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Copies of the EIA rapporteur's qualification documents are provided in Text Annex 1.

REPORT

REPORT CONTENT

INTRODUCTION

Vilnius City Waste Water Treatment Plant (Vilnius NV) is the largest waste water treatment plant in Lithuania which operates continuously throughout the year. The design (hydraulic) efficiency of the cleaning plant is 225$^{m^3\ per}$ day. As of 2013, the treatment of waste water in the$^{treatment\ plant\ amounted\ to\ approximately\ 37.85}$ million m³ (source:Www.vv.lt).

Vilnius NV accepts all urban waste water, treats them and discharges them into Nerry. The treated waste water complies with the requirements of the HELCOM Convention for waste water treatment in the European Union. The history of the waste water treatment plant, which entered into operation in 1986, is now almost 50 years: the design of the plant started in 1965 and construction started a decade later in 1975. The treatment plant has two types of waste water treatment plants, mechanical and biological. As necessary and feasible, the Vilnius NV is introducing new technologies that reduce odour release and the dissatisfaction of the inhabitants of the surrounding regions due to their long-term rainfall. In 2002, mechanical treatment of waste water, sludge drainage facilities and efficient technologies for the removal of nitrogen and phosphorus compounds were upgraded to the list of polluters in the Baltic Sea. The project “Sludge treatment facilities in Vilnius waste water treatment plant” was implemented in 2012. The use of these facilities has significantly reduced the amount of sludge produced.

The reconstruction/modernisation of the Vilnius waste water treatment plant is planned to continue to protect the environment from pollution and to maintain the high quality of the treated waste water in view of the ever-increasing load.

In 2014 UAB Arginta carried out a study to prepare pre-project proposals for the reconstruction of Vilnius City Waste Water Treatment Plant [1].The study analysed the links in the process of waste water treatment and the need for their reconstruction. A public procurement procedure was carried out at the beginning of this year to procure works for the design and reconstruction of the waste water treatment plant of Vilnius urban waste water treatment plant and the procurement procedure is currently suspended. A draft technical specification with an indication of the scope of the works is available on the website of the Public Procurement Office [2].

The principles governing the drawing up of the EIA report by the PFA are as follows:

In accordance with the regulatory requirements in force in Lithuania and the European Union, any development likely to have an impact on the environment must be assessed in terms of its potential environmental impact.

Under the Law of the Republic of Lithuania on the environmental impact assessment of planned economic activities (No X-258 2005 06 21) [3] and its subsequent amendments and supplements [4], all planned economic activities are divided into two categories: activities subject to environmental impact assessment (EIA) and activities subject to mandatory environmental screening.

Annex 1 to the Law on environmental impact assessment of planned economic activities:

9.4 p. points out that an environmental impact assessment is unconditionally mandatory for this type of economic activity: ‘Installation of waste water treatment plants for towns, towns or villages (where the plant is capable of treating 50 000 population equivalent or more pollutants)’.

UAB “Vilniaus vandenys” plans to carry out the reconstruction of the Vilnius Waste Water Treatment Plant. In the specific case, the waste water treatment plant has been operating on this site for many years, the reconstruction project does not provide for an increase in the capacity of the waste water treatment plant, and the formally planned economic activity falls within the activities listed in Annex II of the EIA Law:

14. Modification or extension of planned economic activities included in the list of planned economic activities subject to an environmental impact assessment or in the list of planned economic activities subject to environmental impact assessment, including the reconstruction of existing structures, the modernisation or modification of the production process and technological equipment, changes in the production method, the quantity or type of production, the introduction of new technologies and other changes which may have adverse effects on the environment, except in the cases referred to in point 10 of Annex 1.

However, taking into account the efficiency, the complexity of the technology, the scale and location of the environmental impact of the Vilnius urban waste water treatment plant (in addition to the Neries river, which is part of the European NATURA 2000 natural network), as well as the possible public interest in the planned economic activity and taking into account that UAB Vilniaus Vandenys is a socially responsible company with an interest in properly assessing the environmental and public health impact of the planned economic activity, the public concerned will be duly informed of the planned reconstructive construction of the cleaner, in accordance with Article 7 of the EIA Law, to the public concerned, in accordance with Article 7 of the EIA Law.

In order to carry out the reconstruction of Vilnius City Waste Water Treatment Plant,UAB ‘Vilniaus vandenys’ required the drafter of the environmental impact assessment documents (in this case UAB Sweco Lietuva) to carry out an environmental impact assessment of the planned economic activity, i.e. to draw up an environmental impact assessment programme for the reconstruction and operation of the Vilnius Urban Waste Water Treatment Plant planned by UAB Vilniaus vandenys (drafted and agreed with the EIA entities and approved by the competent authority by letter No (15.9)-A4-6968 of 23-06-6968 (Text Annex 2) and approved by the competent authority).Coordinate the prepared documentation with the environmental impact assessment, discuss with the public and submit it for consideration and approval to the Environmental Protection Agency.

The planned EIA report on the reconstruction and operation of the Vilnius Waste Water Treatment Plant was drawn up in accordance with the requirements of the Law on the environmental impact assessment of planned economic activities in Lithuania. The EIA report is based on the ‘Provisions for the preparation of the Environmental Impact Assessment Programme and Report’ [5] as subsequently amended or supplemented [6], on the basis of an EIA programme already drawn up, agreed by the EIA entities and approved by the competent authority and taking into account the specific nature of the activity of the planned site.

A public meeting was organised to present the resulting EIA report to the public. Members of the public or other interested legal or natural persons did not attend the meeting and no reasoned proposals (oral, telephone, fax, post) were received before and after the meeting. It must therefore be concluded that there is no public interest in the proposed economic activity. After the deadline for informing the public, the EIA report has been agreed with the EIA entities and submitted to the Environmental Protection Agency for approval.

Chapter 2 of the EIA Report provides general information on the organisers and preparers of EIA documentation, and Chapter 3 provides general information on the efficiency of the waste water

treatment plant;

requirements for the quality of treated waste water and work to be carried out during reconstruction. The quantities of waste generated and the ways in which it is treated are described in Chapter 3 of the report. Chapter 4 presents the potential impacts of FBOs on the different environmental components and mitigation measures. Chapter 5 deals with transboundary effects, 6 analyses the analysis of alternatives, and Chapter 7 analyses the need and extent of monitoring the environmental impact of economic activities. Chapter 8 presents the analysis and assessment of risks.

When preparing the EIA report on the EIA, the information available to the developer, provided by the developer and freely available by the developer, was analysed, but non-essential data may be revised at the time of the technical design.

The purpose of the environmental impact assessment for PFAs is to:

identify, characterise and assess the potential direct and indirect impacts of PFAs on the environment (human, soil, subsoil, ambient air, water, climate, landscape, biodiversity, material assets and immoveable cultural goods and the interaction between these environmental components);

identify and propose measures to reduce or avoid adverse effects on public health and other components of the environment from planned activities;

to determine whether the planned economic activity and its effects on the environment are permissible at the site chosen.

EXECUTIVE SUMMARY

Vilnius City Waste Water Treatment Plant (Vilnius NV) is the largest waste water treatment plant in Lithuania which operates continuously throughout the year. The design (hydraulic) efficiency of the cleaning plant is 225$^{m^3\ per}$ day.

In 2014 UAB Arginta carried out a study to prepare pre-project proposals for the reconstruction of Vilnius City Waste Water Treatment Plant [1].The study analysed the links in the process of waste water treatment and the need for their reconstruction. A public procurement procedure was carried out at the beginning of this year to procure works for the design and reconstruction of the waste water treatment plant of Vilnius urban waste water treatment plant and the procurement procedure is currently suspended. A draft technical specification is available on the website of the Public Procurement Office, indicating the scope of the works [2]:

FEEDING WASTE WATER TO THE TREATMENT PLANT

O Construction of a new node for the reception of incoming waste water;**O** Reconstructionof the flow-water accounting node;

O Renovation ofintermediate compartments (between incoming waste water reception site and current flow measurement accounting);**O** Reconstruction ofthe emergency valve chamber (including a building);

- PRE-TREATMENT LINK

  O Reconstruction of the pre-grit division chamber;**O** Reconstructionof the detention line and building of the vehicle;**O** Renovationof the pre-treatment stage operator;**O** Deconstruction of Essam sand bunkers and domestic building;**O** Upstream renovation;**O Renovation** of the sandy pumping station;

- PRE-TREATMENT UNIT

  O Reconstruction of theprimary sludge pumping station;**O** Reconstruction works forprimary precipitators;**O** Construction of the collection chain for precipitator beds;

- BIOLOGICAL TREATMENT UNIT

  O Installation ofprimary sludge hydrolysis;**O** **Reconstruction** of the bioreactor;**O Renovation** of the communication channels of the bioreactor;**O** Construction of a new blower;

  O Renovation/reconstruction of the air supply pipeline to bioreactors;**O** **Renovation** of the returnable sludge pump station;**O** Renovation of treated waste watercourses;

- OTHER WORK

  O Renovation of the local sewage pump station;**O** **Decommissioning** of the electro-chlorinator;**O** Rehabilitation of the electrical switchgear SP-118;**And** TP is a 9 transformer reconstruction; O Extension of the**existing** SCADA system;**O Reconstruction** of the lighting system of the area;

- o Environmental management works, the renovation/reconstruction of civil networks and access roads necessary for the operation, renovation/reconstruction of these links and new construction;o Training of contracted personnel;
- o All works related to the design, construction/renovation, supply, installation and start-up/harmonisation of mechanical and electrical equipment.

The reconstruction of Vilnius urban waste water treatment plant will be carried out on the site of Vilnius NV on the site of the Riitnago g. 74 Vilnius, unique land parcel No 4400-0898-8407.

UAB “Vilniaus vandenys” is currently implementing the project “Construction and operation of sludge final disposal facilities”.These activities are subject to an environmental impact assessment procedure. The Environmental Impact Assessment Report on the Reconstruction and Operation of the Vilnius Waste Water Treatment Plant presents the results of the environmental impact assessment on the construction and operation of the Dumblo final disposal plant as the state of play.

The EIA carried out for a PFA provides:

Impacts on waters

A certain amount of water can be used for the reconstruction of the facilities for the domestic use of workers and for the reconstruction of the facilities. UAB “Vilniaus vandenys” has a fully installed water supply system, so water will be used from the existing centralised water supply system for staff and reconstruction needs.

Thereconstruction of the Vilnius Waste Water Treatment Plant will not change the current situation. No new water consumption activities are foreseen either.

Reconstruction work on a PFAsite will generate a certain amount of domestic waste water (e.g. from temporary sanitary facilities) which will be treated in accordance with the requirements of Order No D1-236 of the Minister for the Environment of 17.05.2006 approving the Waste Water Management Regulation (as subsequently amended).The Vilnius waste water treatment plant will operate continuously during the reconstructive works, i.e. reconstruction works will not interfere with the operation of the waste water treatment plant.

The waste water generated by the activities of the Vilnius waste water treatment plant is fed into the existing domestic waste water network, which is fed to the waste water treatment plant and discharged to Neries after treatment.
river.

Since the reconstruction of the waste water treatment plant does not foresee additional waste water generation and will not change the existing efficiency of the waste water treatment plant, it can be argued that the PFA will not have a negative impact on the Neries river.

Effects on ambient air

According to the Environmental Protection Agency’s website, next to the planned economic activity site:

there are no ambient air quality study stations,

- there are no indicative assessments of ambient air quality to be used;
- The Environmental Protection Agency has conducted air pollution simulations in the area in question;
- The Environmental Protection Agency provided data on emissions from contiguous and planned installations.

At present, Vilnius NV (based on the integrated pollution prevention and control permit No VR-4.7-V-02-01 issued by UAB Vilniaus vandenys and the environmental impact assessment report on the construction and operation of Dumblo final disposal facilities) contains 7 sources of ambient air pollution with a total allowable emissions of around 144 t/year.

Once the planned economic activity has been implemented, existing sources of ambient air pollution remain unchanged. The reconstructed grid building provides for the cessation of contaminated air into the air purification plant – biofilters. After cleaning, air is discharged into the environment through the design a.t. 011. Reactions in sludge hydrolysis tanks produce flammable and odour-emitting gases. In order to avoid the spreading of odours into the environment, it is necessary to fully cover the sludge hydrolysis tanks. The containers are equipped with ventilation that will extract the contaminated air and direct it to the air purification plant via biofilters – a.t. 012. At the time of design, 0,3 t of pollutants per year may be released into the ambient air.

Emission dispersion simulations were carried out in the computer software package “ISC-AERMOD View”, the AERMOD mathematical model for simulating emissions from industrial source complexes in the environment.

Mathematical modelling of the facility’s emissions dispersion in ambient air without background emissions resulted in a maximum concentration of 5,8 % of the 1-hour average time interval for sulphur hydrogen and 4,1 % of the limit value for the residential environment for ammonia during 1 hours.

Also for background pollution, a maximum concentration of 1 hours for ammonia of 91 % and a 1 hour sulphur hydrogen concentration of 5.8 % of the limit value for the residential environment were identified.

Effects on soil

According to the classification given in Lithuanian Hygiene Standard HN 60: 2004, the soil prevailing in the area is classified as resistant (smile and suffix) to chemical pollution and is reluctant to accumulate chemical pollutants, especially heavy metals. The soil erosion intensity of the PFA site is between 0 % and 5 %, but the resistance to erosion according to A. Račinsk is low (k = 1.2-1.5).The risk of soil erosion is moderate. The area has a soil productivity score of less than 27, which is ranked as the worst agricultural area.

The physical effects of theplanned reconstruction of the waste water treatment plant include soil excavation, displacement, possible mixing and compression of soil layers during the construction of the sites. During the construction of the cleaning plant and subsequent reconstructions, the natural soil layer was removed from sites. A large part of the area is currently occupied by buildings and structures in waste water treatment facilities, asphalt concrete blocks, concrete blocks, chippings and access roads. The following are likely to affect the soil:

the phases of theplanned activities shall include: during the construction and reconstruction of existing establishments, during normal operation or during emergencies. The main impact on the fertile soil layer during the construction and reconstruction of PFAs will be the construction of new facilities and existing reconstructed facilities at their access points.

Environmental and organisational measures shall be provided for to prevent or reduce soil exposure.

Effects on subsoil

Under the rules on subsoil pollution, most of the PFA parcels, according to their intended use, economic activity and deployment, fall within the (medium sensitive) group of pollution sensitivities, but the part of the plot closer to Neries and included in the river coastguard strip falls within the (very sensitive) category I and is subject to the strictest requirements in terms of pollution. Monitoring of the impact on groundwater is carried out on Vilnius urban waste water treatment site. The eastern part of the waste water treatment plant, between the aerators and the Neries river, has a cross-section of 5 supervised wells and a group of five wells is also installed in the west. Laboratory results from 2014 show that groundwater flow is subject to a groundwater arbitrage process according to the nitrogen (N) compound group. As regards the results of the groundwater performance of Vilnius NV in 2014, it can be noted that, with the exception of nitrates, none of the components analysed exceeded the standards of the Lithuanian legislation on groundwater contamination. The groundwater in the observed wells was low in terms of electrical conductivity, COD and permanganate index, and low – medium – in terms of overall water hardness.

In emergency situations, in cases of significant surface spillage of dangerous substances, there is a likelihood that part of the surfaces not covered by non-conductive coatings or pollutants spilled due to leaks from pipes and tanks that could contaminate the soil and groundwater of the aeration area may enter the ground.

It is planned that the subsoil can only be affected by technogenic factors during construction and operation of the site. There is a potential mechanical effect when the site is deepened into the surface layer of the ground by partial purchasing, pushing and overfilling with new ground. During reconstruction, the impact on the groundwater aquifer would be minimal, i.e. it can only be expressed as temporary hydrodynamic changes without residual effects at the top of the underground hydrosphere. Chemical effects are unlikely except in emergency cases. When operating under normal operating mode, Vilnius waste water treatment plant will not have an impact on the depth of the land. In emergency situations, in cases of significant ground spills of dangerous substances, there is a likelihood that some of the pollutants spilled on surfaces not covered by non-conductive coatings, which could contaminate the soil and groundwater of the aeration area, may enter the subsurface.

Mitigation measures shall be provided at the establishment to avoid or minimise potential effects in emergency situations.

Impact on biodiversity

The Vilnius waste water treatment site does not enter the protected natural areas but borders the Neries river, a Natura 2000 site, an area of importance for the conservation of habitats.

The waste water generated by the activities of theVilnius waste water treatment plant is fed into the existing domestic waste water network, which is sent to the waste water treatment plant and discharged to the Neries river. The current hydraulic efficiency of the reconstructed Vilnius waste water treatment plant – 225000 m³/d·After the reconstruction, will not change the hydraulic efficiency of the Vilnius waste water treatment plant, i.e. the amount of treated waste water discharged will not increase and therefore no negative impact on the Neries river is expected.

There is no botanically valuable vegetation in the FAS area. The PFA site is industrial, free of protected animals and no negative impact on biodiversity is expected, both during site reconstruction and during operations.

Impacts on Landscape

The area ofUAB “Vilniaus vandenys” is heavily urbanised and has no value in terms of landscape. There is already a local industrial landscape in the site environment. Existing buildings and installations are planned to be reconstructed, so that PFAs will not have a negative impact on the landscape.

Impact on the socio-economic environment

The project’s investments amount to EUR 27431939,30 excluding VAT.The economically useful life of the assets created by the project is 27 years.

The financial analysis assessed that the project remains viable throughout the reporting period. In addition, when assessing the risks, it must be concluded that the likelihood of a project being socially disadvantageous is minimal from an economic point of view and that the risk is therefore acceptable.

The results of the socio-economic analysis suggest that the socio-economic benefits outweigh the expected costs. The need for the project is based even on the application of pessimistic cost-benefit estimates. In this context, it can be said that the real social dimension of the project

- the economic benefits are even greater.

The impact of PFAs on the labour market in the area will have a marginal positive impact during the reconstruction period of the UWWTP.

- creating temporary jobs in the construction sector.

The PFA will not have an impact on the demography, tourism and recreation of the area, and the value of the real estate will not be affected, as the planned economic activity is foreseen in the area of existing urban waste water treatment plants in Vilnius.

It must be assumed that PFAs will not give rise to negative public reactions. Cost-effective and eco-efficient technologies will reduce the cost of environmental measures and the cost of services. The objectives of the project will enable the achievement of universal well-being for current and future generations.

Impact on cultural heritage sites

Cultural heritage sites, archaeological and historical monuments are excluded from the boundaries of the planned economic activity, so that the reconstruction of the waste water treatment plant will not adversely affect them.

Impact on public health

The area of environmental pollution, odour and noise of the planned economic activity (reconstruction and operation of the Vilnius urban waste water treatment plant) and the economic activity carried out is assessed on the basis of environmental pollution, odours and noise.

The airborne noise emission modelling (planned for reconstruction and operation of Vilnius urban waste water treatment plant) shows that the equivalent sound pressure level during the planned economic activity, where the long-term noise assessment duration is one year outside the site, exceeds the maximum permissible noise limit values for day (Lday), evening (Leven) and night (Lnight) for residential areas (assessing stationary source noise) set out in point 4 of Table 1 of HN33: 2011. Taking into account the fact that the top-norm noise at the most sensitive night time (Lnight) is about 30 m away from the northern border of the plot, it is not appropriate to take noise abatement measures as the area is not covered by forests and dwellings.

The analysis of the dispersion of ambient air pollutants (with and without background) has shown that the ground-level concentrations of pollutants will not exceed the maximum permissible concentration for any harmful substance emitted into the atmosphere.

Following a mathematical modelling of the dispersal of odour emissions in ambient air, the highest concentrations of the 1-hour average time interval of odour in the company's area are set at around 22 ouE/m^{3,} i.e. 275 %, for the residential environment. The threshold for smells (8 ouE/m$^{3)}$is reached about 200 m from the boundaries of the company's parcel.

The establishment of the Sanitnago g. 74 of Vilnius urban waste water treatment plant as a whole (sewage treatment step and sludge treatment farm) was based on the following conclusions of the impact assessment in Vilnius:

the projected maximum ambient air pollution does not exceed the values of residential air pollution, even in the production area itself;

the projected noise level will not exceed the limit values for day, evening and night noise outside the sanitary protection zone.

• Forecast odour concentrations will not exceed the maximum levels for odour outside the sanitary protection zone.

Following the assessment of the information provided, it is proposed to establish the sanitary protection zone on the basis of the delimitation of the supra-norm area (i.e. odour).There are no residential areas and no residential buildings in the area of supra-norm effects.

The modification of the planned economic activity in accordance with the requirements of public health legislation will not have a negative impact on public health.

Transboundary effects

The planned economic activity is not expected to have cross-border effects and therefore potential transboundary effects on the environment are not considered.

Analysis of alternatives

In the EIA, the following options were considered:

- Option 0: The current situation, the planned economic activity would not take place.
- Option A: The planned economic activity is being implemented – Vilnius urban waste water treatment plant is being reconstructed.

For option 0, the impacts on the individual environmental components would correspond to the values set out in the IPPC permit issued to the plant and to the values set out in the Environmental Impact Assessment Report [14] on the final construction and operation of the Dumblo recovery facility g. 74 Vilnius. For option A, the impacts on individual environmental compartments have been analysed in this EIA report and are considered acceptable.

Monitoring

The following parameters will have to be continuously monitored at the sludge final disposal plant on thebasis of the technological process monitoring plan contained in the report on the final environmental impact assessment of the sludge recovery facility [14]: temperature, oxygen concentration and water vapour content exhaust gas pressure.

Monitoring of projected emissions from ambient air pollution sources will have to be carried out 1 times a year.

UAB “Vilniaus vandenys” carries out monitoring of discharges from waste water. The implementation of PFAs will not change the existing levels of waste water monitoring.

In accordance with paragraph 8.2.1 of the Staff Regulations, ‘operators treating waste water in agglomerations with a population equivalent of 2000’ are required to monitor the surface water body to which the waste water is discharged. The implementation of PFAs will not change the existing levels of monitoring of surface water.

TheVilnius urban waste water treatment plant must be subject to groundwater exposure monitoring in accordance with the criteria set out in points 8.3.2.5 and 8.3.2.6 of Chapter II.Monitoring under the approved programme [20] is currently carried out by UAB “Vilniaus hydrogeologie”.An analysis of the geographical situation of the Vilnius waste water treatment plant, the location of potential pollution sites on the site, the hydrogeological situation of the area and the results of the monitoring carried out would suggest that the network of observed boreholes in the eastern part of the site is sub-optimal and does not reflect the flow of groundwater from potential pollution sites, so it would be appropriate to install at least two more wells and to reduce the monitoring coverage in the existing ones.

Monitoring of effects on ambient air quality is optional.

Risk analysis and assessment

The purpose of risk analysis and assessment of potential accident hazards is to identify the sources of danger to man and the environment present in the establishment, to assess the hazards they pose and to assess their potential adverse consequences.

The use of hazardous chemicals (a 50 % solution of sodium hydroxide (caustic soda)) is planned for PFA processes.

According to the 'Regulations for the Prevention, Response and Investigation of Industrial Accidents', the economic activity planned during and after the reconstruction of the Vilnius waste water treatment plant is not dangerous, i.e. no notification of a dangerous object, accident prevention plan or safety report is required by the PFA.

For planned economic activities, the risk of potential accidents has been assessed in accordance with Recommendation R 41-02 for the assessment of the potential accident risk of the planned economic activity. The risk analysis analysed the risk objects, hazardous agents and sensitive objects and assessed the likelihood and consequences of an accident related to these factors for humans, nature and property.

The central part of the site has a slope of approximately 18 m elevation. In the event of adverse circumstances due to severe force, the mass of the slope rock may become detached and sliding down, causing negative consequences for the installations or even the people at the bottom at that time.

The possible highest levels of flooding in the Neries river would be at a height of approximately 83.0 m abs (probability every 10 years) and a catastrophic water level with a probability of 85.00 m abs every 20 m. In this case, there is no risk of flooding of a PFA object, although the surface height reserve of the lowest locations would be minimal (several centimetres).

Summary of conclusions

Following the implementation of the EIA report, the environmental impact reduction and monitoring proposed in the EIA report
measures, natural impact of planned economic activity as measured parameter
and the living and social environment is acceptable and the FBOs can be implemented; and
to be carried out at the planned location.

1 FIRST CHAPTER OF THE REPORT

1.1 Information on the organisers of the planned economic activity

The contact person's: name, function	Ms Irma Danilaitienė Head of Project Management Unit
Company name	JSC "Vilniaus Vandenys"
Address, telephone, fax	Dominikonø g. 11, LT-01517 Vilnius Tel.: (8 5) 266 4330, fax (8 5) 261 0204

1.2 Information on the author of the environmental impact assessment documents for the planned economic activity

The contact person's: name, function	Justinas Musteikis Project Manager
Company name	UAB "Sweco Lietuva"
Address, telephone, fax	V.Gerulaitis g.1,08200 Vilnius Tel.: (8 5) 219 6573, fax (8 5) 261 7507

1.3 Name, purpose and installation deadlines of the establishment

Object name	Reconstruction and operation of Vilnius urban waste water treatment plant
Project Phase	Environmental assessment
Location:	Titnago g. 74 Vilnius
Purpose of the establishment:	Sewerage
Capacity:	Design (hydraulic) efficiency of the cleaning plant: 225 m^{3per} day;
Installation/implementation deadlines:	Reconstruction of thewaste water treatment plant: 2015-2018
Alternative locations:	Not foreseen
Intended operation of the facility time	Unlimited
Planned investments	EUR 27.432 million excluding VAT

1.4 Link between the Environmental Impact Assessment Report and the design phases

Planning and design phases	Stages of the environmental impact assessment
Technical project for the reconstruction of the Vilnius City Waste Water Treatment Plant (Vilnius City Waste Water Treatment Plant) by the Riitnago g. 74 Vilnius technical project	Environmental Impact Assessment Programme and Report for the Reconstruction and Operation of Vilnius Urban Waste Water Treatment Plant, 74 Vilnius

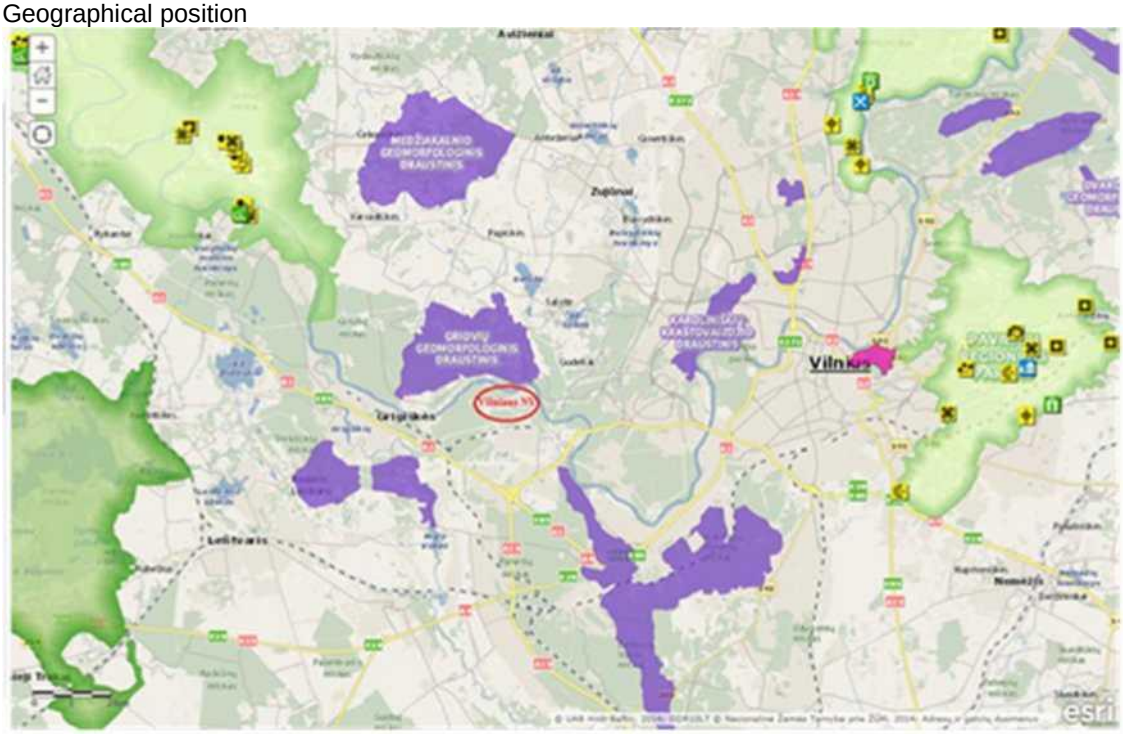
The reconstruction ofVilnius urban waste water treatment plant will be carried out on the site of the N.V. Riitnago g. 74 Vilnius, unique land parcel No 4400-0898-8407, for the use of: other use:

areasof connectivity and engineering network corridors. The extract from the Central Databank of the Land Register is set out in Text Annex 3.

1.5 Description of theplanned location of the economic activity

1.1 figure – location of business activity

Geographical position



Vilnius NV is located in the western part of the city of Vilnius, on the left bank of the Neries river, in the Paneriai seniūnia (address: Titnago g. 74), approximately 12 km from the city centre. The planned place of business is approximately 1.50 km north of the Gariūnai market, 2.3 km west of the Lazzyn micro-district.

The closest facilities, Vilnius CHP plant (VE-3), are 0.4 km south and the nearest residential house 0.230 km north. Other dwellings and single dwellings, situated between 0.315 km and 0.915 km from the PFA site (Graphic supplement 1).

Hydrographic conditions of the area

The area of theplanned economic activity according to the physical geographical area is situated in a transitional zone from the Lowemena-Neries mid-river plain to the Dainava plain in a terraced river valley with a inclinationof 23° towards the Baltic Sea. According to the aesthetic resources of the landscape, the area is classified as an urbanised wooded valley and cropland type with a score of 9. The area of the district is heavily urbanised. The land is used in agriculture, forestry and recreation [7].

The PFA site falls within the main water catchment areas of Nemunas and small Neries tributaries. The area has a river network density of more than 0.5-0.59 km/km and[1]a lake capacity of around 4 % of the

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total area.

Meteorological conditions of the area

2.1 Existing technological processes for waste water treatment and sludge treatment

Meteorological data on the area ofVilnius NV and its surroundings at district level are provided in Table 1.4 of STR 156-94 ‘constructive climateology’.

Table1.4Meteorological data of the area

Distribution of the average wind direction of the year in %

Đ	NW	R	KR	P	IAS	V	SW	Schyli
6	4	7	17	30	14	12	8	7

Average monthly and annual wind speed, m/s

I	II	AG RE	IM	V	MA	VII	VIII	IX	X	XI	XII	Year
4,3	3,9	3,8	3,4	3,2	3,0	2,8	2,7	3,3	3,8	4,2	4,3	3,6

Average monthly and annual air temperature ^{oC}

I	II	AG RE	IM	V	MA	VII	VIII	IX	X	XI	XII	Year
—5,5	—4,5	—0,1	6,4	13,3	16,7	18,0	17,0	12,3	7,2	1,9	— 2,2	6,7

Multi-annual average temperature for the warmest month (July) of the year, ^{oC}

17,2

Multi-annual average temperature for the coldest month (January) of the year, ^{oC}

—7,9

Average annual precipitation mm 664

it is pushed into a precipitator adhesive to be pumped by pipelines into sludge treatment plants.

Biological treatment unit. The biological waste water treatment chain consists of an aerotank consisting of 6 parallel sections (4 of which are suitable for biological removal of nitrogen and phosphorus), five secondary precipitators and reflux sludge pumps. In this chain, organic pollutants and nitrogen and phosphorus compounds are removed from waste water solely by biological means without the use of chemicals. During the summer period, a chemical method of phosphorus removal is also used. The waste water flows successively through all the tanks listed below after the mechanical treatment. After the aerotank, waste water is discharged into secondary precipitators in which the active biological sludge is deposited and the clear waste water is discharged into the discharger. All deposition of the activated sludge is delivered to the activated sludge pump, then most of the activated sludge is returned to the beginning of the aerotank sections, and the excess activated sludge is fed into the sludge treatment plant by centrifugal pumps.

2.1.2 Sludge treatment plants in Vilnius NV

Purpose of the establishment: Treatment of sludge produced and delivered by Vilnius NV.The design capacity of the sludge treatment plant is 62,1 t/FSM (Vilniaus NV 56,1 t/FUD arriving at 6 t/FU).The sludge drying plant leaves 42,3 m^3/day^{dried}sludge with a moisture content of 10 % instead of 160-200 t/day prior to the project.

The primary and surplus sludge collected by theVilnius NV is pumped into a sludge treatment plant where the super-coloured primary and the supernatant sludge is mixed in the sludge tank, further drained/watered with mechanical multiplexers (centrifuges) and thermal hydrolysis facilities foreseen for the treatment of the sludge after draining. After thermal hydrolysis, the sludge is diverted to digesters (methanetanks), the sludge digestion process is carried out in three digesters and the further processed sludge is directed to the final drainage and drying facilities. Dried sludge pellets can be burned, used in agriculture, rehabilitating areas, etc. Sludge pellets produced by Vilnius sewage sludge treatment plants are dry and odourless.

2.1.3 Related projects

UAB “Vilniaus vandenys” is currently implementing the project “Construction and operation of sludge final disposal facilities”.These activities are subject to an environmental impact assessment procedure. The Environmental Impact Assessment Report on the Reconstruction and Operation of the Vilnius Waste Water Treatment Plant presents the results of the environmental impact assessment on the construction and operation of the Dumblo final disposal plant as the state of play.

Recovery technology

The heat treatment of the stored and supplied dried sludge is carried out in a boiling layer-type boiler. The sand in the boiling bed bath recirculates using a compressed air system.

Natural gas is used at the start (inflammation) and end (break) of the heat treatment process and in the event of disturbances in the combustion process, which are not used in normal combustion

economic shocks. The temperature of >850 °C for dioxin combustion needs to be maintained at more than 2 s, so the combustion chamber is an insulated wall of heat-resistant bricks.

The ash stored in thecombustion chamber is removed with the sand in the bath. The ash retained in the air filter is removed by changing the filter and stored in the intermediate storage silo. They are then transported to waste sites.

Design data for Mono-combustion units

The basic design data for mono-combustion plants are given in the table below.

Table2.1Design data for Mono-combustion units

Name	Size	
Incineration lines	1	
Type of boiler	Forced hot water circulation cycle	
Calorific value of fuels	3,8 MWth	
Use of heat	3,0 MWth	
Efficiency	79 %	
Opening hours	8000 h/year	
Quantity of sludge supplied	1680 kgSM/h	1750 kg/h
Dry matter/SM status	40-50 % (mixing 90 % SM dried sludge with 30 % dried sludge)	
Calorific value	10,5 MJ/kg DS	
Additional amount of sludge required	0 kg/h DS	0 kg/h
Maximum amount of sludge combustion	1700 kgSM/h	
Emission	10500 Nm3/h^{O2}6 %	
Waste		
Ash	8000 t/year	
Vapour condensate emissions	None	
Energy		
Temperature of boiler exhaust gas	180 °C TO 220 °C	
Self-consumption	100 kW	
Hot water boiler cycle	<15 bar	
Feed/back flow in the steam boiler	101 °C	190 °C
Feed water flow rate, Cambi THP	3 t/h = 0,83 kg/s	
Feed water flow rate in the steam boiler	5 t/h = 1,38 kg/s	
Energy demand for thermal hydrolysis	< 2.700 kW	
Hot water cycle for sludge drying	<10 bar	
Input/reversible flow at the heat exchanger	70 °C	○ ○ ○ °○
Hot water flow rate in the sludge drying cycle	210 t/h	58,33 kg/s

2.2 Brief description of the company's technological process

2.2.1 Efficiency of the waste water treatment plant

The current hydraulic efficiency of theVilnius waste water treatment plant being reconstructed – 225000 m³/d·After the reconstruction, the hydraulic efficiency of the Vilnius waste water treatment plant will not change. The design parameters of the waste water treatment plant are set out in the table below.

Table2.2Hydraulic efficiency of Vilnius waste water treatment plant

Row No	Parameters	Meas: units	Quantity
1	2	3	4
1	Design minimum hourly flow rate	M3/h	2780
2	Design average hourly flow rate	M3/h	5380
3	Design maximum hourly flow rate (dry day)	M3/h	7900
4	Design maximum hourly flow rate (in raining period)	M3/h	17000
5	Design average daily flow rate	M3/d	129100
6	Design maximum daily flow rate	M3/d	225000

The design contamination of the waste water treated at Vilnius urban waste water treatment plant is set out in the table below.

Table2.3Design values for pollution of waste water entering the waste water treatment plant

Row No	Parameters	Mat. units	Quantity before primary treatment
1	2	3	4
1.	***Biochemical oxygen demand in 5 days (BODs)***		
1a	Daily average	KgO2/d	43894
1b.	Concentration at daily average flow rate	$Mg_{O2/l}$	340
2.	***Biochemical oxygen demand in 7 days (BOD7)***		
2a	Daily average	KgO2/d	50478
2b.	Concentration at daily average flow rate	$Mg_{O2/l}$	391
3.	***Chemical oxygen demand (COD)***		
3a	Daily average	KgO2/d	108960
3b.	Concentration at daily average flow rate	$Mg_{O2/l}$	844
4.	***Suspended substances (SM)***		
4a.	Daily average	kg/d	67261
4b.	Concentration at daily average flow rate	mg/l	521
5.	***Total nitrogen (Ntotal)***		
5a.	Daily average	kg/d	14588
5b.	Concentration at daily average flow rate	MRR/l	113
6.	***Total phosphorus (Ptotal)***		
6a.	Daily average	kg/d	1937
6b.	Concentration at daily average flow rate	MGP/l	15
6.	Minimum waste water temperature	°C	10
7.	Maximum waste water temperature	°C	20

2.2.2 Requirements for the quality of treated waste water

The quality requirements for treatedwaste water have been established in accordance with the Waste Water Management Regulation, taking into account the impact of the planned discharges on the receiver and the requirements for treated waste water. Treated waste water will be discharged into Nerry. The quality requirements for treated waste water are set out in the table below.

Table2.4Pollution standards for the discharge of treated waste water

Row No	Parameters	Measurement units	Meaning
1	2	3	4
1.	***Maximum daily mean MRL for the sample according to***	MgO2/l	13
2.	***Maximum daily mean BOD7 MRL for the sample***	MgO2/l	15
3.	***Average annual MRL for total nitrogen***	MRR/l	10
4.	***Average annual MRL for total phosphorus***	MGP/l	1

Note: 'MRL' means the maximum level.

2.2.3 Work to be carried out during reconstruction

In order to continue to protect the environment from pollution, to maintain a high quality of treated waste water, taking into account continuously renewable technologies, the rehabilitation (modernisation) of the treatment of waste water at Vilnius urban waste water treatment plant and the construction of the "design-construction" procedure in accordance with Lithuanian legislation are necessary in order to solve the problems of unpleasant odours to the maximum extent. In 2014 UAB Arginta carried out a study to prepare pre-project proposals for the reconstruction of Vilnius City Waste Water Treatment Plant [1].The study analysed the links in the process of waste water treatment and the need for their reconstruction. A public procurement procedure was carried out at the beginning of this year to procure works for the design and reconstruction of the waste water treatment plant of Vilnius urban waste water treatment plant and the procurement procedure is currently suspended. A draft technical specification is available on the website of the Public Procurement Office, indicating the scope of the works [2]:

1. FEEDING WASTE WATER TO THE TREATMENT PLANT
1.1. Construction of a new node for the reception of incoming waste water;
1.2. Reconstruction of the waste water metering node;
1.3. Renovation of intermediate compartments (between incoming waste water reception site and current flow measurement accounting);
1.4. Reconstruction of emergency valve chamber (including building);
2. PRE-TREATMENT LINK
2.1. Reconstruction of the distribution chamber in front of the grid;
2.2. Reconstruction of the detention line and building of the vehicle;
2.3. Up-to-date operator renovation of the pre-treatment;
2.4. Dismantling of existing sand bunkers and domestic building;
2.5. Renovation of the grass-roots;
2.6. Renovation of the sand pump;
3. PRE-TREATMENT UNIT
3.1. Reconstruction of the pre-sludge pumping station;
3.2. Reconstruction work for primary precipitators;

3.3. Construction of the collection chain of precipitation flushs;

4. BIOLOGICAL TREATMENT UNIT
4.1. Installation of hydrolysis of primary sludge;
4.2. Reconstruction of the bioreactor;
4.3. Renovation of the communication channels of the Bioreactor;
4.4. Construction of a new blower;
4.5. Renovation/reconstruction of the air supply pipeline to bioreactors;
4.6. Renovation of the returned sludge pump;
4.7. Renovation of treated waste watercourses;
5. OTHER WORK
5.1. Renovation of the local waste water pump;
5.2. Dismantling of an existing chlorinator;
5.3. Reconstruction of the electrical switchgear SP-118;
5.4. TP = 9 transformer reconstruction;
5.5. Extension of the existing SCADA system;
5.6. Reconstruction of the lighting system of the area;
5.7. Environmental works, renovation/reconstruction and new construction of civil networks and access routes necessary for the operation, renovation/reconstruction of these links;
5.8. Training of the client's staff;
5.9. All works related to the design, construction/renovation, supply, installation and start-up/reconciliation of mechanical and electrical equipment.
The establishments being reconstructed are indicated in the layout diagram of the establishments (Graphical Annex 2).

2.2.4 Requirements for the execution of reconstruction and construction works

The section was drawn up on the basis of the procurement documents for the design and reconstruction of the waste water treatment plant of the Vilnius urban waste water treatment plant [2].

Feeding waste water to the treatment plant

Construction of a new incoming waste water reception unit

It is necessary to design and install a new site for the discharge of incoming sewage and septic sludge from slurries with three filling points. After arrival, waste water or septic sludge will have to flow from this stream to the existing sewer. The incoming waste water reception unit may be located in the green zone at the lower entrance gate, or at another location, but when designing a septic sludge intake where slurry trucks travel above the collector, provide for reinforcement of collector ceilings. The construction of a new incoming waste water reception unit must ensure that the construction work carried out does not interfere with the transport of sewage and septic sludge and the proper operation of existing waste water treatment plants.

Reconstruction of the waste water metering node

There is a need to design and install new records for the measurement of incoming waste water. The accounting will have to be installed in a different location from the current one in order to ensure that the necessary lengths are straight before and after the accounting. A straight space is needed to avoid damping due to the effects of the work of the technological part of the bars. Venturi sticks shall be fitted in accordance with the manufacturer's recommendations.

Note that the installation of lock-offs and flow-measuring devices requires the installation of temporary barriers to prevent the flow of water or temporary shut-down lines for the flow of waste water. During the construction works, it is necessary to ensure the continuous flow of waste water through the existing sewer and to ensure that the waste water from the existing sewer does not spill into the environment.

Intermediate compartments (between the incoming catchment area and the current flow measurement)

renovation

It is necessary to carry out the reconstruction of the cameras in accordance with the general

requirements of the work. Reconstructionofemergency valve chamber (including building)
It is necessary to replace existing valves and to reconstruct the ground and underground part of the building or to reconstruct only the underground part of the old building and to demolish the above-ground part and construct a new, light-structure building on its site. It is also necessary to replace the old valves and closures in the building.

Note that the installation of shutters and valves requires the installation of temporary barriers to prevent the flow of water or to install temporary shearing lines to close the waste water flow. During the construction works, it is necessary to ensure the continuous flow of waste water in the existing fluid chamber and to ensure that waste water from the operating chamber is not released into the environment.

Pre-treatment link

Distribution chamber in front of the grill

It is necessary to reconstruct the chambers in accordance with the general requirements of the work. The chamber will have to be equipped with a partition with a power-operated new barrier so that the chamber can be divided into two separate parts.

Reconstruction of the lock-up and building of the vehicle

It is necessary to rebuild the building in the detention chain in accordance with the technological and general requirements of the works and to install new equipment for the treatment of the vehicle.

Note that the repair of trunks requires the installation of temporary barriers to prevent the flow of water, or the establishment of temporary shearing lines for the flow of waste water. Rainfall leads to a significant increase in the volume of waste water flowing, which requires 6 (six) grating channels (4 work stations and 2 back-up) with large and small grilles, skimming equipment and skimming system. During the construction works, it is necessary to ensure continuous flow of waste water through ducts and to ensure that the effluent from the operating channels does not end up in the environment.

Upstream operator renovation

It is necessary to reconstruct the Operator and Transformation Building in accordance with the technological and general requirements of the works. The operator’s premises are too large and need to be restructured and reduced as part of the renovation and conversion of walls and floors.

Dismantling of existing sand bunkers and domestic building

The existing sand bunkers and household buildings need to be dismantled. The amount of structures to be dismantled and dismantled shall be determined as part of the technical design for the reconstruction of waste water facilities. Dismantled demolition waste must be sent to its reception points (specialised landfills or recycling plants).The phases, deadlines and times of dismantling and dismantling must be agreed with the client and the maintenance engineer.

Dismantling and dismantling operations must:

- The requirements for safe working standards are complied with in accordance with the regulatory document DT 5-00 in force in Lithuania.

- Construction waste shall be discharged downwards by means of closed ducts, pipes, crates, containers or similar non-hazardous methods. The place where litter is discharged shall be fenced.

When dismantling and disassembly existing structures and elements, the Contractor must simultaneously dismantle all their attachment, sealing and finishing elements and remove any surface/destruction materials that are not suitable for the new design.

Step-by-step renovation

For the reconstruction of all eight sandy cells, the first step is to prepare them for repair. The containers will have to be emptied successively. Once the tanks have been empty, concrete structures must be inspected in detail and the degree of degradation of the surfaces determined, as this will determine the extent of reconstruction. The sand on the bottom and the degraded structure are then removed. Reconstruction of sandeel is required to be carried out in accordance with the requirements of the technological joint work.

The safe operation of the six sections must be ensured during the works. During the construction works, it is necessary to ensure the continuous flow of waste water through the sandberry and canals and to ensure that waste water from existing sandbreaks and canals does not spill into the environment. Note that the repair of the channels requires the installation of temporary barriers to prevent the flow of water or temporary shut-down lines for the flow of waste water.

Reconstruction of the sand pump

The external walls and roof of the existing building will have to be insulated. Inside the building, walls, floors and ceilings must be renovated and pump and staircase finishes carried out. All corrosive metallic structures will have to be replaced during reconstruction. It is also necessary to replace existing sand pumps.

In the course of the works, it is necessary to ensure the safe operation of sandbreakers. Note that the sand pumping works must ensure the continuous flow of waste water through the sandy-grain, so that due to the halted removal of sand from the sandy process, sand particles do not enter the downstream waste water treatment.

Pre-treatment unit

Reconstruction of the pre-sludge pumping station

There is a need to rebuild or demolish the existing pumping station and build a new one.

The dismantling and dismantling of existing structures and elements must be combined with the dismantling of all their attachment, sealing and finishing elements, and the removal of all surface/destructive materials which are not suitable for the new design. It is necessary to design and build a new light-structure building of the size necessary for the operation of the reconstructed pumping station. During the works, proper disposal of the precipitate from the precipitators and delivery to the sludge treatment facilities must be ensured.

Primary precipitator reconstruction work

The third primary precipitator needs to be fully refurbished and the remaining two to be renovated. All works shall be carried out taking into account the technological and general requirements of the primary precipitators.

Construction of the collection chain of precipitation flushs

The dismantling of existing wells and the installation of new beach collection wells and their existing beach collection system are required.

Biological treatment unit

Installation of hydrolysis of primary sludge

Hydrolysis of primary sewage sludge must be installed in such a way that the waste water treatment process is not disturbed during the works. After reconstruction, all equipment necessary for hydrolysis of sludge must be fully operational.

Reconstruction of the bioreactor

All six bioreactors need to be reconstructed. The stability of the boundaries between the sections of the bioreactor has to be resolved by ensuring the safe operation of the adjacent bioreactor section in the event of full emptying and repair. Bioreactors 1 and 2 will have to be converted (upgraded) in a way similar to the modernisation of the currently existing 3-6 bioreactors to enable the biodepletion of nitrogen and phosphorus in all six. The works will have to ensure the operation of the four sections. Exceptionally, during the dry period of the year, only three bioreactors may be operated in agreement with the management of the waste water treatment plant, for a maximum period of two weeks and no more than once a year. All reactor reconstruction work will have to be carried out in such a way that discharges are not discharged into the environment and the waste water treatment process is not disrupted.

Prior to carrying out work on a specific section, it is necessary to carry out studies on the condition of the structures and to prepare the design of the work, assessing the risk of discrepancies in the condition of the structures in the accompanying material and in the natural state.

Renovation of the communication channels of the Bioreactor

It is necessary to reconstruct the communication channel of bioreactors in line with the requirements of the joint work.

Construction of a new blower

There is a need to build a new orifice building close to the existing returnable sludge pump. The new oraconium building will have to be installed in accordance with the technological and general requirements set out in the procurement documents and will have to comply with the standards in force in Lithuania.

Air supply i bioreactor renovation/reconstruction of pipeline

Note that during the construction of the new compressed air pipeline, the required amount of air must be supplied to the four sections of the bioreactor. The supply of air to existing bioreactors may be interrupted for a maximum period of three hours. At the time of submission of the proposal, a timetable for the reconstruction of the air pipelines must be submitted. In the construction of the pipeline, it is necessary to ensure that the biological process of waste water treatment is not compromised and therefore the exact time for the works to be carried out needs to be agreed with the client.

Renovation of the returned sludge pump

All enclosures and landings on the exterior of the building need to be replaced and returned sludge pumps need to be reconstructed. All works must be carried out in accordance with the requirements laid down in the procurement documents and in accordance with the rules in force in Lithuania.

Renovation of treated waste water channel

There is a need to replace existing enclosures (turns) in collecting ducts.

Other Work

Renovation of the local waste water pump

It is necessary to reconstruct the existing local waste water pump building in accordance with the requirements set out in the procurement documents and with the standards in force in Lithuania.

Dismantling of an existing chlorinator

It is necessary to demolish the existing chlorine building in accordance with the requirements set out in the procurement documents and with the regulations in force in Lithuania.

Reconstruction of the electrical switchgear SP-118

The existing SP-118 building needs to be repaired as part of the renovation of internal walls, ceilings and floors.

2.2.5 Requirements for a technological process for the**supply of waste water to a** treatment plant

construction of a new reception unit for incomingwaste water

A new site for the discharge of incoming waste water and septic sludge from ascensation machinery must be set up inVilnius waste water treatment plant. The site shall be equipped with three reception points for incoming waste water with a plaque plaque. The receiving unit of incoming waste water shall be equipped with an automatic sampler, pH measurement to determine whether the quality of the delivered waste water exceeds the permitted limits. Provision must also be made for the scanning and transmission of the data to the dispatching facility. After arrival, waste water or septic sludge must be released from this stream into the existing waste water sewer. The incoming waste water reception unit must be so arranged that the flow of incoming waste water does not interfere with the flow of waste water coming from the city.

The loading of incoming waste water and septic sludge must be hermetically sealed to prevent the release of pollutants into the environment. The conduit for sewage and septic sludge will be equipped with hydraulic barriers to prevent odours or contaminants from entering the interior and the external environment of the reception unit building. The reception node building will be ventilated naturally through the abrasor, providing the necessary temperature and humidity conditions in the building. A typical waste water reception unit is shown in Figure 2.1.

Surface waste water from newly constructed incoming waste water and septic sludge sites must be discharged to the waste water collectors to be treated through hydraulic barriers in order to prevent unpleasant odours from spreading to the environment.

Figure 2.1Reception node for incoming waste water

There is one waste water reception point in the existing reception facility for incoming waste water. As already mentioned above, the reconstructed site must be equipped with three reception points for incoming waste water with a plaque plaque, i.e. the reception possibilities for incoming waste water are 3 times higher.

The capacity of the receiving system for incoming waste water will be sufficient to accommodate forward-looking amounts of waste water.

On-going reconstruction of the waste water metering node

It is necessary to design and install a new metering of incoming waste water by transferring it to another location. The accounting tools shall be installed on both incoming waste water lines. The location of the accounts must be chosen in such a way that:

- flowmeters are able to accurately measure the flow rate of waste water;
- straight sections of the required length before and after the node are available;
- the ladder resulting from the work of the grids would not interfere with the correct functioning of the flow-water metering node;

For newly constructed commercial waste water flow accounting, metrology-validated measuring instruments must be used and checked. Measuring instruments must measure the flow of waste water with sufficient accuracy at the minimum and maximum flow rate of waste water. The indication of the commercial flowmeter in the “online” mode shall be transmitted to the SCADA system of the sewage treatment plant.

New obscures will have to be provided before the waste water metering nodes flow from both sewers. The closures shall be made of stainless steel AISI 316 or equivalent. The mechanism for lifting/releasing the drinkper shall be mechanical and the shaft shall be so constructed that one person can lift or lower the latency within 10 to 15 minutes, in accordance with the requirements of safety at work. The operating mechanism and lubricating nodes shall be installed in such a way that they can still be operated successfully for at least a couple of years without donning.

Intermediate compartments (between incoming waste water reception site and current flow measurement)
renovation

The waste water flowing from sewers to a sewer feeds into the distribution chamber and flows into two canals towards the wooden. The distribution chamber will have to be renovated in such a way as to avoid accumulation of sand or other suspended particles in corners during run-off.

Reconstruction of emergency valve chamber (including building)

During the reconstruction of theemergency valve chamber, the two existing valves shall be replaced with mechanical controls. The third valve has recently been replaced and will only need to be repaired. There is also a need to replace the four panel closures. A mechanical mechanism for opening/closing docks and valves shall be so constructed that one person can fully open or close the valve/gate within a maximum period of 10 minutes, in accordance with safety requirements at work. The operating mechanism and lubricating nodes shall be installed in such a way that they can still be operated successfully for at least a couple of years without donning.

Pre-treatment link

Distribution chamber in front of the grill

The chambers must be reconstructed in such a way that no carrier and other large particles in the effluents are sown in the corners. It is necessary to ensure that the waste water is properly distributed into the retention chain after reconstruction. All open compartments and channel spaces (spaces in which sewage is in direct contact with ambient air) between the distribution chamber and the grid building shall be covered by readily removable stainless steel or glass fibre structures. The centre of the distribution chamber shall be equipped with a partition with a new, mechanically operated barrier which divides the chamber into two parts.

Reconstruction of the lock-up and building of the vehicle

6lanes will have to be reconstructed in the grid building. Each channel shall be equipped with one large and one small grating. Hydraulic efficiency of single bars 4500 m³/h·The grid design shall be durable and ensure reliable operation at the increased amount of sand and gravel in waste water. The four grating troughs will function as working troughs, but the extremely high flow of run-off during rainfall requires that all 6 channels can be operated. The number of grids operated shall be linked to the flow of waste water. In the event that the grids are repaired, provision shall be made for closing the channel in such a way that the system cannot automatically open the channel until the lanes are repaired. All bars must be installed in such a way that they can be easily removed, if necessary, by means of the shores in the grid. Tactile obscuring devices shall be placed in front of each large grid and beyond each small grid in such a way that, in the event of disconnection of the section of the channel without use, there is no long, blindly finishing run-off section in which the sediment is sinked as a result of a stopover.

Currently, the flow of waste water entering the grid is distributed using ducted stainless steel closures installed in front of the grids. The dredgers are in a sufficiently good condition and, as a result of the reconstructive reconstruction, existing barriers can be exploited to regulate wastewater into the grids. However, it is necessary to install new electric drives near the old docks and to activate them in the SCADA system in order to allow the buckles to be opened/closed on the site and from the purification plant dispatcher. All transmissions shall be capable of being opened/closed mechanically. It needs to be self-assessed that after reconstruction there will have to be an adequate hydraulic permeability of the channel as well as a sufficient flow rate of waste water in the duct to prevent sands and other particles from spreading to the bottom. Steep angles and steep turns must be rounded to avoid accumulation of sediment and heavier carriers in the corners. All troughs shall be covered with local shut-off.

It is necessary to set up a carrier management system in such a way that the carrier from small and large bars is handled in separate installations. Similarly, the vehicle for washing and draining the vehicle must be grouped so that no more than three grills are served per unit. The seized vehicles must be removed by transporter and then washed and drained. The removal process shall be automated and synchronised with bars. The carrier transport system will have to be installed in such a way that the carrier transporters do not lock in or encounter difficulties in their operation. Provision will also have to be made for duplication of transporters. For the transport of small carriers, two transporters shall be provided with the possibility of removing the carriers of each small grenade and between the transporter lines. The transport of large carriers must also be resolved by analogy.

question: Two transporters shall be provided for the transport of large carriers, with the possibility of removing the carriers of each large grenade and between the transporter lines.

Washed carrier containers shall be metal containers with a capacity of between 10 and 12 m^3 and adapted^{to} the outlet vehicles of the containers on the Customer. The building will have to be equipped with at least 2 carrier containers of this type. Washed carrier containers shall be easily accessible so that they can be easily loaded onto a dedicated vehicle. There is also a need to redesign the existing sandwashing system. Four new sand washing facilities must be provided after reconstruction, for sand washing. Sandwashing facilities need to be installed in a separate sandwashing area, in an expanded wooden building, with a convenient access of motor vehicles to sand containers. Sand containers shall be metal containers with a capacity of approximately 10 m to 12$^{m^3}$ and adapted to the outlet vehicles of the containers on the Customer. The building will have to have a minimum of 2 sand containers of this type. The entire carrier and sand management system shall be fully automated and all sand and carrier containers shall be located in a single, partitioned expanded grid room. Containers must be arranged in such a way that the vehicle can lift the full containers without dispersing the sand or carriers contained therein. Access to carriers and sand containers shall be provided from two opposite sides of the building.

The grid building will have to be expanded to accommodate all necessary equipment for the treatment of holes, carriers and seized sands.

All troughs, grates, transporters, vehicle and sand washing/drainers in the building or other areas in which unwashed carriers are in direct contact with ambient air shall be sealed and local shut off into biofilters shall be provided. The closure of the ducts must take place before and after the bars. All areas from which contaminated air is stopped shall be separated from indoor air by creating a pressure differential of at least 25 Pa between the local cut-off area and indoor air, thereby ensuring that air does not penetrate the walls of the contaminated area. A minimum exchange of 12 times/h with the possibility of reducing the number of air exchanges to 6 times/h when the air temperature is below 10 °C shall be provided for the removal of contaminated air from the enclosed areas.

In addition, a wooden building must be equipped with a separate ventilation of the building's premises to ensure the safety of the occupants and an adequate level of air quality. Ventilation in wooden rooms shall be controlled taking into account the oxygen (O_2)and methane (CH_4) concentrationsin the indoor air.

Carrier and sand containers shall be detached from other rooms in such a way that any unpleasant odour from open containers cannot enter other rooms.

In order to ensure coherence, the synchronisation of all equipment, small and large grates, carrier carriers and carrier presses shall be provided by a single supplier. All equipment for the washing of carrier and sand shall be located above the floor level of the wooden building. In order to respect the technological process, all solutions for the handling of carriers and sand need to be agreed with the customer.

Upstream operator renovation

The pre-treatment operating building needs to be reconstructed. The operator building shall be equipped with all the equipment necessary for the control and automation of the pre-treatment chain. All premises must be constructed in accordance with the standards and standards in force in Lithuania.

Dismantling of the existing sand bunker and domestic building

The existing sand bunker and domestic building are currently no longer in use and no longer fulfil any technological function and therefore need to be demolished.

Renovation of the grass-roots

All existing sandbreakers need to be reconstructed. Sandbreakers consist of eight parallel sections. It is necessary to ensure that at least six sections are always in operation during reconstruction in order to achieve the required retention efficiency of sand particles. It is necessary to replace all old sandbreaking equipment (spiral sand carriers, sand-moving pumps, etc.), to replace the existing sandy-grain air pipelines and to ensure that 4 $m^3/(m^2–h)$air flow is fed into sandy grabs. The air flow velocity in the pipelines shall not exceed 20 m/s. The air supply line shall be equipped with a valve to be used for adjusting the output or closing of the line. It must be self-assessed that the air must be fed to the sandbags from newly installed blowers. It is necessary to carry out a self-assessment of all the necessary works and to ensure that the reconstructed sandbream will not lose its efficiency after reconstruction and that the reconstructed sandbream will comply with the standards in force in the Republic of Lithuania. After reconstruction, in accordance with STR 2.02.05: 2004 "Sewage water treatment: Basic provisions', it should be possible to disconnect each sandberry separately. Two sandbreaks shall be replaced by new, AISI 316 or equivalent closures of stainless steel. The remaining six sandbreaks have recently been replaced and can therefore be exploited. All eight closures will have to be equipped with new electrified gears with the ability to open/close the valves at the location and from the dispatcher. The distribution and assembly ducts upstream of the sandy and under the sandy fish will have to be equipped with one stainless steel AISI 316 (or equivalent) detector to separate four sandy grabs.

Reconstruction of the sand pump

During the reconstruction, it is necessary to replace all eight existing de-sanding pumps into new, existing manufacturer and type or fully equivalent pumps. All sand transport pipelines with all the necessary fittings will also have to be replaced. It is necessary to assess the required pump pressure taking into account the hydraulic losses in the pulp renovated sand pipeline in order to successfully remove sand from sand jelly to sandwashing facilities. The design of the sand transport pipeline shall not contain sharp turns and steep angles to prevent the pipeline from locking. The sand pipeline shall provide for visions before turns and long straight sections to allow access to the inside of the pipe if necessary without disassembly of the whole system. All parts of sand transport equipment in direct contact with pulp of sand shall be durable, made of materials resistant to sewage and sand abrasives.

Pre-treatment unit

Reconstruction of the pre-sludge pumping station

During reconstruction, it is necessary to replace the two pre-sludge pumps in the pumping station into new pumps of the existing manufacturer and type or fully equivalent. One pump will be operational and the second one will be a reserve. The existing emptying pump will also have to be replaced.

All existing pipelines in the pumping station, in operation after reconstruction, will have to be converted to new (AISI316 or equivalent) by installing all the necessary fittings. Unused pipelines in the pump room will have to be dismantled.

Primary precipitator reconstruction work

The third precipitator needs to be fully refurbished and the first and second precipitator to be renovated. As a result of heavy rainfall, it will have to be possible to use one primary precipitator as an equalisation tank for the supply of excess waste water during rainfall. The equalisation tank may only be fed through a grid and sandy in order to prevent large carriers and sands entering the precipitator. At the end of the rainfall, provision must be made for the possibility of returning the amount of waste water stored in the equalisation tank before the primary settling stations.

Construction of the collection chain of precipitation flushs

There is a need to reconstruct the collection wells of the precipitator beds. Wells must provide for the collection of beaches into special bags with the possibility of extracting the beds with the aid of an ascensing machine.

Biological treatment unit

Installation of hydrolysis of primary sludge

According to the design data for 2025 years, the composition of the waste water after the primary precipitators is not conducive to the biological removal of phosphorus and nitrogen from the waste water. Primary precipitation leads to a significant reduction in the organic content of the waste water, resulting in too low biodepletion efficiency for nitrogen and phosphorus. Primary precipitators contain approximately 1500 $m^{3sludge}$ per day.

It is necessary to install the equipment necessary for the hydrolysis of primary sludge and to fully integrate the hydrolysis of sludge into the existing sewage treatment plant's technological process. To this end, it is necessary to reconstruct the existing gravitational sludge multiplexes and to adapt them to hydrolysis of primary sludge. The total volume of gravity multiplexes is about 9000 m^{3}·A system for recirculation of the precipitated sludge must be installed so that the primary sludge from the primary precipitators is present in hydrolysis tanks for at least 6 days. This time is needed to convert the soluble part of the COD in the effluent to biodegradable fatty acids at 10 °C.

For the transport ofprimary sludge from precipitators to hydrolysis tanks, it is necessary to provide for separate pumps (at least 1 working and 1 backup) or to describe in detail how the sludge will be delivered and returned without the assistance of pumps. The type and efficiency of pumps shall be similar to those of existing pumps for the supply of primary sludge to sludge treatment plants. The pressure of the pumps must be chosen so that it is sufficient to transport the sludge to hydrolysis tanks. Containers shall be equipped with mixing equipment to ensure that the hydrolysed sludge is continuously mixed and the homogenisation of the mixture is maintained.

During reconstruction, a system for the collection and removal of hydrolysed sludge mix from hydrolysed tanks is needed to allow hydrolysed sludge to be fed before the primary sludge.

precipitators. In addition, provision should be made for the possibility of delivering hydrolysed sludge directly against the bioreactors.

Reactions in sludge hydrolysis tanks produce flammable and odour-emitting gases. In order to avoid the spreading of odours into the environment, it is necessary to fully cover the sludge hydrolysis tanks. Only permanent materials (glass fibre, concrete reinforcement, etc.) may be used for coating. Openings with lids for the handling of mixers shall be possible or provided for. Containers must be provided with ventilation to extract the contaminated air and direct it to the air purification plant. Ventilation shall be sufficient to ensure the safe operation of the installations and to eliminate the risk of explosion of the resulting gases. The contractor will have to install biofilters to clean up polluted air.

Reconstruction of the bioreactor

The biological waste water treatment technology inVilnius waste water treatment plant is unaltered after reconstruction and remains the same as in the existing 3º6 bioreactors: pre-denitrification with additional denitrifier for circulating sludge, selector and anaerobic chamber for the biological removal of phosphorus. The denitrification zone is subdivided into two parts. Each part of the denitrification area is equipped with a longitudinal partition and a mixer to circulate the effluent within the area, thereby increasing the total denitrification capacity.

The first and second bioreactors, which currently do not provide for the biodestruction of nitrogen and phosphorus, must be installed (modernised) in the same way as the 3rd 6 bioreactor, so that the operation of all six reactors can be managed equally.

The mechanical equipment in all reactors will have to be replaced by a new one. It needs to be self-assessed that, once the first and second bioreflectors have been upgraded, they will have to be equipped with new equipment that is exactly the same as in bioreactors 3.

At the endof the nitrification area, each reactor will have to install new nitrified sludge mix pumps that will push the mixture of nitrified sludge and sewage from the end of the nitrification area to the beginning of the denitrification area. At least 6 pumps for a mixture of nitrated sludge (at least 3 in the nitrification part of each section) will have to be installed per bioreactor. The total efficiency of pumps in one section is 2250$^{m^3/h.}$The pumps shall be such that the flow of the nitrified sludge mixture can be controlled between 55 % and 100 % of the maximum pump efficiency of the pump.

A flow-meter shall be provided for each bioreactive unit on the waste water supply line to be treated. According to this flowmeter, when an appropriate recirculation factor is introduced into the SCADA system, the flow of returned activated sludge (from secondary precipitators to circulating sludge denitrifiers) and nitrified sludge (from the end of the nitrification zone to the beginning of the denitrification area) will have to be managed. The flow control of the returned activated sludge requires the installation of 6 new valves (1 on each return sludge line to the bioreflector) with an e-gate control gear. The e-gear control of the valves shall be connected to the cleaning room's SCADA system, with the possibility of on-site and off-site control. The operation of these valves must be linked to the flow of return sludge to each reactor and therefore provision should be made for:

6 sludge flow meters (1 flowmeter on each returned sludge line to the bioreactor).

Bioreactors shall be equipped with the following measurement equipment:

- waste water flow measurement plant at the beginning of the waste water distribution channel: 6 units (minimum 1 flow meter per bioreactor);
- dissolved oxygen meter in nitrification chambers – 24 units (minimum 2 oximetres per bioreactor section);
- opacitometers/solution gauges: 12 units (minimum 1 opacitometer per bioreactor section);

Expected number of mixers in bioreactors:

- 12 units for mixers for circulating sludge dentifiers (1 mixer per bioreactor section);
- mixers for selectors: 24 (2 blenders per bioreactor section);
- 24 for mixers in anaerobic tanks (2 mixers per bioreactor unit);
- mixers in denitrifying containers: 24 (2 stirrers per section)

All six bioreactors, efficient mixing of waste water and activated sludge, will have to be equipped with a total of 84 new mixers. All stirrers shall be installed in accordance with the requirements listed in the procurement documents and shall comply with the specified technical characteristics. In the first and second bioreactors, after upgrading, all other necessary equipment must also be installed in exactly the same way as bioreactors 3.

At the same time, during reconstruction, all gate closures in the lower channel shall be replaced by new AISI 316 (or equivalent) closures of stainless steel.

The above number of measuring equipment, pumps and mixers shall be understood as the minimum requirement of procurement documents for optimisation of the biological waste water treatment process.

Construction of a new blower

A new blower building needs to be designed and constructed with 8 blowers. The question of spare blowers will be left to the customer. All systems related to air distribution shall be designed in such a way that the system can function properly when all eight blowers are operating. The blowers shall be connected to a common network for the distribution of compressed air. All blowers shall be fitted with enclosures and the maximum permissible noise level for the blower shall be 80 dB.The blower must be installed in such a way as to allow free access to all machinery for the personnel operating the sewage treatment plant, the replacement of the airbed filters and the carrying out of repairs if necessary. After each blower, a pressure relief valve, a non-return valve and a repair valve shall be installed on the compressed air line. The blowers shall be connected to a common SCADA system with the ability to operate them locally and from the dispatcher. Blowers shall be installed in such a way that, when the pressure is raised to a critical limit on the pressure line, the blowers automatically shut off by protecting them and pressure air

a pipework against potential damage. During the release of the blower, arrangements shall be made to ensure that the pressure exerted by the exposed orifices does not trap the blower when the blower is released.

Air shall not be taken into the air blower itself, but shall provide for air extraction from the outside. The air suction pipe at the wall of the building shall be equipped with grills to prevent leaves or other large objects from entering the air suction piping. The air suction opening on the external side of the wall must be raised from the ground in such a way as to prevent the suction of sand, dust or other carriers. Each blower shall be fitted with a factory filter on the air suction pipe. Filters must be installed in such a way that they can be easily and safely replaced.

Compressed air piping inside the air blower shall be thermally insulated. The diameter of the piping shall be chosen taking into account the amount of air input so that the flow rate of the pipeline does not exceed 20 m/s at maximum input air flow.

Air supply i bioreactor renovation/reconstruction of pipeline

It is necessary to plan the reconstruction of the air pipeline in such a way that works do not interrupt the supply of process air to existing bioreactors. It is necessary to ensure that, after reconstruction, the flow capacity of the air pipelines is sufficient to supply the required volumes of air to all operational sections of the bioreactor. The works must be organised in such a way that, after any bioreactive unit has been reconstructed, air is fed into the aeration system in that reactor only through a newly installed air pipeline. It is not possible to feed air into a new aeration system through an unreconstructed, old air line.

Currently, the amount of air delivered to each bioreflector is regulated using one electrified valve upstream of the bioreactor. The reconstructing process requires this valve to be re-opened/closed by an electric drive. The nominal size of the valve shall be chosen taking into account the diameter of the pipework designed for the amount of air delivered. The newly installed damper will be used for airline disconnection in case of repair. The control of the new valve shall be connected to the SCADA SCADA system of the cleaner with the ability to operate the valve on-the-spot and from the dispatcher.

During reconstruction, a new system for the distribution and management of air into each bioreactor needs to be installed. The air distribution system shall be so arranged that the amount of air delivered to each branch to which the aerator sections are to be installed can be controlled. For this purpose, at least 2 octimetres and at least 4 branches of the air pipeline from the main distribution pipe for the connection of aerator sections shall be provided in both sections of a single reactor. Each branch must be equipped with electrified valves. The operation of these valves shall be linked to the reading of the nearest oximeter in that section and the full control of the valves shall be connected to a common SCADA system. Depending on the reading of the oximeter, the valves will have to be automatically adjusted to achieve the concentration of dissolved oxygen in individual reactor areas as reported by the operator. A system for collecting and discharging condensate from all possible condensation points shall be provided as part of the aeration system.

Renovation of the returned sludge pump

The return sludge pump room needs to be rebuilt. During reconstruction, all mechanical equipment in the pumping station will have to be replaced: propeller pumps (Archimed screws), pump frequency drives, valves, etc. All operation of pumps shall be fully automated and the control of the pumps shall be activated into the SCADA system with the capability to operate the pumps locally and from the dispatcher.

Work must be organised in such a way that the biological waste water treatment process is not disrupted during the reconstruction of the waste water treatment plant.

Other Work

Local waste water pump renovation

The local sewage pump room will have to be equipped with new shredding bars. Grid efficiency
- 30 m³/h·Before the grating, a new damper shall be installed for the shut-off of the waste water stream. Two new centrifugal sewage pumps are required at the pump, each of which is efficient
- After 60 m³/h, an equivalent pump with a capacity of 60 m³/h will have to be provided for the pumping of^{drainage}water into technical water tanks (geodesic height difference of approximately 12 m)·A new drainage pump with a capacity of 10 m³/h will also have to be installed in the^{pump}attachment.

All fittings will have to be new before and after new pumps. It is also mandatory to replace the entire pressure piping behind the pumps inside the pump.

Reconstruction of treated waste water ducts

The two old closures in the treated waste water channels need to be replaced by new stainless steel AISI 316 (or equivalent) closures. Unused blinders will have to be dismantled.

2.2.6 Comparison of proposed techniques with Best Available Techniques in the European Union and HELCOM recommendations

In a general case, the best available techniques (hereinafter referred to as BAT) shall be understood as the most efficient and advanced stage/production method for the development of economic activities and their methods of operation, which may serve as a basis for setting emission limit values in order to prevent or, where that is not practicable, to generally reduce emissions and their impact on the environment.

Generally, general BAT is the reference point in the environmental impact report for conclusions on the performance of the planned technology and for the assessment of the intended facility. In this respect, general BAT contributes to the establishment of appropriate 'BAT-based' conditions for planned economic activities in accordance with Article 9(8) of Council Directive 96/61/EC.

In accordance with BAT, the planned technological solutions may be chosen in such a way that the activity achieves BAT or even better levels than those provided by the documentation provided.

The capacity of the treatment plant will not be changed during the reconstruction of theVilnius Urban Waste Water Treatment Plant. The rules for granting, amending and revoking integrated pollution prevention and control permits [8] are not applicable to existing and planned economic activities, i.e. a comparison of planned economic activities with BAT is not mandatory.

3 WASTE

3.1 Construction phase of the waste water treatment plant

Duringthe reconstruction of the waste water treatment plant, certain amounts of construction waste will be generated. All waste generated during the construction process will be treated in accordance with the Construction Waste Management Rules [9].

3.2 Operation of the waste water treatment plant

3.2.1 State of play

UAB Vilniaus vandenys 2012-08-21 has been issued (corrected on 2013-06-21) with Integrated Pollution Prevention and Control Permit (IPPC) No VR-4.7-V-02-01 [10].According to the IPPC permit, the maximum quantities of waste generated by UAB “Vilniaus vandenys” are shown in Table 3.1.1.

Table3.1.1: Generation of waste

Waste			**Source of waste generation technological substance**	**Maximum amount of waste generated, t/y**
Code1	**Name**	Hazard2		
1	**2**	**3**	**4**	**6**
19 08 01	Sorting residues	Non-hazardous	Waste water treatment plant	2500
19 08 02	Waste from desanding	Non-hazardous	Waste water treatment plant	7500
19 08 05	Urban domestic sewage sludge (dried sludge pellets)	Non-hazardous	Waste water treatment plant	14000
19 08 05	Urban domestic sewage sludge (dried sludges)	Non-hazardous	Waste water treatment plant	51100
20 01 21	Fluorescent tubes and other mercury-containing waste	4; 5; 6; 7; 10;	Company	0,66
20 03 01	Mixed municipal waste	Non-	Vilnius	1500
12 01 13	Welding waste	Non-	Company	0,1
16 06 01	Lead batteries	4; 5; 8; 14	Company	1,0
12 01 01	Ferrous metal filings and turnings	Non-hazardous	Company	10
12 01 03	Wastes from the grinding and turning of non-ferrous metals	Non-hazardous	Company	3
12 01 04	Non-ferrous metal dust and particles	Non-	Company	0,5
12 01 02	Ferrous metal dust and particles	Non-	Company	0,5
13 02 08	Other engine, gear and lubricating oils	3-A; 3-B; 4;	Company	5,0
13 07 03	Other fuels (including mixtures)	3-A; 3-B; 4;	Company	0,3
13 01 13	Other hydraulic oils	3-A; 3-B; 4;	Company	0,1
15 01 01	Paper and cardboard packaging	Non-	Company	1,0
15 01 06	Mixed packs	Non-	Company	1,0
15 02 02	Absorbents, filter materials, sweepers, protective clothing contaminated with dangerous substances	14;	Company	2,5
16 01 03	Used tyres	Non-	Company	5,00
16 01 07	Oil filters	3-A; 3-B; 4;	Company	0,500

16 01 13	Brake fluids	3-A; 3-B; 4; 14	Company	0,100
16 01 14	Cooling liquids containing dangerous substances	3-A; 3-B; 4; 14	Company	0,300
16 01 12	Brake blocks not specified 16 01 11	Non-hazardous	Company	0,100
16 01 17	Ferrous metals	Non-hazardous	Company	100,0
16 01 18	Nonferrous metals	Non-hazardous	Company	0,100
16 01 21	Used air filters	3-A; 3-B; 4; 14	Company	0,100
16 01 21	Hazardous ingredients	3-A; 3-B; 4; 14	Company	0,700
16 02 14	Components removed from discarded equipment	Non-hazardous	Company	0,100
16 02 16	Components removed from discarded equipment	Non-hazardous	Company	0,100
17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	Non-hazardous	Company	10,0
17 02 01	Wood	Non-hazardous	Company	1,0
17 02 02	Glass	Non-hazardous	Company	0,5
17 05 04	Soil and stones, not specified 17 05 03	Non-hazardous	Company	0,500
17 04 05	Iron and steel	Non-hazardous	Company	20,0
17 06 05	Construction materials containing asbestos	H14	Company	5,0
17 08 02	Gypsum insulation construction materials other than those mentioned in 17 08	Non-hazardous	Company	0,100
17 09 04	Mixed construction and demolition waste	Non-hazardous	Company	150,0
20 01 36	Unused electrical and electronic equipment not specified 20 01 21,20 01 23, 20 01 35	Non-hazardous	Company	0,5
20 01 35	Unused electrical and electronic equipment not specified 20 01 21,20 01 23, containing dangerous constituents	H4; H5; H14	Company	0,800
20 01 33	Batteries and accumulators	H4; H5; H14	Company	0,05
20 01 34	Batteries and accumulators other than those mentioned in 20 01 33	Non-hazardous	Company	0,250
1901 10	Spent activated carbon from flue-gas treatment	*	Company	0,300
08 03 17 08 03 99	Ink cartridges, toners, ribbons for printers	Non-hazardous	Company	0,150
19 12 09	Mineral substances	Non-hazardous	Company	75,0
19 12 02	Ferrous metals	Non-hazardous	Company	0,100
19 12 04	Plastic and rubber	Non-hazardous	Company	0,100
20 01 01	Paper, cardboard,	Non-hazardous	Company	1,0
20 01 02	Glass	Non-hazardous	Company	3,5
20 01 39	Plastics	Non-hazardous	Company	0,500
20 03 06	Waste from sewage cleaning	Non-hazardous	Company	200,0
20 02 01	Biodegradable waste	Non-hazardous	Company	100,0
03 01 05	Sawdust, particles, chips, wood, particle board and plywood	Non-hazardous	Company	0,500
06 03 14	Na2S	Non-hazardous	Waste water treatment plant. Sludge treatment plants	16,4

06 03 14	(NH4)2SO4	Non-hazardous	Waste water treatment plant. Sludge treatment installations	461,5

The waste generated by the plant is transferred to the waste managers.

The waste management activity of the plant is the treatment of sludge from urban domestic sewage treatment in a sludge treatment plant.

Table3.1.2: Waste managed by the plant

Waste			**Use**		
Code [1]	**Name**	**Padaningum** As2	**Efficiency of the installation, t/y**	**Use** Technique3	Estimated consumption4, t/y
1	**2**	**3**	**4**	**5**	**6**
19 08 05	Sludges from treatment of urban waste water	non-hazardous	22666,5 (SM)	R3	22666,5 (SM)

The project “Construction and operation of sludge final disposal facilities” is currently being implemented. The project will:

- 19 08 05 Urban domestic sewage sludge (dried sludge pellets) in the sludge final disposal plant;

  19 08 05 Urban domestic sewage sludge (dried sludge) is managed in a sludge treatment plant and in a sludge final disposal plant;

In the final disposal plants of sludge, during normal operation a sediment filter system (volatile ash) and ash are formed.

The waste generated during the final disposal of the sludge, the quantities and the waste management are shown in Table 3.1.3.

Table3.1.3: Waste, waste management

Technological process	Waste						Storage of waste on site		Expected waste management methods
	name	quantity		physical state (solid, liquid, paste)	Code based on the list of wastes	hazard	storage conditions	maximum quantity	
		T/day	(tpa)						
1	2	3	4	5	6	7	8	9	10
Category final recovery	Urban domestic sewage sludge	SM 40,8	SM 13600	paste	19 08 05	non-hazardous	not to be stored		R1 Use principally as a fuel or other means to generate energy
	Solid waste from gas treatment	4,8	up to 1600	solid	19 01 07	hazardous	bunker (silage)	110 m³	Transfer waste handler
	Ash	19,2	up to 6400	solid	19 01 12	non-hazardous	bunker (silage)	110 m³	

3.2.2 Projected position

The types and quantities of waste generated by the reconstructing of the Vilnius Waste Water Treatment Plant will not change compared to the current situation.

4 THE POTENTIAL IMPACT OF THE PLANNED ECONOMIC ACTIVITY ON THE VARIOUS ENVIRONMENTS

MEASURES TO REDUCE COMPONENTS AND ENVIRONMENTAL IMPACTS

4.1 Water

UAB “Vilniaus vandenys” is issued (2013-06-21 adjusted) with Integrated Pollution Prevention and Control Permit (IPPC) No VR-4.7-V-02-01 on 21.08.2012. According to the IPPC permit, Vilnius Waste Water Treatment Plant treats 40 million m^{3}waste water a year, or on average 110 thousand$^{m^3/day}$.The waste water treatment plant stores 98 % of organic pollutants and generates 53993 tonnes of sludge per year.

4.1.1 Planned use of water

State of play

TheVilnius urban waste water treatment plant uses water for industrial and domestic purposes. The water is supplied from the centralised Vilnius City Water Supply System operated by UAB Vilniaus vandenys.

Projected position

Installation Reconstruction Phase

A certain amount of water can be used for the reconstruction of the facilities for the domestic use of workers and for the reconstruction of the facilities. UAB “Vilniaus vandenys” has a fully installed water supply system, so water will be used from the existing centralised water supply system for staff and reconstruction needs.

Operation of cleaning facilities

Thereconstruction of the Vilnius Waste Water Treatment Plant will not change the current situation. No new water consumption activities are foreseen either.

4.1.2 Planned pollution of waters

State of play

The waste water generated by the activities of the Vilnius waste water treatment plant is fed into the existing domestic waste water network, which is sent to the waste water treatment plant and discharged to the Neries river.

Data on waste water discharger and discharged waste water pollution are given in Tables 4.1.1 and 4.1.2, based on IPPC permit No VR-4.7-V-02-01 issued by UAB “Vilniaus vandenys” on 2012-08-21 (corrected on 2013-06-21).

Table4.1.1: Data on sewage sources and/or dischargers [10]

Coordinates	Host number	Description of planned discharges	Discharger type/technical data	Description of discharge point	Expected maximum discharge of waste water			
					M3/s	M3/h	M3/d	M3/y
x — 6060938.972 y-574855.666	1.	Vilnius City Economic Waste Water – Housewater	Coastline, duct 2000X2000.	Distance to the mouth of the river Neries: 197 km, left bank.	1,395	5023	120548	44000000

Table4.1.2: Pollution of planned waste water [10]

No	Contaminant name	Maximum num pollution	waste water before treatment			Maximum allowable and predicted/desirable actual waste water contamination								Envisages mass for cleaning effect—vum (%)
		MOM. mg/l	medium, mg/l	T/d	(tpa)	MRLS MOM. mg/l	Preferred-LK mom, mg/l	Medium MRL mg/l	Preferred-AL in mg/l	DLT day, t/d	Preferred LT day, t/d	DLT years, t/y	Pageid AU — JAMA EN annua	
1.	BOD7	615	405	74,14	17820	15		15		2,05		660		96
	B. nitrogen	101	78	12,18	3432			10				440		87
	B. phosphorus	12	9,5	1,447	418			1,0				44,0		89
	COD	1776	878	214,1	38632	125		—		15,07		—		86
	Hg	0,53	0,023	0,064	1,012			0,002				0,088		
	CD	0,0035	0,0007	0,0004	0,0308			0,04				1,760		
	Fat	103	46	12,42	2024			10				440,0		78
	CU	0,150	0,0667	0,018	2,935			0,5				22,0		
	Al	5,575	2,022	0,672	88,97			0,5				22,0		
	NI	0,0410	0,0046	0,0006	0,202			0,2				8,8		
	Oil	6,38	2,508	0,769	110,35			5				220,0		
	NO2–N	0,19	0,03	0,004	1,32			0,45				19,8		
	NH4–N	46,23	20	2,411	880			5				220		

Projected position

Installation Reconstruction Phase

Reconstruction work on a PFA site will generate a certain amount of domestic waste water (e.g. temporary sanitary facilities) which will be treated in accordance with the requirements of Order No D1-236 of the Minister for the Environment of 17.05.2006 approving the Waste Water Management Regulation (as subsequently amended).

The Vilnius waste water treatment plant will operate continuously during the reconstructive works, i.e. reconstruction works will not interfere with the operation of the waste water treatment plant.

Operation of the waste water treatment plant

The current hydraulic efficiency of the Vilnius waste water treatment plant being reconstructed – 225000 m^3/d.After the reconstruction, the hydraulic efficiency of the Vilnius waste water treatment plant will not change.

Table4.1.3: Design values for pollution of waste water entering the waste water treatment plant

Row No	Parameters	Mat. units	Quantity before primary treatment
1.	***Biochemical oxygen demand in 5 days (BODs)***		
1a	Daily average	KgO2/d	43894
1b.	Concentration at daily average flow rate	MgO2/l	340
2.	***Biochemical oxygen demand in 7 days (BOD7)***		
2a	Daily average	KgO2/d	50478
2b.	Concentration at daily average flow rate	MgO2/l	391
3.	***Chemical oxygen demand (COD)***		
3a	Daily average	KgO2/d	108960
3b.	Concentration at daily average flow rate	MgO2/l	844
4.	***Suspended substances (SM)***		
4a.	Daily average	kg/d	67261
4b.	Concentration at daily average flow rate	mg/l	521
5.	***Total nitrogen (Ntotal)***		
5a.	Daily average	kg/d	14588
5b.	Concentration at daily average flow rate	MRR/l	113
6.	***Total phosphorus (Ptotal)***		
6a.	Daily average	kg/d	1937
6b.	Concentration at daily average flow rate	MGP/l	15
6.	Minimum waste water temperature	°C	10
7.	Maximum waste water temperature	°C	20

The quality requirements for treatedwaste water have been established in accordance with the Waste Water Management Regulation, taking into account the impact of the planned discharges on the receiver and the requirements for treated waste water. Treated waste water will be discharged into Nerry. The quality requirements for treated waste water are given in Table 4.1.4.

Table4.1.4: Pollution standards for the discharge of treated waste water

Row No	Parameters	Measurement	Meaning
1.	Maximum daily mean BOD5 MRL for the sample	mgO2/l	13
2.	Maximum daily mean BOD7 MRL for the sample	mgO2/l	15
3.	Average annual MRL for total nitrogen	MRR/l	10
4.	Average annual MRL for total phosphorus	MGP/l	1

Note: MRL: Maximum level.

Surface waste water fromVilnius waste water treatment site is collected and discharged into the existing surface waste water networks of UAB “Vilniaus vandenys”.Once the waste water treatment plant has been rehabilitated, the management of storm water will remain unchanged.

4.1.3 Potential (expected) impacts on water bodies

The waste water generated by the activities of the Vilnius waste water treatment plant is fed into the existing domestic waste water network, which is fed to the waste water treatment plant and discharged to Neries after treatment.
river.

Since the reconstruction of the waste water treatment plant does not foresee additional waste water generation and will not change the existing efficiency of the waste water treatment plant, it can be argued that the PFA will not have a negative impact on the Neries river.

Information on the river’s background status and the contamination of waste water discharges is given in Table 4.1.5.

Table4.1.5: Information on the surface water body/receiver to which the waste water is discharged [10]

Name, category and code of the body of water	Rivers swimming pool region the swimming pool, sub-basin	80 % probabilities dryest monthly medium river flow rate,	Surface area of water body, ha (stationary water bodies)	Status of the body of water				
				Criterion	Current (background)		Allowed water deposit load	
					measurement	meaning	measurement	meaning
River Neris 12010001	Neries small tributaries (with Nerimi) sub-basin, Nemunas	47,8	—	BOD7	mg/l	3,6	mg/l	15
				B.phosphorus	mg/l	0,082	mg/l	1,23
				B. nitrogen	mg/l	1,47	mg/l	26,3

4.2 Ambient air

4.2.1 Site-specific information

Background pollution of the ambient air at the site of theplanned economic activity was determined in accordance with Order No AV-112 of the Director of the Environmental Protection Agency of 10.07.2008, 'Recommendations on the use of data on pollution of ambient air for economic activities to assess the impact of economic activities on ambient air' [13].There are no air quality testing stations within a radius of 2 km from the planned location of the economic activity. According to the information available on the Environmental Protection Agency's website, no indicator assessments of ambient air quality to be used in addition to the planned area of economic activity have been carried out. EPA air pollution modelling data: average annual pollution of the site in 2014:

- Carbon monoxide: 210-220 pg/m$^{3;}$
- For particulate matter ($_{PM10}$)from 13.6 to 15.1 pg/m^3;
- Nitrogen dioxide 12-14 pg/m$^{3;}$
- Sulphur dioxide between 3.4 and 4 pg/m$^{3.}$

By letter No (28.7)-A4-13970 of 15/12/2015 on background concentrations, theEnvironmental Protection Agency provided data on emissions from contiguous and planned installations. According to the data provided in the Environmental Impact Assessment Report of Vilnius CHP Plant (Jočinių g. 13, Vilnius) two alternative ways can be developed for the development of PFAs (PFA development option 2 or PFA development option 3).For the ambient air impact assessment, the data on emissions of alternative 2 for the development of the Vilnius CHP plant were used, as this option results in higher ambient air pollution (in the case of Option 2, the installation can emit 1703.268 t/year, while option 3 is 1038.939 t/year).A copy of letter No (28.7)-A4-13970 of the Environmental Protection Agency of 15-12-2015 is provided in text annex 4.

4.2.2 Emissions to ambient air from

theReconstruction Phase of the Waste

Water TreatmentPlant

During the rehabilitation of the waste water treatment plant, construction/destruction works will pollute ambient air from vehicles and other combustion engines (tractors, excavators, etc.) into the ambient air. Depending on the type of fuel used in the internal combustion engine, carbon monoxide, oxides of nitrogen, volatile organic compounds, sulphur dioxide and particulate matter can be released into the ambient air. The effects of the reconstructive phase of the waste water treatment plant on the ambient air will be local and temporary, which will occur on the construction site and its immediate surroundings and only during the operation of internal combustion engines of vehicles and other installations.

Operation of the waste water treatment plant

State of play

Information on existing sources of ambient air pollution and their emissions, Vilnius Water UAB 2012-08-21, issued (2013-06-21)

permit (IPPC) No VR-4.7-V-02-01 [10] and the Environmental Impact Assessment Report for the construction and operation of Dumblo final recovery facilities g. 74 Vilnius [14], as set out in 4.2.1; and 4.2.2 tables.

Projected position

In the design situation, existing ambient air sources remain unchanged, i.e. the level and types of emissions from existing emission sources will remain unchanged.

Ducts, grates, transporters, carrier and sand washing/drainers or other areas in which unwashed carriers are in direct contact with ambient air in a reconstructed grid building will be sealed and provide for local shutdown into biofilters – a.t. 011.

Reactions in sludge hydrolysis tanks produce flammable and odour-emitting gases. In order to avoid the spreading of odours into the environment, it is necessary to fully cover the sludge hydrolysis tanks. The containers are equipped with ventilation that will extract the contaminated air and direct it to the air purification plant via biofilters – a.t. 012.

At this stage of the design, the exact emissions of the biofilters to be designed are not known and therefore, for the assessment of the impact on ambient air, it is accepted that the emissions will be similar to those of the biofilter installed in existing sludge treatment plants a.t. 009.

In order to improve the dispersion conditions, it is proposed to cover the biofilters at design (a.t.r. 011 and 012) and to discharge the air in an organised manner after cleaning through a duct of 5 m height.

4.2.1 physical data on stationary emission sources are shown in Table 4.2.2 for ambient air pollution, a diagram of emission sources is provided in Figure 3.

4.2.1 table: Physical data from stationary sources
event title Vilnius waste water treatment plant

Emission sources						Emission indicators at the point of sampling (measurement)			Contaminants pipe duration hours/years
name	No	coordinates		altitude, m	dimensions of the outlet, m	flow rate, m/s	temperature, °C	volume flow rate, Nm3/s	
1	2	3	3'	4	5	6	7	8	9
Existing a.t.i.									
Co-generator chimney	004	574007	6060610	20	0,4	13	199	0,945	8760
Co-generator chimney	005	573939	6060609	20	0,4	13	199	0,945	8760
Biogas incineration candle	007	573939	6060509	8	1,5	4,23	800	1,901	40
Cross-flow scrubber exhaust duct	008	574017	6060575	20	1,43	8	38	11,278	8000
Biofilter duct	009	574030	6060549	2,5	9,0x2,2 m	0,14	22	2,969	8760
Waste water treatment plants (WTP)	601	574455	6060670	10	0,5	3,5	0	0,687	8760
Chimney of the final sludge disposal plant	010	573932	6060635	34	0,6	19,63	165	3,46	8000
Shall be designed a.t.r.									
Biofilter duct	011	574401	6060635	5	0,5	16,35	22	2,969	8760
Biofilter duct	012	574413	6060780	5	0,5	16,35	22	2,969	8760

4.2.2 table: Pollution into ambient air

event title Vilnius waste water treatment plant

Operational species	Name of the plant, etc., type of production name	Emission sources		Pollutants		Existing pollution			Predicted pollution		
		name	No	name	Code	one-off size		annual,	one-off size		annual,
						Units	Max	t/y	units	max	t/y
1	2	3	4	5	6	7	8	9	10	11	12
030105	Powerplant electrical and heat production burning biogas	Chimney	004	Carbon monoxide (CO) A	177	g/s	0,4573	14,284	g/s	0,4573	14,284
				Nitrogen oxides (NOx) A	250	g/s	1,1997	36,584	g/s	1,1997	36,584
				Sulphur dioxide (SO2) A	1753	g/s	0,0028	0,085	g/s	0,0028	0,085
				VOC	308	g/s	0,0075	0,180	g/s	0,0075	0,180
		Chimney	005	Carbon monoxide (CO) A	177	g/s	0,4573	14,284	g/s	0,4573	14,284
				Nitrogen oxides (NOx) A	250	g/s	1,1997	36,584	g/s	1,1997	36,584
				Sulphur dioxide (SO2) A	1753	g/s	0,0028	0,085	g/s	0,0028	0,085
				VOC	308	g/s	0,0075	0,180	g/s	0,0075	0,180
						Total by type of activity:		**102,265**	**Total by type of activity:**		**102,265**
091006	Cross traffic scrubber	Duct	008	Ammonia	134	g/s	0,2589	6,713	g/s	0,2589	6,713
				Hydrogen Sulphide (H2S)	1778	g/s	0,0019	0,033	g/s	0,0019	0,033
				Mercaptans	1375	g/s	0,0092	0,168	g/s	0,0092	0,168
				VOC	308	g/s	0,0124	0,237	g/s	0,0124	0,237
091006	Biological filter	Oblate source	009	Hydrogen sulfide	1778	g/s	0,0003	0,008	g/s	0,0003	0,008
				Ammonia	134	g/s	0,0056	0,144	g/s	0,0056	0,144
						Total by type of activity:		**7,304**	**Total by type of activity**		**7,304**

020106	Biogas incineration candle	Fakel	007	Carbon monoxide (CO) B	5917	g/s	0,0951	0,014	g/s	0,0951	0,014
				Nitrogen oxides (NOx) B	5872	g/s	0,2853	0,041	g/s	0,2853	0,041
				Sulphur dioxide (SO_2) B	5897	g/s	0,6657	0,096	g/s	0,6657	0,096
				VOC	308	g/s	0,0095	0,001	g/s	0,0095	0,001
						Total by type of activity:		**0,152**	**Total by type of activity:**		**0,152**
091002	Vilnius urban waste water clean-up facility	Waste water for cleaning installations	601	VOC	308	g/s	0,0190	0,599	g/s	0,0190	0,599
	Of bars building	Biofilter duct	011	Hydrogen sulfide	1778	—	—	—	g/s	0,0003	0,008
				Ammonia	134	—	—	—	g/s	0,0056	0,144
	Hydrolysis containers	Biofilter duct	012	Hydrogen sulfide	1778	—	—	—	g/s	0,0003	0,008
				Ammonia	134	—	—	—	g/s	0,0056	0,144
						Total by type of activity:		**0,599**	**Total by type of activity:**		**0,903**
090205	Category final recovery installation	Category final recovery installation chimney	010	Carbon monoxide	177	Mg/Nm3 O211 %	150	4,978	Mg/Nm3 O211 %	150	4,978
				Particulate matter	6493	Mg/Nm3 O211 %	30	0,996	Mg/Nm3 O211 %	30	0,996
				Total organic carbon	308	Mg/Nm3 O211 %	20	0,996	Mg/Nm3 O211 %	20	0,996
				Hydrogen chloride	440	Mg/Nm3 O211 %	60	0,996	Mg/Nm3 O211 %	60	0,996
				Hydrogen fluoride	862	Mg/Nm3 O211 %	4	0,100	Mg/Nm3 O211 %	4	0,100
				Sulphur dioxide	1753	Mg/Nm3 O211 %	200	4,978	Mg/Nm3 O211 %	200	4,978

Nitrogen oxides	250	Mg/Nm3 O211 %	400	19,911	Mg/Nm3 O211 %	400	19,911
Ammonia	134	Mg/Nm3 O211 %	10	0,498	Mg/Nm3 O211 %	10	0,498
Cadmium	3122	Mg/Nm3 O211 %	0,05	0,005	Mg/Nm3 O211 %	0,05	0,005
Thallium	7911						
Mercury	1024	Mg/Nm3 O211 %	0,05	0,005	Mg/Nm3 O211 %	0,05	0,005
Antimony	4112	Mg/Nm3 O211 %	0,5	0,050	Mg/Nm3 O211 %	0,5	0,050
Arsenic	4775						
Lead	2094						
Chromium	2721						
Cobalt	3401						
Copper	4424						
Manganese	3516						
Nickel	1589						
Vanadium	2023						
Dioxins	7866	NG/Nm3 O211 %	0,1	9,96E-06	NG/Nm3 O211 %	0,1	9,96E-06
Furans	7875						
		Total by type of activity:		33,510	Total by type of activity:		33,510
		Total installation:		**143,830**	**Total installation:**		**144,134**

Mobile sources of pollution

On the basis of the application by UAB Vilniaus vandenys for the correction of the integrated pollution prevention and control permit, Table 4.2.3 provides information on mobile sources of pollution and their pollution.

Table4.2.3: Mobile sources of pollution and their pollution

Name	Quantity units	Fuel consumption, t/y	To aambient air emissions				
			CO	NOx	CnHm	SO2	Solid particulat
1	2	3	4	5	6	7	8
Cars, using:	123	254,634	26,758	3,484	8,055	0,245	0,338
(a) petrol	16	21,509					
(b) Diesel oil	104	223,721					
(c) liquefied gas	3	9,404					
(d) compressed natural gas							
(e) other fuels							
Tractors, etc., equipped with internal combustion engines	149	82,594	16,341	1,138	2,559	0,062	0,142

Limit values for contamination level

Limit values for the emission of pollutants into ambient air during the operation of an establishment have been determined in accordance with Order No D1-329/V- 469 of the Minister for the Environment and the Minister for Health of 11 June 2007 on the list of pollutants limited in ambient air in accordance with European Union criteria and the list of pollutants limited in ambient air on the basis of national criteria and the limit values for ambient air pollution (Official Gazette 2007, No 67-2627, as subsequently amended) [15], as set out in Table 4.2.4.

Table4.2.4: Limit values for contaminants

Pollutant name	Limit values for contamination level, [mg/m3]		
	H hours	day	year
Ammonia	0,20	0,04	—
Hydrogen sulfide	0,008	—	—

4.2.3 Prediction of ambient air pollution

Emission dispersion simulations were carried out in the computer software package “ISC-AERMOD View”, the AERMOD mathematical model for simulating emissions from industrial source complexes in the environment.

The AERMOD model, approved by Order No AV-200 of the Director of the Environmental Protection Agency of the Republic of Lithuania of 9 December 2008, ‘Guidelines on the selection of models for calculating the dissemination of pollutants for the assessment of the impact of economic activities on ambient air’ (Official Gazette 2008, No 143-5768, as subsequently amended) [16] recommends that the AERMOD model be modelled.

Data to simulate the dispersion of ambient air pollutants

The planned economic activity will release ammonia and sulphur hydrogen into the ambient air in order to assess the impact on ambient air by means of mathematical modelling of the dispersion of these ambient air pollutants.

Input parameters for emission dispersion modelling. The input parameters for the emission dispersion simulation are given in Table 4.2.5.

4.2.5 table: Input parameters for emission dispersion simulations

Contaminant name	Pollution source No	Coordinates		Amount of pollutant, g/s	Source of pollution			
		XS	Ys		altitude, m	tempe rature, K	traffic speed, m/s	dimen sions of the outlet,
Ammonia	008	574017	6060575	0,2589	20	311	8,00	1,4
Ammonia	009	574030	6060549	0,0056	2,5	295	0,14	5,0
Ammonia	010	573931,6	6060635	0,0346	34	438	19,63	0,6
Ammonia	011	574401	6060635	0,0056	5	295	16,35	0,5
Ammonia	012	574413	6060780	0,0056	5	295	16,35	0,5
Hydrogen sulfide	009	574030	6060549	0,0003	2,5	295	0,14	5,0
Hydrogen sulfide	011	574401	6060635	0,0003	5	295	16,35	0,5
Hydrogen sulfide	012	574413	6060780	0,0003	5	295	16,35	0,5
Hydrogen sulfide	008	574017	6060575	0,0019	20	311	8,00	1,43

Selection of ambient air pollution model.ISC-AERMOD View offers a choice between several models, specifically the AERMOD model for this work.

Average time interval of the results. The average time interval of the results is a critical parameter that has a significant influence on the final modelling results.

The average time interval of the results is the time interval during which fluctuations in concentrations of a pollutant are measured by producing one mean concentration over a given time interval.

The AERMOD model uses very detailed meteorological data in the simulation, with nine meteorological parameters expressed for each hour of the year. On the basis of these data, the model calculates the maximum concentrations in the ground-level layer for each of them (i.e. 8.760 values in simple or elevated years).After selecting any average time interval, the model shall sum the incoming hourly average concentrations and divide the result by the number of hours in that interval. This gives the average ground-level concentration of the pollutant over an appropriate time interval. This enables average concentrations of the pollutant to be determined not only for any hour of the year but also, for example, for a selected day, week, month, season. And the average concentration throughout the year.

As mentioned above, the average time interval of the results has a significant impact on the final outcome: the longer the time interval is selected, the more the hourly concentrations are equalised (sinking peaks) and the absolute value of the concentration decreases.

The AERMOD model offers the following typical average time intervals for results: 1,2, 3, 4, 6, 8, 12 and 24 hours; month and year. It is also possible to indicate any other time interval of interest if there is such a need.

In the case of emission dispersion simulations, the average time interval for a specific pollutant for the facility under consideration is the same as the average time interval of the limit value set.

Emission factors for emission sources. Emission factors at source are factors whose design makes it possible to assess the variability of emissions over time. This is a factor multiplied by the emissions from a given source of ambient air pollution, thus taking into account their imbalance. Emission factors may vary between 0 and 1. Where the emission factor is 0, the emission from a given emission source shall also be zero, where 0,5 is the source emitting 50 % of the declared emissions. When the emission factor is 1, the emission source shall emit 100 % of the declared emissions. For example, in the case of a source of pollution working only during working hours (i.e. 8 hours per day) and only on working days, it is not logical to allow the model to assess these emissions as if they were hours a day and a week. In this case, it is appropriate to indicate the emission factors for each hour of the day (an emission factor of 1 for working hours and 0 for the remaining hours) and per day (an emission factor of 1 is assigned to working days and 0 for the other hours).

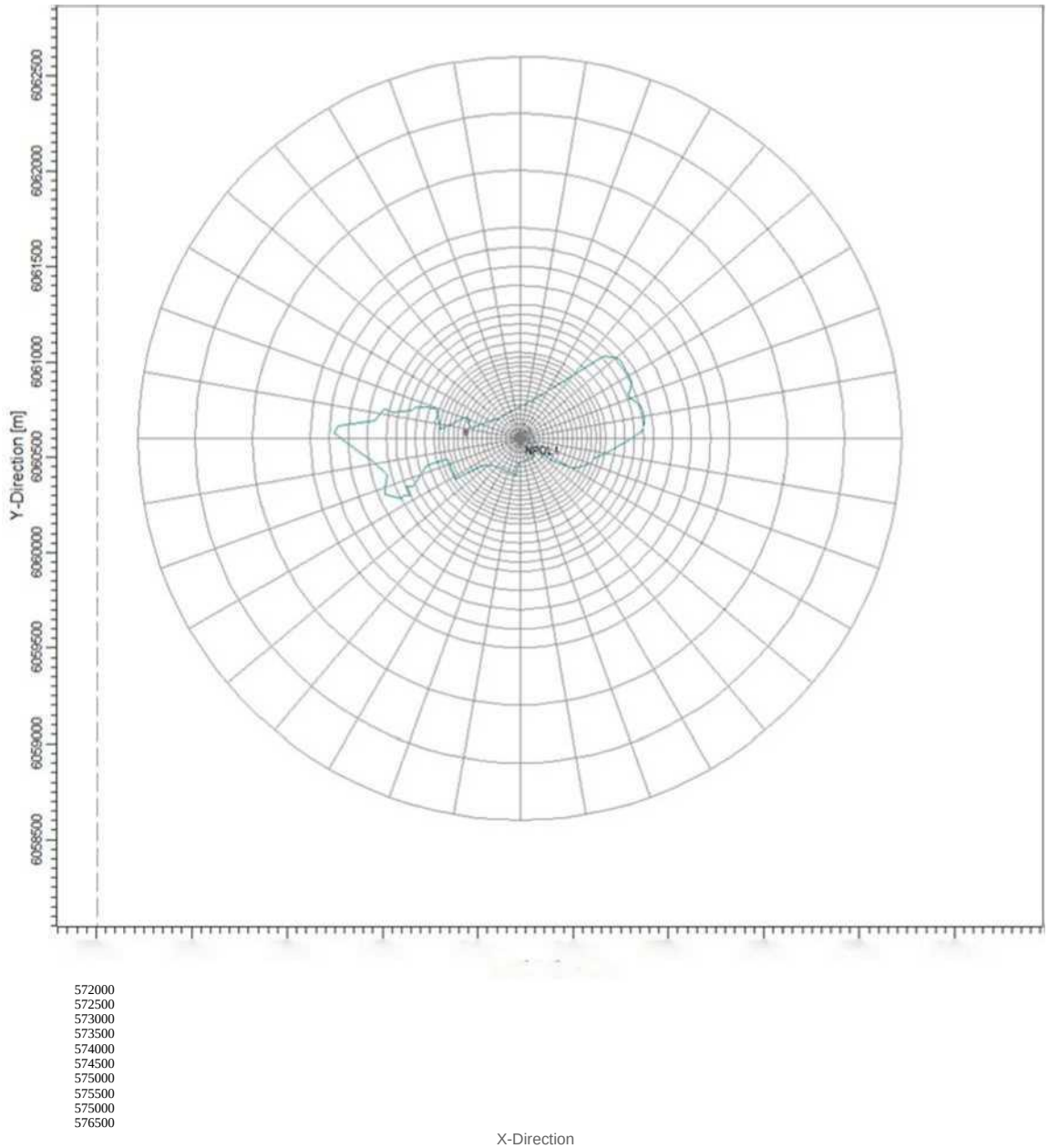
The mathematical modelling of the dispersion of pollutants in ambient air for the installation in question did not include emission factors for emission sources, that is to say, the worst-case scenario in which all sources of ambient air pollution are active throughout the year during a day.

Meteorological parameters. In order to ensure maximum accuracy of the AERMOD model, it is necessary to aggregate the amounts of meteorological data in a very detailed manner: the values of nine meteorological parameters for each hour of the year.

The AERMOD model uses the meteorological data package 2010-2014 provided by the Lithuanian Hydrometeorological Service (Text Annex 5) to perform the mathematical modelling of pollutant dispersion in a specific case. The package includes hourly values for the following meteorological parameters: ambient temperature, humidity, atmospheric pressure, wind speed and direction, precipitation, cloud intensity, height of cloud base and sum of solar radiation on the horizontal surface.

Receptors network. Ground-level concentrations in mathematical models are calculated at certain pre-determined points. These dots are called receptors. Usually, receptors are defined by forming a set of points (network) located at a certain distance from each other. The closer the points to each other, the more accurate the calculations (reducing interpolation intervals for calculating intermediate concentrations between adjacent points) but extending the calculation/simulation time, the optimal solution for selecting the distance between adjacent points in order to minimise the impact on the accuracy and reliability of the results, while minimising the duration of simulations, is sought.

On a case-by-case basis, a polar network of receptors has been established. Network centre coordinates in the LKS'94 coordinate system: X= 574220,69; Y= 6060601.11. The radius of the net is situated in a total of 36 10°; the receptor network rings from the centre of the network to 450 m are spaced every 25 m, 450 m to 700 m every 50 m, 700 m to 1100 m every 100 m, 1100 m to 2000 m every 300 m. A total of the receptor network consists of 30 rings, 1080 receptors, and a radius of 2 km in the receptor network. A network of receptors is shown in Figure 4.2.1.



4.2.1 figure: Receptor network

The concentrations of pollutants are calculated for modelling purposes at a height of 1,5 m, which is assumed to be the height at which a person of average height inhales the air.

Terrain and structures. The AERMOD model makes it possible to assess the impact of the terrain and structures on the dispersion of pollutants. The relief assessment uses the AERMAP sub-programme, which describes the terrain and identifies a pattern of receptors or receptor grids to spread. In the specific case, the SRTM3 (Shuttle Radar Topography Mission) digital data was used, which is global (covering the Earth as a whole).Data Resolution ~90

The assessment of the structures is not carried out on a case-by-case basis.

The height of the anemometer. According to the certificate provided by the Lithuanian Hydrometeorological Service, the wind directions and intensity are determined at a height of 10 m

above the ground.

Percentile: The purpose of the percentile is to exclude statistically unreliable modelling results. Percentiles vary widely and represent the percentage of results considered statistically reliable. Remaining

the results are discarded by avoiding “leavings” of concentrations that are statistically unreliable, which could distort the overall picture.

According to Order No AV-200 of the Director of the Environmental Protection Agency of the Republic of Lithuania of 9 December 2008, ‘Guidelines on the selection of models for calculating the dispersion of pollutants from economic activities to assess the impact of economic activities on ambient air’, if the model is unable to calculate a half-hourly concentration, a percentile of 98.5 % of the hourly values compared to the half-hour limit may be calculated. In the specific case, this method was applied to the concentrations of ammonia and sulphur hydrogen for 1 hours.

Ambient air pollutant dispersion modelling results

The results of simulations of the dispersion of ambient air pollutants are given in Table 4.2.6.

Table4.2.6: Results of emission dispersion simulations

Contaminant name	**Limit value**		**Without background pollution**		**Assessment of background pollution**	
			Cmax	**Cmax/ cut-off value**	**Cmax**	**Cmax/ cut-off value**
	average	[pg/m³]	[pg/m³]	**[unit dl]**	[pg/m³]	**[unit dl]**
1	**2**	**3**	**4**	**5**	**6**	**7**
Ammonia	0,5 hour	200	8,14	0,041	181,35	0,907
Hydrogen sulfide	0,5 hour	8	0,47	0,058	0,47	0,058

Mathematical modelling of the facility’s emissions dispersion in ambient air without background emissions resulted in a maximum concentration of 5,8 % of the 1-hour average time interval for sulphur hydrogen and 4,1 % of the limit value for the residential environment for ammonia during 1 hours.

Also for background pollution, a maximum concentration of 1 hours for ammonia of 91 % and a 1 hour sulphur hydrogen concentration of 5.8 % of the limit value for the residential environment were identified.

Graphical results of emission dispersion mathematical modelling are provided in Figure 3 for ammonia as the maximum concentration for this pollutant has been established.

4.2.4 Exposure reduction measures

State of play

Information on existing discharge air purification plants in accordance with UAB Vilniaus vandenys 2012-08-21 is provided by the Integrated Pollution Prevention and Control Permit (IPPC) No VR-4.7-V-02-01 [10] and the Environmental Impact Assessment Report for the construction and operation of Dumblo final disposal facilities g. 74 Vilnius (2013-06-21) in Vilnius [14] is set out in Table 4.2.7.

Projected position

Existing exhaust air treatment plants shall remain in the design position.

As a result of the reconstruction of the Vilnius Waste Water Treatment Plant, troughs, grates, transporters, carrier and sand washing/drying facilities or other areas in which unwashed carriers have direct contact with ambient air from the reconstructed grid building will be completely covered and local shutdowns to the treatment plant in biofilters – a.t.š. 011.

Reactions in sludge hydrolysis tanks produce flammable and odour-emitting gases. In order to avoid the spreading of odours into the environment, it is necessary to fully cover the sludge hydrolysis tanks. The containers are equipped with ventilation that will extract the contaminated air and direct it to the air purification plant via biofilters – a.t. 012.

4.2.7 table: Waste gas treatment plants and other pollution prevention measures
event title Vilnius waste water treatment plant

Pollution source	Treatment plants1		**Pollutants**	
	name	**Code**	**name**	**Code**
1	**2**	**3**	**4**	**5**
Existing exhaust air purification plants				
008	Cross flow scrubber	56	Ammonia (NH3)	134
			Hydrogen Sulphide (H2S)	1778
			Mercaptans	1375
009	Biofilter	56	Ammonia (NH3)	134
010	Exhaust gas purification unit using sodium bicarbonate and active carbon and bag filter as reagents	90/54	arsenic and its compounds.	217
			chromium hexavalent	2721
			cobalt	3401
			manganese	3516
			nickel and its compounds	1589
			antimony and its compounds	4112
			organic and inorganic compounds of lead	2094
			copper and its compounds	4424
			vanadium pentoxide (A)	2023
			mercury and its compounds	1024
			cadmium and its compounds	3211
			thallium and its compounds	7911
			particulate matter (A)	6493
			chlorine hydrogen	440
			fluorine hydrogen	862
			sulphur dioxide (A)	1753
			PCDD (dioxins)	7866
			PCDFs (furans)	7875
	selective non-catalile NOx purification by injection of ammonia solution	90	oxides of nitrogen (A)	250
Exhaust air treatment plants to be designed				
011	Biofilter	56	Ammonia (NH3)	134
012	Biofilter	56	Ammonia (NH3)	134

Measures to reduce ambient air pollution in adverse conditions of dispersion are not foreseen.

Given that no exceedances of pollutant limit values have been identified outside the site during the mathematical modelling of the dispersion of pollutants, it is proposed that the emissions referred to in Table 4.2.8 be approved as maximum allowable pollution (MPE).

Table4.2.8: Proposals for the establishment of standards for permitted pollution into the air

Contaminant name	Contaminant Code	Source No of ambient air pollution	Existing emissions, t/y	Foreseeable pollution – proposed permitted pollution standards		
				one-off		annual, t/y
				units	size	
Carbon monoxide (CO) A	177	004	14,2838	g/s	0,45725	14,2838
Nitrogen oxides (NOx) A	250		36,5844	g/s	1,19974	36,5844
Sulphur dioxide (SO2)A	1753		0,0847	g/s	0,00276	0,0847
VOC	308		0,1796	g/s	0,00745	0,1796
Carbon monoxide (CO) A	177	005	14,2838	g/s	0,45725	14,2838
Nitrogen oxides (NOx) A	250		36,5844	g/s	1,19974	36,5844
Sulphur dioxide (SO2)A	1753		0,0847	g/s	0,00276	0,0847
VOC	308		0,1796	g/s	0,00745	0,1796
Ammonia	134	008	6,7134	g/s	0,25886	6,7134
Hydrogen Sulphide (H2S)	1778		0,0331	g/s	0,00188	0,0331
Mercaptans	1375		0,1678	g/s	0,00915	0,1678
VOC	308		0,2374	g/s	0,01235	0,2374
Hydrogen sulfide	1778	009	0,0082	g/s	0,00033	0,0082
Ammonia	134		0,1440	g/s	0,00559	0,1440
Carbon monoxide (CO) B	5917	007	0,0137	g/s	0,09510	0,0137
Nitrogen oxides (NOx) B	5872		0,0411	g/s	0,28530	0,0411
Sulphur dioxide (SO2)B	5897		0,0959	g/s	0,66570	0,0959
VOC	308		0,0014	g/s	0,00950	0,0014
VOC	308	601	0,5987	g/s	0,01899	0,5987
Hydrogen sulfide	1778	011	—	g/s	0,00033	0,0082
Ammonia	134		—	g/s	0,00559	0,1440
Hydrogen sulfide	1778	012	—	g/s	0,00033	0,0082
Ammonia	134		–	g/s	0,00559	0,1440
Carbon monoxide	177	010	4,9778	Mg/Nm3^{O211} %	150	4,9778
Particulate matter	6493		0,9956	Mg/Nm3^{O211} %	30	0,9956
Total organic carbon	308		0,9956	Mg/Nm3^{O211} %	20	0,9956
Hydrogen chloride	440		0,9956	Mg/Nm3^{O211} %	60	0,9956
Hydrogen fluoride	862		0,0996	Mg/Nm3^{O211} %	4	0,0996
Sulphur dioxide	1753		4,9778	Mg/Nm3^{O211} %	200	4,9778
Nitrogen oxides	250		19,9111	Mg/Nm3^{O211} %	400	19,9111
Ammonia	134		0,4978	Mg/Nm3^{O211} %	10	0,4978
Cadmium	3122		0,0050	Mg/Nm3^{O211} %	0,05	0,0050
Thallium	7911					
Mercury	1024		0,0050	Mg/Nm3^{O211} %	0,05	0,0050
Antimony	4112		0,0498	Mg/Nm3^{O211} %	0,5	0,0498
Arsenic	4775					
Lead	2094					
Chromium	2721					
Cobalt	3401					
Copper	4424					
Manganese	3516					
Nickel	1589					
Vanadium	2023					
Dioxins	7866		9,96E-06	NG/Nm3^{O211} %	0,1	9,96E-06
Furans	7875					
Total:			**143,8298**			**144,1341**

4.3 Soil

4.3.1 Site-specific information

‘Soil' means the topsoil of the earth’s crust, formed by surface rocks exposed to water, air and living organisms, and capable of producing plants. The thickness of the soil cover, the conductivity and impregnation capacity of the soil determines whether the uptake of precipitation water will be used by plants or overflows into groundwater and surface waters. Essential soil property

- its yield. At present, part of the PFA site is covered by soil (except for areas where it is removed and covered by artificial cover and built-up).

The soil diversity of the area has been determined by the surface corps. The soil is formed on mineral (mainly fluvio-glacial, alluvial, eolian) and biogenic (wet) soil formations. The predominant mechanical composition of mineral rocks (size of soil particles) is loam, loam, sand and clay. These rocks have different quantities of carbonates and substances required for plants.

As cities grow and the infrastructure network densifies, there is a risk of fertile soil loss. Soils accumulate pollutants that adversely affect the structure of the soil. Flooding may lead to discharges of pollutants into surface water or groundwater. They also accumulate in vegetation. In this way, harmful substances and contaminants can be introduced into the human body and may cause health problems. From an environmental point of view, natural degradation and destruction processes of soil cover, which have been activated by human activities and are detrimental to the stability of geosystems and to economic activity (in particular due to reduced soil fertility or total degradation) are of particular importance. These are soil erosion caused by water and wind, resulting in degradation, moderate and severe destruction of soils. Surface constraints, soil formation, soil types and farming conditions lead to soil erosion.

The PFA area, according to the pedological district, is covered by the South-Eastern sandy lowland area in Vilnius

- The district of Ryeiškis (E-III) and the intrazonal unit of the Holy-Neries valleys.

The predominant soil types in the PFA area and its surrounding area according to the Lithuanian Soil Classification (LTDK-99) are common sands (SDPs), glacial bass soils (JDGs), calcareous pulverised soils (IDk) and giant pulleys (IDGs).

In accordance with Lithuanian Hygiene Standard HN 60: 2004 (Official Gazette. According to the classification provided for in No 41-1357 [17], soils prevailing in the area are classified as resistant (blood and suffix) and are not liable to accumulate chemical pollutants, especially heavy metals.

The soil erosion intensity of the PFA site is between 0 % and 5 %, but the resistance to erosion according to A. Račinsk is low (k = 1.2-1.5).The risk of soil erosion is moderate. The area has a soil productivity score of less than 27, which is ranked as the worst farmland (www.geoportal.lt).[18]

On theVilnius NV parcel of 50.92 ha, the layer of natural soil (pd IV) remains in individual areas only. During the construction of the cleaning plant and subsequent reconstructions, the natural soil layer was removed from sites. Currently a large part of the site is occupied by waste water treatment

plant buildings and structures, asphalt concrete, concrete blocks, chippings and access roads.

Natural soils formed by the Baltic-age fluvio-glacial soil formation rock, due to the development/exploitation of the site, have not survived in many places, or have been replaced by an alternative, secondary soil layer when formed in lawns.

Data on soil contamination in the Vilnius waste water treatment site are not available because no preliminary ecogeological study has been carried out on the site. The soil of the area can also be polluted by technogenic dust from industrial areas on the south side, which may also contain heavy metals.

4.3.2 Potential (expected) impact

The following steps of the proposed activity are likely to affect the soil: during the construction and reconstruction of existing establishments, during normal operation or during emergencies.

The main impact on the fertile soil layer during the construction and reconstruction of PFAs will be the construction of new facilities and existing reconstructed facilities at their access points.

The fertile soil layer in the area of construction of new facilities and, where appropriate, in reconstruction sites, will be displaced and excavated already before construction or reconstruction works start. The excavated soil will be filled in in the temporary storage areas of the soil. During construction, the area of vulnerable soil and the amount of soil removed will be assessed at the time of the technical design.

No chemical, entomological, parasitological, radiological or other soil contamination is expected during the construction of PFAs. Reconstructing existing facilities may lead to spills of waste water into the environment due to errors by the contractor.

Due to oil pollution of the motor soil entering the sewage treatment plant, it is not expected that the motor vehicle will move and park only on non-conductive roads and sites. Soil contamination is not possible under the normal operating conditions of the waste water treatment plant. Soil contamination can only occur in emergency situations. The effects of natural origin in this area are unlikely and are not addressed in this paragraph. It is planned that the fertile soil layer can only be affected by technogenic factors during the construction and operation of the FAS.

The physical effects of the planned reconstruction of the waste water treatment plant include soil excavation, displacement, possible mixing and compression of soil layers during the construction of the sites.

4.3.3 Exposure reduction measures

- Organisation of works in accordance with the seasons of the year (in the cold period of the year, soil frost damage may be minimised) and the optimal area of the area used;

- Temporary excavation/removal of the fertile soil layer: After the construction works, the site will be remediated (Resolution No 1116 of the Government of the Republic of Lithuania of 14 October 1995 on the rehabilitation of damaged land and conservation of the fertile soil);

- During construction/reconstruction, the contractor will be required to ensure that waste water from existing facilities does not spill into the environment;

- Only a small part of the territory will bebuilt up. In de-mounted buildings, soils (afforested lawn) will be restored or otherwise treated. This remediation of the site will prevent soil erosion and possible contamination.

- Compliance with strict environmental requirements during construction to avoid chemical (emergency) pollution from mobile vehicles and equipment (STR 1.07.02: 2005 Landworks).

4.4 Deepland

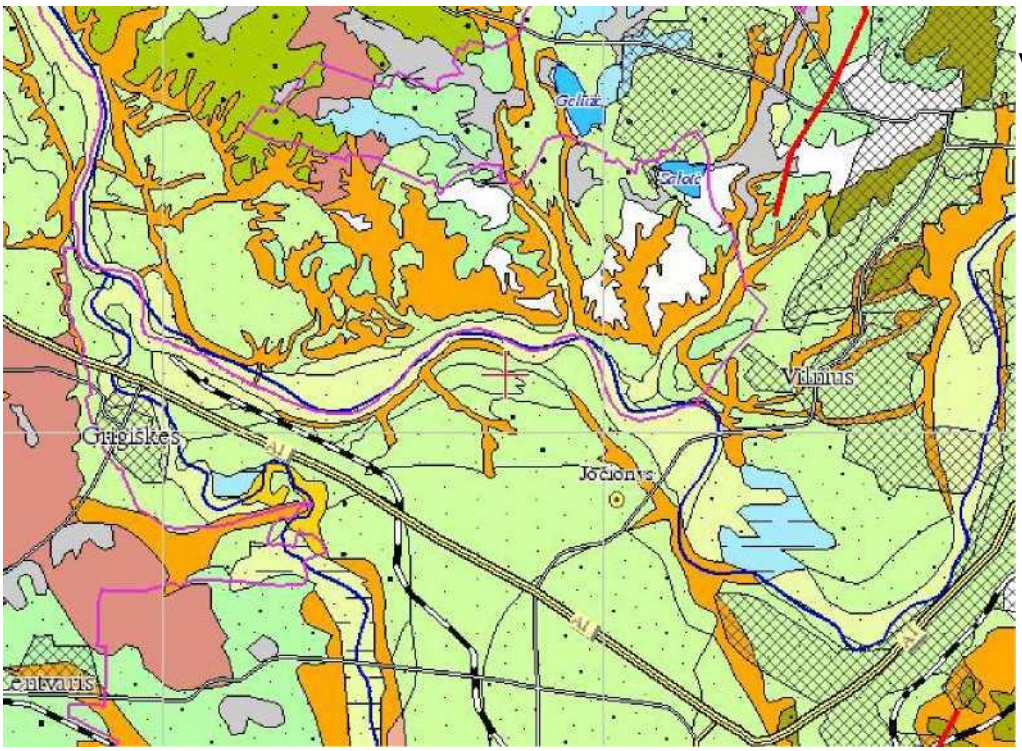
4.4.1 Site-specific information

The geological – hydrogeological conditions of the upper geological section of the PŪV area are described on the basis of theinformation compiled in 1979 by the Institute of Engineering Exploration of additional engineering geological surveys on the construction site of the waste water treatment plant in Vilnius [19], in the programme for monitoring the impact of UAB VILNIAUS hydrogeologies on groundwater [20] andhttp://www.lgt.lt/in the Geological Foundations of the Lithuanian Geological Service[21].

TheGeomorphologically considered area is a micro-terrain of the micro-terrain of the Lower icing Fluviglacial plains in the North-East plain area of the Vilnius plain sub-area of the Mid-River Valley. The parcel has reached the age of holocene and late glaciers and the type of terrain is river valleys.

On the territory ofVilnius NV, the aluvial (a IV) sieves are made up of sand, gravel and dusty loam and sand of different sizes. Soil changes are high in both vertical and horizontal directions. In almost all terraces of the Neries river, a gravel with pebbles and rocks slips on the ground. It is low wet, medium density. Large rolling stock is found in the gravel stove. The thickness of the gravel layer is up to 1,0 to 4,0 m. The maximum thickness of the gravel layer is found in the terraces of river III-IV Neries. Medium-sized sands, mainly in the form of lenses, are found on the II and III Neries terraces at an altitude of 80 to 90 m. Lens thickness between 1,0 m and 3,0 m [22].The most common soil in the cleaning site is fine and dusty sand. Fine sand is dominated by large-scale rocks and gravel lenses. Below ground water level, fine sand has the characteristics of flake.

The southern part of the Vilnius NV plot is characterised by a dusty loamy loam and a dusty substation. Where the maximum thickness of these layers is between 13,5 and 19,0 m. The mushroom is a elastic, brownish-coloured, water-saturated, hytropic characteristics and a grey, yellowish brown-brown-brown brown-brown brown-brown brown-brown brown-brown brown-brown brown-brown-brown, densely elasticity of the dusty layers.



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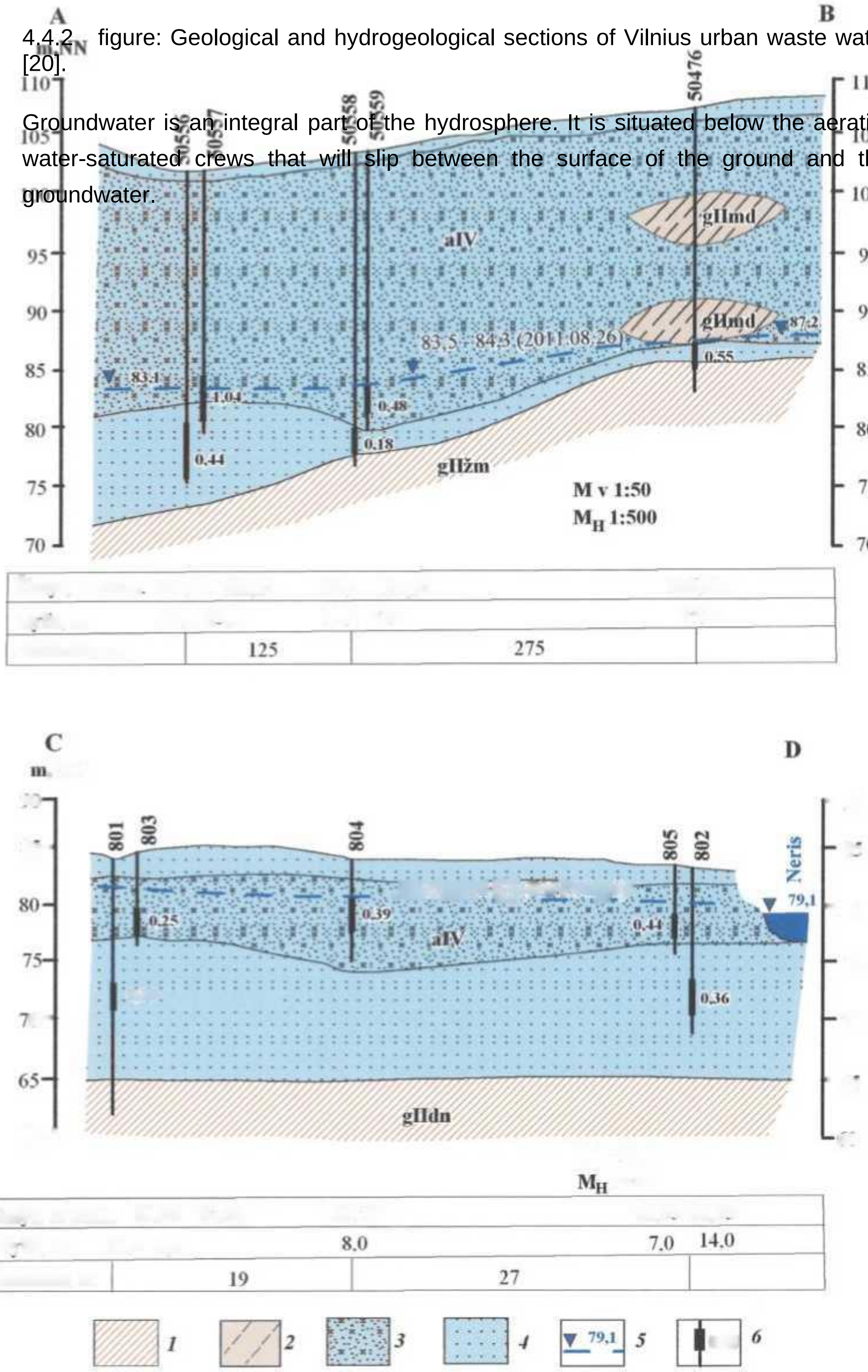
4.4.1 figure: Map of Quarterial Crews in the EIA area and its surroundings.

The PFA area is not covered with hard impermeable coating (asphalt and concrete) and has not been built on a soil layer up to 0.3 m thick (pd IV).Holocene alluvial sands (a IV) are laid down under the soil. Their thickness varies from 1 m to 19 m at different sites of the parcel. They are technogenic structures (t IV) common to the sites of the parcel where the land works were carried out. More deeply under these structures, a large part of the parcel slips the mervical loam of Žemaitija Svita (g II) in the central section of the Pleistoceno system, and to the north, the Dinava turtle fliuvioglacial (f II dn) consisting of yellowish and grey-brown sands and gravel (grain-grained) sands (grained bilge II) of various grains. No 8094).According to the description of the section of well No. 8094, approximately 44 m NN slips about 11 m thick of Dainavos morena, consisting of a grey moiety (g II dn).The quaternary section is completed by a layer of linnoglacial grey aleuritis and fine sand (lg II dz) in the vicinity of the PFA plot, approximately 18 m thick. The total thickness of quartz formations in the area in question is approximately 68 to 86 m and is assaulted by thefine sandstone (drilling)of the lower Kreida (K1).No 8094).

There are no valuable geological sites in the immediate environment of the planned establishment.

1 – Attachment: 2 – Pneau: 3 – sand with gravel, pebbles:

4 – sand: 5 = water level, m abs.a. date.: 6 – Whole filter: to the right: general mineralisation, g/l



4.4.2 figure: Geological and hydrogeological sections of Vilnius urban waste water treatment plant [20].

Groundwater is an integral part of the hydrosphere. It is situated below the aeration zone, i.e. non-water-saturated crews that will slip between the surface of the ground and the surface of the groundwater.

From a hydrogeological point of view, the area in question falls within the groundwater catchment area of the South East Lithuanian Quarter (Nemunas) [21].

Groundwater is spread throughout the territory of Vilnius NV at the top of Quarter's coating, on the first continuous watertight layer (Žemaitija svita morenal loam (g II)).The terrace of the Neries river III, which contains a large part of the buildings, will slip at an altitude of between 5,0 and 21,2 m above the ground at an altitude of between 82,3 and 86,9 m. In terrace II, groundwater will slip between 2,7 m and 5,5 m at an altitude between 80,5 and 79,3 m. The groundwater level descends in the direction of the Neries river [19].Aquifers are fine, less dusty and medium-sized sands. The watery Horizon is fed by atmospheric precipitation and is drained by the Neries river, which runs through the cleansing area in north and partially western directions.

In the PFAarea close to the surface of the land, an intermoral watery Horizon of Žemaitia-Dainava (agl II dn-žm) is covered by a water-based intermoral horizon, and at a depth of approximately 60 m (23,5 m NN) by the mervical apples (~80 m NN) of Žemaitija-Dz-dn. Even deeper (about 14 m NN) are mid-Deton (D2), about 6 m NN – silur (S) and even deeper – Ordovician (O) and Cambro (e) aquifers.

Location of the establishment in relation to water sites and drinking water source

The water site closest to the PFA plot is 1.7 km in the south-east direction of Vilnius/Bukiai, and 2,7 Vilnius (Jankiškiai) water site to the south. The Bukiai water site operates a waterborne intermoral Horizon in the Middle Pleistoceno Žemaitija-Dainava (agl II dn-žm).The waterfield has a maximum flow rate of 12000 m³/day.

There are two aquifers, both ground-based and productive interlayer, in thegeological section. The latter is mainly slippery at a depth of 20 to 30 m, with an average thickness of 15 to 20 m, separated from groundwater and the river by a layer of a mechanic loam with a thickness of 5 to 10 m thick with hydrogeological 'windows'.The aquifer consists of various grained sands and gravels. The hydraulic link between groundwater and Nerimi is poor [23].

The Jankiškis water site operates an underground (a IV) and a waterborne intermoral between Žemaitija-Dainava (agl II dn-žm).The water is situated in an old loose valley filled with aquifers of sand and gravel, the total thickness of which is 56 m in the central part of the water, and a reduction on the periphery to a maximum flow rate of 30000 m³/day in the water area between 20 and 30.

In accordance with HN 44: 2006 'Establishment and maintenance of sanitary protection zones for water areas', a penny water area is classified as a semi-enclosed sub-group of sub-groups of sub-populations (IIb2)and in the group of open water areas in the quay sub-group (IIIb1).The establishment of PFAs does not fall within the boundaries of the sanitary protection zones of water areas.

Eco-geological status of the farmland

The majority of the parcel of the PFA parcel, according to its intended use, economic activity and deployment, falls within the category III (medium sensitive) of pollution, but the part of the parcel closer to Neries and falling within

the river coastguard band is classified as the I-sensitivity (very sensitive) group and is subject to the strictest requirements [24,25].

Information on the contamination of Vilnius NV soil aeration area is not available, as no preliminary eco-geological study has been carried out.

Monitoring of the impact on groundwater is carried out onVilnius urban waste water treatment site. It is currently carried out by UAB "Vilniaus hydrogeologie" in accordance with the approved programme [20].The eastern part of the waste water treatment plant, between the aerators and the Neries river, has a cross-section of 5 supervised wells and a group of five wells is also installed in the west. The monitoring wells monitor the groundwater flowing towards the Neries river. It may be noted that the monitoring network is not optimal because it does not sufficiently represent the eastern part of the cleaning site.

Groundwater monitoring data shall be analysed in accordance with the limit values specified in the legal instruments [24,25,26].

Laboratory results from2014 show that groundwater flow is subject to a groundwater arbitrage process according to the nitrogen (N) compound group. The micro-organisms oxidisethe **reduced forms of**nitrogen compounds (**Norg**This results in an excess of only one nitrate (NO3—)ion in**the**groundwater stream during the arbitrage process, which is diluted with a clean groundwater flow onto the waste water treatment site [27].

As regards the results of the groundwater performance of Vilnius NV in 2014, it can be noted that, with the exception of nitrates, none of the components analysed exceeded the standards of the Lithuanian legislation on groundwater contamination.

Groundwater in observed wells was low to moderate in terms of electrical conductivity, COD and permanganate index [28].

4.4.2. Potential (expected) impact

This part assesses the potential effects on subsoil during the construction and operation of the site.

The upper part of the litosphere, i.e. the area of aeration and the first of the earth's surfaces, is the most sensitive to pollution and mechanical damage on the farmland. During the construction of the facilities and possible emergency situations, namely the aeration area and the groundwater aquifer, the sites will be the most exposed.

Types of potential effects on subsoil

Depending on the period of potential impact on the earth's soil, the following steps can be distinguished:

- effects during the construction of the establishment,
- effects during normal operation of the facility,
- effects in extreme situations.

Depending on the origin of the effects, the following species can be distinguished:

- natural,
- technogenic.

The effects ofnatural origin are unlikely to occur in this area and are therefore not further analysed. It is planned that the subsoil can only be affected by technogenic factors during construction and operation of the site. During reconstruction, the impact on the groundwater aquifer would be minimal, i.e. it can only be expressed as temporary hydrodynamic changes without residual effects at the top of the underground hydrosphere.

The expected effects on the soil of the aeration zone and by type of action can be broken down into:

- mechanical,
- chemical,
- mechanical-chemical.

Aquifers are more likely to be chemically exposed.

Effects attributable to ground effects:

- Mechanical when the site is reconstructed into the surface subsoil partial purchase, displacement and refilling of thelayer with new ground. The depth of mechanical effects can reach 5-6 years. With regard to safe working and environmental requirements, it is likely that the subsoil effects that may occur during the construction of the facilities will be minimised without significant exposure to the underground hydrosphere.

- Chemical effects areunlikely to occur except in emergency cases.

Table4.4.1: Timing and types of potential effects on subsoil at different stages of the facility's operations

Construction and operation of the facility phase	**Timing of potential impacts**	**Type of potential impact**
At the time of construction of the site	Short-term	Mechanical
Normal operation of the facility at the time	No impact*	No impact *
During emergencies	Short-term	Chemical – mechanical
	Long-term	Chemical

* – When the plant is built and put into service and in normal operation mode, there will be no direct impact on the depth of the earth.

Exposure to hazardous substances in the presence of soil

In emergency situations, in cases of significant surface spillage of dangerous substances, there is a likelihood that part of the surfaces not covered by non-conductive coatings or pollutants spilled due to leaks from pipes and tanks that could contaminate the soil and groundwater of the aeration area may enter the ground.

A preliminary assessment of the data shows that, from an ecohydrogeological point of view, the PFA site is considered to be a highly sensitive area to technogenic pollution.

The level of pollution of groundwater and soil by chemical substances is regulated by the 'Environmental protection requirements for the management of chemically contaminated sites' [25] and, for petroleum products, by LAND 9-2009 'Environmental protection requirements for the management of areas contaminated with petroleum products' [24] and approved by Order No 1-06 of the Director of the Lithuanian Geological Survey under the Ministry of the Environment of 3 February 2003, 'Procedure for inventory and collection of information on the release of dangerous substances into groundwater' [26].

Waste water treatment plants fall under Annex 1 of the 'Environmental protection requirements for the management of chemically contaminated sites' [25] as potential pollution objects for soil, soil and groundwater. In so far as it falls within the coastal protection zone of the Neries river, Annex 2 to this document provides that a PFA site is a sensitive (mediumly sensitive) pollution group III.

Under normal operating mode, theVilnius waste water treatment plant is unlikely to be subject to subsoil pollution. The hydrochemical status of groundwater is also unlikely to deteriorate due to existing and planned activities.

Conclusion.

When operating under normal operating mode,Vilnius waste water treatment plant will not have an

impact on the depth of the land.4.4.3. Reducing measures

In order to avoid or minimise potential effects in emergency situations, the following mitigation measures shall be provided for at the establishment:

- the incoming waste water site will be covered with a non-conductive coating;
- the site is equipped with a collection system for storm water,
- The PFA site has a groundwater impact monitoring system in accordance with legal requirements and a groundwater impact monitoring is carried out (see Chapter 7) and results show signs and dispersion of potential pollution and immediate preventive measures.

4.5 Biodiversity

The Vilnius waste water treatment site does not enter the protected natural areas but borders the Neries river, a Natura 2000 site, an area of importance for the conservation of habitats.

The area of agricultural land in the vicinity ofVilnius NV is common in the former areas of broadleaved and non-moral-herbaceous spruce. According to the florist-phytocenological district, the area belongs to the district of the Länder-Neries mid-river plain. The area has a forest content of between 30 % and 40 % of the total area of the site. Forested areas are dominated by pine and spruce. Species of vegetation specific to the area: grenadier, greater blackhead, longhead clover, pealea vetch, woody belly [22].

As the area is highly urbanised, the distribution of fauna in the area is not abundant. Wild boars, squirrels, squirrels, scabbards and beaches live in forested areas and their surroundings.

The waste water generated by the activities of theVilnius waste water treatment plant is fed into the existing domestic waste water network, which is sent to the waste water treatment plant and discharged to the Neries river. The current hydraulic efficiency of the reconstructed Vilnius waste water treatment plant – 225000 m^3/d·After the reconstruction, will not change the hydraulic efficiency of the Vilnius waste water treatment plant, i.e. the amount of treated waste water discharged will not increase and therefore no negative impact on the Neries river is expected.

There is no botanically valuable vegetation in the FAS area. The PFA site is industrial, free of protected animals and no negative impact on biodiversity is expected, both during site reconstruction and during operations.

4.6 Landscape

The area ofUAB “Vilniaus vandenys” is heavily urbanised and has no value in terms of landscape. There is already a local industrial landscape in the site environment.

Existing buildings and installations are planned to be reconstructed, so that PFAs will not have a negative impact on the landscape.

4.7 Socio-economic environment

Information about the area

At the beginning of2014, Vilnius City Municipality had a population of 539.7 thousand inhabitants (Vilnius: 529 thousand, representing 18 % of the total population in Lithuania), with 64.4 % of the working-age population, 19.3 people of pensionable age and 16.3 % children under the age of 16. Compared to the structure of the population of Lithuania as a whole (the country’s working-age population was -61.9 %, the country’s retirement age population 22.4 % and children under the age of 16 15.7 %), Vilnius City Municipality had an increase of 4 % of the working-age population. Women (298 thousand) were 23.3 % more than men (241.7 thousand).Natural population change is positive, i.e. more people are born than die [29].

At the end of2012, foreign direct investment (FDI) in Vilnius City Municipality amounted to LTL 25.9 billion (or EUR 7.5 billion), representing 62 % of the country’s total FDI.Vilnius County’s Gross Domestic Product (GDP) amounted to LTL 43.7 billion (or EUR 12.6 billion) in 2012, representing 38.5 % of the country’s total GDP.LTL 54.3 thousand (or 15.7 thousand) per inhabitant of the county.(euro) GDP.The largest share of gross value added was generated in the wholesale and retail trade, transport and storage, hospitality and food services (33.1 %) and industry (19.4 %) [29].

Table4.7.1: Vilnius City’s socio-economic indicators [30].

Indicators*	**2015**	**2014**	**2013**	**2012**
Population	542.664	539.939	538.747	534.056
Number of children per 1000 inhabitants	183.35	180.8	179	179.04
Number of young people per 1000 inhabitants	190.01	199.89	207.8	182.21

Indicators*	2015	2014	2013	20
Retired population for 1000 population	N/d	192.53	193.4	195.11
Number of disabled persons over the age of 18 Per 1000 inhabitants	N/d	N/d	51	52.65
Number of persons declared for departure abroad Per 1000 inhabitants	N/d	0	12.4	7.1
Number of declared arrivals from abroad Per 1000 inhabitants	N/d	N/d	8.7	7.44
Number of recipients of social benefits for 1000 population	N/d	22.03	25.69	30.64
Number of recipients of compensation for domestic heating 1000— IO population	N/d	N/d	44.1	40.63
Number of registered unemployed persons per 1000 inhabitants	N/d	N/d	52.09	58.63
Number of registered unemployed persons for 1000 working age population	N/d	N/d	80.97	90.82
Number of young registered unemployed persons under the age of 25 1000 young people	N/d	N/d	29.03	36.1
Number of registered long-term unemployed for 1000 population	N/d	N/d	11.91	16.05
Number of old-age pensioners per 1000 population	N/d	184.92	183.51	184.69
Average salary of insured persons, LTL	N/d	N/d	2427.75	2326.4

The comparative table shows the ratio of Vilnius City Municipality's indicators per inhabitant to the corresponding country average per capita. In most cases, Vilnius City Municipality scores below the national average. By way of exception, unemployment rates are below the national average. Average wages in Vilnius City Municipality are above the national average.

Table4.7.2: Comparative table [30]

Comparative table	2014	2013	2012
Number of children per 1000 inhabitants	98.09 %	96.1 %	93.7 %
Number of young people per 1000 inhabitants	104.42 %	86.14 %	88.3 %
Retired population for 1000 population	86.37 %	87.2 %	89.1 %
Number of disabled persons over the age of 18 Per 1000 inhabitants	N/d	65.93 %	69.06 %
Number of declared departures 1000— IO population	N/d	92.52 %	96.25 %

Comparative table	2014	2013	2012
Number of declared arrivals from abroad Per 1000 inhabitants	N/d	112.85 %	110.04 %
Number of recipients of social benefits per 1000 inhabitants	N/d	41.52 %	45.64 %
Number of recipients of compensation for domestic heating for 1000 population	64.1 %	61.49 %	57.58 %
Number of registered unemployed persons per 1000 inhabitants	77.09 %	81.31 %	89.11 %
Number of registered unemployed persons for 1000 working age population	73.76 %	77.5 %	85.41 %
Number of young registered unemployed persons under the age of 25 young people	73.71 %	76.59 %	99.5 %
Number of registered long-term unemployed for 1000 population	62.13 %	73.23 %	76.41 %
Social expenditure for municipal and public budgets per capita support, LTL	N/d	N/d	80.78 %
Number of old-age pensioners per 1000 inhabitants	92.03 %	92.33 %	95.2 %
Average salary of insured persons, LTL	127.85 %	128.4 %	128 %

Potential (expected) social – economic environment

The impact of PFAs on the labour market in the area will have a marginal positive impact during the period of reconstruction of the UWWTP through the creation of temporary jobs in the construction sector.

The PFA will not have an impact on the demography, tourism and recreation of the area, and the value of the real estate will not be affected, as the planned economic activity is foreseen in the area of existing urban waste water treatment plants in Vilnius.

It must be assumed that PFAs will not give rise to negative public reactions.

Cost-effective and eco-efficient technologies will reduce the cost of environmental measures and the cost of services.

Financial – economic overview of LFAs

The financial – economic overview of the PŪV is provided on the basis of a feasibility study carried out by UAB “APVG” on behalf of UAB “Vilniaus vandenys” in 2014 on the analysis of the needs and feasibility of reconstructing the biological treatment plant of Vilnius waste water treatment plant [31].

The financial analysis assessed the financial return and viability of the option chosen for the project to reconstruct the biological treatment plant in Vilnius waste water treatment plant.

The following assumptions were applied in the financial analysis of the project:

- the analysis uses constant prices without inflation adjustments;
- value added tax is excluded from the financial calculations.

- the funding sources for the project are the financial support of the European Union (50 %) and the loan from the Ministry of Finance (European Investment Bank) (50 %).The terms of the planned loan are as follows: The duration of the loan is 20 years, the annual interest rate is 3 %, the loan is deferred for 3 years and the repayment of the loan is in equal instalments.

The following provisions shall be complied with:

- The project will be implemented in accordance with the principles of payback and availability, contributing to the development of a policy on water supply and wastewater disposal prices.
- Cost-effective and eco-efficient technologies will reduce the cost of environmental measures and the cost of services. The objectives of the project will enable the achievement of universal well-being for current and future generations.

The operating revenue of the project consists of the company's revenue from waste water treatment, which is an integral part of the price of drinking water supply, waste water treatment and sales services. The pricing of drinking water supply, waste water treatment and sales services is governed by the methodology for setting prices for drinking water supply and waste water management services approved by Resolution No O3-92 of the State Control Commission for Prices and Energy of 21 December 2006 (version of 17.07.2011, Official Gazette 2011, No 89-4303).For the purpose of determining the revenues of the project, the prices were calculated using the abovementioned methodology of the National Control Commission for Prices and Energy. As loan funds will be used to finance the project, in order to ensure the financial viability of the project, the estimated prices have been adjusted accordingly to the extent necessary to ensure the financial viability of the project. Since, in accordance with the provisions of the above-mentioned methodology, prices are fixed for a period of at least 3 years, the calculations have resulted in the fixing and adjustment of prices every 3 years: 2018-2020, 2021-2023, etc.

Taking into account the operational costs of the project and the need for funds to ensure the financial viability of the project, part of the cost of drinking water supply, wastewater treatment and sales services is allocated to waste water management (excluding sludge treatment) as shown in Table 4.7.3. below.

Table4.7.3: Cost of waste water management

Period	**2018 2020**	**2021 2023**	**2024 2026**	**2027 2029**	**2030 2032**	**2033 2035**	**2036 2038**	**2039 2041**	**2042 2044**
Waste water Handling cost EUR/m³	0,21	0,21	0,21	0,21	0,22	0,21	0,21	0,21	0,21

The reference period for the project is 30 years, covering both the project investment period of 3 years (I – EUR 538307.17 excluding VAT, II – EUR 18899347.49 excluding VAT, III – EUR 7994284.64 excluding VAT, total:**EUR 27431939,30 excluding VAT**) and 27 years for the economically useful life of the assets generated by the project. The reporting period starts in 2015 and is the first year of the project reference period.

The financial analysis assessed that the **project** remains **viable** throughout the reporting period. In addition, when assessing the risks, it must be concluded that the likelihood of a project being socially disadvantageous is minimal from an economic point of view and that the **risk is therefore acceptable**.

The results of the socio-economic analysis suggest that the**socio-economic benefits outweigh the expected costs**.The need for the project is based even on the application of pessimistic cost-benefit estimates. Against this background, it can be said that the real social benefits of the project are even higher.

Measures to reduce the impact on the environment

Since no negative impact on the socio-economic environment is foreseen for PFAs, no mitigation measures are proposed.

4.8 Cultural heritage sites and sites

The closest cultural heritage sites to the Vilnius waste water treatment site are located (Figure 1):

- The border ancient settlement II (unique object code 31930) is 0,18 km north;
- Narava pilocal (unique object code 17206) situated at a distance of 0,2 km in a western direction;
- The border ancient settlement (unique object code 16469) is 0,3 km north;
- Gudeles, Polish greyland, so-called 'Greek'Svedkapiai (unique object code 5644) situated at a distance of 0,45 km in the south-east direction;
- Grigiškių, Narava Greyapyn, so-called 'Grigiškių',Kapiais (unique object code 3512) situated at a distance of 1,2 km in the south-western direction.

Cultural heritage sites, archaeological and historical monuments are excluded from the boundaries of the planned economic activity, so that the reconstruction of the waste water treatment plant will not adversely affect them.

4.9 Public health

Apublic health impact assessment shall be carried out in the area of potential effects. Adverse effects on human health are measured when environmental pollution (ambient air, noise and other factors whose permitted levels are regulated by legislation in a residential or equivalent area) exceeds the prescribed limit values.

4.9.1. Populationdata analysis

The reconstruction and operation of theVilnius urban waste water treatment plant will be carried out in the Vilnius waste water treatment site, which is located in the city of Vilnius (address: Rittnago g. 74. Vilnius City Municipality is located in south-eastern Lithuania, near the Neries river. The city of Vilnius is bordered to the north, east and south by Vilnius district, to the south-west by the Trakai district, and to the north-west of Vilnius city is the municipality of Elektrėnai.

Vilnius is located in south-eastern Lithuania. Located at the junction between Vilnius and Neries. Approximately 20 km south of the geographical centre of Europe. Vilnius is 312 km from the Baltic Sea. The urban area is 402 km$^{2.}$

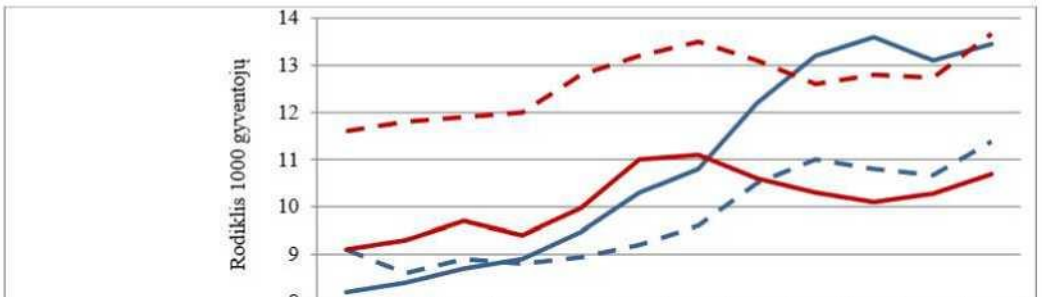
Buildings account for 20.2 % of the urban area. Forests account for 43.9 % of urban areas and 2.1 % of waters. Three larger rivers pass through Vilnius: Neris, Vilnius and Voke.

The city of Vilnius covers an[area] of 401 km² with a population density of 1380.4 inhabitants/km².

Vilnius city has the lowest retirement age population (~1 % lower than county rate) and the highest working age population (~2 % higher than county) compared to the neighbouring municipalities of Trakai and Elektrėnai, while the share of children under 15 is slightly below the county average.

In2013, 538430 people lived in the city of Vilnius, representing 18.2 %.Lithuanian populations.44,8 per centThe population of Vilnius was male, with 55.2 % of the population. Women. The population decreased compared to the previous year. Children up to 17 accounted for 18.02 %.The share of the total population of Vilnius city, women of child-bearing age (15-49), is 26.51 %.All women. The percentage of people aged 18-44 was 41.55 %.25.01 % of the population aged 45-64, 15.43 % of the population aged 65 and over. Residents of Vilnius.

Lithuania's population has declinedover the last few years, and therefore the municipality of Vilnius, which has witnessed a sharp drop in population between 2009 and 2014, is not the exception. Statistics show that 553 034 people lived in Vilnius in 2011 and 535216.2013 in 2012: 530 405 people. However, since 2014 there has been an increase in the population of the city of Vilnius: Up to 539,707 persons in 2014 and, according to preliminary figures, up to 542,664 persons in January 2015. In 2013, 530 405 people lived in the city of Vilnius, representing 18.2 %.Lithuanian populations.44,8 per centThe population of the City of Vilnius was male, with 55.2 % of the population. Women. Children up to 17 accounted for 18.02 % of the total population in Vilnius, while women of child-bearing age (15-49) accounted for 26.51 % of all women. Between 18 and 44 year olds accounted for 41.55 % of the population, 25.01 % for people aged 45-64 and 15.43 % for those aged 65 and over. Residents of the City of Vilnius.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Gimstamumas (Vilnius)	8,2	8,4	8,7	8,9	9,47	10,3	10,8	12,2	13,2	13,6	13,1	13,45
Gimstamumas (Lietuva)	9,1	8,6	8,9	8,8	8,94	9,2	9,6	10,5	11	10,8	10,67	11,38
Mirtingumas (Vilnius)	9,1	9,3	9,7	9,4	9,97	11	11,1	10,6	10,3	10,1	10,28	10,69
Mirtingumas (Lietuva)	11,6	11,8	11,9	12	12,8	13,2	13,5	13,1	12,6	12,8	12,74	13,67

Figure 4.9.1Changes in fertility and mortality 1000 alive.2001-2012 Vilnius and Lithuania

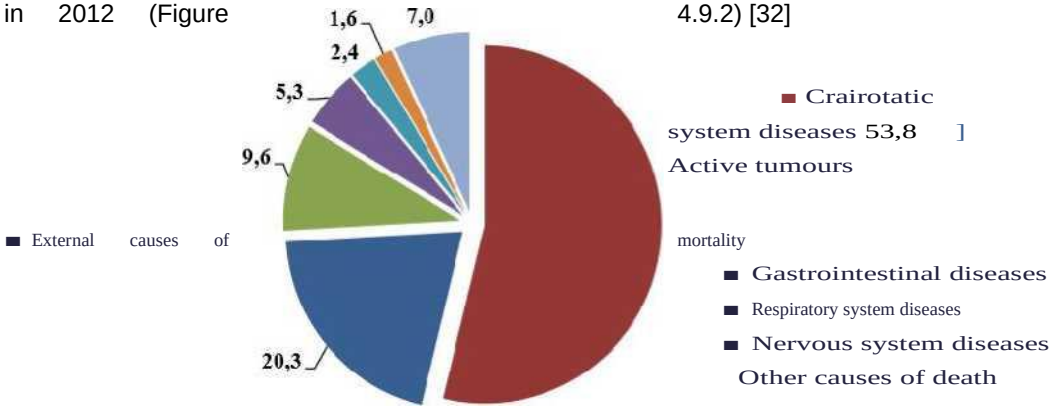
Source: Institute of hygiene

The birth rate inVilnius, which has deteriorated for several years, improved to 13,45/1000 inhabitants in 2012, with an increase of 10.69/1000 inhabitants in 2012, and started to decline from 2013 onwards. Vilnius City has a higher birth rate and a lower mortality rate than in Lithuania.

Natural population growth has been positive in Vilnius since 2008, with 2.77/1000 inhabitants in 2012, while Lithuania was negative at -2.29/1000 live.

In Vilnius, 5740 inhabitants died in 2012 (5682 in 2011).Compared to the Lithuanian average (with 1273.6 deaths per 100000 inhabitants), the death rate in the capital city is lower (1027.4 deaths per 100000 inhabitants).In the municipality of Vilnius, mortality is among the lowest compared to other municipalities in the country (less than in Neringa – 970.15 deaths per 100000 inhabitants), which is partly due to the higher population of the capital of working age. Despite this fact, over ten years the number of deaths per 100000 inhabitants increased from 910.9 in 2001 to 1072.46 in 2012. The most accurate differences in mortality between men and women are reflected in standardised mortality rates (per 100000 inhabitants according to the European standard, when the age and gender factor is eliminated).In 2012, the standardised mortality rate for men in Vilnius (1185/100000 inhabitants) was twice as high as for women (559.44/100000 inhabitants).

As in Lithuania as a whole, the main causes of death in the capital city have remained unchanged for many years. Circulatory diseases, malignant tumours and external causes of death accounted for 83.7 % of all causes of death in 2012 (Figure 4.9.2) [32]



4.9.2 figure: Vilnius City Death Structure, 2012 (%)
Source: Vilnius Public Health Office

2010 inand 2011, there was a slight change in the overall incidence of different diseases in the population, with the largest increases due to respiratory diseases: In 2010, there were 410.7 cases per 1000 inhabitants and 474.4 in 2011. Since 2012, in Vilnius, infections and parasitic diseases, diseases of blood and blood, nervous system, eyes, ears, respiratory, digestive, urogenital system diseases and, to a lesser extent, endocrine, circulatory, urogenital system diseases and mental and behavioural disorders have increased in comparison with Lithuania's average overall morbidity. In 2012, residents in Vilnius were most affected (new and repeated cases) by respiratory, circulatory, eye, connective tissue and skeletal musculoskeletal and urogenital disorders.

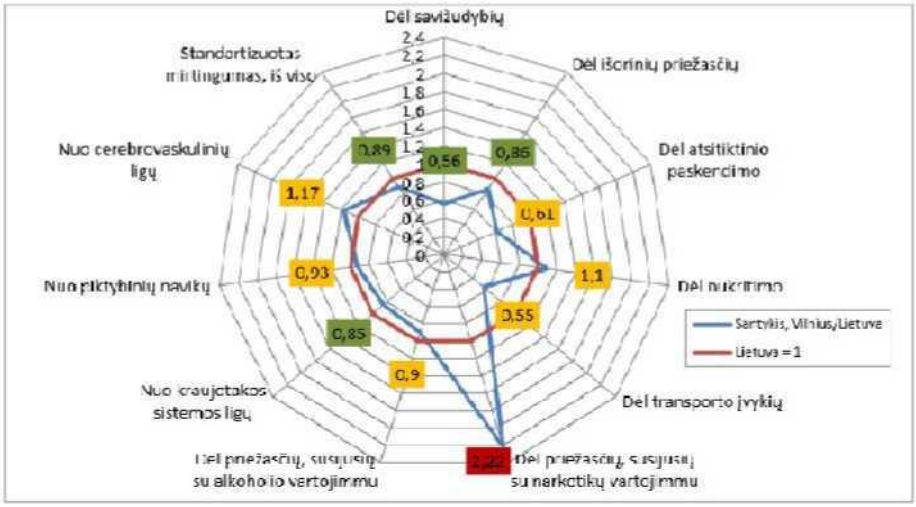
While theoverall average rate of hospitality in the city of Vilnius will increase slightly (from 327 cases per 1000 inhabitants in 2002 to 334 cases per 1000 inhabitants in 2010) under current conditions, hospitalisation needs will increase more and the structure of hospital needs will change as the population grows, and in particular as the population ages. Total Hospital Morbidity in Vilnius County 2002

there were 255 cases per 1000 inhabitants in. If current conditions do not change, the overall average hospitalised morbidity rate will be 252 per 1000 inhabitants in 2010.

2011 in 100, there was an increase in the number of people with recorded trauma or other external cause (poisoning, burns, accidental drownings, transport events, etc.) (13 341.8 persons per 100 000 inhabitants).In 2012, the traumatism rate fell to 12 743.8 people per 100 000 inhabitants. Looking at the health indicators of the inhabitants of the city of Vilnius over the last few years, since 2011 there has been an increase in standardised mortalities following a fall in injuries, which amounted to 14 619 people per 100 000 inhabitants in 2013.

Among the factors in the physical environment which affect public health, the following shall be distinguished: Indicators for bathing water quality, central drinking water quality, air quality (particulate concentrations, nitrogen dioxide (NO_2), sulphur dioxide (SO_2),ozone (O_3),carbonmonoxide (CO), benzopyrene) in Vilnius city.

Microbiological qualitative water indicators tested during the2013 bathing season were in line with hygiene standards on all official Vilnius city beaches. In 4 Vilnius city water sites, the total iron concentration and even 5 manganese concentrations exceeded those laid down in Hygiene Standard 24: 2003 'Requirements for safety and quality of drinking water'.Although 2011 and
2012 No air quality study station recorded more than permitted particulate air pollution in a year, but when the results of the air quality study are summarised, emissions to the atmosphere from stationary sources of pollution are on average 0.04 times higher than the Lithuanian average per km in Vilnius.



4.9.3 figure: Standardised comparison of Vilnius mortality rates (population 100 000) with Average for Lithuania, 2013
Source: Vilnius Public Health Office

Mortality statistics are important as they reflect the general health status of the population, the effectiveness and quality of healthcare, health inequalities and access to healthcare. We therefore provide an analysis of mortality rates based on the main causes of death – a comparison between Vilnius City Municipality and Lithuania (based on the calculated ratio between Vilnius City and Lithuanian average, traffic light principle) (Figure 4.9.3).

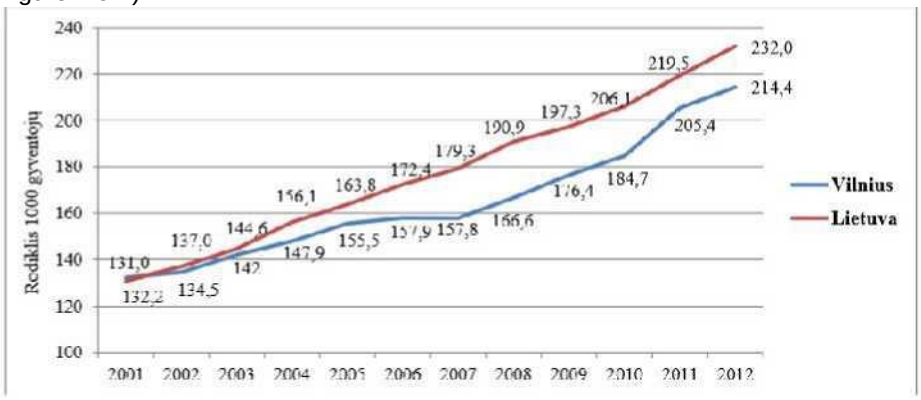
In the municipality ofVilnius, mortality is one of the lowest in comparison with other municipalities in the country in 2013 (lower in Alytus only 1078.86 deaths per 100 000 inhabitants), which is partly due to the higher population of the capital of working age. Despite this fact, over ten years, the number of deaths per 100 000 inhabitants increased from 976.76 in 2003 to 1079.43 in 2013. The most accurate differences in mortality between men and women are reflected in standardised mortality rates (per 100 000 inhabitants according to the European standard, when the age and gender factor is eliminated).In 2013, the standardised mortality rate for men in the city of Vilnius (1180.85 per 100 000 inhabitants) was more than twice as high as for women (539.78/100 000 inhabitants) [33].

As for the average age, Vilnius's demographic old-age ratio was lower in 2014 than in Lithuania, with 86 and 126 older people aged 60 and over, respectively, for hundreds of children under the age of 15.

Density: In 2013, Vilnius County had a population density of$^{1354/km^2}$ (Lithuania 52.8).

At the beginning of 2014, the number of children (0-17) in the country was similar to that of the retired population (18.4 % and 18.2 % of the country's total population respectively).

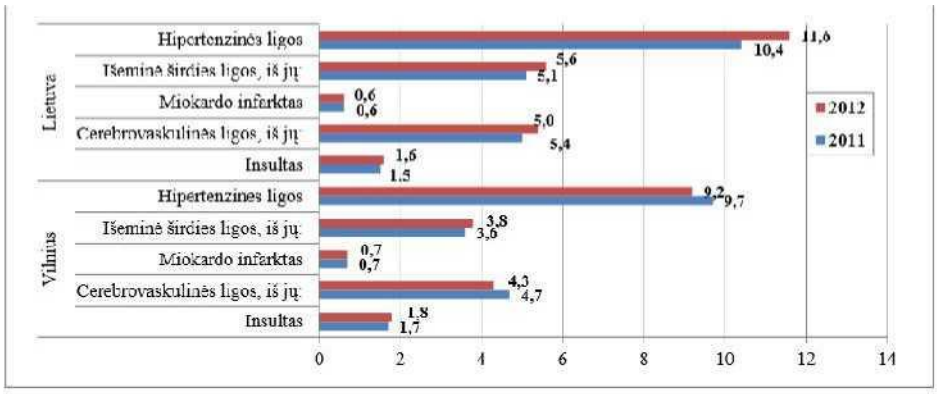
According toHI SIC, the number of people suffering from circulatory diseases is increasing every year in Vilnius, as in Lithuania as a whole. Vilnius City had 1000 inhabitants in 2012
214,4 the number of people suffering fromcirculatory diseases (Lithuania -232.0 inhabitants) was lower than -132.0/1000 live in 2001.(Lithuania-131,0/1000 inhabitants).The capital city observed a lower number of people with these diseases between 2002 and 2012 compared to the Lithuanian average (Figure 4.9.4).



4.9.4 figure: Changes in the number of people suffering from circulatory diseases, 2001-2012
Source: Institute of hygiene

In 2012, more women than men were registered with circulatory diseases in Vilnius: 1000 inhabitants accounted for 182.1 men (Lithuania 187.4) with circulatory diseases and 240.6 women (Lithuania 270.0).

Circulatory diseases are a problem for older people. The number of patients with diseases in the circulatory system increases significantly with age. In 2012, there was an increase in the number of patients in all age groups compared to 2011.



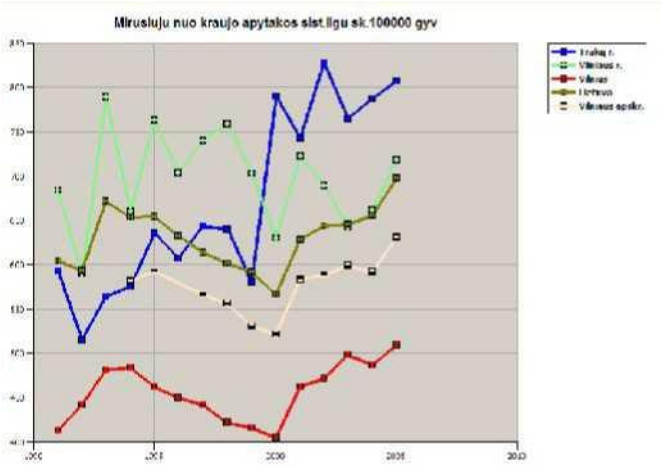
4.9.5 figure: Incidence (emergency) of some diseases in the circulatory system 1000 live. Vilnius and Lithuania between 2011 and 2012. Source: Institute of hygiene

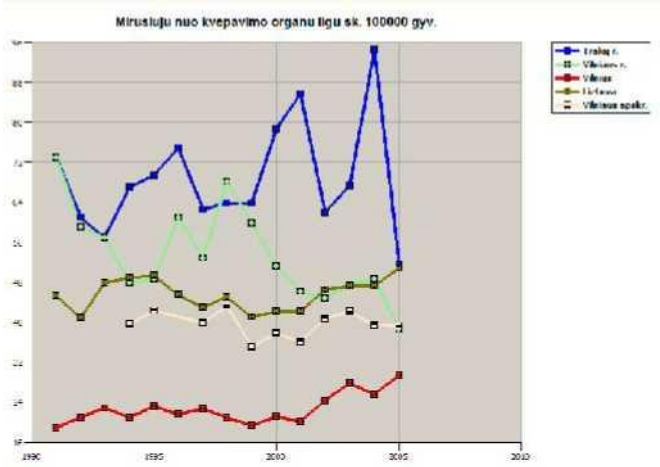
In 2012, in contrast to Lithuania, there were fewer new cases of circulatory diseases in Vilnius than in 2011. The incidence of these diseases in the capital city was 39.0 new cases per 1000 inhabitants in

2012 (40.4 in 2011) and 43.1 new cases in Lithuania (28.9 in 2011).

In 2012, the number of new cases of ischaemic heart disease in 1000 inhabitants was slightly higher than in 2011 (3.8 in 2012, 3.6 in 2011), with myocardial infarction remaining the same (2012 and 0.7 in 2011).

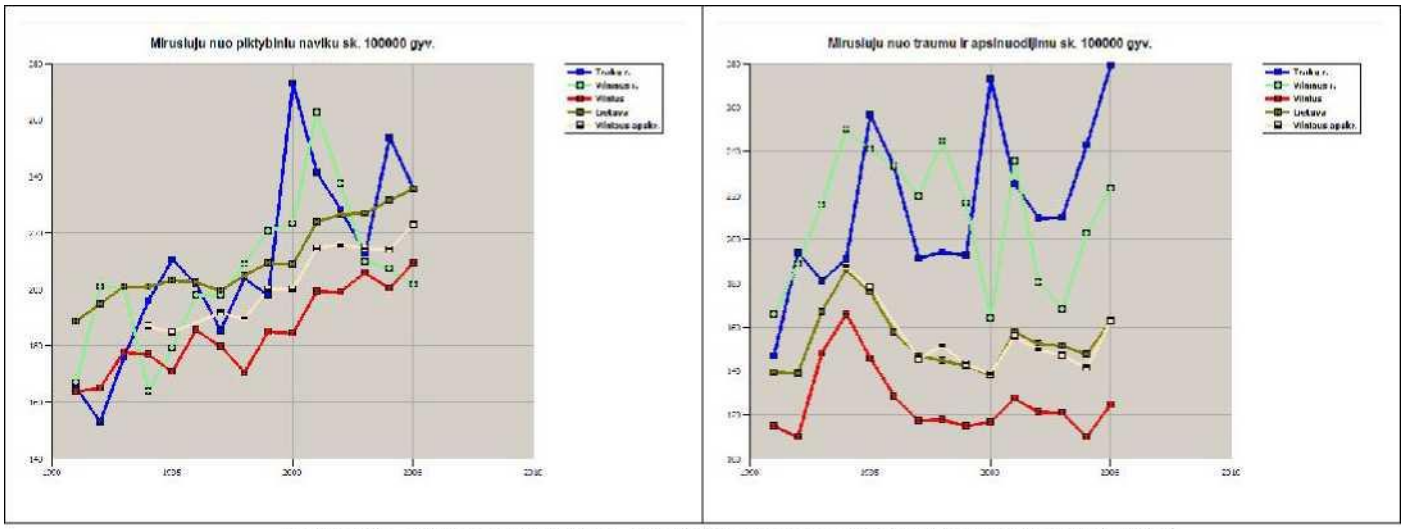
The overall death rate of the inhabitants of the City ofVilnius (100 thousand inhabitants) is among the lowest in comparison with neighbouring municipalities. The overall mortality rate in Vilnius County is 1193.6/100 thousand inhabitants and less in Vilnius City 996.73/100 thousand lives.(Figure 4.9.6).





In Vilnius, the number of cases of circulatory and respiratory leagues was 1.3 times lower than in Vilnius county as a whole. The highest mortality rate is associated with circulatory diseases in the Trakai district, reaching 807.6/100 thousand inhabitants and respiratory diseases in Elektrėnes (53/100 thousand inhabitants).

The overall morbidity rate of the city of Vilnius is among the highest in the county and stands at 2269.52 per cent of the population, but this is only 5 % higher than the county average.



4.9.6 pav. Vilniaus apskrities gyventojų mirtingumo rodikliai (100 tūkst. gyv.)

The main cause of illness inVilnius is respiratory tract, nervous system, skin, infectious and parasitic

diseases. Since 2001, more respiratory and digestive diseases have been diagnosed every year, but the incidence of infectious/parasitic, nervous systems and sensory diseases is gradually decreasing (Figure 4.9.7).

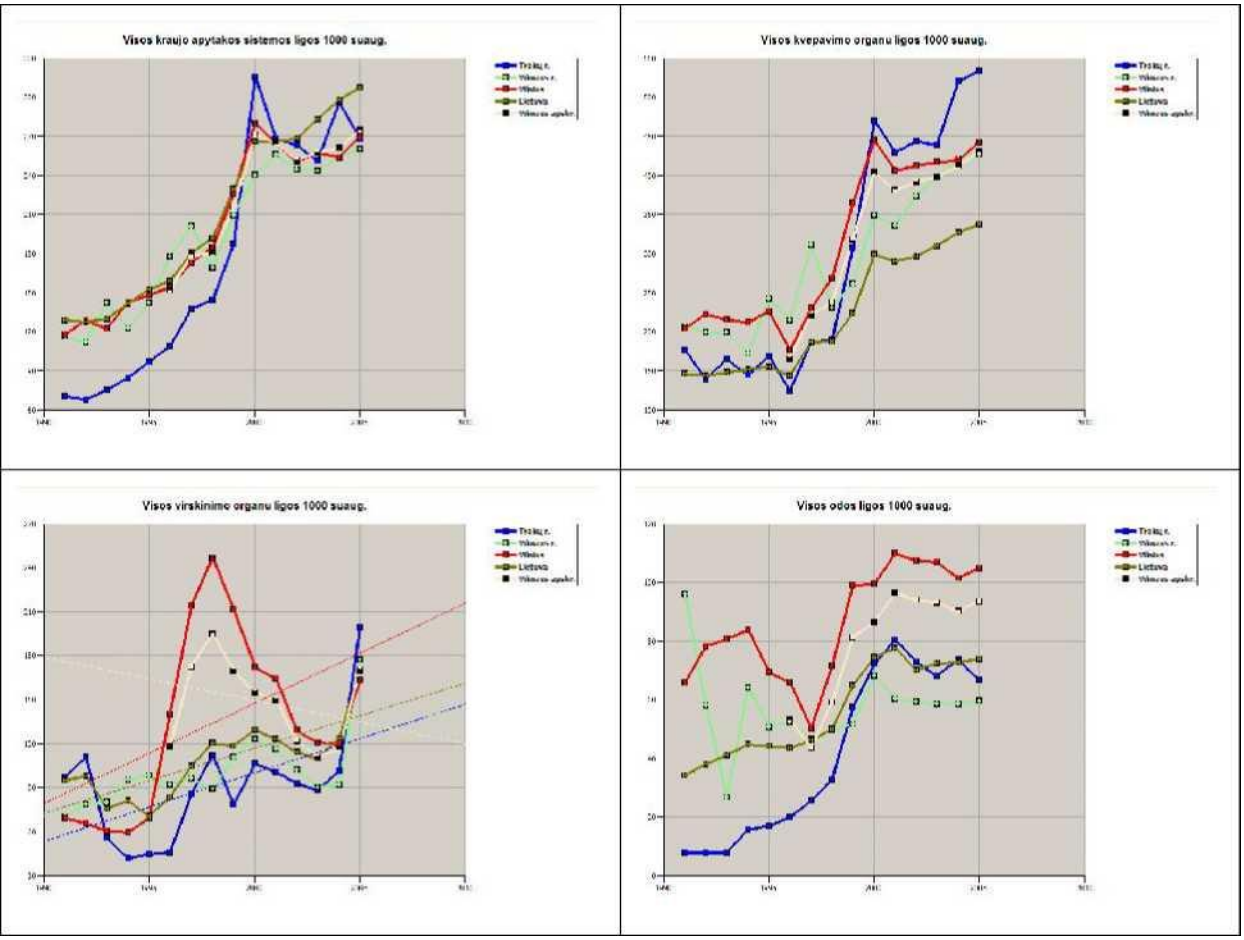


Figure 4.9.7Rate of morbidity in the population of Vilnius County (100 adults)

Temporary incapacity

Source

: Institute of hygiene

Temporary incapacity due to injuries and illnesses in Vilnius City in 2005 on paid sick days is lower than the Lithuanian average (5.67 days) and 4.61 days. This is much higher in the Trakai district and amounts to 8.49 (Figure 4.9.8).

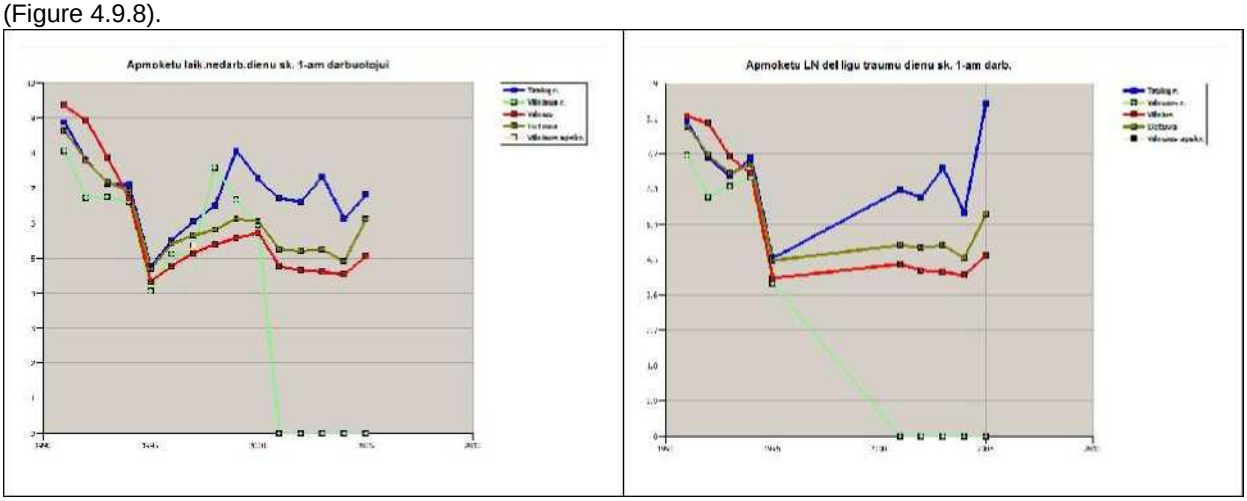


Figure 4.9.8Indicators of temporary incapacity of residents in Vilnius County (No. of days)(Op. 1)

Primary invalidity of the population Source: Institute of hygiene

The primary disability of the population in Vilnius is dominated by circulatory system diseases (19.48/10 thousand people of working age, 2005), malignant tumours (9.81), nervous system diseases (4.99), respiratory systems (1.83) and occupational diseases (0.14/10 thousand inhabitants, 2003).

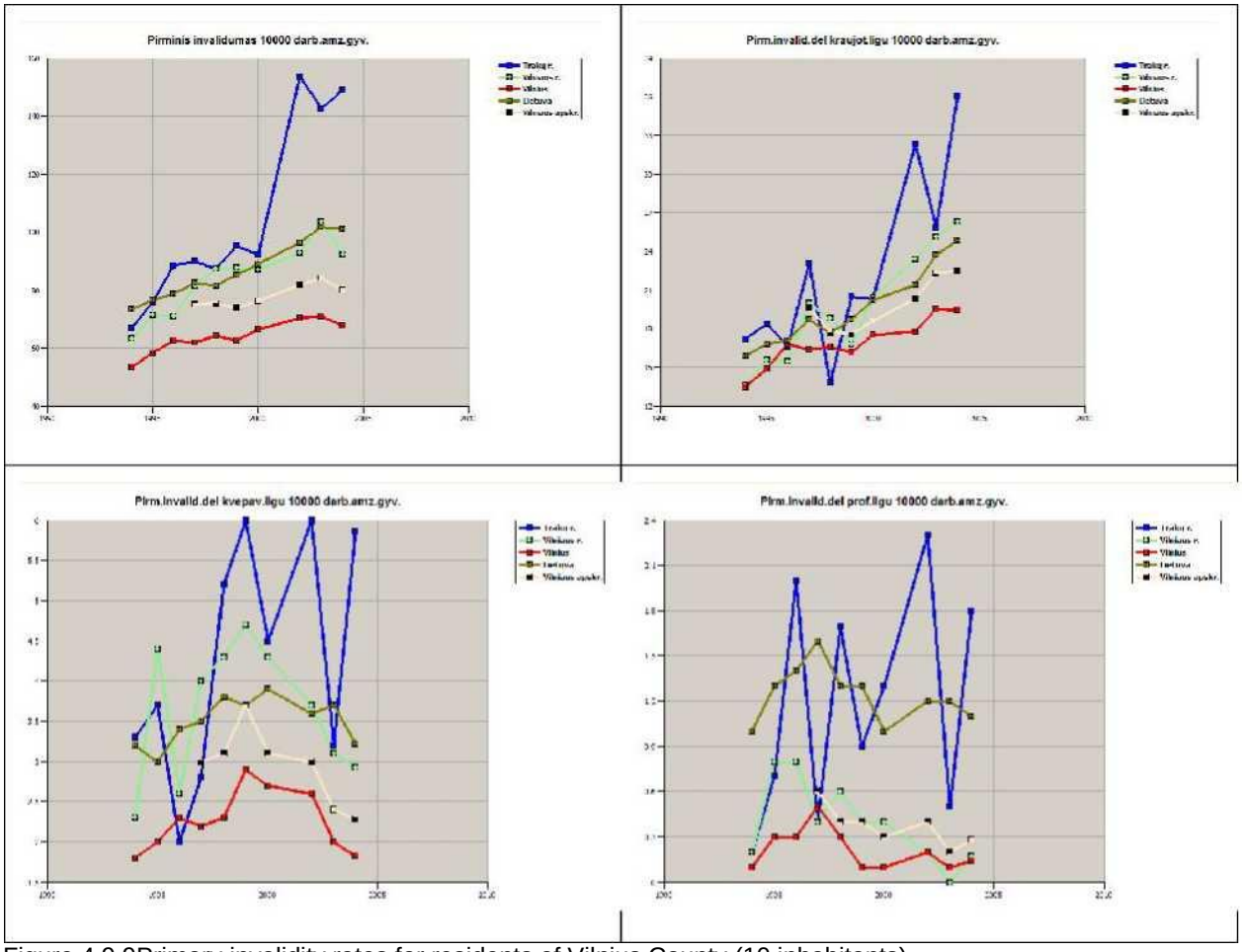


Figure 4.9.9Primary invalidity rates for residents of Vilnius County (10 inhabitants)
Source: Institute of hygiene

4.9.2 Analysis of health determinants

Depending on the nature of the planned economic activity (reconstruction and operation of the Vilnius urban waste water treatment plant), the following risk factors may be considered:

- Ambient air pollution from equipment and motor vehicles;
- Odour contamination;
- Industrial noise;
- Risks to workers;

4.9.2.1 Ambient air pollution

Environmental air pollution isone of the main economic factors that may have an impact on public health. A more detailed description of the ambient air pollution caused by the planned economic activity is given in section 4.2.2.

As a result of the reconstruction of the Vilnius Waste Water Treatment Plant, troughs, grates, transporters, carrier and sand washing/drying facilities or other areas in which unwashed carriers have direct contact with ambient air from the reconstructed grid building will be completely covered and local shutdowns to the treatment plant in biofilters – a.t.š. 011.

Reactions in sludge hydrolysis tanks produce flammable and odour-emitting gases. In order to avoid air pollution and odours spreading to the environment, it is necessary to fully cover the sludge hydrolysis capacity. The containers are equipped with ventilation that will extract the contaminated air and direct it to the air purification plant via biofilters – a.t. 012.

Planned economic activity: Rehabilitation and operation of Vilnius urban waste water treatment plant will have an impact on ammonia and sulphur hydrogen emissions to the ambient air. The purpose of this environmental impact assessment is to establish an effective sanitary protection area for the entire Vilnius urban waste water treatment plant, including the sludge farm, and therefore additionally presents the results of the modelling of the dispersion of emissions from sludge management in accordance with the “Environmental Impact Assessment Report on the construction and operation of sludge final disposal facilities” [14]

Table4.9.1: Results of emission dispersion simulations

Contaminant name	Limit value		Without background pollution		Assessment of background pollution	
			Cmax	Cmax/ cut-off value	Cmax	Cmax/ cut-off value
	average	[pg/m3]	[pg/m3]	[unit dl]	[pg/m3]	[unit dl]
1	2	3	4	5	6	7
Ammonia	0,5 hour	200	8,14	0,041	181,35	0,907
Hydrogen sulfide	0,5 hour	8	0,47	0,058	0,47	0,058
Carbon monoxide	8 hours	10000	31,09	0,003	336,21	0,034
Particulate matter (PM10)	24 hours	50	0,15	0,003	16,23	0,325
	1 years	40	0,07	0,002	15,44	0,386
Particulate matter (PM2,5)	1 years	25	0,03	0,001	—	—
VOC	0,5 hour	5000	6,35	0,001	904,80	0,181
Hydrogen chloride	0,5 hour	200	1,57	0,008	5,76	0,029
Hydrogen fluoride	0,5 hour	20	0,10	0,005	0,38	0,019
Sulphur dioxide	1 hours	350	26,16	0,075	56,13	0,160
	24 hours	125	13,92	0,111	34,86	0,279
Nitrogen dioxide	1 hours	200	41,41	0,207	61,08	0,305
	1 years	40	3,11	0,078	18,08	0,452
Cadmium, Thallium	1 years	0,005	1,60E-04	0,032	5,80E-04	0,116
Mercury	0,5 hour	0,9	1,28E-03	0,001	4,69E-03	0,005
Antimony	0,5 hour	1,5	0,01	0,009	0,05	0,032
Arsenic	24 hours	1	0,01	0,013	0,05	0,047
Lead	1 years	0,006	1,60E-03	0,267	5,94E-03	0,990

Chromium Cobalt Copper Manganese Nickel Vanadium						
Dioxins Furans	0,5 hour	10	2,61 E-06	2,61 E-07	6,40E-06	6,40E-07
Mercaptans	—	—	0,23	—	—	—

Mathematical modelling of the dissipation of pollutants in ambient air without backgroundemissions resulted in a maximum concentration of 27,1 % of the 1-hour average time interval of sulphur hydrogen and 4,1 % of ammonia for 1 hour, total concentrations of antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium, which were 27,1 % of the average time interval of the year, and 21 % of the concentration of nitrogen dioxide at 1 p.m. for other environmental pollutants.

When assessing the dispersal of emissions from the facility, together with background pollution, it was found that the highest combined concentrations of antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium were 99 %, ammonia 1 hour concentration was 91 % for the residential environment, lower concentrations for other pollutants and 6.4E-05-45 % of the limit value for the residential environment.

Therefore, taking into account the results of the mathematical modelling of the dispersion of ambient air pollution and the assessment of predicted ambient air pollution data, the values of the increase in pollution and epidemiological studies, it is concluded that the environmental air pollution of PFAs will not affect the health of the immediate population.

4.9.2.2 Odour

In addition to ambient air pollution at Vilnius City Waste Water Treatment Plant, public health can also be influenced by odour emissions.

The treatment of sewage sludge generates odour. The main sources of odour emissions in the sludge treatment building are: centrifuges and THP, sludge drying, pump rooms. According to the "Environmental Impact Assessment Report on the construction and operation of sludge final disposal facilities" [14]

4.9.2 the table below shows the odour emissions from sludge treatment.

Table4.9.2: Odour emission values

OuE/s ouE/s	
Cross-flow scrubber (a.t. 008)	**Biofilter (a.t. 009)**
389239	102469

In the context of the reconstruction of Vilnius urban waste water treatment plant, existing sources of odours remain the same. Ducts, grates, transporters, carrier and sand washing/drainers or other areas in which unwashed carriers are in direct contact with ambient air in a reconstructed grid building will be sealed and provide for local shutdown into biofilters – a.t. 011.

Reactions in sludge hydrolysis tanks produce flammable and odour-emitting gases. In order to avoid the spreading of odours into the environment, it is necessary to fully cover the sludge hydrolysis tanks. The containers are equipped with ventilation that will extract the contaminated air and direct it to the air purification plant via biofilters – a.t. 012.

Atthis stage of the design, the exact emissions of the biofilters to be designed are not known and therefore, for the assessment of the impact on ambient air, it is accepted that the emissions will be similar to those of the biofilter installed in existing sludge treatment plants a.t. 009. In order to improve the dispersal of odour emissions, it is proposed to cover the design biofilters and to install an exhaust duct with a height of 5 m.

4.9.3 the table below shows the odour emissions of biofilters at the design stage.

Table4.9.3: Projected biofilter odour emission values

OuE/s ouE/s	
Biofilter (a.t. 011)	**Biofilter (a.t. 012)**
102469	102469

The simulation ofodour dissemination was carried out with the software package “ISC-AERMOD View”, the AERMOD mathematical model for simulating emissions from industrial source complexes in the environment. Use of data for simulating odour scattering similar to ambient air pollutant modelling: view. Chapter 4.2.3.

The results of the mathematical modelling of odour dispersion in ambient air are presented in Table 4.9.4.

Table4.9.4: Results of odour dispersion simulations

Contaminant name	**Limit value**		**Maximum fixed**		**At the border of the parcel**	
			Cmax	**Cmax/ limit value**	**Cmax**	**Cmax/ limit value**
	average	[ouE/m³]	[ouE/m³]	**[unit dl]**	[ouE/m³]	**[unit dl]**
1	**2**	**3**	**4**	**5**	**6**	**7**
Odour	1 hours	8	144,11	18,01	22	2,75

Following a mathematical modelling of the dispersal of odour emissions in ambient air, the highest concentrations of the 1-hour average time interval of odour in the company’s area are set at around 22 ouE/m³, i.e. 275 %, for the residential environment. The threshold for smells (8 ouE/m³)is reached about 200 m from the boundaries of the company’s parcel. Graphical results of odour dispersion simulations are presented in Figure 4.

For assessing and predicting odour exposure, odour dispersion models are used to predict the concentration of odour, to decide where to construct certain facilities, to plan control measures, etc. In Lithuania, the methodology for the identification of smells has not yet been implemented, and the limits for odour concentration values are included in the Lithuanian Hygiene Standard HN 121: 2010, approved by Order No V-885 of the Minister for Health of the Republic of Lithuania of 4 October 2010, “Quantity limit value in ambient air and the location of pollution in ambient air, which is a permanent source of environmental pollution”.The concentration limit for odour is 8 European odour units (8 ouE/m³).

It is proposed to define the sanitaryprotection zone on the basis of the boundaries of the supra-norm zone (i.e. odour).There are no residential areas and no residential buildings in the area of supra-norm effects. The modelled emissions of odour from the establishment show that the maximum value of business activity concentration outside the sanitary protection zone will not exceed the maximum permissible odour concentration limit in ambient air, i.e. 8 European odour units (8 ouE/m$^{3)}$.

4.9.2.3 Noise

In addition to ambient air pollution and odours, public health can also be influenced by industrial and motor noise.

Prior to the evaluation work, the necessary preliminary information on planned and existing economic activities and their immediate environment was collected. The necessary data have been collected for noise dispersion modelling, identifying potential sources of noise and adopting their noise emission parameters. After collecting the necessary source information, modelling for the dissemination of acoustic noise was carried out, assessing both the environmental noise emitted by the planned economic activity and the existing facilities.

Detailed information on the site under assessment and an overview of its surrounding areas are provided in section 4.9.1. The immediate living environment is 234 m northwards and 315 m north-east from the border of the plot. The area under assessment is bounded by the forest (Figure 4.9.10):

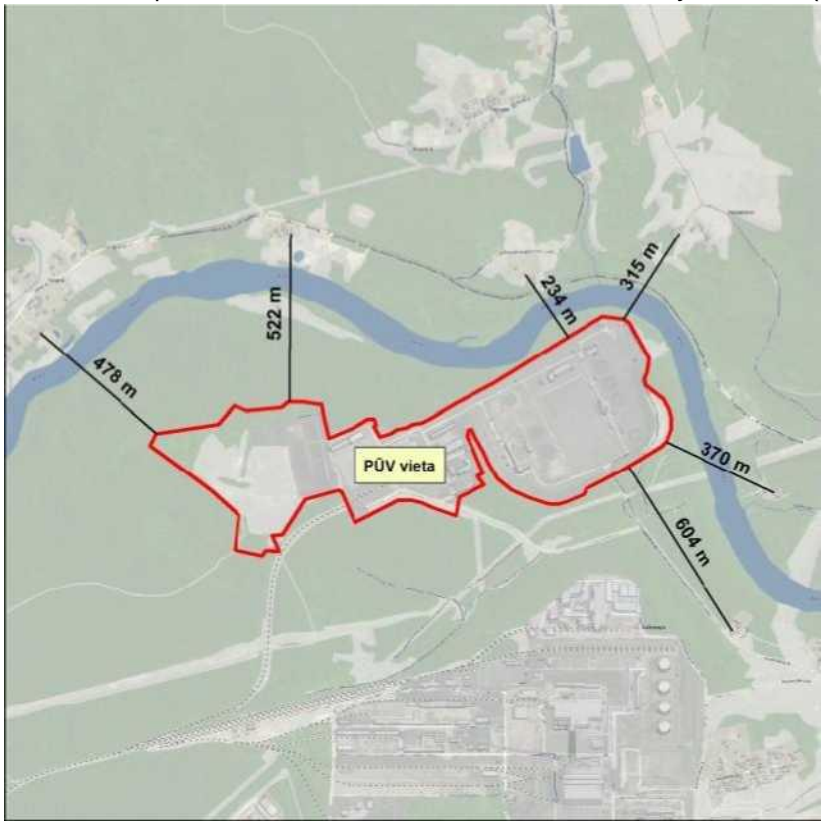


Figure 4.9.10Area under assessment in relation to the living environment

The main stationary sources of noise at the reconstructed Vilnius urban waste water treatment plant will be air chillers, heat exchangers, air blowers, pumps and various installations planned for buildings

inside. Buildings within which various technological installations (noise sources) are foreseen will be assessed as area-based (horizontal – vertical) noise sources by assessing the noise suppression of the building wall structure in the environment. Other technological installations in the area's environment will be considered as area-based horizontal noise sources.

As a result of the reconstruction, the following main sources of noise are expected:

Sludge treatment building;

- Heat exchangers;
- Chillers;

Conveyors;

Sludge incineration building;

Transformers;

Oraurgiai building;

Pumping stations;

- Railcars

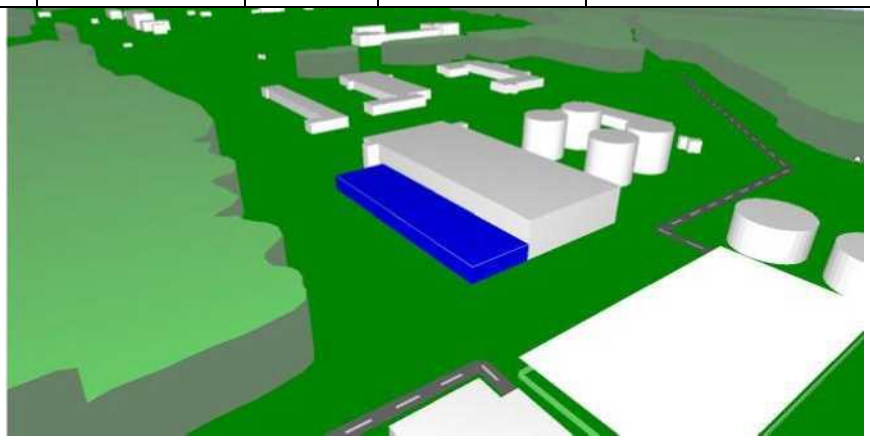
For all these sources of noise, noise emissions were accepted on the basis of the procurement documents for the design and reconstruction of the waste water treatment plant at the Vilnius urban waste water treatment plant, the 'Studija before project proposals for the reconstruction of Vilnius urban waste water treatment plant' prepared by UAB Arginta and the data base for the calculation of the noise dissemination programme. The layout of the assessed noise sources is shown in Figure 4.9.11.

Figure 4.9.11The distribution of noise sources by facility is

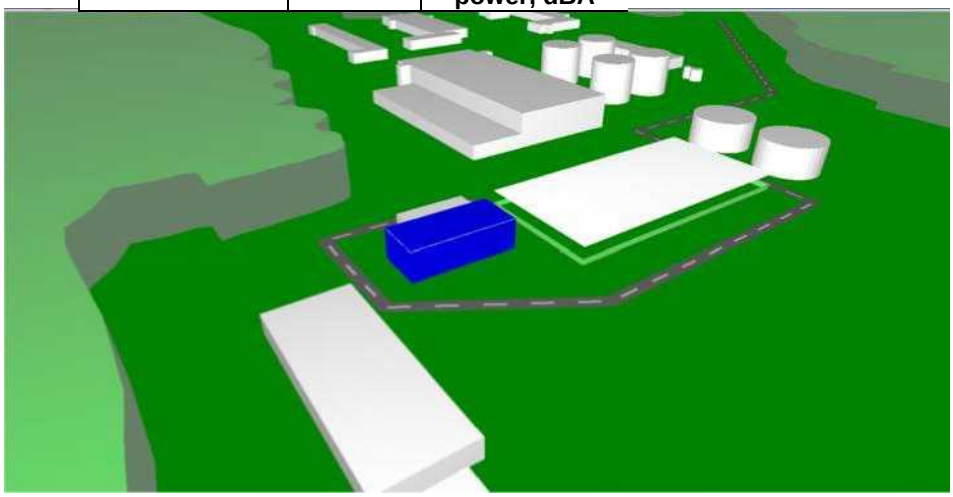
given in Table 4.9.5.

Table4.9.5: List of stationary noise sources

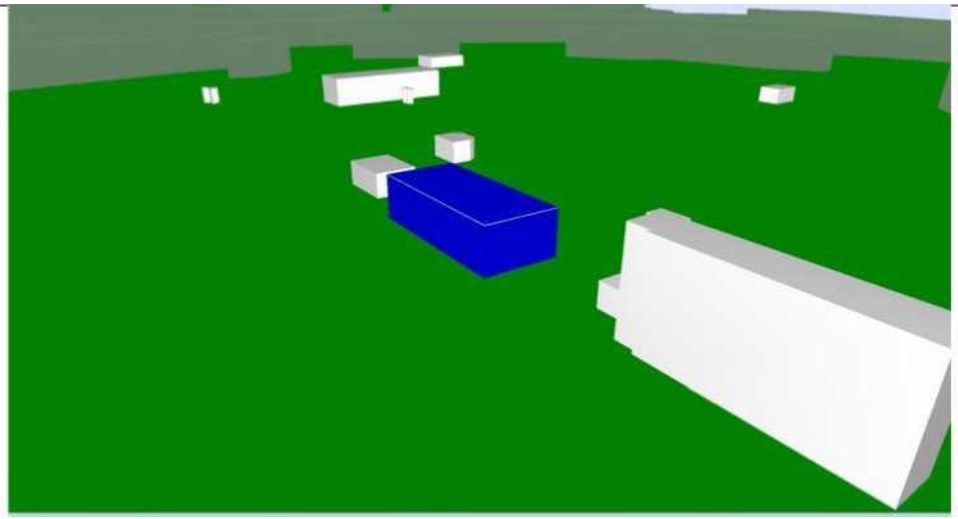
Object	Noise source	Quantity units	Noise power accepted for assessment, dBA	Observations
Category treatment building	Noise sources inside the building		85	Dumblo-processing building we will be seen as a horizontal, area-based source of noise. Accepting that outdoor wall design from double-type panels and noise entering the external environment will be attenuated by 25 dBA. Based on the building parameters (field wall suppression coefficient (Rw – 25 dB) and accepted noise emissions inside the building (Lw— 85 dBA)) the programmes have been calculated theequivalent noise level per square metre of room will be 64 dBA.In this building, noise sources are operating around the clock.



Category final recovery building	Noise sources present inside the building	—	95	Planable dumcanal we will assess the salvage building as horizontal – vertical area the source ofnoise. By accepting that the design of outdoor walls is planned from “two-dimensional” panels, the noise entering the external environment will be attenuated by 30 dBA. Depending on the building parameters (field wall suppression coefficient (Rw – 30 dB) and accepted noise emissions inside the building (Lw — 95 dBA)).Programme Calculated theequivalent noise level per square metre of room will be 69 dBA.In this building, noise sources will be available around the clock.

Object	Noise source	Quantity units	Evaluation done at noise power, dBA	Observations
				
Transformation sandeel	Noise sources inside the building	80		Wewill consider transformers as horizontal, vertical, area-based sources of noise. By accepting that the design of outdoor walls is planned from “two-dimensional” panels, the noise entering the external environment will be attenuated by 25 dBA. Depending on the building parameters (field wall suppression coefficient (Rw – 25 dB) and internal noise emissions accepted (Lw— 80 dBA)).Programme Calculated theequivalent noise level per square metre of room will be 59 dBA.These noise sources will operate around the clock.
Heatexchange units	Ventilation fans	93		We will see the heat exchanger as ahorizontal, area-based source of noise at a height of 4 m above the ground. The equivalent noise level calculated by the programmewill be 82 dBA per square metre of heat exchanger. _____

Object	Noise source	Quantity units	Evaluation done at noise power, dBA	Observations
Chillers	Ventilia-tors	4	93	Wewill consider the cooler as a horizontal, area-based source of noise at a height of 2 m above the ground. The equivalent noise level calculated by the programme per square metre of chiller will be equal to 82 dBA.
			80	TheOra Plower building is expected to be equipped with 8 blowers. All of them are planned to be fitted with enclosures that will effectively reduce noise in the environment. We will consider the Oraurg building as a horizontal, vertical, area-based noise source. By accepting that the design of outdoor walls is planned from “two-dimensional” panels, the noise entering the external environment will be attenuated by 30 dBA.
			70	Conveyors will be considered as linear sources of noise at a height of 4 m above the ground.

Object	Noise source	For evaluation storm power, dBA	Quantity, accepted	Observations
				Depending on the building parameters (field wall suppression coefficient (Rw – 30 dB) and accepted noise emissions inside the building (total noise power of 8 blowers Lw —89 dBA).Programme Calculated theequivalent noise level per square metre of room will be equal to 63 dBA.In this building, noise sources will be available around the clock.
				
Pumping stations	E-engines		85	Pumping stations (reversible circulating sludge; primary sludge; densified sludge; sand) will be seen as horizontal, vertical, area-based sources of noise. By accepting that the design of outdoor walls is planned from “two-dimensional” panels, the noise entering the external environment will be attenuated by 30 dBA. Depending on the building parameters (field wall suppression coefficient (Rw – 30 dB) and internal noise emissions accepted (Lw— 85 dBA)).Programme Calculated equivalent noise level per square metre. These noise sources will operate around the clock.

For the modelling of airborne noise emission, we will accept the worst scenario in which all the above-mentioned sources will continue to operate around the clock.

The southern part of the area provides for the construction of a new reception facility for wastewater and septic sludge, where up to 3 slurries can be spilled into the reception well at the same time. We will assess them as point sources of noise by taking 80 dBA of the noise level at the car. We will accept the assumption that these sources will operate continuously during the day between 6 a.m. and 18 p.m., during the evening they will be around 2 hours and around one hour during the night.

Noise from existing traffic flows

In thecurrent situation, the main flow of Dubliškiai g. consists of sewage and septic sludge coming from lorries to the existing waste water reception. According to the information provided by the company, on average, around 1181 lorries arrive per month during the day, around 36 units in the evening and around 5 units during the night. The maximum speed of driving on this street is 50 km/h in the calculation at night, as this number of trucks per month will not have any impact.

The final disposal of sludge will be served by heavy transport. The tugs will remove the resulting residues (marine) from the sludge combustion building (during the day).Within the territory, this service transport will have its own sections of traffic with an average speed of approximately 30 km/h. Access to the site will take place from the southern side of the parcel from the existing Duubliškiai g.

Noise from planned traffic flows

Figure 4.9.12Traffic organisation scheme within the boundaries of the territory

TheVilnius Urban Waste Water Treatment Plant Reconstruction and Operation flitnago g. 74 project does not foresee an increase in transport flows in Vilnius, as the capacity of the treatment plant is not changed. There is a likelihood of a slight increase of up to 10 % in the flow of slurries due to the development of the building in areas not equipped with centralised waste water collection.

Theslurries will not run on the site in both the current and the projected situation, as the reception facility for the delivered waste water and septic sludge is now and will be located after reconstruction at the southern boundary of the plot, which is relatively bordering with this street. The flow organisation scheme within the boundaries of the area is shown in Figure 4.9.12.

Transport of sewage and septic sludge

Given the above assumption that the number of lorries arriving in sewage and septic sludge will increase by up to 10 %, we accept for the assessment of noise dispersion that the current traffic volume will increase accordingly with an average of 1299 lorries per month during the day, 40 units in the evening and 6 units at night, as this number of lorries per month will not have any impact.

Transport of ash

Theash will be removed from the area by means of an adapted tug. For the planned working regime of 8000 hours, it is estimated that around 8000 tonnes of ash will occur. For assessment, we will accept that they will only be removed during the day in 2 lorries capable of transporting 23 t at the same time.

Access to the area shall be provided for Replyškiai g. (Figure 4.9.13) and a maximum speed of 50 km/h shall be accepted for noise assessment.

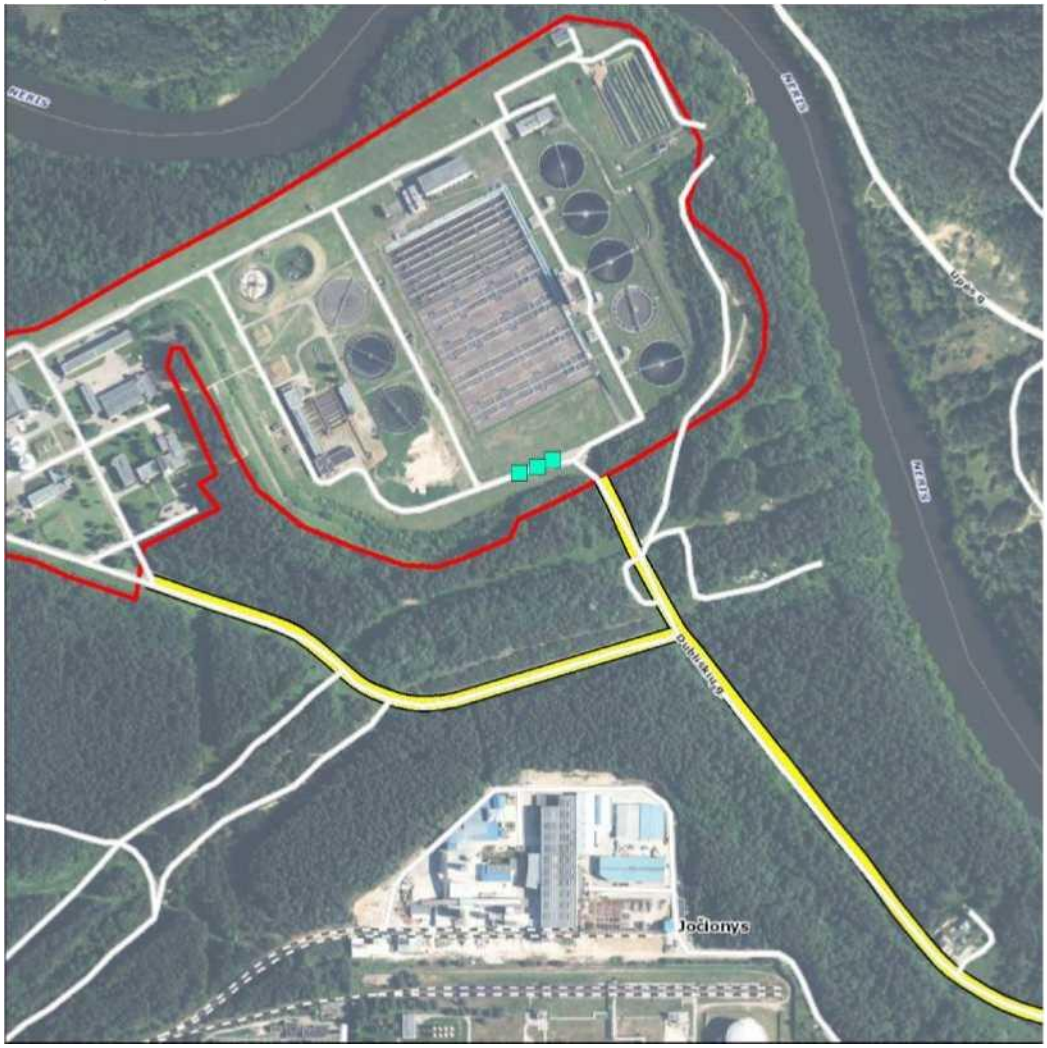


Figure 4.9.13Diagram of planned traffic access to the area

The environment under assessment is located in a partially built-up area, where buildings will be located as some barriers to noise dissemination, in order to obtain more accurate acoustic noise modelling data, as well as in a model. The overall height of the buildings is shown in Figure 4.9.14 within the area under assessment.

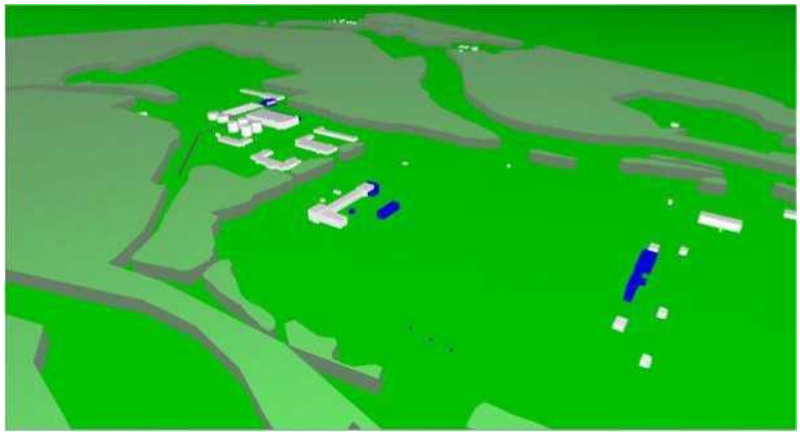


Figure 4.9.14Overall spatial view of the area under assessment

A spatial relief model (Figure 4.9.15) was created for the area under assessment on the basis of the topographical picture available.

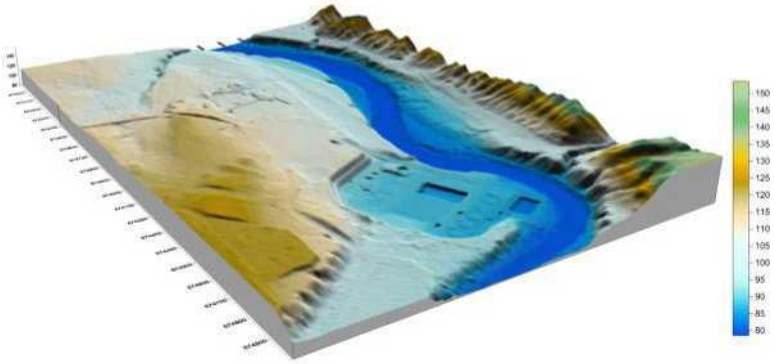


Figure 4.9.15Spatial relief model of the area under assessment

Noise emission calculations are carried out in CadnaA (Computer Aided Noise Abatement).

CadnaA is used to predict and evaluate environmental noise from various sources. It shall calculate and emit noise levels at any point or point situated in horizontal or vertical planes or on the facades of buildings. Airborne emissions from some noise sources are also emitted by technical parameters.

In accordance with Lithuanian Hygiene Standard HN 33: 2011 'Noise limit values in residential and public buildings and their environment', approved by Order No V-604 of the Minister for Health of the Republic of Lithuania of 13 June 2011 (hereinafter 'Lithuanian Hygiene Standard HN 33: 2011'), we used the following methodologies for the calculation of noise identification:

Noise from industrial activities – Lithuanian standard LST ISO 9613-2: 2004 'Acoustics: Attenuation of the sound emitted in the open space. Part 2: General calculation method' (identical to ISO 9613-2: 1996);

Road noise – France's national calculation methodology "NMPB-Routes-96" (SETRA-CERTU-LCPC-CSTB) referred to in the Order of the Minister for the Environment of the French Republic of 5 May 1995 on noise in road infrastructure. Official Journal of 10 May 1995, Article 6 (Arrete du 5 mai 1995 relatif au bruit des infrastructures routieres, Journal Officiel du 10 mai 1995, Article 6) and French standard XPS 31-133. In these documents, the input data for radiated noise shall be obtained in accordance with the 'Guide du bruit des transports terrestres, fascicule Prevision des niveaux sonores, CETUR 1980' (Guide du bruit des transports terrestres, 'Guide du bruit des transports terrestres', 'Guide du bruit des transports terrestres', 'Guide du bruit des transports terrestres, fascicule Prevision des niveaux sonores, CETUR 1980').

The limit values for airborne noise are reflected in the Lithuanian Hygiene Standard HN 33: 2011 'Noise limits in residential and public buildings and their environment', as approved by Order No V-604 of the Minister for Health of the Republic of Lithuania of 13 June 2011, for the assessment of noise in residential and public buildings and their environment on the basis of equivalent sound pressure levels and maximum sound pressure levels. Projected noise from planned economic activities shall be measured by the equivalent sound pressure level or by reference to Lden, Ldiena, Lvakar and Lnight noise indicators.

Noise in residential and public buildings and their surroundings shall be assessed by means of measurement and/or modelling, comparing the results with the respective maximum permissible noise limits for residential and public buildings and their surroundings in Tables 1 and 2 of this hygiene standard (Table 4.9.6).

Table4.9.6: Maximum permissible noise limit values for residential and public buildings and their surroundings

Residential buildings and public buildings (excluding catering and cultural buildings) in environments exposed to transport noise							
Noise brim amounts	**Equivalent sound level, dB(A)**	**Maximum sound level, dB(A)**	**Day time; hours**	**Noise limit values used for assessing environmental noise mapping results**			
				Lden	Lday	Leveni	Lnight
Days	65	70	6-18	65	65	60	55
Yesterday	60	65	18-22				
Night	55	60	22-6				
In the environment of residential buildings and public buildings (excluding catering and cultural buildings), excluding noise from transport							
Noise brim amounts	**Equivalent sound level, dB(A)**	**Maximum sound level, dB(A)**	**Day time; hours**	**Noise limit values used for assessing environmental noise mapping results**			
				Lden	Lday	Leveni	Lnight
Days	55	60	6-18	55	55	50	45
Yesterday	50	55	18-22				
Night	45	50	22-6				

A noise map of the area was drawn up on the basis of the parameters calculated and introduced. According to Lithuanian standard LST ISO 1996-2: 2008 'Acoustics: Description, measurement and assessment of ambient noise, Part 2: Determination of ambient noise" (equivalent to ISO 1996-2: 2007) for planned economic activities, a noise assessment height of 2,0 m with step 5 dBA and a vapour of 2 x 2 m will be used. Background noise from aircraft, rail and road was not assessed.

The assessment showed that, as a result of the reconstruction, the equivalent external noise level generated by Vilnius NV during operation would exceed the maximum permissible noise limit values applicable to the residential area (evaluated noise from stationary sources) in accordance with point 2 of Table 2 of HN33: 2011. During day (Lday), evening (Leven) and night (Lnight), the equivalent noise level at the boundary of the plot will be closest to the sources (Table 4.9.7):

Table 4.9.7: Day (Lday), evening (Levening) and night (Lnight), equivalent noise level at the boundary of the parcel

Part of territory	Ldienai dBA (RV – 55 dBA)	Lavakarasi dBA (RV – 50 dBA)	Lnight! dBA (RV – 45 dBA)
Northern side of the territory	49	49	49
Southern side of the territory	46	45	45
Eastern side of the site	40	35	35
Western side of the territory	<30	<30	<30

At the nearest residential buildings, 234 m northwards and 315 m north-east from the border of the plot, the equivalent noise level from stationary noise sources, due to sufficient distance and existing terrain, will be around 30 dBA for day, evening and night-time noise.

The assessment showed that the equivalent noise level of both existing operational NC traffic flows Dubliškiai g. and prospective traffic as a result of reconstruction will not exceed the maximum permissible noise limit values for the residential area (transport noise) in accordance with point 1 of Table 2 of HN33: 2011. The maximum equivalent noise level will be 61 dBA and 62 dBA respectively based on the daily noise indicator (Lday) at the street axle.

The mapping of the results of the modelling of the dissemination of noise sources is set out in Figure 5.

Simulation of the dissemination of airborne noise by PFAs (planned for reconstruction and operation of Vilnius urban waste water treatment plant) showed that the equivalent sound pressure level during the planned economic activity, with a long-term noise assessment duration of one year outside the site, would exceed the maximum permissible noise limit values for day (Lday), evening (Leven) and night (Lnight) for the residential area (evaluating stationary source noise) as set out in point 4 of Table 1 of HN33: 2011.

Taking into account the fact that the top-norm noise at the most sensitive night time (Lnight) is about 30 m away from the northern border of the plot, it is not appropriate to take noise abatement measures as the area is not covered by forests and dwellings.

4.9.2.4 Occupational risk factors

Occupational risk factors shall be assessed in accordance with the occupational risk regulations approved by Order No A1-159/V-612 of the Minister for Social Security and Labour of the Republic of Lithuania and the Minister for Health of the Republic of Lithuania of 16 October 2003.

The employer must ensure that the requirements of the following legislation are complied with:

- The Regulations on the supply of personal protective equipment for workers, approved by Order No A1-331 of the Minister for Social Security and Labour of the Republic of Lithuania of 26 November 2007;
- The General Regulations on the establishment of workplaces approved by Order No 85/1998 of the Minister for Social Security and Labour of the Republic of Lithuania of 5 May 233;

  The Regulations on the Protection of Workers against the Risks of Noise approved by Order No A1-103/V-265 of the Minister for Social Security and Labour of the Republic of Lithuania of 15 April 2005;

  Methodological instructions for the examination of ergonomic risk factors approved by Order No V-592/A1-210 of the Minister for Social Security and Labour of the Republic of Lithuania and the Minister for Health of the Republic of Lithuania of 15 July 2005;

  Methodological Instructions for the Investigation of Psychosocial Risk Factors approved by Order No V-699/A1-241 of the Minister for Social Security and Labour of the Republic of Lithuania and the Minister for Health of the Republic of Lithuania of 24 August 2005;
- The Rules on safety in the operation of electrical equipment, approved by Order No 1-100 of the Minister for Energy of the Republic of Lithuania of 30 March 2010;

  The Regulations on the protection of workers against chemical agents at work and the protection of workers from exposure to carcinogens and mutagens at work, approved by Order No 97/2001 of the Minister for Social Security and Labour of the Republic of Lithuania and the Minister for Health of the Republic of Lithuania of 24 July 406;

  The Regulations on the protection of workers against exposure to biological agents at work, approved by Order No 80/2001 of the Minister for Social Security and Labour of the Republic of Lithuania and the Minister for Health of the Republic of Lithuania of 21 June 353;
- Rules on the use of pressure vessels approved by Order No 403 of the Minister for the Economy of the Republic of Lithuania of 15 November 2002.

4.9.3 Socioeconomic factors

The planned economic activity will not have a particular impact on the socio-economic environment as the economic activity is being reconstructed by the existing Vilnius urban waste water treatment plant. The expected, albeit marginal, but positive, temporary effects on the population as a result of the creation of new jobs during construction.

4.9.4 Psychological factors Estetical image

The greatest possible impact on the landscape is the visual contamination of the region by technogenic objects and the likelihood of possible accidents. The planned economic activity does not have a lasting impact on the mosaicity of the landscape, the fragmentation of biotopes and the aesthetic value of the landscape, as the planned economic activity will be carried out in the existing Vilnius urban waste water treatment plant.

In order to reduce the likelihood of accidents and thus to avoid adverse effects of accidents on the landscape, it is necessary to implement accident prevention measures during the operation of installations, ensuring the safety of the works, the protection of the site and strict compliance with the instructions for the use of the installations.

4.9.5 Possible conflicts

The planned economic activity is not new to the Vilnius population community. At present, the main complaint of the surrounding residents about the operation of the Vilnius waste water treatment plant is a specific smell of sewage sludge, which is felt not only in the treatment itself but also in neighbouring areas. The reconstruction of Vilnius urban waste water treatment plant should not give rise to conflict since, according to the results of the modelling of odour dispersion, the area of over-normative effects does not include residential areas or residential buildings.

4.9.6 Measures to reduce the impact on public health

During the reconstruction of Vilnius urban waste water treatment plant, air treatment plants and other pollution prevention measures will be installed on site or where they have not yet been available.

Ducts, grates, transporters, carrier and sand washing/drainers or other areas in which unwashed carriers are in direct contact with ambient air in a reconstructed grid building will be sealed and provide for local shutdown into biofilters in the purification plant.

Reactions in sludge hydrolysis tanks produce flammable and odour-emitting gases. In order to avoid the spreading of odours into the environment, it is necessary to fully cover the sludge hydrolysis tanks. The containers provide for ventilation which will extract the contaminated air and direct it to the air purification plant by means of biofilters.

4.9.7 Risks arising from ongoing and planned activities

Odours and noise do not have direct adverse effects, but psycho-emotional stress from these factors negatively affects the functioning of the circulatory system.

Irritation is due to a negative assessment of the irritant. An individual’s response to odour dissatisfaction depends on many aspects, such as individual sensory, physiological characteristics, attitudes towards the source of the irritant, social conditions, etc.

For agroup of substances, an odour threshold value is defined as the lowest concentration of the substance at which 50 % of odour assessors/experts are used in accordance with the dynamic olfactometry method set out in LST EN 13725: 2004/AC: 2006 'Air quality: Odour

determination ofpotency in dynamic olfactometry" with an odour. The smell threshold value shall be equal to one European odour unit (1 ouE/m$^{3)}$.

4.9.8 Description of methods for public health assessment

The main task of the public health impact assessment is to gather the wide range of information needed for the assessment, i.e. epidemiological and statistical data relating to the planned economic activity.

Health impacts shall be considered for the following key groups in society:

- residents living in the area affected by economic activities; A partial assessment of the effects of the proposed economic activity on public health has been carried out in order to clarify the main factors affecting the health of the population closest to the proposed area of economic activity as a result of the proposed activity;

- employees working at the establishment of an economic activity (if an economic activity is already being carried out) or prospective employees.

The work planned in the programme is carried out as part of the SBS process:

- Collection of additional information and data processing;

  Modelling of pollution and risks;

- Statistical processing of data;
- Analysis and comparison of environmental pollution and other values obtained from modelling and study with permitted levels;

- Design and modelling of measures to reduce adverse health impacts with anti-pollution measures;

  Quantification of the impact on public health of factors in the physical environment exceeding the permitted levels, where cost-effective abatement measures cannot be designed);

  Qualitative assessment of the impact on public health of factors affecting health (social economics, lifestyles, psychology);

  Drawing-up of drawings and maps.

  The following software shall be used for modelling:

  ISCST3 (discharge of pollutants in ambient air);

  AERMOD (discharge of pollutants in ambient air);

  SLAB View (emergency emissions);

  ALOHA (emergency emissions);

  SpilCAD (dissemination of pollutants underground);

- ESRI ArcGIS (map preparation);
- Autocad (drawing-up);

  Surfer (relay modelling);

- GSM (surface release of pollutants);

  Noise simulation programme Cadna/A;

- Specific MS Excel tables (risk analysis, dispersion modelling).

The design of measures to reduce adverse health effects shall be carried out on the basis of best available techniques (BAT) information:

- BAT Reference Notes developed by the European Commission;
- BAT Reference Notes developed by World Bank Group's 'Pollution Prevention and Abatement Handbook';
- Batnees Guidance Notes developed by the Irish Environmental Protection Agency;
- PARCOM Recommendation 94/50;
- HELCOM Rrecommendations.

Dose-response information is obtained from relevant databases.

Inaccuracies in the public health impact assessment relate to inaccuracies in external environment modelling and other aspects:

  incomplete modelling;

- the use of a qualitative evaluation method.

<u>Incomplete modelling of adverse effects</u>

Undisturbed:

- ambient air pollution in the event of damage to the integrity of the installations, the failure of treatment plants or technological failures of the equipment, but there are no objective assumptions for this, as the tracking and signalling of parameters of the key technological processes for waste water treatment is equipped with an automated management and tracking system that will permanently record indicators of ambient air pollution, which can be monitored by the State environmental surveillance authorities Vilnius Regional Environmental Protection Department, Environmental Protection Agency;

  The consequences of emergencies, but the planned production is not included in the list of activities posing a risk. In addition, PFAs are not involved in emergency releases of toxic substances.

<u>Use of a qualitative assessment method</u>

The method of evaluating all the epidemiological studies examined has not been used in this work to determine the dose-response (risk) curve, as this is a more scientific task than a task for the work to be carried out. However, studies carried out by foreign scientific institutions or researchers were evaluated in this work. It must be pointed out that there are also restrictions on the application of this research in a given area, which is why this work is limited to a qualitative impact assessment without counting the population likely to develop pollution-related diseases, all the more so because there is no acceptable criterion for the number of illnesses or deaths in the country. It must be stressed that the qualitative assessment of the predicted values of pollution does not lead to an increase in the number of diseases or deaths in the vicinity of a PFA.

4.9.9 Conclusions of the public health impact assessment and proposed SAZ

SAZ is defined in the Rules of Delimitation and Regime ofSanitary Protection Zones as an area around a stationary source of pollution or several sources in which special conditions for the use of the land are in force due to the potential adverse effects of economic activities on public health. Paragraph 64 of the special conditions for land and forest use, approved by Resolution No 343 of the Government of the Republic of Lithuania of 12 May 1992, establishes a sanitary protection zone of 500 m for municipal facilities.

In 2006, the 'Investment Programme for Sludge Management in Lithuania' established the normative boundaries of 500 m SAZ for Vilnius urban waste water treatment plant and sludge treatment plants in accordance with the SAZ delimitation and regime rules for Sanitary Protection Zones (Figure 4.9.16 and Figure 4.9.17).

Figure 4.9.16SAZ delimitation of Vilnius urban waste water treatment plant and sludge treatment plant

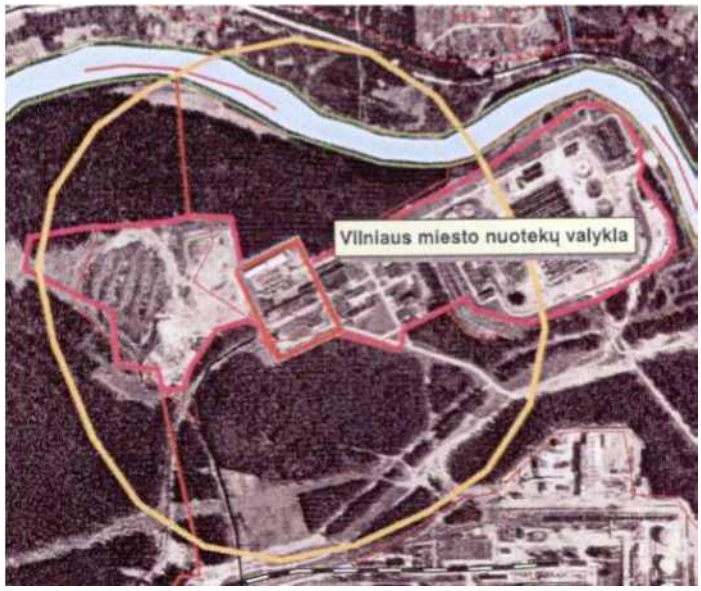


Figure 4.9.17SAZ delimitation of Vilnius urban waste water treatment plant and sludge treatment plant

The establishment of the Sanitnago g. 74 of Vilnius urban waste water treatment plant as a whole (sewage treatment step and sludge treatment farm) was based on the following conclusions of the impact assessment in Vilnius:

the projected maximum ambient air pollution does not exceed the values of residential air pollution, even in the production area itself;

- the projected noise level will not exceed the limit values for day, evening and night noise outside the sanitary protection zone.
- the predicted odour concentration will not exceed the maximum levels for odour outside the sanitary protection zone.

Following the assessment of the information provided, it is proposed to define the sanitary protection zone on the basis of theboundariesof the supra-norm zone (i.e. odour).There are no residential areas and no residential buildings in the area of supra-norm effects.

The modification of the planned economic activity in accordance with the requirements of public health legislation will not have a negative impact on public health.

A drawing of the revised sanitary protection zone proposed by the Vilnius urban waste water treatment plant is set out in Figure 6.

5 TRANSBOUNDARY EFFECTS

The planned economic activity is not expected to have cross-border effects and therefore potential transboundary effects on the environment are not considered.

6 ANALYSIS OF ALTERNATIVES

In the EIA, the following options were considered:

- Option 0: The current situation, the planned economic activity would not take place.

- Option A: The planned economic activity is being implemented – Vilnius urban waste water treatment plant is being reconstructed.

For option 0, the impacts on the individual environmental components would be in line with the values set out in the IPPC permit issued to the plant and the values set out in the Environmental Impact Assessment Report [14] on the final construction and operation of sludge recovery facilities g. 74 Vilnius. For option A, the impacts on individual environmental compartments have been analysed in this EIA report and are considered acceptable.

7 MONITORING

The section has been drawn up in accordance with the regulations on the monitoring of the environment

of economic operators [37].

7.1 Monitoring of technological processes

The final disposal of sludge complies with the environmental monitoring provisions of the economic operators [39]

6.1 the criteriain point (b).The following parameters will have to be continuously monitored at the sludge final disposal plant on the basis of the technological process monitoring plan contained in the report on the final environmental impact assessment of the sludge recovery facility [14]: temperature, oxygen concentration and water vapour content exhaust gas pressure .

7.2 Monitoring of discharges from pollution sources

According to point 7 of the provisions on environmental monitoring of operators [37]'&en; ...> operators' emissions/releases must be monitored by operators:

7.1. discharges (plans to discharge) into surface water bodies and/or natural filtration systems, or discharges into ambient air pollutants and these activities require an integrated pollution prevention and control permit (hereinafter "IPPC permit") or a pollution permit in accordance with the IPPC Regulations or the requirements of the IPPC Regulations, approved by Order No 620 of the Minister for the Environment of the Republic of Lithuania on the limitation of emissions of volatile organic compounds in installations for certain activities, approved by Order No 620 of the Minister for the Environment of 5 December 2002 on the limitation of emissions of volatile organic compounds in installations for certain activities;

7.2. Discharges of 50 m^3 or^{more} of industrial or municipal waste water into the effluent per day. The amount of waste water discharged shall be calculated by dividing the annual discharge or expected discharge by the number of days of discharge;

7.3. which give rise to emissions/releases of pollutants listed in Annex II to Regulation (EC) No 166/2006 of the European Parliament and of the Council concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC (OJ 2006 L 33, p. 1) from one or more of the activities listed in Annex I;

7.4. discharges of industrial waste water containing priority hazardous substances listed in Annex 1 of the Waste Water Management Regulation into a sewage drainage managed by other operators and/or containing

the concentration of hazardous substances is equal to or greater than the concentration limit specified in Parts A and B1 of Annex 2 to the Waste Water Management Regulation into the collecting system;

7.5. which operate combustion plants with a rated thermal input equal to or greater than 20 MW but less than 50 MW and which are subject to emission standards for combustion plants LAND 43-2013. For combustion plants with a lower thermal input falling within the scope of the emission standards LAND 43-2013, the emission limit values shall be controlled in accordance with the requirements for controlling compliance with the emission limit value laid down in the emission limit values for combustion plants LAND 43-2013.&en; ...'.

The planned economic activity complies with the criteria set out in point 7.1 of the provisions on environmental monitoring of economic operators.

7.2.1 Monitoring of sources of ambient air pollution

According to point 4 of Annex 1 to the Environmental Monitoring Regulations,'&en; ...> where a source discharges TPR >10 of a pollutant into ambient air, the monitoring of that pollutant shall be carried out by means of occasional measurements, except in the case referred to in point 9 of this Annex and unless otherwise provided for in other legislation. If the emission source discharges the pollutant TPR <10, this pollutant shall not be monitored.

TPR = $(Mm/RV)^{a}$

where:

Mm is the total emissions of the pollutant from all emission sources (maximum possible), in tonnes per

year;

ELV = daily ambient air pollution limit value (expressed in mg/m³) for a pollutant (excluding particulate matter)established for the protection of human health by sulphur dioxide, nitrogen dioxide, nitrogen oxides, benzene, carbon monoxide, lead, particulate matter and ozone, as approved by Order No 591/640 of the Minister for the Environment and the Minister for Health of the Republic of Lithuania of 11 December 2001 (Official Gazette, No 106-3827)2010, No 82-4364) (hereinafter referred to in this point as "EU norms") or the list of pollutants limited in ambient air according to national criteria and the limit values for ambient air pollution approved by Order No 471/582 of the Minister for the Environment of the Republic of Lithuania and the Minister for Health of the Republic of Lithuania of 30 October 2000 (Official Gazette 2000, No 100-3185; 2007, No 67-2627) ('the national rules' for the purposes of this section).In the case of particulate emissions where all or part of the particulate matter is emitted by the combustion of fuels or waste, ELV is a daily environmental pollution limit value of 0,05 mg/m³ for particulate matter[and] 0,15 mg/m³ for particulate matter in all other cases.If there is a national limit for a pollutant but no daily limit value has been set, 50 % of the half-hourly limit value shall apply for the determination of the TPR.Where there is an EU limit for a pollutant but no daily limit value has been set, an annual limit or target value for the determination of the TPR, or a limit or target value for the 8-hour maximum average per day, shall apply.

a is the fixed amount depending on the group of pollutants emitted into the ambient air referred to in Chapter II of the list of pollutants to be taxed and the groups approved by Resolution No 53 of the Government of the Republic of Lithuania of 18 January 2000 (Official Gazette 2000, No 6-159).Constant value of group I pollutant

‘a’ shall be equal to 1,7, II 1,3, III -1,0, IV-0,9 and nitrogen oxides (as nitrogen dioxide) to 1,3, sulphur dioxide to 1.0, dust (particulate matter) 0,9, vanadium pentoxide -1,7.

The TPRs for the calculation of emissions from planned economic activities (ammonia and sulphur hydrogen) are given in Table 7.2.1.

Table7.2.1: Hazard Indicators for Emissions to Ambient Air (TPR)

Pollutant name	**Mm, [t/m]**	**ELV,** [mg/m^3]	**a**	**TPR**	**TPR >10**
Ammonia	7,6430	0,04	0,9	113,0	+
Hydrogen sulfide	0,0576	0,004	1,3	32,1	+

According to the TPR calculation, emissions from planned economic activities are to be controlled.

Emission source categories

The next step before scheduling stationary sources of ambient air pollution is the identification of categories of emission sources that cause emissions exceeding the TPR limit value.

In accordance with point 5 of Annex 1 to the Environmental Monitoring Regulations,’<...> all operators’ emission sources are divided into the first and second categories for each pollutant emitted by the respective emission source:

5.1. Pollutants limited in ambient air according to national criteria:

5.1.1. the first category includes:

sources of pollution,

where

where

and emission sources equipped with a treatment plant with an average cleaning efficiency greater than

85 % if

where

where:

Cm is the maximum concentration of a pollutant in ambient air, mg/m^{3in} adverse meteorological conditions, according to a calculation of the pollution dispersion;

ELV is a half-hourly limit value for ambient air pollution laid down in legislation, mg/m^3.If the legislation does not set a half-hourly limit value for ambient air pollution, then the daily ambient air pollution limit value shall apply.

M is the maximum possible emission of the pollutant from the source, g/s;

H is the height of the pollution source above the ground, m. Esant H<10 m, calculated as H=10 m;

5.1.2. the second category includes emission sources which do not meet the criteria for the first category of emission sources referred to in point 5.1.1 and those of operators for which the permitted emission standards in the integrated pollution prevention and control permit are set on the basis of actual emissions;

5.2. Pollutants limited in ambient air according to European Union criteria:

5.2.1. The first category includes:

sources of pollution,

wh where
er
e where

and emission sources equipped with a treatment plant with an average cleaning efficiency greater than 85

wh %
er
e where

where

where:

Cm is the maximum concentration of a pollutant in ambient air, mg/m^{3in} adverse meteorological conditions, according to a calculation of the pollution dispersion;

ELV is the statutory hourly limit value for ambient air pollution, mg/m^{3}·If the legislation does not set an hourly limit value for ambient air pollution, then the limit or target value for the minimum average period shall apply.

M is the maximum possible emission of the pollutant from the source, g/s;

H is the height of the source above ground, m. Esant H < 10 m, calculated as H = 10 m;

5.2.2. the second category covers emission sources which do not meet the criteria for category emission sources set out in point 5.2.1 <...'.

The results of the calculations for the determination of the categories are shown in Table 7.2.2.

Table7.2.2: A.t. i.e. results of calculations for the determination of categories

Pollutant	Code	Emission source No	Cm [mg/m³]	ELV, [mg/m³]	Mm, [g/s]	H, [m]	9, [%]	Cm/RV	Mm/(RVX H)	Category
Ammonia	134	008	0,00814	0,200	0,258860	20,0	90	0,0407	0,0647	II
Ammonia	134	009	0,00814	0,200	0,005590	2,5	90	0,0407	0,0112	II
Ammonia	134	010	0,00814	0,200	0,034568	34,0	0	0,0407	0,0051	II
Ammonia	134	011	0,00814	0,200	0,005590	5,0	90	0,0407	0,0056	II
Ammonia	134	012	0,00814	0,200	0,005590	5,0	90	0,0407	0,0056	II
Hydrogen sulfide	1778	009	0,00047	0,008	0,000330	2,5	0	0,0582	0,0165	II
Hydrogen sulfide	1778	011	0,00047	0,008	0,000330	5,0	0	0,0582	0,0083	II
Hydrogen sulfide	1778	012	0,00047	0,008	0,000330	5,0	0	0,0582	0,0083	II
Hydrogen sulfide	1778	008	0,00047	0,008	0,001880	20,0	0	0,0582	0,0118	II

Measurement frequency

In accordance with paragraph 7 of Annex 1 to the Environmental Monitoring Regulation, the pollutant emitted from a pollution source classified in category shall be monitored at least 1 times a year.

The monitoring plan for stationary sources of ambient air pollution is set out in Table 7.2.3.

Table7.2.3: Monitoring plan for emissions to ambient air from pollution sources

Item No	Name of installation/production	Source of contamination1				Pollutants		Measurement frequency
		No	name	coordinates		name	Code	
1	2	3	4	5’	5	6	7	8
1	Cross flow scrubber	008	Duct	574017	6060575	Ammonia	134	1 times/year
						Hydrogen sulfide	1778	1 times/year
2	Biofilter	009	Flat source	574030	6060549	Hydrogen sulfide	1778	1 times/year
						Ammonia	134	1 times/year
3	Bars building	011	Biofilter duct	574401	6060635	Hydrogen sulfide	1778	1 times/year
						Ammonia	134	1 times/year
4	Tanks for hydrolysis	012	Biofilter duct	574413	6060780	Hydrogen sulfide	1778	1 times/year
						Ammonia	134	1 times/year
5	Sludge final disposal plant	010	Chimney of the final sludge disposal plant	573932	6060635	Ammonia	134	1 times/year

7.2.2 Waste water monitoring

According to the Environmental Monitoring Programme of UAB 'Vilniaus vandenys' [38], the company carries out monitoring of discharges from waste water.

At Vilnius waste water treatment plant, 2 times a month, samples of waste water are analysed before and after treatment. The following parameters shall be identified and analysed in the samples taken: Temperature, pH, SM, Ch DSCR, BOD7, total nitrogen, ammonium nitrogen, nitric nitrogen, nitric nitrogen,total phosphorus, phosphate phosphorus, chlorides, anionic surfactants, fat, petroleum products, alkalinity, lead (Pb), zinc (Zn), nickel (Ni), chromium (Cr), copper (Cr), copper (Cion), oil, alkalinity, lead (Pb), zinc (Zn), nickel (Ni), chromium (Cr), copper (Cr), copper (Cr), petroleum products, alkalinity, lead (Pb), zinc (Zn), nickel (Ni), chromium (Cr), copper (Cr), copper (Cr), petroleum products, alkalinity, lead (Pb), zinc (Zn), nickel (Ni), chromium (Cr), copper (Cr), vandis (Cu),1 times a year, the following parameters shall be analysed and determined in the effluent after treatment: phenols (pentachlorophenol), alkylphenol (4-n-noninphenol, 4-n-octylphenol, 4-tert-octylphenol), tin (Sn), organic tin compounds (tributilol), phthalates (Di-2-ethylhesylphthalate, dibutyl phthalate), PAA (petroleumline, anthracene, fluoranthene).

The rebuilding of waste water treatment plants will not change the existing monitoring of waste water.

7.3 Monitoring of effects on the quality of the environment (impact on the environment)

7.3.1 Conditions requiring monitoring of effects on the quality of the environment (impact on the environment) (in accordance with the requirements of Chapter II of these Regulations).

Monitoring of surface water effects

In accordance with paragraph 8.2.1 of the Staff Regulations, 'operators treating waste water in agglomerations with a population equivalent of 2000' are required to monitor the surface water body to which the waste water is discharged. The waste water treated by the Vilnius waste water treatment plant is discharged into the Neries river. The river shall be sampled 2 times a month for analysis and determination of the following parameters: Temperature, pH, SM, CODCr, BOD7,total nitrogen, ammonium nitrogen, nitrites, nitrates, total phosphorus, orthophosphate, dissolved oxygen.

Therebuilding of waste water treatment plants will not change the existing monitoring of waste

water.Groundwater exposure monitoring

TheVilnius urban waste water treatment plant must be subject to groundwater exposure monitoring in accordance with the criteria set out in points 8.3.2.5 and 8.3.2.6 of Chapter II.Monitoring under the approved programme [20] is currently carried out by UAB "Vilniaus hydrogeologie".

The eastern part of the waste water treatment plant, between the aerators and the Neries river, has a cross-section of 5 supervised wells and a group of five wells is also installed in the west. An analysis of the geographical situation of the Vilnius waste water treatment plant, the location of potential pollution sites on the site, the hydrogeological situation of the area and the results of the monitoring carried out would suggest that the network of observed boreholes in the eastern part of the site is sub-optimal and does not reflect the flow of groundwater from potential pollution sites, so it would be appropriate to install at least two more wells and to reduce the monitoring coverage in the existing ones.

Monitoring of impacts on ambient air quality

According to point 8.1.1 of the Environmental Monitoring Regulations, the monitoring of the impact on ambient air quality must be carried out by"<...> economic operators whose activities produce emissions specified in the list of pollutants limited in ambient air according to national criteria and in the limit values for ambient air pollution approved by Order No 471/582 of the Minister for the Environment and the Minister for Health of the Republic of Lithuania of 30 October 2000 (Official Gazette 2000, No 100-3185; 2007, No 67-2627), and the hazard indicator (STR) for one of the pollutants emitted into ambient air in the course of an operation, calculated in accordance with the procedure set out in paragraph 3 of Annex 1 to these Regulations, is greater[than 104 <…]'.No such emissions are expected at the site.

Point 8.1.1 of the environmentalmonitoring provisions also states that the monitoring of effects on ambient air quality must be carried out if the concentrations of any pollutant in the ambient air'<...>, calculated by modelling (without background air pollution), exceed the ambient air pollution limit values for the minimum averaging period set for the protection of human health in the list of pollutants limited in ambient air according to national criteria and in ambient air pollution limit values; <...>".As a result of the mathematical modelling of the dissipation of pollutants in ambient air, the concentrations of any pollutant did not exceed the limit values set out in the list of pollutants in ambient air limited by national criteria and in the limit values for ambient air pollution.

Point 8.1.2 of theEnvironmental Monitoring Regulations states that the monitoring of the impact on ambient air quality must be carried out if the concentration of any pollutant in the ambient air is higher than the lower assessment threshold for the minimum averaging period set out in Annex 1 to the Rules on Assessment of Ambient Air Quality, approved by Order No 596 of the Minister for the Environment of the Republic of Lithuania of 12 December 2001 (Official Gazette 2001, No 106-3828), Annex 1 <...'.As regards planned economic activities, emissions of pollutants for which there are lower assessment thresholds for the protection of human health are not expected and therefore no monitoring of the impact on ambient air quality is required under this point.

8 RISK ANALYSIS AND ASSESSMENT

8.1 Purpose and legal basis of hazard and risk analysis of potential accidents

The purpose of potential accident hazard risk analysis and assessment is to identify the sources of danger to man and the environment present in the establishment, to assess the hazards theypose and to assess their potential adverse consequences.

The analysis and assessment shall be carried out in accordance with the following legal acts of the Republic of Lithuania:

- Regulations on the prevention, response and investigation ofindustrial accidents (Official Gazette 2004, No 1304649; 2008, No 109-4159; TAR, 2015-05-29, No 2015-08354) [39];
- "Recommendation R 41-02 for the assessment of potential accident risks of planned economic activities" (approved by Order No 367 of the Minister for the Environment of the Republic of Lithuania of 16 July 2002, Žin.2002 No 61297) [40].

The operator of an establishment containing substances referred to in Part 1 of Annex I to the Directive or meeting the criteria of Part 2 of Annex I to the Directive, including substances which may be generated in the event of an accident, must:

- **ensure the safe use of the hazardous object and take the necessary measures to prevent accidents and limit their consequences for humans and the environment;**

  in the event of an accident, take the necessary and urgent measures to locate and respond to an accident in a dangerous establishment;

  implementing emergency prevention and response measures, setting up structures and management systems to ensure the protection of human beings and the environment;

- **provide the competent authority and the national supervisory and control authorities with the information specified in these Regulations relating to the safety of the hazardous object and demonstrating that it has taken all necessary measures for the safe use of the hazardous object.**

8.2 Assessment of hazardous substances

The purpose of the assessment is to identify which of the substances used in the activities of the SAB meet the criteria of the "Provisions for the Prevention, Response and Investigation of Industrial Accidents" [30] and, at the same time, pose the greatest risk to the personnel, the surrounding population, the environment and property of the establishment.

This evaluation shall cover only substances directly related to the planned activity. A solution of sodium hydroxide will be used in the biofilter.

Table8.2.1: Data on hazardous chemicals used by PFAs

Chemicals of the preparation name	Quantity per year in tonnes	Name of the substance or preparation		
		Category name	Hazard reference	Risk phrases
Sodium hydroxide Solution (caustic soda) 50 % solution	6	Corrosive	C	R35

8.3 Hazard Identification

In accordance with the requirements set out in Article 5 of Directive 96/82/EC (SEVESO II), the head of an establishment where dangerous substances are stored, used or manufactured must take all necessary measures in the hazard and risk analysis to prevent accidents at the site and, if they occur, to minimise the adverse effects on man and the environment and to provide proof to the competent authority that he has taken all the necessary measures to ensure the safety of the establishment.

According to the "Regulations for the Prevention, Response and Investigation of Industrial Accidents" [39] Hazardous substances and quantities planned to be used in the reconstruction and subsequent technological process of the Vilnius waste water treatment plant will not meet the criteria of these provisions, so that the area to be used by the operator and the facilities designed there are not to be classified as a hazardous object. It is intended to carry out an economic activity which is not dangerous, so that the criteria set out in the Regulations are set out; and

the requirements are not mandatory, i.e. a notification of a dangerous object, an accident prevention plan or a safety report is not required by a FBO.

Despite the above considerations, and in order to increase the efficiency of the analysis, it was chosen to identify the potential sources of hazards at the site planned by the operator and to analyse the worst-case scenario for a full illustration of the situation.

The risk of potential accidents inplanned economic activities was assessed in accordance with Recommendation R 41-02 on the risk assessment of potential accidents in planned economic activities, approved by Order No 367 of the Minister for the Environment of the Republic of Lithuania of 16 July 2003. The risk analysis of the reconstructive and post-constructive operation of the waste water treatment plant based on these recommendations is presented in Text Annex 6.

Accidents may occur in the event of spills of pollutants, the release of uncontrolled energy, as well as natural factors.

This risk analysis analysed the risk objects, hazardous agents and vulnerable objects and assessed the likelihood and consequences of an accident related to these factors for humans, nature and property.

The central part of the site has a slope of approximately 18 m elevation. In the event of adverse circumstances due to severe force, the mass of the slope rock may become detached and sliding down, causing negative consequences for the installations or even the people at the bottom at that time.

The possible highest levels of flooding in the Neries river would be at a height of approximately 83.0 m abs (probability every 10 years) and a catastrophic water level with a probability of 85.00 m abs every 20 m. In this case, there is no risk of flooding of a PFA object, although the surface height reserve of the lowest locations would be minimal (several centimetres).

The maximum expected groundwater level will be higher in the terraces of the river Neries I and II, where groundwater levels are between 1,0 and 2,0 m above existing levels. In the higher terraces, the level of groundwater will not be affected by the Neries tidal waters and the possible maximum water level is 0.5 m above the current level.

9 DESCRIPTION OF THE PROBLEMS

During the EIA and the preparation and coordination of the environmental impact documentation prepared, there were no significant problems for the EIA developer.

LITERATURE COMPENDIUM

1. Study to prepare pre-project proposals for the reconstruction of Vilnius City Waste Water Treatment Plant by UAB Arginta in 2014.

2. Procurement of works for the design and reconstruction of the waste water treatment plant ofVilnius urban waste water treatment plant. Draft technical specification. Approved by Minutes No VP-28-1 of the meeting of the Public Procurement Commission of UAB “Vilniaus vandenys”.

3. Law amending the Law of the Republic ofLithuania on the environmental impact assessment of planned economic activities. Order No X-258 of the Minister for the Environment of 21.06.2005 (Official Gazette 2005, No 84-3105).

4. Law amending Articles 2, 3, 5, 6, 8, 9, 10, 11 and Annexes 1, 2 of the Law of the Republic ofLithuania on the environmental impact assessment of planned economic activities. Order No X-1654 of the Minister for the Environment of 30.06.2008 (Official Gazette 2008, No 81-3167).

5. Provisions for the preparation of the environmental impact assessment programme and report. Order No D1-636 of the Minister for the Environment (Official Gazette 2006, No 6-225).

6. Amending Order No D1-636 of the Minister for the Environment of 23 December 2005 approving the provisions for drawing up the environmental impact assessment programme and report. Order No D1-368 of the Minister for the Environment of 08.07.2008 (Official Gazette 2008, No 79-3138).

7. Lithuanian IAS Atlas. Moscow, 1981.

8. Rules for granting, amending and revoking integrated pollution prevention and control permits, Official Gazette 2013 No 77-3901, as subsequently amended.

9. Rules on the management ofconstruction waste. Official Gazette 2007, No 10-403, as subsequently amended.

10. Integrated pollution prevention and control permit No VR-4.7-V-02-01, issued by UAB Vilniaus vandenys on 2012-08-21 (corrected on 2013-06-21).

11. Rules on waste management (Official Gazette 1999, No 63-2065, as subsequently amended).

12. Waste Water Management Regulation (Official Gazette 2006, No 59-2103, as subsequently amended).

13. Recommendations on the use of background air pollution data to assess the impact of economic activities on ambient air (Official Gazette 2008, No 82-3286, as subsequently amended).

14. Environmental Impact Assessment Report on the construction and operation of the finalsludge disposal plant in Vilnius, p. 74. UAB Sweco Lithuania in 2015

15. List of pollutants limited in ambient air on the basis of European Union criteria and a list of pollutants limited in ambient air on the basis of national criteria and limit values for ambient air pollution (Official Gazette, 2007, No 67-2627, as subsequently amended).

16. Guidance on the choice of models for measuring the impact of economic activities on ambient air" (Official Gazette, 2008, No 143-5768, as subsequently amended). **MR SVVECO**

17. Lithuanian Hygiene Standard HN 60: 2004 (Official Gazette).No 41-1357).

18. www.geoportal.lt

19. Report on additional engineering geological studies on the construction site of the drainage water treatment plant inVilnius. Institute for Engineering Studies, 1979.

20. Programme for monitoring the groundwater impact of UAB “Vilniaus vandenys” sewage treatment plant for the period 2012-2016.

21. http://www.lgt.lt/Www.lgt.lt

22. Investment programme for sludge management in Lithuania. Feasibility study (Volumes I, II).UAB SWECO BKG, Vilnius, 2006.

23. Hydrogeological assessment of the threat to Lithuanian waterfields by the Astrava NPP, Habil. Dr. A. Klimas, Dr. M. Gregorauskas, Water Management, 2014, October 45.

24. Land 9-2009 Environmental protection requirements for the management of areas contaminated with petroleum products (Official Gazette 2009, No 140-6174);

25. Environmental protection requirements for the management of sites contaminated by chemicals (Official Gazette 2008, No 53-1987, 2013, No 86-4325).

26. Procedures for inventory and collection of information on discharges of hazardous substances into groundwater (Official Gazette 2003, No 17-770, as subsequently amended).

27. Environmental monitoring report of UAB “Vilniaus vandenys” sewage treatment mine for 2014, UAB “Vilniaus hydrogeologie”, Vilnius, 2014

28. Eco-geological Surveys Regulation' (Official Gazette, 2008, No 71-2759).

29. official Statistics Portal:http: //www.osp.stat.gov.lt/

30. Social map of Lithuania http: //www.socialiniszemelapis.lt

31. Cost-benefit analysis and feasibility study for reconstructing biological treatment plants atVilnius waste water treatment plant. UAB “APVG”, 2014

32. http: //www.vvsb.lt/wp-content/uploads/2014/09/2013-m.-Vilniaus-miesto-stebesenos-report-uz-2012-m.pdf

33. http: //www.hi.lt/uploads/pdf/padaliniai/savivaldybiu reports/Vilniaus%20m%202013.pDF

34. http: //www.who.int/ipcs/features/10chemicals en.pdf

35. Health aspects of air pollution. Results from WHO project ‘Systematic review of health aspects of air pollution in Europe’, June 2004.

36. WHO Regions for Europe. HIA of air pollution in the eight major Italian cities (2002). www.who.int.en

37. Regulations on environmental monitoring of economic operators, Official Gazette 2009, No 113-4831, as subsequently amended;

38. Environmental monitoring programme of UAB “Vilniaus vandenys”

39. Regulations on the prevention, response and investigation ofindustrial accidents" (Official Gazette, 2004, No 1304649; 2008, No 109-4159; TAR, 2015-05-29, No 2015-08354);

40. “Recommendation R 41-02 for the assessment of potential accident risks of planned economic activities” (approved by Order No 367 of the Minister for the Environment of the Republic of Lithuania of 16 July 2002, Žin.2002 No 61297).

TEXT-ADDITIVES

TEXT ANNEX 1: EIA RAPPORTEURs' QUALIFICATIONS COPIES OF DOCUMENTS

TEXT ANNEX 2: EIA PROGRAMME COORDINATION LETTERS

TEXT ANNEX 3: CENTRAL LAND REGISTER EXTRACT FROM THE DATA BANK

TEXT ANNEX 4: LETTER FROM THE ENVIRONMENTAL PROTECTION AGENCY OF 15/12/2015

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TEXT ANNEX 5: CERTIFICATE OF HYDROMETEOROLOGICAL CONDITIONS

TEXT ANNEX 6: RISK ANALYSIS AND RISK MATRIX

GRAPHICAL ADDITIVES

GRAPHIC ANNEX1: PFA LOCAL OVERVIEW SCHEME

GRAPHIC ANNEX2: LAYOUT OF ESTABLISHMENTS

GRAPHIC ANNEX3: SOURCE SCHEME AND DISSEMINATION OF POLLUTANTS MODELLING RESULTS

GRAPHIC ANNEX4: RESULTS OF ODOUR DISPERSION SIMULATIONS

GRAPHIC ANNEX5: NOISE DISSIPATION MODELLING RESULTS

GRAPHIC ANNEX6: PROPOSED REVISED SANITARY PROTECTION DRAWING OF THE ZONE

EIA REPORT PUBLICITY AND RECONCILIATION DOCUMENTS

2.1.1 Vilnius City Waste Water Treatment Plant

The territory ofVilnius NV covers – 50.92 ha. NV has a project (hydraulic) capacity of225 thousand $m^3/p.$Mechanical treatment plants (started in operation since 1986) and biological treatment plants (starting operation since 1996).In 2002, the treatment plant was upgraded and implemented with nitrogen and phosphorus removal technology. New sludge treatment plants were put into operation in 2012.

Vilnius NV is treated with waste water from the city of Vilnius and some suburban settlements connected to the centralised urban waste water networks in Vilnius. The treatment plant has preliminary, mechanical and biological treatment units, after which waste water treated to the normative parameters is discharged into the Neries river.

Pre-treatment link. The run-off waste water flows primarily into a groove building, which is equipped with four large bars and four small bars. The seized carriers are drained by pressing and loaded into containers and transported to landfill. The previous grid discharges into the aerated horizontal stream sandbreakers. Sand deposited in sand beds is transported to sandwashing facilities or to sand separators, followed by composting of the drained sand.

Mechanical cleaning unitThe mechanical cleaning unit consists of three primary radial precipitators. Precipitated sludge with bottom scrapers is: