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Environment State Bureau of the Republic of Latvia

September 2025

General Directorate for Environmental Protection of Poland

REGARDING THE REPORT ON IMPLEMENTATION OF THE POST-PROJECT ANALYSIS PROGRAMME FOR THE NEW INSTALLATIONS OF IGNALINA NUCLEAR POWER PLANT FOR THE YEAR 2024

The Ministry of Environment of the Republic of Lithuania presents its compliments to the Environment State Bureau of the Republic of Latvia and the General Directorate for Environmental Protection of Poland and hereby provides the Transboundary Impact Monitoring Report for the New Installations of Ignalina Nuclear Power Plant (NPP) for the Year 2024 (hereinafter referred to as the Report). The objective of the Report is to provide an overview of the results of annual environmental monitoring (radiological and chemical) in accordance with the Transboundary Impact Monitoring Programme for the new Ignalina NPP nuclear installations:

- Dry Type Interim Spent Nuclear Fuel Storage Facility (ISFSF, B1 Project);
- Solid Waste Management and Storage Facilities (SWMSF, B2/3/4 Project) consisting of Solid Waste Retrieval Facility (SWRF, B2 Project) and Solid Waste Treatment and Storage Facility (SWTSF, B3/4 Project);
- Landfill Disposal Facility for Short-Lived Very Low-Level Waste (Landfill Repository, B19 Project).

We sincerely hope that you will find this information useful, and we would like to take this opportunity to express our appreciation for the fruitful cooperation between our institutions in the field of environmental protection.

Vice-minister Tomas Vaitkevičius

ENCLOSED: Transboundary Impact Monitoring Report for Year 2024. New INPP Nuclear Installations: Interim Spent Fuel Storage Facility (B1 Project), Solid Radioactive Waste Retrieval Facility (B2-1 and B2-2 Projects), Solid Radioactive Waste Treatment and Storage Facility (B3/4 Project) and Landfill Disposal Modules (B19-2 Project), 31 pages.

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STATE ENTERPRISE
IGNALINA NUCLEAR POWER PLANT

TRANSBOUNDARY IMPACT MONITORING REPORT FOR YEAR 2024.

NEW INPP NUCLEAR INSTALLATIONS: INTERIM SPENT FUEL STORAGE FACILITY (B1 PROJECT), SOLID RADIOACTIVE WASTE RETRIEVAL FACILITY (B2-1 AND B2-2 PROJECTS), SOLID RADIOACTIVE WASTE TREATMENT AND STORAGE FACILITY (B3/4 PROJECT) AND LANDFILL DISPOSAL MODULES (B19-2 PROJECT)

2025

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1 INTRODUCTION

The purpose of the present document is to provide an overview of the summarising annual environmental monitoring (radiological and chemical) results subject to implementation of the Transboundary Impact Monitoring Programme for the new Ignalina NPP nuclear installations for which transboundary environmental impact assessment has been carried out pursuant to the Convention on Environmental Impact Assessment in a Transboundary Context of the United Nations Economic Commission for Europe (Espoo, 1991), including the results of the cumulative impact to the population and the environment as a result of operation of all the INPP nuclear installations located on the INPP site.

The present Report includes an overview of the environmental impact of the following INPP spent nuclear fuel and radioactive waste management and storage facilities:

- Dry Type Interim Spent Nuclear Fuel Storage Facility (ISFSF, B1 Project);
- Solid Waste Management and Storage Facilities (SWMSF, B2/3/4 Project) consisting of Solid Waste Retrieval Facility (SWRF, B2 Project) and Solid Waste Treatment and Storage Facility (SWTSF, B3/4 Project);
- Landfill Disposal Facility for Short-Lived Very Low-Level Waste (Landfill Repository, B19 Project).

* Concerning the project related to reconstruction and transformation of the Ignalina NPP Bituminized Radioactive Waste Storage Facility (Building 158) into the Near Surface Repository (B20 Project), the Transboundary Impact Monitoring Programme of this project will be developed separately and presented for review to the interested parties.

The purpose of the continuous and systematic environmental monitoring carried out pursuant to the legal acts of the Republic of Lithuania [1-6] is to:

- limit radionuclide pathways into the environmental components, thus protecting the INPP personnel, the population, and the environment against hazardous radionuclide impact, as well as to forecast contamination effects;
- prove conformity with the discharge limits set for airborne and waterborne discharges;
- demonstrate that the exposure doses of the personnel and the population do not exceed the limit dose values set in the normative documents;
- analyse and assess efficiency of the implemented environmental protection measures;
- accumulate, analyse and submit to the state institutions and the population the information on the environment condition on the INPP territory and the sanitary protection zone, including the interested neighbouring countries in implementing the provisions of the Espoo Convention.

The environmental monitoring of the Ignalina NPP region is performed in accordance with the approved Environmental Monitoring Programmes [7-9] developed on the basis of the above mentioned legal acts of the Republic of Lithuania.

1.1 Abbreviations and Definitions

BOD	Biochemical Oxygen Demand;
COC	Chemical Oxygen Consumption;
FIBC	Flexible Intermediate Bulk Container;
ISO container	Standard 20ft half height ISO container (1CX);
ISFSF	Interim Spent Fuel Storage Facility;

MPC	Maximum permissible concentrations;
NI	Nuclear Installation;
RU	Retrieval Unit;
RW	Radioactive waste;
SE INPP	State Enterprise Ignalina Nuclear Power Plant;
SPZ	Sanitary Protection Zone;
SZ	Surveillance Zone;
SSC	Structures, system and components important to safety;
SWRF	Solid Radioactive Waste Retrieval Facility;
SWMSF	Solid Radioactive Waste Management and Storage Facility;
SWTSF	Solid Radioactive Waste Treatment and Storage Facility.

Representative person is assumed as a representative person, a member of a representative public group who is subject to significant exposure due to airborne and waterborne discharges. The exposure dose of a representative person is evaluated taking into consideration all exposure pathways from the radiation source.

The Lithuanian Hygiene Standard HN 73:2018 “Basic Standards of Radiation Protection” [2] establishes the dose constraint of annual effective dose -0.2 mSv for the public due to exposure resulting from airborne and waterborne discharges from the nuclear installation and the exposure resulting directly from the NI. Exposure of the public is evaluated based on the exposure dose calculated for the representative person.

1.2 Interim Spent Nuclear Fuel Storage Facility, ISFSF (B1 Project)

The ISFSF is located within approximately 0.5 km to the south of the INPP Units. The territory of the ISFSF occupies 5.93 ha. The ISFSF site is connected to the INPP via railway as well as the road connection. The transfer of the casks to the ISFSF was performed by the rail transport. In total 190 casks are temporary stored at the ISFSF, 22 casks out of the total number of casks contain damaged and experimental fuel bundles.

Three basic areas are distinguished at the main ISFSF storage building: Reception Hall, Storage Hall, and Fuel Inspection Hot Cell. The building and all the structures were designed taking into consideration the seismic loads and explosion impact. The structures of the ISFSF building are designed in such a way as to protect the objects inside the building against consequences of external meteorological and seismic phenomena, as well as human activity (e.g., external fire, transportation accidents, etc.). The building stability calculations were performed in compliance with the requirements of valid normative documents considering the initial impact data of the seismic loads and explosion wave. For more detailed information regarding the seismic safety and measures taken to ensure it for all the new NI, as well as the technical surveillance measures of the new NI building structures, see the Post-Project Analysis Programme for the New Ignalina NPP Nuclear Installations [10]. Commissioning of the ISFSF and start-up of the commercial operation was performed following the regulatory requirements of the Republic of Lithuania.

CONSTOR® RBMK1500/M2 casks are designed as dual-purpose casks for storage and transport after expiration of the storage period. They meet the ISFSF requirements for storage period of not less than 50 years from the scheduled completion of transfer of all SNF into the ISFSF without any need for scheduled intervention during the entire storage period plus an allowance of 5 years for the subsequent transport of the fuel to the final storage site. The storage configuration of the cask CONSTOR®RBMK1500/M2 loaded with 91 Spent Fuel Assembles or 182 Fuel Bundles is 102 Fuel Bundles in the 32M Basket and 80 Fuel Bundles in the Ring Basket.

Loading of the ISFSF with the SNF casks, including fuel debris collection from the bottom of the spent fuel storage pools and fresh fuel assemblies transportation from the on-site Fresh Nuclear Fuel Store (Bld. 165) for interim storage was completed on 30 December 2022.

In total 190 CONSTOR®RBMK1500/M2 type casks containing 15555 of spent fuel assemblies, 1 cartridge with the fuel debris collected from the bottom of spent fuel storage pools and 8 transport packaging containers containing 75 fresh fuel assemblies and 4 packaging cans with fresh fuel pellets are stored at the ISFSF.

Information related to the operation of the ISFSF

The ISFSF is operated strictly following the requirements of the Interim Spent Nuclear Fuel Storage Facility Operation Technical Specification [11]. Safety of the ISFSF is ensured by the safe operation of the ISFSF process equipment for handling of storage casks and the building infrastructure systems, their timely technical maintenance, monitoring, periodic testing and inspections.

No breach of the normal operation conditions and operational limits were identified during the ISFSF operation in 2024. All systems and components of the storage facility were operated without failures. No changes to the safety features of the ISFSF site have been identified. No initiating events of either natural or man induced origin as provided for in the ISFSF safety justification documents have been identified.

Mandatory monitoring of the surface temperature of each cask body is performed once per month. The measured temperature of all the casks was below the established limit and is dependent on the outside temperature seasonal fluctuations.

Radiological monitoring of the casks is performed in compliance with the INPP Instruction on Performance of Radiological Monitoring during Handling of CONSTOR®RBMK1500/M2 Cask [12].

All the procedures related to the ISFSF operation are carried out in compliance with the Nuclear Safety Requirements BSR-3.1.1-2016 “Spent Nuclear Fuel Handling at the Dry Type Spent Nuclear Fuel Storage Facility” [13].

1.3 Solid Radioactive Waste Management and Storage Facility, SWMSF (B2/3/4 Project)

The Solid Radioactive Waste Management and Storage Facility (SWMSF, B2/3/4 Project) consists of separate facilities located on two different sites:

- Solid Waste Retrieval Facility (SWRF, B2 Project) constructed within the boundary of the INPP site close to the existing solid waste storage buildings 155, 155/1, 157 and 157/1;
- Solid Waste Treatment and Storage Facility (SWTSF, B3/4 Project) constructed on a separate site located approximately 0.6 km to the south from the Ignalina NPP adjacent to the Interim Spent Fuel Storage Facility.

The main objectives of the SWMSF are as follows:

- Waste retrieval from the existing storage buildings 155, 155/1, 157 and 157/1;
- Sorting, preliminary treatment and packaging of waste retrieved from the storage buildings;
- Waste processing (fragmentation, incineration, compaction);

- Loading of processed and dedicated for interim storage waste into appropriate containers subject to the generated waste class;
- 50-years interim storage of RW packages.

1.4 Solid Radioactive Waste Retrieval Facility, SWRF (Retrieval Unit 1, B2-1 Project and Retrieval Units 2,3, B2-2 Project)

The purpose of the SWRF is to retrieve waste from its present storage location, i.e. buildings 155, 155/1, 157 and 157/1, pre-sort and package this waste. The SWRF consists of three Retrieval Units (RU), the Landfill Separation Facility and the Control Building.

The Retrieval Unit 1 (RU1) is used to retrieve radioactive waste from buildings 155 and 155/1, to receive Group 1 waste retrieved from buildings 157 and 157/1 (RU2), to receive class A operational RW, to perform pre-sorting, processing and radiological characterization of the waste; to transfer pre-sorted RW either to the LSF sorting area or to SWTF for further treatment.

Waste is retrieved by using remotely operated vehicles which enter the waste storage compartments of buildings 155 and 155/1 via access apertures cut in the side of the waste buildings. The remote control of all operations is carried out from the control room arranged in the control building.

The Retrieval Unit 2 (RU2) is used to retrieve, pre-sort and pack Group 1 and Group 2 radioactive waste from buildings 157 and 157/1. RU2 is a mobile unit located on the top of the waste storage building. Waste retrieval is performed from the top of the waste storage compartments, after removal of closure panels. Waste is retrieved remotely with a girder crane equipped with specific grabs, which is lowered through an existing aperture of the roof slab of the waste compartment. Then the waste is loaded into appropriate waste transport containers for transfer to corresponding waste sorting and processing sites.

The Retrieval Unit 3 (RU3) is used to retrieve Group 3 radioactive waste from compartments 1 and 4 of building 157. Like the RU2, the RU3 is a mobile framed metal structure located on the top of the storage building. The waste retrieval is performed from the top of the compartments of building 157 after removing plugs from waste compartment roofs. All waste retrieval and packaging operations are performed inside the Unit with a remote tool carrier arm (manipulator). Operations are remotely controlled from the Control Building.

Information related to the Retrieval Units 1, 2, 3 (B2-1, B2-2 Projects) Operation

31 m^3 of radioactive waste of class A (very low-level waste, short-lived) was retrieved from Bld. 155/1 during 2024 and in total 2243.8 m^3 of radioactive waste was retrieved from the beginning of the waste retrieval process. Dismantling waste originating from Bld. 101/1,2;130/2, 159B and transported to RU1, as well as industrial waste retrieved from Bld. 155/1 was treated at the Landfill Separation Facility of RU1.

1984 m^3 of radioactive waste of classes A, B, C (very low, low and intermediate level waste, short-lived) was retrieved from Bld. 157/1 during 2024 and in total 3739.6 m^3 of radioactive waste was retrieved from the beginning of the waste retrieval process from this building.

80.1 m^3 of radioactive waste of classes D and E (low and intermediate level waste, long-lived) was retrieved from Bld. 157 during 2024 and in total 290.59 m^3 of radioactive waste was retrieved from the beginning of the waste retrieval process from Bld. 157.

The SWRF (RU1, RU2/RU3) is operated strictly following the requirements of the Operation Technical Specifications [14, 15]. Safety of the SWRF is ensured by the safe operation of the SSC important to safety and the buildings infrastructure systems, their timely technical maintenance, monitoring, periodic testing and inspections.

All the procedures related to the SWRF operation, radioactive waste retrieval and initial processing are carried out in compliance with the requirements stated in the Nuclear Safety Requirements BSR-3.1.2-2017 "Pre-disposal Management of Radioactive Waste at Nuclear Installations" [16].

1.5 Solid Radioactive Waste Treatment and Storage Facility, SWTSF (B3/4 Project)

The SWTSF consists of the Solid Waste Treatment Facility (SWTF) and the Solid Waste Storage Facility (SWSF).

Solid Waste Treatment Facility (SWTF)

The primary function of the SWTF is to treat Group 2 and Group 3 radioactive waste. For this purpose, the following operations are performed at the SWTF:

- Reception of the solid radioactive waste from the SWRF as well as decommissioning solid waste originating due to dismantling of the INPP equipment;
- Sorting and assessment of the waste according to radiological and physical characteristics;
- Size reduction, where necessary;
- Incineration, where applicable;
- High pressure compaction, where applicable;
- Waste loading into storage containers (optimum capacity);
- Grouting (i.e., filling of containers with grouted waste);
- Waste characterization;
- Waste transfer to the dedicated interim storage facility.

The SWTF consists of two different sorting cells and sorted waste further processing facilities. In the sorting cells, named after the incoming waste type (G2 and G3 sorting cells, respectively), the waste is processed in parallel streams considering its respective radiological properties. In both Sorting Cells the waste is sorted by the remotely operated equipment. After the sorting procedure the size reduction and other preparatory actions take place prior to incineration, high force compaction, grouting and / or loading into containers.

Prior to loading the waste into containers, the waste is repeatedly characterized (weight, radionuclide content, dose rate, physical and chemical condition, etc.). Consideration is also given to the waste further technological treatment characteristics, i.e. further interim storage type: in the short-lived waste (SLW) or long-lived waste (LLW) storage facilities.

Solid Waste Storage Facility, SWSF

The SWSF comprises two separate stores directly connected to the SWTF: intermediate short-lived waste storage facility and intermediate long-lived waste storage facility which are directly connected to the SWTF. This ensures transportation of waste containers within the enclosed area.

The SLW waste storage facility can accommodate ~2500 m^3 of treated short-lived waste and allows the waste packages to be stored for a period of 50 years. The LLW storage facility can accommodate ~2000 m^3 of treated long-lived waste and allows the waste packages to be stored for a period of 50 years.

The LLW waste storage is dedicated for storage of waste packages containing waste of classes D (low level waste, long-lived), E (intermediate level waste, long-lived) and F (spent sealed sources). The storage is provided with separate compartments for spent sealed sources. Besides, the LLW storage is designed so that it can be extended by addition of additional modules.

Information related to the SWTSF Operation

During 2024 the following solid radioactive waste volumes were accepted and treated at the SWTSF:

- Group 1 (class A) combustible waste – 207.1 m^3;
- Group 2 (classes B and C) non-combustible compactable waste –333.1 m^3;
- Group 3 (classes D and E) metal waste – 206.1 m^3.

Group 3 (class F) spent sealed sources – 0.48 m^3. This group of waste is only packed into 200 litre drums. After filling up of 4 drums they are placed into ILW-LL container and transported for interim storage to the SWSF(Intermediate Level Long-Lived Waste Storage Facility).

The number of formed packages for transfer to the appropriate storage facility is as follows:

- Short-lived waste packages – 95 pieces;
- Long-lived waste (class E) packages – 66 pieces;
- Long-lived waste (class F) packages – 0.

Three radioactive waste incineration campaigns were conducted during 2024. 357.2 m^3 of solid radioactive waste and 0.4 m^3 of combustible liquid radioactive waste (oil) was incinerated during these incineration campaigns.

Acceptance and treatment of the radioactive waste at the SWTSF and the SWTSF operation is conducted strictly following the requirements of the Solid Radioactive Waste Treatment and Storage Facility Operation Technical Specification, B3/4 Project [17]. Safety of the SWTSF is ensured by the safe operation of the SSC important to safety and the buildings infrastructure systems, their timely technical maintenance, monitoring, periodic testing and inspections.

All the procedures related to the SWTSF operation, radioactive waste treatment and storage is carried out in compliance with the requirements stated in the Nuclear Safety Requirements BSR-3.1.2-2017 "Pre-disposal Management of Radioactive Waste at Nuclear Installations" [16].

1.6 Landfill Disposal Facility for Short-Lived Very Low-Level Radioactive Waste (B19-2 Project)

The Landfill Disposal Facility consists of two separate facilities:

- 4000 m^3 capacity Buffer Storage Facility built on the INPP site;
- Three Disposal Modules with the capacity of 20000 m^3 of packed radioactive waste each. The Modules are constructed in sequence, one after another, approximately every 10 years.

The Landfill Disposal Facility is constructed in the vicinity of the INPP, to the south (~50 m) of the ISFSF and the SWTSF sites. The Buffer Storage Facility is built on the INPP territory and is dedicated for accumulation of the waste packages in the volumes necessary for start-up of the waste disposal campaign.

The purpose of the Landfill Disposal Facility is to dispose of very low-level radioactive waste (class A) in compliance with the safety and environmental protection requirements providing the necessary protection level of the environment against both the radiological and non-radiological impact.

The Disposal Modules are the above-ground structure, with the where the waste is placed in the standard half height ISO containers, compacted waste plastic bales, and flexible plastic containers (FIBC package) serving also as barriers protecting against radionuclide discharge into the environment. The waste is loaded in several tiers on the supporting concrete foundation to roughly form a "hill shape" and is fully isolated from the environment by several layers of natural and artificial material layers (engineered barriers) by achieving a smooth, hill-shaped form. Finally, hydro-isolation, drainage and protective layers will be laid on top to prevent water penetration into the waste stack and washout of radionuclides from the waste to the environment. Modules will occupy the area of 4.4 ha.

The radioactive waste is loaded into the Landfill Disposal Facility with no intention of its retrieval in the future. It is planned to operate the Disposal Modules until the termination of the INPP equipment and buildings dismantling projects. Subsequently the repository will be closed, and the surveillance of the repository will be performed in compliance with the Nuclear Safety Requirements BSR-3.2.2-2016 "Radioactive Waste Repositories" [18]. The active surveillance continues for not less than 30 years and the passive surveillance continues for not less than 70 years. Upon termination of both surveillance periods, monitoring of the Landfill Disposal Facility surrounding environment will be carried out.

Landfill Disposal Modules Radioactive Waste Loading Campaigns

The third campaign of the radioactive waste packages stacking on the Landfill Disposal Facility site as part of the 1-st Disposal Module "Hot" Trials Programme started on 25 August 2024. To ensure complete verification of the compliance of the technological process conducted at the repository with the safety requirements and design solutions the third campaign was also included into the scope of the "hot" trials.

3782.334 m^3 (3168.33 t) of treated and packed radioactive waste was transported to the 1-st Disposal Module during the third campaign. Construction of the engineering barriers was partially completed by installing required protective layers, including the main engineering barrier (HDPE layer), except for the top sand filling and soil formation layer, erosion protective layer and vegetation layer which was stopped on 18 November 2024 due to unfavourable weather conditions. These works were completed by May 2025. The total weight of the waste stacked in the 1-st Disposal Module during the three campaigns is 9694.71 t and the volume of disposed of waste is 11656.08 m^3.

The Landfill Disposal Modules are operated strictly following the requirements of the Ignalina NPP Short-lived Very Low-Level Radioactive Waste Disposal Facility Operation Technical Specification, B19-2 Project [19]. Inspections and testing of SSC important to safety, their maintenance is carried out in compliance with the INPP Equipment and Facilities Technical Maintenance Regulations [20]. Technical supervision of the Landfill Disposal Modules foundation plate and the structures is carried out at the periodicity and following the requirements and the procedure established in the Instruction on the Technical Supervision of the INPP Buildings and the Territory [21] and B19/2 Facility Sedimentation Monitoring Programme [22].

All the procedures related to the Landfill Disposal Modules operation was carried out in compliance with the requirements stated in the Nuclear Safety Requirements BSR-3.2.2-2016 "Radioactive Waste Repositories" [18].

2 ENVIRONMENTAL MONITORING RESULTS

2.1 Radiological Monitoring Results

Radiological condition of the environmental components and the radiological situation within the Ignalina NPP sanitary protection zone, including the ISFSF/SWTSF, Landfill Disposal Facility sites, and the surveillance zone is evaluated based on radionuclide activity concentration measurement results in samples of the environmental components. The environmental components, their sampling periodicity and the sequence are established in the Radiological Environmental Monitoring Programme [7].

Find below the radiological monitoring results, including the meteorological conditions of the INPP region based on the Report of the INPP Region and Maišiagala Radioactive Waste Storage Facility Radiological Monitoring Results for Year 2024 [23].

2.1.1 Meteorological Conditions of the INPP Region

Meteorological parameters (temperature, precipitation, relative humidity, atmospheric pressure, wind speed and wind directions (wind rose)) of the INPP region are measured all year round 24 hours per day since 1987 in compliance with the scope and periodicity established in the Radiological Environmental Monitoring Programme [7]. Meteorological parameters measuring tools are installed at the special meteorological station and on 40 m-height tower located close to Environmental Protection Laboratory (Bld. 438), see Fig. 2.1-1 (permanent monitoring point No.1) 6 km to the west from the INPP.

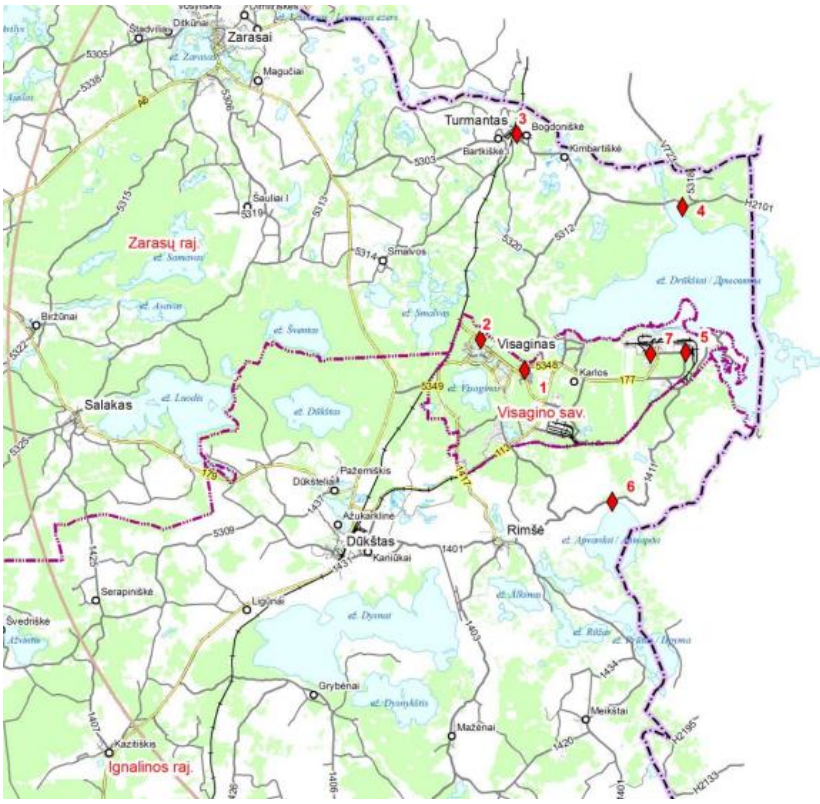


Figure 2.1-1 Layout of permanent monitoring points

In 2024, the average air temperature was 8.8°C, the coldest month was January with an average monthly air temperature of -6.2°C and the warmest month was July with an average monthly temperature of 19.4°C. The average annual temperature within the observation period (1987-2024) was in the rage of 5.0 and 9.0°C.

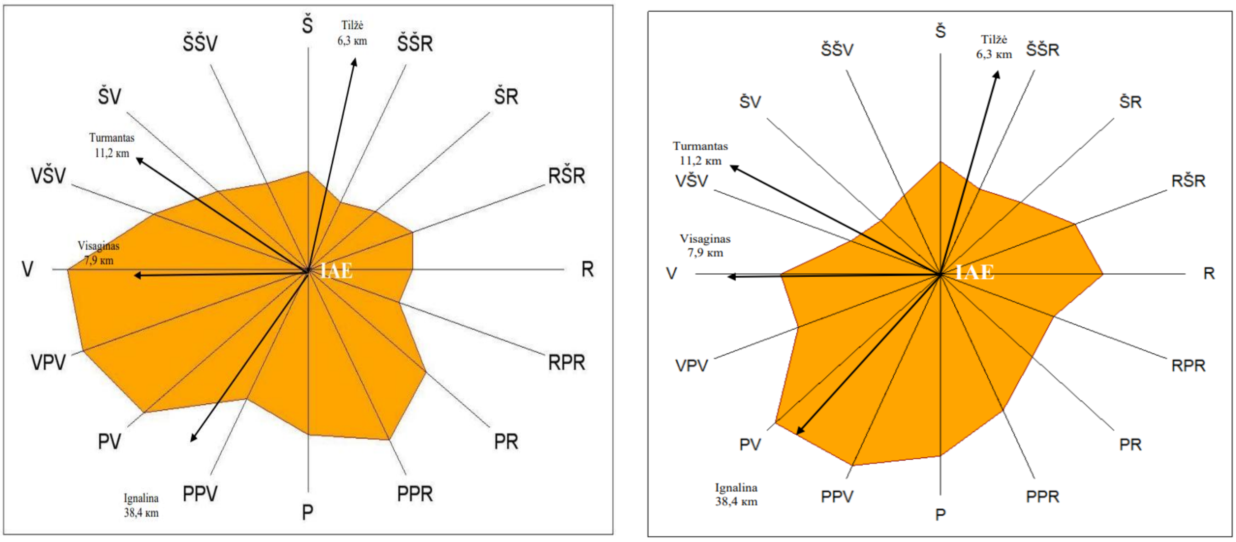
The average relative humidity value was 82.3% with the minimum value in May (68 %) and the maximum value in November (89.9%). Within the observation period (38 years) the average monthly fluctuation of the relative humidity was between 69.6 % to 89.7 %.

During 2024, the mean monthly atmospheric pressure in the INPP region was 985.7 hPa with the minimum value in February (854.3hPa) and the maximum value of 10039.6 hPa in July.

The major average monthly atmospheric pressure fluctuation values from minimum to maximum values were observed during the winter season, the fluctuation range of 22.2 hPa – 169.1 hPa, less significant fluctuation values were observed during the summer season, the fluctuation range of 15 hPa – 54.6 hPa.

During 2024 the average value of precipitation was 696.7 mm. 52.6% of precipitation was observed during the warn season of the year (April-October) and 47.4% of precipitation was observed during the cold season of the year (November-March).

The average wind speed in 2024 was 3.2 m/s with the maximum speed (gust) of 32. 9 m/s registered in February. As it could be seen from the figure below western and southwestern winds prevail.



2023 **2024**

Figure 2.1-2 Wind rose of the INPP region in 2023 and 2024

2.1.2 Discharge of Radionuclides and Radionuclide Activity Concentration in the Atmospheric Air

The air volume discharged during 2024 into the atmosphere from the INPP organised airborne discharge sources amounted to 1.800E+10 m^3.

Discharges of long-lived radionuclides (H-3 and C-14 excluded) into the atmosphere from the INPP during 2024 amounted to 1.272E+08 Bq which made up 4.38 % from the limit discharge value of 2.90E+09 Bq/year, as set in the Plan on Radionuclide Releases into the Environment from the Ignalina NPP [24]).

H-3 discharges amounted to 1.99E+10 Bq/year (0.20% from the limit discharge value of 1.01E+13 Bq/year, as set in the Plan [24]). C-14 discharges amounted to 6.50E+10 Bq/year (45.71% from the limit discharge value of 1.42E+11 Bq/year, as set in the Plan [24]).

The total activity of radionuclides discharged into the atmosphere during 2024 constituted 8.500E+10 Bq/year and was far below the permissible values set in the Plan [24] (the limit value of 3.81E+13 Bq/year). Co-60, Sr-90, Cs-137, Nb-94, H-3, C-14 mostly contributed to the activity of the overall discharges from all on-site INPP nuclear installations.

Table 2.1-1 Radionuclide composition, discharge activity and the resultant dose of the representative person during 2024

Radionuclide	Discharged activity, Bq/year	Input to dose, %	Dose, Sv
Co-60	4.802E+07	13.15	4.711E-07
Sr-90	6.652E+05	0.17	5.993E-09
Cs-137	7.778E+07	73.41	2.629E-06
Nb-94	7.384E+05	0.41	1.477E-08
H-3	1.987E+10	0.05	1.949E-09
C-14	6.500E+10	12.80	4.583E-07
Total*	8.500E+10	100.00	3.581E-06

* Discharges from the following on-site NI contribute to the overall airborne discharges: Bld. 101/1, 101/2, 150, 156, 158/2, 159, 117/1, 117/2, 130/2, Landfill buffer storage facility, ISFSF, SWRF, SWTSF.

Based on the exposure dose calculations, the total exposure dose of the representative person resulting from the radionuclide discharges into the atmosphere from the INPP in 2024 constituted 3.581E-03 mSv and it made up 3.58% of the half (0.1 mSv) of the dose constraint - 0.2 mSv.

The table below provides the discharged activity from the new NI and the resultant exposure doses of the representative person.

Table 2.1-2 Activity discharged from the new NI and resultant doses of the representative person during 2024

Bld.	Discharged activity, Bq/year	Dose, Sv
B1 (ISFSF)	1.289E+08	7.248E-10
B2 (SWRF)	3.233E+07	3.176E-07
B34 (SWTSF)	4.243E+10	1.841E-07

The analysis indicates that H-3 and C-14 mostly contribute to the total activity of airborne discharges from the INPP NI, whereas the exposure doses determined by Co-60 and Cs-137 give the major contribution into the total exposure dose of the representative person, see Table 2.1-1.

The major contribution into the total activity discharged from B34 facility gives H-3 and C-14, but the input of these radionuclides into the total exposure dose is negligible, if compared to Cs-137, see Table 2.1-1. On the other hand, the major contribution into the total activity discharged from B2 facility gives Co-60 and Cs-137 and as it could be seen from Table 2.1-1 these radionuclides, especially Cs-137, give the most significant input into the total exposure dose, therefore based on the above explanation the estimated exposure dose of the representative person due to discharges from these two facilities is of the same order of magnitude.

2.1.3 Radionuclide Activity Concentration in the Atmospheric Precipitation

Based on the atmospheric precipitation measurement results from 15 sampling points installed within the INPP surveillance (SZ) and sanitary protection zones (SPZ), the natural radionuclide

Be-7 mostly determined the radionuclide composition in precipitation in 2024. The average annual radionuclide activity concentration (Be-7, K-40 excluded) in the atmospheric precipitation in SZ amounted to 0.06 10^4 Bq/(km^2 day), whereas in the SPZ it amounted to 8.64 10^4 Bq/(km^2 day).

The average concentration of Be-7 in SZ was 129.38 10^4 Bq/(km^2 day) ranging from 33.26 to 330.48 10^4 Bq/(km^2 day). The average concentration of Be-7 in SPZ was 93.34 10^4 Bq/(km^2 day) ranging from 25 to 176.28 10^4 Bq/(km^2 day).

The concentration of K-40 in SZ and SPZ was below the detection limit*.

* In this Report the activity value "0" is indicated if after multiple sampling from the same sampling point the measured radionuclide activity values are below the detection limit.

2.1.4 Radionuclide Activity Concentration in the Aquatic Environment

The water volume discharged from the organized waterborne discharge sources during 2024 amounted to 1.8E+06 m^3. The water from the new NI is not discharged into the environment but is collected into accumulation tanks and then transported to the Liquid Waste Treatment Facility. The input of wastewater from the new NI into the overall INPP wastewater volume is negligible, for instance during 2024, 188.4 m^3 of wastewater from SWTSF and 71.3 m^3 from the SWRF was accumulated and transported for further treatment.

The radionuclide discharges into Lake Drūkšiai from the INPP with the wastewater during 2024 (including debalanced water[1]) constituted 4.217E+10 Bq/year (0.28% from the limit value of 1.50E+13 Bq/year [24]). The list of discharged radionuclides and their activity values correspond to radionuclide discharges in 2023 (H-3, Co-60, Cs-137).

The total annual Tritium activity discharged into Lake Drūkšiai through all organized waterborne discharge sources in 2024 amounted to 0.28% of the annual Tritium discharge limit (1.50E+13 Bq/year) specified in the Plan on Radionuclide Discharges into the Environment from the Ignalina NPP [24].

The total annual Cs-137 activity discharged into Lake Drūkšiai through all organized waterborne discharge sources in 2024 amounted to 0.06% of the annual Cs-137 discharge limit (3.00E+09 Bq/year) specified in the Plan on Radionuclide Discharges into the Environment from the Ignalina NPP [24].

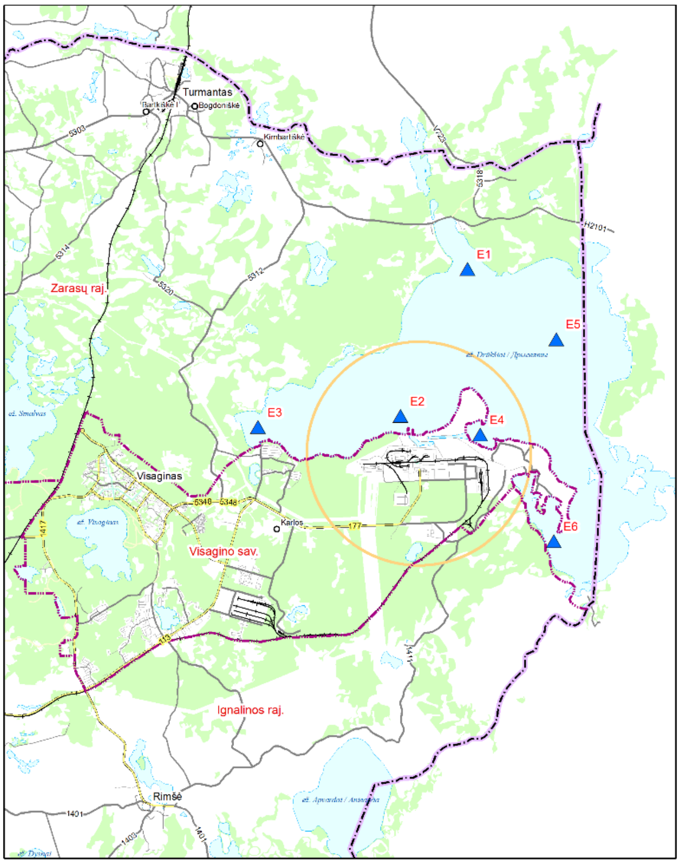
The total annual Co-60 activity discharged into Lake Drūkšiai through all organized waterborne discharge sources in 2024 amounted to 0.13% of the annual Co-60 discharge limit (4.644E+08 Bq/year) specified in the Plan on Radionuclide Discharges into the Environment from the Ignalina NPP [24].

[1] Debalansed water is the wastewater originating due to processing of the liquid radioactive waste, which is then cleaned at the evaporation installations following the normative requirements and discharged (directed) to the water body. Prior to discharge of the wastewater into the environment sampling and laboratory measurements of the wastewater accumulated in the corresponding tanks are performed to ensure compliance of the wastewater parameters with the normative requirements.

Figure 2.1-3 Layout of water sampling points

IK, PK, GPNN-1,2, GPNN-3, GPNN-SPBKS (Lithuanian abbreviation) denoting the channels as presented in the order below:

- (IK) Discharge channel – service water discharge from Bld. 101/1,2;
- (PK) Inlet channel;
- (GPNN-1,2) Industrial and Surface Wastewater Drainage channels 1,2 – discharge of rainwater and melted snow from the entire INPP site, discharge of service and debalanced water from Bld. 150 (INPP Liquid Radioactive Waste Treatment and Bituminising Facility);
- (GPNN-3) Industrial and Surface Wastewater Drainage channel 3 – discharges of process equipment located in Bld. 120/1,2 (pumping stations) and drainage water from Bld. 101/1,2;
- (GPNN-PBKS) Dry Type Spent Fuel Storage Facility (the old storage facility) site channel – discharge of rainwater from this site and household wastewater.



"Nulinio" fono tyrimo vietos (Sampling locations)

Figure 2.1-4 Baseline sampling locations in Lake Drūkšiai

Table 2.1-3 Dose of the representative person due to radionuclide discharges into Lake Drūkšiai in 2024

Radionuclide	Discharged activity, Bq/year	Dose, Sv
H-3	4.216E+10	3.42E-08
Co-60	5.987E+05	3.87E-09
Sr-90	0	0
Cs-137	1.826E+06	5.15E-08
Total	**4.217E+10**	**8.96E-08**

The estimated dose of the representative person due to radionuclide discharges into Lake Drūkšiai (including debalanced waters) equalled to 8.96E-05 mSv and it made up 0.1 % of the half (0.1 mSv) of the dose constraint – 0.2 mSv.

The total estimated dose to the representative person during 2024 due to airborne and waterborne discharges from the INPP equalled to 3.671E-03 mSv, which was 54.5 times less than the dose constraint of the representative person - 0.2 mSv/year.

2.1.5 Radionuclide Activity Concentration in the Water of Monitoring Wells

Within the framework of the Radiological Environmental Monitoring Programme [7] monitoring of the condition of the ground water, its chemical and radiological composition is performed. Periodicity and monitoring scope of the ground water parameters is established in the Radiological Environmental Monitoring Programme [7]. Twice a year, in spring and autumn, the ground water level, gamma nuclide composition, Sr-90 and H-3 are measured.

The layout of monitoring wells within the territory of the ISFSF/SWTSF and the Landfill Disposal Modules is provided in Fig. 2.1-5.

The measurement results of radionuclide activity concentration in the water of monitoring wells in the vicinity of the ISFSF/SWTSF showed that H-3 concentration in the water of the monitoring wells on the ISFSF/SWTSF territory varied between 5.74 – 10.36 Bq/kg. Higher values of H-3 concentration compared to the previous year's concentration values are due to start of using of a more efficient and sensitive new liquid scintillation counter ensuring more precise measurements of H-3 concentration and detection of smaller quantities of H-3 in samples. Now the minimum detectable activity is 5 Bq/kg in comparison with the minimum detectable activity of 8 Bq/kg in previous years. The detected values slightly exceed tritium concentration values in natural environment (1÷4 Bq/kg, in non-contaminated surface waters and rainwater [25], but they are significantly lower than the value of tritium activity concentration of unconditional clearance level, equal to 100 kBq kg^{-1} [26].

Radiochemical analysis of Sr-90 and gamma spectrometric radionuclide measurements showed that Sr-90 activity concentrations during 2024 remained at the same level as during the previous years and varied within the range of $<3.45 \cdot 10^{-4}$ and $3.83 \cdot 10^{-3}$ Bq/kg and could be compared with the background concentrations.

No Co-60 and Cs-137 concentrations were detected in the water of monitoring wells on the ISFSF/SWTSF site.

The measurement results of radionuclide activity concentration in the water of monitoring wells in the vicinity of the Landfill Disposal Modules showed that H-3 concentration in the water of the monitoring wells on the Landfill Disposal Modules territory varied between 8.04 and 10.19 Bq/kg in comparison with the previous year's H-3 concentrations when H-3 concentration in water of almost all of the monitoring wells was 0 Bq/kg. As it is explained earlier use of new more sensitive counter enabled to detect smaller quantities of H-3 concentrations in samples.

Radiochemical analysis of Sr-90 and gamma spectrometric radionuclide measurements of the water of monitoring wells in the vicinity of the Landfill Disposal Modules showed that Sr-90 activity concentrations during 2024 remained at the same level as during the previous years (preoperational (baseline) monitoring results) and could be compared with the background concentrations (the range of Sr-90 values in 2024 was between $<3.91 \cdot 10^{-4}$ and $2.73 \cdot 10^{-3}$ Bq/kg).

No Co-60 and Cs-137 concentrations were detected in the water of monitoring wells on the Landfill Disposal Modules site.

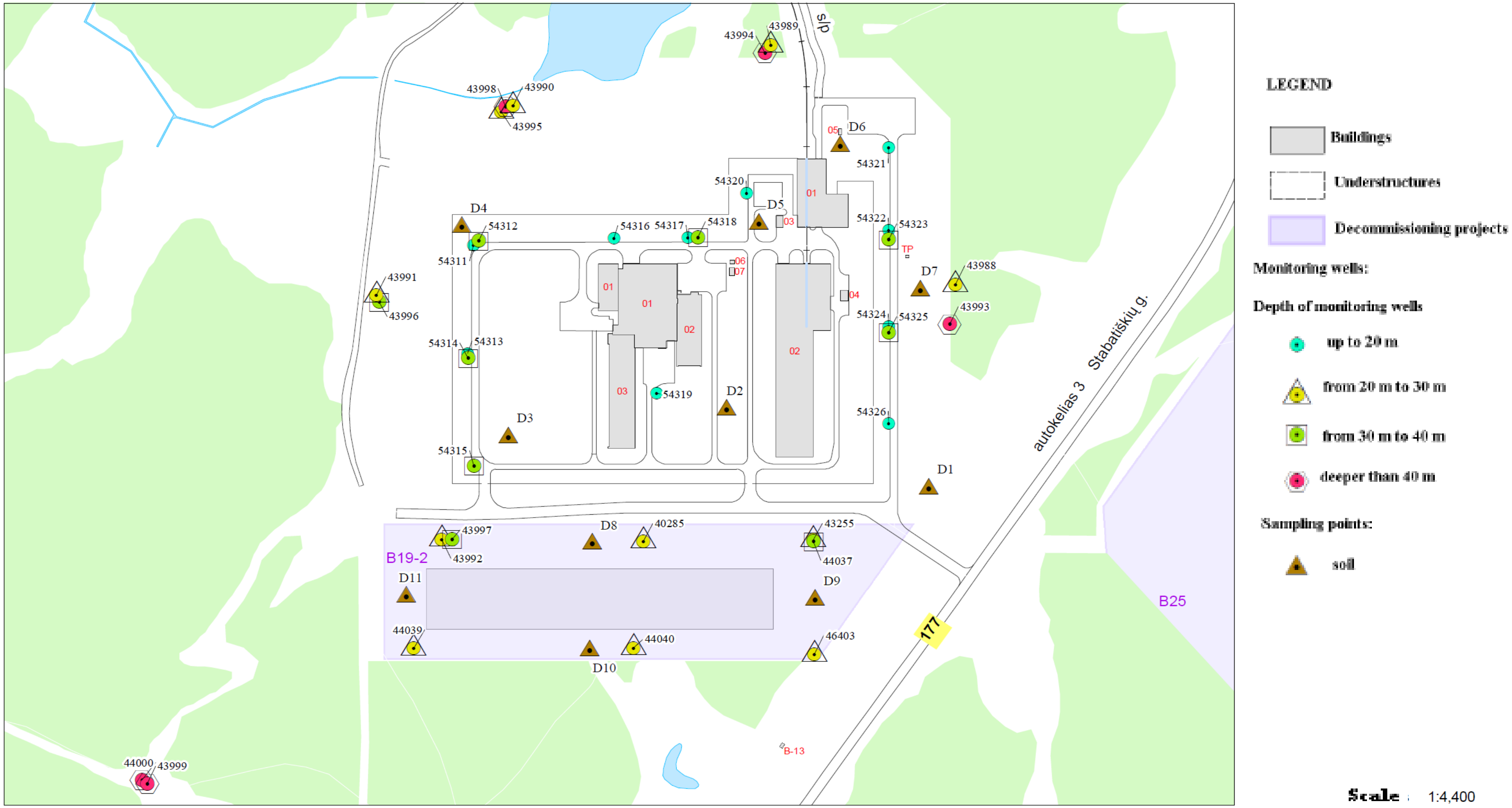


Figure 2.1-5 Layout of monitoring wells within the territory of ISFSF/SWTSF and Landfill Disposal Modules (B19-2)

The measurement results of radionuclide activity concentration in the water of monitoring wells in the vicinity of the SWRF showed that H-3 concentrations in most of the monitoring wells varied between 8.42 and 74.85 Bq/kg with the exception of two monitoring wells that demonstrated higher H-3 concentration values in the water of monitoring wells close to the SWRF reaching 1107.27 Bq/kg (monitoring well No. 29202) and 1797.15 Bq/kg in the water of monitoring well No. 29535 located in the vicinity of Bld. 157/1 (see Fig. 2.1-6 the layout of the monitoring wells in this area), but which is still lower than the value of tritium activity concentration of unconditional clearance level, equal to 100 kBq kg^{-1} [26]. The explanation of detected higher H-3 values in comparison with the previous year's concentration values is provided hereafter above in this section. Tritium concentration fluctuation close to the Interim Radioactive Waste Storage Facilities is provided in Figure 2.1-7.

Radiochemical analysis of Sr-90 and gamma spectrometric radionuclide measurements showed that Sr-90 activity concentrations during 2024 were in the range of $3.92 \cdot 10^{-4}$ and $2.68 \cdot 10^{-3}$ and could be compared with the background concentrations.

Performed measurements also showed that only very negligible traces of Co-60 characteristic for the nuclear industry radioactive waste were detected just in several monitoring wells (in the vicinity of Bld. 157/1) (ranging between 0.02 and 0.48 Bq/kg) and has the tendency for decrease in comparison with the previous year monitoring results, see Report on the Implementation of the Post-Project Analysis Programme for the New INPP Nuclear Installations for Year 2023.

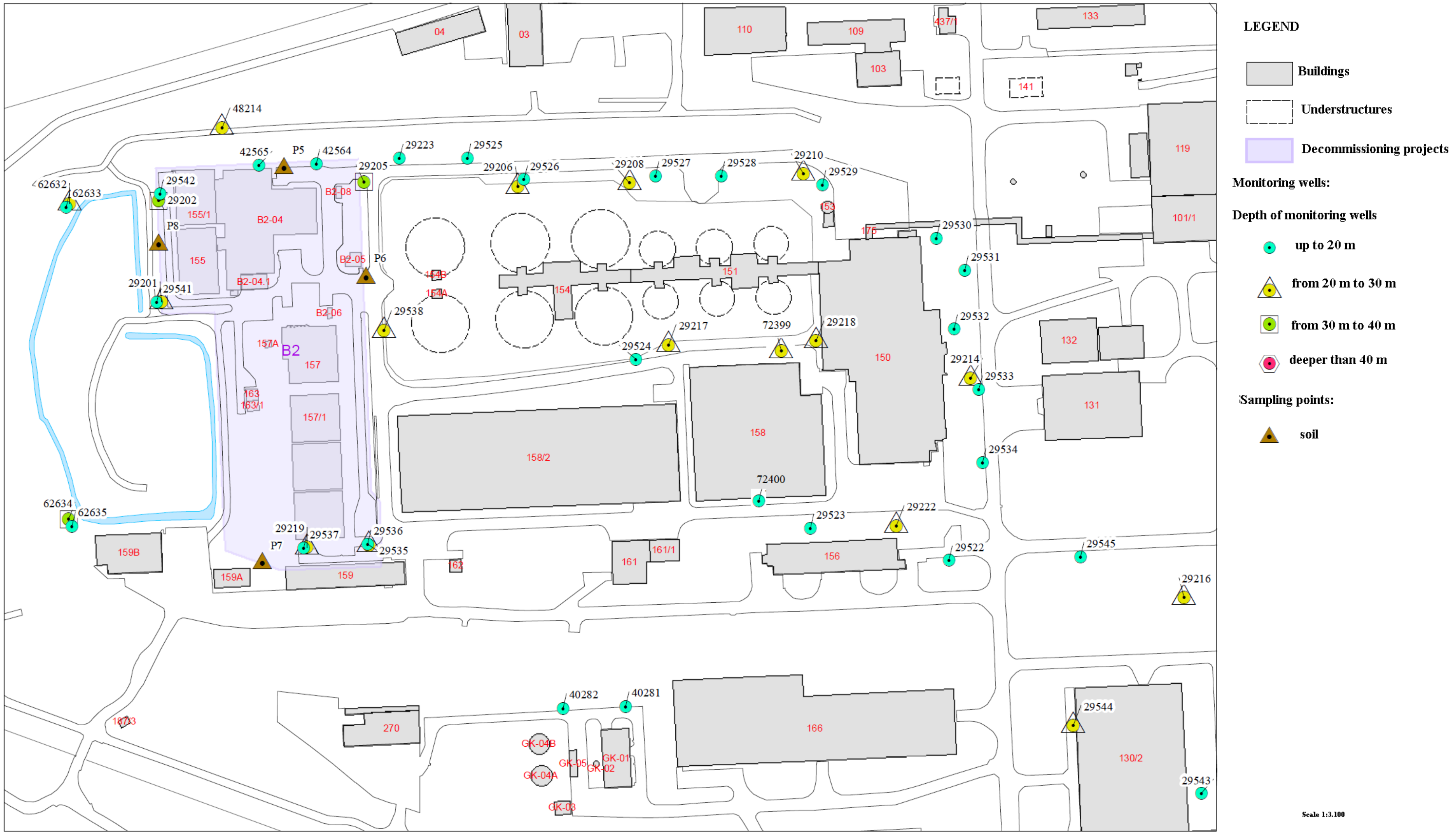


Figure 2.1-6 Layout of monitoring wells within the territory of Interim Radioactive Waste Storage Facilities

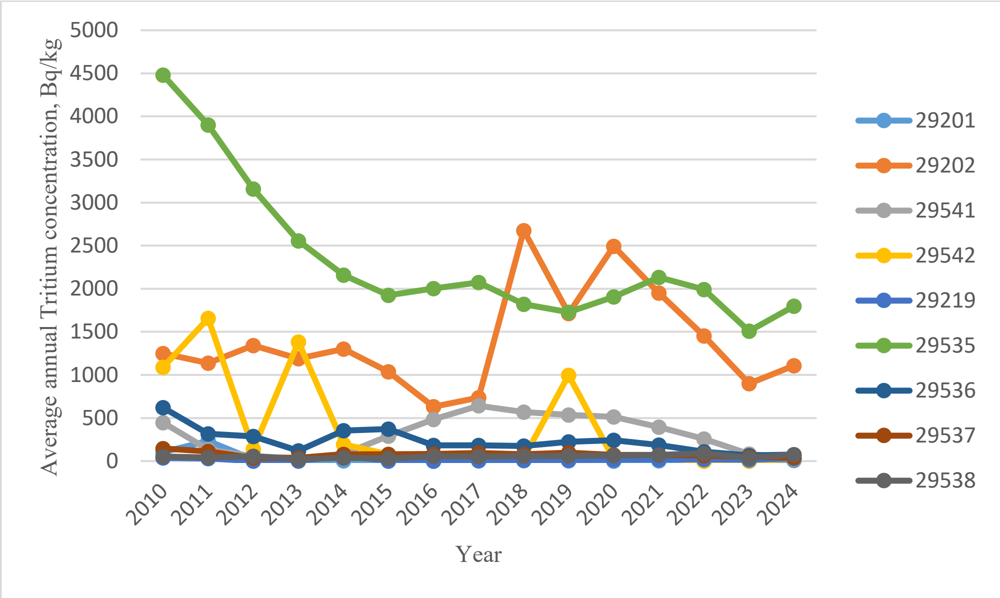


Figure 2.1-7 Tritium concentration in the water of monitoring wells located in the vicinity of the Interim Radioactive Waste Storage Facilities

Based on the multiyear monitoring data, the radionuclide activity concentration in water of monitoring wells close to the SWRF indicate the clearly expressed tendency for decrease (see explanation for higher Tritium values in year 2024), therefore it could be stated that this indicates sufficiently good state of the physical barriers providing radionuclide confinement. Continuous functioning and control of the INPP buildings drainage systems also serve as preventive measure against contamination of the groundwater. Migration of H-3 towards Lake Drūkšiai is not observed since the increased values of H-3 were not detected in the water of the sampling point GPNN-1 (see Fig. 2.1-3) located in close vicinity to the above indicated monitoring well.

To assess the potential consequences due to the increased Tritium concentration in the groundwater, the conservative assessment of the cumulative effective dose due to Tritium impact on the human body after its consumption was performed. Based on the European Commission publication „Methodology for Assessing the Radiological Consequences of Routine Releases of Radionuclides to the Environment“ on average 600 litres intake rate is assumed in assessment for the tritium model. If the tritium concentration is 1797,15 Bq/kg (one of the highest Tritium concentrations in year 2024 close to SWRF), then $1.08*10^6$ Bq would get into the human body. The annual effective dose of the representative due to tritium impact as a consequence of water consumption as the only source of potable water is equal to 0.0194 mSv and is lower than the dose constraint of the annual effective dose - 0.2 mSv set in the Lithuanian Hygiene Standard HN 73:2018 "Basic Standards of Radiation Protection" [2]. It should be noted that the water from the monitoring wells located on the INPP site is not intended for human consumption or any other human needs.

2.1.6 Radionuclide Activity Concentration in the Soil

The ISFSF, SWTSF, SWRF and the Landfill Disposal Modules operation did not have impact on the radionuclide activity concentration in the soil of the INPP region. K-40, Th-232 and Ra-226 mostly contribute to the soil activity (natural radionuclides K-40, Th-232 and Ra-226 are not released from the INPP). The radionuclide activity concentration (Ra, Th, K excluded) in the soil of the ISFSF/SWTSF was in the range of 1.26 and 16.84 Bq/kg, whereas radionuclide activity concentration (Ra, Th, K excluded) in sampling points of the SWRF were in the range between 5.0 to 19.7 Bq/kg. Radionuclide activity concentration (Ra, Th, K excluded) in sampling points on the Landfill Disposal Modules area were in the range between 0 to 6.2 Bq/kg. The total radionuclide activity concentration in the soil samples of the INPP region shows the tendency for decrease.

2.1.7 *Radionuclide Activity Concentration in Bottom Sediments of Water Bodies (not related to the ISFS, SWTSF, SWRF and Landfill Disposal Modules operation)*

Natural radionuclides K-40, Th-228 and Ra-226 (not discharged from the INPP) mostly contributed to the activity of bottom sediments of water bodies (the layout of sampling points is provided in Fig. 2.1-3 and Fig. 2.1-4). The average radionuclide activity concentration (K-40, Th-228 and Ra-226 excluded) in bottom sediments of water bodies in 2024 was 25.9 Bq/kg. The average Cs-137 activity concentration was 25.3 Bq/kg and the average Sr-90 activity concentration was 0.6 Bq/kg. Cs-137 and Sr-90 background concentrations in bottom sediments of Lake Drūkšiai during the start-up period varied between 44 and 170 Bq/kg (Cs-137) and from 0.9 to 1.3 Bq/kg (Sr-90) for dry mass. Specific radionuclide activity concentrations during 2024 were within the level of the background values.

2.1.8 *Radionuclide Activity Concentration in Plants and Foodstuff*

No nuclear origin radionuclides were detected in vegetative and animal products sampled during 2024. The total annual exposure dose due to consumption of measured vegetation- and animal-origin products due to induced radionuclide activity constituted $23.9 \cdot 10^{-4}$ mSv and was practically in line with the previous year's results. The calculated exposure dose due to consumption of fish caught in Drūkšiai lake amounted to $1.55 \cdot 10^{-4}$ mSv (K-40 excluded) under condition that 13 kg of fish was consumed per year. The exposure dose due to consumption of mushrooms was $11.3 \cdot 10^{-4}$ mSv (K-40 excluded) under condition that 3 kg of mushrooms was consumed per year.

Measurements showed that natural radionuclides K-40 and Be-7 make the biggest contribution to the total specific activity of algae during 2024. The total specific radionuclide activity concentration (K, Be, Th, Ra excluded) in algae varied in the range of 0 and 25.3 Bq/kg.

2.1.9 *Dose Rate. Exposure Dose*

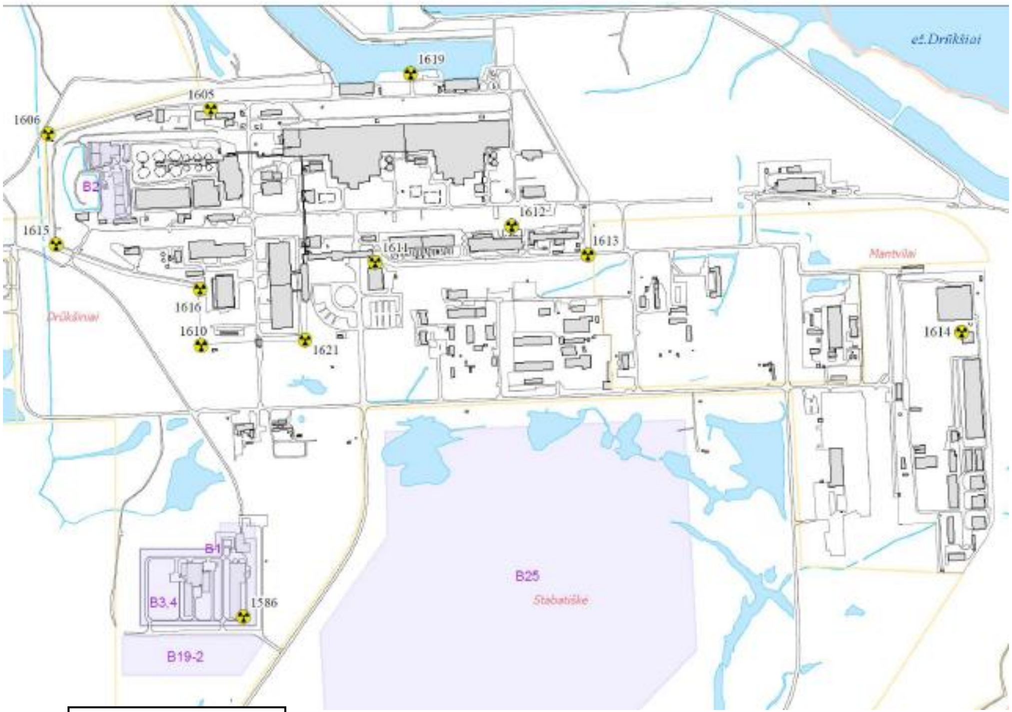
The INPP environmental monitoring includes monitoring of the exposure dose and dose rate in different locations of the INPP region. Continuous dose rate monitoring is performed by the "Skylink" system stationary gamma detectors. 12 detectors are installed in the INPP SPZ (Fig. 2.1-8). 10 detectors are installed in the 30 km surveillance zone (Fig. 2.1-9). In addition to stationary detectors, dose rate is measured by portable devices 4 times per year in various locations of the surveillance zone.

The measured dose rate within the surveillance zone was between 0.072 and 0.152 μSv/h during 2024. The average dose rate within the surveillance zone was 0.102 μSv/h in 2024.

The measured dose rate within the sanitary protection zone was between 0.077 and 0.162 μSv/h during 2024. The average dose rate within the sanitary protection zone was 0.105 μSv/h in 2024.

The average gamma radiation dose rate in the INPP region measured by the portable dosimeters was 0.094 μSv/h in 2024. The average dose rate of the representative persons, living in the surveillance zone, due to external radiation background measured by the portable dosimeters was 0.83 mSv/year in 2024.

The radiological impact to the population and the environment due to nuclear origin radionuclides detected in the atmosphere and water media is far below than the impact due to cosmogenic radionuclides and the globally distributed in the atmosphere radionuclide Cs-137[2].



Skylink system detectors

Figure 2.1-8 Layout of the Skylink system gamma detectors within the INPP 3 km zone

[2] Globally distributed in the atmosphere radionuclide Cs-137 is one of the major radioactive contamination components of the biosphere, mostly originating due to nuclear weapon tests and nuclear accidents. Cs-137 is the main fission product of the nuclear fission of uranium-235 (reactor fuel). Since Cs-137 concentrations measured in the environmental components in the INPP surroundings are at the background values level, separation of globally distributed in the atmosphere Cs-137 from Cs-137 originating due to the INPP activity is not possible. Therefore, the INPP controls radionuclide composition and their activities in all airborne and waterborne discharges into the environment from all the NI located in the INPP SPZ, including Cs-137, as well as possesses authorisations for discharge of respective quantities of radionuclides that are coordinated following the procedure established by the legal acts of the Republic of Lithuania. Each year INPP performs environmental impact assessment of the activities conducted by the INPP NI, including assessment of Cs-137 impact.

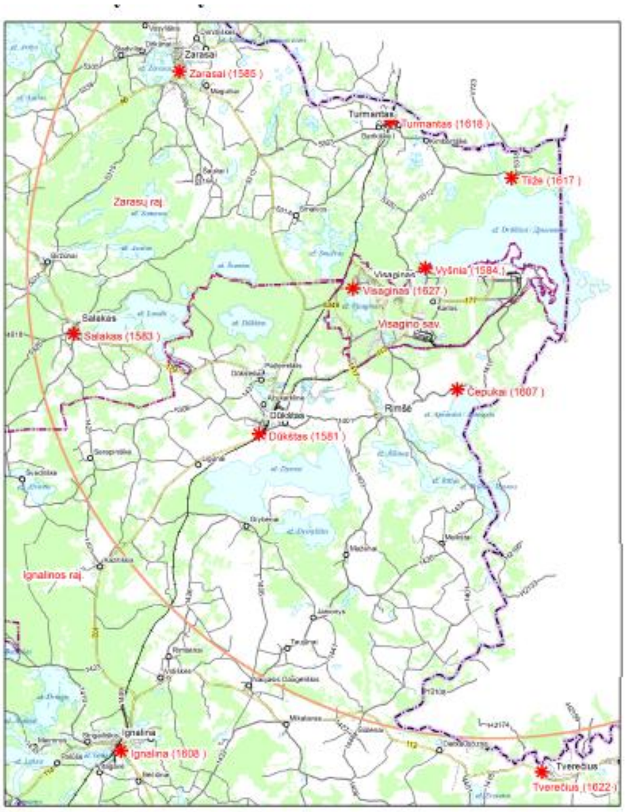


Figure 2.1-9 Layout of the Skylink system gamma detectors within the INPP 30 km zone

The annual ambient dose equivalent of the representative person due to all gamma radiation sources in the sanitary protection zone and surveillance zone continuously measured by 25 thermoluminescent dosimeters (Fig. 2.1-10) was in the range of 0.50 mSv and 0.95 mSv with the average value of 0.70 mSv in 2024.

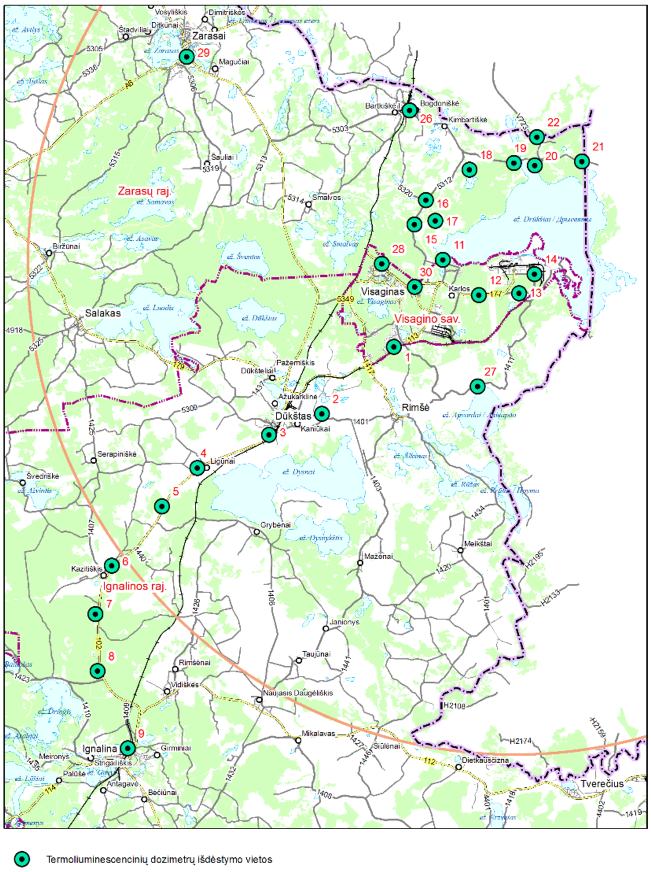


Figure 2.1-10 Layout of TLD dosimeters in the INPP area

The annual ambient dose equivalent measurements on the ISFSF/SWTSF site are performed continuously by 17 thermoluminescent dosimeters (8 dosimeters around the ISFSF and 9 dosimeters around SWTSF) (Fig. 2.1-11). The estimated average annual ambient dose equivalent of the representative person in 2024 based on TLD measurement results was in the range of 0.63 and 0.70 mSv with the average value of 0.67 mSv.

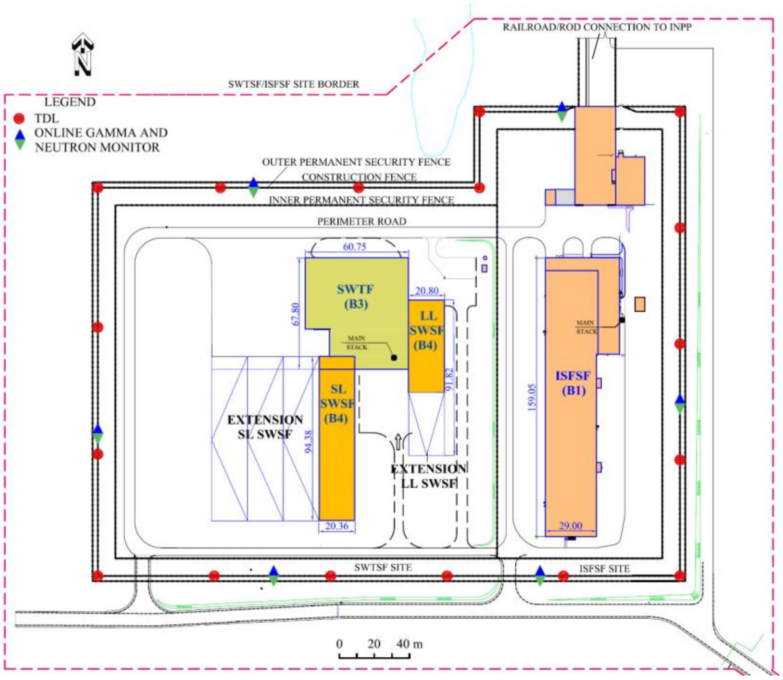


Figure 2.1-11 Layout of TLD, gamma and neutron dosimeters on the ISFSF/SWTSF sites

The annual ambient dose equivalent measurements on the Landfill Disposal Modules site are performed continuously by 14 thermoluminescent dosimeters. The estimated annual ambient dose equivalent of the representative person on the Landfill Disposal Modules site based on TLD measurement results was in the range of 0.61 and 0.97 mSv with the average value of 0.68 mSv.

2.1.10 Conclusions

The operation of the ISFSF, SWRF, SWTSF and the Landfill Disposal Modules did not have impact on the radiological situation within the INPP sanitary protection zone and the surveillance zone in 2024, as:

- No radionuclides that had not been identified in the Plan on Radionuclide Release into the Environment from the Ignalina NPP [24] were identified in airborne discharges from the ISFSF, SWRF, SWTSF and the Landfill Disposal Modules, including no other radionuclide discharge pathways had been identified.
- Radionuclide discharges during the operation of the ISFSF, SWRF and SWTSF in 2024 were 1.289E+08 Bq/year, 3.233E+07 Bq/year and 4.243E+10 Bq/year, respectively. The total annual airborne radionuclide discharges from all the nuclear installations on the INPP site amounted to 8.50E+10 Bq/year and were far below the permissible values set in the Plan [24] (limit value of 3.81E+13 Bq/year).
- The estimated dose of the representative person due to radionuclide discharges from the ISFSF, SWRF and SWTSF were 7.248E-10 Sv, 3.176E-07 Sv and 1.841E-07 Sv, respectively and they gave the input of 14.03% into the total exposure dose of the representative person due to airborne discharges from all the NI on the INPP site. The total exposure dose of the representative person due to airborne discharges from all the NI on the INPP site was 3.581E-03 mSv and constituted 3.58 % of the half (0.1 mSv) of the dose constraint - 0.2 mSv [2].
- No uncontrolled waterborne discharges into the environmental waters during the normal operation of the new nuclear installations have been detected. The radionuclide discharges into the environmental waters from other NI on the INPP site was 4.217E+10 Bq/year (0.28% from the limit value of 1.50E+13 Bq/year). The estimated dose of the representative person due to radionuclide discharges into Lake Drūkšiai (including debalanced waters) is equal to 8.959E-05 mSv and it makes up 0.1 % of the half (0.1 mSv) of the dose constraint – 0.2 mSv [2].
- The total estimated dose to the representative person during 2024 due to airborne and waterborne discharges from all the INPP nuclear installations is equal to 3.671E-03 mSv which is 54.5 times less than the dose constraint of the representative person - 0.2 mSv/year [2].
- The radiological impact to the population and the environment due to nuclear origin radionuclides detected in the atmosphere and water media is far below than the impact due to cosmogenic radionuclides and the globally distributed in the atmosphere radionuclide Cs-137.
- No operational occurrences breaching the safe operating limits and conditions have occurred. All the required accident elimination instructions and plans related to the ISFSF, SWRF, SWTSF and the Landfill Disposal Modules operation are developed and tested regularly.
- No uncontrolled radionuclide airborne and waterborne discharges from the ISFSF, SWRF, SWTSF and the Landfill Disposal Modules to the environment have been detected.

- The ISFSF, SWRF, SWTSF operation and the Landfill Disposal Modules regular radioactive waste loading campaign and subsequent radioactive waste storage, including operation of all other INPP nuclear installations did not have negative impact on the health of the population and the environment of the neighbouring countries.

Besides, based on the measurements conducted by the Radiation Protection Centre of the Republic of Lithuania during 2024 within the scope of the State Environmental Monitoring Programme 2024–2029 and the summarised results provided in the State Radiological Environmental Monitoring Report for Year 2024 [27], it is concluded that:

- The analysis of obtained radiological environmental monitoring survey and measurements results show that the radiological situation of the environment did not change due to the INPP activities, no higher-than-normal volumes of radioactive substances in the environment were detected;
- The average annual ambient dose equivalents in the Ignalina Region (0.63±0.05 mSv) reliably did not differ from the average annual ambient dose equivalent values in other measuring points within the territory of the Republic of Lithuania. For comparison in the Kupiškis region, with no industrial enterprises and located at a sufficient distance from the INPP, it constituted 0.66±0.06 mSv. Therefore, it indicates that decommissioning activities carried out at the Ignalina NPP do not cause additional exposure of the population of Lithuania;
- Contamination of foodstuffs (meat, fish, milk, grain, vegetables) and drinking water by Cs-137 and Sr-90 was negligible. The analysed radionuclide activity concentrations in samples from the INPP region do not differ from the activity concentrations in samples taken from other regions of Lithuania. The activity concentrations of radionuclides in most of the taken samples is less than 0.1 Bq/kg;
- It is concluded that the Ignalina NPP decommissioning activities did not have impact on the environmental contamination with radioactive materials. The radiological contamination of samples of foodstuff and drinking water and the external exposure of the population in the Ignalina NPP region did not differ from that in other regions of Lithuania.

The current Lithuanian seismic monitoring network consisting of 4 seismic stations of the Ignalina NPP and 2 very wide-range seismic observation stations connected to the international GEOFON network ensure uniform seismicity monitoring over the entire territory of Lithuania. Though Lithuania is a seismically stable region, but it is still important to conduct seismic observations. No local earthquakes have been registered in the territory of Lithuania. The main focus of Lithuanian seismic monitoring is local seismic events within the Baltic region.

All new NI building structures and systems important to safety are designed to withstand the impact of the design basis earthquake loads and crash of a large aircraft based on the performed assessments and safety justifications.

2.2 Chemical Monitoring Results

The scope of monitoring of the chemical parameters in the INPP environment is established in the INPP Environmental Monitoring Program [8] and the Summarising Report on Monitoring of the Impact of the Facilities located on the SE INPP Territory to the Groundwater for Years 20017-2021 and the Programme for Years 2022-2026 [9].

The results of Lake Drūkšiai water chemical monitoring performed by the accredited INPP Laboratories according to the INPP Environmental Monitoring Program [8] are provided in Table 2.2-1. Sampling locations are provided in Fig. 2.2-1.

According to the data of Table 2.2-1, Lake Drūkšiai water quality indicators comply with the established norms. According to the physical and chemical indicators based on the results of the Environmental Monitoring Report [28] Lake Drūkšiai may be classified as of good ecological state [29].

Table 2.2-1 Pollutants concentration in water of Lake Drūkšiai

Parameters	Limit values according to the established norms	2024		
		Min. value	Average value	Max. value
t, ^{0}C	28	7.9	18.8	25.1
pH,	6 – 9	7.5	8.2	8.9
Suspended solids, mg/l	≤25	<2,0	2.06	3.5
BOD_7, mgO_2/l	≤ 6	0.6	1.2	2.3
COC, mgO_2/l		<30	35.38	50
NH_4-N content, mg/l	≤0.78	0.033	0.036	<0.065
NO_3-N content, mg/l	-	0.013	0.043	0.373
NO_2-N content, mg/l	≤0.045	<0.006	0.007	0.012
N total content, mg/l	<0.90	0.25	0.62	0.96
PO_4-P content, mg/l	≤0.13	<0.038	0.039	0.093
P total content, mg/l	0.051-0.070	<0.036	0.053	0.133
Petroleum products content, mg/l	0.2	0.060	0.113	0.300

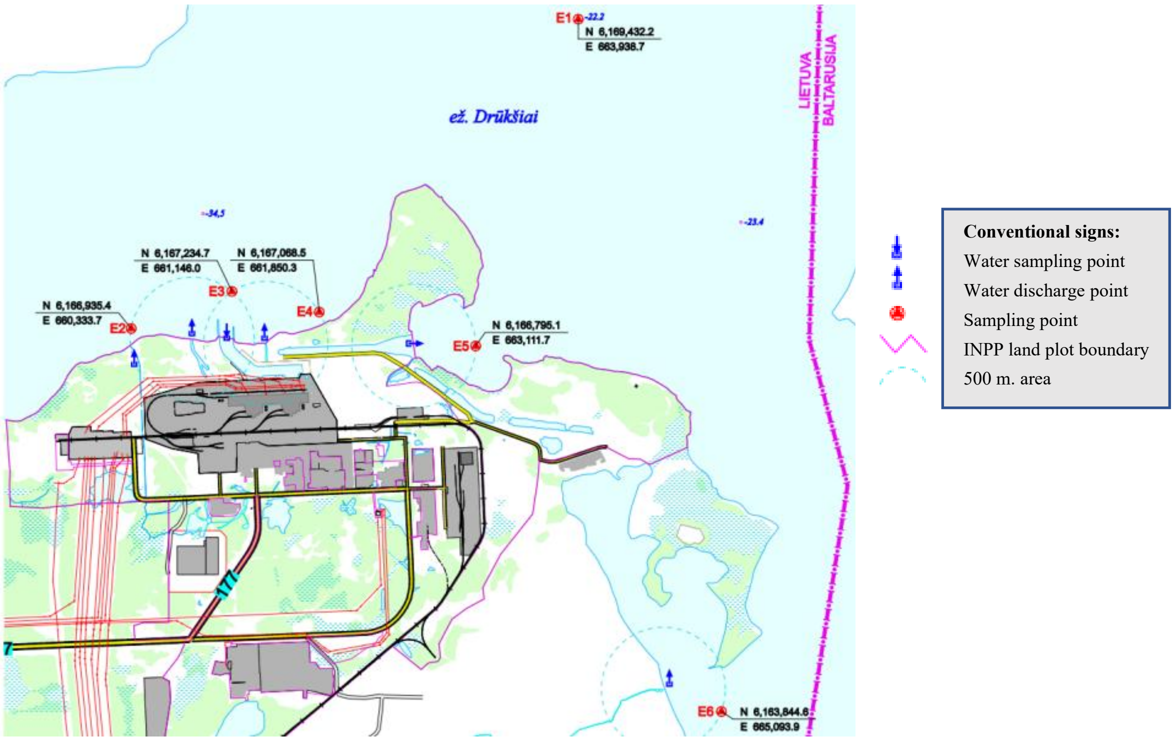


Fig. 2.2-1 Lake Drūkšiai Water Sampling Locations

Regarding the atmospheric air pollution from the established air pollution source (Steam Boiler Plant) during the monitored period (2024), it could be stated that the measured values do not exceed the limit values set in the Permit for Pollution No. TV(2)-3 /TL-U.5-13/2016 [30] and are in line with the discharge values measured in 2023.

In compliance with the Regulation of Environmental Monitoring of Economic Entities [5] analysis of data on monitoring of the impact to the underground water are performed and the related conclusions are submitted each 5 years. The certified INPP laboratory develops simplified annual monitoring reports providing the performed measurement data and the 5-year period aggregated data are summarised in the report developed by the contracted company. The last 5-year period report is developed for the period of 2017-2021. The next 5-year reporting period expires in 2026.

In compliance with the Summarising Report on Monitoring of the Impact of the Facilities located on the SE INPP Territory to the Groundwater for Years 2017-2021 and the Programme for Years 2022-2026 [9] developed on the basis of the requirements of the Regulation of Environmental Monitoring of Economic Entities [5] the following general chemical composition parameters, general pollution indicators and indicators specific to the INPP activity and produced waste are measured 2 times/year: groundwater level, temperature, pH, oxygen concentration, electric conductivity, total chemical analysis (dissolved solids total. hardness total, Permanganate, Bichromate index, Cl, SO_4, NO_2, NO_3, Na, K, Ca, Mg, NH_4), COD, petroleum products total content, heavy metals content, Nitrogen (N), Phosphate (P) total content, PO_4, BOD_7.

In summarising the annual groundwater monitoring results [9], it should be stated that the measured values of the following monitored microelements/heavy metals Cd, Cr, Cu, Hg, Zn did not exceed the maximum permissible concentrations (hereafter referred to as MPC), but the measured values of Pb, Ni in several monitoring wells increased in comparison with the monitoring results of the previous years. Such increase of heavy metals concentrations in the groundwater of the INPP territory stands out against the clean hydrochemical background of the groundwater of the INPP territory according to the other measured parameters and could be explained by the fact that a specific rarely found hydrogeological environment has formed in this area that is favourable for accumulation and migration of these metals.

The episodic groundwater pollution by petroleum products is observed but not exceeding the MPC (1 mg/l) with the tendency for reduction. Results of measurement of such parameters as electric conductivity, water temperature, pH, dissolved oxygen show that neither increased salinity of the water, nor abnormal temperatures are observed. In most cases pH of monitoring wells water is within the range of 7-8. However increased acidity (pH<7) of the water is observed in the vicinity of the Solid Radioactive Waste Retrieval Facility and the area between the Units and Lake Drūkšiai. This may be related to technological processes carried out in these facilities using acids. Increased alkalinity (pH>8, pH>10-12) of the water is observed in the area between the Units and Lake Drūkšiai and the Buffer Storage of the Landfill Disposal Facility and is related to degradation of organic materials.

Analysis of Cl, SO_4, NO_2, NO_3, Na, K, Na, Ca, Mg, NH_4-N in samples indicate that only NH4-N is of concern (MPC – 10 mg/l). The maximum values are observed in shallow monitoring wells in the vicinity of the recultivated wastewater sludge dumping site reaching 35.2 – 63.5 mg/l. However, in deeper monitoring wells the values are within the range of background level and do not exceed 0.5 mg/l, thus indicating that only shallow ground water is polluted by sludge.

Permanganate index does not exceed the established value of <20 mg/l O_2 in water of none of the monitoring wells, however BI/COD (MPC<30 mg/l O_2) values within the range of 30 – 100 mg/l O_2 (average pollution level) are detected. The maximum measured values of BOD_7 (MPC 29 mg/l O_2) in the water of monitoring wells close to the recultivated wastewater sludge dumping site (the only monitoring point) reached only 8.4 – 8.5 mg/l O_2 and are considered as negligible.

The total content of N_t (MPC - 30 mg/l) and P_t (MPC - 4 mg/l), as well as PO_4-P (MPC - 3.3 mg/l) are also measured only in the water of monitoring wells close to the recultivated wastewater sludge dumping site and the maximum values of N_t reaches 34.2- 58.3 mg/l. All this nitrogen is bonded into ammonium. The maximum values of P_t and PO_4-P are far below the established MPC and are negligible.

3 REFERENCES

1. Law of the Republic of Lithuania on Environmental Monitoring;
2. Lithuanian Hygiene Standard HN 73:2018 “Main Radiation Protection Standards” (Off. Journal, 2002, No. 11-388; new redaction TAR 2018, No, 2018-13208);
3. Nuclear Safety Requirements BSR-1.9.1-2017 “Standards of Release of Radionuclide from Nuclear Installations and Requirements for the Plan on Release of Radionuclides”, approved by the Order No 22.3-89 of the Head of the State Nuclear Power Safety Inspectorate of 27 September 2011 (As amended by Order No 22.3-198 of the Head of the State Nuclear Power Safety Inspectorate of 31 October 2017);
4. Description of the Procedure of Radiological Environmental Monitoring by Economic Entities (TAR, 2020-12-28, No. 28642);
5. Regulations of Environment Monitoring by Economic Entities (Off. Journal, 2009-09-22, No. 113-4831, new redaction TAR, 2021-03-31, No. 06606);
6. Methodological Requirements for Development of the Underground Water Monitoring Part of the Monitoring Programme (Off. Journal, 2011, No.107-5092, TAR, 2018, No. 9811);

7. Radiological Environmental Monitoring Programme, DVSed-0410-3;
8. Ignalina NPP Environmental Monitoring Programme, MtDPl-342(7.3E), dated 7 June 2023;
9. Summarising Report on Monitoring of the Impact of the Facilities located on the SE INPP Territory to the Groundwater for Years 20017-2021 and the Programme for Years 2022-2026, ArchPD-0445-78165vl;
10. Post-Project Analysis Programme for the New INPP Nuclear Installations, Epg-130(3.254), dated 24 October 2017;
11. Interim Spent Nuclear Fuel Storage Facility Operation Technical Specification, DVSed-1225-2;
12. Instruction on Performance of Radiological Monitoring during Handling of CONSTOR®RBMK1500/M2 Cask, DVSed-0512-3;
13. Nuclear Safety Requirements BSR-3.1.1-2016 “Spent Nuclear Fuel Handling at the Dry Type Storage Facility”, approved by the Order No 22.3-59 of the Head of VATESI of 21 July 2010 (version of Order No 22.3-130 of the Head of VATESI of 22 July 2016, last amended 2023);
14. Solid Radioactive Waste Retrieval Facility Operation Technical Specification, B2-1 Project, DVSed-1325-3;
15. Solid Radioactive Waste Retrieval Facility Operation Technical Specification, B2-2 Project, DVSed-1325-5;
16. Nuclear Safety Requirements BSR-3.1.2-2017 “Pre-disposal Management of Radioactive Waste at Nuclear Installations”, approved by the Order No 22.3-120 of the Head of the State Nuclear Power Safety Inspectorate of 31 December 2010 (As amended by Order No 22.3-132 of the Head of the State Nuclear Power Safety Inspectorate of 31 July 2017, last amended 2023);
17. Solid Radioactive Waste Treatment and Storage Facility Operation Technical Specification, B3/4 Project, DVSed-1325-4;
18. Nuclear Safety Requirements BSR-3.2.2-2016 “Radioactive Waste Repositories”, approved by the Order No 22.3-188 of the Head of the State Nuclear Power Safety Inspectorate of 30 November 2016, last amended 2023;
19. Ignalina NPP Short-lived Very Low-Level Radioactive Waste Disposal Facility Operation Technical Specification, B19-2 Project, DVSed-1325-6;
20. INPP Equipment and Facilities Technical Maintenance Regulations, DVSed-1025-3;
21. Instruction on the Technical Supervision of the INPP Buildings and the Territory, DVSed-2612-2;
22. B19/2 Facility Sedimentation Monitoring Programme, EPg-92(3.280);
23. INPP Region and Maišiagala Radioactive Waste Storage Facility Radiological Monitoring Results for Year 2024 No At-867(3.267E), dated 31 March 2025;
24. Plan on Release of Radionuclides into the Environment, MtDPl-5(3.254E), dated 26 May 2020;
25. Tritium and the environment, IRSN, Radionuclide fact sheet, https://www,irsn,fr/EN/Research/publications-documentation/radionuclides-sheets/environment/Documents/Tritium_UK,pdf;

26. Nuclear Safety Requirements BSR-1.9.2-2018 “Establishment and Application of Clearance Levels of Radionuclides for the Materials and Waste Generated during the Activities with the Sources of Ionising Radiation in the Area of Nuclear Energy“, approved by the Order No 22.3-90 of the Head of the State Nuclear Power Safety Inspectorate of 31 September 2011 (As amended by Order No 22.3-72 of 29 April 2016, by Order No. 22.3-34 of 7 February 2018, by Order No. 22.3-104 of 21 May, 2020 of the Head of State Nuclear Power Safety Inspectorate);
27. State Radiological Environmental Monitoring Report for Year 2024, Radiation Protection Centre, https://rsc.lrv.lt/public/canonical/1741074294/549/2024%20m%20valstybinio%20radiologinio%20aplinkos%20monitoringo%20ataskaita.pdf;
28. State Enterprise Ignalina Nuclear Power Plant Environmental Monitoring Report for Year 2024; No. At-501(1.195E), dated 14 February 2025;
29. Order of the Minister of Environment No D1-210 “On Approval of Methodology for Evaluation of Ecological Status of the Surface Water Bodies (Off. Journal 2007, No. 47-1814, new redaction TAR 2021-11-04, No 2021-22923);
30. Permit for Pollution No. TV(2)-3 /TL-U.5-13/2016, as of 2 January 2023.

DETALŪS METADUOMENYS	
Dokumento sudarytojas (-ai)	Lietuvos Respublikos aplinkos ministerija 188602370, A. Jakšto g. 4, LT-01105 Vilnius
Dokumento pavadinimas (antraštė)	REGARDING THE REPORT ON IMPLEMENTATION OF THE POST-PROJECT ANALYSIS PROGRAMME FOR THE NEW INSTALLATIONS OF IGNALINA NUCLEAR POWER PLANT FOR THE YEAR 2024
Dokumento registracijos data ir numeris	2025-09-16 Nr. D8(E)-3753
Dokumento gavimo data ir dokumento gavimo registracijos numeris	–
Dokumento specifikacijos identifikavimo žymuo	ADOC-V1.0
Parašo paskirtis	Pasirašymas
Parašą sukūrusio asmens vardas, pavardė ir pareigos	Tomas Vaitkevičius, Viceministras
Sertifikatas išduotas	TOMAS VAITKEVIČIUS LT
Parašo sukūrimo data ir laikas	2025-09-15 23:16:02 (GMT+03:00)
Parašo formatas	XAdES-T
Laiko žymoje nurodytas laikas	2025-09-15 23:16:17 (GMT+03:00)
Informacija apie sertifikavimo paslaugų teikėją	SK ID Solutions EID-Q 2021E, SK ID Solutions AS EE
Sertifikato galiojimo laikas	2025-03-19 18:45:56 – 2030-03-19 23:59:59
Informacija apie būdus, naudotus metaduomenų vientisumui užtikrinti	"Registravimas" paskirties metaduomenų vientisumas užtikrintas naudojant "RCSC IssuingCA-2, VI Registru Centras - i.k. 124110246 LT" išduotą sertifikatą "DBSIS, Informatikos ir ryšių departamentas prie Lietuvos Respublikos vidaus reikalų ministerijos, į.k.188774822 LT", sertifikatas galioja nuo 2025-05-16 11:31:08 iki 2028-05-15 11:31:08
Pagrindinio dokumento priedų skaičius	1
Pagrindinio dokumento pridedamų dokumentų skaičius	–
Pridedamo dokumento sudarytojas (-ai)	–
Pridedamo dokumento pavadinimas (antraštė)	–
Pridedamo dokumento registracijos data ir numeris	–
Programinės įrangos, kuria naudojantis sudarytas elektroninis dokumentas, pavadinimas	DBSIS, versija 3.5.85.4
Informacija apie elektroninio dokumento ir elektroninio (-ių) parašo (-ų) tikrinimą (tikrinimo data)	Atitinka specifikacijos keliamus reikalavimus. Visi dokumente esantys elektroniniai parašai galioja (2025-09-16 08:03:07)
Paieškos nuoroda	–
Papildomi metaduomenys	Nuorašą suformavo 2025-09-16 08:03:07 DBSIS