on the Organization and Method of Operation of the Fire and Rescue Unit ("Official Gazette of the RS", No. 66/2021);
  - Rulebook on the Manner of Preparation and Content of the Accident Protection Plan ("Official Gazette of the RS", No. 41/2019);
  - Rulebook on the Type and Quantity of Hazardous Substances on the Basis of which the Accident Protection Plan is Drawn Up ("Official Gazette of the RS", No. 34/2019);
  - Regulation on the Implementation of Evacuation ('Official Gazette of the RS', No. 22/2011);

Pursuant to the provisions of the Seveso Directive, Article 58 of the Law on Environmental Protection (Official Gazette of the RS, No. 135/2004, 36/2009, 36/2009 - Other Law, 72/2009 - Other Law, 43/2011 - Decision of the Constitutional Court, 14/2016, 76/2018, 95/2018 and 94/2024 – other law) and the Rulebook on the List of Hazardous Substances and Their Quantities and Criteria for Determining the Type of Documents Produced by the Operator of Seveso Installations or Establishments ("Official Gazette of the RS", No. 41/2010, 51/2015, and 50/2018), and considering the maximum possible quantities of hazardous substances that may be present at any time in the complex, the facility in question is classified as a "higher-tier" Seveso plant. Therefore, it is the obligation of the Project Holder, in terms of managing accident risk, to:

- In accordance with the Rulebook on the Content of the Notification on the New Seveso Plant or Complex, Existing Seveso Plant or Complex and on the Permanent Cessation of Operation of the Seveso Plant or Complex ("Official Gazette of the RS", No. 41/2010), submit the Notification on the New Seveso Plant or Complex <u>at least three months before the start of operation;</u>
- In accordance with the Rulebook on the Content of the Accident Prevention Policy and the Content and Methodology for Preparing the Safety Report and the Accident Protection Plan ("Official Gazette of the RS", No. 41/2010), prepare the Safety Report and the Accident Prevention Plan and submit them to the competent authority <u>at least three months prior to the commencement of operation;</u>
- to submit a request for approval of the Safety Report and Accident Protection Plan, along with the required documents.

Management of raw materials/chemicals will be carried out in accordance with the following legal acts:

- Law on Chemicals (Official Gazette of the RS, No. 36/2009, 88/2010, 92/2011, 93/2012, 25/2015);
  - Regulations on the List of Classified Substances (Official Gazette of the RS, No. 41/2023);
  - Rulebook on the Classification, Packaging, Labelling and Advertising of Chemicals and Products in accordance with the UN Globally Harmonized System of Classification and Labelling ("Official Gazette of the RS" No. 105/2013, 52/2017, 21/2019, 40/2023);
  - Rulebook on the Content of the Safety Data Sheet ("Official Gazette of the RS", No. 11/2024)
  - Rulebook on the Register of Chemicals ("Official Gazette of the RS", No. 16/2016, 6/2017, 117/2017, 44/2018 - other Law, 7/2019, 93/2019, 6/2021, 126/2021, 20/2023 and 10/2024).
- The packaging of dangerous chemicals must correspond to the properties, purpose and method of use of the chemical or product and must be labelled in the prescribed manner.
- It is the responsibility of the Project Holder to keep records on chemicals, which in particular contain data on the identity of the chemical, distributors and quantities of chemicals
- All chemicals used must have a safety data sheet, which in particular contains the identification of the chemical, data on the properties of the chemical, the method of use, preventive measures, risk reduction measures and data on the supplier of the chemical.

- The Project Holder is obliged to store dangerous chemicals in such a way that they do not endanger the life and health of people and the environment.
- The Project Holder is obliged to collect, store and safely dispose of the residues of dangerous chemicals and empty packaging in accordance with the regulations governing waste management.

8.1.2 Measures provided for within the framework of the Landfill for non-hazardous waste

The Landfill for non-hazardous waste is designed to complete the process and manage the residues from the fluidized bed boiler plant (unburned solid residues such as slag, ash, sludge/thickened sediment from wastewater treatment), which have been previously stabilized and solidified through physical-chemical treatment, as close as possible to their point of origin, all in accordance with the Law on Waste Management ("Official Gazette of the RS", No. 36/2009, 88/2010, 14/2016, 95/2018 - other Law, and 35/2023), Regulation on disposal of waste on landfills ("Official Gazette of the RS", No. 92/2010) and the principles of Waste Management.

- In accordance with Article 30 of the Law on Waste Management, the operator at the landfill (Project Holder) is obliged to, and accordingly, the Project Holder will:

  - Develop the **Plant Working Plan** as specified in Article 16 of this Law and ensure its implementation and updating;
  - Develop an Accident Protection Plan in accordance with the law;
  - Obtain a waste disposal permit and dispose of waste in accordance with that permit;
  - Implement measures to ensure environmental protection, in accordance with regulations;
  - Establish monitoring of the operation of the landfill during the active and passive phase of work;
  - Ensure the reclamation of the landfill after its closure and perform expert supervision of the landfill or location for a period of at least 30 years, with the aim of reducing risks to human health and the environment;
  - In the event of an accident, notify the competent authority without delay in accordance with the Law;
  - Keep records of waste in accordance with the Law;
  - Designate a qualified person responsible for professional work at the landfill;
  - Enable the competent inspector to control the locations, facilities, plants and documentation.
  - The operator at the landfill is obliged, in accordance with the aforementioned law, to refuse to accept waste that does not meet the requirements for waste disposal from the permit or to refuse to accept waste when mixed with some other waste, i.e. it poses a risk to human health or the environment. The operator is obliged to inform the licensing authority about the refusal to accept waste.

- In accordance with Article 42 Law on Waste Management:
  - Disposal of waste at the landfill shall be carried out if there is no other appropriate solution, in accordance with the principle of the Waste Management hierarchy.
  - Waste shall be treated before disposal in accordance with the provisions of this Law and other regulations.
  - The waste is disposed of at a landfill that meets the technical, technological and other conditions and requirements, in accordance with the permit issued based on the aforementioned Law.
  - The acceptance of waste at the landfill will be carried out according to the procedures set forth in the relevant regulation:
    - Regulation on the Disposal of Waste at Landfills ("Official Gazette of the RS", No. 92/2010)
    - Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", No. 56/2010, 93/2019 and 39/2021): Disposal of non-reactive hazardous waste at Landfill for non-hazardous wastes.
    - EU Landfill Directive: (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste);
  - Prior to disposal, the landfill operator shall ensure the verification of the delivered waste,

including its characterization, identification by type, quantity, and properties, by determining the waste mass and reviewing the accompanying documentation before acceptance.

Article 59a of the Law on Waste Management ("Official Gazette of the RS", No. 36/2009, 88/2010, 14/2016, 95/2018 - other Law, and 35/2023) and the Regulation on the Type of Financial Guarantees and Equivalent Insurance ("Official Gazette of the RS", No. 103/23) stipulate that the Operator, and thus Elixir Craft, Eco Energy Branch, is obligated to provide a financial guarantee and equivalent insurance to ensure the proper conduct of waste management activities.

- The landfill operation procedure will be carried out in accordance with the technical and technological conditions provided for in the design and technical documentation, permit, law and the Regulation on the Disposal of Waste at Landfills ("Official Gazette of the RS", No. 92/2010).
- It is the obligation of the Project Holder to monitor the operation of the landfill in accordance with the proper technological procedure and legal obligations (Article 26):
  1) monitoring of meteorological parameters;
  2) surface water monitoring;
  3) monitoring of leachate;
  4) groundwater monitoring;
  5) monitoring the amount of rainwater;
  6) landfill stability monitoring;
  7) monitoring of protective layers;
  8) monitoring of pedological and geological characteristics.
- It is envisaged by the project that the monitoring will be carried out by sampling and measurement in the manner given in Appendix 6. – Monitoring the operation of the landfill, which is printed with the Regulation on the Disposal of Waste at Landfills ("Official Gazette of the RS", No. 92/2010) and forms an integral part thereof.

- Sampling and measurement will be carried out:

  1) in a laboratory where certain tests are performed daily;

  2) in an accredited laboratory at certain intervals prescribed by this Regulation or more frequently, if the data in the landfill laboratory show that there has been any accident situation or deviation from the parameters defined by the permit.

- All data obtained by monitoring shall be submitted as part of the regular Annual Reports that the Project Holder is obliged to submit to the Environmental Protection Agency.

8.2 Measures to be taken in the event of an accident

By applying the aforementioned protective measures, which are carried out in accordance with technical standards in the fields of construction, electrical engineering, technology, and mechanical engineering for the construction of facilities of this type and purpose, with strict application to the relevant regulations and operational instructions, regular technical inspections of the facility, and proper maintenance, accident situations (such as fires, explosions, spills, etc.) are avoided. In the event of accidental situations, emergency interventions of a local character will be carried out, in accordance with the appropriate instructions and Rulebooks. If the accident situations are of a larger scope, the coordination of remediation will be carried out in cooperation with the competent institutions.

8.2.1 Accident Prevention and Preparedness Measures

8.2.1.1 Accident Prevention and Preparedness Measures During Construction Works of Waste-to-Energy Plant

The following will be implemented within Elixir Craft, a branch of Eco Energy:

- All contractors and employees involved in the construction of facilities will be trained and familiarized with the necessary procedures and instructions for the work activities, including the handling of hazardous substances in accordance with their Safety Data Sheets, waste management (both hazardous and non-hazardous), equipment and means, fire protection measures, occupational safety and security measures, as well as environmental protection measures (both preventive and remedial);

- To prevent the leakage of hazardous materials from construction machinery and stored materials, impermeable sheeting and appropriate containers (bundwall) must be placed under construction machinery and temporary storage areas for materials and hazardous chemicals (paints, varnishes, thinners, coatings, etc.), equipment, and tools. Any intervention on the engaged machinery, such as servicing, will be prohibited if contact with hazardous materials has occurred;
- All construction and other materials that may contaminate the environment (various insulating materials, paints, ACP, coatings, thinners, etc.) on the construction site should be stored in closed facilities, with a waterproof floor covering that can be cleaned.
- At the construction site, it is necessary to provide sufficient quantities of absorbents and degreasing agents (sand, zeolite or other sorbent) in case of spillage of harmful substances (petroleum products, oils, chemicals, etc.), all according to the plan of organization and operation of the construction site.
- In case of leakage of small quantities of oil and other fluids, fuel, wastewater (polluted) and the like, it is necessary to carry out emergency localization and remediation. First, take all measures to prevent further leakage, and then sprinkle the place with sand, zeolite or other sorbent. Dispose of the soiled sorbent in special containers and ensure its collection through an authorized operator in accordance with the previously obtained Waste Test Report.
- The management of chemicals/hazardous substances will be carried out in accordance with the manufacturer's recommendations and the associated Safety Data Sheets.
- Only small quantities of hazardous and harmful substances for surface and groundwater and soil may be kept at the site in so-called handy storages, in the amount necessary for daily/weekly construction needs, which must always be adequately secured against leaks/spills.
- When painting, varnishing, and similar works at the location in question, large quantities of paint and varnish must not be used. This is especially true for solvents and other chemicals that evaporate very easily and have a very low lower explosive limit (< 1 vol.%).
- During construction, carry out all necessary measures with flammable materials that can cause fire (boards, beams, slats, flammable chemicals, etc.). Keep such materials away from ignition sources.
- Flammable liquids (gasoline, oil, various oils, anti-corrosion protection agent, paints, etc.) should be stored in special storages protected from fire in accordance with applicable regulations.
- Electroenergetic installation, devices and equipment must comply with the applicable technical regulations by their construction and execution.
- In all places on the construction site where there is a risk of fire, implement protective measures according to the Law on Fire Protection.
- The site administration is responsible for the implementation of these measures. Control of the implementation of these measures is carried out by the site manager, the supervising engineer and the authorized body of the municipality or the Republic.
- Ensure the environment of the welding area by placing appropriate warning signs:
    - FIRE HAZARD
    - RESTRICTED ACCESS TO THE UNEMPLOYED.
- Workers who perform complete works must be trained in handling initial fire extinguishers, to know to whom and how to report in case they are unable to extinguish the initial fires.
- Maintain roads in a condition that ensures the safety of traffic and people.

- Organize traffic with vehicles and construction machines in such a way as to reduce the likelihood of traffic accidents, idling, unnecessary dust raising and noise generation;

- Collect and remove sanitary water from the construction site by installing temporary sanitary cabins. The maintenance of these cabins should be entrusted to a specialized authorized company, which will regularly discharge them;

- Upon completion of the construction of the facility, it is necessary to arrange the construction site and remove all remains of the material, as well as construction and other materials.

- The management of construction waste shall be ensured continuously during the execution of works in accordance with the Law on Waste Management and the Construction and Demolition Waste Management Plan, to which the consent of the competent ministry for environmental protection has previously been obtained.

- Construction waste must be separately collected, sorted, transported, stored, prepared for reuse, and/or disposed of.

The construction waste management measures to be applied are as follows:

- Extraction of useful components that are not considered waste in accordance with the law governing waste management and that can be reused for the same purpose for which they were produced (brick, tile, etc.);
- Prevention of mixing of hazardous and non-hazardous waste from construction and demolition and mixing of different types of waste;
- Preventing the dispersal, spillage, discharge of hazardous waste into soil, surface and groundwater and air;
- Determination of places for temporary storage of construction waste at the place of origin, i.e. at the construction site;
- Testing and classification of construction waste;
- Execution of works in such a way as to prevent the generation of waste;
- Encouraging the reuse and recycling of construction waste;
- Keeping records and reporting on the amount and type of construction waste generated, as well as the treatment to which it is subjected.
- Reporting on the types, quantities and characteristics of produced, treated and disposed waste from construction shall be carried out in accordance with the law governing waste management.
- The owner of construction waste is obliged to ensure that hazardous construction waste is first separated on the construction site, to prevent the mixing of hazardous construction waste with non-hazardous construction waste.
- The owner of the construction waste is obliged to obtain a report on the testing of the waste generated on the construction site.
- Waste from construction and demolition should be collected in containers or appropriate bags of sufficient strength and load-bearing capacity for the waste to be collected in them. Containers or bags should be placed on the construction site where the construction works are carried out.
- Containers and bags must be made in such a way that the transport of waste from construction to the waste management plant is carried out without transfer and in a safe manner without danger to human health and the environment.
- Hazardous waste from construction should be collected in closed containers or bags, which possess approvals issued by the competent authority and which are marked in accordance with a special regulation.
- The owner of the construction waste temporarily stores the waste on the construction site where it was created, by storing it separately, by types of construction waste in accordance with the waste catalogue and separately from other waste, in a way that does not pollute the environment.
- Construction waste may be temporarily stored on the construction site until the completion of the works for which the construction permit has been issued, and at the latest until the submission of the application for the issuance of a decision on the use permit.
- The owner of the construction waste is obliged to ensure the transport of that waste to the facility for storage and/or treatment of construction and demolition waste, respecting the waste management hierarchy.

- Transport waste in such a way that it does not mix the sorted waste, or in such a way that it does not pollute other substances so that its reuse, utilization or recycling is not prevented or feasible without disproportionately high costs.
- Transport of hazardous waste from construction should be carried out in accordance with the regulations on the transport of dangerous goods.
- Transport of non-hazardous and hazardous construction waste should be carried out in accordance with the regulations on waste management and road transport.
  The owner of construction and demolition waste may either treat the waste independently or transfer it to an operator who holds a permit for treating this type of waste.
- The costs of treatment, including reuse and/or disposal of construction waste, shall be borne by the owner of the waste.
- Non-hazardous construction waste can be treated with R1 to R12 reuse operations.
- If possible, hazardous construction waste will be treated with disposal operations (D operations) or reuse operations (R operations).

- The possibility will be considered that construction waste determined by the test report to be inert waste can be used to cover landfills, if it meets the limit values of the parameters for the disposal of inert waste.
- Non-hazardous construction waste can be disposed of at inert waste landfills, if it meets the limit values of inert waste disposal parameters.
- Certain types of non-hazardous construction waste may also be disposed of in sanitary landfills of non-hazardous waste, if the waste has been previously treated and if it meets the limit values of the parameters for the disposal of non-hazardous waste.
- Hazardous waste from construction may be permanently stored at the location for which the consent for permanent storage issued by the competent authority of the local self-government unit on whose territory that location is located has been obtained.
- Hazardous waste from construction and demolition can be disposed of at sanitary landfills for hazardous waste, which have a permit issued by the competent authority for the disposal of the specified waste.
- Certain types of hazardous construction waste can be disposed of at landfills for non-hazardous waste that have specially designated cells for the disposal of such hazardous waste, provided that the waste has been pre-treated through surface curing and solidification processes, in accordance with a permit issued by the competent authority.
- All contractors and employees must complete training covering procedures related to waste management.

8.2.1.2 *Accident Prevention and Preparedness Measures During Routine Operations*

- Fire protection at the plant complex in question is designed in accordance with the applicable regulations of the Republic of Serbia.
- As part of the design and technical documentation within the Preliminary Design, in accordance with the Law on Fire Protection, regulations, standards and norms in the field of fire protection and the rules of the profession, the document Fire Protection Study and Hazard Zone Analysis were prepared, which define all preventive protection measures.
- All equipment and devices are designed in accordance with the characteristics of the substances with which they come into contact. All installed equipment is duly attested and supplied with the necessary attestation documentation.
- Analysis of the microlocation of the facility from the aspect of fire transmission to adjacent facilities and from adjacent facilities, as well as the possibility of fire and rescue units coming to the intervention and accessing the facilities with a fire intervention vehicle.
- Access to the facilities by a fire intervention vehicle is enabled by local existing roads in the Elixir Prahovo industrial zone and internal roads designed as part of the plant.
- Internal roads can be accessed by all facilities with at least one facade. In accordance with Article 5 of the Rulebook on Technical Norms for the Protection of Storages from Fire and Explosions (Official Gazette of SFRY No. 24/87), and by classifying the storage, the access of the fire engine to this storage is provided from a minimum of 3 sides. The boiler plant can

be accessed from 3 sides.

- Access roads have characteristics that satisfy all the requirements of the Rulebook on Technical Norms for Access Roads, Ring Roads, and Arranged Platforms for Fire-fighting Vehicles Near the Facility of Increased Risk of Fire ("Official Gazette of FRY", No.8/95):
  - Load-bearing capacity of the roadway with 130 kN axle load,
  - the minimum width of the roads for one-way movement of the vehicle is 3.5 meters, and for two-way movement 6 meters,
  - Vertical clearance of 4.5 meters,
  - Inner curve radius of 7 meters and outer curve radius of 10.5 meters,
  - Maximum gradient of 6%.
- Within the Waste-to-Energy Plant, a Pumping Station and a fire station (facility W-C04) are planned for rapid intervention at the site. The Elixir Prahovo industrial complex has a trained and equipped environmental protection service, occupational safety, fire brigade, rescue unit (within the fire brigade), physical and technical security, etc. In addition to the aforementioned services at the location in question for firefighting intervention and for the rescue of people and property endangered by fire or other natural disasters, the firefighters from the Fire Department in Negotin, located at Ljube Nešić 3, will respond as the nearest fire brigade. If necessary, additional fire brigades from the surrounding area will also be called upon.
- The fire brigade within the Elixir Prahovo complex is about 3 km away from the Waste-to-Energy Plant. From the moment of receiving the call for intervention and the departure of the fire truck from the garage, the vehicle will arrive at the location in 4-5 minutes.
- Given the distance of the Negotin fire brigade of about 10.5 km and the speed of movement of the fire engine of about 50 km/h, the waiting time for the arrival of firefighters is approximately: The time of 18 minutes to start the intervention is considered favourable and provides effective protection in the event of a fire of higher intensity.
- From the aspect of fire protection, the facilities are designed as separate facilities and as facilities in a row. Separate facilities are designed to be located at a distance from other facilities in the complex at a minimum of 4m, which prevents the transfer of fire from one facility to another. In facilities designed as buildings in a row, measures to prevent fire transmission, such as separation distances on the facade and roof, are provided.
- Requirements for safe installation in Terms of fire and explosion protection measures with a certified Site plan were obtained, Ministry of the Interior, Emergency Situations Sector, Emergency Situations Department in Bor, No. 217-8865/23 of 13/10/2023.
- The required fire resistance of roof structures of 30 min is achieved by fire-resistant coatings for steel. Only the main roof supports (IPE 450) are treated with fire-resistant coatings. The roof that serves as a fire separation has a fire resistance rating of 60 minutes in accordance with the standard SRPS EN 1365-2.
- The Fire Protection Study defines the essential elements for the protection of facilities against fire and explosions so that in the event of a fire:
  - preserve the load-bearing capacity of the structure of the subject facility for a certain period of time;
  - prevent the spread of fire and smoke within the subject facility;
  - prevent the spread of fire to adjacent facilities;
  - enable the safe and secure evacuation of people, i.e. their rescue.
- As a first condition of preventive action, it is necessary to exclude the possibility of finding ignition sources at critical points in the facility.
  To avoid a fire or explosion, it is necessary to remove at least one of the 3 listed conditions that lead to a fire, namely:
  - combustible material (usually flammable gases, liquids or solids…)
  - oxidizer (oxygen or air)
  - sources of ignition are direct causes of fire and can be classified into several groups: heated surface, open flames, sparks of mechanical origin and welding, malfunctions on live electroenergetic installations, atmospheric discharge, etc.

If this condition is met a fire cannot occur.

Fire protection measures related to equipping facilities with security systems and devices have been developed based on the following:

1. Rulebook on Technical Norms for Fire Protection of Industrial Facilities ("Official Gazette of the RS", No. 1/2018 and 81/2023)
2. Rulebook on Technical Norms for the Protection of Storages from Fire and Explosions ("Official Gazette of SFRY", No. 24/87)
3. Rulebook on Technical Norms for Fire Protection of Residential and Commercial Buildings and Public Facilities ("Official Gazette of the RS", No. 22/2019)
4. Risk assessments based on the generally accepted EUROALARM method.

Based on the results of the fire risk assessment and the aforementioned regulations for the facilities, the following safety systems were adopted in project documentation:

I. **The entire complex is to be protected by an external hydrant system**

J. **Facility W-C01 Reception guardhouse and administrative building**
   a. Internal hydrant system
   b. Fire detection system
   c. Ventilation of the evacuation staircase through a window in the facade

K. **Facility W-C02 Operational Centre**
   a. Internal hydrant system
   b. Fire detection system
   c. Ventilation of the evacuation staircase through a window in the facade
   d. Gas extinguishing of certain technical rooms

L. **Facility W-C04 Pump station and fire station**
   a. Internal hydrant system
   b. Fire detection system
   c. Stable extinguishing system in the pumping station part

M. **Facility W-C08 Pretreatment and Waste Storage**
   a. Internal hydrant system (in an area where persons can access)
   b. Fire detection system
   c. Methane detection system in the sludge bunker area
   d. Stable extinguishing system
   e. Natural smoke extraction system

N. **Facility W-C11 Thermal Waste Treatment Plant**
   a. Internal hydrant system
   b. Fire detection system
   c. Stable extinguishing system in the zone around the burner
   d. Natural smoke extraction system

O. **Facility W-C12 Stabilization and Solidification**
   a. Internal hydrant system
   b. Fire detection system (only in a space accessed by people)
   c. Hydrogen detection system

P. Facility U-C02 Maintenance Building and Auxiliary Systems Facility

a. Internal hydrant system

b. Fire detection system

c. Natural smoke extraction system.

The project defines **the boundaries of fire sectors (SOPs)** in accordance with the adopted degree of resistance, i.e. the calculation of:

- The division of facilities into fire sectors was primarily based on regulations that require the fire separation of specialized rooms. This was done in accordance with the possibilities that allow the smooth operation of the technological process, the fire risk assessment, and the goal of ensuring the effective and safe evacuation of all occupants, while also preventing the spread of fire and smoke within the facilities.
- The construction measures envisaged to prevent the transfer of fire are the limitation of the filling of the waste bunker (max. up to 80% of the volume) to prevent the transfer of fire from one bunker to another or from the bunker to the conveyors transporting waste to the W-C11 facility. In case burning waste is transferred by crane on conveyors, local extinguishing systems on the conveyors are provided.
- The facilities are separated by a fire-resistant concrete wall for at least 120min and connected only by conveyor openings. Fire transmission over the roof is prevented by a fire-resistant roof covering in accordance with the adopted SOP on facility W-C08.
- The return of the flame from the boiler to the bunker is prevented by a technological solution that is an integral part of the boiler technology.
- Within the W-C08 facility, which, due to its primary purpose, was treated in accordance with the Rulebook on Technical Norms for the Protection of Storages from Fire and Explosions ("Official Gazette of the SFRY", No. 24/87), there is an area used for the pretreatment of hazardous and non-hazardous waste (such as shredding of waste). If the area serves other purposes, due to technological requirements, it could not be separated from the storage bunkers by fire protection measures. This room is connected to the bunkers only by conveyor openings, and in the rest, it is separated by a fire-resistant concrete wall for at least 120 minutes. Local fire extinguishing systems are envisaged as a measure to reduce the possibility of fire transmission on these conveyors.

- Resistance of structural elements in accordance with the Rulebook on Technical Norms for Fire Protection of Residential and Commercial Buildings and Public Facilities ("Official Gazette of the RS", No. 22/2019) is defined for the following facilities:

    - **W-C01 Reception guardhouse and administrative building**

    In accordance with the adopted category of the facility (IP1) and the class of the facility (P2), the degree of fire resistance of the facility is II.

    - **W-C02 Operational Centre;**

    In accordance with the adopted category of the facility (NP2) and the class of the facility (P2), the degree of fire resistance of the facility is III.

    The operational centre is located in the immediate vicinity of the boiler plant (10m), so due to the possibility of transferring fire to the roof from a higher to a lower facility, the resistance of the roof covering was adopted in accordance with the adopted SOP III, which is 30min.

    - **W-C04 Pump station and fire station;**

    In accordance with the adopted category of the facility (NP2) and the class of the facility (P2), the degree of fire resistance of the facility is II.

    The requirement for the resistance of the facade wall exists and is met only in the zone of the pump station, namely fire resistance of 60 min. This requirement is derived from the standard for stable extinguishing systems SRPS EN 12845.

- The resistance of structural elements for the facility W-C08 Pretreatment and waste storage was carried out in accordance with the Rulebook on Technical Norms for Fire and Explosion Protection of Storages ("Official Gazette of SFRY", No. 24/87) In accordance with Article 4 of the Rulebook, the facility in question, based on its area, belongs to large storages with a high fire load.

- In accordance with the Rulebook on Technical Norms for Fire Protection of Industrial Facilities ("Official Gazette of the RS", No. 1/2018 and 81/2023) defines the resistance of structural elements to facilities:
    - **W-C11 – Waste thermal treatment plant** - there is no requirement for fire resistance of structural elements of the facility
    - **W-C12 – Stabilization and solidification –** Fire resistance of structural elements that support the building and the elements constituting the fire sector is required for at least 30 minutes. This includes construction elements whose failure could not lead to the collapse of the bearing structure or the fire sector's structure, as well as construction elements of the roof's bearing structure, whose failure might lead to the collapse of the remaining roof structure.
    - **U-C02 – Maintenance building and auxiliary systems facility –** The required fire resistance of structural elements that support the building and the elements that define the fire sector must be at least 30 minutes, while there is no specific fire resistance requirement for other building elements.

Considering the need to preserve the process and the value of the equipment, it was determined that the elements at the boundary of the fire sector should have the following fire resistance: fire-resistant walls with a rating of 90 minutes, fire-resistant floors with a rating of 60 minutes, and fire-resistant doors with a rating of 30 minutes (or 60 minutes if the door surface exceeds 3.6 m^2).

- For evacuation and rescue of persons and materials from the facility in case of fire, it is necessary to define and mark the evacuation routes in the facility in accordance with the Law on Fire Protection ("Official Gazette of the RS", No. 111 of 29 December 2009, 20 of 24 February 2015, 87 of 13 November 2018, 87 of 13 November 2018 - others Laws) and applicable standards in this field.
- Evacuation routes and exits are designed to be marked as easily recognizable and visible. Marking of evacuation routes and exits is provided for by the prescribed signs placed in the most visible places.
- Identification of evacuation routes and exits must not be hindered by placed objects or decoration. Evacuation routes do not lead past fire-explosive and hazardous premises and substances.
- The floors of the evacuation routes are designed to be flat, without protrusions or damage that could cause people to fall, especially during evacuation. They are also non-slip and free from mats that could wrinkle or shift.
- Evacuation exits lead to free space - areas outside the facility, which is large enough to accommodate all evacuees.
- Traditional building materials that provide the required fire resistance will be used as the basic principle for the selection of materials for structures that should be fire resistant.
- The prevention of the horizontal spread of fire on the facade, i.e. the transfer of fire at the border of the fire sectors of the part of the project in question to the rest of the space in the zone of the outer wall, is also achieved by applying a horizontal breaking distance of not less than 1 m, whose fire resistance is equal to the fire resistance of the wall that is perpendicular to the facade.
- The facade (outer) wall is constructed in such a way as to prevent the path of flame between two adjacent floors by performing a vertical construction element whose fire resistance is in accordance with the adopted degree of fire resistance of the facility.
- Wall, ceiling and floor coverings installed on evacuation routes that do not belong to the evacuation corridor (e.g. floor corridors, passages, etc.) must be fire reaction characteristics according to the standard SRPS EN 13501-1.
- All structural elements and fire-resistant doors must be constructed of construction products with fire reaction characteristics according to SRPS EN 13501-1.
- Horizontal breaking distances at the boundaries of fire sectors must meet the requirements regarding the characteristics of reactions to fire, i.e. construction products must be applied according to the standard SRPS EN 13501-1.

- The walls of vertical ducts for accommodation of installations must be fire-resistant for 30 min for facilities with II and III degrees of resistance. The walls of vertical channels must be made of construction products with fire reaction characteristics according to the standard SRPS EN 13501-1.
- The category of technological process was established based on Article 11 of the Rulebook on Technical Norms for Hydrant Fire Extinguishing Network Installations ('Official Gazette of the RS', No. 3/2018);

    - K2 - plants in which flammable liquids of category 3 are used, produced or processed, plants in which explosive dusts are generated by processing with a smouldering temperature of over 350°C or an ignition temperature of over 450°C, pumping plants for liquid substances whose flash point is between 60°C and 100°C, plants in which coal dust is generated, wood chips, flour, powdered sugar, synthetic rubber powder, etc., **large storages**, medium-sized storages for rubber products, facilities over 30 m high, facilities in which more than 500 persons reside, etc.
    - K4 - plants in which non-combustible substances are used, produced or processed, plants in which liquids with a flash point above 300°C are operated, solid substances with a flash point above 300°C and substances processed in a heated, softened or molten state, whereby heat is released accompanied by sparks and flames, melting, casting and metal processing plants, gas-generating plants, internal combustion engine testing departments, **boiler rooms**, **control buildings in power plants,** plants in which solid, liquid and gaseous fuel is burned, small garages, small storages, facilities in which 100 to 200 persons reside, facilities in which children, elderly persons, immobile patients, etc. and facilities up to 22 m high.
    - K5 - represents the category of the technological process of fire hazard, which includes plants that work with non-combustible materials and cold wet material, for example: plants for mechanical processing of metals, compressor stations, plants for the production of non-combustible gases, wet departments of the textile and paper industry, plants for the extraction and cold processing of minerals, asbestos and salts, facilities for the processing of fish, meat and dairy products, water stations and **facilities that can accommodate up to 100 persons**.

- For the facility W-C08 Pretreatment and storage of waste, according to the requirements given in the Rulebook on Technical Norms for the Protection of Storages from Fire and Explosion ("Official Gazette of the SFRY", No. 24/87), given the adopted size of the fire sector for the storage part of the facility, **the obligation to install a stable system for timely fire detection and alarm is prescribed.** For other facilities in the complex, the installation needs for automatic fire detection and alarm are adopted in accordance with the results of the risk assessment (Numerical documentation of the Fire Protection Study).
- The project documentation outlines the installation of **addressable central devices for fire detection, alarm, and fire extinguishing management**. The planned central devices are modern, modular, and redundant, with the capability to monitor and manage fire extinguishing systems across multiple sectors.
- The installation of the central device in the operational centre in the command room, in the part of the entrance hall of the administrative building with the guardhouse and in the technical room of the waste storage is planned. In addition to the aforementioned central devices of the fire detection and alarm system, the project documentation also envisages the installation of central devices at level +8.40 of the waste storage, which serves exclusively for the management of the Novec 1230 MCC gas extinguishing system of the room, as well as the installation of a central device in the operational centre at level +8.16 for the management of the MCC extinguishing system of the room of the operational centre.
- In addition to the previously mentioned facilities, the gas extinguishing system is managed from the DCS room in the operational centre. This system will be controlled via a fire alarm switchboard located in the control room, which not only handles fire detection and alarms but also manages the fire extinguishing system.
- In addition to the central device in the command room of the operating centre, the installation

of software for graphic monitoring of the system is envisaged, which allows the user an unlimited number of graphic folders and management of all system functions. The software aims to indicate to the user, through integrated graphic maps, the position of the elements where the alarm, shutdown error or any other protocol-defined event occurred.
- All central devices of the fire detection and alarm system will be connected via a single-mode optical cable to enable the entire fire alarm system to function as a unified entity.

- Depending on the purpose, possible causes of the outbreak, the first manifestations of the occurrence of fire, different types of detection were selected:
    - **Point detectors—optical addressable detectors** - are installed in rooms where smoke is expected as the first indication of fire. Additionally, in rooms where smoke, water vapour, or other vapours may be present during normal operations, combined fire detectors are planned. These combined detectors function as thermal detectors during the facility's operating hours and switch to smoke detection after hours.
    - **Flame detectors** - Due to the mode of fire manifestation, the installation of IR 3 flame detectors is planned in some facilities. This detector reduces false alarms and is widely used in industrial and commercial facilities. IR 3 also offers 3-4 times the distance of any conventional IR or UV/IR detector. The envisaged type of flame detector is intended for both indoor and outdoor installation.
    - **IC flame detectors** - Due to the manner of fire manifestation, the installation of IC temperature change detectors, i.e. hot parts of materials above 100ºC, is planned in the waste pretreatment and waste storage facility. The IC temperature change detector responds to the infrared part of the spectrum. The detected radiation is led through one filter to an optical-electric transducer that gives an electrical signal. In case of heavily soiled environment, it is also necessary to consider the option of blowing compressed air into the detector housing itself to clean the optical part.
    - **Digital thermo-sensitive cable** – In facilities where moisture and high humidity are present, the installation of a digital thermo-sensitive cable with a reaction temperature of 78 ºC will be envisaged. The thermo-sensitive cable is connected to the monitored input of the addressable module of the fire alarm system, or to the controller for the connection of the digital temperature-sensitive cable.
    - **Line smoke detectors** - If the mounting height is not suitable for installing optical (point) smoke detectors, the design includes the installation of linear fire detectors with a controller. The linear detector consists of a controller, receiver, and reflector.
    - **Aspiration Smoke Detector (Suction Smoke Detectors)** - Smoke detection in the initial phase of the fire is a very important factor that provides additional time that can be used to prevent damage in specific parts of the facility. The principle of operation of suction detectors is based on constant air sampling through sampling holes, after which the air is transported to a high-sensitivity laser smoke detector and analysed for the purpose of detecting smoke particles.
- In addition to the mentioned types of detection, the project documentation includes the installation of **manual fire alarm** call points in passageways, evacuation routes, and corridors. The purpose of the planned manual detectors is manual activation by the person who noticed the fire, and the automatic fire detectors have not yet been activated. In the case of requests for external installation of manual detectors, the project documentation will provide manual detectors in the appropriate degree of IP protection (according to the standard SRPS EN 60529:2011 Degrees of protection of electrical equipment achieved using protective enclosures (IP code) (identical to IEC 529:1989).
- The installation of **addressable input/output modules** is also envisaged to manage and accept/process data. Modules that are intended to activate executive functions from the fire detection and alarm system must be connected to the fire function loop.
- In all facilities and on all floors in the facilities, sirens or alarm sirens with a flash are provided in such a way that a minimum sound level of 65dB or 10dB above the noise level is provided.
- In the waste storage and pretreatment facility, the installation of alarm flashers is also planned, intended to signal the activation of the fire extinguishing system.
- In addition to its standard function of activating light-sound alarm devices, the siren alarm

switchboard can activate or stop other processes relevant to the system's functionality, the facility's operations, and the safety of personnel and equipment. Upon activation of the automatic fire detection and alarm system, the defined executive functions are as follows:

- Activation of the natural smoke and heat extraction system of the stairwell
- Lowering the elevator to the evacuation level
- Sending alarm signals via telephone alarm apparatus

- Activation of the natural smoke and heat extraction system
- Activation of the water curtain at the border of pretreatment of non-hazardous waste and the reception bunker for non-hazardous waste
- Extinguishing the shredder after detecting a fire on the shredder or in the waste bunker
- Stopping conveyor belts in case of fire on the shredder or in the waste bunker and waste pretreatment
- Extinguishing the hazardous waste shredder after the completion of the initiated process in the event of a fire in the waste bunker and waste pretreatment
- Activating the burner extinguishing
- Activating the transporter shutdown
- Activation of extinguishing - monitor
- Activating the crane protection

- In addition to the standard function of the system, which is the activation of light-sounding alarm devices, i.e. sirens, sirens with a flash and light warning panels, the fire extinguishing system control panel has the ability to activate or stop other processes relevant to the functionality of the system, the functionality of the facility and processes that would affect the safety of personnel and equipment in the facility. Blockage of Emergency Ventilation: Emergency ventilation systems are designed to remove combustion products and extinguishing agents from the room. To ensure that the extinguishing agent remains effective and continues to address any potential residual hot spots, the emergency ventilation is automatically blocked for a specified period after the fire is detected and the extinguishing system is activated. This blockage prevents the premature expulsion of the extinguishing agent before it has had sufficient time to act. The emergency ventilation blockage is automatically engaged by the central system upon receiving a fire signal and remains in effect for 30 minutes. After this period, it can be reactivated by pressing the red mushroom button located on the emergency ventilation cabinet.
- To mitigate or completely eliminate false alarms, the project envisages that the entire fire detection system has an integrated false alarm verification system that will, through complex algorithms and a series of predefined rules, enable users to eliminate the controlled occurrence of alarm triggers and reduce the number of false alarms to a minimum. The system for automatic detection, alarm and fire extinguishing management requires a detailed alarm plan in which procedures must be established during and outside working hours, i.e. in the case of the presence of employees and in the case when there is no one in the protected area. Directly adjacent to each central device, the following items must be placed:
  - Scheme of the alarm plan
  - Arrangement of fire detection and extinguishing zones
  - Operating instructions of the main fire extinguishing centre
  - System control notebook
- In addition to the alarm procedures related to the operation of the central fire detection, alarm, and fire extinguishing management system, the facility-wide alarm plan also includes procedures for:
  - Warning other persons that are present and evacuating them
  - Involving the persons on duty in extinguishing the fire
  - Alarming the nearest professional fire brigade
  - Alarming a person who has special duties in connection with fire protection.
- **Hydrogen sulfide (H_2S) detection** is planned in the areas with storage tanks, the liquid waste storage area 3, and the transfer stations for IBC containers/barrels, as well as in the sludge storage and dosing equipment area, and the hazardous waste pretreatment area, due to its highly toxic properties. Space for sludge storage and dosing equipment: When the

concentration reaches 30 ppm, ventilation is activated at a lower speed, and an intermittent alarm signal with a flashing siren is triggered. At a concentration of 50 ppm, ventilation increases to a higher speed, and a continuous alarm signal with a flashing siren is activated. Additionally, light warning panels displaying "GAS DO NOT ENTER" and "GAS LEAVE THE ROOM" are turned on.

IBC Storage and Barrels, and Rooms for Fuel and Non-Combustible Liquid Tanks: In these areas, ventilation operates continuously. If the concentration reaches 50 ppm, a continuous alarm siren with a flash will be activated, along with light warning panels displaying "GAS DO NOT ENTER" and "GAS, LEAVE THE ROOM".
Hazardous Waste Pretreatment: At a concentration of 30 ppm, ventilation control/flap opening will be activated, and an intermittent alarm siren with a flash will sound. When the concentration reaches 50 ppm, a continuous alarm siren with a flash will be activated, along with light warning panels displaying "GAS DO NOT ENTER" and "GAS LEAVE THE ROOM."

- In the facility W-C08, a **methane ventilation and detection system (CH_4)** are installed in the area for sludge storage and dosing equipment. Given that the amount of methane emissions from the sludge is unknown, it is not possible to calculate the required number of air changes in the space to keep the methane level below the LEL (Lower Explosive Limit). Therefore, a methane detection system is installed in this area. The gas detector is mounted on the aspiration system pipe. For methane detection in the sludge bunker, an aspiration system designed for industrial environments and contaminated areas is used. The proposed methane detector (CH4) monitors the gas within the range of 0-100% LEL. At 10% of the LEL, the space will be inertized, that is, nitrogen will be injected and an intermittent tone will be activated via an alarm siren with a flasher. At 40% of the LEL, the power supply to the sludge bunker will be turned off and a continuous signal will be activated via an alarm siren with a flasher, as well as an alarm flasher will be activated via an alarm siren with a flasher and light warning panels displaying "GAS DO NOT ENTER", i.e. "GAS LEAVE THE ROOM". Executive functions are defined in the explosive gas detection project.
- Within the stabilization and solidification facility, a **hydrogen (H_2) detection system** is also planned, with alarm functions set at 10% and 25% of the Lower Explosive Limit (LEL). The facility will include the installation of a central unit for detecting explosive gases and vapours. Stationary fire detectors are to be installed at all locations where there is a potential risk of gas leakage, particularly in front of and around intake points of ventilation ducts, valves, joints, etc. All detectors will be equipped with appropriate Ex protection. Warning of the presence of an increased concentration of hydrogen will be carried out by sound signals via alarm sirens with flash distributed on the outside above the entrance door to the facility, as well as inside the facility. The installation of light panels marked "GAS DO NOT ENTER" is planned at the entrance to the room, while inside the room, above the door, light panels marked "GAS LEAVE THE ROOM" will be installed. These panels are activated when the methane concentration reaches 25% of the Lower Explosive Limit (LEL). The system's executive functions include: activating evacuation sirens with a flash via controlled outputs from the switchboard, activating the light panels marked "GAS DO NOT ENTER" and "GAS LEAVE THE ROOM," switching on ventilation at 10% of the LEL, and switching off the power supply at 25% of the LEL. The fire alarm system will receive a fault signal, a Threshold I alarm, and a Threshold II alarm.
- **An ammonia detection system (HN_3)** for monitoring the concentration of ammonia is provided within the facility where the ammonia water tank is located and near the SCR module in the thermal waste treatment plant.
  Since ammonia is lighter than air, an ammonia detector is installed below the roof of the bund wall where the storage tank is located. Additionally, detectors are provided near the transfer pumps situated next to the storage tank, as well as near joints, valves where there is a high likelihood of ammonia leakage. Furthermore, alarm warning panels with the inscription “GAS DO NOT ENTER” and an alarm siren with a flasher are provided on the bund wall panels to inform personnel about the detection of ammonia toxicity.
  In the vicinity of the SCR module located in the thermal waste treatment plant, the project documentation provides for ammonia detection above the skid with valves, since ammonia, as previously mentioned, is lighter than air. Additionally, alarm warning panels marked "GAS

LEAVE THE ROOM" and an alarm siren with a flasher are provided to notify personnel of toxic gas detection.

- **Carbon monoxide (CO)** detection is also envisaged in the garage area of fire trucks within the pump station and fire station. In emergency conditions, such as when many vehicles with internal combustion engines are operating or if there is a malfunction in the ventilation system, carbon monoxide concentrations may increase. The detection system is designed to identify carbon monoxide in the event of such incidents. When the central device receives this information, it processes the data and activates both visual and audible alarms if the gas concentration exceeds the preset alarm levels through the fire alarm control panel. If a concentration of 250 ppm of carbon monoxide is detected in the garage, the system will also trigger the executive function to open the garage door to allow for air exchange. In addition to the above, the project documentation also includes sending signals from the relay outputs of the central carbon monoxide detection device to the inputs of the designated addressable input/output module of the fire detection and alarm system. The signals to be forwarded from the carbon monoxide detection system to the fire alarm system include: Alarm I threshold (100 ppm), Alarm II threshold (250 ppm), and error signals.

- In accordance with the Rulebook on Technical Norms for the Hydrant Fire Extinguishing Network ("Official Gazette of the RS", No. 3/2018) all facilities must be covered by an external and internal hydrant network. The amount of water in the installation of the external and internal hydrant fire extinguishing network of a facility to be protected is defined according to:
  - the degree of the facility structure resistance to fire;
  - the category of technological process according to the fire risk to which the facility is classified (K1 to K5 and K1E);
  - volume of the facility.

- Based on the calculated water requirements for each facility, the minimum required amount of water was established. This was used to determine the total amount of water needed for the hydrant network to operate for 120 minutes.
- The internal hydrant network must have a minimum water flow at the most unfavourable place in accordance with the following table:

Height of facility (m)	Up to 22*	From 22 to 40*	From 40 to 75*	Above 75
Water quantity [l/s]	5	7.5	10	12.5

- The above results in the number of internal and external hydrants for simultaneous operation for each facility as shown in the table below:

Facility designation	Facility name	Amount of water internal network [l/s] (number of hydrants)	Amount of water external network [l/s] (number of hydrants)	Water quantity [l/s]
W-C01	*W-C01 Reception guardhouse and administrative building*	5 (2)	15 (3)	20
W-C02	*Operational centre*	5 (2)	10 (2)	15
W-C04	*Pump station and fire station*	5 (2)	10 (2)	15
W-C08	*Pretreatment and waste storage*	5 (2)	25 (5)	30
W-C11	*Waste thermal treatment plant*	7.5 (3)	20 (4)	27.5
W-C12	*Stabilization and solidification*	5 (2)	15 (3)	20
U-C02	*Maintenance building and Auxiliary systems facility*	5 (2)	15 (3)	20

- The W-C08 facility is designed in such a way that the process is fully automated, and it is not provided with human access due to the layout of the bunker, except in the part where there are technical rooms, waste pretreatment rooms, liquid waste storage rooms. The layout of hydrants for this facility will be such that it is possible to distribute the envisaged amount of water to the internal and external hydrant network, but also to have enough external hydrants so that all the amount of water is used only for external hydrants.
- A facility that has limited human access is a W-C12 solidification facility. Non-combustible material is stored in this facility. The internal hydrant network will be provided in the part of the facility that people can access, while the part where people cannot physically access will remain uncovered. In all other facilities, the internal hydrant network will cover the entire surface of the facility.
- The lowest pressure on the fire extinguishing nozzle in the most unfavourable place must not be less than 2.5 bar.
- Above-ground hydrants are installed on the water supply network (pipelines of the external hydrant network). All overhead hydrants must comply with the standard SRPS EN 14384, which is proved by an appropriate document of compliance in accordance with a special regulation governing this area.
- In the immediate vicinity of the external hydrant intended for immediate fire extinguishing, there must be a cabinet with fire hoses of the required length, nozzles and other firefighting fittings (reducers, dividers, etc.).
- The distance of the external hydrant, intended for immediate extinguishing, from the wall of the facility to be protected is at least 5 m, and at most 80 m.
- The internal hydrant network must be constructed in such a way as to enable safe and efficient handling of internal hydrants, as well as their use for immediate fire extinguishing.
- Internal hydrants and associated equipment that comply with SRPS EN 671-2 are used for the internal hydrant network, which is proved by an appropriate document of compliance in accordance with a special regulation governing this area.
- Galvanized steel pipes with a minimum internal diameter of Ø52 mm must be used for the internal hydrant network.
- Pipelines of the internal hydrant network that are exposed to impacts (such as those caused by moving motor vehicles in garages, storage areas, etc.), freezing of water, and similar influences must be protected from the harmful effects of these factors.
- When using internal hydrants and related equipment according to SRPS EN 671-2, the spacing of wall hydrants is determined so that the entire area is covered by at least one water jet, considering a fire hose length of 15 meters or 20 meters and a jet length of 5 meters.
- Fire hydrant cabinets should be installed at a height of 1.50 meters from the floor to the hydrant valve and marked with a fire hydrant symbol, using the letter H. The cabinet should be equipped with a fire hose with a diameter of 52 mm and a nozzle with a diameter of 12 mm.
- The waste-to-energy plant is supplied with technological-hydrant water from the existing Elixir Prahovo complex, and from the newly designed pit housing the shut-off valve and water meter.
- The connection pipeline for the technological-hydrant water is DN200 PN10 with a pressure rating of up to 5 bars.
- The technological water also supplies the fire water reservoir (W-C03, with a capacity of 1200 m^3), which is equipped with pumps of sufficient capacity to support all fire protection equipment (hydrants + fixed extinguishing systems). The reservoir is sized for two hours of autonomous firefighting and does not impose a load on the complex's connection. A replenishment rate of 20 l/s is provided, which can fill the reservoir in less than the prescribed 36 hours.
- The required water flow will be ensured by the simultaneous operation of 5 external fire hydrants with a diameter of DN80 mm, each with a capacity of 5 l/s, and 2 internal fire hydrants with a diameter of DN50 mm, each with a capacity of 2.5 l/s, resulting in a total flow rate of: $Q_f = 5 \times 5 + 2 \times 2.5 = 30$ l/s, in accordance with the Rulebook on Technical Norms for Hydrant Fire Extinguishing Network Installations ("Official Gazette of the RS", no. 3/2018).
- A sufficient number of external, above-ground fire hydrants with a diameter of DN80 mm, a capacity of 5.0 l/s, a height of H = 1900 mm, and a breakable column, are designed for the external fire protection technological-hydrant ring network. This setup ensures efficient and

reliable fire extinguishing in the event of a fire occurring in any part of the facility or location.

- For the internal hydrant network needs, the facilities will be supplied from the external hydrant network of the complex.

- In accordance with the applicable fire safety regulations and considering the purpose and size of the facility, the installation of an internal fire protection network is planned, with the capacity to simultaneously operate two internal hydrants (2x2.5 l/s). Additionally, an external ring hydrant network is planned, with the capacity to simultaneously operate five external hydrants (5x5.0 l/s), resulting in a total capacity of 30.0 l/s.
- After the 1200 m^3 fire water reservoir, of which 216 m^3 is allocated for the hydrant network, and the pressure-boosting unit (Q = 30 l/s, H = 50 m, N = (2 operational + 1 standby) x 15 kW) with a 1500 l hydro-pneumatic tank, located in the pump station, the hydrant water for the entire location is distributed through a ring-type network with above-ground DN80 hydrants at the specified distance. A DN65 connection is branched off from the ring for the internal hydrant network of the facilities.
- An internal hydrant network with a capacity of 5 l/s (2x2.5 l/s) has been installed in the facility, with a minimum pressure of 2.5 bar at the last hydrant connection.
- Fire hydrants with a diameter of DN50 are located in wall-mounted tin cabinets (marked 'H'), positioned in visible, easily accessible, and impact-resistant locations. The hydrants are installed at a height of 1.5 meters from the floor.
- In the facility W-08, hydrants are installed only on the ground floor of the facility with a hose length of 20 m.
- In accordance with the applicable regulations, the requirement for a stable fire extinguishing system applies only to the W-C08 facility for waste pretreatment and storage. This requirement is outlined in the Rulebook on Technical Norms for Fire and Explosion Protection of Storages (“Official Gazette of the SFRY”, no. 24/87).
  Due to the specific technology and geometry of the space, the facility cannot be divided into fire sectors with areas compliant with the requirements of Article 19. Therefore, automatic fire detection and extinguishing systems are provided within the facility to avoid limitations on the size of fire sectors. For other facilities, the need for a stable extinguishing system is defined based on the fire risk of the facility.
- A stable fire extinguishing installation will consist of the following systems:
  - Stable water/foam fire extinguishing system and
  - Steady gas fire extinguishing system Novec 1230.
- The primary standards used for designing the system and calculating the required amount of water are SRPS EN 12845 “Fire Extinguishing Installations – Automatic Sprinkler Systems – Design, Installation, and Maintenance” and SRPS CEN/TS 14816 “Fire Extinguishing Installations – Water Spray Systems – Design, Installation, and Maintenance”.
- For the purposes of the foam fire extinguishing system, the standard SRPS EN 13565-2 "Fire extinguishing installations – Foam extinguishing systems – Part 2: Design, execution and maintenance was used.
- In cases where certain hazard classifications are not addressed by the aforementioned standards, guidelines from VdS and NFPA standards were used. VdS standards 4001, 2108, and 2109 were also utilized as supplementary standards (support) for design, as they are considered the “most similar” to SRPS EN 12845, SRPS CEN/TS 14816, and SRPS EN 13565-2.
- The stable water/foam fire extinguishing system is divided into 10 extinguishing zones, with each zone being controlled by one alarm control valve (except for extinguishing zone 3.2, which is controlled by a solenoid valve supplied from extinguishing zone 3). The project includes the following extinguishing zones:
  - **EXTINGUISHING ZONE 1** - W-C04 FIRE STATION AND PUMP STATION
    Two identical sprinkler pumps (working and spare) are provided for diesel-powered fire extinguishing and one electric "jockey" pump for maintaining pressure in the system. During the operation of the diesel pumps, adequate ventilation of the pumping station is provided, in order to supply the air necessary for the combustion of the diesel engine.
  - **EXTINGUISHING ZONE 2** - W-C08 PRETREATMENT and WASTE STORAGE

Receiving hoppers for non-hazardous waste, receiving hopper for hazardous was mix hopper, hopper for non-hazardous waste, hoppers for hazardous waste and hopper of prepared waste.

A total of 4 monitors are provided for the protection of waste storage bunkers, 2 of which are in operation while the remaining two are spare.

- **EXTINGUISHING ZONE 3** - W-C08 PRETREATMENT and WASTE STORAGE Pretreatment of non-hazardous waste

In the pretreatment of non-hazardous waste, a wet sprinkler system is provided to protect the space itself. The pipe mesh with nozzles is filled with water and installed under the roof. Activation of this system is automatic due to rupture of the nozzle ampoule at elevated temperature.

The shredders themselves have their own local spark extinguishing and immersion systems that are part of the system's operation technology itself and are not covered by this project.

- **EXTINGUISHING ZONE 3.2** - W-C08 PRETREATMENT AND WASTE STORAGE

As an additional level of protection, i.e. reducing the possibility of transferring fire from one place to another, a local system for the protection of this opening for the insertion of shredded waste into the reception bunker for non-hazardous waste is envisaged.

Activation of the extinguishing zone 3.2 is automatic. Activation of this system is a combination of automatic due to the rupture of the ampoule on the nozzle at elevated temperature, automatic and manual activation depending on the operator's decision. Activation of manual activation is also possible and depends on the operator's decision.

- **EXTINGUISHING ZONE 4** - W-C08 PRETREATMENT AND WASTE STORAGE Crane track axis E and **EXTINGUISHING ZONE 4.1** - W-C08 PRETREATMENT AND WASTE STORAGE Crane track axis A

  In order to protect the horizontal steel structure for the crane, a drainage system with spray nozzles is provided. Activation of this system is a combination of automatic and manual activation and depends on the operator's decision.
- **EXTINGUISHING ZONE 5 and ZONE 6 -** W-C08 PRETREATMENT and WASTE STORAGE Movable floors

  In order to protect the moving floors towards the W-C11 facility, a drainage system with spray nozzles is provided. The activation of this system is a combination of automatic and manual activation and depends on the operator's decision.
- **EXTINGUISHING ZONE 7 and EXTINGUISHING ZONE 8** -W-C11 THERMAL WASTE TREATMENT PLANT Burners

  Two drain check valves with spray nozzles are provided for the protection of the area around burners 1 and 2 (extinguishing zones 7 and 8). The activation of this system is a combination of automatic and manual activation and depends on the operator's decision.

- Hydrants and hydrant equipment must be regularly inspected, kept in a clean and tidy condition and kept in the necessary book of records, which must be made available at the request of the competent inspection authority:
  - pressure and flow measurement: every 6 months,
  - inspection of all devices and fittings: at least once a year.

- At the request of the investor, the server rooms and electrical rooms where equipment of high value and importance for the preservation of the technological process is located will be protected by a stable gas extinguishing system NOVEC 1230, as follows:
  - **W-C08 Pretreatment and waste storage**
    - MCC of all rooms
  - **W-C02 Operational Centre;**
    - MCC of all rooms
    - DCS of all rooms

- The extinguishing agent is gas FK-5-1-12 which is commercially named NovecTM 1230. The system is designed in accordance with the standards SRPS EN 15004-1, SRPS EN 15004-2 and the manual for design, installation, operation and maintenance of the equipment manufacturer Kidde Engineered Fire Suppression System.

- NovecTM 1230 gas fire extinguishing systems are designed as "total flooding system" systems that fill the entire volume of the said rooms and to retain the appropriate gas concentration for the selected time.
- The activation of the system is carried out automatically, through the fire alarm and fire extinguishing control system. In the event that the automatic fire alarm fails completely, there is also a manual mechanical actuator on the pilot bottle with which the system can be activated.
- The person who performs manual activation must first check whether the entire staff has left the protected area because during manual activation there is no so-called tensile time, but the gas is immediately discharged into the protected area.
- All equipment used must be designed and tested to operate in a temperature range of -20°C to 55°C. Upon completion of the extinguishing, the cracked gas must remain in the protected area for a minimum of 10 minutes. After that, the space will be ventilated for 60 minutes.
- The selection of mobile fire extinguishing equipment was made on the basis of the classes of fires that may occur in the facilities in question.
- Mobile equipment consisting of portable handheld appliances with dry powder, marked "S" with a capacity of 9 kg and "CO_2" with a capacity of 5 kg is intended for extinguishing initial fires.
- The number of fire extinguishers is determined on the basis of the fire load on the surface of the area of the facility to be protected. In accordance with the geometry of the facility and respecting the rule that the user must not be more than 20 m away from the fire extinguisher, 15 fire extinguishers are adopted in the facility in question.
- Place the initial fire extinguishers in a visible and accessible place. In the case of hand-held appliances, place them at a height of not more than 1.5 m.
- Fire extinguishers should be regularly maintained, cleaned of dust and dirt. The correctness control should be performed every 6 months, and specialized services should be hired for the control. It is recommended to introduce records of cartons on performed tests, replacement of filling or replacement of parts.
- Despite the fact that the apparatus contains instructions for use and its use, it is necessary for persons working in the facility to educate and perform demonstration exercises, in order to be able to use the apparatus properly and efficiently and extinguish the initial fire at the critical moment, because the efficiency of the use of the apparatus largely depends on the education of employees. Therefore, it is necessary to familiarize all persons with the most necessary facts about fire and fire-fighting technique and to hold extinguishing drills from time to time, and also to make a plan and program of fire-fighting actions.
- For better visibility and visibility, operating boards for initial fire extinguishers can be placed next to the extinguisher or in fire hazard areas.

In accordance with the requirements of Article 71a of the Regulations on technical standards for fire and explosion safety of establishments and facilities for flammable and combustible liquids and on storage and flow of flammable and combustible liquids („Official Gazette of the Republic of Serbia “, nos. 114/2017 and 85/2021) the above-ground tanks for the storage of liquid waste are located in a building W-C08 that meets the following requirements:

- It is separated from other rooms by horizontal and vertical partitions reinforced with concrete and fire resistance doors for 120 minutes;
- Considering the position of the room in the facility, safe relief due to the occurrence of an explosion is provided on the facade wall;
- Forced ventilation with at least five air changes per hour is provided in the room;
- The windows and doors of the room open to the outside;
- The floor is made of non-combustible impermeable material.
- The tanks will be located in a concrete waterproof bund wall. Leaked contents from the bund wall will be collected in the collection pit from where they will be returned to the tanks by the pump.

- The room contains two tanks of 24m3 each, which is a total of 48m3, and at the same time the maximum allowed amount of combustible liquids in one room is intended to accommodate the tank.
- In accordance with Article 8, an above-ground tank, i.e. a construction facility for the accommodation of above-ground tanks must be provided with at least one access road for firefighting vehicles at a distance from which a safe firefighting intervention is possible, built in accordance with the regulation governing this area.
- Connection of vehicles to hydrants must be provided on the access road for firefighting vehicles.
- At 21 m from the facade wall of the room where the tanks are located, there is a fire truck access road.
- In accordance with Article 71b of the Rulebook, the following distances are provided:

Distance from	**Required distance [m]**	**Achieved distance for the first tank group [m]**
Public road and boundaries of the plot that does not belong to the plant.	7.5	> 65.5
Facility that does not belong to the plant referred to in Article 3, paragraph 1, item 5, and which are located on the plot that belongs to the plant.	7.5	31.6

- According to Article 29 of the aforementioned Rulebook, the distance between two tanks, regardless of the structure of the tank, must not be less than 1/3 of the sum of their diameters.
- The diameters of the tank are 3m, so based on that the minimum required distance between the tanks is 2m.
- A stable explosive gas detection system must be installed in the rooms for the accommodation of above-ground tanks.
- The room for the accommodation of above-ground tanks must be protected by a hydrant network with at least two standard hydrants.
- The above-ground tank with combustible liquids must be protected by at least two mobile fire extinguishing devices with a capacity of filling 9kg of powder or other appropriate means, and several above-ground tanks must be protected by two such devices for every two tanks. In the present case, this would mean that two mobile fire extinguishing devices should be installed in the liquid waste storage room.
- In accordance with Article 74, for access to the tanks, free space must be provided in all directions around the tank at least 1m.
- Storage of containers with combustible liquids in a closed room in a construction facility designated for production, distribution and consumption-use (product storage) is carried out in groups of containers that cannot exceed the permitted amount of a group of containers according to Article 96 of the Rulebook on Technical Norms for Fire and Explosion Safety existence and facilities for flammable and combustible liquids and on storage and transfer of flammable and combustible liquids ("Official Gazette of the RS", nos. 114/2017 and 85/2021);
- For combustible liquids stored in the room, which is separated from the rest of the building by fire-resistant walls for 120 minutes, the permissible amount of a group of containers is 48,000 liters.
- The containers in the subject facility are stored in three groups so that Group 1 has a quantity of 8,000 liters, while Group 2 and 3 have quantities of 20,000 liters each.
- In all groups, the containers are stored in two levels up to a height of 2.7 m.
- Only undamaged and properly packed containers can be stored in a closed room.
- The containers are stored in a group, so that the nearest container must not be less than 1m away from the load-bearing beams of the facility, steel ropes, supports and from water spraying systems or other extinguishing systems.
- The mutual distance of the group of containers must be at least 1m horizontally and vertically so as not to jeopardize the strength and stability of the containers.

- The rest of the room is intended for the storage of non-reusable waste in accordance with technological requirements. All storage vessels are in accordance with the law and by-laws governing this area.
- The maximum allowed storage height of combustible liquid containers can be a maximum of 4.5m.
- The storage of these containers is provided for on the ground floor of the facility in accordance with the requirement referred to in Article 96 of the Rulebook on Technical Standards for Fire and Explosion Safety of Existing Facilities and Facilities for Flammable and Combustible Liquids and on the Storage and Transfer of Flammable and Combustible Liquids ("Official Gazette of the RS", No. 114/2017 and 85/2021), while the distance of the room or building in accordance with Article 97 of the Rulebook:

Distance from	**Required distance [m]**	**Achieved distance for the first tank group [m]**
Public road and boundaries of the plot that does not belong to the plant	7.5	>105.5
Facility that does not belong to the plant referred to in Article 3, paragraph 1, item 5, and which are located on the plot that belongs to the plant	7.5	>7.5
Other facilities using flammable and combustible liquids and flammable gases	7.5	10.2

- In accordance with the requirements of Article 98 of the aforementioned Rulebook, the vessels are placed in a room within the construction facility that meets the following requirements:
  - It is separated from other rooms by horizontal and vertical partitions made of solid construction material and a fire resistance door of 120min;
  - The roof of the room is made of lightweight material (maximum mass per unit area of 150 kg/m2), which ensures safe relief due to explosion;
  - Forced ventilation with at least five air changes per hour is provided in the room;
  - The windows and doors of the room open to the outside;

- All containers of hazardous materials that have the potential to damage and leak liquid hazardous materials will be stored in appropriate standard portable tanks. The floor of the room is impermeable from the joining of the floor and the wall to a height corresponding to the lowest point of entry. It is designed from non-welding material with a slope from the entrance door to the opposite wall, along which there is a channel with a slope of 2% in the direction of the collection point of spilled liquids.
- The transfer of flammable and combustible liquids from one vessel to another or from tanks to tanks in a technological process in a closed room in a building or in the open, as well as from one auto-tank to an above-ground or underground tank in places where only one auto-tank is provided with access, is carried out by means of a pump at a designated and equipped flow point.
- The place of transferring must comply with the requirements of Article 115a of the Regulations on technical standards for fire and explosion safety of establishments and facilities for flammable and combustible liquids and on the storage and discharge of flammable and combustible liquids („Official Gazette of the Republic of Serbia ", No. 114/2017 and 85/2021) in terms of location and safe placement.
- As an exception to the requirement in Article 115a, the place of discharge must be at least 7,5m away from the public road, the border of the adjacent land and the facility that does not belong to the plant referred to in Article 3, paragraph 1, item 5, and are located on a plot belonging to the plant.

Distance from	**Required distance [m]**	**Achieved distance [m]**
Public road and boundaries of adjacent land	7.5	>78.2

Facility that does not belong to the plant referred to in Article 3, paragraph 1, item 5, and which are located on the plot that belongs to the plant oja pripada postrojenju	7.5	>7.5
	7.5	10.2
The nearest wall of the building intended for storage of vessels	7.5	10.2
Other facilities using flammable and combustible liquids and flammable gases	7.5	10.2
Public railway track for electric and other traction	20	>20m

- In accordance with Article 117 about technical standards for the fire and explosion safety of establishments and facilities for flammable and combustible liquids and for the storage and flow of flammable and combustible liquids („Official Gazette of the Republic of Serbia “, No. 114/2017 and 85/2021) the parts of the hatchery serving to connect the transport tanks shall be above ground.
- In accordance with Article 118 for the access of transport tanks to the connection point at the transfer point for the transfer of flammable and combustible liquids, there must be an access road that is an integral part of the transfer point. The length of the access road must be without slope and twice the total length of the connected tanks. The part of the access road, which corresponds to the length of the connected transport tanks increased by at least 12m on both sides of the transferring device, must not be in a curve.
- The part of the access road must be concreted, visibly marked and dimensioned according to the planned traffic, and the movement of the vehicle must be in one direction, all in accordance with the requirement of Article 119 („Official Gazette of the Republic of Serbia”, No. 86/2015).
- According to Article 118, for the access of transport tanks to the connection point at the transfer point for the transfer of flammable and combustible liquids, there must be an access road that is an integral part of the transfer point. The length of the access road must be without slope and twice the total length of the connected tanks. The part of the access road, which corresponds to the length of the connected transport tanks increased by at least 12m on both sides of the transferring device, must not be in a curve.
- The part of the access road must be concreted, visibly marked and dimensioned according to the planned traffic, and the movement of the vehicle must be in one direction, all in accordance with the requirement of Article 119.
- According to the requirement referred to in Article 121, spilled liquids may be discharged only into the technological sewer, and their acceptance can be ensured by special vessels from which the spilled liquid is discharged into the designated area.
- The pump and its equipment must be constructed and approved for transferring flammable and combustible liquids.
- In accordance with Article 136, the transferring point must be protected from heat sources by a hydrant network and mobile fire extinguishers in accordance with Article 135.
- The hydrant network of the transfer point consists of at least two hydrants, whereby the total number of hydrants is determined so that the distance between the two hydrants cannot exceed 50m. A cabinet with two 50m hoses, equipped with nozzles, must be installed next to each hydrant.
- The total number of mobile fire extinguishers according to the manufacturer's instructions, the filling capacity of 9kg of powder or other suitable means depends on the surface to be protected and they must be placed so that the distance between the two mobile devices does not exceed 10m.
- During transferring, there must be at least one other mobile fire extinguishing device with a filling capacity of at least 50 kg of powder or other appropriate means of destruction next to the transport tank.
- The installation of the pipeline route must be envisaged in accordance with the Rulebook on the conditions for uninterrupted and safe distribution of natural gas by gas pipelines with a pressure of up to 16 bar ("Official Gazette of the Republic of Serbia No. 86/2015

- When selecting the route, designing and constructing the gas pipeline, safe and reliable operation of the distribution gas pipeline must be ensured, as well as the protection of people and property, i.e. the possibility of harmful environmental impacts on the gas pipeline and the gas pipeline on the environment must be prevented.
- Within the complex, the route of the overhead gas pipeline is planned, which will be led by pipe bridges from the entrance to the consumer.
- In accordance with Article 7 on conditions for uninterrupted and safe distribution of natural gas by gas pipelines with a pressure of up to 16 bar ("Official Gazette of the Republic of Serbia No. 86/2015), it is necessary to ensure adequate distances of the gas pipeline from other installations. The minimum horizontal permissible distances of overhead gas pipelines to overhead power lines and telecommunication lines are:

Installation	**Minimum distances (m)**
Overhead power lines	
1 kV ≥ U	Post height + 3 m*
1 kV < U ≤ 110 kV	Post height + 3 m
110 kV < U ≤ 220 kV	Post height + 3.75 m
400 kV < U	Post height + 5 m
Telecommunication lines	2.5

* but not less than 10 m. This distance can be reduced to 2.5 m for lines with self-supporting cable harness.

- In accordance with Article 8, the minimum height of installation of overhead gas pipelines from the elevation of the terrain are:

	Minimum height (m)	**Achieved**
In the passages of the people	2.2	≥2.2
In places where there is no transport and no passage of people	0.5	≥0.5

- In accordance with Article 9, it is necessary to provide for vertical light distances between overhead gas pipelines and other pipelines:
  - at the nominal diameter of the gas pipeline up to DN300 - not less than the diameter of the gas pipeline, but at least 150 mm;
  - at the nominal diameter of the DN300 gas pipeline and higher - minimum 300 mm

- Intersection of the overhead gas pipeline with overhead power lines is allowed only if these are constructed as self- supporting cable harnesses.
- When intersecting overhead gas pipelines with overhead power lines, the power lines must pass above the gas pipeline, with a protective network placed above the gas pipeline, and the gas pipeline must be grounded.
- The minimum horizontal distances of the outer edge of overhead gas pipelines from other facilities or facilities parallel to the gas pipeline shall be in accordance with Article 10, as follows:

Buildings and structures in the industrial complex	**Distance Required (m)**	**Achieved distance (m)**
From gas pipelines to sources of danger of plants and facilities for the storage of flammable and combustible liquids and flammable gases	15	>15

Buildings and structures in the industrial complex	Distance Required (m)	Achieved distance (m)
From gas pipelines to other industrial facilities classified in the first and second fire hazard categories in accordance with a special regulation	10	>10
Roads within the factory or company	1	>1
Pipeline pillar foundation to underground installations	1	>1
Substation in the building	5	12.9

- In the complex in question, the only facility in which a larger number of people is expected is the Operational Centre, which is 16.3 m away from the control station, which is more than the required 5m according to Article 11 in the Regulations:

Facility	Distance Required (m)	Achieved distance (m)
Railway	10	> 10
Pavement of city roads	3	>3
Local road	3	>3
State road, except highway	8	> 8%
The highway	15	>15
Internal roads	3	4.8
Source of danger of the petrol station for road transport, smaller vessels	10	None
Hazard source of plants and facilities for the storage of flammable and combustible liquids and flammable gases	10	13.1
Transformer station	10	15.3
Overhead power lines		
1 kV ≥ U	Post height + 3 m*	
1 kV < U ≤ 110 kV	Post height + 3 m*	
110 kV < U ≤ 220 kV	Post height + 3.75 m	
400 kV < U	Post height + 5 m	

- In the event of a power outage, a backup power source, a diesel electric generator (DEA) with complete equipment necessary for automatic operation, is provided for the supply of certain consumers in the facilities. For the power supply of all general electrical consumers, from a backup power source, the main distribution cabinet GROA-OP is planned, which will be located in the electrical room with a low-voltage plant.
- It is envisaged that safety systems operating in case of fire are powered through DEA and diesel pumps with their own tank. Diesel pumps are provided in the pumping station of the fire extinguishing system.
- In accordance with the Regultions on Technical Norms for Fire Protection of Industrial Facilities ("Official Gazette of the RS", No. 1/2018 and 81/2023) on the facilities, the areas needed to compensate for fresh air are also provided, which must be of the same surface area as the smoke and heat extraction openings.
- Smoke extraction of the facility W-C11 – Waste thermal treatment plant is carried out using 10 roof domes, each measuring 2,100 x 1,800 mm. The total area to smoke is >3% of the building area. Air compensation is via external rain protection blinds explained within the ventilation of the facility.
- It is necessary to provide openings for the supply of fresh air of at least the same surface in the lower half of the height of the facade.
- The total area of smoke and heat extraction openings in the facility U-C02 – Maintenance building and auxiliary systems facility is ~ 45m2. It is necessary to provide openings for the supply of fresh air of at least the same surface in the lower half of the height of the facade.

- In the facility W-C08, where, due to the type of raw material to be stored, a large smoke is expected in the event of a fire, the design envisages a system for natural smoke and heat removal through roof domes that will be opened on fire alarm. Therefore, the smoke extraction of the facility was solved using roof domes in the zone of the waste unloading room and service reception of the rake with 2% of the surface area and for the higher part of the facility with 3% of the base area. Replacement of air is carried out through the front door (roll door) of the waste unloading rooms and service reception of the rake and pretreatment of non-hazardous and hazardous waste
- Natural smoke and heat extraction switchboards should be connected via addressable modules to the fire alarm centre for the purpose of exchanging information, as well as activating executive functions from the smoke extraction switchboards. Manual activation of the smoke extraction switchboards is done through manual detectors of orange colour.
- Addressable modules must be installed on a special fire alarm loop that will be equipped with a fire function.
- An air conditioning chamber on the roof of the building W-C01 Reception guardhouse and administrative building are planned to ventilate the space and prevent the penetration of outside air into the rooms (all rooms are under mild overpressure).
- A PP flap is provided on the wall of the laboratory room, where the duct enters the room. In addition to the FP flap, a regulating blind is also provided, which is guided by the pressure difference in front and behind the room in order to prevent the penetration of contaminated air into the rest of the facility. Laboratories have their own local digesters.
- The laboratory sample warehouse has a local suction fan to maintain underpressure and minimal ventilation.
- Ventilation of transformer boxes is foreseen by forced ventilation in the facility W-C02 Operations Centre. Fan operation control is performed based on the thermostat in each room.
- The ventilation of the diesel generator is carried out using a fan integrated into the diesel generator (as part of the diesel generator project). The ventilation ducts are used to directly drain the exhaust air from the diesel generator cooler. There are rain blinds on the facade. The air supply is on the opposite side of the building, and the blinds are located in the front door of the diesel generator room.
- Ventilation of the MCC room is carried out by means of suction fans, which are located in the frequency regulator zone. The air supply is from the outer facade, and in the zone of the double floor. In order to seal the room in case of fire, a sealing flap with an electric drive with a quick response was installed before each rain blind. During the fire alarm, and before the activation of

the fire extinguishing gas, all flaps are closed and the fans are extinguished. A pressure relief damper was also installed to reduce the pressure during fire extinguishing activation (the dimensions of the damper should be defined in the fire extinguishing design). After a successful shutdown, flaps open and ventilation is activated.

- The DCS room is ventilated using an aspiration fan. The ignition and extinguishing is done on the basis of a timer. The air supply is from the outer facade, on the opposite side in relation to the suction fan. In order to seal the room in case of fire, a sealing flap with an electric drive with a quick response was installed before each rain blind. During the fire alarm, and before the activation of the fire extinguishing gas, all flaps are closed and the fans are extinguished. A pressure relief damper was also installed to reduce the pressure during fire extinguishing activation (the dimensions of the damper should be defined in the fire extinguishing design). After a successful shutdown, flaps open and ventilation is activated.
- In the zone of the garage in the facility W-C04 Pumping station and fire station, an axial wall fan is provided, which is guided on the basis of the CO concentration in the space (on/off mode). Air compensation is a door roller at the entrance to the garage.
- Mechanical ventilation in the facility W-C08 Pretreatment and waste storage is provided for the following rooms:
  - Space for sludge storage and dosing equipment – with existing suction ventilation for the needs of the boiler 2,000 m^3/h. Air compensation is from the facade of the building
  - Oily and bilge water tank room – Axial wall fan for suction from a space with a floating blind with a capacity of 4,500 m^3/h. The air compensation is from the external roller shutter door from this room, as well as the waste unloading room and the service reception of the rake and the pretreatment of non-hazardous and hazardous waste
  - Pretreatment of hazardous waste – axial wall fan for suction from a space with a floating blind with a capacity of 3,500 m^3/h. Air compensation is from the facade of the building
  - IBC warehouse and barrels – axial wall fans (3 pieces) for suction from spaces with floating blinds with a total capacity of 17,000 m^3/h. Replacement of air is from the facade of the building – 4 rain blinds
  - Room for tanks of combustible and non-combustible liquid – 2 channels are provided with associated elements for inserting and sucking air from the space
  - Total amount of insertion/extraction is 2.500 m^3/h
  - The open part of the facility to the roof is ventilated by suction of 33,000 m^3/h using the system required for the operation of the boiler in W-C11. Air compensation is on the ground floor from the facade of the building using 2 ducts and 2 rain blinds.
- Therefore, the smoke extraction of the facility was solved using roof domes in the zone of the waste unloading room and service reception of the rake with 2% of the surface area and for the higher part of the facility with 3% of the base area. Replacement of air is carried out through the front door (roll door) of the waste unloading rooms and service reception of the rake and pretreatment of non-hazardous and hazardous waste
- In addition to the planned fans for the ventilation of the facility for the needs of the boiler plant, an additional 35,000 m^3/h is extracted from the space – constantly in operation (this part is not the subject of the thermomechanical design). So, the maximum ventilation that can be achieved is 335,000 m^3/h. Replacement of air is carried out through external rain blinds located in the lower zone of the building on the west facade. The dimension of one of the 29 grids is 2,000 x 1,155 mm, i.e. the effective area per grid is 1.0974m2, i.e. the total effective area of all grids is 31.8246m^2.
- The W-C11 facility is smoked using 10 roof domes, each measuring 2,100 x 1,800 mm. The total area to smoke is >3% of the building area. Air compensation is via external rain protection blinds explained within the ventilation of the facility.
- On the southwest facade of the building W-C12 Stabilization and solidification, 3 fans are provided in EX protection, which is switched on if the main ventilation system of the building W-C12 is stopped. The planned fans have a total capacity of 15,000 m^2/h, designed to avoid an increase in hydrogen concentration in any part of the facility. Replacement of air is carried out through 10 external rain blinds, each measuring 400 x 1,155 mm.
- The lightning protection installation of each facility consists of internal and external lightning protection installations (UGI and SGI) that are galvanically interconnected and form an effective

protection against atmospheric discharges.

- For the protection of buildings from direct lightning strikes, a classic lightning protection installation is planned, formed in the form of a "Faraday cage".
- Visually inspect lightning protection installations at least once a year. Recommended periods of complete control and testing of the lightning protection installation depending on the level of protection, according to SRPS EN 62305-3:2011 are: every two years for the I level of protection; every four years if the II level of protection and every six years if the III or IV level of protection;
- The earthing conductor is intended as a foundation earthing conductor. The grounding is performed by placing a galvanized steel strip FeZn 25x4mm in the foundation of the facility.
- Grounding of metal masses in facilities: cable racks, electrical and TCS cabinet housings, hydrant network pipes, hydrants, machine channels, equipment stands, machine equipment, other metal structures, is carried out with the N2XH-J 1x16mm^2 conductor, which is laid from the equipotential bonding boxes or from the PE bus of the cabinet, along the cable routes, and the connection is made through cable lugs and screws with a gear washer.

In order to prevent and protect against explosions, it is necessary to ensure the application of organizational and technical measures for safe work in accordance with the nature of work and according to priorities, starting from the following principles:

- prevention of the occurrence of explosive atmospheres except when the nature of the work carried out so requires;
- avoidance of ignition of explosive atmospheres;
- mitigating the adverse effects of the explosion.

If necessary, these measures will be combined and/or supplemented with other measures whose application should prevent the spread of the explosion and revise them periodically, as well as in the event of significant changes that may affect the safety of employees. In places where there is a risk of potential explosions, the applied protection measures have achieved that this risk is very small.

It is the obligation of the Project Holder to:
- train employees for safe work;
- inform employees about all types of risks that may occur due to explosive atmospheres.
- to act according to the prepared Study on Hazardous Zones,
- ensure that work in the hazardous area is carried out in accordance with the instructions in writing,
- issues permit to work in high-risk workplaces, as well as in other workplaces where the performance of work may lead to risks due to explosive atmospheres and
- the work permit is issued by the responsible person, prior to the commencement of work

The primary protection measure is provided through design technical and technological solutions of equipment, installations and process parameters, as well as by placing the facility at an appropriate distance from other facilities. Secondary protection measures are provided by working regulations and the following solutions:
- Grounding of pipelines, metal structures, equipment and construction locksmiths;
- Appropriate local ventilation of the equipment;
- Adequate general ventilation of the premises;
- The design ventilation system must meet the requirements of the Regulations on technical standards for ventilation or air conditioning systems (Official Gazette of the SR No. 38/89).
- Before starting work, the correctness and cleanliness of the device is checked;
- It is forbidden to use sparking tools;
- It is forbidden to introduce open flames into the Plant and
- Workers in the facility are required to wear appropriate clothing.

In order to ensure adequate preventive fire protection during the work process, the following should be undertaken:

- The design ventilation system must meet the requirements of the Regulations on technical standards for ventilation or air conditioning systems (Official Gazette of the SRJ br.38/89).
- Regularly check the functionality of all electrical devices and fire-fighting equipment.
- Inform visitors and staff about the behaviour at the plant in order to prevent fire outbreaks.
- It is important to detect the fire at the beginning and not allow its duration. All fire protection systems are based on its early detection and timely intervention with mobile and stable fire extinguishing equipment.

- Electrical devices are placed in zones of as low a degree of danger as possible or in a non-hazardous space if the technological and technical conditions of operation of the plant allow.
- If electrical appliances and installations are placed in areas endangered by explosive mixtures of flammable gases, vapours or mists, then they must meet the requirements for the area endangered by these mixtures.
- New electroenergetic installations and electrical installations to be reconstructed containing devices and installations that may cause the ignition of an explosive atmosphere must be supplied with the following information:

  - documentation on the basis of which the classification of the hazardous area was carried out (based on SRPS IEC 60079 – 10) with plans showing the classification and scope of hazardous areas including zoning
  - optional assessment of the consequences of ignition,
  - assembly and connection instructions,
  - documentation – data on conditions of use,
  - a document describing the system for the self-insurance system,
  - statement of the manufacturer / qualified person - applies in case the code is non-standard (except in case of a simple assembly in self-safety version or energy limited circuits),
  - necessary information to ensure the correct placement of the equipment to suit the personnel handling it,
  - information necessary for the inspection, for example the cleaning period,
  - information on the repair (replacement) carried out, whether the repair was carried out by the user or service technician,
  - temperature class or ignition temperature of the gas or vapor present,
  - external influence and ambient temperature.

- The basic principle of anti-explosive protection is to prevent the formation of a potentially explosive atmosphere, and when this is not feasible, to prevent the contact of the explosive atmosphere with ignition agents.
- For areas where there is a risk of explosion, the Rulebook on equipment and protective systems intended for use in potentially explosive atmospheres („Official Gazette of the Republic of Serbia", nos. 10/17 and 21/2020) and the Regulation on preventive measures for safe and healthy work due to the risk of explosive atmospheres („Official Gazette of the Republic of Serbia", nos. 101/12 and 12/13) shall apply.
- In order to prevent and protect against explosions, the Project Promoter is obliged to ensure the implementation of technical and/or organizational measures for safe and healthy work in accordance with the nature of the work performed, according to priorities, starting from the following principles:

  1. prevention of the occurrence of explosive atmospheres except when the nature of the work carried out so requires;
  2. avoidance of ignition of explosive atmospheres;
  3. mitigating the harmful effects of the explosion in order to ensure the safety and health at work of employees.

- Measures for safe and healthy work should, if necessary, be combined and/or supplemented with other measures whose application should prevent the spread of the explosion and should be revised periodically, as well as in the event of significant changes that may affect the safety and health of employees.

- The Project Holder is obliged, in accordance with the basic principles of risk assessment, starting from the principles of prevention, to ensure the application of preventive measures in order to ensure the safety and health at work of employees so that:

    1. Where explosive atmospheres may occur in quantities that may endanger the safety and health of employees or other persons, ensure working environment conditions in which work can be carried out in a safe manner;
    2. In a work environment where explosive atmospheres may occur in quantities that may endanger the safety and health of employees, use appropriate technical means, and in accordance with the risk assessment, ensure appropriate monitoring of the situation at all times while the employees are present.

- Safety labels, for areas where explosive atmospheres may occur, based on the Regulation on Preventive Measures for the Safety of Workers at Risk of Explosive Atmospheres ("Official Gazette of the Republic of Serbia ", br. 101/2012 i 12/2013) Exposed signs of a hazardous and healthy environment where explosive atmospheres may occur: shape – triangle; black pictogram on a yellow background; bordered in black; yellow occupies at least 50% of the surface of the mark.

SPACE WITH THE POSIBILITY OF EXPLOSIVE ATMOSPHERE OCCURRENCE

Hazardous areas must not contain substances and devices that can cause a fire or allow it to spread.

- In danger zones it is not allowed to:

    1. Holding and use of tools, devices, equipment and installations that are not intended for operation in danger zones, and may be the cause of fire, or explosion;
    2. Smoking and using open fire in any form;
    3. Disposal of flammable and other substances not intended for the technological process;
    4. Access to vehicles that can produce sparking during the operation of their drive device;
    5. Wearing clothing and footwear that may lead to the accumulation of static electricity and the use of devices and equipment that are not properly protected against static electricity.

- In danger zones, signs must be placed in visible places warning of the obligation and reading:
    - "NO SMOKING AND ACCESS TO OPEN FLAMES",
    - " ACCESS DENIED TO THE UNEMPLOYED",
    - “RISK OF FIRE AND EXPLOSION”
    - "MANDATORY USE OF NON-SPARKING TOOLS", etc.
- When performing works in danger zones, the user of the plant must take the prescribed safety measures.
- The execution of electroenergetic, non-electroenergetic installations and protective systems in danger zones shall be carried out in accordance with the regulations and standards governing fire and explosion safety in areas endangered by explosive atmospheres.
- Vehicles with an internal combustion engine may be used in areas endangered by explosive atmospheres only if they are equipped with protective devices on the engine exhaust systems.
- Provide employees with protective equipment and control the wearing of protective equipment.
- issues permit to work in high-risk workplaces, as well as in other workplaces where the performance of work may lead to risks due to explosive atmospheres and
- It is the obligation of the project holder and the equipment supplier that the installed equipment in the danger zones must have an appropriate domestic document of conformity of the Designated Conformity Assessment Body, as well as to comply with the applicable Serbian standards, according to the Decree on the manner of conducting conformity assessment and the Decree on the manner of recognition of foreign documents and signs of conformity („Official Gazette of the Republic of Serbia”,

no. 98/2009);

- The management of all technological processes will be carried out through the DCS system through which the monitoring of all process parameters will be carried out, as well as the envisaged building management system (BMS) through which video surveillance, operation of ventilation systems (air conditioning) will be monitored.
- Liquid waste storage tanks will be located in reinforced concrete tanks of sufficient volume to receive the leaked liquid from one of the tanks (including the leak of the largest tank). All tanks are closed type and will be located within the facility for pretreatment and storage of waste
- Each tank will be equipped with the necessary instrument equipment, control valves, ON/off valves, pressure, temperature gauges, level gauges with remote indication on the DCS, high level switch as overfill protection, which upon reaching the high level stops the pump for receiving from the car loading station.
- Nitrogen connections are provided on the dosing container, which enters the container if there is an increase in temperature in this device (nitrogen as an inert gas prevents the appearance of flames).

- When the boiler plant does not work, nitrogen is automatically introduced into the sludge receiving hopper in order to interties the space.
- After inserting the waste into the chamber of the hazardous waste shredder, the door of the chamber closes automatically and at that moment nitrogen ($N2$) is introduced into the chamber of the stove, thus intertie the atmosphere in the chamber and preventing the emission of pollutants outside the shredder. Complete mechanical treatment equipment will be located in a closed facility intended for pretreatment and storage of waste.
- A double-walled reservoir to be housed in a concrete waterproof tank is provided for the storage of ammonia water (25% solution). During the summer months when the outside temperature is above 75 degrees Fahrenheit [25°C], it is necessary to cool the ammonia water storage tank. The reservoir is cooled by water from the water pool for recycling. There are 2 pumps (working and spare) for the tank armament.
- In the W-C12 and W-C08 facility in the event of an explosion, in the bag filter, the inlet pipeline is provided for the installation of a mechanical PEK flap, which prevents the explosion from spreading to another part of the system. To protect the other side, the filter outlet, a chemical barrier is provided on the filter outlet channel, which prevents the penetration of the explosion to other equipment. On the bag filter itself there will be a service door and an anti-explosive panel (the destructive foils), which prevents an increase in pressure in the device in the event of an explosion, they are split, and the explosive flow is directed upwards by means of a repellent, thus preventing the endangerment of both people who are in the immediate vicinity, and other equipment;
- Maintenance and repair will be carried out according to a clearly defined dynamic, all in accordance with the applicable standards and regulations in this field and the instructions of the manufacturer/supplier of the equipment.
- Maintain green areas in good order. The grass must be mowed regularly and kept green by regular watering.
- Regularly keep streets clean and passable.
- All safety precautions are observed when maintaining premises and equipment.

8.2.2 Measures to respond to the accident and eliminate the consequences of the accident

- Accident response measures will be defined by the Safety Report and the Accident Protection Plan, to which the consent of the competent Ministry of Environmental Protection will be obtained within the legally prescribed period;
- In the event of a leak or spill of hydraulic and insulating oil, or small quantities of diesel, secure the spill site, pour the spilled quantity with a sufficient amount of absorbent, collect the contaminated absorbent and store it in appropriate containers until it is handed over to an authorized operator;
- If there has been a leakage of diesel outside the area where the diesel generator is located and environmental pollution that requires remediation or remediation of the area by specialized companies, inform the ministry responsible for environmental protection as soon as possible;
- Water from fire extinguishing within the waste warehouse will be collected in collection pools and transferred to one of the tanks by means of a pump from where it will be dosed to the boiler plant for

thermal treatment.

- Within the facility W-C08 Pretreatment and waste storage, two basins are planned for the collection of wastewaters from fire extinguishing:
  - T.4 Fire extinguishing water basin 1 – designed to collect fire extinguishing water in waste bunkers
  - T.5 Fire extinguishing water basin 2– is designed to collect fire extinguishing water in the premises where the waste and water pretreatment equipment is located from the drainage of the pipeline from the fire extinguishing system valve station.

- Pumps for emptying the water pool from fire extinguishing will be located in room T.3 Pumping station for water from fire extinguishing.

- If a fire occurs in the area where the waste is pre-treated, the contaminated water resulting from extinguishing, collect and drain the collection channels into the designed pool marked T.5 Fire extinguishing water pool 2.
- If there is a fire in the waste bunkers, take the contaminated water/foam resulting from the fire extinguishing, through the grate openings provided at the bottom of the bunker, to the collection pool T.4 Fire extinguishing water pool 1.
- Bearing in mind that these are wastewater that may be loaded with various pollutants whose treatment is not possible within the wastewater treatment plant in question, these waters should be pumped to the pumping station for water from fire extinguishing, pumped to the liquid waste storage from where they will be dosed to the boiler plant for thermal treatment.
- Due to possible complex activities during evacuation and extinguishing, upon arrival of the fire brigade on site, an operational headquarters should be formed, whose task is to connect and organize all tactical actions (rescue of endangered persons, fire extinguishing, uninterrupted water supply, delivery of necessary equipment, etc.);
- In the event of an accident at the facility in question, the project holder is obliged to immediately inform the ministry responsible for environmental protection, the local self-government unit (city) and the authorities responsible for handling emergency situations, in accordance with the regulations governing the said activity, about the circumstances related to the accident, the presence of hazardous substances, the available data for assessing the consequences of the accident on people and the environment and the emergency measures taken;
- In order to ensure timely and adequate response and make immediate decisions, which contributes to reducing the consequences or preventing the development of an emergency situation, define the method of notification of emergency events.
- It is the obligation of the project holder to develop a post-accident monitoring program after possible accident situations, which will contain planned activities for monitoring the state of the environment in terms of pollution by substances from the group of hazardous substances involved in the accident.

8.3 Environmental protection plans and technical solutions (recycling, treatment and disposal of waste materials, reclamation, remediation, etc.)

During the preparation of planning, project and technical documentation, certain legal acts in the field of environmental protection were also applied.

According to the Zoning Plan of the Municipality of Negotin („Official Gazette of the Municipality of Negotin“, No. 16/2011), the area in question is defined as an industrial zone or industrial-port centre of significant development potential.
The development of the chemical industry complex in Prahovo, which consists of "Elixir Prahovo - Chemical Products Industry LLC Prahovo" and "Phosphea Danube" LLC (hereinafter referred to as the Industrial Complex) is defined by the Second Amendments and Supplements to the Detailed Regulation Plan for the Chemical Industry Complex in Prahovo („Official Gazette of the Municipality of Negotin“, No.

17/2022), and by building an industrial park, a chemical park, an energy island, an ecological island, expanding the phosphorus gypsum warehouse, as well as providing a green buffer zone and displacing the routes of local roads outside the industrial complex, thereby ensuring the isolation of the impact of the industrial complex and the production process. The existing Industrial Complex occupies an area of about 148 ha, and there is a planned expansion in the east-west direction, so that the planned Industrial Complex occupies about 594.41 ha.

8.3.1 Environmental protection plans and technical solutions during the execution of works on the construction of the Waste-to-Energy Plant and Landfill for non-hazardous waste

- Before starting the execution of works, the Project Holder is obliged to obtain the appropriate technical documentation (PGD, PZI and the Main Fire Protection Design, etc.), provide its control and collect the necessary approvals in accordance with the Law on Planning and Construction ("Official Gazette of the RS", No. 72/2009, 81/2009 - correction, 64/2010 - CC decision, 24/2011, 121/2012, 42/2013 - CC decision, 50/2013 - CC decision, 98/2013 - CC decision, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law, 9/2020 and 52/2021 and 62/2023).
- Perform the works according to the technical documentation on the basis of which the Decision on the execution of works of the Ministry of Construction, Transport and Infrastructure was issued, i.e. according to the technical measures, regulations, norms and standards applicable to the construction of this type of facilities
- It is the obligation of the Project Holder to appoint an expert to supervise the execution of works, who will be the link between the contractor and the designer.
- Prior to the commencement of works on the installation, the Contractor is obliged to thoroughly study the design and clarify any ambiguities with the supervisory authority or the designer.
- The Contractor is obliged to prepare a study on the arrangement of the construction site, which, together with the report on the commencement of works, shall be submitted to the competent labor inspection.
- The Contractor is obliged to keep a construction log in which, in addition to the records of the performed works, he will record all changes, additional and subsequent works during that day. After the daily inspection, the Supervisory Authority shall certify the Contractor's statements with its signature.
- Only certified welders should be allowed to perform works on pipeline installations (SRPS – EN 287–1–2)
- Reinforcement works should be prepared in the workshop, and only installed on the facility
- Protect steel structures, supports and pipelines in contact with air, water and soil from corrosion with an appropriate protection system
- Spatially restrict the execution of construction and other works without removal or with the smallest possible removal of the cover protective layer due to the needs of site preparation and the construction of facilities, i.e. only with the necessary minimum penetration through the cover protective layer issued exclusively for the needs of (deep) foundation of piles in the aquifer environment;
- When clearing the terrain in the works area, all regulations on the protection and safety of work must be observed and any harmful impact on the environment and the immediate environment of the site must be prevented
- When performing earthworks, use data on the exact position of existing infrastructure facilities (underground electroenergetic cables, pipelines, etc.) in order to avoid damage to them.
- If, during the construction of the planned facilities, the presence of pollutants in the soil and groundwater, hazardous to their quality, is determined, it is mandatory to plan and carry out remediation and remediation of the soil/soil, in accordance with the Law on Environmental Protection ("Official Gazette of the RS", No. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - decision of the Constitutional Court, 14/2016, 76/2018, 95/2018 - other law and 95/2018 - other law), the Law on Land Protection ("Official Gazette of the RS", No. 112/2015), Regulation on systematic monitoring of the state and quality of soil ("Official Gazette of the RS", no. 88/2020), the Rulebook on the content of remediation and reclamation projects ("Official Gazette of the RS", No. 35/2019) and other regulations in this field;
- Backfilling of the terrain (up to the planned elevation) and/or soil replacement should be carried

out in accordance with the recommendations of previous and planned engineering-geological surveys, exclusively with material that does not endanger the quality of soil and groundwater.
- During construction, use materials that meet the prescribed standards or that are provided with a certificate issued by a professional organization registered for the activities of testing that material
- Use existing roads and roads as access to the construction site.
- The construction material, where the dusted shredded material is located, should be covered with foil/tarpaulin or sprinkled with sprayed water in order to reduce the possibility of raising dust due to wind.
- Organizational measures to prevent the scattering of construction materials during transport by covering the truck.

- In the event of high-speed wind and "critical" directions, the works should be temporarily suspended.
- In order to reduce emissions of pollutants into the air originating from machinery, do not leave running engines on vehicles and machinery when not in use.
- Work should be carried out in day mode. Observe the regulations related to the maximum permissible noise level in the environment.
- In the event of interruption of works for any reason, it is necessary to provide the facility and the environment.
- Work tools and accessories must always be clean and neatly stacked.
- After the completion of the works, repair the environment of the construction site in accordance with the design and according to the following:
  - all temporary traffic signalization, installed for the functioning of the construction site and traffic regulation, is completely removed after the completion of works and the original traffic regime is restored;
  - after the completion of works and individual phases of works, completely clean the construction site from all waste construction materials, temporary scaffolding, obstacles and protective fences and remaining construction tools, equipment and machines.
- If archaeological sites or archaeological objects are encountered during the execution of earthworks, the contractor is obliged to immediately, without delay, stop the works, take measures to prevent the finding from being destroyed and damaged, and to preserve it in the place and position in which it was discovered (Article 109 Of the Law on Cultural Property) and the competent institute for the protection of cultural monuments.
- The project holder is obliged to provide funds for research, protection, preservation, publication and display of goods that enjoy prior protection that is discovered during the construction of the investment facility - until the goods are handed over to an authorized protection institution (Art. Article 110 of the Law on Cultural Property).

8.3.2 Environmental protection plans and technical solutions during the regular operation of the Waste-to-Energy Plant

Thermal treatment of non-recyclable hazardous and non-hazardous waste must be carried out in accordance with the Regulation on technical and technological conditions for the design, construction, equipment and operation of facilities and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023), and to that end, the Project Holder within Waste-to-Energy Plant will obtain the following:

- Waste thermal treatment shall provide and ensure conditions to prevent or limit negative impacts on the environment, in particular pollution by air, soil, surface and groundwater emissions, as well as possible risks to human health from waste thermal treatment, while meeting the technical conditions in accordance with the established emission limit values for incineration, or other conditions provided for in the project-technical documentation of waste management, in accordance with the permit, law and regulation.
- Measuring equipment will be installed, using a method for monitoring parameters, working conditions and mass concentrations that are important for the incineration process.

- Monitoring will be carried out by measuring under the conditions and in the manner determined by the permit.
- The installation and correct operation of automatic equipment for monitoring emissions into air and water are subject to annual control measurements in accordance with the certificate.
- Measuring devices used to measure emissions will be controlled and calibrated and tested in accordance with the regulation governing the emission of pollutants into the air (Regulation on the Measurement of Emissions of Pollutants into the Air from Stationary Pollution Sources "Official Gazette of the RS", no. 5 /2016 and 10/2024) in relation to the half-hour mean value at least once a year, and their calibration and testing are performed by laboratories accredited for calibration and testing, in accordance with the prescribed standard.

- Calibration and testing of measuring devices used to measure emissions will be performed through parallel measurements with reference methods at least every third year, that is, it will be repeated after each significant change (repair or modification of the gauge).
- The certificate of calibration and the report on the results of calibration and testing of the correctness of the device are prescribed to be submitted to the relevant authority for the authorization of professional measurement organizations within 60 days.
- The technical and technological conditions for the operation of the waste thermal treatment plant have been implemented and installed in the project technical documentation and will be carried out at the location in Prahovo so:
  - that the plant is designed and equipped, capable of operation and maintenance, so that it meets the requirements prescribed by the Regulation on technical and technological conditions for the design, construction, equipment and operation of facilities and types of waste for thermal treatment of waste, emission limit values and their monitoring and the Law on Waste Management, bearing in mind in particular the categories of waste to be incinerated;
  - that emissions of pollutants and energy into the air and water do not exceed the limit values for emissions of pollutants into the air from the incineration plant and the limit values for emissions of pollutants when discharging wastewater from the waste gas cleaning system of the incineration plant, prescribed in the annexes to the regulation, as well as the limit values prescribed by the relevant conclusions on the best available techniques;
  - that the construction and other technical requirements have been met, in accordance with a special regulation;
  - that during the waste thermal treatment, the obtained heat was used and used for the production of electricity, cogeneration production of thermal energy and electricity, **production of process steam for the needs of other industrial plants within the industrial complex (for the needs of production facilities within the Elixir Prahovo complex);**
  - that the conditions for reducing the quantities of waste incineration residues, their hazardous characteristics and their reuse are met, which is achieved by using the best available technologies;
  - that residues of waste after waste thermal treatment are minimized, that these residues are reused, if technically feasible and economically justified;
  - that incineration residues, the formation of which cannot be prevented, reduced or which are disposed of if they cannot be reused, in accordance with the regulation and regulations governing the incineration of waste;
  - that accident protection measures are envisaged;
  - that monitoring of operation is planned, which includes a program for monitoring emissions of pollutants into the air, soil and water.
- It is envisaged that the waste incineration plant will be managed by a qualified person who is responsible for professional work.

8.3.2.1 Measurement, reception and unloading of waste

- At the location for the operation of the waste thermal treatment plant in Prahovo by the incineration, it is provided a sufficient space for the reception, inspection and sampling of the received waste, i.e. the manipulative space where the undisturbed internal traffic of transport vehicles, loading and unloading of waste is carried out.

- Access to the Waste-to-Energy Plant will be done through internal roads that have been formed within the existing industrial chemical complex Elixir Prahovo. Vehicles with waste materials can enter only through the gate of the Elixir Prahovo complex where the ramp and the guardhouse are located, and then after the first check and identification of the vehicle, the vehicle moves along the internal road to the Waste-to-Energy Plant itself, where the vehicle enters exclusively through the gate located on the southeast side of the complex.
- In order to control the entry/exit from the subject Waste-to-Energy Plant at the entrance, the facility W-C01 Reception guardhouse and administrative building are planned, where the inspection, verification, measurement, reception and examination of the delivered waste will be carried out.

- At the entrance to the thermal waste treatment plant, the installed scale will measure the mass of the waste transport vehicle and measure the waste received in the plant, i.e. complete control and registration of the reception.
- The waste thermal treatment plant is equipped with devices for washing vehicles before and after unloading waste into the plant, and the exit of clean vehicles outside the boundaries of the complex is ensured.
- Based on the characteristics of the thermal treatment plant, identification of types of waste that can be thermally treated (in terms of e.g. physical condition, chemical characteristics, hazardous properties and acceptable ranges of calorific value, humidity, ash content, etc.), as well as in accordance with the provisions of the Rulebook on waste categories, examination and classification ("Official Gazette of the RS", No. 56/2010, 93/2019 and 39/2021) and the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023) **clearly defines the list of waste that may/may not be received and treated in the plant in question and which is attached to the study.**
- **It is strictly forbidden** to receive waste to the plant, that is explosive, flammable, infectious, radioactive, waste materials containing or contaminated with polychlorinated biphenyls (PCBs) and/or polybrominated triphenyls (PCTs) and/or polybrominated biphenyls (PBB), waste containing cyanides, isocyanates, thiocyanates, asbestos, peroxides, biocides, cytostatics, with the following characteristics:

HP 1	"Explosive": waste in which, due to chemical reactions, gas can be generated at such temperatures, pressures and rates that it can cause destruction in the environment. This includes self-igniting waste, explosive organic peroxide waste and explosive self-reactive waste.
HP 3	"Flammable": waste which, according to its properties, is easily ignited or which, due to friction, can ignite or contribute to the creation of a fire: - flammable liquid waste: liquid waste whose ignition point is below 60°C or waste gas oil, diesel and light fuel oil whose ignition point is in the temperature interval between > 55 °C and ≤ 75 °C; - self-igniting liquid and solid waste: solid or liquid waste that, even in small quantities, can ignite within five minutes after coming into contact with air; - flammable solid waste: solid waste that is easily flammable or can cause or promote fire by friction; - flammable gaseous waste: gaseous waste that can ignite after coming into contact with air at a temperature of 20 °C and a standard pressure of 101.3 kPa; - waste that reacts with water: waste that in contact with water releases flammable gases in dangerous quantities; - other flammable waste: flammable aerosols, flammable self-heating waste, flammable organic peroxides and flammable self-reactive waste.
HP 9	"Infectious": waste containing active microorganisms or their toxins, which are known or suspected to cause disease in man or other living organisms

HP 12	Release of acute toxic gases: waste that releases toxic or highly toxic gases in contact with water or acid (classified as acute toxic, cat. 1, 2 or 3)

- The project documentation defines the range of waste calorific value (finished fuel) from 7 MJ/kg to 20 MJ/kg that can be treated at the boiler, as well as humidity, ash content and ash particle size.
- The project documentation defines that waste containing more than 1% of halogen organic substances expressed as chlorine **cannot be treated** in the boiler.
- **Additional restrictions on reception** to the plant in question are waste substances in the form of aerosols, as well as organometallic compounds (spent metal-based catalysts, or organometallic wood preservatives) and aluminized paints.
- It is forbidden to receive waste sludge containing illicit hazardous substances whose reception and treatment is prohibited at the plant in question, in accordance with the following: radioactive sludge, sludge containing or contaminated with polychlorinated biphenyls (PCBs) and/or polybrominated triphenyls (PBT) and/or polybrominated biphenyls (PBBs), sludge containing cyanides, isocyanates, thiocyanates, asbestos, peroxides, biocides, as well as sludge classified as explosive, highly flammable and flammable, infectious and sludge releasing toxic or highly toxic gases in contact with water, air or acid. The acceptance of substances exceeding the POPs limit values of substances pursuant to Article 4 and Annex I Part A of Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 shall not be permitted.
- It is the obligation of the Project Holder that when the vehicle with the waste material arrives at the location in question, the recipient of the waste, at the entrance to the complex, before receiving the waste, performs a radioactivity test of the delivered waste. If the meter detects elevated radioactivity, immediately inform the relevant republic inspection and the ministry, bearing in mind that it is strictly forbidden to receive radioactive waste at the warehouse in question, and give the driver an order to park the vehicle until the inspection arrives.
- It is the obligation of the Project Holder to regularly implement the procedures of pre-acceptance and acceptance of waste in accordance with the conclusions on the best available techniques[74] BAT9(c) and BAT11, as well as in accordance with the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring. These procedures define the elements that are checked and verified when accepting the waste into the plant, as well as the criteria for accepting or not accepting waste.
- The acceptance of waste that can be reused or recycled is prohibited.
- Before receiving **non-hazardous waste**, the waste recipient will carry out the following verification procedures:
  1) documentation following the waste (Documents on the movement of waste, delivery notes, weighing sheet, etc.);
  2) Waste Examination Report prepared in accordance with the list of parameters for waste examination for the needs of thermal treatment in accordance with Annex 9 of the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021);
  3) hazardous characteristics of waste, the substances with which it should not be mixed and precautions to be taken when handling waste;
- When receiving the waste, the recipient is obliged to check:
  1) all data on the waste generation process contained in the documents monitoring the movement of waste;
  2) the label, name, description of the waste and its physical and chemical properties and all necessary information required for the sampling and characterization of the waste before the thermal treatment;
  3) a description of the hazardous characteristics of the waste, the substances with which the waste cannot be mixed and the precautions to be taken by the operator when handling the waste in the thermal treatment process.
- Prior to the reception of **hazardous waste** in the facility in question, the waste recipient is obliged to carry out a reception procedure identical to that for the reception of non-hazardous waste, and

in particular to carry out:

1) checking the documentation following hazardous waste (Documents on the movement of hazardous waste, delivery notes, weighing sheet, etc.), and, if necessary, the documentation defined by the regulations governing the transport of hazardous goods (in accordance with the Law on the Transport of Dangerous Goods, etc.)
2) taking representative samples of waste before unloading, in order to check compliance with the data from the accompanying documentation and the Report on Waste Testing prepared in accordance with Annex 9 of the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021);
3) measures enabling the relevant authority to inspect and identify waste subject to thermal treatment.

- In order to check the compliance of the delivery with the accompanying documentation, (waste characterization report, preliminary test report (in accordance with BATC 9[117], etc.) is envisaged, if necessary, to perform rapid analyses (about 60 min.) in accordance with BATC 9 and BATC 1188, before being admitted to the site. In order to verify the physical and chemical properties of the delivered waste, referrals for treatment will be made, representative samples will be taken and the representative samples taken will be analyzed and tested within the internal central laboratory. During rapid analyses, the following parameters should be tested: determination of sensory properties, determination of the calorific value of waste, ash content, moisture, concentration of total halides. Rapid analyses will be performed within the internal laboratory at the entrance to the complex. In the event of a deviation of the parameters from the expected values determined in the previous acceptance procedure, the truck will not be allowed to unload until the complete analysis and determination of all parameters that were the subject of the previous acceptance procedure. If it is determined that the waste does not correspond to the contracted through the analytical procedure, the acceptance will be rejected. Additional waste tests may include determination of ignition temperature, halogen content, sulfur content (S), heavy metal content, viscosity, density, POPs content, etc. (in accordance with BATC 9 and BATC 11[117]).
- In order to check the physical and chemical properties of the delivered waste, before unloading the waste at the designated place and further referral to pretreatment and then thermal treatment, take representative samples and perform analysis and testing of representative samples as needed within the internal central laboratory, by examining the following parameters: sensory properties, ignition temperature, calorific value (MJ/kg), water or moisture content, ash content, total halogen content expressed as chlorine (Cl), sulfur content (S), polychlorinated biphenyls (PCB) content, heavy metal content: arsenic (As), antimony (Sb), copper (Cu), beryllium (Be), vanadium (V), mercury (Hg), cadmium (Cd), tin (Sn), cobalt (Co), nickel (Ni), lead (Pb), thallium (Ta), chromium (Cr) and zinc (Zn). If necessary, additional detailed analyses will be performed, such as the content of halogen substances individually (Cl, F, Br, I), cyanide content, viscosity, density, mechanical impurities, content of macro-elements (SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, TiO_2, Mn_2O_3, K_2O) and more.
- During the performance of rapid analyses, until the results of examination and confirmation of compliance with the data from the accompanying documentation are obtained, the transport vehicle with waste material must be temporarily parked in the foreseen area, Truck Parking, which is located directly next to the facility W-C01 Reception guardhouse and administrative building, and outside the fence of the Waste-to-Energy plant itself.
- Representative samples may only be taken by trained and equipped employees of the operator in accordance with regulations and standards in this field. The representative sample of waste represents a sample taken from the total amount of waste that has the same characteristics as the average waste composition and that is subject to chemical analysis.
- In addition to the central laboratory on the first floor of the facility, a warehouse for storing laboratory samples, the documentation archive room and the laboratory office are also planned.
- Wastewater generated from washing dishes and equipment in the laboratory should be collected and piped into a buried polypropylene tank (V=5 m^3), and then pumped into IBC containers and transported by a forklift for unloading to liquid waste storage tanks and then treated at the boiler

[129] BAT-Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)

plant in question.

- Within the central laboratory, 4 digesters are planned to prevent the spread of unpleasant odours when performing experiments and examinations of waste, wastewater, etc. Each digester is equipped with a ventilation system with an air purification filter and a roof outlet.
- All analyses may only be performed by professional staff of the appropriate profession (engineers, chemists, laboratory technicians, sampling technicians, etc.).
- Waste that does not meet the requirements for admission to the facility in question must not be accepted and it must be returned to the supplier without delay by the same means of transport.
- In order to determine the amount of waste received at the facility in question the measurement at the entrance to the waste thermal treatment plant on the intended freight scale (W-C10) is performed.
- After reception control and measurement, refer the vehicle to the truck wheel washer (U-C03 Wheel Washing Unit). It is envisaged to install a package unit that is based on a modular concept and is distinguished by a robust construction, as well as a large cleaning capacity. The wheels of the vehicles which has delivered the waste to the site of the plant must also be washed after unloading the waste, and before leaving the site in question.
- The water from the washing of the wheels of the trucks which has delivered the waste material is drained into the collection shaft located within the package wheel washer unit. The wastewater is then pumped into a tank where solids are deposited by passing water through the overflow chamber. The purified water is then reused by the pump to wash the wheels and therefore no outflow of water into the recipient is foreseen.
- Water reception tanks should be periodically cleaned of saturated water and precipitated substances, and the contents of the cleaning should be temporarily stored in the W-C08 facility until treatment at the plant in question.
- When taking over non-hazardous waste, the Project Holder is obliged to fill in and certify a copy of the Document on the movement of waste, in accordance with the Rulebook on the form of the document on the movement of waste and the instructions for its completion ("Official Gazette of the RS" no. 114/13) and keep them for at least two years;
- In case of receiving hazardous waste, the shipper of hazardous waste is obliged to submit to the ministry responsible for environmental affairs and the Environmental Protection Agency, at least 48 hours before the start of movement, a prior notification with data on waste in electronic form, by entering the data into the information system of the National Register of Pollution Sources, in accordance with the Rulebook on the form of the Document on the movement of hazardous waste, the form of prior notification, the manner of its delivery and instructions for their completion. ("Official Gazette of the RS", No. 17/17) and the law governing the protection of personal data.
  Upon receipt of hazardous waste at the location of the plant in question, it is the obligation of the Project Holder to submit to the Environmental Protection Agency, in electronic form, no later than 15 days from the end of the movement of waste, by entering the data into the information system of the National Register of Pollution Sources, the Form of the Document on the Movement of Hazardous Waste with the final, supplemented data on waste, in accordance with the law governing the protection of personal data. The recipient of hazardous waste shall also submit a fully certified and signed Waste Movement Document to the postal address of the Ministry and the Agency, in accordance with the law governing waste management.
- It is the obligation of the Project Holder to record and adequately dispose of the non-hazardous and hazardous waste in question immediately upon receipt at the location of the waste management plant in accordance with special regulations, i.e. it must keep records of the received quantities of non-hazardous and hazardous waste.
- It is the obligation of the Project Holder to keep daily reports on waste, and to submit the report on annual quantities of waste to the Environmental Protection Agency on the basis of the Rulebook on the daily records form and the annual report on waste with instructions for its completion ("Official Gazette of the RS", nos. 7/2020 and 79/2021); Reports must be kept in the company archives for the next five years.
- All legally provided documentation, as well as documentation produced by the procedures of preliminary testing and waste testing at the acceptance will be combined with the measured mass at the acceptance and stored under a unique code in the database of accepted waste uniquely generated. The documentation will be stored in the electronic database of accepted waste for treatment.

- The Operational Instructions for the Acceptance and Preparation of Waste for Treatment prescribes the verification of the compatibility of hazardous waste characteristics in accordance with the compatibility matrices available in the European Commission, Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on Emissions from Storage, July 2006. In the absence of available information, a laboratory mixing test is carried out in the plant's internal laboratory. In both cases, the decision on mixing and the conditions under which it is done is made by an expert of high chemical profession.
- In order to automate and optimize the fuel mixing process in the bunkers, cranes have been designed for waste transfer and will be operated by operators from the Operations Centre facility.
- Different types of solid waste, depending on their characteristics, should be stored in, designed for this purpose, reinforced concrete, waterproof bunkers for the separation of compatible and incompatible types of waste.
- After the vehicle with waste material enters the unloading facility, the front door must be automatically closed. The unloading points in the receiving bunker itself will also be equipped with industrial segment doors, which open only when the truck is ready to unload waste into one of the aforementioned reception bunkers. The industrial segments of the doors are equipped with an electric drive with an automatic door stop when encountering an obstacle and the possibility of manual opening in the event of a power failure. When the unloading of the waste is completed, the bunker door is closed, the truck can then leave the facility, after which the main door at the entrance to the facility is closed again, which prevents the emission of unpleasant odours outside the facility.
- When operating the cranes, the external door of the facility cannot be opened (there is a blockage).
- In order to ensure the reception of a wide range of different types of liquid waste, all pipelines will be made of stainless steel with electric trace heating.
- It is the responsibility of the Project Holder to keep the place for storing the waste in question clean and tidy.
- Waste handling can only be carried out by trained and professional persons.

- It is mandatory to turn off the engine of transport vehicles when they are stationary, ie when unloading waste;

8.3.2.2 *Waste thermal treatment and production of thermal energy in the form of steam*

- The thermal waste treatment plant is fully automated, which enables control of incineration efficiency, monitoring of parameters and prevention/reduction of emissions.
- The thermal waste treatment plant is based on a fluidized bed boiler plant (BFB) with precise incineration control.
- The waste incineration plant will be equipped with at least one auxiliary burner which must be activated automatically when the process gas temperature drops below 850°C. The burner must be activated automatically when the process gas temperature drops below 850°C.
- In the waste incineration plant, the prescribed temperatures are measured near the inner wall of the incineration chamber.
- The auxiliary burner is not powered by fuel that can cause higher emissions than those resulting from the combustion of fuel oil, liquid or natural gas (For the operation of the burner on the plant in question, natural gas is used as auxiliary and ignition fuel).
- The incineration plant has and uses an automatic system to prevent the addition of waste:

  1) at the start-up of the plant, until the temperature reaches the level of 850 °C;
  2) when the temperature is not maintained at 850 °C;
  3) when it is determined by continuous measurement carried out in accordance with the Regulation that the limit values have been exceeded due to some malfunction or interruption of the operation of the waste gas cleaning plant.

- The project envisages a boiler plant with optimization of waste flow and composition, temperature,

flow of primary and secondary combustion air in order to efficiently oxidize organic compounds while reducing the formation of NOx.
- The construction of the boiler is such as to allow a residence time of 2 seconds and a temperature of 850-950ºC.
- The waste incineration plant works to achieve a level of incineration that guarantees that the total level of organic carbon (TOC) in slag and boiler (combustion) ash will be less than 3% in accordance with Article 8 of the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", No. 103/2023), as a binding requirement for a technological solution.
- In accordance with BATC 20 WI 89 the minimum requirement for boiler efficiency when treating hazardous waste is 60-80% and 60-70% for sludges from wastewater treatment. As the said installation has the possibility of using all the above types of waste, a minimum efficiency of 0.7 expressed in decimal was adopted. In the operational work, a significantly higher energy utilization is expected than the above, and expressed according to the methodology described in the Rulebook on categories, testing and classification of waste ("Official Gazette of RS", no. 56/2010, 93/2019, 39/2021 and 65/2024);
- In the event of a malfunction of the thermal waste treatment plant, it is the obligation of the Project Holder to reduce or completely cease the activity as soon as possible until the normal operation is established.
- It is conditioned by the project that the Waste-to-Energy Plant may in no case continue to operate for more than four hours without interruption if the emission limit values are exceeded, whereby the cumulative period of operation in such conditions must not exceed 60 hours during one year. The 60-hour period also applies to those lines in the plant that are connected to a single combustion gas treatment device.
- Carbon monoxide (CO) and total organic carbon (TOC) emission limits cannot be exceeded.
- It is the obligation of Project Holder to report to the relevant ministry the **Annual report, which refers to operation and monitoring of the waste incineration plant**. The report contains data on the incineration process and on emissions into air and water compared to the emission limit values set out in the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023).
- Annual monitoring reports on the complex in question will be submitted to the relevant authority in accordance with the Regulations of the methodology for the development of the national and local register of pollution sources, as well as the methodology for the types, methods and deadlines for data collection ("Official Gazette of the RS", nos. 91/2010, 10/2013, 98/2016 and 72/2023).

8.3.2.3 *Procedures for solid residues from the boiler plant*

- The incineration process is designed in such a way that the amount of residues from the boiler plant is minimized and that the environmental and human health impacts are minimized.
- The residues will be treated on-site or off-site, whenever possible, in accordance with the regulation governing waste management.
- For waste incineration plants, the change in operating conditions must not cause higher residues or residues with a higher content of organic pollutants compared to those residues that can be expected in accordance with the conditions referred to in Article 12. Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023).
- The ash suspension from the reactor and the ash suspension storage, together with the gypsum suspension from SO_2 Scrubber is delivered to the centrifuges (where the separation of the solid and liquid phases is performed) and ends up in the equipment for the transport of incineration residues in the boiler plant (slag and ash).
- It is envisaged that before determining the manner of disposal or recovery operations of the residue from the incineration plant, appropriate examinations will be carried out to determine the

physical and chemical properties and potential pollution from various residues from the incineration process, in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021); The examinations shall cover in particular the total soluble fractions and the heavy metals in the soluble fraction.

- In order to manage all waste streams generated by the operation of the subject fluidized bed boiler plant (slag, boiler ash, cyclone ash, economizer ash, filter ash, activated carbon with a fraction of fine particles from flue gas and sludge/thickened sediment from wastewater treatment) and to dispose them in accordance with the Law on Waste Management and related by-laws, all streams are collected in a controlled manner by the designed boiler conveyor system and taken to the stabilization and solidification plant (W-C12).
- In order to harmonize the characteristics of the solid residues from the boiler plant and bring them to a state suitable for disposal at the subject Landfill for non-hazardous waste in accordance with the criteria defined by the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021), the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010), i.e. with the EU Landfill Directive (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste), the first step in the solid residue treatment process is the **removal of metals from coarse ash (“bottom ash”)** using magnetic separation and separation induced by a magnet (eddy current). The second step is the process of **stabilization** (when reactions take place in which controlled hydrogen release occurs, chromium (Cr(VI)) reduction reaction, etc.) and **solidification** by adding cement, water and, if necessary, additives in accordance with previously performed waste analyses. The aim of the treatment is to process solid residues from the boiler plant, curing and obtaining material that is formed at the landfill into a material with high mechanical strength, low permeability and encapsulated pollutants, i.e. low leaching rate.
- It is the obligation of the Project Holder to regularly, before the very beginning of the solidification process, examine the physical and chemical characteristics of previously stabilized residues from the boiler plant, in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021), Appendix 8 List of parameters for determining the physico-chemical properties of hazardous waste intended for physico-chemical treatment.

- Analyses of physical and chemical properties should be performed on a representative sample taken, within the laboratory provided for in the plant. Based on the test results, the recipes and material balances for the solidification process will be defined.
- The obtained solidificate, a product of physical and chemical treatment, will be examined and classified in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021): Disposal of non-reactive hazardous waste at landfills for non-hazardous waste. If these results meet the conditions prescribed for the disposal of non-reactive hazardous waste at landfills for non-hazardous waste, the solidified material will be disposed of at the Landfill for non-hazardous waste. On the other hand, if this is not the case, the solidificates will be sent to the authorized operator of landfills and/or hazardous waste storage.
- Waste examining must be carried out through professional organizations and other legal entities authorized for sampling and characterization according to the scope of examination for which they are accredited, in accordance with special regulations. Waste characterization is performed for hazardous waste and for waste that, according to its origin, composition and characteristics, may be hazardous waste. Waste examination reports must be kept in the archives of the company for at least five years.
- In order to reduce the retention time of solid residues from the boiler plant in the stabilization and solidification facility, the project envisages a mixer for solidification of appropriate capacity, and for the purpose of disposal of solidificates that has the characteristics of non-reactive hazardous waste, the Landfill for non-hazardous waste is designed next to the plant.

8.3.2.4 Air protection measures

- The incineration plant is designed, and will be equipped, built and operated so that after the last injection of air into the incineration process, the process gases reach a temperature of at least 850 °C for two seconds of duration in a controlled and homogeneous manner, even under the most unfavourable conditions.
- Ventilation of the space in which IBC containers /barrels/jumbo bags are located, as well as the space of the transfer station from IBC containers/barrels, is provided through axial wall fans for suction from the space with floating blinds. The air compensation is from the facade of the building over 4 rain blinds.
- The air from the sludge compartment should be taken to the boiler plant using a combustion air fan, in order to keep the storage under pressure and prevent the spread of unpleasant odours outside the facility. Air compensation is from the facade of the building. When the boiler plant does not work, nitrogen is automatically introduced into the sludge reception bunker in order to inertize the space.
- In order to reduce air emissions from storage tanks, the tanks are equipped with:
    - nitrogen maintains a constant overpressure of 0.3 barG in tanks, which ensures that there are no unpleasant odours or vapours of stored liquids in the room.
    - exhaust gas drainage system via automatic valves on the outlet pipelines from the gas tank space. When reaching a pressure of 0.4 barG in the tank, the valve is opened and the gas is discharged, which is taken by pipeline to the intake of the combustion air fan in the boiler installation, and then to the thermal treatment. As the vessels are maintained under nitrogen overpressure, the composition of the exhaust gas is predominantly nitrogen.
    - If for any reason these systems fail, the tanks are equipped with safety and relief valve that allows pressure relief, i.e. prevents the occurrence of vacuum.
- Ventilation of the space in which the storage tanks (of combustible and easily volatile liquids) are located is provided through 2 channels with associated elements for inserting and exhausting air from the space.
- Ventilation of the space in which the storage tanks for oily and bilge water are located is foreseen through the suction ducts by which the air is taken to the intake of the combustion air fan in the boiler plant, and then to the thermal treatment. In case of downtime of the boiler plant, an axial wall fan is provided for ventilation of this space for suction from the space with a floating blind.

  The compensation of air is from the external roller doors from this room, as well as the rooms for unloading waste and service reception of the rake and pretreatment of non-hazardous and hazardous waste.
- When transferring liquid waste from tank trucks to the gas phase arm, a pressure balancing line is connected, which represents the connection with the gas space of the tank to which the transfer is carried out in case that the discharge is carried out into one of the tanks under overpressure of nitrogen, in order to prevent the evaporation of easily volatile liquids when discharging.
- When transferring waste, the engine of the transport vehicle must be switched off, and the tank truck must be properly grounded.
- The project envisages a flue gas cleaning plant from the boiler plant, and before discharge into the atmosphere, which includes:
    - **dry flue gas cleaning system** (cyclone, bag filter system and activated carbon filter) in which the separation of first, larger particles of fly ash, and then the separation of dioxins and heavy metals by adsorption of said particles into the pores of activated carbon, and finally the removal of particulate matter.
    - **wet flue gas cleaning system** (scrubber system - HCl Scrubber and SO_2 Scrubber). In the HCl scrubber, cooling of flue gases to saturation temperature in contact with water and absorption of halogen and SO_3 compounds takes place. The second (SO_2) scrubber is used to remove sulfur oxide from the flue gases.
    - **NO_x catalytic reduction system** (SCR system).
- The waste incineration plant is designed and equipped so that the limit values of emissions into the air from Appendix 2 LIMIT VALUES FOR EMISSIONS OF POLLUTANTS INTO the AIR of the aforementioned Regulation are not exceeded during operation, as well as the values prescribed by the conclusions on the best available techniques Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution

prevention and control Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration.

- Waste gases from the waste incineration plant will be discharged in a controlled manner through a smokestack whose height has been calculated in such a way as to protect human health and the environment.
- It is envisaged that measurements of pollutants into the air from the incineration plant are carried out in accordance with Annexes 2, 3 and 6 of the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023), in accordance with the monitoring prescribed in Chapter 9 of this Study and the Integrated Permit.
- Measurement will be performed by standardized methods in accordance with the conditions of measurement referred to in Article 15 of the Regulation, the method of calculation referred to in Article 17 of the Regulation and Annex 5. FORMULA for calculating the EMISSION CONCENTRATION UNDER NORMAL OXYGEN CONCENTRATION PERCENTAGE CONDITIONS.
- The measuring points will be determined in accordance with the regulation governing the emission of pollutants into the air (Regulation on the measurement of emissions of pollutants into the air from stationary sources of pollution "Official Gazette of the RS", no. 5/2016).
- All emitters must have measuring points for measuring the emission of pollutants into the air in full compliance with standard SRPS ISO 9096:E. Determination of the position and equipment of representative measuring points for emission measurement shall be carried out by an authorized legal entity in accordance with the requirements and recommendations of SRPS EN 15259. The measuring point shall be established in such a way that it is sufficiently large, easily accessible and equipped so that the measurement can be carried out in a prescribed manner and without danger to the measurement contractor, and that the measurements performed are representative of emissions from the stationary source of pollution in question and in relation to metrological conditions. In general, it is necessary to ensure that there are no disturbances (curves, flaps, openings, etc.) on the emitter in front of and behind the measuring orifice, in the length of 5 hydraulic diameters of the emitter in order to provide conditions for isokinetic sampling of powdery substances.
- In accordance with Articles 15 and 16 of the Regulation on measurements of emissions of pollutants into the air from stationary sources of pollution ("Official Gazette of RS", no. 5/16 and 10/24), develop an Emission Measurement Plan for all stationary emitters in its possession. The emission measurement plan shall be prepared in cooperation with the authorized legal entity for emission measurement. If over time there are changes in the stationary source (reconstruction, change of fuel, raw materials, etc.) or changes in regulations, it is necessary to change the existing measurement plan. The content of the Emission Measurement Plan is given in Section A of Appendix 4 - Emission Measurement Plan and Report on the Measurement of Emissions of Pollutants into the Air, of the said Regulation.
- Dedusting of the solid residue storage from the boiler plant and its solidification equipment should be carried out through a bag filter system where particulate matter was separated.
- The cement silo, mixer, cement weighing scale and solid residue weighing scale are equipped with a filter that prevents the emission of powdered substances into the atmosphere. Measurement of differential pressure with a high value alarm is provided on the aforementioned filters. If there is an increase in differential pressure, the alarm and the self-shaking system are activated (the filter self-shaking system is part of the filters themselves).
- During the trial operation of the stationary pollution source in the process of obtaining a use permit in accordance with the regulations governing planning and construction, the Project Holder is obliged to perform a warranty emission measurement. Warranty measurement is performed in order to compare the measured values of pollutant emissions with the emission limit values defined in Chapter 9 of the study. Warranty measurement is performed under operating conditions at the highest load of the stationary source of pollution.

8.3.2.5 *Water and soil protection measures*

- All waste material should be stored in a closed facility, with a waterproof concrete floor, under strictly controlled conditions, so that there is no possibility of water and land pollution and no possibility of access by unauthorized persons.
- The access road for the reception/dispatch of liquid waste materials in tank trucks is levelled in such a way that it has a drop towards the existing road and that it is raised from the existing terrain about 20 cm and from the second branch of the access road the water from the road flows towards the existing road. All service roads from this area will be connected to the rain sewer collector, and before entering the stormwater into the collector, they will be treated on the grease and oil separator;
- Within the transfer point, the installation of a line grate is planned, which will collect any leaked liquids during transfer and drain them to the collection pit. In this way, the possibility of leakage of the leaked fluid into the atmospheric sewerage and the surrounding soil is avoided.
- The contents of the collection pit will be pumped into IBC containers by the pump, which will be transported to the IBC container warehouse, and then treated at the Hazardous Waste Treatment Line (delivered in IBC containers, barrels, etc.).
- In the case of a small-scale spillage, appropriate absorbents for the collection of potentially leaked content (sawdust, sand, oil, alkali and acid absorbents) will be provided within the transfer station for the collection and dry cleaning of the leaked content. The contaminated sorbent will be disposed of in containers and subsequently treated at the plant in question.
- In addition to the transfer point (W-C13), it is also planned to install a shower for the purpose of rinsing hands and eyes in case of pouring on the operator when discharging liquid waste (in case of an accident). The water from the shower flows into the aforementioned manhole.
- IBC containers/barrels with waste material should be stored separately in the rack or non-rack part of the warehouse, according to the waste groups and their compatibility.
- All containers with hazardous substances where there is a possibility of damage and discharge of liquid or powdery hazardous substances must be stored in appropriate standard portable bundwalls.
- Liquid hazardous waste must be packed in packaging that is approved (UN code, http://www.unpackaging.com/) for the international transport of dangerous goods, and that meets the following criteria:
    - strong enough to withstand shocks, loading, displacement from pallets or removal from over-pack packaging, suitable for manual or mechanical handling,
    - made and closed in such a way as to prevent loss of contents during preparation for transport, transport, due to vibration or change in temperature, pressure, humidity,
    - is closed according to the manufacturer's instructions so as to prevent the occurrence of waste outside the packaging.
- In all storage facilities, envisage corridors that will be used for handling, i.e. bringing waste by forklifts or trolleys for storage in designated and marked places.
- It is the obligation of the Project Holder to periodically check the structural integrity of the vessels (mechanical cracks) and the occurrence of leaks. In case of need, certain measures will be taken such as replacing the packaging (container), rehabilitation of accidentally spilled contents, etc. In order to carry out the aforementioned control smoothly, access to the hazardous waste warehouse should be easy and free for easy repackaging, measurement, sampling, transport, etc.
- A sufficient number of mobile bundwalls will be provided for the collection of any leaked contents, as well as appropriate absorbents for the collection and dry cleaning of the leaked contents (sawdust, sand, oil, alkali and acid absorbents).
- Dispose the contaminated sorbent in intended containers for the collection of hazardous waste until further disposal and dispose it in a temporary storage facility for hazardous waste;
- In the storage room of IBC containers and barrels, drainage grids are designed, which will carry all possibly leaked contents or water from washing to the collection pit. It is the obligation of the Project Holder to regularly maintain and empty the contents of the collection pit and to treat the contents of the pit at the boiler plant in question.

- Different types of liquid waste should be stored in divided, separate tanks located in concrete waterproof bundwalls, depending on the characteristics of the waste (combustible, non-combustible, easily volatile, etc.).
- In the bundwalls of the tanks, pumps are located, which will be used for transferring, possibly spilled liquid waste materials, from the bundwall to the appropriate tank.
- Bundwalls are dimensioned in the manner defined by the Rulebook on Technical Norms for Fire and Explosion Safety of Plants and Facilities for Flammable and Combustible Liquids and on Storage and Transfer of Flammable and Combustible Liquids (Official Gazette of the RS nos.114/2017, 85/2021).
- Each tank will be equipped with the necessary instrument equipment with a level meter with remote indication on the PLC, a high level switch as overfill protection, which upon reaching the high level stops the pump for receipt from the vehicle transfer point.
- Store sludge waste in a separate watertight bunker intended for this purpose only.
- Unload the sludge by tipping from the truck directly into the sludge reception bunker. After the unloading is completed, the transport vehicle leaves the facility, and the lid of the reception bunker closes.
- The sludge reception and dosing system is automated to control and monitor the process from the reception of sludge to its dosing into the thermal treatment furnace.
- In order to protect water and soil within the plant, a separate sewerage system is envisaged for:
  - Atmospheric water from the roof of the facility;
  - Oily atmospheric waters;
  - Sanitary-foul wastewater,
  - Technological wastewater,
  - Wastewater from extinguishing possible fires.

  In all water treatment systems, devices are provided for measuring water flow, as well as measuring water quality at the inlet and outlet of the plant.
- Wastewater arising from wet flue gas cleaning should be treated at the wastewater treatment plant in the boiler plant consisting of:
  - three-stage neutralization,
  - the settling of heavy metals,
  - flocculation,
  - sedimentation and
  - filtration.
- Wastewaters from Waste-to-Energy Plant, created after the waste gas cleaning process, are discharged in accordance with the permit issued on the basis of special regulations, that is, with the water conditions obtained in the process of obtaining the location conditions governing this area.
- Monitoring of the concentration of pollutants in wastewater is planned and will be carried out in the manner and within the deadlines determined in accordance with the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023), regulations governing water quality management and the issued permit.
- The discharge of wastewater into the recipient is maximally limited to the extent possible, so that the emission limit values are in accordance with Appendix 4. LIMIT VALUES FOR POLLUTANT EMISSIONS IN WASTEWATER FROM THE WASTE GAS TREATMENT PROCESS GENERATED IN THE PLANT FOR INCINERATION AND CO-INCINERATION OF WASTE of the Regulation, as well as in accordance with the conclusions on the best available techniques Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration.
- Wastewater may be discharged into the recipient after special treatment, in accordance with the issued permit, if:

1) the discharge is carried out within the prescribed emission limit values, in accordance with the regulation and other regulation;
2) mass concentrations of pollutants do not exceed the emission limit values set out in Annex 4 of the Regulation.

Emission limit values are applied at the point where the wastewater generated in the waste gas treatment process containing pollutants referred to in Annexes 2 and 3 of the Regulation is discharged, in this case at the point of discharge of wastewater into the collector of all clean and treated waters of the Waste-to-Energy Plant.

- The Project Holder must perform appropriate material balance calculations to determine the emission levels in the final discharged wastewater that may in some way be associated with the water from the gas from incineration cleaning process, in order to verify compliance with the emission limit, values set out in Annex 4 of the Regulation for wastewater from the incineration gas treatment process.
- The project solved the wastewater treatment, i.e. wastewater cannot be diluted in order to achieve the emission limit values from Annex 4 of the Regulation on technical and technological conditions for the design, construction, equipment and operation of plants and types of waste for thermal treatment of waste, limit values of emissions and their monitoring ("Official Gazette of the RS", no. 103/2023).
- Within the subject complex, a wastewater reception pool with separate chambers is planned to provide sampling and checking of water quality before discharge to the recipient.
- In case that the quality of wastewater collected in the pool does not meet the criteria defined for the discharge of water into the recipient (Danube River), the project envisages returning the water back to the wastewater treatment boiler plant via a sand filter system and an activated carbon filter. In case that it is still not possible to purify the water to the required quality for discharge into the final recipient, the contaminated wastewater should be diverted to the liquid waste tank and from there to thermal treatment in the boiler.
- Before discharging into the clean water collector, sanitary-foul wastewater must be treated at the mechanical and biological treatment plant. Buried biological purifier with continuous recirculation of activated sludge with a capacity of 20 PE (40 employees) is planned. Purified wastewater should be discharged into the collector of conditionally clean rain sewage and then into the internal network of the Elixir Prahovo Industrial Complex, which ends with a discharge into the Danube River. Two bypass separators are planned for the efficiency of separating light petroleum products - light liquids in the separator outlet water up to 5mg/l.
- Potentially oily atmospheric water from all manipulative surfaces, roads and parking lots should be drained to the grease and oil separator for treatment before discharge into the recipient (with the collector of conditionally clean rainwater, purified water is conducted to the drainage Central collector for the entire Elixir Prahovo complex, and through it is discharged into the Danube).
- It is the obligation of the Project Holder to regularly clean and maintain the grease and oil separators and to treat the resulting sediment in accordance with the Law on Waste Management and by-laws in this field. An appropriate document shall be drawn up/completed on the amount and type of waste.
- It is the obligation of the Project Holder to regularly test the quality of wastewater on the grease and oil separator 4 times a year, through an authorized legal entity. The quality of wastewater must be in accordance with the Law on Waters ("Official Gazette of the RS", nos. 30/2010, 93/2012, 101/2016, 95/2018 and 95/2018 - other law), the Rulebook on the manner and conditions for measuring and testing the quality of wastewater and the content of the report on the performed measurements ("Official Gazette of the RS", no. 33/2016) and the Regulation on Emission Limit Values of Pollutant into Water and Deadlines for Their Reaching ("Official Gazette of the Republic of Serbia", nos. 67/11, 48/12 and 1/16).
- The dynamics of discharge and cleaning of the separator depends on the amount of sludge and petroleum products separated, i.e. on the method of operation and manipulation at the site itself (the interval must not exceed 6 months);
- The Waste-to-Energy plant, including the storage areas for waste within the plant area, is

designed in such a way as to prevent illegal and unintentional leakage of pollutants into the soil, surface waters or groundwater, in accordance with the regulations.
- For diesel generators, which are planned to provide an alternative power supply solution, and their diesel fuel tanks, envisage a technical solution with the necessary protection in order to prevent pollution of surface and groundwater in the event of accidents.
- Wastewater generated by washing the process equipment used for solidification of residues from the boiler plant should be collected in the collection pit located in the facility W-C12 Stabilization and solidification. Return the collected water from washing the equipment to the solidification process. In this way, the consumption of process water is saved, and the required humidity of the material is also achieved, as well as the prevention of dust emission when manipulating residues from the boiler plant.
- Wastewater from fire extinguishing and other contaminated water that cannot be purified to the required quality for discharge into the final recipient (Danube River) must be thermally treated at the boiler plant in question.

8.3.2.6 Noise protection measures

- All activities related to waste handling as well as equipment that can emit noise are located in closed facilities.
- Regularly monitor the condition of noise-emitting equipment through a regular maintenance plan. Additional verification of the integrity of the equipment should be carried out by establishing an inspection plan, as well as an equipment testing plan.
- Noise at the boundary of the complex must not exceed the limit value for the zone it borders, i.e.:
    - For day and evening 60 dB(A) and
    - For the night 50 dB(A).
- Facilities that are not part of an indivisible technological whole are separated, in order to minimize noise levels. The plant itself is not near other noise emitters.
- The obligation of the Project Holder is to perform noise measurement at the nearest residential buildings during the commissioning of the plant
- In case of exceeding the permissible noise level, the Project Holder is obliged to implement additional measures in order to reduce and achieve the permissible noise level.

8.3.3 Environmental protection plans and technical solutions during regular operation of the Landfill for non-hazardous waste

In accordance with the Regulation on the disposal of waste at landfills ("Official Gazette of the RS", no. 92/2010), a landfill of non-hazardous waste for the disposal of stabilized and solidified residues from the boiler plant at the location in Prahovo was designed:
- In order to meet the necessary conditions for preventing pollution of soil, underground and surface water, air and to ensure controlled management of leachate.
- The protection of soil, groundwater and surface water is achieved by the combination of the geological barrier and the bottom impermeable layer during the active phase of the landfill and the combination of the geological barrier and the upper impermeable layer during the passive phase after the landfill closure.
- During the design of the landfill, the technical and technological conditions for the construction of the landfill were complied with in accordance with Appendix 2. – Technical and technological conditions for the design, construction and commissioning of the landfill, relating to:
    1) landfill body;
    2) manipulative serving plateau;
    3) roads and necessary infrastructure;
    4) pools for collecting atmospheric and leachate wastewater;
    5) vegetation protection belt.
- The landfill operation procedure will be carried out in accordance with the technical and technological conditions provided for in the design and technical documentation, permit, law and regulation.

- Waste can be accepted at the landfill only if it meets the criteria for accepting waste at the Landfill for non-hazardous waste. The criteria for accepting or not accepting waste at the landfill are the limit values of the parameters for the disposal of solid, non-reactive hazardous waste (stabilized and solidified).
- Solid non-reactive hazardous waste is one whose leachate is equivalent to that for non-hazardous waste and which meets the limit values of the parameters for the disposal of non-reactive hazardous waste at landfills for non-hazardous waste in accordance with Annex 8, item 2. Disposal of non-reactive hazardous waste at landfills for non-hazardous waste in cassettes that are not used for disposal of biodegradable waste and Annex 10. List of parameters for waste testing for disposal, Rulebook on waste categories, examination and classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021);
- Only pre-treated waste is disposed of at the landfill in accordance with the Law on Waste Management and other regulations.
- The acceptance of waste into a landfill is carried out according to a procedure that includes the following actions:
    1) disposal waste examination;
    2) compliance check;
    3) on-site check.
- Examination of waste for disposal shall be carried out for each type of waste, in accordance with a special regulation, and sampling in accordance with the prescribed standards. Data obtained by testing waste for disposal at a landfill, in particular must contain:
    1) a description of the previous waste treatment or a statement that the waste can be disposed of without prior treatment;
    2) composition of waste and leachate;
    3) the class of landfill to which the waste is disposed;
    4) proof that the waste is not waste from Article 9 of the Regulation on landfill disposal;
    5) special requirements and measures to be taken when disposing of, if necessary, in accordance with Article 13 of the Regulation on landfill disposal;
    6) certain key parameters for checking compliance, as well as its dynamics.
- For waste regularly produced in the same procedure and in the same plant, the examining in paragraph 1 of this Article produces data which particularly refer to:
    1) variability in the composition of individual types of waste;
    2) limits of variability of significant properties.
- Testing of waste intended for disposal should be carried out by hiring an authorized professional waste testing organization in accordance with the Law on Waste Management.
- The data obtained from waste testing are an integral part of the waste testing report for disposal submitted by the Project Holder to the competent authority.
- For waste regularly produced in the same process (S/S) in the plant in question, for which there is data specified in Article 16, paragraphs 2 and 3 of the Regulation on the disposal of waste at landfills, if the measurement results show small deviations from the limit values of the disposal parameters, testing should be performed at the first delivery, and then periodic compliance verification in accordance with the Regulation.
- The compliance check shall be performed periodically, at least once a year, in order to check the waste that is regularly delivered for disposal in order to determine whether the parameters of that waste correspond to the parameters obtained by testing the waste for disposal and whether they meet the limit values of the parameters for waste disposal. The compliance check should be performed only for those parameters that are determined as critical when testing waste for disposal.
- When checking compliance, the same tests that were used in testing waste for disposal will be applied.
- For waste whose characteristics are variable, waste to be disposed of shall be tested for each batch of waste and shall not be subject to compliance checks.
- It is the obligation of the project holder to regularly check the waste on site by visual inspection of each batch of waste before and after unloading, as well as checking the accompanying documentation in accordance with the Regulation on the disposal of waste at landfills. Waste is

accepted at the landfill if it has been determined on the spot that it is identical to the waste for which the testing was performed, i.e. compliance check.

- The project holder must not accept waste at the Landfill for non-hazardous waste if it does not meet the requirements for disposal set out in the permit, when different types of waste are mixed, i.e. when the delivered waste poses a risk to human health and the environment and when the conditions for disposal prescribed by the Regulation on the disposal of waste at landfills and the Law on Waste Management are not met.
- It is the obligation of the project holder to prepare a location plan of the landfill during the disposal of waste (zoning of the disposal site of each batch of waste) with exactly indicated micro locations of cassettes in which solid non-reactive hazardous waste is disposed of and to keep it both during operation and after the closure of the landfill.
- In case that the waste does not correspond to the thermally treated recipe with a known composition of combustion residues, it is necessary to perform rapid analyses (surrogate) of waste leaching in the internal laboratory in order to determine the expected leaching of materials according to the ordinance established by the standard. According to the accredited method NEN 7345 Leaching Characteristics of Soil and Stony Building and Waste Materials (or equivalent method), the compatibility of waste for disposal as non-reactive hazardous waste at a non-hazardous waste landfill in accordance with the Rulebook on categories, testing and classification of waste ("Official Gazette of RS", No. 56/2010, 93/2019, 39/2021 and 65/2024) will be determined after the leaching test of 64 days or less with the correction of the limit values in accordance with the said Rulebook.
- If the acceptance of waste that is determined to require supplementation or retesting of waste is refused, temporary storage of waste in the designated landfill area may be allowed for a period not exceeding four months. The authority responsible for issuing the permit shall be informed of the non-acceptance of waste at the landfill.
- Waste that, upon analysis, is found not to meet the prescribed criteria for disposal at the Landfill for non-hazardous waste shall, in accordance with Regulation on the disposal of waste at landfills ("Official Gazette of RS", No. 92/2010) and the EU Directive (Landfill Directive 1999/31/EC, Council Decision 2003/33/EC for disposal to Non-hazardous waste landfill, shall, upon obtaining the results, be removed from the landfill in question and handed over to an authorized operator for further disposal at home or abroad, through an authorized operator who holds a permit and appropriate trucks for the transport of hazardous waste in accordance with the regulations on the transport of dangerous goods. The recipient of the waste must be an authorized operator of a hazardous waste landfill and / or an operator for the disposal of waste in an underground mine, who has a permit for the acceptance and disposal of such type of hazardous waste.
- In accordance with Appendix 5 – Procedures and mode of operation of the landfill of the Regulation on the disposal of waste at landfills, it is the obligation of the Project Holder to comply with the procedures and mode of operation of the landfill when disposing of waste at the landfill, which refers to:
  - **movement regime and operating procedures for all vehicles entering the landfill complex;**

(1) control and visual inspection of waste at the entrance;
(2) measurement of waste over the weighbridge;
(3) movement along service roads to the active section of the landfill;
(4) unloading of waste to the planned location – landfill segment;
(5) washing the wheels of the unloaded vehicle after unloading on the package washing unit;
(6) departure of the clean vehicle from the landfill;
(7) in the working zone of the landfill there are vehicles for spreading and compacting waste and they do not leave the landfill complex

  - **rules applicable when disposing of waste;**

(1) waste disposal begins at the lowest level of the landfill;
(2) ensure that the daily, working area is kept as small as possible;
(3) each batch of waste brought in shall be immediately spread out and compacted;
(4) "layers" of waste are formed up to the projected height;
(5) provide the projected slopes of the work surface;
(6) provide and define individual segments on the landfill body for each batch of waste material

accepted at the landfill;
(7) a layer of compacted waste is sprayed with water in order to reduce air pollution;
- **control of the formation and quality of leachate at the landfill;**

(1) control of the type and quantity of waste unloaded;
(2) control of the implementation of the designed technological process of landfill exploitation;
(3) control of maintenance of landfill bodies and roads;
(4) quality control of washing of transport vehicles;
(5) control of the quantity and quality of leachate;

(6) control of worker protection;
- **control of the formation and quality of leachate at the landfill;**

(1) temperature at the entrance to the designed facility and ambient air temperature;
(2) pH value of the leachate at the inlet and the purified liquid at the outlet of the designed facility;
(3) consumption of permanganate;
(4) BOD (biological oxygen demand);
- **control of particulate matter emissions from the landfill body.**

- At the very entrance to the landfill complex, there is a gate and a reception desk, so that, first of all, a check is carried out, a waste reception control is carried out and a sample is taken for the purpose of waste analysis.
- At the entrance to the landfill, place a sign made of durable material with permanent inscriptions, containing the name, the landfill operator's name, the landfill class, the address of the company disposing of the waste, operating hours, types of waste allowed for disposal, types of waste not allowed for disposal, and other significant information.
- After visual inspection of the condition of the waste and verification of the accompanying documentation, it is the obligation of the waste recipient, a qualified person responsible for professional work at the landfill, to fill in part D of the Document on the movement of waste/hazardous waste in accordance with the Rulebook on the form of the document on the movement of waste and the instructions for its filling ("Official Gazette of the Republic of Serbia", no. 114/13) or the Rulebook on the form of the Document on the movement of hazardous waste, the form of prior notification, the manner of its delivery and the instructions for their completion ("Official Gazette of the RS", No. 17/17).
- When receiving each batch of waste, the authorized persons of the accredited laboratory will take a sample (the minimum amount of matter necessary for laboratory tests) of the solidificate, which is further analysed in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", nos. 56/2010, 93/2019 and 39/2021): Disposal of non-reactive hazardous waste at landfills for non-hazardous waste.
- Testing of the taken waste samples should also be carried out within the internal laboratory designed as part of the Waste-to-Energy Plant. Leaching tests for the monolithic waste in question (solidificate) will be performed according to the standard NEN 7345 Leaching Characteristics of Soil and Stony Building and Waste Materials – Leaching Tests – Determination of the Leaching of Inorganic Components from Building and Monolithic Waste Materials with the Diffusion Test (or equivalent method). The values of the concentration limit value are given by the above Rulebook in relation to the 64-day test. For the purpose of obtaining preliminary rapid analyses for the test, use a shorter test, whereby the concentration limit values for individual parameters are adjusted to the duration of the test, in accordance with the aforementioned Rulebook.
- In order to protect against air pollution, i.e. to prevent the spreading of fine-grained material from the landfill, regular spraying of the landfill with water is planned.
- In the event that there is not enough atmospheric water for landfill spraying, a water tank will be provided.
- It is planned to establish on the landfill a completely closed system of water circulation from the landfill. Two separate water collection systems are envisaged:
  - Leachate collection system by which water is transported to the wastewater pool provided in the space of the Waste-to-Energy Plant and
  - The system for collecting atmospheric runoff from the landfill slopes to be collected and used for spraying water on the landfill slopes, thus achieving water recirculation.

- From the leachate pool, an emergency overflow to the stormwater pool is planned, in case of termination of the operation of the pump for transport to the wastewater pool in the area of the Waste-to-Energy Plant
- An emergency overflow is planned from the stormwater pool, which in the event of extreme precipitation will allow water to be evacuated into the peripheral canal of the phosphogypsum storage facility, which is located on the south side of the future Landfill for non-hazardous waste.
- In order to protect soil and groundwater, the bottom of the landfill body will be arranged as follows:
    - the excavation of humus and other surface materials will be carried out in the area where future cassettes will be formed to a depth of 0.3-1.3 m, so that a uniform bottom elevation of 48 masl will be achieved,
    - the cleaned area will be well rolled by multiple passage of rollers and compactors, which will ensure sufficient compaction that mimics the mineral barrier and at the same time prevent damage to the film during installation,
    - a geomembrane made of high density polyethylene (HDPE) with a thickness of not less than 1.5 mm will be placed on the rolled surface, which meets the requirements of the Geosynthetic Research Institute (GRI) Test method GM 13 "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes"3 or the relevant European standards (EN 134934) and recommendations,
    - a protective layer of geotextile, with a minimum mass of 200 g/m^2, will be placed on the geomembrane,
    - above the geotextile protective layer, a drainage and relief layer of gravel with a minimum thickness of 50 cm will be placed,
    - corrugated perforated drainage pipes Ø160 mm will be laid on the gravel, at a distance of 15 m from each other, and outlets made of solid pipes with a slope of 20%, which drains the drainage water from the contours of the landfill and drains it to the eastern, western and southern sides of the landfill into the drainage water collection pipelines, which are located on the outside of the stormwater collection channel.
    - The drainage pipes will be covered with a layer of gravel of at least 50 cm thickness, which will be wrapped with a layer of geotextile according to the detail shown in Figure 3.20.
    - drainage pipes are installed in the interior of the landfill up to a maximum length of 30 m, in order to maintain their structural strength, while further in the interior of the landfill a drainage layer of stone is formed at the same distance as the drainage pipes.
- In the southern part of the Landfill for non-hazardous waste complex, a unit for washing the wheels of trucks delivering waste, as well as the machinery used within the landfill, is planned. A standard washing facility for truck wheels, featuring high-pressure water with water recirculation, will be installed. When the washing water becomes contaminated, it will be pumped into an IBC container and transported to a plant for treatment.

- It is the obligation of the Project Holder to monitor the operation of the landfill in accordance with the proper technological procedure and legal obligations (Art. 26).
    1) monitoring of meteorological parameters;
    2) surface water monitoring
    3) monitoring of leachate;
    4) groundwater monitoring;
    5) monitoring the amount of rainwater;
    6) monitoring the stability of the landfill body;
    7) monitoring of protective layers;
    8) monitoring of pedological and geological characteristics.
- It is envisaged by the project that the monitoring will be carried out by sampling and measurement in the manner given in Appendix 6. – Monitoring the operation of the landfill, which is printed with the aforementioned regulation and forms an integral part thereof.
- Sampling and measurement will be carried out:

1) in a laboratory where certain tests are performed daily;

2) in an accredited laboratory at certain intervals prescribed by this Regulation or more

frequently, if the data in the landfill laboratory show that there has been any accident situation or deviation from the parameters defined by the permit.

- All data obtained by monitoring shall be submitted as part of the regular annual reports that the Project Holder is obliged to submit to the Environmental Protection Agency.

8.4 Other measures that may affect the prevention or reduction of harmful effects on the environment:

- In order to improve the overall performance from the point of environmental protection, it is envisaged to establish and implement an Environmental Management System (EMS). The preparation of the Plant Management and Operation Manual (Management Handbook) is in progress, which will define all activities, precise environmental protection policy, waste management quality guarantee policy, organization, work protocols, working conditions, conditions and method of treatment of residues from the thermal treatment process, reporting, EMS, work procedures in emergency situations, etc.
- The qualified person responsible for professional work in the waste management plant, appointed by the authorized person of the Project Holder, is obliged to monitor the handling of non-hazardous and hazardous waste when performing waste storage and treatment activities, in accordance with the law governing waste management and other legal regulations.
- It is the obligation of the Project Holder to provide an adequate space at the site in which the documentation on the location, plant and records kept on the types and quantities of non-hazardous and hazardous waste in question are stored.
- The management of all technological processes will be carried out through the DCS system through which all process parameters (energy consumption, water consumption, waste quantities...) will be monitored; BMS system is envisaged as well, through which video surveillance, operation of ventilation systems (air conditioning) will be monitored.
- At the entrance to the non-hazardous and hazardous waste management plant at the location in Prahovo, a board should be placed with clearly visible information on the name and type of the waste management plant, types of non-hazardous and hazardous waste whose storage is carried out, working hours of the plant, as well as contacts of the owner or persons in charge of managing the plant.
- It is the obligation of the Project Holder to label non-hazardous and hazardous waste during storage in a way that ensures safety for human health and the environment and in accordance with the applicable regulations of the Republic of Serbia.
- Municipal waste generated during the regular operation of the facility shall be sorted, separating recyclable from non-recyclable types of waste. Provide containers for separate collection of waste and delivery of recyclables (pet packaging, paper, cardboard, metal, etc.) to authorized operators for further disposal. The collected non-recyclable substances should be handed over to the authorized operator for further disposal.
- Separated secondary raw materials during pretreatment of waste and treatment of slag from the boiler plant should be temporarily stored on the concrete plateau until they are handed over to authorized operators for further disposal (recycling).
- Waste stretch film, metal frames/grids removed from IBC containers/drums/jumbo bags before treatment, and damaged wooden pallets, which are considered non-hazardous waste (secondary raw materials), shall be temporarily stored in designated containers (metal containers etc.) on a concrete platform until they are handed over to authorized operators for recycling.
- The temporary storage of non-hazardous waste (separated secondary raw materials) provided in the open air is provided with a waterproof substrate from which all atmospheric water is collected and taken to the grease and oil separator.
- Packaging made of chemicals to be used at the plant in question should be used as returnable packaging or, if this is not possible, it should be referred for thermal treatment at the plant in question.
- All dust that is separated in the filtration process in the bag filter of the Waste Pretreatment Filter System and the Solidification filter system, should be collected in the associated bunkers and the screw conveyor, which is placed along the entire length of the bottom of the bunker, should be taken to the sector dispenser, which further inserts the material into the container provided for this purpose. The contents of the container should be emptied into one of the receiving waste bunkers

and further referred for thermal treatment.
- After replacement, waste damaged filter bags should be treated in the boiler plant in question.

- Commercial waste generated due to daily activities in the office (paper, cardboard, staples, staples, wood in the form of disused chairs, tables, shelves, electrical and electronic equipment (telephones, computers, fax, printers ...) and other office supplies) should be sorted at the place of origin on paper and cardboard, PET, metal, wood that can be used as secondary raw materials and as such handed over to authorized operators for further treatment, and special waste streams should be disposed of in accordance with legal regulations.
- Within the complex in question, perform only temporary storage of waste generated during operation (overhauls, cleaning of process equipment, oil replacement, etc.) until its permanent disposal, which will be performed either within the boiler plant in question or by third parties, i.e. companies that have permits issued by the competent authority and that are registered to perform waste collection, transport, storage and/or treatment activities.
- Waste management generated during the regular operation of the plant should be carried out in accordance with the Waste Management Plan, which is periodically updated in accordance with the Law on Waste Management.
- Waste manipulation can only be performed by persons of the appropriate profession, trained and authorized for this type of work, dressed and equipped with proper equipment;
- The ammonia water transfer site (W-C13) is provided with a grate that will be connected to the collection pit in which any leaked contents will be collected during transfer. In this way, the possibility of possible leakage of the leaked fluid into the atmospheric sewage and the surrounding soil is avoided. The collected contents should be pumped into an IBC container and taken to a temporary storage of liquid waste materials from where, together with other liquid waste, they will be sent for thermal treatment.
- In addition to the area for transferring ammonia water, it is also planned to install a shower for the purpose of rinsing hands and eyes in case of pouring on the operator when discharging liquid waste (in case of an accident). The water from the shower flows into the aforementioned manhole.
- Below the HCl scrubber, a plastic bundwall basin is planned, and below the SO2 scrubber, a concrete containment basin for capturing any potential leaks during normal operation of the scrubber system or during maintenance of system components (e.g., pumps). A drain is provided in the bundwall and the water gravitationally flows into the general technological sewer, which is connected to the wastewater basin U-C06.
- Develop appropriate technical instructions and procedures for work in the facility;
- Establish grass and other green areas in a way that does not require the use of hazardous and harmful herbicides and pesticides, or requires their minimal and always controlled application.
- It is the obligation of the Project Holder to keep the waste management plant fenced and under constant supervision, in order to prevent access to unauthorized persons. The project envisages video surveillance of the entire plant.
- The ammonia water storage tank must be cooled in the summer months by spraying the process water. The water from the cooling of the tank should be collected in the associated bundwall, then taken to the collection basin located in the immediate vicinity of the tank, and then reused for cooling purposes, thus achieving water recirculation. If there is a possible contamination of the cooling water with ammonia water, it should be pumped into an IBC container /tank and sent first to the liquid waste storage, and then treated in the boiler plant together with other liquid waste.
- Considering that leachate is treated as part of the wastewater treatment plant in the Waste Energy Plant, any change in groundwater quality determined after the analysis of samples taken from piezometers in Zone A, B or C will be considered a contingency scenario requiring corrective action including:
    - Physical introduction of a hydraulic barrier that changes the elevation of groundwater, changing the flow with the aim of preventing the flow towards the Danube River as close as possible to the location of the landfill.
    - Weekly verification of groundwater quality downstream during the period of existence of the hydraulic barrier.
    - Extraction of contaminated groundwater and routing to the wastewater treatment plant of the complex during the period of active measures of the hydraulic barrier.
    - Performing analysis of groundwater samples with the aim of determining the nature of the

occurrence, i.e. continuing observation or notification of a one-time event and/or determining the type of contamination with an appropriate mechanism of migration of contaminants.

- Performing a professional program of mitigation measures after the analysis of groundwater samples has been completed (physical, mechanical or construction problem requires maintenance work, induction of an inert layer at certain locations of the landfill, introduction of material layers with metal sorption characteristics, etc.).
- Re-establishing the connection of groundwater with the Danube River or inducing a permanent mechanical barrier to the flow of water in accordance with an expert mitigation plan.

If there is a leakage of fuel or pollutants and soil pollution at the location in question and if the concentrations of pollutants, hazardous and harmful substances in the soil exceed the prescribed remediation values, it is the obligation of the Project Holder to:

- Notify the competent Ministry of Environmental Protection as soon as possible.
- Perform soil testing and develop the Land Remediation and Recultivation Project and obtain the consent of the competent authority to the same Remediation Project and the recultivation project may be prepared by a company or company or other legal entity that meets the requirements for design activities in the field of soil protection.
- Perform remediation and reclamation of soil by hiring specialized companies/operators (using e.g. physical remediation method, chemical remediation method, biological remediation, phytoremediation, etc.).
- Submit to the competent Ministry of Environmental Affairs a Report on the performed remediation and reclamation of the land no later than 30 days from the date of completion of the project. The report shall contain in particular:

  1) data on the condition of the soil before the remediation or reclamation is carried out;
  2) a list of methods and standards used in the implementation of remediation or recultivation;
  3) a list of materials used to achieve remediation or recultivation;
  4) data on the condition of the soil after remediation or recultivation;
  5) assessment of the success of the measures taken;
  6) a proposal of measures to maintain the achieved state of the land;
  7) data on the registration and competence of the contractor on rehabilitation and remediation and the author of the report.

8.4.1 Landfill closure method and procedure

- The surface of the landfill or one part thereof shall be closed when the conditions specified in the permit and the project for closing the entire landfill or one part thereof are met. When the designed elevations are reached, the closure reduces the effect of the open landfill immediately after reaching the final elevations and reduces leachate and air pollution.
- As the landfill progresses in height, carry out the reclamation of the external slope by first placing a waterproof layer with a minimum thickness of 50 cm, followed by a 20 cm drainage layer of gravel, on top of which a 50 cm thick layer of humus must be applied. A geotextile with a minimum weight of 150 g/m^2 should be placed between the gravel and the humus layer. This will help prevent potential air pollution and slow down surface runoff, which can be significant in the case of greater landfill heights.

- After the completion of the exploitation period, it is the obligation of the Project Holder to close the landfill for further disposal by forming an upper covering layer that meets the following technical and technological requirements:

Measures applied in terms of the formation of the upper overlay	Landfill class
	For non-hazardous waste
Landfill gas drainage layer ≥ 0.3 m	not required *
Artificial waterproof lining - foil	not required
Impermeable mineral layer ≥ 0.5 m	required
Reclamation layer ≥ 0.5 m	required

*At the subject landfill for the disposal of non-hazardous waste / solid, non-reactive hazardous waste (solidified) whose leachate is equivalent to that for non-hazardous waste and which meets the limit values of the parameters for the disposal of hazardous waste at landfills of non-hazardous, there will be no emissions of landfill gas. All chemical reactions in which hydrogen may be emitted, etc., will take place during the stabilization and solidification process, which takes place under strictly controlled conditions in the stabilization and solidification facility within the plant, and before the process of disposing of the solidificates at the landfill in question.

- For the reclamation layer, use compost or waste obtained through other biological treatment technologies, provided that it meets the concentration limits for waste disposal parameters.
- The landfill or part of the landfill shall be closed in accordance with the permit, when the conditions for closing the landfill are met or due to unforeseen circumstances that endanger the environment, in accordance with special regulations.
- After the closure of the landfill and until its final closure, the landfill operator (Project Holder) must take measures related to:
  (1) maintenance, supervision, control and monitoring of the landfill area, in accordance with the Regulation on the disposal of waste at landfills and the Law on Waste Management;
  (2) compiling a report on the state of the landfill for each calendar year and submitting it to the competent authority no later than 31st March for the previous calendar year;
  (3) reporting of irregularities determined by control and monitoring, which may adversely affect the environment, which shall be submitted to the competent institutions, within seven days from the date of determination.
- Measures to prevent or reduce environmental pollution shall be implemented by the Project Holder at its own expense and within the given deadline, in accordance with the Law on Waste Management.
- The landfill or a portion of it is considered finally closed for further disposal when all requirements of Article 24, Paragraph 2 of the Regulation on Waste Landfill Disposal are met, in accordance with the permit from the relevant authority regarding the cessation of landfill operations.

9.0. ENVIRONMENTAL IMPACT MONITORING PROGRAMME (MONITORING)

Environmental monitoring is the measurement of basic parameters, i.e. indicators of environmental quality. Based on the results of the measurements, the most appropriate measures can be taken in certain situations in order to preserve the quality of the environment.

The purpose of monitoring is not to identify undesirable levels of environmental pollution, but to warn in time that pollution may occur so that measures and activities can be taken to reduce negative impacts on the environment. Also, the purpose of monitoring is to warn in time of possible hazards due to possibly inadequate functioning of one of the elements of the system.

Obligations to monitor the state of the environment (monitoring) are defined by the Law on Environmental Protection ("Official Gazette of the RS", no. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - CC, 14/2016, 76/2018 and 95/2018 - other law and 94/2024 – other law); Under the provisions of this Law, the obligations are as follows:

- The Republic, the Autonomous Province and the local self-government unit, within their competencies, ensure continuous control and monitoring of the environment, as well as financial resources for monitoring. The Government shall determine the criteria for determining the number and arrangement of measuring points, the network of measuring points, the scope and frequency of measurements, the classification of phenomena to be monitored, the methodology of work and environmental pollution indicators and their monitoring, deadlines and the manner of data submission.
- A legal and natural person who is the owner or user of an installation that is a source of emission and environmental pollution, is obliged that, in accordance with Article 72 of the Law on Environmental Protection ("Official Gazette of the RS", nos. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - CC decision, 14/2016, 76/2018, 95/2018 - other law and 95/2018 - other law and 94/2024 – other law), through the relevant authority or authorized organization:
    - monitor emission indicators, i.e. indicators of the impact of their activities on the environment, indicators of the effectiveness of applied measures to prevent the occurrence or reduction of the pollution levels;
    - provide meteorological measurements for large industrial complexes or facilities of special interest to the Republic of Serbia, an autonomous province or a local self-government unit.
- The Government shall determine the types of emissions and other phenomena that are the subject of pollutant monitoring, the methodology of measurement, sampling method, the method of recording, the deadlines for submission and the requirements for data storage. The polluter plans and provides financial resources to perform emission monitoring, as well as other measurements and monitoring of the impact of its activity on the environment.

In accordance with the Law on Environmental Protection ("Official Gazette of the RS", nos. 135/04, 36/09, 36/09 - other law, 72/09 - other law, 43/11 - decision of the CC and 14/16 and 94/2024 – other law), and according to Article 72, the operator is obliged to monitor emission indicators, i.e. indicators of the impact of its activities on the environment and indicators of the effectiveness of applied measures for preventing the occurrence or reducing the level of pollution. The project holder is obliged to develop a monitoring plan, which will define the dynamics of monitoring and the type of pollutants to be measured. The Project holder shall submit the data on the performed monitoring to the competent authorities within the legally prescribed deadline.

9.1 An overview of the state of the environment prior to the commencement of the project operation in locations where environmental impact is expected;

An environmental impact monitoring program already exists at the location of the Elixir Prahovo industrial complex, and monitoring reports are regularly submitted to the competent authorities. As part of the monitoring, the following is carried out:

- Monitoring the emission of pollutants into the air;

- Air quality monitoring;
- Monitoring of wastewater, surface water and groundwater;
- Soil quality monitoring;
- Noise monitoring;
- Record and reporting on waste.

In order to define the state of the environment before the start of the project operation at the locations of the Waste-to-Energy Plant and the Landfill for non-hazardous waste, the study includes updated reports on the monitoring of the basic environmental factors at the location of the nearest existing Elixir Prahovo complex, as well as reports on targeted measurements of environmental factors at the locations in question prepared by authorized laboratories.

As part of the examination of the zero state of the soil at the site in question and the surrounding area in the period from privatization 2012 to 2020, composite samples of the surface layer of the soil were taken, as well as samples of deeper layers (from the identified geological layers), up to the groundwater level. A part of the wells was used for the installation of piezometers, from which water samples were taken for laboratory analysis. Bearing in mind the historical pollution data on the complex, the characteristics of the emitters, as well as the types of pollutants, the Initial Conceptual Location Model (ICSM) was applied, which also takes into account the potential migration pathways of pollutants.

Report **"Analysis of the state of environmental factors", given in the Appendix of Study,** analysed the results presented by geotechnical studies of the Elixir Prahovo complex and other targeted laboratory tests, and it was noted that:

- the pH values of the samples (water and soil), located near the former pyrite burn landfill, are more acidic, compared to the pH values in the samples closer to the current phosphogypsum storage facility;
- Groundwater levels change and directly depend on the height of the Danube, with a slight increase in levels;
- The content of organic matter is the highest in the surface layer of soil;
- Slightly higher concentrations of pollutants are registered in the surface layer and in the higher layers of soil, up to the groundwater level;
- the marly-clay complex occurs at depths of over 15 m and has a significant thickness estimated at over 12 m. This complex is a hydrogeological insulator.
- tests have shown that higher concentrations of Ni occur regularly in the samples, but at concentrations lower than the remediation values (RV). This occurrence of Ni, regardless of the location and depth of the samples taken, indicates the geological origin of this metal, which coincides with the results of soil examinations at several other locations in Serbia.
- The increased concentrations of Co are probably the result of surface contamination occurring in the period when a phosphate with a higher cobalt content was used in the phosphoric acid production plant, prior to privatisation. Concentrations of Co are not over RV in any place.
- In the surface layer of the soil, higher concentrations of pollutants were found in relation to the deeper layers, especially those of organic origin (hydrocarbons and pesticides above the limit values of LV, and below the remediation values (RV)) in several samples taken in the Energy and Ecological Island Zone.
- in only one sample, in addition to the phosphogypsum storage, and outside the location intended for the construction of the subject Waste Energy Plant and Non-hazardous Waste Landfill, the values of As and Cu > RV (Zone II) were determined. Increased concentrations of As and Cu are likely to have occurred as a result of the deposition of pyrite burns over a longer period.
- Slightly higher concentrations of pesticides in Zone IV are probably the result of historical pollution caused by poor waste management from the time of pesticide production, which has not been performed on the site for more than 15 years. The long half-life of these pollutants, increased concentrations of organic matter in the surface layer of the soil and probably weaker leaching of soil by atmospheric precipitations, influenced the longer retention of pesticides in the soil. Due to the observed increased concentrations of pesticides and hydrocarbons, no special interventions are required, except for soil and groundwater monitoring, especially during preparatory works for the

construction of facilities.

By analyzing the results of soil sample testing, which was conducted in 2023 by the Institute for Prevention, Occupational Safety, Fire Protection and Development DOO Novi Sad, Branch "27. January" Nis, it can be concluded that the results comply with the corrected limit and remediation values prescribed by the Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of RS", No. 30/2018 and 64/2019), except for Cd, Cu, Ni, Zn, Co, which are not in accordance with the corrected limit values, but are in accordance with the corrected remedial values.
The results of groundwater testing show that all values of the tested parameters are in accordance with the average annual concentrations, prescribed by the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them ("Official Gazette of RS", No. 50/2012, Appendix 2, Table 1) and remediation values prescribed by the Regulation on Limit Values for Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of the RS" no. 30/2018 and 64/2019, Appendix 2).

Data on surface water quality for the territory of the Republic of Serbia, including the quality of the Danube River, are maintained by the Environmental Protection Agency and are publicly available through the website www.sepa.gov.rs
The results of the physical, chemical and microbiological analyses of the samples, i.e. the relevant values of the parameters for the annual period, were compared with the limit values of the quality classes prescribed by the Regulation on limit values of pollutants in surface and groundwater and sediment and the deadlines for reaching them ("Official Gazette of RS", No. 50/2012), while the values of priority and priority hazardous substances were compared with the values of environmental quality standards (EQS), i.e. the average annual concentration (ACC) and the maximum permissible concentration (MRL), prescribed by the Regulation on Limit Values of Priority and Priority Hazardous Substances that Pollute Surface Waters and Deadlines for Reaching Them ("Official Gazette of RS", No. 24/2014).According to the examination results, the water quality on the stretch from the dam to the border with Bulgaria occasionally does not correspond to the prescribed quality in physico-chemical and microbiological terms.

In 2024, in order to determine the zero state of wastewater quality and surface water quality of the Danube River for the construction of the Eco Energy complex, the Institute for Prevention, Occupational Safety, Fire Protection and Development LTD. Novi Sad, Branch "27. January" Nis performed sampling and physical and chemical testing of the quality of wastewater and surface water at four measuring points.
The results of the testing of surface water from the Danube River upstream of the wastewater discharge show that the concentrations of the tested parameters comply with the limit values prescribed by the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them ("Official Gazette of RS", No. 50/2012, Appendix 1, Table 1 and 3) and the Regulation on limit values of priority and priority hazardous substances that pollute surface waters and the Deadlines for achieving them ("Official Gazette of RS", no. 24/2014), Appendix 1, Table 1.

In previous years, the municipality of Negotin, and therefore the settlement of Prahovo, was not covered by the network of automatic air quality monitoring stations (AMSKV), therefore, for the purpose of presenting the zero situation, the City Institute of Public Health Belgrade, at the request of Elixir Prahovo doo, performed air quality monitoring for 15 days from 19.04.- 3 May 2023 at measuring point 1: Dragiša Brebulović-Žmiga, 11 Vuka Karadžića Street, Prahovo (N 44°17'40.6", E 22°35'9.5"). During the measurement period, the following parameters were tested:

- Mass concentrations of suspended particles PM_{10} and $PM_{2.5}$;
- Total metal content (As, Cd, Pb, Ni, Cr) in the PM_{10} suspended particles fraction;
- Hydrogen fluoride (HF) mass concentration;
- Total phosphorus (P) content in the PM_{10} suspended particles fraction.

The results of the measurements show that all the tested parameters are in accordance with the Regulation on monitoring conditions and air quality requirements ("Official Gazette of RS", no. 11/2010, 75/2010 and 63/2013), except for one measurement (29.04.2023) when the measured mean 24-hour value of PM_{10} suspended particles (51 μg/m^3 exceeded the limit value (50 μg/m^3, must not be exceeded more than 35 times in one calendar year).

Institute for Prevention, Occupational Safety, Fire Protection and Development LTD., Novi Sad, Branch 27 January Nis, in May 2024, measured the level of noise in the open space, during the operation of the production facilities of IHP Elixir Prahovo, by. The results of the measurements show that the relevant noise level at the all measuring points DO NOT EXCEED the noise limit values for the terms day, evening and night, i.e. the test results comply with the requirements of the aforementioned Regulation during the regular operation of the IHP Elixir Prahovo complex.

Based on the aforementioned reports in Chapter 5 of the Study in question, an overview of the state of the environment, the so-called "zero" state before the start of the operation of the projects in question, is given.

9.2 Parameters for identification of adverse environmental effects

9.2.1 MONITORING OF THE WASTE-TO-ENERGY PLANT OPERATION

In terms of thermal waste treatment plants, the technical and technological conditions of measurement, emission limit values and their monitoring are defined by the Regulation *on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal waste treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023),* as well as *Conclusions on best available techniques for waste incineration (Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987).*

Measuring equipment will be installed, using a method to monitor the parameters, operating conditions and mass concentrations that are relevant to the incineration process.

Monitoring shall be by measurement under the conditions and in the manner determined by the permit, in accordance with the law. The plant and the correct operation of automatic equipment for monitoring emissions into air and water are subject to annual control measurements.

Measuring devices used for emission measurement shall be calibrated and tested in accordance with the regulation governing the emission of pollutants into the air in relation to the half-hour mean value at least once a year, and their calibration and testing shall be performed by laboratories accredited for calibration and testing, in accordance with the prescribed standard.

Calibration and testing of measuring devices used for emission measurement will be carried out by comparative measurements by reference methods at least every third year, i.e. it is repeated after each significant change (repair or modification of the meter).

The certificate of calibration and the report on the results of calibration and testing of the correctness of the device are envisaged to be submitted to the competent authority for the authorization of professional organizations for measurement within 60 days.

Measuring points shall be determined in accordance with the regulation governing the emission of pollutants into the air.

The correctness of the continuous emission measurement device shall be ensured in accordance with the regulation governing the emission of pollutants into the air.

Periodic (intermittent) measurements of emissions to air and water shall be carried out in accordance with Annexes 2 and 4. Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", no. 103/2023). The emission limit values for air and water are considered to be complied with if the conditions set out in the said Annexes 2 and 4 are met.

In addition to the aforementioned domestic legislation, the Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)) was used to define the monitoring of thermal waste treatment plants.

For the thermal waste treatment plant in question, the annual reporting shall also include data on the operation and monitoring of the plant and take into account the performance of the thermal treatment procedure and the level of emissions to air and water compared to the emission limit values and the submitted data to the competent authority shall be available to the public.

In accordance with all of the following, the monitoring program within the Waste-to-Energy Plant in question is given.

9.2.1.1 MONITORING OF POLLUTANT EMISSIONS INTO THE AIR

The study and monitoring of air quality aims to control and determine the degree of air pollution, as well as to determine the trend of pollution in order to act in a timely manner to reduce the emission of harmful substances to a level that will not significantly affect the quality of the environment.

The results of measurements of pollutant concentrations are compared with the prescribed emission limit values (ELVs), and on the basis of the performed analyses, the conditions and trends are determined to take appropriate air protection measures.

Air monitoring activities may be performed by professional organizations accredited as a testing laboratory, which meets the prescribed requirements and has the permission of the ministry responsible for environmental protection to perform air monitoring and/or emission measurement.

By implementing the project in question from point stationary sources of pollutants into the air, where monitoring of emissions into the air should be established, the following are:

- **Emitter of the boiler plant:** particulate matter, heavy metals, (Sb+As + Pb + Cr + Co + Cu + Mn + Ni+V), Cd + Tl, HCl, HF, SO_2, NOx, CO, NH_3, TVOC, PCDD/F, dioxins as PCBs and Hg);
- **Emitter of the Waste Pretreatment Filter System and Activated Carbon Filters:** particulate matter, TVOC, i.e. organic matter, expressed as total carbon and unpleasant odours;
- **Stabilization/solidification plant emitter:** particulate matter.

9.2.1.1.1 Monitoring of pollutant emissions from the boiler plant into the air

The largest and most technically complex part of the Waste-to-Energy Plant in Prahovo is the flue gas cleaning system created during the combustion of waste. These systems are designed on the basis of the defined chemical composition of the recipes of different types of waste entering the thermal treatment process and include: Waste gases generated by combustion of waste are first treated in cyclones where large particles are separated, and then in an activated carbon reactor that adsorbs heavy metals, dioxins and furans and a bag filter system where reacted particles are separated together with ash particles from the flue gas. Then dry cleaned gases are sent to the scrubber system where wet cleaning of gases and separation of chlorides, fluorides and heavy metals, as well as sulfur oxides are performed. The last stage of purification is in the DeNOx filter where nitrogen oxides (NO_x) are removed, after which the cleaned gases are discharged via a stack whose height is calculated in such a way as to protect human health and the environment (the height of the stack is 56 m in relation to the level 0).

Measurements of pollutant emission into the air from the thermal treatment plant shall be carried out in accordance with Annexes 2 and 3. Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023) and the Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12

November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration):

1) **continuous measurement** of: nitrogen oxides (*NO_x*), ammonia (NH_3), carbon monoxide (*CO*), total particulate matter, total organic carbon (TVOC), hydrochloric acid (*HCl*), hydrofluoric acid (*HF*), sulfur dioxide (*SO_2*).

Note: For waste thermal treatment plants with a proven low and stable mercury content (e.g. monostreams of controlled composition waste), as is the case here, continuous monitoring of emissions can be replaced by long-term sampling (there is no EN standard for long-term mercury sampling) or periodic measurements with a minimum frequency once every six months. In the second case, EN 13211 is relevant.

2) **continuous measurement of the following process parameters:** temperature at the inner wall of the combustion chamber or at another representative point of the combustion chamber and/or additional combustion chamber, in accordance with the permit of the competent authority, as well as the volume fraction of oxygen, flue gas flow, pressure, temperature and water vapor content in the waste gases;

The gas retention time as well as the minimum temperature and oxygen content of the process gases shall be adequately checked, at least once, when the thermal treatment plant is put into operation and under the most unfavourable operating conditions expected.

3) **individual measurement** of the heavy metals concentration and metalloids (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V), dioxins and furans **at least twice a year**, whereby these measurements **in the first year of operation are performed at least four times a year** with an interval of three months, as well as benzo[a] pyrene once a year. Emissions during start-up and shutdown until waste is incinerated, including emissions of PCDD / Fs and dioxins similar to PCBs, are estimated on the basis of measurement campaigns, carried out at regular intervals, such as every three years, carried out during planned start-up or shut-down operations.

Limit values for emissions of pollutants into the air from thermal waste treatment plants are prescribed in *Appendix 2. Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring* ("Official Gazette of the RS", No. 103/2023) and the *Conclusions on best available techniques for waste incineration* (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration) as shown in Table 9.1 and 9.2.

Emission limit values are prescribed for dry waste gas, under normal conditions: T=273.15 K and P=101.3 kPa. The standard values are with an oxygen content of 11%, except in cases of incineration of mineral waste oil, in accordance with the regulation governing the management of waste oils, when the standard value is 3% of the oxygen content (formula given in Appendix 7. Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023).

Table 9.1 Emission limit values of pollutant emissions into the air from waste thermal treatment plant

Emitter	Pollutant	Unit	ELV in accordance with RS regulations[1]		BAT-AELs in accordance with BATC for WI[2]		Test method according to BAT-AELs in accordance with BATC for WI[4]	Proposed ELV of the thermal waste treatment plant of the subject WtE Plant [5]
			ELV	Averaging period	BAT-AEL[3]	Averaging period		
Stack after DENOX FILTER Emitter height: 56 m in relation to elevation 0 Internal diameter of the emitter at its top:1.7 m Flue gas temperature at the top of the emitter: 147 ± 3°C Flue gas volume flow through the emitter: 70,000 Nm^3/h	Total Particulate matter	mg/Nm^3	10	Mean Daily Value	< 2–5	Mean Daily Value	General Standard and EN 13284-2	**5**
			30	Mean half-hourly emission limit 100%				
			10	Mean half-hourly emission limit 97%				
			150	Total concentration expressed as half-hourly average				
	Cd+TI	mg/Nm^3	Total 0.05	Mean value during sampling for a minimum of 30 min and a maximum of 8 h	0.005-0.02	Mean value during the sampling period	EN 14385	**0.02**
	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	mg/Nm^3	Total 0.5	Mean value during sampling for a minimum of 30 min and a maximum of 8 h	0.01-0.3	Mean value during the sampling period	EN 14385	**0.3**
	HCl	mg/Nm^3	10	Mean Daily Value	< 2–6	Mean Daily Value	General EN Standards	**6**
			60	Mean half-hourly emission limit 100 %				

Emitter	Pollutant	Unit	ELV in accordance with RS regulations[1]		BAT-AELs in accordance with BATC for WI[2]		Test method according to BAT-AELs in accordance with BATC for WI[4]	Proposed ELV of the thermal waste treatment plant of the subject WtE Plant [5]
			ELV	Averaging period	BAT-AEL[3]	Averaging period		
			10	Mean half-hourly emission limit 97%				
	HF	mg/Nm³	1	Mean Daily Value	< 1	Mean daily value / mean value during the sampling period	General EN Standards	**1**
			4	Mean half-hourly emission limit 100 %				
			2	Mean half-hourly emission limit 97%				
	SO_2	mg/Nm³	50	Mean Daily Value	5–30	Mean Daily Value	General EN Standards	**30**
			200	Mean half-hourly emission limit 100 %				
			50	Mean half-hourly emission limit 97%				
	NOx (NO and NO_2 expressed as NO_2)	mg/Nm³	200	Mean Daily Value	50–120	Mean Daily Value	General EN Standards	**120**
			400	Mean half-hourly emission limit 100 %				
			200	Mean half-hourly emission limit 97%				

Emitter	Pollutant	Unit	ELV in accordance with RS regulations[1]		BAT-AELs in accordance with BATC for WI[2]		Test method according to BAT-AELs in accordance with BATC for WI[4]	Proposed ELV of the thermal waste treatment plant of the subject WtE Plant [5]
			ELV	Averaging period	BAT-AEL[3]	Averaging period		
	CO	mg/Nm^3	50	Mean Daily Value	10–50	Mean Daily Value	General EN Standards	**50**
			100	Half-hour values				
			150	Mean ten-minute value				
			100	Mean hourly value (for fluidized bed furnaces)				
	NH_3	mg/Nm^3	-	-	2-10	Mean Daily Value	General EN Standards	**10**
	TVOC	mg/Nm^3	10	Mean Daily Value	< 3–10	Mean Daily Value	General EN Standards	**10**
			20	Mean half-hourly emission limit 100%				
			10	Mean half-hourly emission limit 97%				
	Dioxins and furans PCDD/F	ng I-TEQ/Nm^3	0.1	Mean value during sampling for a minimum of 6 h and a maximum of 8 h	< 0.01–0.04	Mean value during the sampling period	EN 1948-1, EN 1948-2, EN 1948-3	**0.04**
					< 0.01–0.06	Long sampling period (the limit value does not apply if it is proven that the emission value is		**0.06**

Emitter	Pollutant	Unit	ELV in accordance with RS regulations[1]		BAT-AELs in accordance with BATC for WI[2]		Test method according to BAT-AELs in accordance with BATC for WI[4]	Proposed ELV of the thermal waste treatment plant of the subject WtE Plant [5]
			ELV	Averaging period	BAT-AEL[3]	Averaging period		
						sufficiently stable)		
	Hg	μg/Nm³	50	Mean value during sampling for a minimum of 30 min and a maximum of 8 h	< 5–20	Mean daily value / mean value during the sampling period	General EN standards and EN 14884	**20**
					1–10	Long sampling period		**10**

1 Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of the RS", no. 103 of 21st November 2023). Appendix 2, tables:

1. Mean daily limit values for the following pollutants
2. Mean half-hourly limit values for the following pollutants
3. Mean emission limit values for the following heavy metals during sampling for a minimum of 30 min. and a maximum of 8 h.
4. Mean emission values for dioxins and furans over a sampling period of at least 6 h and at most 8 h. The emission limit values apply to the total concentrations of dioxins and furans, calculated on the basis of the toxic equivalent factors in Appendix 1.
5. That is, the emission limit values for carbon monoxide (CO) must not be exceeded when it comes to gases from the combustion process:
6. The total concentration of particulate matter in air emissions from waste incineration plants shall in no case exceed 150 mg/Nm3, expressed as a half-hour average. The air emission limit values for gaseous or vapour organic substances, expressed as total organic carbon (TOC) referred to in point 2 and carbon monoxide (CO) referred to in point 5 (b) of this Annex, shall not be exceeded.
7. The competent authority may lay down rules regarding the exceptions granted to these values.

2 The Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration):
3 New plants.
4 The general EN standards for continuous measurement are EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181.
5 Emission limit values according BATC are proposed as stricter ELVs compared to the values prescribed by the RS regulations. ELVs are finally prescribed as part of the process for the issuance of the Integrated Permit (IPPC), after the trial period of the plant, bearing in mind the BATC related to the demonstrated production process of the plant (after commissioning).

In order to determine the toxic equivalence (TE) of dioxins and furans, the mass concentrations of dioxins and furans are multiplied by the equivalent pre-total factors given in Annex 1. Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", No. Gazette of the Republic of Serbia", no. 103/2023):

Equivalent toxicity factor		
2,3,7,8	- tetrachlordibenzodioxin (TCDD)	1
1,2,3,7,8	- pentahlordibenzodioxin (PeCDD)	0.5
1,2,3,4,7,8		0.1
(HxCDD)	- hexachlordibenzodioxin- hexachlordibenzodioxin	0.1
1,2,3,6,7,8	(HxCDD)	0.1
1,2,3,7,8,9	- hexachlordibenzodioxin (HxCDD)	001
1,2,3,4,6,7,8	- heptachlordibenzodioxin (	0.001
	HpCDD)	0.1
2,3,7,8	- octahlordibenzodioxin (OCDD)	0.5
2,3,4,7,8	- tetrachlordibenzofuran (TCDF)	0.05
1,2,3,7,8	- pentahlordibenzofuran (PeCDF)	0.1
1,2,3,4,7,8	- pentahlordibenzofuran (PeCDF)	0.1
1,2,3,6,7,8	- hexachlordibenzofuran (HxCDF)	0.1
1,2,3,7,8,9	- hexachlordibenzofuran (HxCDF)	0.1
2,3,4,6,7,8	- hexachlordibenzofuran (HxCDF)	0.01
1,2,3,4,6,7,8		0.01
1,2,3,4,7,8,9	- heptachlordibenzofuran (HpCDF)	0.001
	- octahlordibenzofuran (OCDF) -	

In addition to regular monitoring of pollutant concentrations in accordance with the aforementioned regulations of RS and BATC, the Project Holder will perform additional monitoring of nitrogen suboxide concentrations once a year regardless of the fact that no limit emissions have been defined for this pollutant:

Pollutant	Testing method
Nitrous oxide (N_2O)	SRPS EN ISO 21258:2011
Benzo[a]pyrene	-

Measurement techniques related to air pollutants

1. Measurements made to determine the concentration of pollutants emitted into the air must be representative.
2. Sampling and analysis of all pollutants, including dioxins and furans, as well as reference methods for calibration of automatic measuring devices must be in accordance with international, regional or national standard methods, the application of which will provide data of equal quality.
3. At the level of daily emission limit values, the values of the 95% confidence interval for one result obtained by measurement must not exceed the following percentages of emission limit values:

Carbon monoxide	10%
Sulfur dioxide	20%
Nitrogen dioxide	20%
Total Particulate matter	30%
Total Organic Carbon	30%
Hydrochloric acid	40%
Hydrofluoric acid	40%

If the measurements show that the air emission limit values have been exceeded, the competent authority must be informed thereof without delay.

Extraordinary working conditions include the maximum allowed period of all technical unavoidable interruptions in operation, disturbances in operation, or malfunctions of treatment or measurement devices, the period during which concentrations from emissions to air and purified water may exceed the prescribed emission limit values. In the event of a malfunction, the operator of the thermal waste treatment plant shall reduce or completely suspend the activity as soon as possible until normal operation is restored.

The thermal treatment plant may in no case continue to operate for more than four hours without interruption if the emission limit values are exceeded, whereby the cumulative period of operation in such conditions must not exceed 60 hours during one year. The 60-hour period also applies to those lines in the plant that are connected to a single combustion gas treatment device. If emission limit values are exceeded, the waste incineration plant must under no circumstances incinerate waste for a maximum of four hours continuously from the moment of exceeding. The total duration of work under such conditions shall not exceed 60 hours during one year. The time limit applies to those furnaces that are connected to one individual waste gas treatment plant.

9.2.1.1.2 Monitoring of pollutant emissions into the air from the Waste Pretreatment Filter System and Activated Carbon Filters and the Filter system of the stabilization and solidification process

During the regular operation of the pretreatment plant (mechanical treatment) of waste to be thermally treated at the boiler plant in question, as well as during the unloading of waste, particulate matter, unpleasant odours and TVOC may be emitted (only when the organic compounds in question have been identified as relevant in the waste gas stream (BAT3[77]). In order to dedust and remove unpleasant odours, the air from the area where the unloading and pretreatment of non-hazardous and hazardous waste intended for energy generation is carried out will be conducted by means of a fan with a capacity of 24,000 m^3/h through a system of suction hoods and pipelines to the filter unit (W- C09 Waste Pretreatment Filter System and Activated Carbon Filter). The filter unit consists of a bag filter with pulsed shaking by compressed air, an activated carbon filter and an emitter (stack high 21.5 m).

All sources **of particulate matter emission into the air from the stabilisation/solidification process** are equipped with **bag filters** on which particulate matter is separated (ash mixture and thickened sediment storage bunker in which the stabilisation process takes place; mechanical treatment of slag or separation of ferrous metals using magnetic separators and non-ferrous metals using eddy current separators; mixer reactor in which the process of mixing cement, ash and water or the solidificates takes place; cement storage silo; cement weighing scale and ash weighing scale). The dedusting system consists of: exhaust shutters and hoods, pipelines, filter unit with accompanying equipment, centrifugal fan (capacity Q=25,000 m3/h, P=37 kW) and emitter (stack) 21.5 m high.

Limit values of emissions into the air for these emitters are prescribed by the Regulation on Limit Values of Emissions of Pollutants into the Air from Stationary Pollution Sources, except for combustion plants ("Official Gazette of the RS", No. 111/2015 and 83/2021)

In accordance with the Regulation on measurements of pollutant emissions into the air from stationary sources of pollution ("Official Gazette of the RS", no. 5/16 and 10/24) and the Regulation on limit values for the emission of pollutants into the air from stationary sources of pollution, except for combustion plants ("Official Gazette of the RS", no. 111/2015 and 83/2021) - Annex 1, Part VII WASTE TREATMENT PLANTS and OTHER MATERIALS, with the EXCEPTION OF THERMAL TREATMENT and BAT conclusions for waste treatment plants (Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) it is necessary to:

- On the emitter of the Waste Pretreatment Filter System and Activated Carbon Filters, measure the concentrations of particulate matter, TVOC or organic matter, expressed as total carbon;
- Measure the concentrations of particulate matter on the emitter of the stabilization/solidification plant.

At the specified point emission sources, periodically measure emissions **twice during the calendar year**, in accordance with legal regulations. One periodic measurement is performed in the first six calendar months, and the other periodic measurement in the second six ones.

Table 9.2 shows the limit values for the emission of pollutants into the air from the Emitter of the Waste Pretreatment Filter System and Activated Carbon Filter, as well as Filter system of the stabilization and solidification process.

Table 9.2 Limit values for the emission of pollutants into the air

Emitter		**Pollutants**	**Unit**	**ELV with RS regulations** [1]	**BAT-AELs in accordance with BATC for WI**[2] **/ BAT for WT**[3]	**Test method according to BAT-AELs in accordance with BATC for WI**[2] **/ BAT for WT**[3]	**Proposed ELVs for the emitters of the subject Waste to Energy Plant**[4]
Emitter of the Waste Pre-treatment Filter System and Activated Carbon Filters	Smokestack after bag filter and activated carbon filter Emitter height: 21.5m in relation to elevation 0 Internal diameter of the emitter at its top: 1.2 m Gas temperature at the top of the emitter: ambient Gas volume flow through the emitter: 24,000 Nm^3/h	Particulate matter	mg/Nm^3	10	2-5	EN 13284-1	**5**
		TVOC	mg/Nm^3	-	10-30*	EN 12619	**30***
		Organic matter, expressed as total carbon	mg/Nm^3	20	-	-	**20**
Emitter of the stabilization and solidification process Filter system	Smokestack after bag filter Emitter height: 21.5m in relation to elevation 0 Internal diameter of the emitter at its top: 1.2 m Gas temperature at the top of the emitter: ambient Gas volume flow through	Particulate matter	mg/Nm^3	10	2-5	EN 13284-1	**5**

	the emitter: 25,000 Nm^3/h						

1 Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of the RS", no. 103 of 21st November 2023).

2 The Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration):

3. Conclusions on best available techniques for waste treatment: Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council.

4. Emission limit values according BATC are proposed as stricter ELVs compared to the values prescribed by the RS regulations. ELVs are finally prescribed as part of the process for the issuance of the Integrated Permit (IPPC), after the trial period of the plant, bearing in mind the BATC related to the demonstrated production process of the plant (after commissioning).

* BAT- AEL applies only when the organic compounds in question have been identified as relevant in the waste gas stream, based on the inventory mentioned in BAT 3

Reference methods prescribed in the Regulation on measurements of emissions of pollutants into the air from stationary sources of pollution (Official Gazette of the RS, No. 05/2016 and 10/2024) will be used for measurements of pollutant emissions and determination of measurement conditions.

In addition to the reference methods, other measurement methods may be used if their equivalence can be proven, i.e. if an equivalence test has been carried out in accordance with SRPS CEN/TS 15675.

Emission measurements will be carried out in accordance with the requirements and recommendations of SRPS EN 15259. Periodical emission measurements will be carried out twice during the calendar year with a mandatory gap of six months between the two measurements, one of which is periodical measurement in the first six calendar months, and the other periodical measurement in the second six calendar months.

Periodical measurements will be performed under operating conditions at the highest load of the stationary source of pollution.

Periodical measurements will be performed by an authorized professional organization to perform such measurements and in accordance with the Regulation on measurements of emissions of pollutants into the air from stationary sources of pollution (Official Gazette of the RS, No. 05/2016 and 10/2024).

The control of the operation of the waste gas treatment device will be carried out by the operator in accordance with the prescribed procedures in the plant.

If emission limit values are exceeded or accidents (uncontrolled release of pollutants into the air) occur, the operator is obliged to immediately inform the Republic Environmental Inspection.

All reports, in the prescribed form, must be available to the environmental inspection when inspecting the plant.

The operator is obliged to report to the Environmental Protection Agency on the monitoring of pollutants emitted into the air for the National Register of Pollution Sources by 31 March of the current year for the previous year in accordance with regulations.

After the start of production, it is necessary to first perform a warranty measurement, in order to compare the measured values of pollutant emissions with the emission limit values defined in tables 9.1 and 9.2.

Warranty emission measurement is carried out in the period between the third and sixth month from the beginning of the trial operation of the stationary source of pollution in the process of obtaining a certificate of occupation in accordance with the law governing the construction of facilities. Warranty measurement is performed under operating conditions at the highest load of the stationary source of pollution.

9.2.1.2 AMBIENT AIR QUALITY TESTING

The impact on air quality in the subject area will be based on the monitoring of ambient air quality as stated above.

Currently, in accordance with the adopted environmental monitoring plan and program, the operator Elixir Prahovo performs monitoring of ambient air quality in the vicinity of the subject location through an authorized accredited laboratory of the City Institute for Public Health Belgrade. Air quality monitoring is carried out **once a year for 15 days at the** measuring point 1: Dragiša Brebulović-Žmiga, 11 Vuka Karadžića Street, Prahovo (N 44°17'40.6", E 22°35'9.5 "), which is about 2.5 km northwest of the location of the Waste-to-Energy Plant and Landfill for non-hazardous waste. The tests include monitoring of the following parameters:

- Mass concentrations of suspended particles PM_{10} and $PM_{2,5}$;
- Total content of metals (As, Cd, Pb, Ni, Cr) in fraction of suspended particles PM_{10};
- Hydrogen fluoride (HF) mass concentration;
- Total content of phosphorus (P) in fraction of suspended particles PM_{10}.
- Mass concentrations of dioxins and furans, with a measurement frequency of once every 3 years.

The analysis of the pollutants concentration in the air results, in the impact zone in relation to the maximum permissible concentration, was carried out in accordance with the Regulation on monitoring conditions and air quality requirements ("Off. Gazette of RS" no.75/10, 11/10 and 63/13): Appendix XV-Section A- Maximum permissible concentrations (the report on the air quality testing is attached to the Study).

Based on the results of the Report on the conducted public consultations in the implementation of the projects for the construction of the Waste-to-Energy Plant in Prahovo, a strategic and systematic approach to future long-term interactions between investors and the local community regarding the operation of the Waste-to-Energy Plant has been defined through consultations with citizens.

In addition to the conducted consultation, the need to donate an **automatic measuring station to the municipality of Negotin** was recognized (attached is the Agreement on Donation of automatic measuring station addressed to the municipality of Negotin, signed on 26 June 2024). The automatic measuring station is part of the network of the Environmental Protection Agency, at whose initiative an adequate location would be defined and relevant parameters for measurement would be determined.

In accordance with the above, in the Environmental Protection Agency, a meeting was held in mid-April, attended by the President of the Municipality of Negotin and representatives of the Elixir Foundation. On May 13, the Head of the Monitoring Group of the Environmental Protection Agency, the representative of Urbanism of the Municipality and the representative of the Elixir Foundation visited 6 potential locations in Negotin, after which the representative of the Agency selected the location of the PU “Pčelica” /in the centre/ where the automatic measuring station is installed. Representatives of urbanism and the "Negotinci in Action" association were also introduced to all of the above. The automatic measuring station Negotin has become part of the state network of the Environmental Protection Agency, on which continuous measurement is performed k: SO_2, NO_x and NH_3, measurement of suspended PM10/PM2.5 particles, measurement of ground-level ozone, meteorological parameters, measurement of benzene, toluene, ethylbenzene, xylene and continuous measurement of CO.

In this way, the legal obligation has been fulfilled and continuous air quality monitoring is enabled, which will be carried out by the Environmental Protection Agency. This will provide accurate and up-to-date environmental data to the local community, thereby further enhancing transparency and the effectiveness

of real-time environmental oversight, and restoring public trust in the reporting process.
Continuous monitoring of air quality will enable the local community to monitor the state of the environment in real time, which will increase the transparency and accountability of investors. Citizens will have access to updated air quality data, which is displayed on publicly accessible platforms, allowing citizens to monitor air quality in their community. Also, information can be integrated into smartphone apps that provide alerts and recommendations in case of high concentrations of pollutants. For example, citizens may be informed to avoid outdoor activities when air quality is poor.

This initiative would also contribute to building trust between the local community and the project holder, as citizens could directly monitor the potential impact of the Waste-to-Energy Plant on air quality in the municipality of Negotin. Transparency of air quality data and openness to citizen feedback will create a sense of involvement and partnership, which is key to long-term success.

If during the testing it is shown that certain pollutants exceed the allowable values, which originate from the production process of the Waste-to-Energy Plant or from the Landfill for non-hazardous waste, it should perform measures to reduce such pollutants to the prescribed limits.

Besides aforementioned and based on the consultations with the public, it was concluded that, in addition to the monitoring of air quality, it is necessary to establish a kind of **civil control** that is in accordance with the best practices of similar plants in the European Union, thus guaranteeing that the operation of the plant remains transparent, responsible and compliant with high environmental and social standards.

This model works by providing citizens with access to real-time air quality data through online platforms. This approach enables citizens to be actively involved in environmental monitoring and to react in a timely manner to possible changes in air quality.
Such systems not only increase the transparency of environmental measures, but also encourage greater participation of citizens in local environmental initiatives.

9.2.1.3 WASTEWATER QUALITY MONITORING

In accordance with the Law on Waters ("Official Gazette of the RS", no. 30/2010, 93/2012, 101/2016, 95/2018 and 95/2018 - other law), and the Rulebook on the manner and conditions for measuring and testing the quality of wastewater and their impact to the recipient and the content of the report on the performed measurements ("Official Gazette of the RS", no. 18/2024), APPENDIX 1 - TECHNICAL CONDITIONS for the IMPLEMENTATION OF MONITORING, it is the obligation of the water treatment plant owner, in this case the Project Holder, to monitor wastewater before and after their treatment through a legal entity authorized for wastewater testing or independently if the conditions are met.

Rulebook on the method and conditions for measuring the amounts and examination of the quality of wastewater and its impact on the recipient and the content of the report on the measurements performed ("Official Gazette of the RS", no. 18/2024), wastewater monitoring is prescribed, which includes measuring the amount and testing the quality of wastewater, which aims to provide information and necessary data on the amounts of wastewater, concentration and mass flow of pollutants in wastewater and treated wastewater.

The frequency of measuring the amount and testing the quality of wastewater is performed in accordance with the dynamics of wastewater generation and the applied methods for their treatment or pretreatment, based on the regulations governing ELV and in accordance with APPENDIX 2. WASTEWATER SAMPLING, item 3, Minimum number of sampling in periodic measurements, of the said Rulebook.

The purpose of measuring the amount of wastewater and testing its quality is to:

1. verify compliance with the emission limit values for pollutants into water (ELV) and the efficiency of the wastewater treatment plant;
2. determine the impact of discharged wastewater on the receiver (recipient) and
3. collect data for keeping national registers in accordance with regulations in the field of water and

environmental protection.

A legal entity or entrepreneur that discharges wastewater into the recipient in accordance with the law governing water shall monitor wastewater in accordance with the technical conditions for conducting monitoring, through a legal entity authorized for wastewater testing or independently if it meets the conditions in accordance with the law governing water.

Monitoring includes:

1. Measurement of wastewater flow during sampling at a given measuring point, i.e. measurement of wastewater amount;
2. Sampling of wastewater for the purpose of their examining;
3. Measurements and examinations carried out in the field, such as: water and air temperature; pH value of wastewater during the sampling period, content of oxygen, barometric pressure, electrical conductivity, appearance (presence of oil droplets, rags, hairs, etc.), precipitants, odour, change of colour;
4. Preparation, transport and storage of wastewater samples;
5. Examination of basic and specific physico-chemical and chemical parameters that include both eco-toxicological parameters and microbiological analysis of wastewater;
6. Preparation of reports on performed measurements.

In addition to the aforementioned activities, monitoring also includes:

1) Collection of data on the conditions for conducting monitoring in accordance with Annex 1 of the aforementioned rulebook, as well as calculations;
2) Calculation of the average value of the emission of polluting substances, heat emission (if the temperature of the wastewater exceeds the prescribed threshold value for the recipient), the annual amount of wastewater in accordance with Annex 3 - Calculation of the average value of the parameters;
3) Calculation of emitted pollutants (wastewater load) in accordance with Annex 4 - Calculation of wastewater load;
4) Calculation of the mass balance of wastewater in accordance with Annex 5 - Calculation of the mass balance;
5) Calculation of the emission factor in accordance with Annex 6 - Emission factors;
6) Calculation of the efficiency of wastewater treatment for certain parameters.

In accordance with regulations, wastewater monitoring can be carried out:

1. **continually**- when a 24-hour measurement of the amount of wastewater, basic and specific parameters of wastewater quality is carried out, in accordance with the regulation governing ELV and/or water permit or integrated permit, especially in the case where wastewater contains hazardous substances;
2. **periodically**- in cases where wastewater is generated and discharged periodically at regular time intervals during the year or during seasonal operation if wastewater is not discharged throughout the calendar year. In this case, a 2-hour or current sample is taken and the amount of wastewater measured during sampling, as well as the testing of basic and specific parameters in accordance with the regulation governing ELV and/or water and integrated permit.

The measuring point must be equipped and arranged as follows:

1. to provide the sampler with access to a sufficiently wide shaft, climbers or ladders and with sufficient space at the bottom of the shaft, to enable the work of the sampler, if the equipment cannot be mounted from the top of the shaft;

2. to enable the installation of appropriate equipment for sampling and for the possibility of field measurement;
3. to allow flow measurement, if the measuring equipment is installed elsewhere, but is connected to the sampling point so as to allow simultaneous sampling and flow measurement. In the event that this is not possible, a laminar flow must be provided at the measuring point, whereby the length of the flat part of the supply pipe in front of the measuring point must be at least ten times the diameter of the pipe;
4. that a sufficient depth of wastewater (at least 5 cm) is provided at the measuring point to allow

the use of an underwater probe (sensor) for measuring or installing a suction pipe for sampling;

Sampling of treated and/or untreated wastewater will be done by taking a composite or instantaneous sample depending on the dynamics of wastewater discharge.

The basic parameters of the wastewater to be tested are: flow (minimum, maximum and mean daily), air temperature, water temperature, barometric pressure, colour, odour, visible substances, sediment matter (after 2h), pH value, BOD_5, COD, oxygen content, dry residue, annealed residue, annealing loss, suspended matter and electrical conductivity.

In addition to the above basic parameters, testing **of certain groups or categories of pollutants prescribed for technological and other wastewater** that is directly discharged into the recipient will be performed (in accordance with the *Regulation on Emission Limit Values for Pollutant into Water and Deadlines for Their Reach* ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016), as well as parameters related to emissions from wastewater treatment from the waste gas treatment process generated in the incineration plant (in accordance with the *Regulation on technical and technological conditions for the design, construction, equipment and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring* ("Official Gazette of the RS", no. 103/2023).

In accordance with the characteristics of wastewater generated and discharged into the recipient, it is the obligation of the Project Holder to perform regular monitoring of wastewater quality:

- **after treatment at the boiler plant wastewater treatment plant**: total suspended solids (TSS), total organic carbon (TOC), metals and metalloids (As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Tl, Zn, Mo), ammonium-nitrogen (NH_4-N), sulfates (SO_4^{2-}) and PCDD/ F, chlorides;

- **before and after treatment on the grease and oil separator:** temperature, pH value, biochemical oxygen demand (BOD_5), chemical oxygen demand (COD), hydrocarbon index.

9.2.1.3.1 Monitoring of wastewater from the boiler plant

The wastewater generated in the wet gas washing processes is treated by a physical and chemical process of three-stage neutralization with the precipitation of heavy metals in the wastewater treatment plant of the emitter (under the license of Envirochemie (ECWWT), after which the quality of the treated water is achieved, which is in accordance with domestic and EU regulations. Cleaned water is supplied from this plant to chamber 2 of the wastewater tank U-C06 whose main role is to accept them **in order to perform their testing before discharge to the recipient**. The maximum flow of treated wastewater from the boiler plant is 10 m^3/h.
In order to facilitate manipulation and possible response in the event that the water quality does not correspond to the required quality for discharge into the recipient, chamber 2 is divided into 4 identical parts (subchambers 2a, 2b, 2c, 2d). The volume of each part, i.e. each subchamber, is 80 m^3, which is enough for each subchamber to accept wastewater for a period of 8 hours. After that, the wastewater from the sub-chamber in question is sampled and the quality parameters are tested. In this way, it is possible for each batch of 80 m^3 to be analysed before discharge. By dividing chamber 2 into smaller segments, a semi-batch method of wastewater treatment management is enabled, in order to have time to perform complete physico-chemical analyses. The maximum duration of the analysis is 8 hours, and then the water can be discharged in an appropriate manner, depending on the analysis results. If the analyses show that the waters have a satisfactory quality for discharge into the final recipient, they are gravitationally discharged first into subchamber 2e, which is intended to function as a common channel, i.e. the wastewater pool purified water collector U-C06. From subchamber 2e, the treated water is gravitationally transported to the manhole (pumping station) for pumping the treated water to the Central collector of clean water of the industrial complex Elixir Prahovo, which flows into the natural recipient – the Danube River.
If the water quality is not satisfactory for discharge into the recipient, water is transported to the chamber 3 of the U-C06 basin, and it will be possible to do this by gravity discharge through chamber 2e by closing the valve and opening the valve. In the event that there is already a certain amount of water in chamber 3, so that it is not possible to perform the aforementioned gravity discharge, it is planned to transport wastewater of unsatisfactory quality from subchambers 2a, 2b, 2c or 2d to chamber 3 using a mobile submersible pump. From chamber 3 of the basin, contaminated water is sent to the wastewater treatment plant by filtration (sand filter column and activated carbon column) located within the facility U-C02 Maintenance building and auxiliary systems facility. After the treatment at the filter plant, the water is referred for re-treatment, to the wastewater treatment plant from the boiler plant (ECWWT) in the W-C11 facility. In emergency situations when it is known that excessive pollution or contamination of wastewater has occurred, it is possible to pump those from chamber 3 into chamber 4. At the bottom of chamber 4, submersible pumps are installed by which the wastewater from chamber 4 is transported to the liquid waste storage tanks in facility W-C08 and further for thermal treatment to the boiler plant.

Limit values for emissions of pollutants at discharging wastewater from the waste gas treatment system of the incineration plant are prescribed IN *APPENDIX 4. LIMIT VALUES FOR EMISSIONS OF POLLUTANTS IN WASTEWATER FROM THE WASTE GAS TREATMENT PROCESS GENERATED IN THE INCINERATION PLANT AND CO-INCINERATION OF WASTE, Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023).*
Emission limit values shall be applied at the point where the wastewater generated in the waste gas treatment process, containing the pollutants referred to in Annexes 2 and 3 of the said Regulation is discharged, i.e. at the point where the cleaned process water from the receiving basin is discharged into the collector of wastewater from the Waste-to-Energy Plant.

In addition to domestic legislation to define the monitoring of *wastewater from the waste gas treatment system of the incineration plant*, the Conclusions on best available techniques for waste incineration BATC (Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)) were also used.

Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023), the following measurements are performed at the wastewater discharge point:

1) **continuous measurement** of the parameters referred to in the aforementioned Annex 4 of the Regulation;
2) **individual daily measurement** of total suspended solids;
3) **monthly measurement** also on a representative sample of discharged waters during 24 hours, i.e., pollutants in connection with Annex 4 of the Regulation;
4) **measurements of dioxins and furans every six months** (in the first year of operation, it is recommended to measure at least four times a year with an interval of three months).

Table 9.3 gives the emission limit values for pollutants at discharging wastewater from the waste gas treatment system of the thermal treatment plant.

Table 9.3 Emission limit values for pollutants at discharging of wastewater from the waste gas treatment system of the thermal treatment plant

Parameter		**Process**	**Unit of measure**	**BAT-AELs in accordance with BATC for WI[1]**	**Averaging time**	**ELV expressed as mass concentrations of unfiltered samples in accordance with the regulations of the RS[2]**		**Testing method** **ELV in accordance with BATC for WI[1]**	**Minimum monitoring requirement**	**Proposed ELVs when discharging wastewater from the waste gas treatment system of the thermal waste treatment plant of the subject WtE Plant to[3]**
						95% of the measured values	(100% of measured values) A			
Total suspended solids (TSS)		FGC Treatment of bottom ash	mg/l	10-30	Random sampling	30	45	EN 872	Once daily	30
Total organic carbon (TOC)		FGC Treatment of bottom ash		15 – 40	Daily average value or 24 h flow proportional composite samples	-		EN 1484	Once per month	40
Metals and	As	FGC		0.01-0.05		0.15		Different EN	Once per month	0.05

Parameter		Process	Unit of measure	BAT-AELs in accordance with BATC for WI[1]	Averaging time	ELV expressed as mass concentrations of unfiltered samples in accordance with the regulations of the RS[2]		Testing method ELV in accordance with BATC for WI[1]	Minimum monitoring requirement	Proposed ELVs when discharging wastewater from the waste gas treatment system of the thermal waste treatment plant of the subject WtE Plant to[3]
						95% of the measured values	(100% of measured values) A			
metalloids	Cd	FGC		0.005-0.03	Composite sampling may be applied in proportion to the time provided that sufficient flow stability has been demonstrated	0.05		standards (e.g. EN ISO 11885, EN ISO 15586 or EN ISO 17294-2)		0.03
	Cr	FGC		0.01-0.1		0.5				0.1
	Cu	FGC		0.03-0.15		0.5				0.15
	Hg	FGC		0.001-0.01		0.03		Different EN standards (e.g. EN ISO 12846 or EN ISO 17852)		0.01
	Ni	FGC		0.03-0.15		0.5		Different EN standards (e.g. EN ISO 11885, EN ISO 15586 or EN ISO 17294-2)		0.15
	Pb	FGC		0.02–0.06		0.2				0.06
	Sb	Treatment of bottom ash		0.02–0.9		-				0.9
	Tl	FGC		0.005-0.03		0.05				0.03
	Zn	FGC		0.01-0.5		1.5				0.5
Dioxins and furans PCDD/F		FGC	ng I-TEQ/l	0.01-0.05		0.3		No EN standard	once every 6 months	0.05

1 Conclusions on BAT: Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration (notified under document C(2019) 7987)

2 Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of the RS", no. 103 of 21 November 2023).

3 Emission limit values according BATC are proposed as stricter ELVs compared to the values prescribed by the RS regulations. ELVs are finally prescribed as part of the process for the issuance of the Integrated Permit (IPPC), after the trial period of the plant, bearing in mind the BATC related to the demonstrated production process of the plant (after commissioning).

Monitoring of the pollutants concentration in wastewater shall be carried out in the manner and within the deadlines established in accordance with the regulations governing water quality management and the issued permit.

If the measurements show that the air emission limit values have been exceeded, the competent authority must be informed thereof without delay.

In accordance with the characteristics of the wastewater that is generated and discharged into the recipient, it is the responsibility of the Project Holder to carry out regular monitoring of the quality of wastewater after treatment at the wastewater treatment plant of the boiler plant: total suspended matter (TSS), total organic carbon (TOC), metals and metalloids and (As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Tl, Zn, Mo) and PCDD/ F.

Figure 9.1 shows a schematic view of the wastewater flows and the U-C06 wastewater basin.

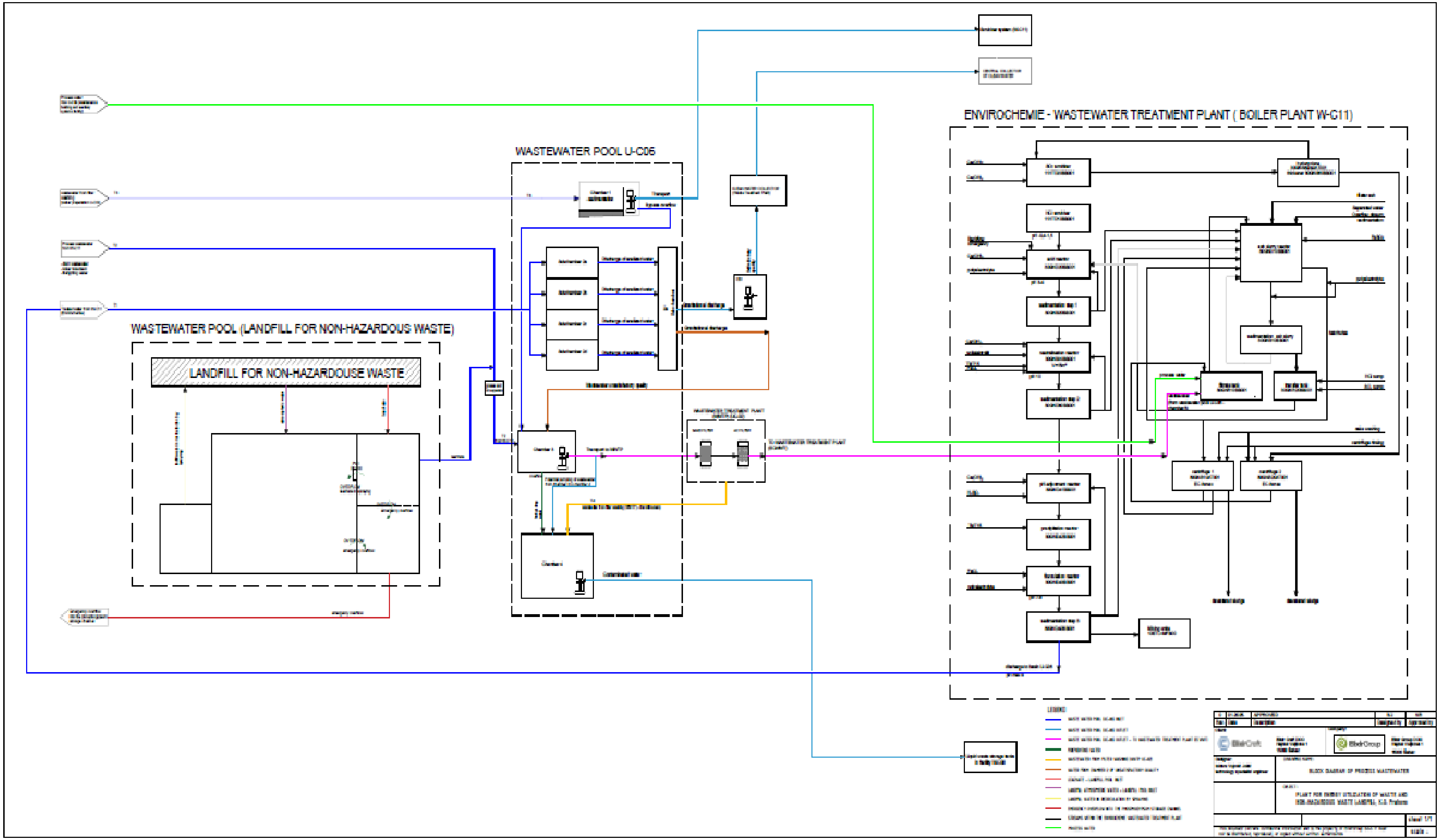


Figure 9.1 Schematic view of the wastewater flows and the U-C06 wastewater pool

9.2.1.3.2 Monitoring of atmospheric wastewater

During the regular operation of the plant in question, atmospheric (potentially polluted) wastewater will be generated. For the purpose of treating oily atmospheric water from manipulative surfaces, roads and parking lots, two "by pass" separators of petroleum products are planned, made and tested according to SRPS EN 858, rated size NS10/100 (flow through the separator 10 l/s while the max flow is 100 l/s) and rated size NS15/150 (flow through the separator 15 l/s while the max flow is 150 l/s). The efficiency of separating light petroleum products - light liquids in the separator outlet water is up to 5 mg/l. So cleaned oily sewer is connected to the conditionally clean rainwater sewer and conducted to the drainage Central collector for the entire Elixir Prahovo complex, and through it it is discharged into the Danube.

Wastewater quality control will include regular analyses of samples of potentially polluted atmospheric wastewater, before and after their treatment on the separator of petroleum products. Wastewater quality testing **<u>will be carried out 4 times a year</u>** in accordance with Article 99 Law on Waters (Official Gazette of the RS, no. 30/10 and 93/2012) and in accordance with the Rulebook on the method and conditions for measuring the amounts and examination of the quality of wastewater and its impact on the recipient and the content of the report on the measurements performed ("Official Gazette of the RS", no. 18/2024) and the Regulation on Limit Values of Pollutant Emissions into Water and Deadlines for Reaching Them ("Official Gazette of the RS", nos. 67/2011, 48/2012 and 1/2016);

When sampling, preparing samples, storing and storing them, handling samples, as well as during field testing and analysis of wastewater samples, reference methods as required by standard SRPS ISO/IEC 17025 will be applied.

The quality of wastewater discharged into the recipient (Danube River) must correspond to the values prescribed by the Rulebook on the method and conditions for measuring the amounts and examination of the quality of wastewater and its impact on the recipient and the content of the report on the measurements performed ("Official Gazette of the RS", no. 18/2024) and the Regulation on Limit Values of Pollutant Emissions into Water and Deadlines for Reaching Them ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016, Appendix 2, 19. Emission limit values for wastewater; II Other wastewater; Section 4. Limit values for the emission of wastewater containing mineral oils.

Table 9.4 provides emission limit values at the point of discharge into surface waters.

Table 9.4 Emission limit values at the point of discharge into surface waters(I)

Parameter name	Unit	Limit value(I)	Testing method
Temperature	°C	30	EPA Method 150.1:1982
pH		6.5-9	EPA Method 170.1:1974
Biochemical Oxygen Demand (BOD_5)	mgO2/l	40	EN 1899
Chemical Oxygen Demand (COD)	mgO2/l	150	EPA Method 410.1:1978
Hydrocarbon index	mg/l	10	EN ISO 9377-2

(I) *<u>The values refer to a two-hour sample.</u>*

In accordance with the characteristics of the generated wastewater and discharge of them into the recipient, it is the responsibility of the Project Holder to perform regular monitoring of the quality of wastewater before and after treatment at the grease and oil separator: temperature, pH value, biochemical oxygen demand (BOD_5), chemical oxygen demand (COD), hydrocarbon index.

9.2.1.3.3 Monitoring the quality of sanitary foul wastewater after biological treatment

Waste-to-Energy Plant's foul sewerage system will collect all sanitary-foul wastewater and carry it to the treatment plant (mechanical and biological treatment). A buried biological purifier type ACO-INTERPLAN BIOTIP kup 20ES with technology of continuous recirculation of activated sludge with a capacity of 20 PE (40 employees), hydraulic load 3 m3/day, biological load BOD: 1.2 kg/day, intended for biological treatment of sanitary waste water. Cleaned wastewater will be connected to the shaft of conditionally clean rain sewerage, which will be connected to the collector of all clean and purified water of the Elixir Prahovo complex, through which the water is discharged into the recipient - the Danube River.

In accordance to the Regulation on Emissions Limit Values for Pollutant into Water and Deadlines for Their Reach ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016) III municipal wastewater, Table 2. Emission limit values for municipal wastewater discharged into the recipient, water quality after treatment must meet the criteria given in table 9.8:

Table 9.5 Emission limit values

Parameter	LV[1]	Unit
Biochemical oxygen demand (BOD_5)[2,5,6]	**25** **40[3]**	**mgO_2/l**
Chemical Oxygen Demand (COD)[5]	**125**	**mgO_2/l**
Total suspended solids[4.7]	**35 (more than 10,000 ES)** **60(2000 to 10 000 EC)**	**mg/l**

[1]According to Regulation on Limit Values of Emissions of Pollutants into Water and Deadlines for Reaching Them ("Official Gazette of RS", No. 67/2011, 48/2012 i 1/2016)
[2] The parameter may be replaced by another parameter: total organic carbon (TOC) or total chemical oxygen demand (CODtotal), if a dependency can be established between BOD_5 and these parameters.
[3] If it is proven that the discharged wastewater after treatment will not adversely affect the quality of the watercourse.
[4] Suspended substances are not a mandatory parameter.
[5] Homogenized, unfiltered, undecanted sample.
[6] Addition of nitrification inhibitors.
[7] By filtration of a representative sample through a membrane filter 0.45 μm. Drying at 105 ˚C and weighing.

In accordance to the Rulebook on the method and conditions for measuring the amounts and examination of the quality of wastewater and its impact on the recipient and the content of the report on the measurements performed ("Official Gazette of the RS", no. 18/2024) the frequency of measuring and period of sampling for municipal wastewater is given in Table 9.6.

Table 9.6 Frequency of measuring and period of sampling for municipal wastewater

Wastewater treatment plant capacity expressed in PE(1), (population equivalent)	Frequency of measurement of basic and specific parameters (number of measurements per year)(2), (3)	Sampling period of a representative sample (hours)
< 50	1 measurement per year	2

In accordance with the characteristics of the generated wastewater and discharge of them into the recipient, it is the responsibility of the Project Holder to perform regular monitoring of the quality of wastewater after biological treatment: temperature, pH value, biochemical oxygen demand (BOD_5), total inorganic nitrogen (NH_4-N, NO_3-N, NO_2-N), total phosphorus, total carbon, toxicity to fish (T_F).

At the point of discharge of wastewater from the WtE Plant complex into the Central collector of the Elixir Prahovo complex, the temperature, quantity and quality of the discharged water will be regularly measured.

The selected technical solutions envisage easy access to places for measuring the quantities of wastewater and for taking samples for water quality testing, before and after purification, at the inflow of purified water into the recipient, i.e. Central collector of the Elixir Prahovo complex.

9.2.1.4 SURFACE WATER QUALITY MONITORING

The nearest watercourse to the site in question is the Danube River (at a distance of about 500m in the north direction from the plant boundary). River basin – Danube; Water district - Danube according to Art. 27. of the Law on Waters, Decision on determining the boundaries of river basin districts ("Official Gazette of the RS" no. 75/2010) and the Rulebook on Determination of Sub-basins ("Official Gazette of the RS" no. 54/2011). According to the Decision on Determining the List of Waters of the First Order ("Official Gazette of the RS" No. 83/10), the Danube River is classified as 1. Interstate waters 1) natural watercourses. According to the Regulation on the Categorization of Watercourses ("Official Gazette of the RS" no. 5/1968), the river section in question belongs to Class II for the Danube section: from the Hungarian border - to the Bulgarian border. The facilities in question are located in the area of water unit number 12, "Danube and Timok – Negotin", according to the Rulebook on the determination of water units and their boundaries, ("Official Gazette of the RS", no. 8/2018).

Considering that the Danube is an international river, on 29 June 1994 the Convention on Cooperation for the Protection and Sustainable Use of the Danube River was signed in Sofia (Bulgaria), which entered into force in October 1998 when it was ratified by the ninth signatory. Serbia became a contracting party by adopting the Law on Ratification of the Convention on Cooperation for the Protection and Sustainable Use of the Danube River ("Official Gazette of FRY - International Treaties", no. 2/2003). The Convention aims to ensure that surface and groundwater in the Danube River Basin is managed and used in a sustainable and equitable manner, including:

- conservation, improvement and rational use of surface and groundwater;
- preventive measures to control hazards arising from accidents involving floods, ice or hazardous substances;
- measures to reduce the burden of pollution entering the Black Sea from sources in the Danube River Basin.

In order to obtain a more complete view of the state of surface water quality at the subject location as well as an adequate assessment of the impact of the existing ELIXIR PRAHOVO complex on the water quality of the Danube River, the operator of the chemical complex conducts regular monitoring of wastewater and surface water quality in the subject area. Testing of wastewater from the ELIXIR PRAHOVO complex and surface waters of the Danube River is carried out **quarterly on an annual** basis, by sampling and physical and chemical testing of water quality by the Institute for Prevention, Occupational Safety, Fire Protection and Development LTD. Novi Sad, Branch "27. January" Niš at four measuring points as shown in Table 9.7.

Table 9.7 Sampling points for wastewater of the ELIXIR PRAHOVO complex and surface waters (Danube River)

Measuring point	Wastewater	Sampling point	Coordinates	
			N	E
OV1	Wastewater before treatment system	Sampling point manhole located at the entrance to the neutralization pit	44º17’06.89’’	22º36’35.39’’
OV2	Wastewater after treatment system	Sampling point manhole located in auxiliary facility at the outlet of wastewater from the plant	44º17’07.78’’	22º36’37.93’’

PV1	**Danube River 150 m upstream of the inlet of collective wastewater**	**The sampling point is located on the bank of the Danube River, 150 m upstream of the wastewater outflow**	**44º17'27.50''**	**22°36'58.08''**
PV2	**Danube River 100 m downstream of the inlet of collecting wastewater**	**The sampling point is located on the bank of the Danube River, 100 m downstream of the wastewater outflow**	**44º17'21.08''**	**22º37'25.39''**

The results of the testing of wastewater after treatment system facility from the Elixir Prahovo complex show that the concentrations of the tested parameters comply with the emission limit values prescribed by the Regulation on Limit Values of Pollutant Emissions into Water and Deadlines for Reaching Them ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016, Appendix 2, Other wastewaters, 4. Limit values for emissions of wastewater containing mineral oils and with emission limit values prescribed by Commission implementing decision EU 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliaments and the Council for waste incineration (notified under documents C(2019)7987, tables 5.9 and 5.10.

The results of the physico-chemical and chemical analyses of surface water samples (watercourses), i.e. relevant parameter values, were compared with the limit values of quality classes prescribed by the **Regulation on limit values of pollutants in surface and groundwater and sediment and deadlines for their reach (Official Gazette of the RS, no. 50/2012), Appendix 1, Table 1 and 3.** 50/2012) The values of priority and priority hazardous substances were compared with the values of environmental quality standards (EQS), i.e. the average annual concentration (AAC) and the maximum allowable concentration (MAC), prescribed by the **Regulation on Limit Values of Priority and Priority Hazardous Substances that Pollute Surface Waters and Deadlines for Reaching Them ("Official Gazette of the RS", No. 24/2014), Appendix 1, Table 1**. To determine the quality class, the criteria prescribed by the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Their Reach (Official Gazette of the RS, No. 50/2012).
Measurements were performed in accordance with the Rulebook on the manner and conditions for measuring and testing the quality of wastewater and their impact to the recipient and the content of the report on the performed measurements ("Official Gazette of the RS", no. 18/2024) and the applicable standards in this field.

Bearing in mind that all wastewater, which meets the prescribed ELV, from the subject Waste-to-Energy Plant will be collectively discharged into the existing Central collector of clean water of the Elixir Prahovo industrial complex, which is discharged into the natural recipient – the Danube River, it is the obligation of the Project Holder to perform regular quarterly monitoring of the surface water quality of the Danube River upstream and downstream of the inflow of wastewater from the Central collector of clean water of the Elixir Prahovo industrial complex after the implementation of the project in question.

At the request of the Ministry of Environmental Protection and Water of the Republic of Bulgaria and Romania, access to data on surface water quality monitoring will be provided.

The monitoring program envisages testing the quality of the natural recipient in accordance with the aforementioned RS regulations and international regulations with almost equivalent scope as stated in the Romanian regulation "Regulation on Setting Pollutant Load Limits for Industrial and Urban Wastewater Discharge into Natural Recipients, NTPA-001/2002, of February 28, 2002.". The list of parameters and limit values for pollutants for the natural recipient (Danube River) is given in Table 9.8. Monitoring envisages the monitoring of parameters determined by the regulations of the Republic of Serbia, and as a supplement to monitoring, monitoring of additional parameters that are not defined by the regulations of the Republic of Serbia is defined, and they are prescribed by the appropriate Romanian legislation, which also defines

the limit values for them.

Table 0.1 List of parameters and limit values

Parameter	Regulation	Unit	Limit value
General	**Law on Waters ("Official Gazette of RS", no. 30/10 and 93/2012), Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them (Official Gazette of RS, No. 50/2012), Appendix 1, Table 1 and 3.** **To determine the quality class, the criteria prescribed by the Regulation (Official Gazette of RS, no. 50/2012)** **Rulebook on Hazardous Substances in Waters ("Official Gazette of SRS", no. 31/82)**		
pH		-	6.5 - 8.5
Temperature		°C	35
Suspended Solids		mg/l	25
Oxygen mode			
Dissolved oxygen		mg O_2/l	7
Oxygen saturation			
epilimnion (stratified water)		%	70-90
- hypolimnion (stratified water)		%	70-50
- unstratified water		%	50-70
BOD5		mg O_2/l	5
COD (dichromate method)		mg O_2/l	10
CODMn (permanganate method)			5
Total Organic Carbon (TOC)		mg/l	5
Nutrients			
Total nitrogen		mg N/l	2
Nitrates		mg N/l	3
Nitrites		mg N/l	0.03
Ammonium ion		mg N/l	0.3
Non-ionized ammonia		mg l/ NH_3	0.025
Total phosphorus		mg P/l	0.2
Orthophosphates		mg P/l	0.1
Salinity			
Chlorides		mg/l	100
Total residual chlorine		mg/l HOCl	0.005
Sulfates		mg/l	100
Total mineralization		mg/l	1000

Electrical conductivity at 20°C		mS/cm	1000
Metals			
Arsenic		µg/l	10
Boron		µg/l	1000
Copper		µg/l	5 (T = 10) 22 (T = 50) 40 (T = 100) 112 (T = 300)
Zinc		µg/l	300 (T = 10) 700 (T = 50) 1000 (T = 100) 2000 (T = 500)
Chromium (total)		µg/l	50
Iron (total)		µg/l	500
Manganese (total)		µg/l	100
Organic compounds			
Phenolic compounds (as C_2H_5OH)		µg/l	1
Petroleum hydrocarbons		mg/dm3	20
Surfactants (as laurilsulfate)		µg/l	200
AOH (Adsorbing Organic Halogen)		µg/l	50
Microbiological parameters			
Fecal coliforms		cfu/100 ml	1000
Total coliforms		cfu/100 ml	10000
Intestinal enterococci		cfu/100 ml	400
Number of aerobic heterotrophs (Kohl method)		cfu/100 ml	10000
Priority and priority hazardous substances	**Regulation on Limit Values of Priority and Priority Hazardous Substances Polluting Surface Waters and Deadlines for Reaching Them ("Official Gazette of RS", No. 24/2014), Appendix 1, Table 1.**	unit	**MAC (maximum allowable concentration)**
Mercury and its compounds		µg/l	0.07
Cadmium and its compounds (depending on water hardness class)		µg/l	<0.45 (Class 1) 0.45 (Class 2) 0.6 (Class 3) 0.9 (Class 4) 1.5 (Class 5)

Nickel and its compounds		µg/l	34
Lead and its compounds		µg/l	14
Substances that can be extracted with organic solvents	**Regulation on Setting Pollutant Load Limits for Industrial and Urban Wastewater Discharge into Natural Recipients, NTPA-001/2002, of February 28, 2002.**	mg/dm3	20
Petroleum derivatives		mg/dm3	5
Filtered residue at 105°C		mg/dm3	0.1
Sulphur and hydrogen sulphide		mg/dm3	0.5
Sulfites		mg/dm3	1
Total cyanides (CN)		mg/dm3	0.1
Fluorides		mg/dm3	2000
Aluminium		mg/dm3	300.6
Cadmium		mg/dm3	0.2
Lead		mg/dm3	0.2
Hexavalent chromium		mg/dm3	5
Nickel		mg/dm3	0.5
Mercury		mg/dm3	0.1
Silver		mg/dm3	0.1
Molybdenum		mg/dm3	0.1
Selenium		mg/dm3	1
Magnesium		mg/dm3	1

The Block Scheme for the Treatment and Discharge of Wastewater from the Energy Plant Complex to Waste is attached to the study.

9.2.1.5 GROUNDWATER AND SOIL QUALITY MONITORING

9.2.1.5.1 Groundwater quality monitoring

It is the obligation of the Project Holder to perform regular monitoring of groundwater quality. At the location in question, a network of piezometers for monitoring groundwater quality has been established, and additional new piezometers are planned to be installed in order to monitor the possible impact of the future Eco Energy complex on groundwater quality.

The parameters to be monitored to keep track of groundwater quality are: pH, water temperature, air temperature, barometric pressure, presence and type of smell of visible matter, color, electrical conductivity, suspended matter at 105 ˚C, total mineralization, biochemical oxygen demand (BOD), chemical oxygen demand (COD)), total phosphorus, phosphates (as PO43-), mineral oils C10-C40, Anionic surfactant chlorides, sulphates, ammonia, nitrates, nitrites, Ca, Mg, fluorides, metals (Z, Cd, Cr, Cu, Ni, Fe (total), Pb,Co., As,Hg, Se, Sb, Mo, You, Sn, Ba, BE, B, Te, In, Ag, Th) , aromatic organic compounds (benzene, ethylbenzene, toluene, xylenes, styrene, phenol), PAH-polycyclic aromatic hydrocarbons (naphthalene, anthracene, phenanthrene, fluoranthene, benzo(a)anthracene, chrysene, benzo(a)pyrene, benzo(ghi)perylene, benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene), total α-activity, total β- active substances in pesticides3, including their relevant metabolites, degradation and reaction products, Aldrin/Dieldrin, Atrazine, bentazone, Hexachlor iheptachlorepoxide, chlorotoluron, isoproturon, carbofuran, lindane, MCPA, molinate, pendimentalin, pentachlorophenol, permethrin, pyridate, simazine, trifuralin, dichlorprop.

Quality control and observation of the groundwater regime in piezometers will be carried out in accordance with the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them ("Official Gazette of the RS", No. 50/2012)- Appendix 2 and the Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of the RS", No. 30/2018 and 64/2019) - Appendix 2 – Remedial values of pollutants, harmful and hazardous substances in the aquifer.

Table 9.9 provides a List of parameters and test methods for groundwater quality control in piezometers.

Table 9.9 List of parameters and test methods for groundwater quality control in piezometers

<table>
<tr><th>Pollutants</th><th>Testing method</th><th>LV[2]</th><th>Unit</th><th>Minimum monitoring requirement</th></tr>
<tr><td>pH value</td><td>EPA Method 150.1:1982</td><td>/</td><td>/</td><td rowspan="17">During the first year of groundwater quality monitoring, it is proposed that monitoring is carried out quarterly on all monitoring piezometers at the same time, with daily groundwater level measurements. After the annual review of the situation, it is proposed to switch to 6-month quality monitoring, in the event that there is no deterioration in the quality of groundwater, i.e. that all tested parameters are in accordance with the applicable legislation

During the first year of groundwater quality monitoring, it is proposed that monitoring is carried out quarterly on all monitoring piezometers at the same time, with daily</td></tr>
<tr><td>Water temperature,</td><td>EPA Method 170.1:1974</td><td>/</td><td>˚C</td></tr>
<tr><td>Air temperature,</td><td>IPO1 03 108</td><td>/</td><td>˚C</td></tr>
<tr><td>Barometric pressure,</td><td>IPO1 03 108</td><td>/</td><td>mbar</td></tr>
<tr><td>Presence and type of odor</td><td>IPO1 03 108</td><td>/</td><td>/</td></tr>
<tr><td>Visible substances</td><td>IPO1 03 108</td><td>/</td><td>/</td></tr>
<tr><td>Color</td><td>IPO1 03 108</td><td>/</td><td>/</td></tr>
<tr><td>Electrical conductivity</td><td>BS EN 27888:1993</td><td>/</td><td>µS/cm</td></tr>
<tr><td>Suspended substances at 105 C</td><td>IPOL 04 04</td><td>/</td><td rowspan="7">mg/l</td></tr>
<tr><td>Total mineralization</td><td>EPA Method 160.3:1971</td><td>/</td></tr>
<tr><td>Biochemical Oxygen Demand (BOD)</td><td>SRPS EN 1899-2:2009</td><td>/</td></tr>
<tr><td>Chemical Oxygen Demand (COD)</td><td>EPA Method 410.1:1978
EPA Method 410.2:1978</td><td>/</td></tr>
<tr><td>Total phosphorus</td><td>EPA Method 365.3:1978</td><td>/</td></tr>
<tr><td>Phosphates (as PO43-)</td><td>EPA Method 365.2:1971</td><td>/</td></tr>
<tr><td>Mineral oils C10-C40</td><td>IPOL 04 13</td><td>/</td></tr>
<tr><td>Anionic surfactant</td><td>IPOL 04 06</td><td>/</td><td>µg/l</td></tr>
<tr><td>Chlorides</td><td>SRPS ISO 9297:1997</td><td>/</td><td>mg/l</td></tr>
</table>

Pollutants	**Testing method**	**LV[2]**	**Unit**	**Minimum monitoring requirement**
Sulfates	EPA Method 375.4:1978	/		groundwater level measurements. After the annual review of the situation, it is proposed to switch to 6-month quality monitoring, in the event that there is no deterioration in the quality of groundwater, i.e. that all tested parameters are in accordance with the applicable legislation
Ammonia	SRPS H.Z1.184:1974	/		
Nitrates (NO_3-N)	IPOL 04 52	50[1]		
Nitrites (NO_2-N)	EPA Method 354.1:1971	/		
Ca	IPOL 04 07	/		
Mg	IPOL 04 07	/		
Fluorides	EPA Method 340.2:1974	/		
Metals				
Zn	EPA Method 289.1:1974	800		
Cd	EPA Method 213.2:1978	6		
Cr	EPA Method 218.2:1974	30		
Cu	EPA Method 220.1:1978	75		
Fe (Total)	EPA Method 236.1:1974	/	mg/l (in solution)	
Pb	EPA Method 239.2:1978	75		
Co	EPA Method 219.1:1978	100		
As	EPA Method 206.2:1978	60		
Hg	IPOL 04 51	0.3		
Se	EPA Method 200.9:1994	160	µg/l (in solution)	
Sb	EPA Method 200.9:1994	20		
Mo	EPA Method 7010:2007	300		
Ti	EPA Method 283.2:1978	/		
Sn	EPA Method 200.9:1994	50		
Ba	EPA Method 7010:2007	625		
Be	EPA Method 200.9:1994	15		
B	IPOL 04 11	/		
Te	MS-64-11-45	70	µg/l (in solution)	
V	EPA Method 7010:2007	70		
Ag	EPA Method 200.9:1994	40		
Th	EPA Method 200.9:1994	7		
Aromatic organic compounds:				
Benzene	IPOL 04 09	30	µg/l (in solution)	
Ethylbenzene	IPOL 04 09	150		

Pollutants	Testing method	LV[2]	Unit	Minimum monitoring requirement
Toluene	IPOL 04 09	1000		
Xylenes	IPOL 04 09	70		
Styrene	IPOL 04 09	300		
Phenol	EPA Method 420.1:1978	2000		
Polycyclic aromatic hydrocarbons (PAHs):				
Naphthalene	IPOL 04 09	70	µg/l (in solution)	
Anthracene	IPOL 04 09	5		
Phenanthrene	IPOL 04 09	5		
Fluoranthene	IPOL 04 09	1		
Benzo(a)anthracene	IPOL 04 09	0.5		
Chrysene	EPA Method 420.1:1978	0.2		
Benzo(a)pyrene	IPOL 04 12	0.05		
Benzo(ghi)perylene	IPOL 04 12	0.05		
Benzo(k)fluoranthene	IPOL 04 12	0.05		
Indeno(1,2,3-cd)pyrene	IPOL 04 12	0.05		
Other pollutants				
Total α-activity	DML 2.12:2016	/	Bq/l (in solution)	
Total β- activity	DML 2.12:2016	/		
Active substances in pesticides[3], including their relevant metabolites, degradation and reaction products	EPA 25.2/625:1994/1984	0.1[1] 0.5(total)[1.4]	µg/l (in solution) Cyclohexanone	
Aldrin/dieldrin	EPA 25.2/625:1994/1984	0.1		
Atrazine	EPA 25.2/625:1994/1984	150		
Bentazone	EPA 25.2/625:1994/1984	/		
Heptachlor	EPA 25.2/625:1994/1984	0.3		
Heptachlorepoxide	EPA 25.2/625:1994/1984	3		
Chlorotoluron	EPA 25.2/625:1994/1984	/		
Isoproturon	EPA 25.2/625:1994/1984	/		
Carbofuran	EPA 25.2/625:1994/1984	100		
Lindan	EPA 25.2/625:1994/1984	/		
MCPA	EPA 25.2/625:1994/1984	50		
Molinate	EPA 25.2/625:1994/1984	/		
Pendimentalin	EPA 25.2/625:1994/1984	/		

Pollutants	Testing method	LV[2]	Unit	Minimum monitoring requirement
Pentachlorophenol	EPA 25.2/625:1994/1984	3		
Permethrin	EPA 25.2/625:1994/1984	/		
Pyridate	EPA 25.2/625:1994/1984	/		
Simazine	EPA 25.2/625:1994/1984	/		
Trifuralin	EPA 25.2/625:1994/1984	/		
Dichlorprop	EPA 25.2/625:1994/1984	/		

1 Average annual concentration in accordance with the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them ("Official Gazette of RS", No. 50/2012)-Annex 2
2 Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of RS", No. 30/2018 and 64/2019) - Appendix 2 – Remedial values of pollutants, harmful and hazardous substances in the aquifer.
3 *'Pesticides' include: organic insecticides, herbicides, fungicides, nematocides, acrylics, algicides, slimicides and other similar products such as e.g. growth regulators, their metabolites and products of degradation reactions.*
4 "Total" means the sum of all individual pesticides detected and quantified in the monitoring procedures, including their relevant metabolites, degradation and reaction products.

9.2.1.5.2 Soil Quality Monitoring

In accordance with the provisions of the Law on Soil Protection ("Official Gazette of the RS", no. 112/2015) and the Rulebook on the list of activities that may be the cause of soil pollution and degradation, procedure, data content, deadlines and other requirements for soil monitoring ("Official Gazette of the RS", no. 102/2020) and the Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of the RS", No. 30/2018, 64/2019) the obligation of the Project Holder is to implement the procurement procedure and select an authorized, accredited laboratory for performing Soil Monitoring at the subject location of the Waste-to-Energy Plant.

According to Rulebook on the list of activities that may be the cause of soil pollution and degradation, procedure, data content, deadlines and other requirements for soil monitoring ("Official Gazette of the RS", no. 102/2020) Appendix 1, subject design contains a list of activities that may be the cause of soil pollution and degradation: **5. Waste Management**

5.1. Facilities intended for the disposal or reuse of hazardous waste with a capacity exceeding 10 t per day;
5.2. Municipal waste incineration plants whose capacity exceeds 3 t/h;
5.3. Facilities for the disposal of non-hazardous waste with a capacity of over 50 t per day.

Monitoring of the soil, where the activities from the List of the aforementioned Rulebook are performed, should show data on the condition and quality of the soil during the performance of activities.

Soil monitoring at the location in question should be carried out **every five years.** If monitoring determines the presence of certain hazardous, polluting and harmful substances in the soil, caused by human activity, in concentrations above the maximum limit values, in accordance with the regulation on limit values of polluting, harmful and hazardous substances in the soil, monitoring of these substances is carried out every year. If the results of the annual monitoring in the period of three consecutive years show that there has been no deterioration in the condition and quality of the soil, monitoring will be further performed every five years.

By hiring an authorized legal entity to perform soil monitoring with an accredited laboratory with an appropriate scope of accreditation for soil sampling and laboratory testing, the execution of soil monitoring services through sampling and analysis of soil quality parameters will be ensured at the location in question.

Soil monitoring will include the following activities:

- Field investigations
- Development of the Soil Monitoring Plan
- Soil sampling and laboratory testing
- Preparation of soil monitoring reports.

Monitoring of the soil where the activities from the List referred to in this Rulebook are performed involves monitoring the following parameters:

1. Mechanical composition of soil
2. Soil acidity (pH in water and pH in 1M KCl)
3. $CaCO_3$ content
4. Exchangeable cation capacity
5. Degree of saturation with bases
6. Organic matter content
7. Physical properties of the soil: dry soil density, solid phase density, total porosity, water retention at different pressures, accessible water, water permeability rate, structure and hardness.
8. Chemical properties: hydrolytic acidity of the soil, total N and S, content of accessible micro and macro elements (P2O5, K2O, Fe, Cu, Zn, Mn), electrical conductivity of the soil extract, anions (fluorides, chlorides, nitrites, nitrates, bromides, orthophosphates, sulfates) and cations in the soil, heavy metals (Cd, Cr, Cu, Ni, Pb, Zn, Hg, As, Ba, Co, Mo, Sb, Se)
9. Total petroleum hydrocarbons (fractions C6- C40)
10. Polycyclic aromatic hydrocarbons (PAH-total)
11. PCB polychlorinated biphenyls (total)
12. Aromatic organic compounds (benzene, ethylbenzene, toluene, xylenes, styrene, phenol and aromatic solvents)
13. Inorganic compounds (cyanides free, cyanides - complex (pH<5), cyanides - complex (pH ≥ 5)

The competent authority for issuing the Integrated Permit may define additional soil monitoring parameters. Table 9.10 provides a List of parameters and test methods for soil quality control.

Table 9.10 List of parameters and testing methods for soil quality control

Soil (mg/kg of absolutely dry matter)			**Unit**	**Test methods**[3]	**Minimum monitoring requirement** [2]
Pollutant	**Limit maximum value** [1.4]	**Remediation value** [1.4]			
Mechanical composition of soil	-	-	-	Methods of investigation and determination of physical properties of soil. Novi Sad: Yugoslav Society for Soil Studies (JDPZ), Soil Testing Manual, Group of Authors, Đ. Bošnjak, ed. (1997). ISO 11277	**Every 10 years**

Soil acidity (active acidity pH in H_2O and substitution acidity pH 1M KCl, ($CaCl_2$)	-	-	-	EPA Method 9045D:2004 SRPS ISO 10390	**Every five years** *Note:* If monitoring determines the presence of certain hazardous, polluting and harmful substances in the soil, caused by human activity, in concentrations above the maximum limit values, in accordance with the regulation on limit values of polluting, harmful and hazardous substances in the soil, **monitoring of these substances is carried out every year**. If the results of the annual monitoring in the period of three consecutive years show that there has been no deterioration in the condition and quality of the soil, monitoring will be further performed every five years.
$CaCO_3$content	-	-		SRPS ISO 10693	
Moisture content	-	-	%	IPOL 04 30 SRPS ISO 11465:2022	
CEC Exchangeable cation capacity (Na^+, K^+, Ca^{2+}, Mg^{2+})				SRPS ISO 11260	
Degree of saturation with bases			V%	Manual for soil testing JDPZ, Group of authors, M. Bogdanović, ed. (1966).	
Organic matter content	-	-	%	IPOL 04 38 SRPS ISO 10694	
Clay content	-	-	%	IPOL 04 40	
Soil hydrolytic acidity	-	-		Manual for soil testing JDPZ, Group of authors, M. Bogdanović, ed. (1966).	
Total N	-	-		SRPS ISO 11261 SRPS ISO 13878	
Total S	-	-		SRPS ISO 15178	
Content of accessible micro and macro elements (P_2O_5, K_2O, Fe, Cu, Zn, Mn)	-	-		Manual for soil testing JDPZ, Group of authors, M. Bogdanović, ed. (1966). SRPS ISO 11263 SRPS ISO 14870	

ECe Electrical conductivity of soil extract	-	-		SRPS ISO 11265	
Anions and cations in soil (SO_4^{2-}, NO_2^-, CN^-, CO_3^{2-}, HCO_3^-, Cl^-, NH_4^+, K^+, Na^+, Ca^{2+}, Mg^{2+})	-	-		ISO/TS 14256-1 ISO 14256-2 SRPS EN ISO 10304-1 SRPS EN ISO 14911 ISO 11048 ISO 11262 SRPS EN ISO 17380	
Metals					
Cadmium (Cd)	0.8	12	mg/kg	IPOL 04 19 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Chromium (Cr)	100	380	mg/kg	IPOL 04 22 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Copper (Cu)	36	190		IPOL 04 21 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Nickel (Ni)	35	210		IPOL 04 26 SRPS ISO 11047 SRPS ISO 11466	

			mg/kg	SRPS ISO 14870 ISO 16772	
Lead (Pb)	85	530		IPOL 04 27 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Zinc (Zn)	140	720	mg/kg	IPOL 04 28 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Mercury (Hg)	0.3	10		IPOL 04 34 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Arsenic (As)	29	55		IPOL 04 17 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Barium, Ba	160	625	mg/kg	IPOL 04 17 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Cobalt (Co)	9	240		IPOL 04 24 SRPS ISO 11047	

				SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Molybdenum, Mo	3	200		SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772 MS-64-11-48	
Antimony (Sb)	3	15		IPOL 04 17 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Beryllium (Be)	1.1	30		IPOL 04 17 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Selenium, Se	0.7	100		SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Tellurium (Te)	-	600		IPOL 04 17 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Thallium (Th)	1	15		IPOL 04 17 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870	

				ISO 16772	
Tin (Sn)	-	900		SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Vanadium (V)	42	250		IPOL 04 17 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Silver (Ag)	-	15		IPOL 04 17 SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772	
Boron (B)	-	-		SRPS ISO 11047 SRPS ISO 11466 SRPS ISO 14870 ISO 16772 MS-64-11-48	
Inorganic compounds					
Cyanides - Free	1	20	mg/kg	-	
Cyanides - complex (pH < 5)[1*]	5	650		-	
Cyanides - complex (pH ≥ 5)	5	50		-	
Thiocyanates (total)	1	20		-	
Bromides (mgBr/l)	20	-		-	
Fluorides (mgF/l)	500*	-		-	
Aromatic organic compounds:					

Benzene	0.01	1	mg/kg	IPOL 04 33 SRPS EN ISO 22155 SRPS EN ISO 15009	
Ethylbenzene	0.03	50			
Toluene	0.01	130			
Xylenes	0.1	25			
Styrene (vinylbenzene)	0.3	100			
Phenol	0.05	40			
Aromatic solvents	-	200			
Polycyclic aromatic hydrocarbons (PAHs):					
PAH (total) [2*]	1	40	mg/kg	IPOL 04 32 ISO 18287 ISO 11264 SRPS ISO 10382 ISO 14154 SRPS EN ISO 15009	
Other pollutants					
Total petroleum hydrocarbons (fractions C_6-C_{40})*	50	5000	mg/kg	IPOL 04 31 SRPS EN ISO 16703	
Naphthalene	-	-		IPOL 04 32	
Anthracene	-	-		IPOL 04 32	
Phenanthrene	-	-		IPOL 04 32	
Fluoranthene	-	-		IPOL 04 32	
Benzo(a)anthracene	-	-		IPOL 04 32	
Chrysene	-	-		IPOL 04 32	
Benzo(a)pyrene	-	-		IPOL 04 32	

Benzo(ghi)perylene	-	-		IPOL 04 32	
Benzo[k]fluoranthene	-	-		IPOL 04 32	
Indeno(1,2,3-cd)pyrene	-	-		IPOL 04 32	

1. Regulation on Limit Values of Polluting, Harmful and Hazard nces in Soil ("Official Ga 30/2018 and 64/2019) – Annex 1: Maximum Limit and Re /alues for Polluting, Ha Substances in Soil.
2. Rulebook on the List of Activities That May Cause Soil Poll Degradation, the Proce Deadlines and Other Requirements for Soil Monitoring ("Official Gazette of the RS", No. 102/2020).
3. Sampling, sample preparation, and testing of the physical and chemical properties of soil shall be performed according to the methods and standards set out in Annex 3 – *Methods and Standards for Sampling, Sample Preparation, and Testing of Physical and Chemical Soil Properties*, of the above-mentioned Rulebook.
4. Maximum limit values and remediation values for metals and arsenic, with the exception of antimony, molybdenum, selenium, tellurium, thallium, and silver, depend on the clay and organic matter content of the soil. Maximum limit and remediation values for organic compounds depend on the organic matter content in the soil. Maximum limit and remediation values for polycyclic aromatic hydrocarbons (PAHs) also depend on the organic matter content in the soil.
For soils with an organic matter content of up to 10%, no correction is applied to the maximum limit and remediation values for PAHs.
When determining the type and properties of the soil, values from the table must be adjusted to those applicable to the actual soil, based on measured organic matter and clay content.

- 1* – pH value is determined in 0.01 M $CaCl_2$.
- 2* – Sum of ten polycyclic aromatic hydrocarbons: anthracene, benzo(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, phenanthrene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, and benzo(ghi)perylene.
- * – Clay content differentiation: (F) = 175 = 13·L (L = % clay content)

Soil monitoring should be carried out in accordance with the procedure given in Appendix 2 – Monitoring of soil on which activities from the List are performed, which is an integral part of the *Rulebook on the list of activities that may be the cause of soil pollution and degradation, procedure, data content, deadlines and other requirements for soil monitoring ("Official Gazette of the RS", no. 102/2020) as follows:*

1. Selection of measuring points and taking samples for soil testing before the construction of the plant

Prior to the construction of the plant for performing activities from the List, soil testing is performed, in order to assess the condition and quality of the soil, by:
1) soil samples are taken from the places where the foundations of the facility will be laid;
2) in places where the relief is uniform and where the area of the tested site is less than 4 ha, soil samples are taken from at least four places where the factory will be constructed;
3) in places where the terrain is uneven, soil samples are taken from all major sublocalities in order to obtain an accurate characterization of the variability of the site in terms of soil and groundwater;
4) for sites where underground facilities will be built, samples must be taken from a depth below the base of the intended facility.

2. Selection of the number and layout of measuring points for soil sampling at the sites where the activities from the List are performed

Before selecting the number and layout of measuring points, it is necessary to review the existing relevant documentation and conduct interviews with experts who are familiar with the technological processes in the facility and who are familiar with, if any, previous accidents at the site.

When choosing the number and layout of measuring points at the sites where the activities from the List are performed, the following shall be taken into account, in particular:

1) places where soil or groundwater pollution is known to have occurred;
2) places for storing products, raw materials, chemicals, catalysts or waste;
3) places in the immediate vicinity of plants, devices and installations where the production process is carried out or other equipment for carrying out the production process;
4) the places where the facilities for loading and unloading chemicals and/or waste are located, including loading docks;
5) storages serving the new and worn out equipment (including but not limited to transformers, vehicles and compressors) which may be a source of soil pollution;
6) area for servicing and maintenance of machines;
7) equipment washing area including but not limited to containers, tanks, filters and vehicles;
8) places close to underground septic tanks, reservoirs and pipelines;
9) areas outside the factory circle that may be affected by factory activities.

Exceptionally, if the risk of pollution is minimal due to the nature of the production process itself or if some production processes have maximum protection, the appropriate parts of the site may be exempted from monitoring.

In accordance with all of the above, soil monitoring measuring points have been determined:

- Measuring point 1: Location of the Waste-to-Energy Plant (new measuring point near the liquid waste transfer point)

GPS coordinates: N 44°17'6.35" E 22°37'5.00

- Measuring point 2: Green area immediately next to the wastewater basin U-C06 and the sanitary foul wastewater treatment plant

GPS coordinates: N 44°17'3.76 E 22°36'56.64

The exact position of the measuring points from which the samples will be taken is defined by an accredited laboratory authorized by the Ministry of the Environment, which will be hired by the Project Holder to perform the subject testing. The map of the position of measuring points with precisely defined UTM coordinates will be an integral part of the Soil Quality Test Report.

3. Schemes of sampling of soil where activities from the List are performed

The sampling of the soil where the activities from the List are performed is carried out according to the sampling schemes given in the standard SRPS ISO 18400-104 Soil Quality - Sampling - Part 104: Strategies.

Sampling, preparation of samples and testing of physical and chemical properties of the soil should be carried out according to the methods and standards given in *Appendix 3 – Methods and standards for sampling, preparation of samples and testing of physical and chemical properties of the soil of* the aforementioned Rulebook.

The measured values of soil parameters are compared with the limit maximum and remediation values of polluting, harmful and hazardous substances in the soil prescribed by the *Regulation on limit values of polluting, harmful and hazardous substances in the soil ("Official Gazette of the RS", no. 30/2018 and 64/2019)-Annex 1.*

9.2.1.6 ENVIRONMENTAL NOISE LEVEL MONITORING

Noise at the subject location occurs as a result of traffic on the complex (vehicles that deliver waste), as well as due to the operation of process equipment (pumps, shredders, cranes, mixer, fans, etc.). Most of the equipment that emits higher-intensity noise will be located in closed facilities. The envisaged distance between the equipment is sufficient so that the noise level does not increase. Facilities that are not part of an indivisible technological whole are separated, in order to minimize noise levels. The plant itself is not in vicinity other noise emitters. Since the facilities in question are located in an industrial zone, noise will not have a significant impact on the environment.

In accordance with Article 23 Of the Law on Environmental Noise Protection ("Official Gazette of the RS", No. 96/2021), the obligation of the Project Holder is to perform the first noise control measurement during the trial operation of the plant and to perform regular periodic measurement of the noise level in the environment during the regular operation of the plant thereafter, **once every three years.**

Measurement of noise from individual noise sources is carried out in the manner prescribed by the Regulation on noise indicators, limit values, methods for assessing noise indicators, disturbance and harmful effects of noise on human health ("Official Gazette of the RS", no. 75/10), which also defines the outdoor noise limit values (Table 1 of Appendix 2). Environmental noise measurement is performed by an authorized accredited legal entity.

Table 9.11 Maximum permissible external noise level

Zone	**Purpose of the space**	**Maximum allowable external noise level dB(A)**	
		Day	**Night**
1.	Rest and recreation area, hospital zones and convalescent homes, cultural and historical sites, large parks	50	40
2.	Tourist areas, small and rural settlements, campsites and school zones	50	45
3.	Purely residential settlements	55	45
4.	Commercial-residential areas, commercial and residential areas, children's playgrounds	60	50
5.	City centre, craft, commercial, administrative zone with apartments, zone along highways, main and city roads	65	55
Zone	**Purpose of the space**	**Maximum allowable external noise level dB(A)**	
		Day	**Night**
6.	Non-residential industrial, storage and service areas and transport terminals	At the border of the zone, noise must not exceed the levels in the zone bordering with	

Since there is no data on the zoning of the area in accordance with the regulations for the area in question, the criterion for the external environment in terms of noise emission was taken according to the purpose of the vulnerable facilities in the vicinity of which the complex in question is located. The subject location of the future Waste-to-Energy plant and Landfill for non-hazardous waste is located within the industrial zone IHP ELIXIR PRAHOVO. Immediately next to the border of the subject location of the future Eco Energy complex are the following existing facilities of the Elixir Prahovo complex:

- Phosphogypsum Storage – to the South
- Waste Railway sleepers Storage, Non-hazardous Waste storage and Concrete plant – to the North
- Unconstructed land and wastewater treatment plant of the Elixir Prahovo complex – to the West
- Land intended for the expansion of the production part of the industrial complex (towards Radujevac), for the formation of a chemical park, a new production complex of the same or compatible activity, with the necessary accompanying, technologically and functionally related facilities, with several independent units, with new Investors – to the East.

There are no residential buildings in the immediate vicinity of the Eco Energy complex. The settlement of Prahovo, located at a distance of about 2 km in the direction of the west, the village of Radujevac is located at a distance of about 4 km in the east-southeast direction of the project in question, the settlement of Samarinovac, at a distance of about 5 km in the southwest direction, the settlement of Srbovo, at a distance of about 6 km in the south direction, the settlement of Dušanovac, at a distance of about 7 km in the northwest direction, and the settlement of Negotin, at a distance of about 10 km in the southwest direction. Along the border of the expansion of the Elixir Prahovo complex, at a distance of about 1300 m from the plant in the direction of the west, there is a workers' settlement (a smaller group of residential buildings).

In the subject area, the noise level in the open space is regularly measured during the operation of the production facilities of IHP Elixir Prahovo by the Institute for Prevention, Occupational Safety, Fire Protection and Development LTD., Novi Sad, Branch 27 January Niš. Measurements are made in terms of day, evening and night at three measuring points:

- M1 – is located in an open area, northwest of the production complex, on a green area in front of a residential area on the left side of the Prahovo-Radujevac road;
- M2 – is located in an open space, west of the complex, on a green area in front of the old administrative building and the settlement Kolonija, at a distance of about 100 m from the main gate;
- M3 – is located in an open area, on a green area in front of the Prahovo settlement at about 500 m from the plant and about 70 m from residential buildings.

The report on the results of noise measurements from 2024 is given as part of the State of Environmental Factors Analysis, which is attached to the Study.

In order to define the potential cumulative impact of noise in the subject area, the Project Holder is obliged to perform regular noise monitoring at the emitters aforementioned after the construction of the Eco Energy complex, as aforementioned firstly during trial operation and later during the regular operation, all in accordance with the Regulation on noise indicators, limit values, methods for assessing noise indicators, disturbance and harmful effects of noise on human health ("Official Gazette of the RS", No. 75/10), more precisely on the basis of Table 1 of Annex 2 of the said Regulation, for zone 4 (business-residential areas, commercial-residential areas) for which an allowed outdoor noise level of 60 dB(A) is prescribed for day and evening, and 50 dB(A) for night.

9.2.1.7 WASTE

Waste thermal treatment shall be carried out in plants designed and built in accordance with the law governing the construction of facilities and which are equipped in accordance with this Law and other regulations.
At the site for the operation of the thermal waste treatment plant, a space must be provided for the temporary storage of waste which has determined that cannot be thermally treated.

Pursuant to the Law on Waste Management ("Official Gazette of the RS", no. 36/09, 88/2010, 14/2016, 95/2018 – other law and 35/2023), the Project Holder is obliged to constantly monitor and record the quantities and types of waste collected, stored and treated at the waste management plant in question.

Waste monitoring is achieved by the following activities:

- Implementation of the Work Plan /Waste Management Plan, given that it is an IPPC plant primarily by implementing the conditions defined by the integrated permit;
- As part of the reception control, the radioactivity of the delivered waste will be tested in accordance with the Law on Radiation and Nuclear Safety and Security ("Official Gazette of the RS" no. 95/18 and 10/19) and the Rulebook on Radioactivity Monitoring ("Official Gazette of the RS", no. 97/2011). If the meter detects elevated radioactivity, the relevant state inspection and the ministry are immediately notified, and the driver is instructed to park the vehicle in the designated parking lot for trucks until the arrival of the inspection.
- At the entrance to the thermal waste treatment plant, the installed scale shall measure the mass of the waste transport vehicle and measure the waste received by the plant.
- Before reception of the waste for thermal treatment, the operator shall check:

1) documentation accompanying waste;
2) a waste test report prepared in accordance with the list of parameters for waste testing for the needs of thermal treatment in accordance with a special regulation;
3) hazardous characteristics of waste, the substances it should not be mixed with and precautions to

be taken when handling waste;

- Prior to reception of hazardous waste for thermal treatment, the operator must implement the waste reception procedure referred to in paragraph 6 of this Article, and in particular:

1) checking the documentation accompanying hazardous waste, and, if necessary, the documentation prescribed by the regulations governing the transport of dangerous goods;
2) taking representative samples before unloading, except in cases where this is not feasible, in order to check compliance with the data from the accompanying documentation;
3) enable the competent authority to inspect and identify the waste which will undergo thermal treatment.

- The Project holder is obliged to regularly perform sampling and analysis of waste before the commencement of thermal treatment and prepare a Waste Test Report for thermal treatment and keep reports in the archive of the company; it is also the obligation of the Project holder to regularly perform testing of residues from the boiler plant before treatment (stabilization and solidification procedure). Analyses of physical and chemical properties should be performed on a representative sample taken, within the laboratory provided within the Waste-to-Energy Plant. Based on the test results, the recipes and material balances for the solidification process will be defined.
- It is envisaged that before determining the manner of disposal or recycling operations of the residue from the thermal treatment plant, appropriate examinations will be carried out to determine the physical and chemical properties and potential pollution from various residues from the process, in accordance with the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", No. 56/2010, 93/2019 and 39/2021), the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010), i.e. EU Landfill Directive: (Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste); The tests shall cover in particular the total soluble fractions and the heavy metals in the soluble fraction. Leaching tests for the monolithic waste in question will be performed according to the NEN 7345 Leaching Characteristics of Soil and Stony Building and Waste Materials – Leaching Tests – Determination of the Leaching of Inorganic Components from Building and Monolithic Waste Materials with the Diffusion Test or equivalent method. The concentration limit values are given in relation to the 64-day test, but it is possible to use a shorter test, where the concentration limit values are proportionately adjusted to the length of testing.
- Reporting (announcement) to the competent ministry on the movement of hazardous waste in electronic form; Submitting data from the document on the movement of hazardous waste to the Environmental Protection Agency, electronically, by entering data from the document on the movement of hazardous waste into the Agency's information system through the portal www.sepa.gov.rs.
- Completely certified and signed Document on the movement of waste in accordance with the Rulebook on the form of the document on the movement of hazardous waste, the form of prior notification, the manner of its delivery and the instructions for their completion ("Official Gazette of the RS", no. 17/2017), as a recipient /donor of hazardous waste, must also submit it to the postal address of the Ministry and the Agency, in accordance with the law governing waste management.
- By regularly completing the Document on the movement of waste as a recipient /donor of hazardous waste in accordance with the Rulebook on the form of the document on the movement of waste and the instructions for its completion ("Official Gazette of the RS" no. 114/13).
- By keeping daily records on the types and quantities of waste pursuant to Article 75 of the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016 and 95/2018 - other law and 35/2023) and the Rulebook on the form of daily records and annual report on waste with instructions for its completion ("Official Gazette of the RS", nos. 7/2020 and 79/2021), as follows:
    - Form DEO 1 - Daily Waste Records of Waste Producers – for generated waste amounts
    - Form DEO 3 - Daily waste records of the operator of the waste reuse facility - for waste that will be thermally treated and for the treatment of plant residues (S/S);
- By submitting a regular annual report on the quantities of waste to the Environmental Protection Agency by 31 March of the current year for the previous year, based on the Rulebook on the daily

record form and the annual report on waste with instructions for its completion ("Official Gazette of the RS", no. 7/2020 and 79/2021);

- Form GIO 1 - Annual Waste Report of the Waste Producer – for generated waste amounts;
- Form GIO 3 - Annual Waste Report of the Operator of the Waste Reuse Facility - for waste that will be thermally treated and for the treatment of plant residues (S/S);

Report forms shall be submitted to the Agency as follows:

- in electronic form by entering data into the information system of the National Register of Pollution Sources at the address of the Environmental Protection Agency:

http://www.sepa.gov.rs/index.php?menu=20170&id=20004&action=showAll

The report contains data on the type, quantity, origin, characterization and classification, composition, storage, transport, import, export, treatment, i.e. reuse and disposal of the generated waste, as well as waste received at the waste management plant.

- Submits to the competent authority an annual report related to the operation and monitoring of the thermal treatment plant in accordance with the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023). The reporting also includes data on the operation and monitoring of the plant and takes into account the performance of the incineration process and the level of emissions to air and water compared to the emission limit values.

9.2.2 MONITORING OF LANDFILL OPERATION AND MAINTENANCE AFTER CLOSURE

The content and method of monitoring the operation of the landfill, as well as subsequent maintenance after the closure of the landfill are defined by the Regulation on the disposal of waste at landfills ("Official Gazette of the RS", No. 92/2010), Appendix 6 - Monitoring the operation of the landfill.

In order to put the subject Landfill for non-hazardous waste into functional and intended use, it is necessary to establish an effective system of monitoring and control of work in order to increase environmental safety and protection of human health. Mandatory and continuous monitoring of the operation of the Landfill for non-hazardous waste will be carried out in accordance with the aforementioned regulation.

The monitoring of the landfill operation will be carried out during the active and passive phase of the landfill and will include the following:

1) monitoring of meteorological parameters;
2) monitoring of surface waters;
3) monitoring of leachate;
4) monitoring of gas emissions;
5) monitoring of groundwater;
6) monitoring of the amount of rainwater;
7) monitoring of the landfill body stability;
8) monitoring of protective layers;
9) monitoring of pedological and geological characteristics.

The aforementioned monitoring will be carried out by sampling and measurement in the manner defined in *Appendix 6. – Monitoring the operation of the landfill*, the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010).

The following sampling and measurements will be performed:
1) in the in-house laboratory provided within the Waste-to-Energy Plant, where particular examinations are performed on a daily basis;
2) in an accredited laboratory at certain intervals prescribed by the Regulation on the disposal of waste at landfills ("Official Gazette of the RS", No. 92/2010) or more frequently, if the data in the in-house laboratory show that there has been any accident situation or deviation from the zero state of certain parameters.

All data obtained from the conducted monitoring will be submitted to the Environmental Protection Agency.

In addition to the aforementioned regular monitoring, daily visual control of the operation of the landfill will be carried out, maintenance of all facilities within the landfill complex, maintenance of machinery as well as control of the efficiency of the truck wheel washing unit.

9.2.2.1 <u>Monitoring of meteorological parameters</u>

In accordance with the Regulation on the disposal of waste at landfills ("Official Gazette of the RS", No. 92/2010), the operator is obliged to regularly measure meteorological parameters in accordance with the following schedule (see Table 9.14).

Table 9.12 Measurement of meteorological parameters

Parameter	Active phase	Passive phase
1. Rainfall	daily	daily, added to the monthly value
2. Temperature (min, max at 14.00)	daily	monthly average
3. Air flow velocity and direction	daily	not necessary.
4. Evaporation (lysimeter) *	daily	daily, added to the monthly value
5. Atmospheric humidity (at 14.00)	daily	monthly average
* or other appropriate method		

Measurements can be processed in an internal laboratory that will be located within the Waste-to-Energy Plant or data can be downloaded from the nearest meteorological station, as long as the competent authority requires it in accordance with the regulation and the Law on Waste Management.

9.2.2.2 Surface water monitoring

Bearing in mind that the Danube River is located in the immediate vicinity of the location of the Landfill for non-hazardous waste in question (≈100), it is the obligation of the operator to regularly monitor the quality of the Danube River, as follows:

(1) before commissioning the landfill, by taking surface water samples, i.e. by determining the "zero state" of the quality of the Danube River;

(2) in the process of landfill exploitation for the purpose of comparison with the "zero state", at the beginning of landfill exploitation (first year) – **every month, and later every three months.**

(3) upon cessation of exploitation of the landfill for the first five years every six months, and later once a year, until the landfill dies, if the results of monitoring show that there was no accident situation.

Sampling should be carried out **at least two points, one upstream of the landfill and one downstream of the landfill.**

Sampling and testing of surface waters performed at the prescribed time intervals should be performed by hiring an accredited institution for this type of testing.

Permanent monitoring of surface waters during the exploitation of the landfill with shortened chemical and bacteriological analyses will be carried out every 15 days in the internal laboratory. Table 9.15 shows the frequency of sampling and measuring of surface water quality.

Table 9.13 The frequency of sampling and measuring should be performed as follows:

Parameter	Active phase	Passive phase(1)
Volume and composition of surface water(7)	Quarterly(1)	Every six months

(1) if the assessment of the data indicates that longer intervals are equally effective, measurements can be performed at those intervals, but only once a year.

9.2.2.2.1 Surface water quality monitoring

As stated in chapter 9.2.1.4 of the study, the nearest watercourse to the location in question is the Danube River (at a distance of about 500 m in the north direction from border NHWL). Basin – Danube; Water district - Danube according to Art. 27. of the Law on Waters, Decision on determining the boundaries of river basin districts ("Official Gazette of the RS" no. 75/2010) and the Rulebook on Determination of Sub-basins ("Official Gazette of the RS" no. 54/2011). According to the Decision on Determining the List of Waters of the First Order ("Official Gazette of RS", no. 83/10), the Danube River is classified as 1. Interstate waters 1) natural watercourses. According to the Regulation on the Categorization of Watercourses ("Official Gazette of SRS", no. 5/1968) the river section in question belongs to Class II for the Danube section: from the Hungarian border - to the Bulgarian border. The facilities in question are located in the area of water unit number 12, "Danube and Timok – Negotin", according to the Rulebook on the determination of water units and their boundaries, ("Official Gazette of the RS", no. 8/2018).

In order to monitor the status of surface water quality at the subject location as well as to adequately assess the impact of the operation of THE FUTURE NHWL on the water quality of the Danube River, it is the obligation of the Project Holder to conduct regular monitoring of surface water quality in the subject area.
The results of the physico-chemical and chemical analyses of surface water samples (watercourses), i.e. relevant parameter values, were compared with the limit values of quality classes prescribed by the Regulation on limit values of pollutants in surface and groundwater and sediment and deadlines for reaching them (Official Gazette of RS, no. 50/2012), Appendix 1, Table 1 and 3. The values of priority and priority hazardous substances were compared with the values of environmental quality standards (EQS), i.e. the average annual concentration (AAC) and the maximum permissible concentration (MAC), prescribed by the Regulation on Limit Values of Priority and Priority Hazardous Substances that Pollute Surface Waters and Deadlines for Reaching Them ("Official Gazette of RS", No. 24/2014), Appendix 1, Table 1. To determine the quality class, the criteria prescribed by the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them (Official Gazette of RS, No. 50/2012).

Table 9.14 shows the limit values of pollutants in surface waters in accordance with the aforementioned regulations.

Table 0.2 Limit values of pollutants in surface waters

Parameter	Unit	Limit value[1]	Average annual concentration [2]	Maximum allowable concentration[2.3]
General parameters				
pH	-	6.5 - 8.5	-	-
Temperature	°C	35	-	-
Suspended Solids	mg/l	25	-	-
Oxygen mode				
Dissolved oxygen	mg O2/l	7		-
Oxygen saturation				
- epilimnion (stratified water)	%	70-90	-	-
- hypolimnion (stratified water)	%	70-50	-	-
- unstratified water	%	50-70	-	
BOD5	mg O2/l	5	-	-
COD (biochromatic method)	mg O2/l	15	-	-

CODMn (permanganate method)		10	-	-
Total Organic Carbon (TOC)	mg/l	5	-	-
Nutrients				
Total nitrogen	mg N/l	2	-	-
Nitrates	mg N/l	3	-	-
Nitrites	mg N/l	0.03	-	-
Ammonium ion	mg N/l	0.3	-	-
Non-ionized ammonia	mg l/ NH3	0.025	-	-
Total phosphorus	mg P/l	0.2	-	-
Orthophosphates	mg P/l	0.1	-	-
Salinity				
Chlorides	mg/l	100	-	-
Total residual chlorine	mg/l HOCl	0.005	-	-
Sulfates	mg/l	100	-	-
Total mineralization	mg/l	1000	-	-
Electrical conductivity at 20°C	mS/cm	1000	-	-
Metals				
Arsenic	µg/l	10	-	-
Boron	µg/l	1000	-	-
Copper	µg/l	5 (T = 10) 22 (T = 50) 40 (T = 100) 112 (T = 300)	-	-
Zinc	µg/l	300 (T = 10) 700 (T = 50) 1000 (T = 100) 2000 (T = 500)	-	-
Chromium (total)	µg/l	50	-	-
Iron (total)	µg/l	500	-	-
Manganese (total)	µg/l	100	-	-
Mercury	µg/l		-	0.07 [2] 1 [3]

Cadmium	µg/l		<0.08 (Class 1) [2] 0.08 (Class 2) [2] 0.09 (Class 3) [2] 0.15 (Class 4) [2] 0.25 (Class 5) [2]	<0.45 (Class 1)[2] 0.45 (Class 2) [2] 0.6 (Class 3) [2] 0.9 (Class 4) [2] 1.5 (Class 5) [2] 5[3]
Nickel	µg/l		4 [2.4]	34[2] 50 [3]
Lead	µg/l		1,2 [4]	14[2] 50[3]
	Organic substances			
Phenolic compounds (as C_2H_5OH)	µg/l	1	-	-
Petroleum hydrocarbons	mg/dm3	20	-	-
Surfactants (as laurilsulfate)	µg/l	200	-	-
AOH (adsorbent organic halogen)	µg/l	50	-	-
	Microbiological parameters			
Faecal coliforms	cfu/100 ml	1000	-	-
Total coliforms	cfu/100 ml	10000	-	-
Intestinal enterococci	cfu/100 ml	400	-	-
Number of aerobic heterotrophs (Kohl method)	cfu/100 ml	10000	-	-
Regulation on Setting Pollutant Load Limits for Industrial and Urban Wastewater Discharge into Natural Recipients, NTPA-001/2002, of February 28, 2002.				
Substances that can be extracted with organic solvents	mg/dm3	20	-	-
Petroleum derivatives	mg/dm3	5	-	-
Filtered residue at 105°C	mg/dm3	0.1	-	-
Sulphur and hydrogen sulphide	mg/dm3	0.5	-	-
Sulfites	mg/dm3	1	-	-
Total cyanides (CN)	mg/dm3	0.1	-	-
Fluorides	mg/dm3	2000	-	-
Aluminium	mg/dm3	300.6	-	-
Cadmium	mg/dm3	0.2	-	-
Lead	mg/dm3	0.2	-	-
Hexavalent chromium	mg/dm3	5	-	-
Nickel	mg/dm3	0.5	-	-

Mercury	mg/dm3	0.1	-	-
Silver	mg/dm3	0.1	-	-
Molybdenum	mg/dm3	0.1	-	-
Selenium	mg/dm3	1	-	-
Magnesium	mg/dm3	1	-	-

[1] by Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them (Official Gazette of RS, No. 50/2012), Appendix 1, Table 1 and 3.
[2]by Regulation on Limit Values of Priority and Priority Hazardous Substances Polluting Surface Waters and Deadlines for Reaching Them ("Official Gazette of RS", No. 24/2014), Appendix 1, Table 1 and 2.
[3]by Rulebook on Hazardous Substances in Waters ("Official Gazette of SRS", no. 31/82)
[4] These values for the environmental quality standard indicate concentrations of the substance that are bioavailable

9.2.2.3 Monitoring of leachate

The subject project envisages a closed system with the collection of leachate by a system of canals that first deliver the leachate to the leachate pool, and then pump it to the waste-to-energy plant where its treatment is carried out.

The subject project envisages monitoring the quality of leachate on a representative number of samples, which are taken before the controlled drainage of water from the landfill site.

Measurement of the volume and composition, i.e. qualitative and quantitative parameters of leachate, is performed once a month during the exploitation of the landfill. The quality of the leachate will be examined in the wastewater pool at the Waste-to-Energy Plant, where it is pumped from the leachate pool.

These measurements will also be carried out after the cessation of exploitation of the landfill every six months for the first five years, and then once a year until the landfill dies. Table 9.15 shows the frequency of sampling and measuring of leachate.

Table 9.15 The frequency of sampling and measuring should be performed as follows

Parameter	Active phase	Passive phase(2)
1. Leachate volume	Monthly[(1)(2)]	Every six months
2. Leachate composition (2)	Quarterly[(3)]	Every six months

(1) the frequency of sampling can be adjusted based on the morphological composition, and is determined by the permit.
(2) if the assessment of the data indicates that longer intervals are equally effective, measurements can be performed at those intervals, but only once a year.

9.2.2.3.1 Leachate quality monitoring

The project envisages a closed system for the collection of leachate by a system of channels that first bring the leachate to the leachate basin, and then use the pump to pump it to the plant for energy recovery of waste where its treatment is carried out and then the final analysis at the discharge of technological wastewater from the Energy Plant complex to waste in accordance with the monitoring prescribed in Chapter *9.2.1.3.1 Monitoring of wastewater* from the boiler plant.
The project envisages internal monitoring of the quality of leachate on a representative number of samples, which are taken at the controlled drainage of water from the landfill site, and before admission

to the appropriate wastewater basin U-C06 within the Energy Waste Plant complex (see Chapter 9.2.2 of the study).

Leachate from the landfill of non-hazardous waste will be treated as part of the Energy Waste Complex first through a grease and oil separator, after which it is discharged into the U-C06 wastewater basin (chamber 3), from where it is discharged through a sand filter and activated carbon filter into the boiler plant's wastewater treatment plant for final treatment (under the license of Envirochemie (ECWWT), after which the quality of treated water is achieved, which is in accordance with domestic and EU regulations. Cleaned water is supplied from this plant to chamber 2 of the wastewater tank U-C06 whose main role is to accept them in order to perform their testing before discharge to the recipient.
Measurement of the amount of leachate will be carried out in the receiving manhole provided within the Waste Energy Plant complex. Sampling to test the quality of the leachate will be carried out before and after the treatment of these waters at the designated plants. Emission limit values in leachate from a non-hazardous waste landfill are given below in accordance with the ***Regulation on Limit Values of Pollutant Emissions into Water and Deadlines for Reaching Them ("Official Gazette of RS", No. 67/2011, 48/2012, 1/2016), Annex 2 EMISSION LIMIT VALUES for WASTEWATER, II. OTHER WASTEWATER 2. Limit values for the emission of wastewater from the disposal of waste at the surface.***

Emission limit values before mixing with other wastewater at plant level

Parameters	**Unit of measure**	**Emission limit value**	**Frequency of measurement**[4]
Temperature	°C	30[(1)]	Leachate monitoring is performed on a representative number of samples (representative random sample or two-hour composite sample) Measurement of the volume and composition, i.e. qualitative and quantitative parameters of leachate, is performed once a month during the exploitation of the landfill. These measurements will also be carried out after the cessation of exploitation of the landfill every six months for the first five years, and then once a year until the landfill dies.
pH		6.5-9[(1)]	
Biochemical Oxygen Demand (BOD5)	mgO_2/l	40[(1)]	
Chemical Oxygen Demand (COD)	mgO_2/l	150[(1)]	
Hydrocarbon index	mg/l	10[(1)]	
AOH (adsorbent organic halogens)[(3)]	mg/l	0.5[(2)]	
Mercury	mg/l	0.05[(2)]	
Cadmium	mg/l	0.1[(2)]	
Chromium	mg/l	0.5[(2)]	
Chromium VI[(3)]	mg/l	0.1[(2)]	
Nickel	mg/l	1[(2)]	
Lead	mg/l	0.5[(2)]	
Copper	mg/l	0.5[(2)]	
Zinc	mg/l	2[(2)]	
Arsenic	mg/l	0.1[(2)]	
Cyanide, readily released	mg/l	0.2[(2)]	

Sulphide	mg/l	1 [(2)]	

[1]Regulation on Limit Values of Emissions of Pollutants into Water and Deadlines for Reaching Them ("Official Gazette of RS", No. 67/2011, 48/2012, 1/2016), Annex 2 EMISSION LIMIT VALUES for WASTEWATER, II. OTHER WASTEWATER Section 4. Limit values for the emission of wastewater containing mineral oils.
[2]Regulation on Limit Values of Emissions of Pollutants into Water and Deadlines for Reaching Them ("Official Gazette of RS", No. 67/2011, 48/2012, 1/2016), Annex 2 EMISSION LIMIT VALUES for WASTEWATER, II. OTHER WASTEWATER 2. Limit values for the emission of wastewater from the disposal of waste at the surface
[3] For AOH, chromium VI, readily released cyanides and sulphides, the values related to the random sample apply.
[4]Regulation on the disposal of waste at landfills ("Official Gazette of RS", no. 92/2010).

9.2.2.4 Monitoring of gas emissions

At the subject landfill for the disposal of non-hazardous waste / solid, non-reactive hazardous waste (solidified) whose leachate is equivalent to that for non-hazardous waste and which meets the limit values of the parameters for the disposal of hazardous waste at landfills of non-hazardous**, there will be no emissions of landfill gas and unpleasant odours.** All chemical reactions in which hydrogen may be emitted, etc., will take place during the stabilization and solidification process, which takes place under strictly controlled conditions in the stabilization and solidification facility within the Waste-to-Energy Plant and before the process of disposing of the solidificate at the landfill in question.

9.2.2.4.1 Ambient air quality testing

The impact on air quality in the subject area will be based on the monitoring of ambient air quality, monitoring of suspended particles (PM_{10}, PM $_{2.5}$ and total precipitants in accordance with the Regulation on monitoring conditions and air quality requirements ("Official Gazette of RS", No. 75/10, 11/10 and 63/13): Annex XV - Section A - **MAXIMUM ALLOWABLE CONCENTRATIONS:**

Total suspended particles (PM_{10},$PM_{2.5}$)		
Averaging period	**Maximum allowed value**	**Sampling method:**
Single day	120 μg/m^3	SRPS EN 12341:2015
Calendar year	70 μg/m^3	
Total settling matter		
Averaging period	**Maximum allowed value**	**Sampling method:**
One month	450 mg/m^2/day	SRPS EN 14902:2008/AC:2013
Calendar year	200 mg/m^2/day	

UPPER AND LOWER GRADING LIMIT
Suspended particles (PM_{10}/PM2.5)

	Average 24-hour concentrations PM_{10}	Average annual concentrations of PM_{10}	Average annual concentrations of $PM_{2.5}$ [(1)]
Upper Limit of Rating	70% of the limit value (35	70% of limit value (28	70% of limit value (17 μg/m^3)

	μg/m³, not to be exceeded more than 35 times in one calendar year)	μg/m³)	
Lower Assessment Limit	50% of the limit value (25 μg/m³, not to be exceeded more than 35 times in one calendar year)	50% of limit value (20 μg/m³)	50% of limit value (12 μg/m³)

(1) *The upper and lower assessment limits for $PM_{2.5}$ suspended particles shall not apply in the case of measurements used to assess the fulfilment of the objective of reducing exposure to suspended particles $PM_{2.5}$ in order to protect human health.*

LIMIT VALUE, TOLERANCE VALUE AND TOLERANCE LIMIT FOR SUSPENDED PARTICLES (PM_{10}, PM2,.5)

Suspended particles PM_{10}		
	Limit value	**Tolerance value**
Single day	50 μg/m³, not to be exceeded more than 35 times in one calendar year	75 μg/m³
Calendar year	40 μg/m³	48 μg/m³
Suspended particles $PM_{2.5}$ STAGE 1		
Calendar year	25 μg/m³	30 μg/m³
Suspended particles $PM_{2.5}$ STAGE 2(2)		
Calendar year	20 μg/m³	20 μg/m³

TARGET VALUES FOR SUSPENDED $PM_{2.5}$

1. Target value for suspended $PM_{2.5}$

Averaging period	**Target value**
Calendar year	25 μg/m³

2. Allowable exposure level for suspended particles $PM_{2.5}$

Allowable exposure level
20 μg/m³

9.2.2.5 Groundwater Monitoring

In accordance with the Regulation on the disposal of waste at landfills ("Official Gazette of the RS", no. 92/2010), the operator is obliged to regularly monitor groundwater in three stages:

- sampling
- supervision
- determination of critical values.

Groundwater monitoring below the bottom of the landfill and in the immediate zone of the landfill impact must be such as to provide information on groundwater that can be contaminated as a result of the operation of the landfill.
Samples are taken as reference values for groundwater monitoring before the commissioning of the landfill and marked as "zero state", and according to ISO 5667-2 part 11, 1993.

Groundwater samples are taken from hydrogeological facilities (piezometers, piezometer banks or observation wells) from at least three points, and of such arrangement to monitor the movement of groundwater. The final number of measuring facilities is defined by the hydrogeological conditions of the environment.

These tests of groundwater samples are carried out in order to possibly determine the occurrence of accident situations in the protective layers of the landfill, i.e. to determine the pollution of groundwater.

In addition to determining the composition of groundwater, permanent measurement of groundwater levels is also performed.

Table 9.16 The frequency of groundwater level and composition measurements will be performed in accordance with the following dynamics

Parameter	Active phase	Passive phase
Water table	Every six months (1)	Every six months (1)
Groundwater composition	frequency depending on the specificity of the terrain (2) (3)	frequency depending on the specificity of the terrain (2) (3)

(1) With an increase in the frequency of changes in water table, the frequency of sampling should be increased.
(2) If a critical level is reached, the frequency must be based on the possibility of taking corrective measures between the two samplings, i.e. the frequency must be determined on the basis of knowledge and assessment of the groundwater flow rate.
(3) When the critical level is reached, it is necessary to check by repeated sampling. Once the level has been confirmed, the contingency plan (set out in the permit) must be implemented.

In the first six months of the landfill operation every 15 days, measurement and testing (shortened chemical and bacteriological analyses) of groundwater will be performed, and after this period according to the frequencies given in the above table.

Groundwater samples, taken at the time intervals given in the above table, are treated as complete chemical and bacteriological analyses in accredited institutions for this type of testing.

If the results of the testing of the taken samples show that it has deviated from the limit values in accordance with the law governing water, it is considered that an accidental situation of the protective layers of the landfill has occurred.

In this case, additional hydrogeological facilities shall be made taking into account the hydrogeological conditions of the environment.

All processed data are displayed by control charts with established control rules of limit values for each groundwater measuring point.

9.2.2.5.1 Groundwater quality monitoring

It is the obligation of the Project Holder to perform regular monitoring of groundwater quality. At the location in question, a network of piezometers will be established to monitor the quality of groundwater, and additional new piezometers will be installed in order to monitor the possible impact of the future NHWL on the quality of groundwater.

The parameters that need to be monitored in order to monitor the quality of groundwater are: general parameters (pH, temperature, pressure, presence and type of smell of visible matter, color, electrical conductivity, suspended matter, total mineralization, biochemical oxygen demand (BOD), chemical oxygen demand (COD), chlorides, sulphates, mineral oils C_{10}-C_{40}, ammonia, nitrates, nitrites, Ca, Mg, fluorides, phosphates (as PO_4^{3-}) and total phosphorus, metals (Cd, Cr, Cu, Ni, Fe, Pb, Zn, Hg, As, Ba, Co., Mo, Sb, BE, Se, Te, Th, Sn, In, Ag), aromatic organic compounds (benzene, ethylbenzene, toluene, xylenes, styrene, phenol), PAH-polycyclic aromatic hydrocarbons (naphthalene, anthracene, phenanthrene, fluoranthene, benzo(a)anthracene, chrysene, benzo(a)pyrene, benzo(ghi)perylene, benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene), total α-activity, total β- activity, total pesticides, Aldrin/Dieldrin, Atrazine, bentazone, Hexachlor iheptachlorepoxide, chlorotoluron, isoproturon, carbofuran, lindane, MCPA, molinate, pendimentalin, pentachlorophenol, permethrin, pyridate, simazine, trifuralin, dichlorprop.

Table 9.17 provides a List of parameters and test methods for groundwater quality control in piezometers.

Table 0.3 List of parameters and test methods for groundwater quality control in piezometers

Pollutants	Testing method	LV[2]	Unit	Minimum monitoring requirement
pH value	EPA Method 150.1:1982	/	/	During the first year of groundwater quality monitoring, it is proposed that monitoring is carried out quarterly on all monitoring piezometers at the same time, with daily groundwater level measurements. After the annual review of the situation, it is proposed to switch to 6-month quality monitoring, in the event that there is no deterioration in the quality of groundwater, i.e. that all tested parameters are in accordance with the applicable legislation
Water temperature,	EPA Method 170.1:1974	/	˚C	
Air temperature,	IPO1 03 108	/	˚C	
Barometric pressure,	IPO1 03 108	/	mbar	
Presence and type of odor	IPO1 03 108	/	/	
Visible substances	IPO1 03 108	/	/	
Color	IPO1 03 108	/	/	
Electrical conductivity	BS EN 27888:1993	/	µS/cm	
Suspended substances at 105 C	IPOL 04 04	/	mg/l	
Total mineralization	EPA Method 160.3:1971	/		
Biochemical Oxygen Demand (BOD)	SRPS EN 1899-2:2009	/		During the first year of groundwater quality monitoring, it is proposed that monitoring is carried out quarterly on all monitoring piezometers at the
	EPA Method 410.1:1978	/		

Pollutants	Testing method	LV[2]	Unit	Minimum monitoring requirement
Chemical Oxygen Demand (COD)	EPA Method 410.2:1978			same time, with daily groundwater level measurements. After the annual review of the situation, it is proposed to switch to 6-month quality monitoring, in the event that there is no deterioration in the quality of groundwater, i.e. that all tested parameters are in accordance with the applicable legislation
Total phosphorus	EPA Method 365.3:1978	/		
Phosphates (as $PO4^{3-}$)	EPA Method 365.2:1971	/		
Mineral oils C10-C40	IPOL 04 13	/		
Anionic surfactant	IPOL 04 06	/	µg/l	
Chlorides	SRPS ISO 9297:1997	/	mg/l	During the first year of groundwater quality monitoring, it is proposed that monitoring is carried out quarterly on all monitoring piezometers at the same time, with daily groundwater level measurements. After the annual review of the situation, it is proposed to switch to 6-month quality monitoring, in the event that there is no deterioration in the quality of groundwater, i.e. that all tested parameters are in accordance with the applicable legislation
Sulfates	EPA Method 375.4:1978	/		
Ammonia	SRPS H.Z1.184:1974	/		
Nitrates, (NO_3-N)	IPOL 04 52	50[1]		
Nitrites, (NO_2-N)	EPA Method 354.1:1971	/		
Ca	IPOL 04 07	/		
Mg	IPOL 04 07	/		
Fluorides	EPA Method 340.2:1974	/		
Metals				
Zn	EPA Method 289.1:1974	800	µg/l (in solution)	
Cd	EPA Method 213.2:1978	6		
Cr	EPA Method 218.2:1974	30		
Cu	EPA Method 220.1:1978	75		
Ni	EPA Method 249.2:1978	75		

Pollutants	Testing method	LV[2]	Unit	Minimum monitoring requirement
Fe (Total)	EPA Method 236.1:1974	/	mg/l (in solution)	
Pb	EPA Method 239.2:1978	75	µg/l (in solution)	
Co	EPA Method 219.1:1978	100		
As	EPA Method 206.2:1978	60		
Hg	IPOL 04 51	0.3		
Se	EPA Method 200.9:1994	160		
Sb	EPA Method 200.9:1994	20		
Mo	EPA Method 7010:2007	300		
Ti	EPA Method 283.2:1978	/		
Sn	EPA Method 200.9:1994	50		
Ba	EPA Method 7010:2007	625	µg/l (in solution)	
Be	EPA Method 200.9:1994	15		
B	IPOL 04 11	/		
Te	MS-64-11-45	70		
V	EPA Method 7010:2007	70		
Ag	EPA Method 200.9:1994	40		
Th	EPA Method 200.9:1994	7		
Aromatic organic compounds:				
Benzene	IPOL 04 09	30	µg/l (in solution)	
Ethylbenzene	IPOL 04 09	150		
Toluene	IPOL 04 09	1000		
Xylenes	IPOL 04 09	70		

Pollutants	Testing method	LV[2]	Unit	Minimum monitoring requirement
Styrene	IPOL 04 09	300		
Phenol	EPA Method 420.1:1978	2000		
Polycyclic aromatic hydrocarbons (PAHs):				
Naphthalene	IPOL 04 09	70	µg/l (in solution)	
Anthracene	IPOL 04 09	5		
Phenanthrene	IPOL 04 09	5		
Fluoranthene	IPOL 04 09	1		
Benzo(a)anthracene	IPOL 04 09	0.5		
Chrysene	EPA Method 420.1:1978	0.2		
Benzo(a)pyrene	IPOL 04 12	0.05		
Benzo(ghi)perylene	IPOL 04 12	0.05		
Benzo(k)fluoranthene	IPOL 04 12	0.05		
Indeno(1,2,3-cd)pyrene	IPOL 04 12	0.05		
Other pollutants				
Total α-activity	DML 2.12:2016	/	Bq/l (in solution)	
Total β- activity	DML 2.12:2016	/		
Active substances in pesticides[3], including their relevant metabolites, degradation and reaction products	EPA 25.2/625:1994/1984	0.1[1] 0.5 (total)[1.4]	µg/l (in solution) Cyclohexanone	
Aldrin/dieldrin	EPA 25.2/625:1994/1984	0.1		
Atrazine	EPA 25.2/625:1994/1984	150		

Pollutants	Testing method	LV[2]	Unit	Minimum monitoring requirement
Bentazone	EPA 25.2/625:1994/1984	/		
Heptachlor	EPA 25.2/625:1994/1984	0.3		
Heptachlorepoxide	EPA 25.2/625:1994/1984	3		
Chlorotoluron	EPA 25.2/625:1994/1984	/		
Isoproturon	EPA 25.2/625:1994/1984	/		
Carbofuran	EPA 25.2/625:1994/1984	100		
Lindan	EPA 25.2/625:1994/1984	/		
MCPA	EPA 25.2/625:1994/1984	50		
Molinate	EPA 25.2/625:1994/1984	/		
Pendimentalin	EPA 25.2/625:1994/1984	/		
Pentachlorophenol	EPA 25.2/625:1994/1984	3		
Permethrin	EPA 25.2/625:1994/1984	/		
Pyridate	EPA 25.2/625:1994/1984	/		
Simazine	EPA 25.2/625:1994/1984	/		

Pollutants	Testing method	LV[2]	Unit	Minimum monitoring requirement
Trifuralin	EPA 25.2/625:1994/1984	/		
Dichlorprop	EPA 25.2/625:1994/1984	/		

[1] Average annual concentration in accordance with the Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them ("Official Gazette of RS", No. 50/2012)-Annex 2
[2]by Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of RS", No. 30/2018 and 64/2019) - Appendix 2 – Remedial values of pollutants, harmful and hazardous substances in the aquifer.
[3] *'Pesticides' include: organic insecticides, herbicides, fungicides, nematocides, acrylics, algicides, slimicides and other similar products such as e.g. growth regulators, their metabolites and products of degradation reactions.*
[4]*"Total" means the sum of all individual pesticides detected and quantified in the monitoring procedures, including their relevant metabolites, degradation and reaction products.*

Proposal for additional monitoring of soil and groundwater in the area of the Eco Energy complex

The necessary step in determining the state of soil quality in the subject area includes the drilling of new exploration wells in the hinterland of the industrial complex with soil and groundwater sampling. Additional drilling should be carried out:

- In order to determine the characteristics of the drilled soil, sampling should be performed for laboratory testing of the granulometric composition of approximately 5 samples per well, which would include all changes in relation to the heterogeneity of the lithological column, as well as the material immediately below the ground up to 1 m, the area above the aquifer zone, and specifically the capillary rise zone and the aquifer zone.
- Based on the drilled core of the well, soil sampling for physical and chemical soil analysis should be performed on the characteristic changes of the terrain. From each exploration well, take 1 sample in the over aquifer zone above the capillary zone, 1 sample in the capillary rise zone, 1 sample in the groundwater fluctuation zone, as well as 1 sample in the zone one meter below the aquifer level) – approximately 4 samples per well, in accordance with SRPS ISO 18400-101:2019, SRPS ISO 18400-104:2019, SRPS ISO 18400-203:2020.
- Installation of a piezometer structure made of solid threaded PVC pipes with a diameter of Ø 90 mm in accordance with (SRPS EN ISO 1452-1 and SRPS EN ISO 1452-5 as well as standards EPA/540/S-95/500).
- During the first year of groundwater quality monitoring, it is proposed that monitoring be carried out on a quarterly basis in all observation piezometers simultaneously, with daily groundwater level measurements. After the annual review of the status, it is proposed to switch to 6-month quality monitoring, in the event that there is no deterioration in the quality of groundwater, i.e. that all tested parameters are in accordance with the applicable legislation.

The establishment of an adequate monitoring system will ensure:

- consideration of the direction of groundwater flow under different conditions of the relationship between the groundwater regime, the precipitation regime and the surface water regime, by forming potentiometer maps,
- encompassing the complete convection image of the aquifer formed in the terraced deposits of the "City Terrace" as well as the aquifer formed in the Pliocene deposits, in order to determine the hydraulic dependence of the roof and floor aquifer.
- hydraulic connection between the surface waters of the Danube and the intergranular aquifer formed within the "City Terrace".
- defining hydrogeological parameters for each facility – piezometer, by testing them,
- monitoring the potential movement of the pollutant in order to alert early and applying preventive and remediation measures to improve the quality of groundwater drained into the Danube.

The concept of establishing monitoring in order to alert early by establishing three zones of representative piezometers:

A- zone - background piezometers in relation to the position of ICP Prahovo and Danube reflecting the neutral-natural composition of groundwater – where, in addition to the existing X-4 piezometer, two more piezometers, PP-1 and PP-2, being executed, of which PP-1 in the cluster – two piezometers, deeper and shallower;

Leachate monitoring zone in the landfill zone with two piezometers, one of which is the existing X-1 and D-2 whose depth reaches above the HDPE film.

B – zone – placed downstream in the direction of the underground flow towards the Danube in the immediate zone in relation to the position of a potential source of pollution – Landfill for non-hazardous waste; Based on the calculated values of advective transport, this zone should be set to a distance of 125 m in relation to the landfill, namely 3 piezometers, of which NP-1 is in a cluster (deeper and shallower)

C – zone – is set downstream in the direction of the underground flow, as a downstream control zone. Based on the calculated values of the advective transport, the control piezometers should be placed at a distance of 250 and 500 in relation to the landfill in the direction of the flow. In this zone, it is necessary to place 3 piezometers at a distance of 250 m from the landfill, with the piezometer CP-1 in a cluster (deeper and shallower). In addition, two more piezometers must be installed at a distance of 500 m.

The above concept is applied to examples of contaminated areas in Lower Saxony – Germany. With the aforementioned concept, it is necessary to include the layers that represent the Perched aquifer as well as the lower intergranular aquifer formed in Pliocene deposits.

Figure 9.2 provides a conceptual model of the proposed zoning system for monitoring the subject area.

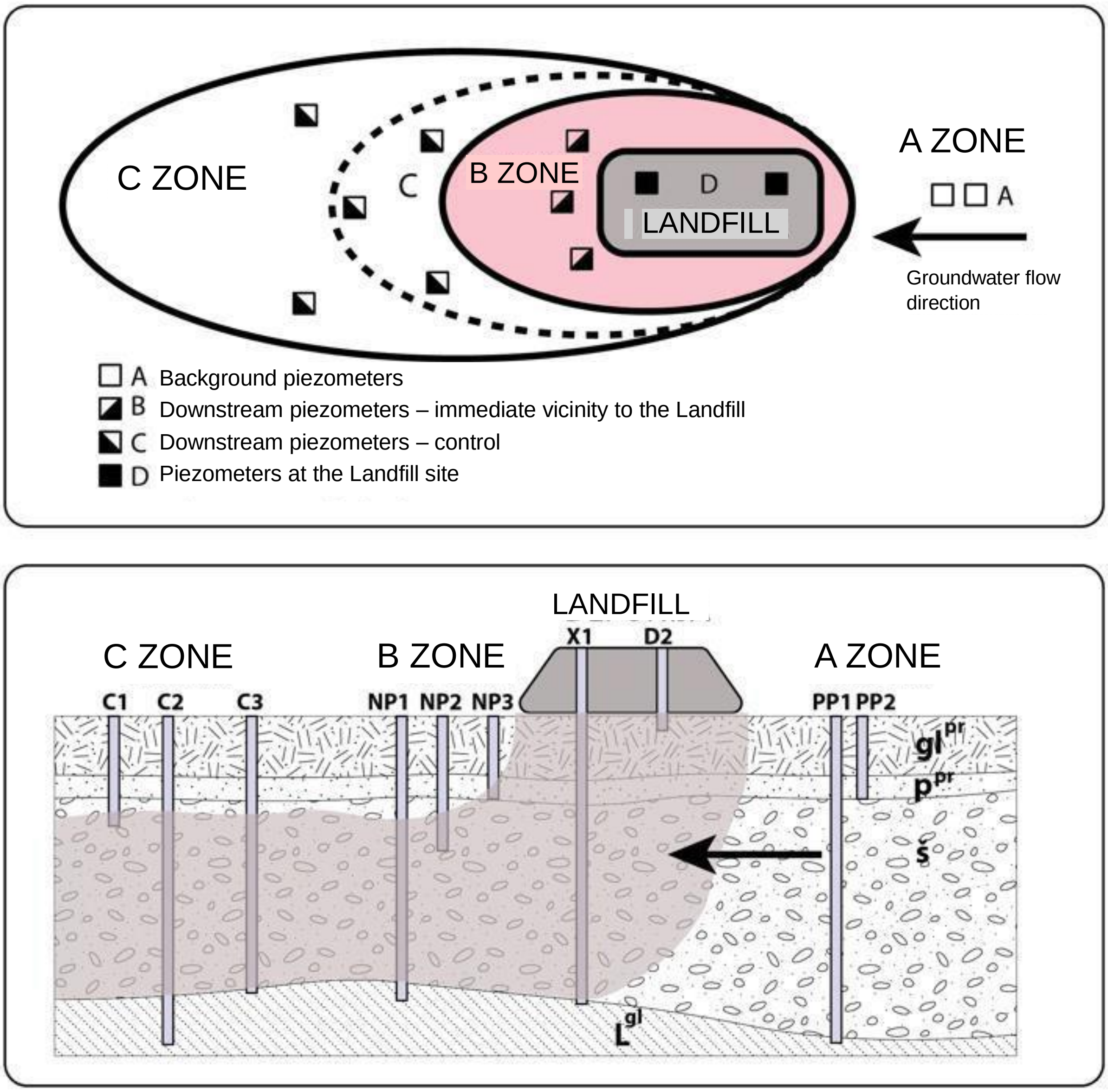


Figure 9.2 Conceptual model of the proposed zoning system for monitoring the subject area.

9.2.2.6 <u>Monitoring the amount of rainfall (atmospheric) water</u>

Measurement of the amount of rainwater in the area of the landfill, its accompanying facilities and in the wider protection zone, is carried out in accordance with the Law on Waters ("Official Gazette of RS", no. 30/2010, 93/2012, 101/2016, 95/2018 and 95/2018 - other law).

Establishment of a landfill water circulation system is planned at the landfill. As stated in the study, 2 separate water collection systems are envisaged:

1. The **leachate collection system** by which water is first collected in the leachate basin within the landfill, and then transported to the wastewater basin provided for in the space of the waste energy recovery plant from where it will be referred for treatment and Measurement of the quantity and quality of leachate is foreseen by the switchover of the Energy Plant to waste, and
2. **A system for collecting atmospheric precipitation (runoff) from the slopes of the landfill** to be collected in a concrete and waterproofed basin and used for spraying water on the slopes of the landfill, thus achieving water recirculation.

The amounts of precipitation in the subject area will be washed in accordance with the monitoring of meteorological parameters provided for in item 9.2.2.1.

9.2.2.7 Monitoring the stability of the landfill body

Monitoring of the stability of the landfill body will be performed by monitoring the data on the landfill body and will be performed in the manner as shown in the table 9.18.

Table 9.18 Monitoring the stability of the landfill body

Parameter	Active phase	Passive phase
Landfill structure and composition (1)	Every year	
Landfill body level subsidence characteristic	Every year	Annual reporting
(1) Data for assessing the current state of the landfill, area occupied by waste, volume and composition of waste, method of disposal, time and duration of disposal, calculation of the remaining capacity of the landfill		

9.2.2.8 Monitoring of protective layers

Monitoring of the protective layers of the landfill will be carried out continuously by sensors installed in the artificial waterproofing lining, and the data will be monitored in the internal laboratory within the Waste-to-Energy Plant.

Monitoring of the protective layers of the landfill will be carried out continuously during the exploitation of the landfill, and after the cessation of exploitation, observation and data processing will be carried out at the intervals prescribed in the landfill permit.

9.2.2.9 Monitoring of pedological and geological characteristics

Monitoring of soil pedological characteristics and geological characteristics of the soil in the immediate zone of the landfill for the "zero state" is carried out by taking samples from shallow and deep probing pits, as well as wells periodically performed with the aim of taking samples of the geological environment from deeper layers in the immediate zone of the landfill.

The results of sample testing are performed in accredited institutions and compared with the limit values established by the landfill permit.
Sampling will be performed once a year during the exploitation of the landfill, and after the cessation of operation of the landfill once every five years until the landfill dies.
All data obtained by monitoring are recorded in the internal laboratory and submitted to the Environmental Protection Agency.

9.2.3 WASTE

Pursuant to the Law on Waste Management ("Official Gazette of the RS", no. 36/09, 88/2010, 14/2016, 95/2018 – other law and 35/2023), the Project Holder is obliged to constantly monitor and record the quantities and types of waste that are taken over and disposed of at the Landfill for non-hazardous waste, in accordance with the work procedures of the plant (pre-acceptance, acceptance, operation guidance of the plant and landfill).

Waste monitoring is achieved by the following activities:

- Implementation of the Work Plan and the permit of the competent authority for the disposal of waste at the Landfill for non-hazardous waste;

- At the entrance to the waste disposal plant, the installed scale shall measure the mass of the waste transport vehicle and measure the waste received by the plant.

- The acceptance of waste into a landfill is carried out according to a procedure that includes the following procedures:

1) examination of waste for disposal;

2) compliance check;

3) on-site check.

- By obtaining the Waste Characterization Report:

Examination of waste for disposal shall be carried out for each type of waste, in accordance with a special regulation prescribed by Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010) and sampling in accordance with the prescribed standards. The data obtained by examination of waste for disposal at the landfill, in particular relate to:

1) a description of the previous waste treatment or a statement that the waste can be disposed of without prior treatment;

2) composition of waste and leachate;

3) the class of landfill to which the waste is disposed;

4) proof that the waste is not the waste referred to in Article 9 of this regulation;

5) special requirements and measures to be taken when disposing of, if necessary, in accordance with Article 13 of Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010);

6) certain key parameters for checking compliance, as well as its dynamics.

For waste regularly produced in the same procedure and in the same plant, the examination produces data which particularly refer to:

1) variability in the composition of individual types of waste;

2) limits of variability of significant properties.

For waste that is regularly produced in the same process but in different plants, examination provides data related to waste from each plant based on a certain number of measurements performed.

Examination of waste intended for disposal shall be carried out by authorized professional waste examination organizations in accordance with the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016 and 95/2018 - other law).

The data obtained from examination of waste are an integral part of the waste examination report for disposal, in accordance with a special regulation prescribed by Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010).

Special examining: For waste regularly produced in the same process and in the same plant, for which there are data specified in Article 16, par. 2 and 3 of the Regulation on the disposal of waste at landfills, if the measurement results show small deviations from the limit values of the disposal parameters, perform examination at the first delivery, and then periodic compliance verification in accordance with the Regulation.

For waste that is not regularly produced in the same process and in the same plant, as well as for waste whose characteristics are variable, examination of waste for disposal is performed for each batch of waste and no compliance check is performed for it.

Compliance check is a periodic check of waste that is regularly submitted for disposal in order to determine whether the parameters of that waste correspond to the parameters obtained by examination of the waste for disposal and whether they meet the limit values of the parameters for disposal of waste.

The parameters for the compliance check and the dynamics of the implementation of the compliance check are contained in the report referred to in Article 16, paragraph 6 of the Regulation on disposal of waste on landfills ("Official Gazette of the RS", no. 92/2010).

The compliance check is performed only for those parameters that were determined as critical during the examination of waste for disposal.

When checking compliance, the same examinations that were used in examination of waste for disposal will be applied.

The compliance check is carried out at least once a year, and the landfill operator makes sure that it is carried out according to the scope and dynamics in accordance with the regulation.

On-the-spot checks: The on-the-spot check consists of a visual inspection of each batch of waste before and after unloading, as well as a check of the accompanying documentation in accordance with this Regulation.

- Waste is accepted at the landfill if it has been determined on the spot that it is identical to the waste for which the testing or compliance check was performed, as well as the description in the waste testing report.
- Criteria for accepting or not accepting waste at the landfill are limit values of waste disposal parameters defined by the Rulebook on Waste Categories, Examination and Classification ("Official Gazette of the RS", No. 56/2010, 93/2019 and 39/2021), Appendix 8, point 2. **Disposal of non-reactive hazardous waste at Landfill for non-hazardous wastes in cassettes not used for the disposal of biodegradable waste:**

Parameter	**Concentration limit value in granular waste**
Total Organic Carbon (TOC)	5%
pH	Minimum 6
Acid neutralizing capacity (ANC)	Must be assessed
	Concentration limit value in leachate in mg/ kg dm* (L/S= 10 l/kg)**
Antimony, Sb	0.7
Arsenic, As	2
Copper, Cu	50
Barium, Ba	100
Mercury, Hg	0.2
Cadmium, Cd	1
Molybdenum, Mo	10
Nickel, Ni	10
Lead, Pb	10
Selenium, Se	0.5
Chromium Total, Cr	10
Zinc, Zn	50
Evaporation residue at 105°C	60000
Soluble Organic Carbon (DOC)	800
Sulphates (SO_4^{2-})	20000

Fluorides (F^-)	150
Chlorides (Cl^-)	15000
	Concentration limit value in leachate in mg/m²kg dm (monolithic waste)* **
Antimony, Sb	0.3
Arsenic, As	1.3
Copper, Cu	45
Barium, Ba	45
Mercury, Hg	0.1
Cadmium, Cd)	0.2
Molybdenum, Mo	7
Nickel, Ni	6
Lead, Pb	6
Selenium, Se	0.4
Chromium Total, Cr	5
Zinc, Zn	30
Soluble Organic Carbon (DOC)	Must be assessed
Sulphates (SO_4^{2-})	10000
Fluorides (F-)	60
Chlorides (Cl-)	10000
	Additional concentration values in monolithic waste
pH	Must be assessed
Acid neutralizing capacity (ANC)	Must be assessed
Electrical conductivity, mS/cm at 20°C/m²	Must be assessed

- *and non-reactive hazardous waste is hazardous waste whose leaching behaviour does not deteriorate over a long period of time, under the conditions present at the landfill or a possible accident: in the waste itself, due to the influence of external factors (temperature, air or the like), the influence of other waste including waste disposal products: landfill gas and leachate).*
- ** dm – dry mass*
- *** Refers to granular or fractured monolithic waste. Leaching tests are performed according to the following standards:*
- *EN 12457-2:2002 Characterization of waste-Leaching – Compliance test for leaching of granular waste materials and sludges – Part 2: One stage batch test at a liquids to a solid ratio of 10l/kg for materials with particle size below 4mm (without or with size reduction),*
- *EN 12457-4:2002 Characterization of waste-Leaching – Compliance test for leaching of granular waste materials and sludges – Part 4: One stage batch test at a liquids to a solid ratio of 10l/kg for materials with particle size below 10mm (without or with size reduction).*
- ****Leaching tests for the monolithic waste in question will be performed according to the NEN 7345 Leaching Characteristics of Soil and Stony Building and Waste Materials – Leaching Tests – Determination of the Leaching of Inorganic Components from Building and Monolithic Waste Materials with the Diffusion Test. The concentration limit values are given in relation to the 64-day test, but it is possible to use a shorter test in the first four steps, where the concentration limit values are a quarter of the concentration values for individual parameters given in the table.*
- *In addition to the parameters given in the table, it is possible to examine other parameters that can be found in waste such as pollutants, which are significant from the aspect of risk assessment.*

- Reporting (announcement) to the competent ministry on the movement of hazardous waste in electronic form; Submitting data from the document on the movement of hazardous waste to the Environmental Protection Agency, electronically, by entering data from the document on the movement of hazardous waste into the Agency's information system through the portal www.sepa.gov.rs.
- Completely certified and signed Document on the movement of waste in accordance with the Rulebook on the form of the document on the movement of hazardous waste, the form of prior notification, the manner of its delivery and the instructions for their completion ("Official Gazette

of the RS", no. 17/2017), as a recipient /donor of hazardous waste, must also submit it to the postal address of the Ministry and the Agency, in accordance with the law governing waste management.

- By regularly completing the Document on the movement of waste as a recipient /donor of hazardous waste in accordance with the Rulebook on the form of the document on the movement of waste and the instructions for its completion ("Official Gazette of the RS" no. 114/13).

- Pursuant to Article 75 of the Law on Waste Management ("Official Gazette of the RS", nos. 36/2009, 88/2010, 14/2016 and 95/2018 - other law) and the Rulebook on the form of daily records and annual report on waste with instructions for its completion ("Official Gazette of the RS", nos. 7/2020 and 79/2021) The operator at the landfill is obliged to keep daily records of the collected and disposed quantities of waste, i.e. to submit to the Agency a regular annual report on the types and quantities of disposed waste and the results of monitoring, as follows:
    - Form DEO 2 - Daily waste records of the operator of the waste disposal facility;
    - Form GIO 2 - Annual Waste Report of the Landfill Operator; The report shall in particular contain data on all necessary costs during the operation of the landfill.

  Report forms shall be submitted to the Agency as follows:

    - in electronic form by entering data into the information system of the National Register of Pollution Sources at the address of the Environmental Protection Agency:

  http://www.sepa.gov.rs/index.php?menu=20170&id=20004&action=showAll

  In particular, the report also contains data on all necessary costs during the operation of the landfill.

9.3 The locations, manner and frequency of measurement of the determined parameters.

Based on everything presented in article 9.2 of this Study consideration, table 9.19 shows a summarized tabular overview of the environmental impact monitoring program of the projects in question:

Table 9.19 Tabular overview of the environmental impact monitoring program within the Waste-to-Energy Plant

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	Legislation in accordance with which the measurement is carried out
Ambient air quality testing	Measuring point 1: Dragiša Brebulović-Žmiga, 11 Vuka Karadžića Street, Prahovo Coordinates: N 44°17'40.6", E 22°35'9.5"	Mass concentrations of suspended PM10 and PM2.5 particles; Total metal content (As, Cd, Pb, Ni, Cr) in the PM10 suspended particles fraction; Mass concentration of hydrogen fluoride (HF); Total phosphorus (P) content in the PM10 suspended	once a year for 15 days	Law on Air Protection ("Official Gazette of RS", no. 36/2009, 10/2013 and 26/2021 - other law); Regulation on monitoring conditions and air quality requirements (Official Gazette RS", No. 11/2010, 75/2010 and 63/2013)

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	Legislation in accordance with which the measurement is carried out
		particles fraction. Mass concentrations of dioxins and furans	Once every 3 years	
	Measuring point 2: The automatic measuring station Negotin has become part of the state network of the Environmental Protection Agency **Location: PU „Pčelica“ /in the center/** **Continuous monitoring of air quality is carried out by the Environmental Protection Agency**	Continuous measurement of SO2, NOx and NH3, measurement of suspended PM10/PM2.5 particles, measurement of ground-	Air quality monitoring;	Law on Air Protection ("Official Gazette of RS", no. 36/2009, 10/2013 and 26/2021 - other law); Regulation on monitoring conditions and air quality requirements (Official Gazette RS", No.

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	Legislation in accordance with which the measurement is carried out
	Coordinates: N 44° 13' 44'' E 22° 31' 43''	level ozone, meteorological parameters, measurement of benzene, toluene, ethylbenzene, xylene and continuous measurement of CO		11/2010, 75/2010 and 63/2013)

Figure 9.3 shows the location of the current measuring point for ambient air quality testing.

Figure 9.3 Position of the current measuring point for ambient air quality testing – Measuring point 1

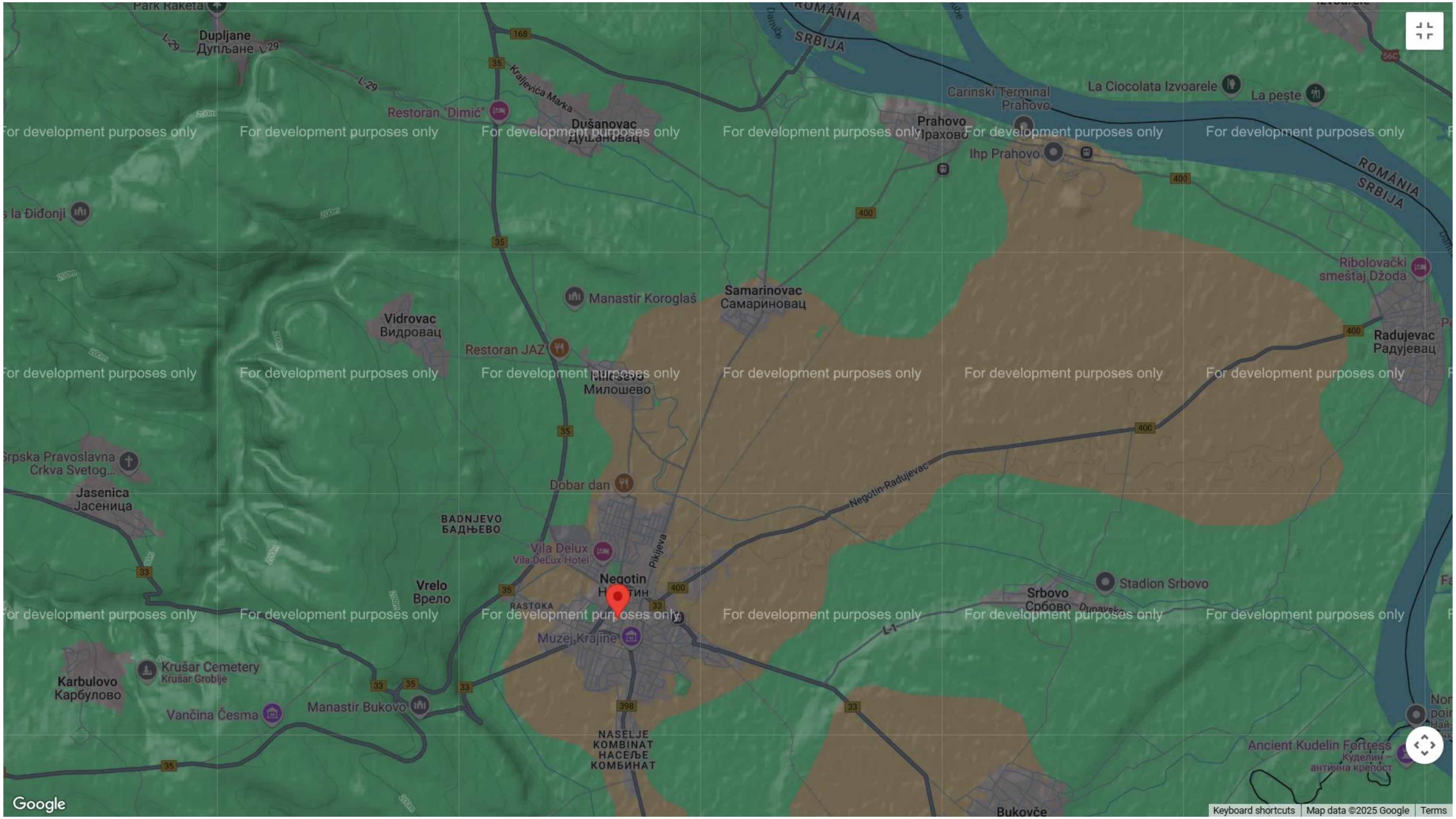


Figure 9.4 Location of the automatic monitoring station Negotin – Monitoring Site 2

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	The measurement is carried out in accordance with legislation
Air Emission Testing	1. Emitter of boiler plant Coordinates: [Lat/Long] 44.284570 22.616845	Total Particulate matter *Cd+Tl* *Sb+As+Pb+Cr+Co +Cu+Mn+Ni+V* *HCl* *HF* SO_2 *NOx* *CO* NH_3 *TVOC* *Benzo[a]pyrene* *PCDD/F* *PCDD/F + dioxin-like PCBs* *Hg* N_2O	1) continuous measurement of: nitrogen oxides (NOx), carbon monoxide (CO), total powdered substances, total organic carbon (TOC), hydrochloric acid (HCl), hydrofluoric acid (HF), sulfur dioxide (SO2); 2) continuous measurement of the following process parameters: temperature at the inner wall of the combustion chamber or at another representative point of the combustion chamber and/or additional combustion chamber, in accordance with the permit of the competent authority, as well as the volume share of oxygen, flue gas flow, pressure, temperature and water vapor	*Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", No. 103/2023) Appendix 2. LIMIT VALUES FOR EMISSIONS OF POLLUTANTS INTO THE AIR* *Conclusions on best available techniques for waste incineration (Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration):*

			content in the waste gases; 3) individual measurement of the concentration of heavy metals, dioxins and furans at least twice a year (of which one measurement in the first six calendar months and the other individual measurement in the second six calendar months), whereby these measurements in the first year of operation are performed at least four times a year with an interval of three months. Note: If the emission limit value for HCl is not exceeded, and since a device for reducing HC emissions is used, the concentration of HF is measured periodically, and at least twice a year. If the waste gas sample is dried before analysis, continuous	

			measurement of water vapour in the waste gas is not required. The gas retention time as well as the minimum temperature and oxygen content of the process gases shall be adequately checked, at least once, when the incineration plant is put into operation and under the most unfavourable operating conditions expected. Individual measurements of heavy metals may be carried out once every two years, instead of twice a year, and for dioxins and furans once a year instead of twice a year, if the emissions resulting from the incineration process do not exceed 50% of the emission limit values determined in accordance with Annex 2 or Annex 3. Regulation on technical and technological conditions for the design, construction,	

			equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", No. 103/2023) and in accordance with the criteria referred to in paragraph 8, items 1) and 4) article 15 of Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", No. 103/2023). *N_2O* - once a year Benzo[a]pyrene - once a year Emissions during start-up and shutdown until waste is incinerated, including emissions of PCDD / Fs and dioxins similar to PCBs, are	

			estimated on the basis of measurement campaigns, carried out at regular intervals, such as every three years, carried out during planned start-up or shut-down operations.	

			measurement of water vapour in the waste gas is not required. Periodic measurements for hydrochloric acid (HCl), hydrofluoric acid (HF) and sulphur dioxide (SO_2) at the incineration plant may be performed instead of continuous measurements, if the operator can prove that the emissions of these pollutants can in no case exceed the prescribed emission limit values. The gas retention time as well as the minimum temperature and oxygen content of the process gases shall be adequately checked, at least once, when the incineration plant is put into operation and under the most unfavourable operating conditions expected. Individual measurements of heavy metals may be carried out once every two years, instead of twice a year, and for dioxins and furans once a year instead of twice a year, if the emissions resulting from the incineration process do not exceed 50% of the emission limit values determined in accordance with Annex 2 or Annex 3 of the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the	

			RS", No. 103/2023) and in accordance with the criteria referred to in paragraph 8, items 1) and 4) of Article 15 of the Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for waste thermal treatment, emission limit values and their monitoring ("Official Gazette of the RS", No. 103/2023).	
Air Emission Testing	2. Emitter of the Waste Pretreatment Filter System and Activated Carbon Filters Coordinates: [Lat/Long] 44.285472 22.617081	Particulate matter, TVOC (BAT-AEL applies only when the organic compounds in question are identified as relevant in the waste gas stream, based on the inventory mentioned in BAT 3) Organic matter, expressed as total carbon	twice a year	Law on Air Protection ("Official Gazette of the RS", no. 36/2009, 10/2013 and 26/2021 - other law); In accordance with the Regulation on measurements of pollutant emissions into the air from stationary sources of pollution ("Official Gazette of the RS", no. 5/16) and Regulation on Limit Values of Emissions of Pollutants into the Air from Stationary Pollution Sources, Except for Combustion Plants ("Official Gazette of the RS", No. 111/2015 and 83/2021) - Annex 1, Part VII PLANTS for the TREATMENT OF WASTE and OTHER MATERIALS, WITH THE EXCEPTION OF THERMAL TREATMENT AND AND BAT Conclusions for waste treatment plants (Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment, under Directive

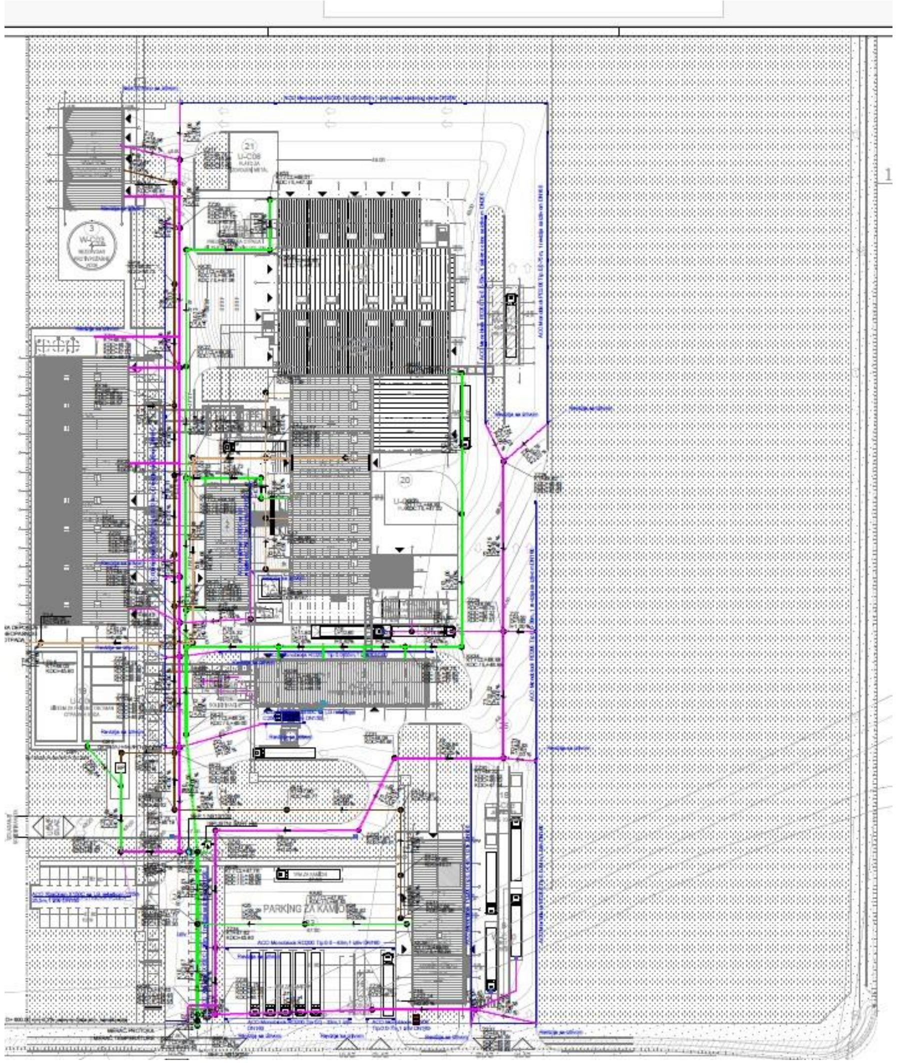
				2010/75/EU of the European Parliament and of the Council (notified under document C (2018) 5070) (Text with EEA relevance.)
	3. Emitter of the stabilization and Solidification filter system Coordinates: [Lat/Long] 44.284418 22.616549	Particulate matter	twice a year	Law on Air Protection ("Official Gazette of the RS", no. 36/2009, 10/2013 and 26/2021 - other law); In accordance with the Regulation on measurements of pollutant emissions into the air from stationary sources of pollution ("Official Gazette of the RS", no. 5/16) and Regulation on Limit Values of Emissions of Pollutants into the Air from Stationary Pollution Sources, Except for Combustion Plants ("Official Gazette of the RS", No. 111/2015 and 83/2021) - Annex 1, Part VII PLANTS for the TREATMENT OF WASTE and OTHER MATERIALS, WITH THE EXCEPTION OF THERMAL TREATMENT AND BAT Conclusions for waste treatment plants (Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C (2018) 5070) (Text with EEA relevance.)

Figure 9.5 shows the position of measuring points of air emissions.

Figure 9.5 Position of measuring points of air emissions

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	The measurement is carried out in accordance with legislation
Waste Water	- Chamber 2 (i.e. subchambers 2a, 2b, 2c, 2d): Wastewater from the boiler plant before discharge into the clean water collector, i.e. before release into the Central clean water collector of the industrial complex Elixir Prahovo	Total suspended solids (TSS), pH, temperature, flow Total organic carbon (TOC) Metals and metalloids: As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Ti, Zn Dioxins and furans PCDD/F	1) continuous measurement of pH, temperature, flow 2) individual daily measurement of total suspended solids (TSS); 3) monthly measurement on a representative sample of discharged waters during 24 hours, i.e., pollutants As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Ti, Zn, TOC; 4) measurements of dioxins and furans per month (in case of stable results, the measurement can be done 1 in six months).	Law on Waters ("Official Gazette of RS", no. 30/10 and 93/2012), Rulebook on the manner and conditions for measuring the quantity and testing the quality of wastewater and their impact on the recipient and the content of the report on the performed measurements ("Official Gazette of RS", No. 18/2024), Regulation on technical and technological conditions for the design, construction, equipping and operation of plants and types of waste for thermal treatment of waste, emission limit values and their monitoring ("Official Gazette of RS", No. 103/2023) and Conclusions on best available techniques for waste incineration BATC (Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste

				incineration (notified under document C (2019) 7987)).
Waste Water	- Inlet to the Petroleum Products Separator - Exit from the separator of petroleum products before discharge into the Central collector of clean water of the industrial complex Elixir Prahovo	Temperature pH Biochemical Oxygen Demand (BOD_5) Chemical Oxygen Demand (COD) Hydrocarbon index	Four times a year	Law on waters ("Official Gazette of the RS“, no. 30/10 and 93/2012), Rulebook on the manner and conditions for measuring and testing the quality of wastewater and their impact to the recipient and the content of the report on the performed measurements ("Official Gazette of the RS", no. 18/2024), the Regulation on Limit Values of Pollutant Emissions into Water and Deadlines for Reaching Them ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016, Appendix 2, 19. Emission limit values for wastewater; II Other wastewater; Section 4. Limit values for the emission of wastewater containing mineral oils.



LEGEND OF EXTERNAL HYDROTECHNICAL INSTALLATIONS:

K13 RAIN SEWERAGE

Z2 OILY SEWERAGE

F3 FOUL SEWERAGE

T24 PROCESS T2 SEWERAGE

SEPARATOR OF PETROLEUM PRODUCTS

CS FOUL DRAINAGE STATION

BP BIOLOGICAL AND MECHANICAL PURIFIER

LINE GRATE

Figure 9.6 Situation of hydrotechnical installations of sewers

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	The measurement is carried out in accordance with legislation
Sanitary fecal wastewater,	- Before the biological treatment plant - After the biological treatment plant	Temperature pH Flow Suspended Solids Biochemical Oxygen Demand (BOD5) Chemical Oxygen Demand (COD) Total inorganic nitrogen (NH4-N, NO3-N, NO2-N) Total phosphorus Total carbon Toxicity to fish (T_F)	Once in a year	Law on Waters ("Official Gazette of RS", no. 30/10 and 93/2012), the Regulation on Limit Values of Pollutant Emissions into Water and Deadlines for Reaching Them ("Official Gazette of the RS", No. 67/2011, 48/2012 and 1/2016, point 44. Limit values for wastewater emissions from biological waste treatment plants, table 44.1, Rulebook on the manner and conditions for measuring and testing the quality of wastewater and their impact to the recipient and the content of the report on the performed measurements ("Official Gazette of the RS", no. 18/2024)
Surface waters	- PV1: Danube River 150 m upstream of the inlet of collective wastewater GSP coordinates: N 44º17’27.50’’ E 22º36’58.08’’	pH Suspended Solids Oxygen mode Dissolved oxygen	Four times a year	Law on Waters ("Official Gazette of RS", no. 30/10 and 93/2012), Regulation on limit values of pollutants in surface and groundwater and sediment and deadlines

	The sampling point is located on the bank of the Danube River, 150 m upstream of the wastewater outflow - Danube River 100 m downstream of the inlet of collecting wastewater GSP coordinates: N: 44°17'21.08'' 22º37'25.39'' The sampling point is located on the bank of the Danube River, 100 m downstream of the wastewater outflow	Oxygen saturation: - epilimnion (stratified water) - hypolimnion (stratified water) - unstratified water BOD5 COD (dichromate method) CODMn (permanganate method) Total Organic Carbon (TOC) Total nitrogen Nitrates Nitrites Ammonium ion Non-ionized ammonia Total phosphorus Orthophosphates Chlorides Total chlorine residue Sulfates Total mineralization Electrical conductivity at 20°C Arsenic		for reaching them (Official Gazette of the Republic of Serbia No. 50/2012), Annex 1, Tables 1 and 3. Regulation on limit values of priority and priority hazardous substances polluting surface waters and deadlines for reaching them (Official Gazette of the Republic of Serbia No. 24/2014), Annex 1, Table 1 and 2 To determine the quality class, the criteria prescribed by the Regulation (Official Gazette of the Republic of Serbia, No. 50/2012) and the Regulation on Hazardous Substances in Water ("Official Gazette of the Republic of Serbia", No. 31/82) were used.

		Boron Copper Zinc Chromium (total) Iron (total) Manganese (total) Phenolic compounds (as C_2H_5OH) Petroleum hydrocarbons Surfactants (as laurilsulfate) AOH (Adsorbing Organic Halogen) Faecal coliforms Total coliforms Intestinal enterococci Number of aerobic heterotrophs (Kohl method) Priority and priority hazardous substances Mercury Cadmium Nickel Lead		

		Substances that can be extracted with organic solvents Petroleum derivatives Filtered residue at 105°C Sulphur and hydrogen sulphide Sulfites Total cyanides (CN) Fluorides Aluminium Cadmium Lead Hexavalent chromium Nickel Mercury Silver Molybdenum Selenium Magnesium		Regulation on Setting Pollutant Load Limits for Industrial and Urban Wastewater Discharge into Natural Recipients, NTPA-001/2002, of February 28, 2002.

Figure 9.7 shows the measuring points of surface water quality testing (Danube River).

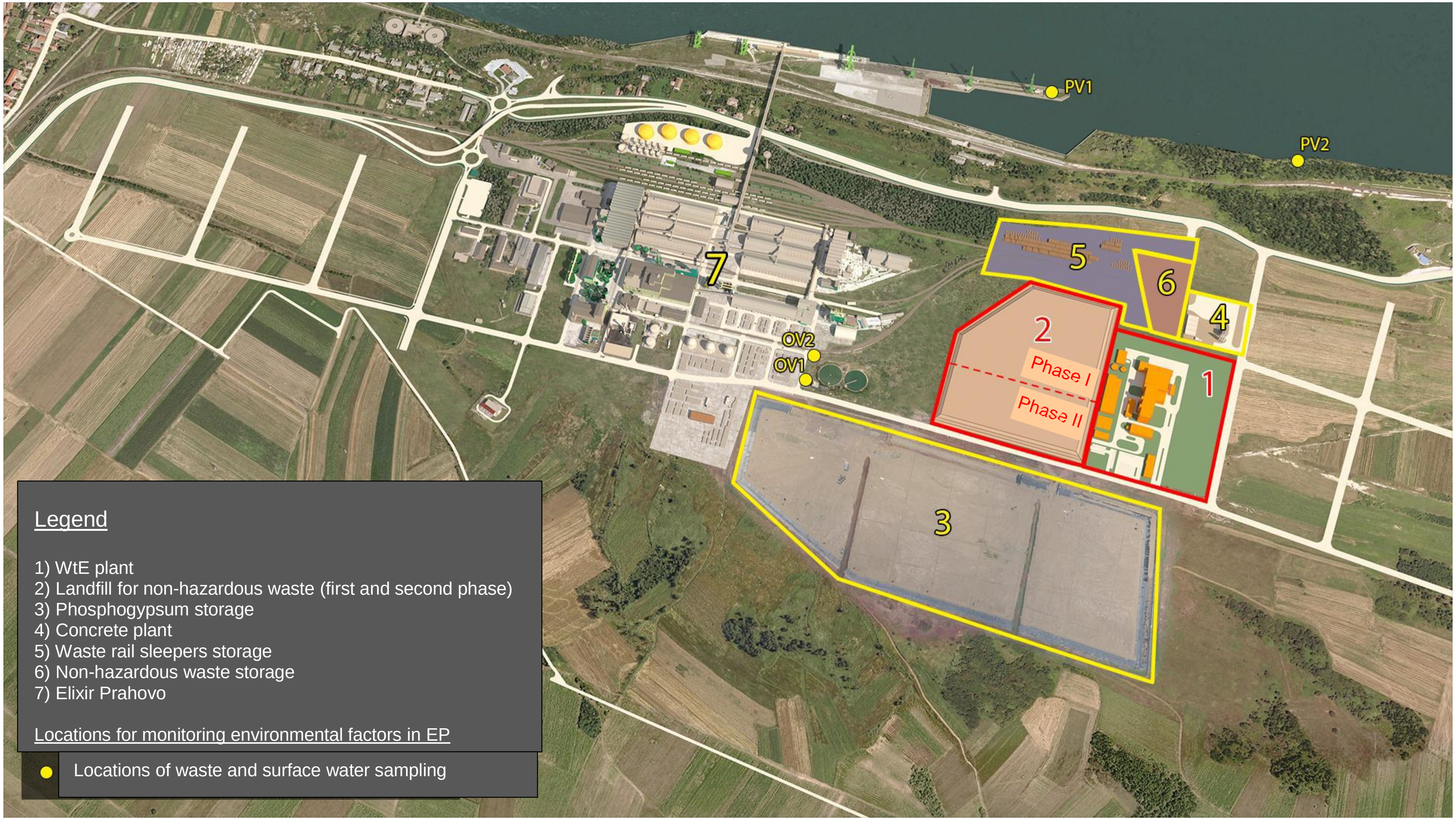


Figure 9.7 Measuring points for surface water quality testing (Danube River)

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	The measurement is carried out in accordance with legislation
Groundwater	**Locations of existing piezometers:** • **Name: X-1 (Coordinates: N 44º17'05.4", E 22º36'52.7")** • **Name: X-2 piezometer (Coordinates:** N 44º 17'1.97", E 22º 37 '13.05' ') • **Name: X-3 (Coordinates:** N 44°17'11.68", E 22°38'50.0") • **Name: X-4 (Coordinates:** N 44°16'41.9", E 22°36'42.9") • **Name: X-5 (Coordinates:** N 44°17'3.68", E 22°38' 8.2 ") • **Name: PA-1 (Coordinates:** N 44° 17'09.31", E 22°36'38.98") • **Name: PM-1 (Coordinates:** N 44°17'10.03", E 22°36'26.93") • **Nama: P-2, (Coordinates:** N 44º17'19.34", E 22º36'32.63") **New three zones of representative piezometers:** **A- zone -** background piezometers in relation to the position of ICP Prahovo and Danube reflecting the neutral-natural composition of groundwater – where, in addition to the existing X-4 piezometer, two more piezometers, PP-1 and PP-2, being executed, of which PP-1 in the cluster – two piezometers, deeper and shallower;	pH, water temperature, air temperature, barometric pressure, presence and type of smell of visible matter, color, electrical conductivity, suspended matter at 105 ˚C, total mineralization, biochemical oxygen demand (BOD), chemical oxygen demand (COD)), total phosphorus, phosphates (as PO43-), mineral oils C10-C40, Anionic surfactant chlorides, sulphates, ammonia, nitrates, nitrites, Ca, Mg, fluorides, metals (Z, Cd, Cr, Cu, Ni, Fe (total), Pb,Co., As,Hg, Se, Sb, Mo, You, Sn, Ba, BE, B, Te, In, Ag, Th) , aromatic organic compounds (benzene, ethylbenzene,	During the first year of groundwater quality monitoring, it is proposed that monitoring be carried out on a quarterly basis in all observation piezometers simultaneously, with daily groundwater level measurements. After the annual review of the status, it is proposed to switch to 6-month quality monitoring, in the event that there is no deterioration in the quality of groundwater, i.e. that all tested parameters are in accordance with the applicable legislation.	Uredba o odlaganju otpada na deponije ("Sl. ("Official Gazette of RS" No. 92/2010). Regulation on Limit Values of Pollutants in Surface and Groundwater and Sediment and Deadlines for Reaching Them ("Official Gazette of RS", No. 50/2012)- Attachment 2 and the Regulation on Limit Values of Pollutants, Harmful and Hazardous Substances in Soil ("Official Gazette of RS", No. 30/2018 and 64/2019) - Appendix 2 – Remedial values of pollutants, harmful and hazardous substances in the aquifer.

	D-zone Leachate monitoring zone in the landfill zone with two piezometers, one of which is the existing X-1 and D-2 whose depth reaches above the HDPE film. **B – zone** – placed downstream in the direction of the underground flow towards the Danube in the immediate zone in relation to the position of a potential source of pollution – Landfill for non-hazardous waste; Based on the calculated values of advective transport, this zone should be set to a distance of 125 m in relation to the landfill, namely 3 piezometers NP-1, NP-2 and NP-3, of which NP-1 is in a cluster (deeper and shallower) **C – zone** – is set downstream in the direction of the underground flow, as a downstream control zone. Based on the calculated values of the advective transport, the control piezometers should be placed at a distance of 250 and 500 in relation to the landfill in the direction of the flow. In this zone, it is necessary to place 3 piezometers CP-1, CP-2 and CP-3at a distance of 250 m from the landfill, with the piezometer CP-1 in a cluster (deeper and shallower). In addition, two more piezometers must be installed at a distance of 500 m.	toluene, xylenes, styrene, phenol), PAH-polycyclic aromatic hydrocarbons (naphthalene, anthracene, phenanthrene, fluoranthene, benzo(a)anthracene, chrysene, benzo(a)pyrene, benzo(ghi)perylene, benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene), total α-activity, total β- active substances in pesticides3, including their relevant metabolites, degradation and reaction products, Aldrin/Dieldrin, Atrazine, bentazone, Hexachlor iheptachlorepoxide, chlorotoluron, isoproturon, carbofuran, lindane, MCPA, molinate, pendimentalin, pentachlorophenol, permethrin, pyridate, simazine, trifuralin, dichlorprop.		

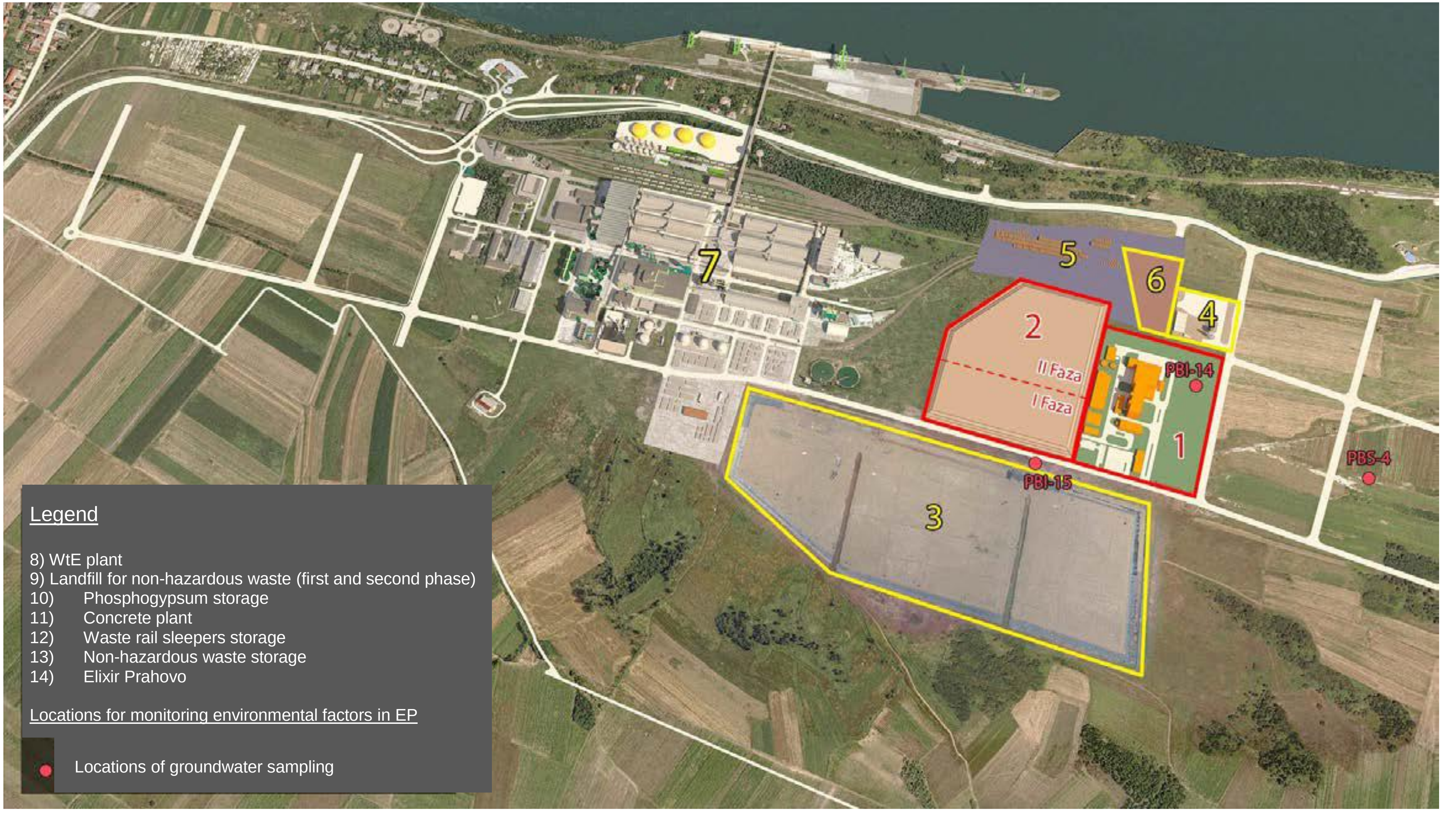

7
5
6
4
2
II Faza
I Faza
PBI-14
1
PBI-15
PBS-4
3
Legend
8) WtE plant
9) Landfill for non-hazardous waste (first and second phase)
10) Phosphogypsum storage
11) Concrete plant
12) Waste rail sleepers storage
13) Non-hazardous waste storage
14) Elixir Prahovo
Locations for monitoring environmental factors in EP
Locations of groundwater sampling

Figure 9.8 The location of existing piezometers

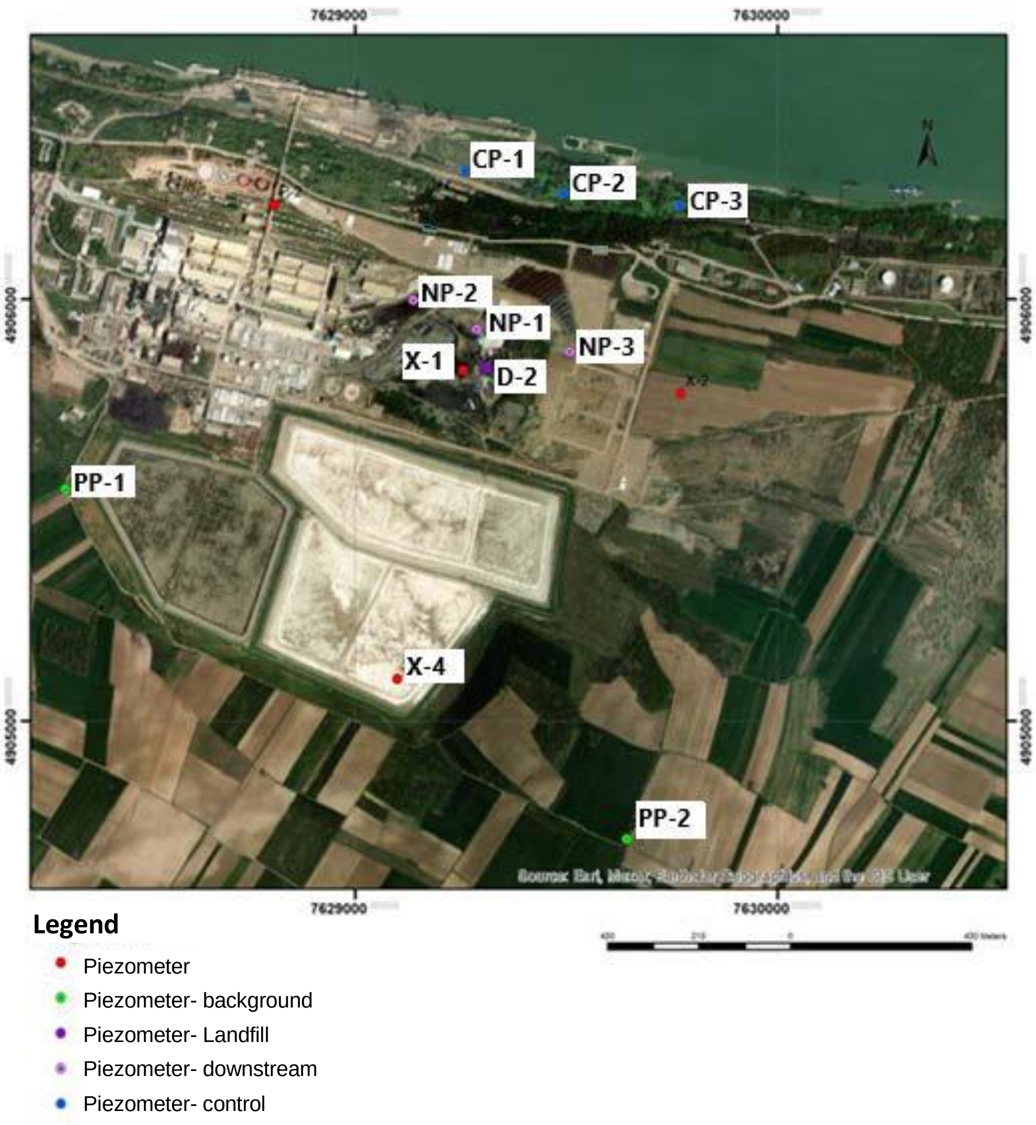


Figure 9.9 General proposal for disposition of piezometers for monitoring

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	The measurement is carried out in accordance with legislation
Soil monitoring	- Measuring point 1: Location of the WtE plant complex (new measuring point near the liquid waste transfer point) GSP coordinates: N 44°17'6.35" E 22°37'5.00 - Measuring point 2: Green area immediately next to the wastewater basin U-C06 and the sanitary faecal wastewater treatment plant GSP coordinates: N 44°17'3.76 E 22°36'56.64 *Note: The exact position of the measuring points from which the samples will be taken is defined by an accredited laboratory authorized by the Ministry of the Environment, which will be hired by the Project Holder to perform the subject testing. The map of the position of measuring points with precisely defined UTM coordinates will be an integral part of the Soil Quality Test Report.*	Mechanical composition of soil Soil acidity (active acidity pH in H_2O and substitution acidity pH 1M KCl, ($CaCl_2$) $CaCO_3$ content Moisture content CEC Exchangeable cation capacity (Na^+, K^+, Ca^{2+}, Mg^{2+}) Degree of saturation with bases Organic matter content Clay content Soil hydrolytic acidity Total N Total S Content of accessible micro and macro elements (P_2O_5, K_2O, Fe, Cu, Zn, Mn) ECe Electrical conductivity of soil extract Anions and cations in soil (SO_4^{2-}, NO_2^-, CN^-, CO_3^{2-},	Once every five years *Note: If monitoring determines the presence of certain hazardous, polluting and harmful substances in the soil, monitoring of these substances shall be carried out every year. If the results of annual monitoring for a period of three consecutive years show that there has been no deterioration in the condition and quality of the soil, monitoring shall continue to be carried out every five years.*	Law on Soil Protection ("Official Gazette of the Republic of Serbia", No. 112/2015) Regulation on the list of activities that may cause soil pollution and degradation, procedure, data content, deadlines and other requirements for soil monitoring ("Official Gazette of the Republic of Serbia", No. 102/2020) Regulation on limit values of polluting, harmful and hazardous substances in soil ("Official Gazette of the Republic of Serbia", No. 30/2018, 64/2019) - Annex 1

		HCO_3^-, Cl^-, NH_4^+, K^+, Na^+, Ca^{2+}, Mg^{2+}) **Metals**: Cadmium (Cd) Chromium (Cr) Copper (Cu) Nickel (Ni) Lead (Pb) Zinc (Zn) Mercury (Hg) Arsenic (As) Barium, Ba Cobalt (Co) Molybdenum, Mo Antimony (Sb) Beryllium (Be) Selenium, Se Tellurium (Te) Thallium (Th) Tin (Sn) Vanadium (V) Silver (Ag) Boron (B) Cyanides - complex (pH < 5)1* Cyanides - complex (pH ≥ 5) Thiocyanates (total) Bromides (mgBr/l) Fluorides (mgF/l) Aromatic organic compounds: Benzene Ethylbenzene Toluene		

		Xylenes Styrene (vinylbenzene) Phenol Aromatic solvents **Polycyclic aromatic hydrocarbons (PAHs):** PAH (total) Other pollutants Total petroleum hydrocarbons (fractions C6- C40)* Naphthalene Anthracene Phenanthrene Fluoranthene Benzo(a)anthracene Chrysene Benzo(a)pyrene Benzo(ghi)perylene Benzo(k)fluoranthene Indeno(1,2,3-cd)pyrene		

On Figure 9.10, position of measuring points of soil quality testing is given.

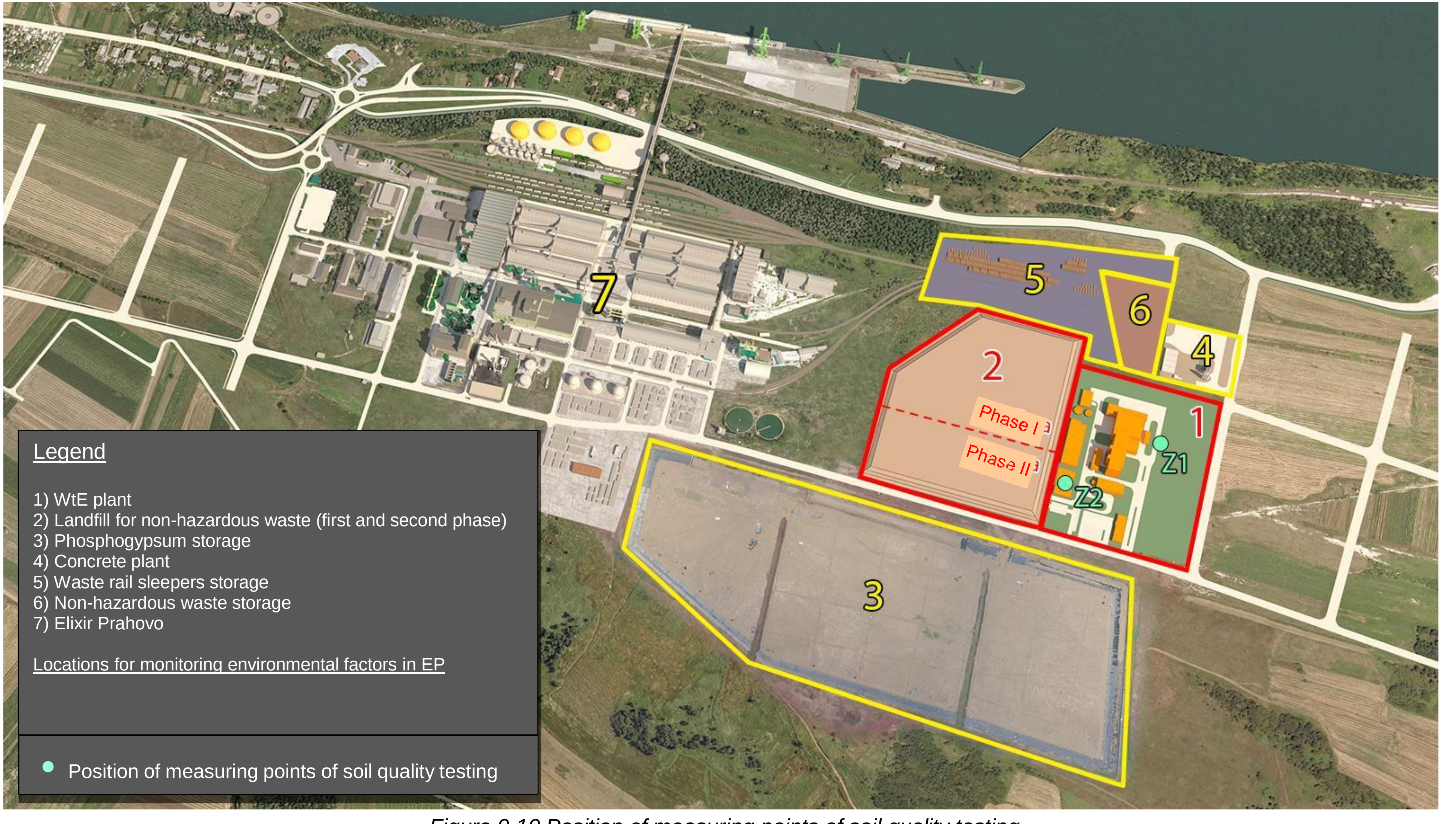


Figure 9.10 Position of measuring points of soil quality testing

Measurement type	Place of measurement or sampling	Parameter	Frequency of measurement	The measurement is carried out in accordance with legislation
Environmental noise monitoring	Measuring point - M1 – is located in an open area, northwest of the production complex, on a green area in front of a residential area on the left side of the Prahovo-Radujevac road; - M2 – is located in an open space, west of the complex, on a green area in front of the old administrative building and the settlement Kolonija, at a distance of about 100 m from the main gate; - M3 – is located in an open area, on a green area in front of the Prahovo settlement at about 500 m from the plant and about 70 m from residential buildings.	Noise level in day, evening and night intervals	Once every three years	Law on Environmental Noise Protection ("Official Gazette of RS", br.96/2021), Regulation on noise indicators, limit values, methods for assessing noise indicators, disturbance and harmful effects of noise on human health ("Official Gazette of RS", No. 75/10) of Table 1 of Annex 2. Maximum permissible external noise level

On Figure 9.11, position of measuring points for noise testing in the environment is given.

Figure 9.11 Position of measuring points for noise testing in the environment

10.0.NON-TECHNICAL SUMMARY OF THE DATA SPECIFIED IN ITEMS 2) TO 9)

The non-technical summary is a brief overview of the Environmental Impact Assessment Study of the project for the construction of the Waste-to-Energy on CP no. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. Prahovo and phase construction of Landfill for non-hazardous waste within the Complex IHP Elixir Prahovo at CP no. 2300/1, 1491/1 and 1541/1 C.M. PRAHOVO

The non-technical summary is attached as a separate document, in a separate printed document and in electronic format

11. INFORMATION ON TECHNICAL DEFICIENCIES OR LACK OF APPROPRIATE PROFESSIONAL KNOWLEDGE AND SKILLS OR INABILITY TO OBTAIN APPROPRIATE DATA

The Study Processor did not encounter significant difficulties, deficiencies or lack of appropriate professional knowledge and skills The Study Processor was obtain all necessary data in cooperation with the Project Holder.

The Study in question was developed through the following activities:

- By analysing the location of the future plant.
- By analysing data from the project-technical documentation;
- By analysing data provided by insight into the applicable standards;
- By analysing domestic and international legislation relevant to the project in question;
- By analysing data provided from the literature;
- By visiting and inspecting the operation of similar plants in Europe as well as by analysing the obtained data;
- By consultation with domestic and international experts;
- By analysing data provided from external sources and obtained from state and related institutions;
- By consultation with responsible persons for environmental protection as well as with responsible persons for development and investments;
- By comparative analysis of results related to similar projects in other locations in the world;
- By supplementary verification of key findings of the analysis;

When preparing the environmental impact assessment study, the following was used:

- Legislation of the Republic of Serbia;
- Design and technical documentation
- Planning and zoning documents;
- Conditions of the competent authorities;
- BREF documents;
- European directives;
- Other literature.

CONCLUSION

The Environmental Impact Assessment Study of the planned project defines all potential environmental impacts that occur and may occur during the construction and operation of the project. Also, the Study defines the necessary environmental protection and monitoring measures that must be taken to prevent negative consequences to the environment.

12.0. ANNEXES

1. *Decision on determining the scope and content of the environmental impact assessment study, number 000886163 2024 of 17 June 2024, Ministry of Environmental Protection.*
2. Excerpt from the preliminary design – Waste-to-Energy Plant, CP no. 1420/1, 1420/4, 1491/1, 1541/1, 1541/2, 5824/1, 6513/1, 6513/2 C.M. Prahovo, January 2024.
3. Excerpt from the preliminary design - Phased construction of a landfill for non-hazardous waste within the chemical industry complex in Prahovo, March 2024.
4. Report on the performed expert control of the Preliminary Design of the Waste to Energy Plant construction, Ministry of Construction, Transport and Infrastructure, no. 000186359 2024 14810 005 000 000 001 of 26/03/2024
5. Report on the performed expert control of the Preliminary Design for the Landfill for Non-hazardous Waste within the Chemical industry complex in Prahovo, by Ministry of Construction, Transport and Infrastructure, no. 001129027 2023 14810 005 000 000 001 of 06.08.2024. godine.
6. R1 operation_Capacities by index numbers
7. R12 operation_Capacities by index numbers
8. R13 operation_Capacities by index numbers
9. D operations_Capacities by index numbers
10. List of excluded index numbers
11. Location terms of the Ministry of Construction, Transport and Infrastructure, no. ROP-MSGI-32562-LOC-1/2023 dated 22 November 2023 for the Waste-to-Energy plant with appendices:
    - Copy of the plot plan no. 952-04-155-21149/2023 of 12 October 2023, Republic Geodetic Authority, Real Estate Cadastre Service Negotin;
    - Copy of the cadastral plan of lines no. 956-309-25298/2023 of 11 October 2023, Republic Geodetic Authority Real Estate Cadastre Sector, Department for Lines Cadastre Niš;
    - Water conditions of the Ministry of Agriculture, Forestry and Water Management no. 325-05-1/210/2022-07 of 14 November 2022 and notice no. 285878 2023 14843 000 000 000 001 of 7 November 2023;
    - Requirements regarding fire and explosion protection measures no. 217-8864/23 of 11.04.2023 and for safe installation in terms of fire and explosion protection measures no. 217-8865/23 of 13 October 2023, Ministry of the Interior, Emergency Situations Sector, Emergency Situations Department in Bor;
    - Certified site plan, September 2023, MoI;
    - Terms of the public utility company "Badnjevo" Negotin no. 2962-06/2023-1 of 20 October 2023;
    - Terms of the Institute for Nature Protection no. 03 br. 021-3738/2 of 10 November 2023;
    - Terms of the Civil Aviation Directorate of the Republic of Serbia no. 4/3-09-0222/2022-0002 of 03.11.2022 and no. 4/3-09-0322/2023-0002 of 17 October 2023;
    - Terms of "Elektrodistribucija Srbije" Doo Belgrade, Branch of Elektrodistribucija Zaječar, no. 2540400-D-10.08-452295/2-2023 dated 23 October 2023;
    - Terms of Elektromreža Srbije no. 130-00-UTD-003-1393/2023 of 20 October 2023;
    - Terms of Srbijagas no. 06-07-11/3213-1 of 31 October 2023;
    - Terms of Telekom Srbija no. D211–442574/2–2023 of 13 October 2023.
12. 12 Decision (no. ROP-MSGI-32562-TECCORO-3/2024 of 21 January 2025) on the correction of an error in the Location Conditions of the Ministry of Construction, Transport and Infrastructure, no. ROP-MSGI-32562-LOC-1/2023 of 22 November 2023
13. Location terms of the Ministry of Construction, Transport and Infrastructure, no. ROP-MSGI-27919-LOCA-7/2023 of 18.08.2023. for phase construction of landfill for non-hazardous waste within IHP Elixir complex in Prahovo with Annexes
    - Copy of the plot plan no. 952-04-155-6413/2023 of 31.03.2023., Republic Geodetic Authority, Real Estate Cadastre Service Negotin;
    - Water conditions of the Ministry of Agriculture, Forestry and Water Management no. 325-05-13/125/2023-07 of 17 August 2023;

- Opinion of the Public Water Management Company Srbijavode 7615/1 of 25 July 2023;
- Opinion of the Environmental Protection Agency no. 325-00-00001/252/2023-02 of 25 July 2023;
- Opinion of the Republic Hydrometeorological Institute no. 922-1-223/2022 of 1 November 2022 and no. 922-1-130/2023 of 21 July 2023;
- Terms of the Institute for Nature Protection no. 03 br. 021-2591/2 of 3 August 2023;
- Terms of Elektromreža Srbije no. 130-00-UTD-003-1399/2023 of 14 November 2022;
- Terms of the public utility company "Badnjevo" Negotin no. 3296-06/2022-1 of 04.11.2022;
- Notice No. 217-6494/23 of 27 July 2023, Ministry of the Interior, Emergency Situations Sector, Emergency Situations Department in Bor, Preventive Protection Department;
- Notification of Srbijagas no. 06-07-11/3321 of 27 October 2022;
- Terms of Telekom Srbija no. D211–430019/2–2022 of 20 October 2022.

14. Decision on Non-Accession to the Preparation of the Strategic Environmental Impact Assessment IDPDR-2 for the Chemical Industry Complex in Prahovo" No. 501-11/2022-IV/02 of 1 March 2022
15. Decision on the issuance of a water permit no. 325-04-281/2023-07 of 30 June 2023.
16. Decision on granting approval to the Disaster Risk Assessment, Ministry of the Interior of the Republic of Serbia, Sector for Emergency Situations, Department for Emergency Situations in Bor - Department for Civil Protection and Risk Management, no. 217-118/2024 of 5 January 2024.
17. Decision on granting consent to the Construction and Demolition Waste Management Plan for the construction of plants for energy utilization of waste, Ministry of Environmental Protection, no. 19-00-01318/2024-06 of 18 March 2025
18. Construction and Demolition Waste Management Plan for the Construction of Waste-to-Energy Plant, Eco Energy, March 2025
19. Decision on granting consent to the Construction and Demolition Waste Management Plan for the phased construction of a non-hazardous waste landfill, Ministry of Environmental Protection, no. 19-00-01318/2024-06 of 18 March 2025
20. Construction and demolition waste management plan for the phased construction of a non-hazardous waste landfill, Eco Energy, March 2025
21. Biodiversity Study for Industrial complex „Elixir Prahovo“ – Industrija hemijskih proizvoda DOO Prahovo by Institute for biological research „Siniša Stanković“, National Institut of RS, University of Belgrade, June 2024
22. Study of the impact for WtE plant and Landfill of non-hazardous waste on air quality for wider area of Chemical industry complex in Prahovo, University of Belgrade, Faculty of mechanical engineering, April 2024.
23. Study of the impact of the filter system of pre-treatment of waste and activated carbon filters within the plant for WtE plant on air quality of the wider location of the chemical industry complex in Prahovo, University of Belgrade, Faculty of Mechanical Engineering, July 2024.
24. Study on the impact of the Waste-to-energy plant on the concentration of selected heavy metals in the air of the wider location of the chemical industry complex in Prahovo, University of Belgrade, Faculty of Mechanical Engineering, March 2025;
25. Analysis of the state of environmental factors - zones envisaged for the expansion of the chemical industry complex in Prahovo at the address: Braće Jugovića no. 2, Prahovo, Company for Copyright Protection and Engineering, Belgrade Copyright Bureau, March 2023;
26. Report of physical and chemical analysis of soil samples prepared by the Institute for Prevention Ltd. Novi Sad, Branch "27. January" Nis, December 2023.
27. Reports of physical and chemical analysis of groundwater samples made by the Institute for Prevention Ltd. Novi Sad, Branch "27. January" Nis, June 2022.
28. Reports of physical and chemical analysis of groundwater samples made by the Institute for Prevention Ltd. Novi Sad, Branch "27. January" Nis, April 2024.
29. Report on physico-chemical analysis of the sample of wastewater and surface water made by the Institute for Prevention, Occupational Safety, Fire Protection and Development doo Novi Sad, Branch "27. January" Nis, July 2024.
30. Report for Air Quality Monitoring prepared by the City Institute of Public Health Belgrade, April

19-03.05.2023.
31. Report on testing – measurement of environmental noise made by the Institute for Prevention, Occupational Safety, Fire Protection and Development doo Novi Sad, Branch "27. January" Nis, April 2024.
32. Review of project compliance with best available techniques (BATs), Elixir Engineering DOO, March 2025;
33. Report on the conducted public consultations in the implementation of projects for the construction of Waste-to-Energy plant – Waste-to-Energy Plant in Prahovo, Elixir craft DOO, 2024;
34. Contract on the donation of an automatic measuring station to the municipality of Negotin, concluded on 21 June 2024.
35. References' 'TBU Stubenvoll" GMBH
36. Presentation TBU_EN for TBF October 2018;
37. ABRG_Waste Quality Acceptance;
38. Live data from the ABRG website on emissions from 2 Fluidized Bad;
39. Confirmation on Technology Suitability for Treatment of EWC Codes in the Waste-To-Energy Plant in Prahovo – TBU Stubenvoll GmbH Austria;
40. Confirmation on Technology Suitability for Treatment of EWC Codes in the Waste-To-Energy Plant in Prahovo – AK2 Energy GmbH Austria;
41. Tabular view of storage bunkers;
42. Summary of the industrial ventilation, filtration and dedusting system;
43. Cadastre of emitters;
44. Calculation and sizing of the aspiration system of waste pre-treatment filter systems and activated carbon filter and filter stabilization and solidification system with the display of gas flow velocities in the pipeline;
45. Analysis of the subject plant from the aspect of regulations in the field of protection against chemical accidents, i.e. SEVESO PLANTS;
46. Sand specification;
47. Specification of SCR Catalyst (Technical Data Sheet_SCR Catalyst);
48. MSDS lists.

GRAPHIC ATTACHMENTS

49. Graphical representation of macro and micro-location.
50. Graphical appendices for the waste-to-energy plant:
    - Layout with roof base, drawing number 23-WTE-IDP-00-C00-0001-R00;
    - Waste storage block diagram, drawing number 23-WTE-PGD-0701-WC08-1002-R00;
    - Block diagram – Pre-treatment of non-hazardous and hazardous waste, sludge waste storage, drawing number 23-WTE-IDP-0701-WC08-1003-R00;
    - P&ID – Acceptance, storage and transport of sludge waste, drawing number 23-WTE-PGD-0701-WC08-3002-R00;
    - P&ID – Pre-treatment of non-hazardous and hazardous waste, drawing number 23-WTE-PGD-0701-WC08-3004-R00;
    - P&ID – Tank truck transfer point, drawing number 23-WTE-PGD-0702-NN-3003-R00;
    - P&ID – Liquid waste storage tank 21EGB20BB001, drawing number 23-WTE-PGD-0702-NN-3004-R00;
    - P&ID – Liquid waste storage tank 21EGB21BB001, drawing number 23-WTE-PGD-0702-NN-3005-R00;
    - P&ID – Liquid waste storage tank 21EGB20BB001, drawing number 23-WTE-PGD-0702-NN-3006-R00;
    - P&ID – Liquid waste storage tank 21EGB21BB001, drawing number 23-WTE-PGD-0702-NN-3007-R00;
    - P&ID – Liquid waste storage tank 21EGB20BB001, drawing number 23-WTE-PGD-0702-NN-3008-R00;

- P&ID – Liquid waste storage tank 21EGB21BB001, drawing number 23-WTE-PGD-0702-NN-3009-R00;
- P&ID – Liquid waste storage tank 21EGB20BB001, drawing number 23-WTE- PGD -0702-NN-3011-R00;
- P&ID – Liquid waste storage tank 21EGB21BB001, drawing number 23-WTE- PGD -0702-NN-3012-R00;
- Layout of the liquid waste reception and storage system, drawing number 23-WTE- PGD - 0702-NN-4001-R00;
- Material and energy balance according to the flows given in the technological scheme 23-WTE- PGD -0704-WC11-2001-R00;
- PFD-Technological scheme, drawing number 23-WTE- PGD -0704-WC11- 2001-R00;
- P&ID – Bag filters, drawing number 23-WTE- PGD -0704-WC11-3002-R00;
- P&ID – Activated Carbon System, Drawing No. 23-WTE-PGD-0704-WC11-3003;
- P&ID – SCR system, drawing number 23-WTE- PGD -0704-WC11-3004-R00;
- P&ID – SCR preparation module, drawing number 23-WTE -PGD -0704-WC11-3005-R00;
- P&ID – HCl scrubber system, drawing number 23-WTE- PGD -0704-WC11-3007-R00;
- P&ID – SO2 scrubber system, drawing number 23-WTE- PGD -0704-WC11-3008-R00;
- P&ID – Wastewater treatment from the wet gas washing system – step 3+4, drawing number 23-WTE- PGD -0704-WC11-3011-R00;
- P&ID – Treatment of wet ash, drawing number 23-WTE- PGD -0704-WC11-3012-R00;
- P&ID – Centrifuge system, drawing number 23-WTE- PGD -0704-WC11-3013-R00;
- P&ID – Lime milk storage and dosing system, drawing number 23-WTE- PGD -0704-WC11-3014-R00;
- Block diagram – Solidification, drawing number 23-WTE- PGD -0705-WC12-1001-R00;
- Block diagram – Pre-treatment of slag, drawing number 23-WTE- PGD -0705-WC12-1002-R00;
- Technological scheme – PFD Solidification, drawing number 23-WTE- PGD -0705-WC12-2001-R00;
- Schematic diagram of the WWTP;
- Block diagram of process wastewater; Situation of hydrotechnical installations - sewage, drawing number 3-WTE- IDP -0301- C00-0001-R00;
- Layout of hydrotechnical installations – water works, drawing number 3-WTE- PGD -0301-C00-0002-R00;
- Legend E1 - Fire Protection Study, drawing number 23-WTE- PGD -E1-NN-1001-R00;
- Layout E1 - Fire Protection Study, drawing number 23-WTE-IDP-E1-WC01-1001-R00.

51. Graphic attachments for the landfill for non-hazardous waste:
    - Overview situation of phase I-A, drawing number NHWL-IDP-H-01;
    - Overview situation of phase I-B, drawing number NHWL-IDP-H-02;
    - Overview situation of phase II, drawing number NHWL-IDP-H-03.