ENVIRONMENTAL IMPACT ASSESSMENT FOR THE RAIL BALTIC RAILWAY LINE SECTION KABLI – ESTONIAN/LATVIAN BORDER

Report

INSPIRING ENVIRONMENT

Co-financed by the European Union
Connecting Europe Facility

2025

Title	Environmental impact assessment for the Rail Baltic railway line section Kabli – Estonian/Latvian border. Report.
Version	Draft report
Project	24TP62KR
Date	09.09.2025

Developer	Rail Baltic Estonia OÜ

Environmental impact expert	Estonian, Latvian & Lithuanian Environment OÜ; Estonian, Latvian & Lithuanian Environment SIA
Lead expert	Toomas Pallo, *MSc* (EIA licence no. 0090)
Participants	Katrin Ritso, *MSc*
	Pille Antons, *MSc*
	Lea Jalukse, *MSc*
	Teele Kaljurand, *MSc*
	Kadri Kipper-Klaas, *MSc*
	Silver Lind, *MSc*

TABLE OF CONTENTS

ANNEXES:

Annex 1. Summary in English of the Compliant EIA programme

Annex 2. Natura appropriate assessment report (available in Estonian)

Annex 3. Table of mitigation measures (available in Estonian)

Annex 4. Table of monitoring measures (available in Estonian)

Annex 5. Cross-border impact assessment materials in Latvian and in English

ABBREVIATIONS

CO	carbon dioxide
CO_2	carbon dioxide, carbonic acid gas
DPS3	Rail Baltic railway section Kabli–Estonian/Latvian border
EELIS	Estonian Nature Information System
EIA	Environmental Impact Assessment
EU	European Union
EMF	electromagnetic field
ERTMS	*The European Rail Traffic Management System* (European Union standard system for railway signalling management and interoperability)
ETAK	Estonian Topographic Database
EE	Republic of Estonia
FE	Fossil electricity
FOD	falling object detectors
h	hour
H	height
ha	hectare
IPCC	Inter*governmental Panel on Climate Change*
KeHJS	Environmental Impact Assessment and Environmental Management System Act
GHG	greenhouse gases
km	kilometre
EIA	environmental impact assessment
EIA8	Rail Baltic railway section Pärnu-Kabli
EIA9	Rail Baltic railway section Kabli–Estonian/Latvian border
SAC	Special Area of Conservation
SPA	Special Protection Area
SEA	strategic environmental assessment
W	width
VOC	volatile organic compounds
LULUCF	Land *Use, Land-use change and Forestry*
LV	Republic of Latvia
MaRu	Estonia Land and Spatial Planning Board

m	metre
NO_2	nitrogen dioxide
NO_X	nitrogen compounds
OCPS	contact line protection system
PAH	polycyclic aromatic hydrocarbons
PM_{sum}	*Total Suspended Particles*, total amount of airborne particles
$PM_{2.5}$	very fine particulate matter
PM_{10}	fine particulate matter
RE	Renewable electricity
RB	Rail Baltic
RdtS	railway law
SO_2	sulphur dioxide
t	ton
TTJA	Consumer Protection and Technical Regulatory Authority
VE	*value engineering*
VEP	key habitat

1 INTRODUCTION

Rail Baltic is a railway infrastructure project aimed at establishing a double-track, 1435 mm gauge, electrified high-speed railway (with a design speed of 249 km/h) on the route Tallinn–Pärnu–Riga–Kaunas–Lithuania/Poland border. The construction of the railway and related infrastructure will enable the integration of the Baltic countries, including Estonia, into the European rail network. The construction of the Rail Baltic railway will create opportunities for better movement of people and goods.

To implement the project in Estonia, Rail Baltica county-wide spatial plans have been established in Harju, Rapla and Pärnu counties[1] . The county-wide spatial plans establish a north-south route corridor approximately 213 km long on Estonian territory. In addition to the main route, international passenger terminals will be built in the Ülemiste area of Tallinn and in Pärnu, and freight stations will be built in Muuga Harbour, Soodevahe and Pärnu. Simultaneously with the Rail Baltic county-wide spacial plans, a strategic environmental assessment (SEA) was initiated and carried out to assess the overall environmental impact of the Rail Baltic project. A joint SEA report was prepared for the three county-wide spatial plans[2]. First, the preferred route option was identified, followed by a detailed environmental impact analysis (at degree of accuracy of the preliminary design) and the development of necessary environmental impact mitigation measures.

In addition to the Rail Baltic county-wide spatial plans, county-wide spatial plans for 2030+ have also been adopted, which include local stops along the route. In Pärnu County, local stops are planned in Kaisma, Tootsi, Urge, Surju and Urissaare (Häädemeeste)[3].

Although the SEA of the county-wide spatial plans has been carried out thoroughly, it is reasonable to assess and specify the environmental impact also at the design stage and for each section of the railway, which will ensure that the environmental impact is taken into account sufficiently and that the interested parties are better involved.

Pursuant to § 26 (3) of the Environmental Impact Assessment and Environmental Management System Act (KeHJS)[4] and the application of the Estonian branch of RB Rail AS, the Consumer Protection and Technical Regulatory Authority (TTJA) initiated environmental impact assessments of the construction project for eight sections of the Rail Baltic railway line. Following the renewal of the Pärnu County-wide spatial plan by the Supreme Court decision[5], the section between Pärnu and Kabli was cancelled,

---

[1] The Harju County-wide spatial plan "Determination of the location of the Rail Baltic railway corridor" was established by Order No. 1.1-4/41 of the Minister of Public Administration on 13 February 2018. The Rapla County-wide spatial plan "Determination of the location of the Rail Baltic railway corridor" was established by Order No. 1.1-4/43 of the Minister of Public Administration on 14 February 2018. The Pärnu County-wide spatial plan "Determination of the location of the Rail Baltic railway corridor" was established by Order No. 1.1-4/40 of the Minister of Public Administration and Local Government on 13 February 2018; The Pärnu County-wide spatial plan "Determination of the location of the Rail Baltic railway corridor" In the area of the route sections repealed by the Supreme Court decision No. 3-18-529 of 19 May 2020, the following has been established by the Minister of Economic Affairs and Industry Order No. 47 of 1 April 2025

[2] The Rail Baltic county-wide spatial plan materials, including the SEA report with annexes, are available in the planning database (PLANK), https://planeeringud.ee/plank-web/#/planning/detail/10102130

[3] Pärnu County-wide spatial plan (2030+) explanatory memorandum, section 4.2.2. The names of local stops have been specified during the design of the railway section and differ slightly from those given in the explanatory memorandum to the Pärnu County-wide spatial plan (2030+).

[4] Based on the version of the Environmental Impact Assessment and Environmental Management System Act in force at the time of initiation of the EIA (published in RT I, 22.02.2019, 15). Electronic State Gazette: https://www.riigiteataja.ee/akt/122022019015

[5] Supreme Court decision of 19 May 2020 in case no. 3-18-529

and on 7 May 2024, the developer submitted a proposal to divide the section "Pärnu–Estonian/Latvian border" into two sections: "Pärnu–Kabli" (section 8 of the route) and "Kabli–Estonian/Latvian border" (section 9 of the route).

The section of the railway line assessed in this environmental impact assessment runs from Kabli to the Estonian/Latvian border and is approximately 12.7 km long (Figure 1-1). The EIA for the section of the Rail Baltic railway line between Kabli and the Estonian/Latvian border was initiated by the Consumer Protection and Technical Regulatory Authority on 7 June 2024 with decision no. 1-7/24-184.

Pursuant to § 3^1 (1) of the KeHJS, the purpose of the EIA is to provide the issuer of the development consent with information on the significant environmental impact of the planned activity and its realistic alternatives, and to select the most suitable solution for the planned activity, which will make it possible to prevent or reduce adverse effects on the environment and promote sustainable development.

The EIA identifies, describes, and assesses the significant direct and indirect environmental impact of the construction and operation of the railway and proposes measures to prevent or mitigate this impact.

Figure 1-1. Sections of Rail Baltic environmental impact assessments following the decision of the TTJA 07.06.2024[6]

[6] Base map: Land and Spatial Planning Board 23.07.2025

2 EIA PARTIES

The EIA parties are the decision-maker (institution that decides whether the EIA programme and report comply with the requirements), the developer and the EIA expert. The details of these parties are presented in the table below (Table 2-1). The cross-border environmental impact assessment process and participation are managed by the Ministry of Climate of the Republic of Estonia.

Table 2-1. EIA parties

Party	Authority	Contact	Contact
Decision-maker	Consumer Protection and Technical Regulatory Authority	Raili Kukk, Chief Specialist	Endla 10a, 10122 Tallinn raili.kukk@ttja.ee
Developer	OÜ Rail Baltic Estonia	Janis Erilaid, Chief Project Manager Tanika Ojasild, Senior Environmental Expert	Veskiposti 2/1, 10138 Tallinn info@rbe.ee
EIA expert	Estonian, Latvian & Lithuanian Environment OÜ	Katrin Ritso, Senior Expert-Project Manager	Tõnismägi 3a-15, 10119 Tallinn katrinr@environment.ee

The EIA was carried out in cooperation with Estonian, Latvian & Lithuanian Environment OÜ and SIA Estonian, Latvian & Lithuanian Environment experts. The members of the expert group are as follows:

- Toomas Pallo, *MSc* – EIA lead expert (licence no. KMH0090); impact on protected natural objects, habitats, landscape, mineral resources; impact of the spread of alien species; Natura assessment; impact on human well-being and health; light pollution; socio-economic impact.
- Katrin Ritso, *MSc* – EIA coordinator; impact on soil, relief, landscape and the aquatic environment (including surface water and groundwater), protected areas, individual protected natural objects and species, cultural heritage and the socio-economic environment, including human health, well-being and property; possible impact associated with accidents; indirect impacts; GIS analyses.
- Evija Skrastiņa, *MSc* – Coordinator for the assessment of transboundary impacts on the territory of the Republic of Latvia.
- Pille Antons, *MSc* – impact on protected natural objects, biodiversity, plants and animals, water bodies, landscape, land use, socio-economic environment (including mobility), cultural heritage; GIS analyses.
- Silver Lind, *MSc* – impact on surface water, soil, landscape and relief, noise levels, vibration; electromagnetic impact.
- Lea Jalukse, *MSc* – impact on ambient air, soil, landscape and relief, waste generation, material use; potential impact associated with accidents; impact on the socio-economic environment, including human health, well-being and property; impact on mobility and the impact of barriers; indirect impacts.

- Kadri Kipper-Klaas, *MSc* – impact on surface water and marine life, the socio-economic environment, including human health, well-being and property; potential impact associated with accidents; impact on cultural heritage.
- Teele Kaljurand, *MSc* – impact on climate.
- Aiga Tora, *MSc* – noise expert, model calculations and mitigation measures.
- Lūcija Kursīte, *MSc* – Latvian Natura assessment expert, impact on nature conservation areas, protected habitats and species.
- Anete Pošiva-Bunkovska, *MSc* – Latvian habitat expert, impact on protected habitats and species.
- Laura Kurzemniece, *MSc* – Latvian landscape expert, impact on landscapes.
- Krišjānis Ralfs Veinbergs, *MSc* – GIS expert.

In addition, the following experts in specific fields/compilers of baseline studies were involved in the work:

- Heikki Luhamaa, *MSc* – ornithologist, impact on birdlife in Estonia.
- SIA EU Temporalis – Pēteris Daknis, *MSc* – ornithologist, impact on birdlife in Latvia.
- Estonian Nature Conservation Centre – Meelis Tambets (responsible expert) – impact on river ecology.
- Entec Eesti OÜ – Andres Piir (authorised hydraulic engineer, professional certificate 150783), Andres Piirsalu (authorised water supply and sewerage engineer, professional certificate 152121) – Impact of Rail Baltic drainage on the water regime of the Mērnieku dumbrāji Natura 2000 site.
- Markus Hengst, *Dipl. Eng., Univ.* – analysis of bridge solutions.
- Rewild OÜ – Piret Remm, *PhD*; Jaanus Remm, *PhD* – specifying the dimensions and location of animal passages.

A more detailed overview of the EIA parties is provided in the EIA programme (Annex 1 to the report).

3 DESCRIPTION OF THE PLANNED ACTIVITY

3.1 Rail Baltica railway

The general principles for the design of the Rail Baltica railway[7], which apply to the entire project (i.e. to the sections to be built in Estonia, Latvia and Lithuania), are described in this EIA programme.

Rail Baltic is a new, fast, modern, electrified, double-track railway line for passenger and freight transport, that is equipped with ERTMS[8]. The railway is planned to run from Tallinn via Pärnu, Riga, Panevėžys and Kaunas to the Lithuanian-Polish border. In order to prevent people and animals from colliding with the trains, the railway and its infrastructure (an area approximately 40–50 m wide, which may be smaller or larger in some sections depending on the terrain) will be separated by a fence, and movement will be ensured by underpasses or overpasses. There are no stops, freight stations or rolling stock maintenance depots in the section covered by this EIA.

In places where the Rail Baltic railway corridor intersects with structural elements of the green network at different levels, the county-wide spatial plan provides for areas where mitigating measures are necessary to ensure the connectivity and functionality of the network and the movement of animals, such as large animal passages, shore paths under bridges and inside the culverts, etc.

3.2 Objective and location of the planned activity

Rail Baltic is a rail transport project aimed at establishing a 1435 mm gauge high-speed railway with associated infrastructure. Its broader objective is to integrate the Baltic States, including Estonia, into the European rail network.

From the perspective of this EIA, the planned activity is the construction and use of a railway in the southern part of Pärnu County on a section approximately 12.7 km long from Kabli to the Estonian-Latvian border (Figure 3-1). The section in question is part of the railway running through Estonian territory (total length in Estonia is approximately 213 km). The railway section runs in Häädemeeste municipality in Pärnu County, starting from the Kabli River in Penu village and ending in Ikla village on the Estonian-Latvian border, from where the railway continues on the territory of the Republic of Latvia. The railway section is located in the territory of the villages of Ikla, Metsapoole, Treimani, Orajõe, Majaka and Penu.

Previously prepared Rail Baltic county-wide spatial plans have determined the planned railway route corridor[9] and the basic solution for the railway. This environmental impact assessment will be carried out for the railway project, during which a more detailed solution for the aforementioned section will be prepared. A description of the planned railway is provided in chapter 3.3.

---

[7] These principles are summarised in the *Design Guidelines*, which are publicly available at https://www.railbaltica.org/design-guidelines/ (2 January 2025) and the *Operational Plan*, which is publicly available at http://www.railbaltica.org/wp-content/uploads/2019/05/RB_Operational_Plan_Final_Study_Report_final.pdf

[8] The European Rail Traffic Management System; European Union standard system for railway signalling management and interoperability ; see in more detail: https://www.era.europa.eu/domains/infrastructure/european-rail-traffic-management-system-ertms_en

[9] The railway corridor designated in county-wide spatial plans is the land required for the construction of the railway and the railway protection zone, including the "corridor adjustment area". The "corridor adjustment area" is the area within which the route may be adjusted during the project implementation. The width of the route corridor is mainly 350 m, and 150 m in densely populated areas.

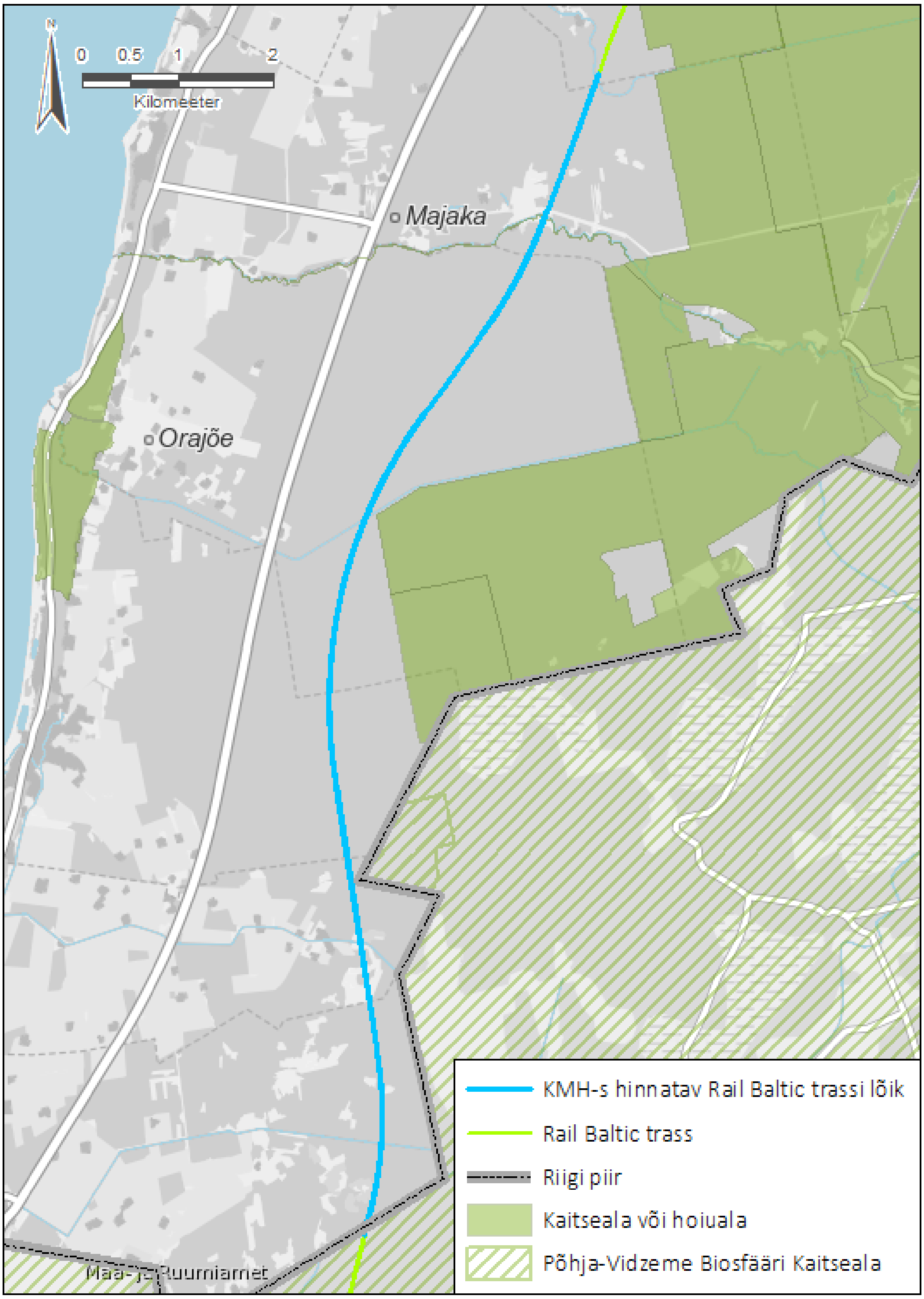


Figure 3-1. Location of the Rail Baltic railway section subject to EIA[10]

[10] Data: EELIS (Estonian Nature Information System), Environmental Agency, 15 January 2025; Dabas Aizsardzības Pārvalde (Latvian Nature Conservation Agency), 15 January 2025; Base map: Land and Spatial Planning Board, 15 January 2025;

3.3 Description of alternatives for the planned activity

The EIA considers two main alternatives:

1) preliminary design solution (alternative 1);
2) value engineering solution (alternative 2).

Based on the results of the EIA (conducted in parallel with the EIA), a final project solution will be prepared, taking into account the planned mitigation measures.

All alternative solutions take into account the 350 m wide railway corridor established in the county-wide spatial plan, within which the precise location of the railway does not conflict with the Rail Baltic county-wide spatial plan.

This EIA does not address alternatives outside the railway corridor specified in the county-wide spatial plan or the zero alternative, i.e. a situation where no railway is built, as these issues have been addressed and assessed in the SEA report for the Rail Baltica county-wide spatial plans and there is no substantive need to repeat this in the EIA stage of the railway project.

3.3.1 Alternative 1: preliminary design

The preliminary design solution for the railway section includes a total of four structures: one road bridge, one railway bridge and two ecoducts (see Figure 3-2).

Grade-separate solutions have been designed for intersections with the following local roads:

- road bridge at the intersection with the Vanaraudtee forest road at 3.9 kilometres;
- a railway bridge at the intersection with Loigu tee at 11.1 kilometres, which also crosses the Lemmejõgi River.

The railway is fenced on both sides along its entire length and two ecoducts have been designed for the section in question to ensure the movement of animals (at kilometres 4.3 in Treimani village and 9.7 in Orajõe village in the preliminary design).

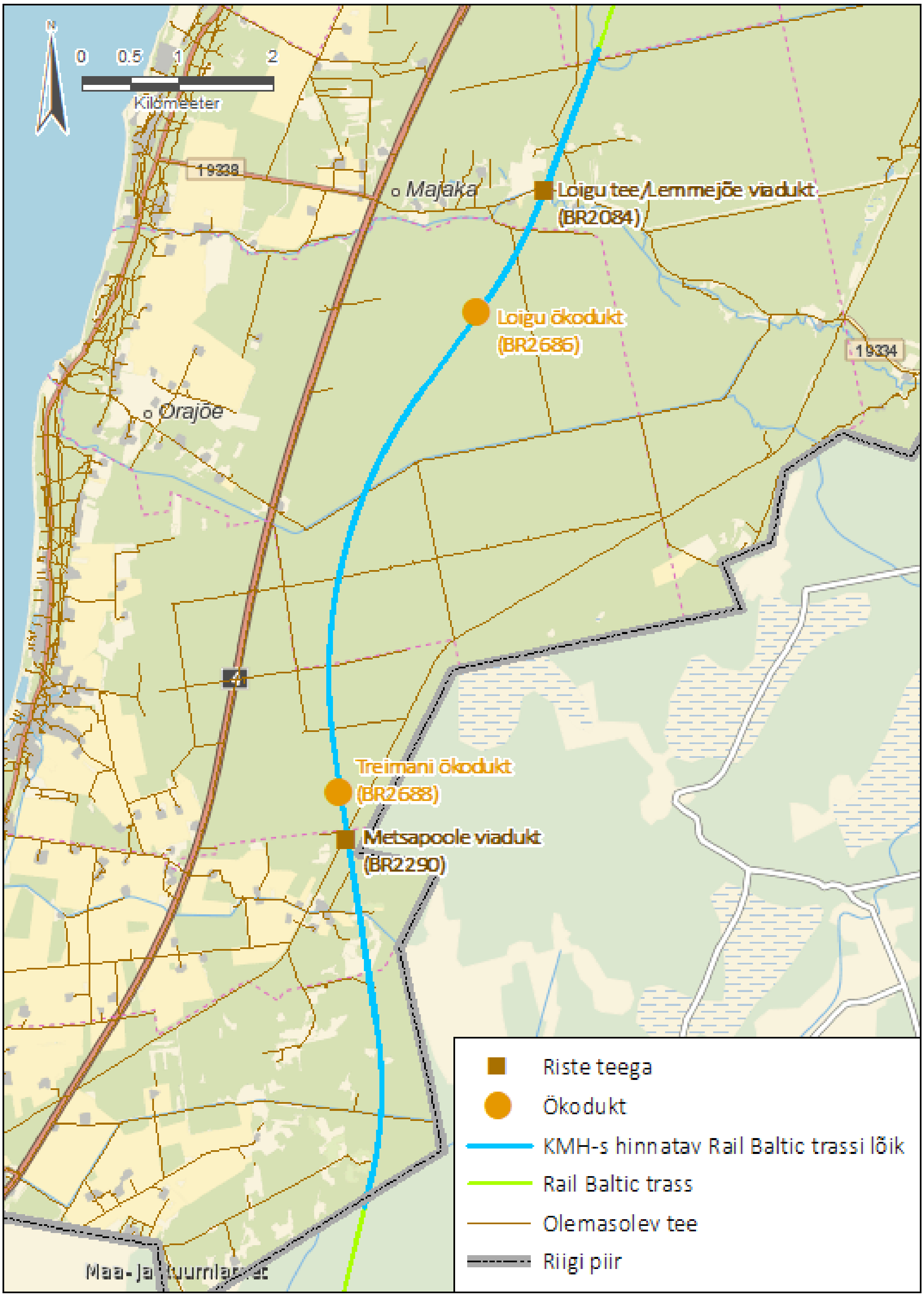


Figure 3-2. The route of the Rail Baltic line according to the preliminary design and the locations of grade-separated intersections and ecoducts[11]

[11] Base map: Land and Spatial Planning Board 15 January 2025; Roads: ETAK complete spatial data, Land and Spatial Planning Board 15 January 2025

For smaller water bodies (ditches), the project solution provides for culverts to ensure the preservation of the water regime in the area and the functioning of land improvement systems. As part of the preliminary design, the condition of land improvement structures (drainage ditches, artificial recipients, culverts, drainage pipe outlets and drainage wells) and the extent of reconstruction necessity to ensure the functioning of land improvement systems and the drainage of surface water from the planned railway section into artificial recipients or ditches of the land improvement system was studied. The preliminary design provides for the partial cleaning of existing ditches in the section and, if necessary, the construction of new ditches. 21 culverts will be constructed in this section in accordance with the preliminary design. These solutions also take into account the requirements set out in the RB county-wide spatial plan SEA to ensure the passage of various animal groups.

The railway embankment will be formed in layers of draining soil transported from the nearest quarries. The layers will be levelled and compacted. A protective layer with a minimum thickness of 0.4 m will be formed on top of the embankment. Ditches and water collection channels shall be constructed on both sides of the embankment to drain surface water. The slopes of the railway embankment shall be designed with a gradient of 1:1.5 to 1:1.75[12].

In total, the preliminary design solution for this section includes 10 different typical cross-section, one of which is shown in the figure below (Figure 3-3).

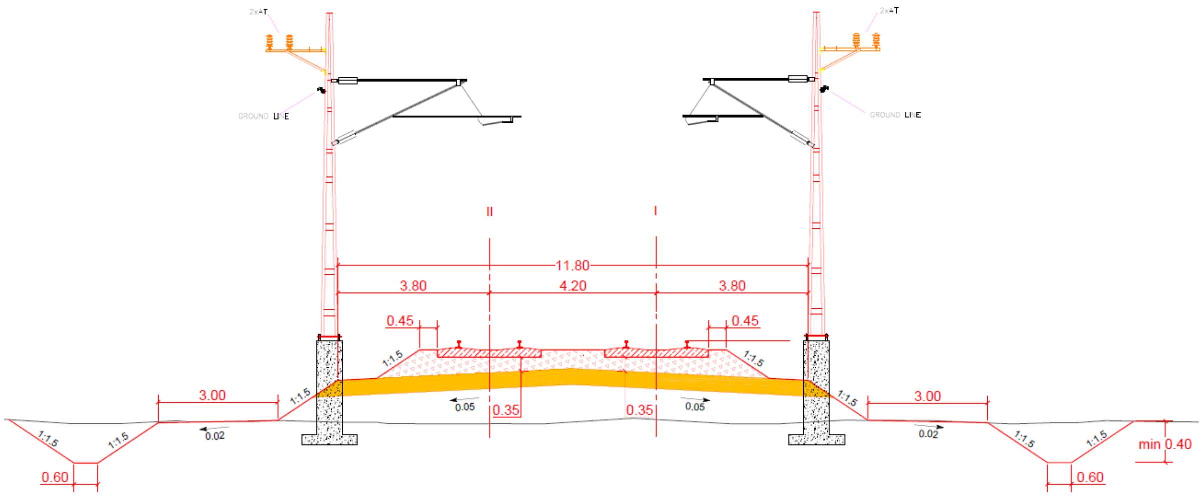


Figure 3-3. Typical cross-section used in the section under consideration in the preliminary design solution (Preliminary design documentation prepared by Reaalprojekt, 2018)

Figure 3-4 illustrates the height of the railway embankment (in metres) according to the preliminary design on this 12.7 km section.

[12] Kelprojektas. Preliminary project RB-EP-01-RW-EL Explanatory note.

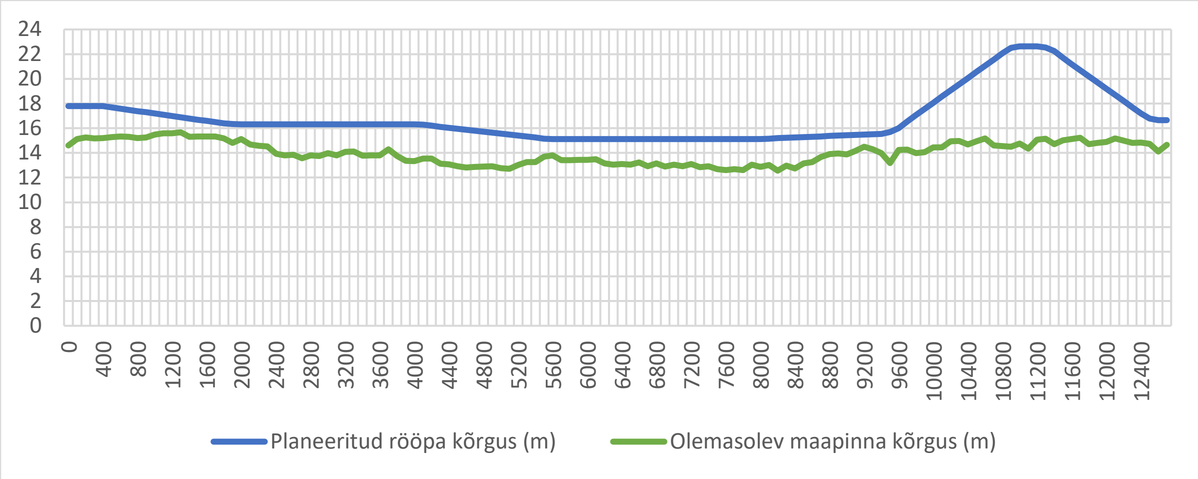


Figure 3-4. Preliminary design railway embankment height from the Estonian-Latvian border to Kabli[13]

The preliminary design does not provide for noise barriers in the EIA9 section.

Substations necessary for connection to the main grid are planned for the entire length of the 2x25 kV AC electrified railway. No substations are planned for the section covered by this EIA.

3.3.2 Alternative 2: value engineering

After the preliminary design was completed, the RB Rail AS team first developed a consolidated preliminary design based on a more efficient railway solution, taking into account, where possible, the environmental measures set out in the RB county-wide spatial plan SEA. The main and most important basis for harmonising the technical solutions of the preliminary designs is the uniform design guidelines developed for the RB railway passing through all three Baltic countries[14].

The consolidated preliminary design served as input for the preparation of a *value engineering* (VE) project. The value engineering solution was developed with particular attention to keeping the Rail Baltica project within budget, but also to improving the preliminary design solution in terms of railway operation, technical and economic aspects. During the value engineering process, the developer analysed and compared different alternatives for the railway and related major structures in order to optimise design solutions and achieve the best price-quality ratio from the perspective of the railway's life cycle, while ensuring safety, railway system capacity, operational efficiency, reliability and flexibility, as well as the social, economic, environmental and other objectives set for the Rail Baltica railway by the governments of the three Baltic States.

The value engineering solution includes the planned railway layout, longitudinal profile, structures and culverts. In the value engineering solution, the designer, in cooperation with environmental experts, developed environmental protection solutions (animal crossings, solutions for maintaining the water regime, noise barriers, etc.) based on differences in the height of the railway embankment and changes in the location of the railway axis.

[13] Preliminary design, RB-EP-01-RW-3PP-01.

[14] "Design Guidelines for Rail Baltic / Rail Baltica Railway". Systra SA

The EIA section covers the value engineering solution section DS1DPS3. *Option 2* is the preferred option in the project.

Based on the value engineering solution, a final railway project will be prepared in parallel with the ongoing EIA process.

3.3.2.1 Railway line

There are two pairs of tracks along the entire length of the route. No stops are planned for this section.

The railway embankment will be constructed in layers of draining construction materials (sand, crushed stone, etc.) transported from quarries. The railway embankment structure typically consists of the following layers (from the bottom): embankment, upper embankment, base ballast and ballast, on top of which the sleepers and rails are laid. Ditches will be constructed on both sides of the embankment as necessary to drain surface water. The slopes of the railway embankment are generally designed with a gradient of 1:1.5 to 1:2.

The railway is mainly on an embankment of normal height. See the typical cross-section Figure 3-5. Other cross-sections are also used on this section, depending on the specific location. The height of the embankment is mostly between 2 and 3.5 m, exceeding 8 m (max 8.5 m) when crossing the Lemmejõgi River. There are no cavities on this section.

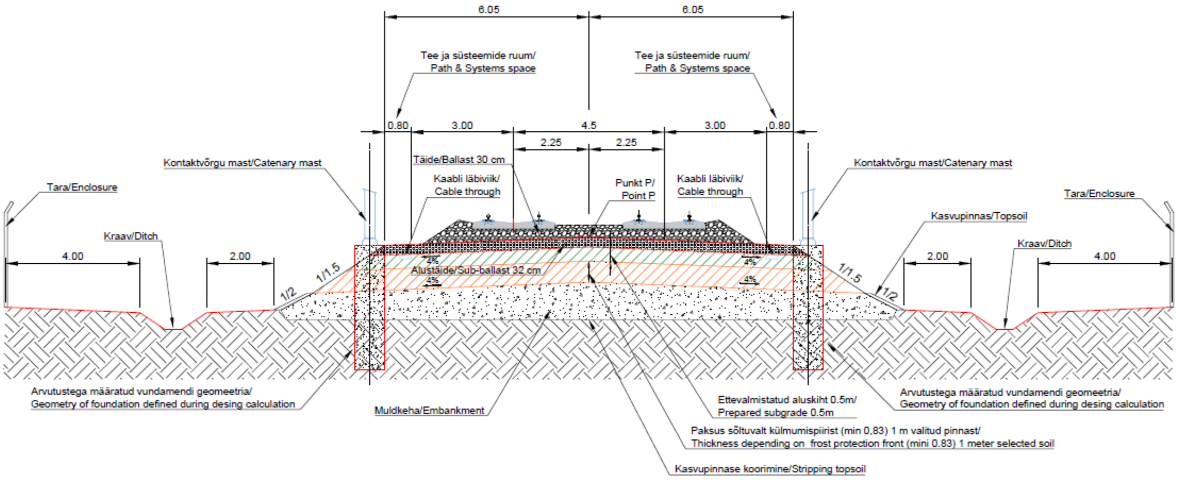


Figure 3-5. Example of a typical railway cross-section. Extract from the value engineering design drawing RBDTD-EE-DS3-DPS3_OBR_ZZZZZZ-ZZ_ZZZZ_D3_RT-TR_VE_00001_Main_Line_Embankment_Double_Track

Changes in the relative height of the railway embankment on the section covered by the EIA, see Figure 3-6.

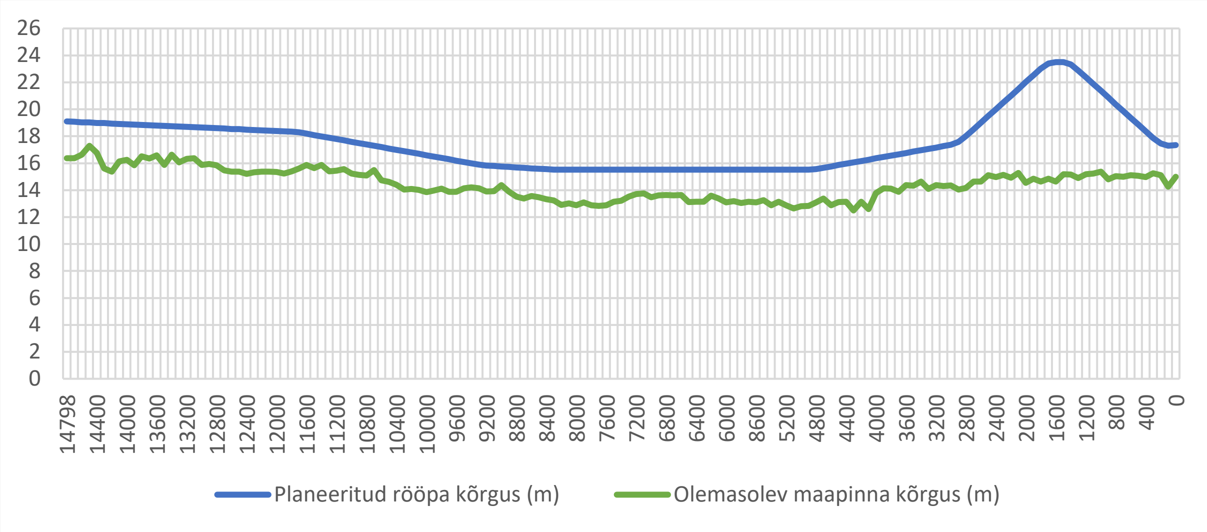


Figure 3-6. Value engineering solution for the height of the railway embankment from the Estonian-Latvian border to Kabli[15]

The necessary electrical infrastructure for the railway section will be provided as a separate project, which is not covered by this EIA.

3.3.2.2 <u>Facilities</u>

Within the framework of value engineering, a total of five major structures are planned for the section under consideration: one railway bridge, one road bridge and three ecoducts (see Figure 3-6). Two grade-separated junctions with the Rail Baltica railway are planned for this section.

Three ecoducts are planned for the Kabli–Estonian/Latvian border section: Loigu (BR2686), Treimani (BR2688) and Piiri (BR2690). For more information on animal crossings, see chapter 3.3.2.4. The railway is fenced on both sides along its entire length, which is also impassable for small mammals. This is necessary primarily for railway safety and also helps to prevent animal mortality. Special animal tunnels or culverts with shoreline paths are provided for small mammals and amphibians at watercourse crossings.

The railway bridge crossing the Lemmejõgi River is also planned to cross Loigu Road, and space has been provided along the river for wildlife to pass through.

A road bridge is planned at the intersection of the forest road at the border of the Metsapoole village and Treimani village. During the impact assessment, two alternative locations for the Metsapoole viaduct were identified (see Figure 3-7). Not building the road bridge was also considered as an alternative.

For smaller watercourses (ditches, collector ditches and drains), culverts are planned to ensure the preservation of the water regime in the area and the functioning of land improvement systems.

[15] Obermeyer, 2021, Design Priority Section 3, Value Engineering Report

Figure 3-7. Rail Baltica railway, the locations of grade-separated junctions and ecoducts according to the value engineering solution[16]

[16] Base map: Land and Spatial Planning Board15.01.2025; Roads: ETAK complete spatial data, Land and Spatial Planning Board15.01.2025

Intersections with roads

During the preparation of the national special plan and preliminary design, it was agreed which roads will be closed and which will be constructed as grade-separate junctions. On the section of the railway under consideration, grade-separated solutions (crossings) have been designed for two roads intersecting with the RB. For a list of roads intersecting with the Rail Baltic railway and their main parameters, see Table 3-1.

Table 3-1. List of intersecting roads in the value engineering design solution

Road name	Road code/viaduct code	Intersection location PK, km	Pavement type and width, m
Loigu road	2130022/BR2084	1+550 km	Gravel, 6 m
Vanaraudtee road	7560543/BR2290	8+910	Soil, 3 m

The roads are planned to be covered with gravel. Filling materials from nearby quarries (sand, gravel, crushed stone) will be used for road construction.

Compared to the preliminary design, there are some differences in the value engineering design's intersection solutions, which are mainly due to the clarification of the RB railway height and road solutions (see Table 3-2).

Table 3-2. Differences in the absolute heights of the railway and road surface at the intersection based on the preliminary design and value engineering design solutions

Road name	Intersection location in PK VE (km point)	Preliminary design		Value engineering design		Change compared to preliminary design	
		Railway height at intersection (m)	Road surface height at the crossing (m)	Railway height at the crossing (m)	Road surface height at the crossing (m)	Difference in railway height (m)	Difference in road surface height (m)
Loigu road	DPS3, 1+550	22,63	15,53	23,5	15,99	+0,87	+0,46
Vanaraudtee road	DPS3, 8+910	16,32	25,17	15,7	24,84	-0,59	-0,33

The following is a general description of the aforementioned structures (road intersections), which supplements the information presented in the table above (Table 3-1). For the locations of road intersections/viaducts, see Figure 3-7. Detailed solutions for intersections will be specified in the final designs.

Loigu road bridge BR2084

Loigu road is a gravel-covered local road for public use. The road begins approximately 2 km west of the planned railway bridge on the Tallinn-Pärnu-Ikla main road (No. 4) connects Majaka village with Massiaru village, and runs approximately 4 km southeast of the planned railway bridge across the

Laiksaare-Massiaru-Teaste side road (No. 19334), intersecting with the Vanaraudtee road (No. 7560543). The average daily traffic frequency on Loigu tee road is 67 vehicles per day, including 3 trucks[17].

The planned railway bridge will have three openings and a total length of approximately 80-90 m (the length of the bridge has been increased in accordance with environmental measures). In addition to Loigu road, the bridge will also cross the Lemmejõgi River. A strip has been left on both banks of the river to allow animals to pass.

Vanaraudtee road bridge or Metsapoole viaduct BR2290

The Vanaraudtee road is a private and forest road, which is covered with soil in the section intersecting with Rail Baltic. The road has been built on an old narrow-gauge railway embankment, and there is no data on its traffic frequency. Due to the proximity of the viaduct and its potential adverse impact on the Mērnieku dumbrāji Natura 2000 site, as well as the low traffic demand on the road, the possibility of moving the intersection approximately 1 km north or eliminating the intersection altogether and ensuring access to the properties located between the RB and the Estonian-Latvian border via the existing Vanaraudtee road.

RB railway maintenance road

Maintenance and access roads are provided in places where access to real estate or railway structures must be ensured. Structures that require access include bridges, viaducts, tunnels, ecoducts, turnouts, railway communication and safety equipment (land allocation areas). Access must also be provided to culverts and noise barriers. The width of these roads is between 3,5 and 6 metres. The railway maintenance road is also planned as an access road to real estate located south of the Vanaraudtee forest road (7560543) in order to maintain access to real estate between the RB and the Estonian-Latvian border.

Fill material from nearby local quarries (sand, gravel, crushed stone) will be used for the construction of the roads. No asphalt pavement is planned for the maintenance roads or local roads at railway crossings.

Bridges over watercourses

One bridge crossing a watercourse is planned for this section, over the Lemmejõgi River, which also crosses the Loigu road (see section above on the Loigu road bridge BR-2084). The bridge is located at kilometre 1+550 of the section. The total length of the bridge is approximately 80-90 m, and the height of the bridge opening at the local road crossing is planned to be 5 m to allow larger vehicles to pass on Loigu road.

The bridge is planned as a three-span bridge with the central span crossing the river, the northern span crossing Loigu Road and the southern span crossing the access road, with space also provided for animals to pass. No bridge pillars are planned in the water. On both sides of the river, there will be a bank path for animals to pass through, which is also suitable for large animals.

Water culverts

The objectives of the RB transverse drainage system are to maintain and mitigate the hydrological regime of surface water bodies and to protect the railway from extreme water flows. The culverts

[17] Teede Tehnokeskus AS, 2025. Local road 2130022 Loigu road traffic survey

crossing the railway embankment will be designed with sufficient dimensions to ensure the functioning of land improvement systems, the connectivity of drainage ditches and water reception capacity.

The value engineering solution provides for 21 culverts on the section in question (Figure 3-8), of which 18 are multi-purpose (both for watercourses and to allow smaller animals to pass through) and 3 are for watercourses only (with no passage for animals). In addition, culverts ensuring passage for animals are planned for the railway (see chapter 3.3.2.4). The exact number and locations of the culverts will be determined on the basis of the EIA report at the final project stage.

The culverts are planned to be perpendicular to the railway axis in order to optimise the length of the culvert body.

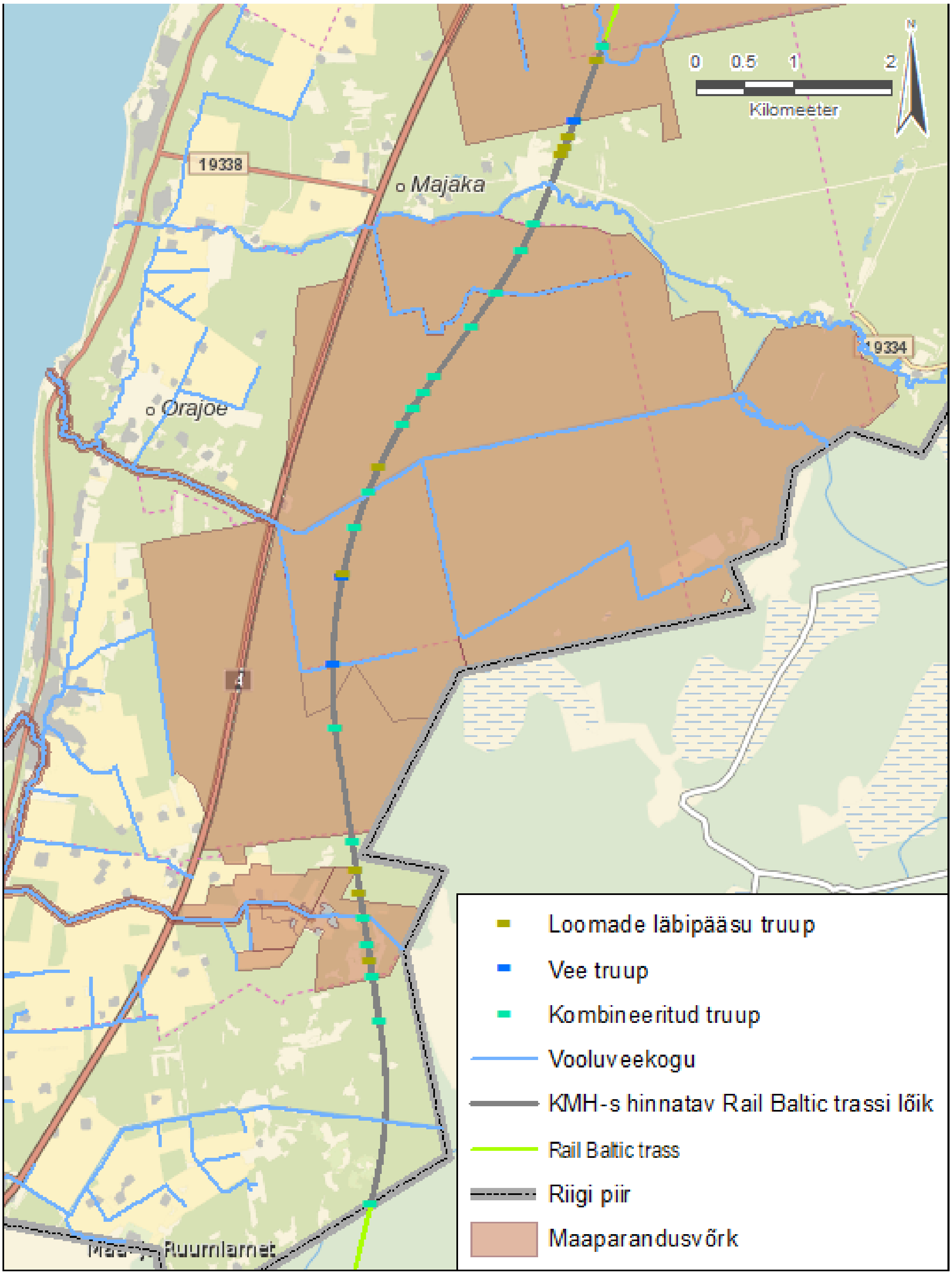


Figure 3-8. Location of culverts according to the value engineering solution[18]

[18] Data: EELIS (Estonian Nature Information System), Environmental Agency, 23.07.2025; Land improvement network: Land and Spatial Planning Board, 23.07.2025; Base map: Land and Spatial Planning Board, 23.07.2025;

The main purpose of longitudinal drainage is to protect and drain the railway and the embankment from runoff. Drainage also helps to protect against accidental leaks and the uncontrolled spread of soil contamination, as it directs contamination to a specific location and creates opportunities for its collection. Longitudinal drainage includes ditches, drains and culverts.

Ditches are designed on both sides of the railway. The design takes into account that the bottom of the ditches must remain below the frost protection layer, the minimum height of the ditches must be 0.50 m and the minimum longitudinal slope must be 0,2%. In order to reduce the amount of sediment entering natural water bodies, longitudinal ditches along the railway are equipped with flow retarders, which are approximately 1 metre wider and deeper than the ditch, where the water flow slows down and a significant part of the sediment settles at the bottom of the ditch. A stone covering at the bottom of the flow retarders helps to slow down the water flow, improves sedimentation if necessary and facilitates the cleaning of the water from sediments. The addition of suitable plants to this section improves self-cleaning.

Solutions for ensuring the functioning of land improvement systems

The regulatory network of a land improvement system consists of watercourses for receiving excess water (drainage network) and artificial recipients and ditches connected to natural watercourses. The purpose of the land improvement system is to regulate the groundwater regime on agricultural land in order to support agricultural and forestry activities (increase and maintain the cultivation value of agricultural land). In addition, the system supports railway drainage by mitigating the impact of groundwater and surface water.

The planned drainage systems will limit the rise in water levels at the edge of the railway corridor. The effectiveness of the systems depends on the hydraulic capacity of the main collectors and proper maintenance.

Checking ditches before and after extreme rainfall is essential for effective railway drainage. Maintenance work must include the removal of debris, cleaning of drainage infrastructure and checking the presence of beaver dams.

3.3.2.3 Local stops

No local stops are planned for this section.

3.3.2.4 Animal crossings

Compared to the preliminary design, the value engineering solution for animal crossings has three fundamental differences:

1) the mesh of the railway fence is narrower to prevent smaller animals from passing the railway;
2) it is not possible to construct simple underpasses under the rails for amphibians and reptiles;
3) there are no gaps in the fence for animals to pass the railway.

The client and designer have made these important decisions based on safety considerations and technical aspects.

According to the design guidelines, no fence openings are permitted on the section covered by the EIA, and the mesh size of the lower part of the fence is set at 1–5 cm. Therefore, animals can only cross the railway via animal passages at different levels.

In order to determine the locations of the animal passages, several animal movement studies were carried out during the value engineering stage[19,20,21], on the basis of which various alternative locations and solutions for the animal passages were considered. The solutions selected for evaluation (described below) take into account the location of animal habitats and technical considerations arising from the design of the railway (see Figure 3-9).

Passages for large animals

The railway mainly passes through forest areas that are part of the green network. The purpose of animal crossings is to ensure the functionality of green corridors so that animal species living on both sides of the railway form a single population. Three ecoducts have been planned for the section under consideration during the value engineering process: Loigu, Treimani and Piiri. Compared to the preliminary design, an ecoduct at Piiri (km 10+520) has been added based on the results of large mammal surveys conducted[22,23]. In addition to the ecoducts, the bridge crossing the Loigu road and the Lemmejõgi River, described above, are also considered to be passages for large mammals.

To ensure the functionality of ecoducts, they must blend in with the surrounding natural environment and encourage animals to use them. To this end, plant species characteristic of the area will be planted on the slopes of the ecoducts and other natural elements (stones, stumps, branches, etc.) will be installed to help the ecoducts blend into the natural environment and provide animals with food and shelter.

Taking into account the animal species present in the area of the section of the railway in question and the surrounding landscape, the width of the ecoducts at their narrowest point shall be at least 60 m (see below for details). Considering the flat terrain characteristic of Estonia, the slopes of the planned ecoducts will have a maximum gradient of 10%, which is more suitable for local ungulates (especially elks) (Figure 3-10). The ecoducts on the section under consideration are located mainly on flat terrain, with the area below the slopes being 4-6 hectares.

Wooden fences will be installed along the outer edge of the ecoducts to prevent animals from accidentally entering the tracks and to shield train traffic from animals. The fence will consist of steel posts, reinforcing steel connections and wooden boards. The foundations of the posts are made of reinforced concrete, and the surrounding soil and slope protection are reinforced with stones.

---

[19] Obermeyer, 2021, Design and design supervision services for the construction of the new line Pärnu – Estonian/Latvia border (No. RBR 2018/28), Design Priority Section 3, Annex 4. VE DPS3 Implementation of EIA studies: New mitigation measures

[20] Environmental Agency Viridis OÜ, 2024, Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border

[21] OÜ Rewild, 2024, Amphibian habitats in Pärnu County on the RB DS3DPS3 section, Occurrence of amphibian breeding water bodies and assessment of habitats on the Rail Baltic route and necessary measures

[22] Obermeyer, 2021, Design and design supervision services for the construction of the new line Pärnu – Estonian/Latvian border (No. RBR 2018/28), Design Priority Section 3, Annex 4. VE DPS3 Implementation of EIA studies: New mitigation measures

[23] Environmental Agency Viridis OÜ, 2024, Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border, part 1 – clarification of ecoducts planned in section DPS2

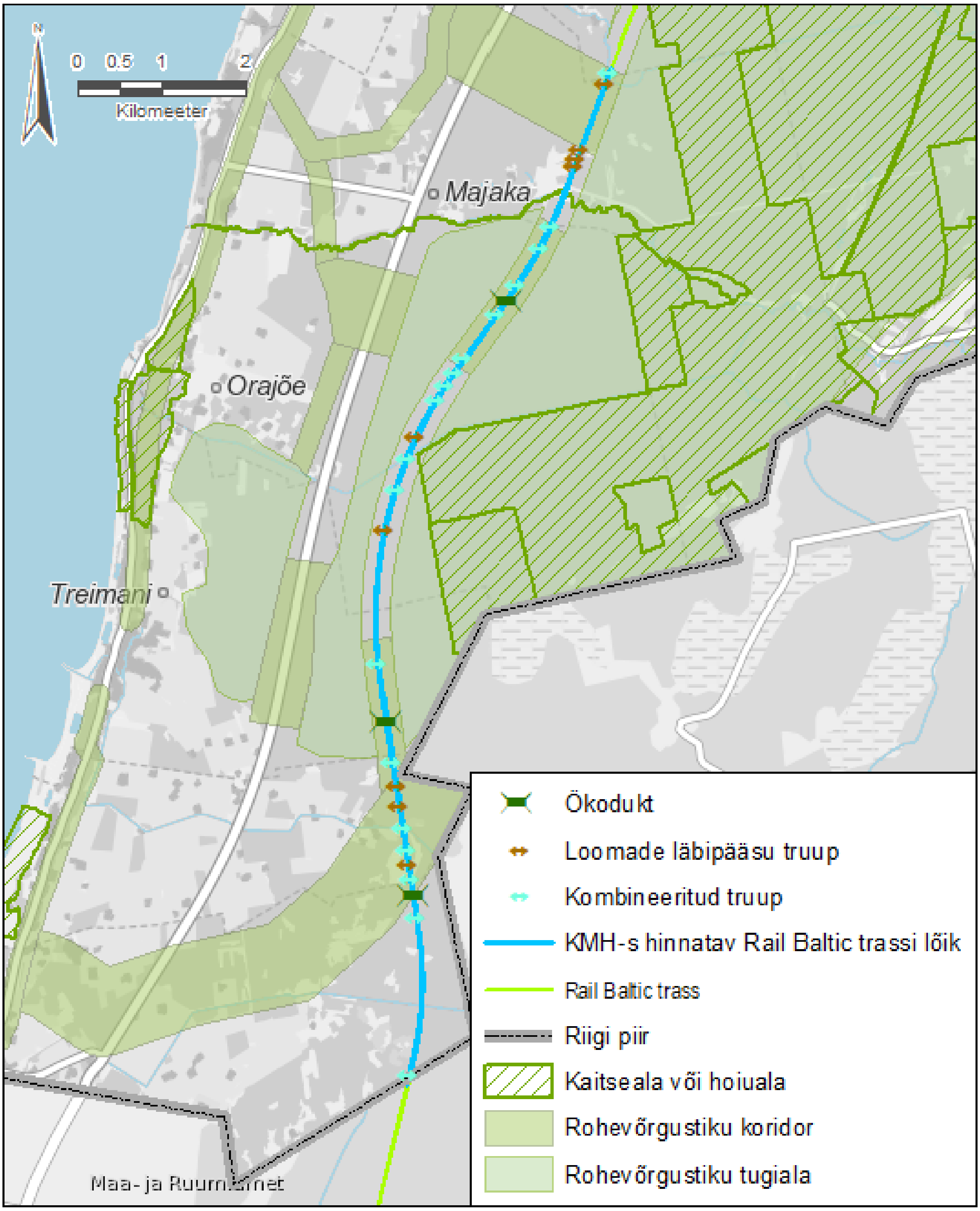


Figure 3-9. Location of animal passages according to the value engineering solution[24]

[24] Data: EELIS (Estonian Nature Information System), Environmental Agency, 15 January 2025; Base map: Land and Spatial Planning Board, 15 January 2025

The Loigu ecoduct (BR2686) is designed for railway section kilometre 3+031 in Orajõe village, Häädemeeste municipality. The location is approximately the same as in the preliminary design. The region is home to wild boar, red deer, roe deer and bear populations. During fieldwork in 2024, traces of wild boar activity and wolf droppings were found[25]. The width of the wildlife crossing at the narrowest point of the ecoduct is 60 m. The slope of the ecoduct is a maximum of 10%. The ecoduct will be covered with soil and vegetation (including trees).

The Treimani ecoduct (BR2688) is designed for kilometre 8+442 of the railway section in Treimani village, Häädemeeste municipality. The location of the ecoduct has been left approximately the same as in the preliminary design. There are clearly distinguishable east-west trails used by wild boars, elks and roe deer in the area, which run through a roadside ditch with steep slopes[26]. The width of the wildlife crossing at the narrowest point of the ecoduct is 60 m. The slope of the ecoduct is a maximum of 10%. The ecoduct will be covered with soil and vegetation (including trees).

The Piiri ecoduct (BR2690) is designed for the railway section at kilometre 10+520 in Ikla village, Häädemeeste municipality. The region has a high density of roe deer, red deer, elk, wild boar, lynx and wolf populations. During fieldwork in 2024, numerous traces of wild boar, elk, badger and fox were found[27]. Due to their age, composition and low level of economic activity, the forest stands in the area are valuable for the development and preservation of large and diverse mammal populations. The width of the wildlife crossing at its narrowest point is 60 m. The slope of the wildlife crossing is a maximum of 10%. The wildlife crossing will be covered with soil and vegetation (including trees).

[25] Environmental Agency Viridis OÜ, 2024, Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border

[26] Environmental Agency Viridis OÜ, 2024, Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border

[27] Environmental Agency Viridis OÜ, 2024, Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border

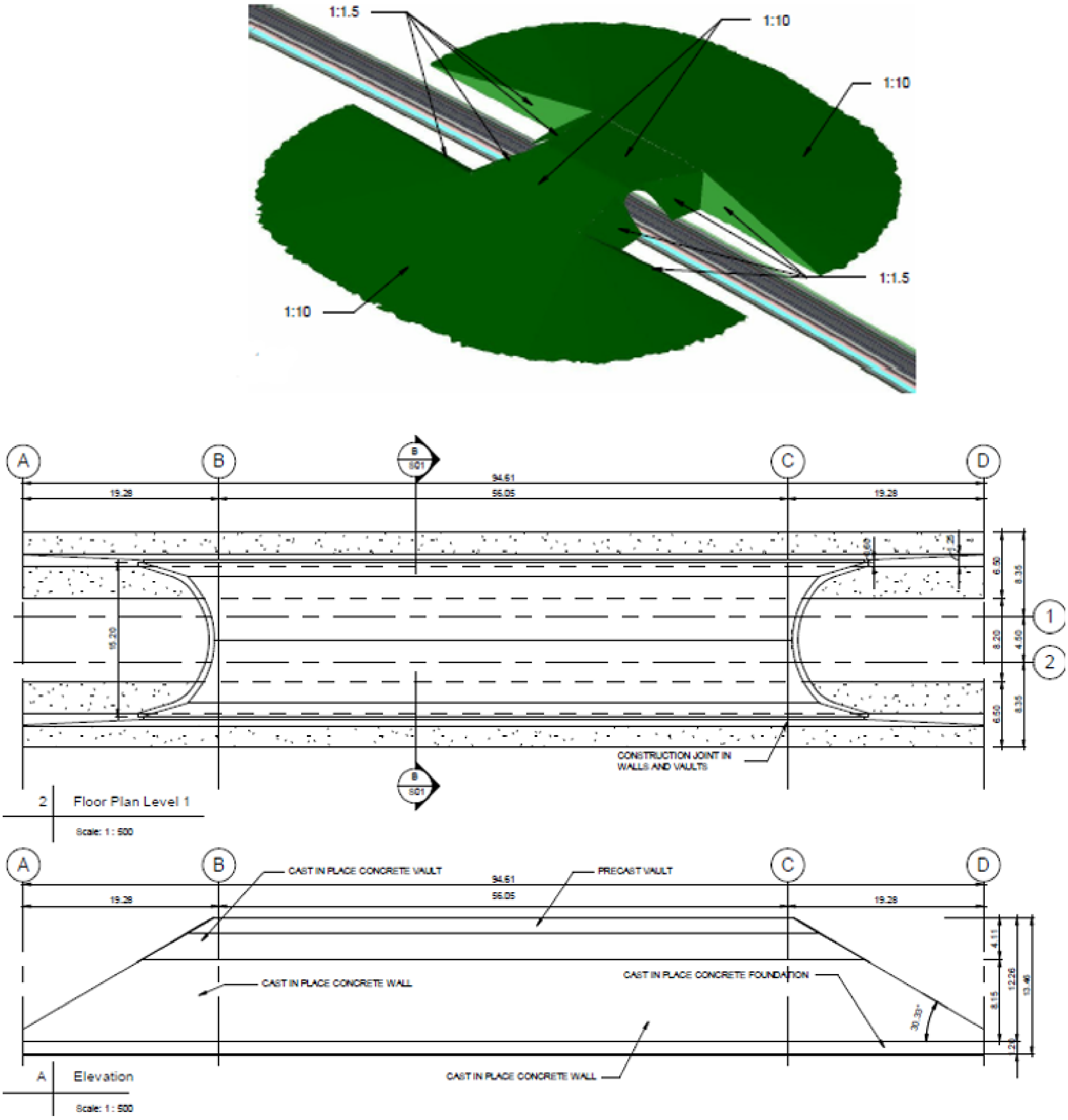


Figure 3-10. Drawing of the ecoduct planned for the section from the value engineering explanatory note

Small animal passages

In addition to large animal passages, 18 culverts with shoreline paths (culverts with a combined function, designed to ensure the hydrological regime and allow animal movement) and 9 tunnels for small animals and amphibians are planned for the section under consideration. The culverts with shoreline paths and small animal tunnels are designed for amphibians and small and medium-sized mammals.

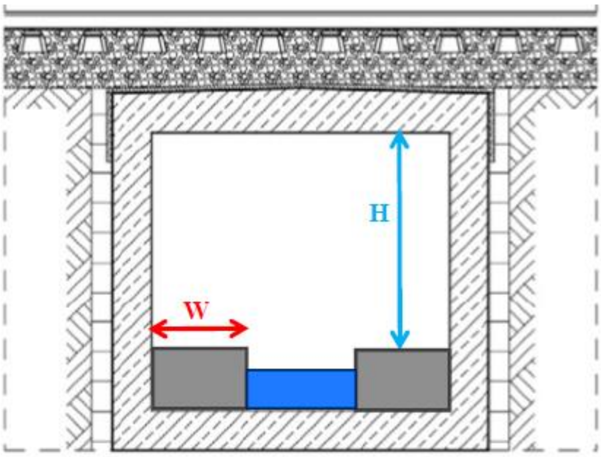


Figure 3-11. Example of a combined culvert designed to ensure the hydrological regime and allow animal movement. The figure shows the width of the dry shoreline path with the letter W and the height between the path and the tunnel ceiling with the letter H

Combined tunnels (Figure 3-11) are designed in the project solution as box culverts with dimensions of 1,5 x 1,5 m to 3 x 2 m, while tunnels for amphibians and reptiles are designed as pipe culverts with a diameter of 1,6 m. The recommendations of the wildlife expert regarding the parameters of combined culverts and animal passages are provided in section 10.2.4.1.

Animal paths along the RB fence

Guiding structures such as fences and landscaping are essential for animal passages to function properly. Without fences, most animals would not be able to find the passages.

To enable animals to move along the RB fence in the crossing area, animal passages have been provided along the riverbank under the Loigu tee/Lemmejõe (BR2084) viaduct.

3.3.2.5 Railway fences

The fences along the section covered by the EIA will be marked along their entire length on both sides of the railway to make them more visible and safer for birds.[28]

The standard height of the boundary fence is 2.0 m. If there are elk or red deer in the area, the fence must be at least 2,5 m high, as these species are capable of jumping over lower fences and, as large animals, can cause train accidents. The section covered by this EIA mainly runs through forests, which are a suitable habitat for various game animals, including elk and red deer. Therefore, a higher fence, 2,5 m high, is planned for the entire EIA section. In sections where noise barriers (expected to be at least 3,0 m high) are planned, no additional high mesh fences are required. Rather, the fence and noise barrier should be combined.[29]

The section of the RB railway under consideration is mainly surrounded by habitats suitable for wild boars, which is why fence solutions are used along the entire section to prevent them from accessing

---

[28] Rewild OÜ, 2024, Special requirements for fences and overhead lines on the Rail Baltica DS3DPS3 section. Marking of fences and overhead lines and the need for and locations of fence types on the Rail Baltica DS3DPS3 section from the perspective of wildlife.

[29] Rewild OÜ, 2024, Special requirements for fences and overhead lines on the Rail Baltica DS3DPS3 section. Marking of fences and overhead lines and the need for and locations of fence types on the Rail Baltica DS3DPS3 section from the perspective of wildlife.

the railway. In sections where noise barriers with foundations along their entire length are planned, no additional measures are necessary. Instead, the fence and noise barrier should be combined.[30]

There are feeding areas suitable for amphibians along the entire length of the EIA section[31], which is why the RB railway will be bordered with amphibian barriers and amphibians will be provided with the possibility to cross the railway via special crossings.

3.3.2.6 Noise barriers

During the value engineering noise study, a total of two noise mitigation measures with a total length of 1562 m were proposed for the section to protect residential buildings (noise barrier R1 "Kurejõe" in Majaka village, 458 m, and noise barrier R2 "Kiviloo-Eegi" in Metsapoole village, 1104 m). For both noise barriers, compliance with noise limits can be achieved with conventional noise barriers that comply with noise reduction class B3 and noise absorption class A3. No noise barriers were proposed in the noise assessment for the protection of wildlife.

The noise study did not identify a need to mitigate road traffic noise in the area of the intersections located on the railway section in question.

3.3.2.7 Volume of deforestation associated with the construction of the railway

The railway section in question runs largely through forest land, which means that deforestation is part of the preparatory work for the construction of the railway. Deforestation will be carried out across the entire railway area (railway embankment, side ditches, maintenance roads and fences), as well as in the areas necessary for the construction of road crossings, viaducts, ecoducts and other RB infrastructure and for the reconstruction of land improvement objects.

In places where the railway line passes through forest stands, trees must be felled and brushwood removed. The area of forest to be cleared has been estimated in accordance with the value engineering design solution and map material describing the existing location. The total area of the planned deforestation (forest area and non-forest land, including forest patches of 0,1 ha or more) on the section of the railway under consideration is 110 ha. The total timber reserves of the forest area to be cleared on the section under consideration are estimated at 21 637 cubic metres. The reserves have been calculated using the average reserves per hectare of forest land in Pärnu County (196,7 m^3/ha)[32]. During the preparation of the main project, the need for deforestation may decrease, as the area to be cleared has been calculated with a margin during the value assessment, as the final project solution has not yet been decided.

3.4 General description of maintenance work

The following description has been prepared on the basis of the materials of the final project for RB section EIA6 (Rapla and Pärnu county border – Tootsi) (the general principles and guidelines for the maintenance of high-speed railway infrastructure are provided, therefore they can also be extended

[30] Rewild OÜ, 2024, Special requirements for fences and overhead lines on the Rail Baltica DS3DPS3 section. The need for and locations of fences and overhead lines and fence types on the Rail Baltica DS3DPS3 section from the perspective of wildlife

[31] Rewild OÜ, 2024, Amphibian habitats in Pärnu County on the RB DS3DPS3 section

[32] Yearbook of Forests 2021. Environmental Agency, 2023. https://keskkonnaportaal.ee/sites/default/files/Teemad/Mets/Mets2021.pdf (25.06.2025)

to the section covered by this EIA). The preliminary design of the RB does not address the issue of maintenance work (this is not the task of the preliminary design), nor is it addressed in sufficient detail in the railway value engineering materials. The description of maintenance work will be specified in the final design.

3.4.1 Railway

The guidelines for the maintenance of high-speed railway systems are based on two lines of action:

a) preventive maintenance according to condition;

b) integrated management according to the product life cycle.

Maintenance of railway infrastructure is one of the basic elements of railway management and consists of all maintenance activities on all structures and equipment that enable the following objectives to be achieved:

- ensuring the safety of railway traffic;
- achieving the required level of quality, particularly in passenger transport;
- achieving a certain level of reliability and availability that allows regular railway traffic to be guaranteed.

Track

Maintenance of the track in accordance with its condition shall be carried out in accordance with the requirements of high-speed rail lines and international reference standards.

The track geometry, profile, track tension, condition of welds, fastenings, condition of turnouts, ballast contamination and other necessary parameters are checked. Various specialised vehicles and equipment are used for this work, as well as trained employees who inspect the track superstructure on foot.

The frequency of various track measurements and inspections depends on the parameter being inspected and ranges from 1 to 12 times a year.

Slopes of cavities and embankments

The main inspection of surface structure elements consists of a visual inspection to identify any damage or deterioration of these elements as quickly as possible. Based on the information on the condition of each cavity and embankment, appropriate repair measures are established, which usually consist of slope maintenance work (removal of material that has fallen onto the slopes, restoration and covering of slopes, restoration of vegetation cover, etc.) and cleaning and repair of drainage elements. After extraordinary events such as floods, etc., inspection campaigns are planned, which may lead to more extensive checks if significant damage is detected.

At least two inspections must be carried out each year, but three inspections are recommended.

Embankment and drainage

Small mechanised maintenance machines, such as excavator loaders, can be used to maintain the drainage system, including minimising maintenance costs, for cleaning railway side ditches, etc. Inspection chambers are provided at the connection points of pipes and ditches and for monitoring the operation of deep drainage. Water drainage structures are monitored at the ends of longitudinal railway ditches where erosion may occur. Maintenance activities for cleaning and repair are established based on information about the condition of the drainage system.

Corrective measures for the railway embankment are very complex, as the tracks usually have to be raised in order to restore the damaged layers. Therefore, these works have a significant impact on railway operations, as the entire track must be closed for their execution (usually one track is lifted, diverting all traffic to the other track).

The inspection of the embankment and drainage system is carried out simultaneously with the inspection of the entire infrastructure. Follow-up inspections are also planned after heavy rainfall to identify any damage.

At least two inspections must be carried out each year, but three inspections are recommended.

Fences

The condition of the fence network and posts, the condition of gates and the growth of vegetation in the area adjacent to the fence shall be checked.

The results of the inspections, together with the corresponding photo report, shall be recorded and stored in the infrastructure management system and used as a basis for planning the necessary corrective measures.

The recommended frequency of inspections is once a year.

Maintenance roads

The condition requirements for public roads are specified in Regulation No. 92 of the Minister of Economic Affairs and Infrastructure of 14 July 2015[33]. Maintenance work must ensure that the condition of the road complies with the condition requirements established for the given type of road. The condition requirements define the condition of a road that allows safe movement in accordance with the traffic regulations established under the Traffic Act and the requirements for the use and protection of roads and road protection zones. Compliance with the condition requirements is mandatory for all owners of public roads. The owners of structures and utility networks located on the road are responsible for ensuring that they meet the condition requirements. In addition, special conditions arising from the nature of the project and the requirements for summer and winter maintenance must be observed.

3.4.2 Culverts

Inspections

A basic inspection of culverts is a visual inspection that must be carried out by maintenance personnel, but not necessarily by specialised maintenance personnel. This type of inspection is useful for early detection of damage and prevention of critical damage. It also allows elements requiring urgent maintenance to be identified. This type of inspection should be developed as part of regular railway maintenance work.

Regular technical inspections of culverts can be carried out in conjunction with inspections of the railway line and other structures on the same section every three years or, depending on the size of

[33] Regulation No. 92 of the Minister of Economic Affairs and Infrastructure of 14 July 2015, 'Road condition requirements', https://www.riigiteataja.ee/akt/102112018003?leiaKehtiv

the structures and their lower maintenance requirements, less frequently with the agreement of the owner.

All damage must be recorded to enable the causes to be identified. Where possible, culvert inspections should be carried out while trains are passing to check for vibration or extensive deformation.

If dangerous defects are found during general or regular inspections, a special inspection must be carried out immediately to plan the necessary emergency or routine repairs. These inspections must be carried out by technicians and specialised personnel.

Maintenance work

The culverts are designed to require minimal maintenance. To ensure the stability of the structure, regular maintenance must be carried out twice a year – in spring and autumn.

During routine maintenance, the condition of the drainage system must be checked and it must be ensured that the water inlets are not blocked in order to guarantee the proper functioning of the system.

Every spring, visible elements must be pressure washed and all structural connections must be checked.

The work must be carried out in accordance with the specifications for railway maintenance and the manufacturer's quality requirements for the maintenance of the materials used in the structure.

3.4.3 Intersections and viaducts

Maintenance work must ensure that the condition of the road, including viaducts, complies with the condition requirements established for the given type of road. The condition requirements for public roads are specified in Regulation No. 92 of the Minister of Economic Affairs and Infrastructure of 14 July 2015[34]. The condition requirements define the condition of the road that allows safe movement in accordance with the traffic regulations established under the Traffic Act and the requirements for the use and protection of the road and the road protection zone. Compliance with the condition requirements is mandatory for all owners of public roads. The owners of structures and technical networks located on the road are responsible for ensuring that they comply with the condition requirements.

Viaducts are designed to require minimal maintenance. However, to ensure the durability of the structure, regular maintenance must be carried out twice a year – in spring and autumn. The carriageway must be kept clean of dirt and obstacles.

Summer and winter maintenance must be carried out in accordance with the road condition requirements. Depending on the nature of the object, the condition of the following elements must be checked: culverts, ditches, drainage systems (including water inlets, surface water pipes), embankments (including erosion), slope protection, gravel maintenance roads (including ensuring surface water drainage from the road), barriers, noise barriers, edge strips, overhead contact line protection systems (OCPS) and falling object detectors (FODs). Regular maintenance work shall be

[34] Regulation No. 92 of the Minister of Economic Affairs and Infrastructure of 14 July 2015, ‘Road condition requirements’, https://www.riigiteataja.ee/akt/102112018003?leiaKehtiv

carried out (e.g. pressure washing of barriers and noise barriers). Any defects found shall be rectified. If damage is discovered during an inspection before the end of the service life, the damaged parts shall be replaced or repaired. The same applies to components damaged as a result of an accident, fire or other incident. The work must be carried out in accordance with the applicable road maintenance requirements and, where necessary, the quality requirements of the component manufacturer. Compliance with winter maintenance requirements must be ensured separately.

Road and intersection maintenance guidelines shall be specified in cooperation with road owners.

3.4.4 Ecoducts

Detailed instructions for the use and maintenance of ecoducts shall be compiled at the end of the construction work, together with additional instructions specifying the products and materials approved for the construction of ecoducts. The following are general maintenance principles.

Inspections

The condition of the ecoduct must be checked regularly and any defects caused by animals, natural causes, rail traffic or other factors must be identified. In case of danger, all damage must be marked and repaired. Damage to the fence must be repaired as soon as possible. If necessary, the crossing may be temporarily closed or restrictions imposed on rail traffic.

A basic inspection to identify the need for urgent maintenance and detect damage at an early stage and to prevent critical damage shall be carried out by maintenance staff. This type of inspection shall be developed as part of regular railway maintenance.

During the manufacturer's warranty period, a general visual inspection shall be carried out annually and repairs shall be carried out as necessary. Thereafter, regular inspections shall be carried out every 3 years. The general condition of the barriers shall be checked to ensure compliance with safety requirements. The condition of the surface coating of the wooden elements must also be checked. If damage is found during the inspection, measures must be taken to repair it.

Maintenance

Ecoducts are designed to require minimal maintenance. However, to ensure the durability of the structure, regular maintenance must be carried out twice a year – in spring and autumn. Dirt and obstacles must be removed from the animal crossing. In winter, snow and ice must be removed from the railway tunnel at the base of the ecoduct. Snow must not be allowed to accumulate inside the ecoduct, as this will block emergency exits.

Slope protection – sunken or loose stones must be put back and vegetation affecting the integrity of the stones must be removed. Slope drainage must be maintained in a condition that ensures its functionality.

If necessary, visible concrete structures must be cleaned of dust, dirt and vegetation. Pressure washing is primarily necessary for ecoduct structures bordering the railway. This does not cause significant disturbance to animals. The sides of the ecoduct boundary fences facing the animal passageways are washed during the day to minimise disturbance to animals.

As regular maintenance of ecoducts has no significant impact on wildlife, this topic is not addressed in the EIA report in the chapter on impacts 8.

Landscaping maintenance

Landscaping maintenance must ensure the functionality of the ecoduct. Detailed maintenance instructions will be established in the basic project and specified in the maintenance plan during use.

3.4.5 Ponds

Ponds can be constructed in such a way that they are relatively maintenance-free. The less nutrients enter the water, the longer the pond will remain open. Detailed pond maintenance principles will be specified in the pond maintenance plan.

3.5 Train traffic

The train traffic frequency on the section covered by the environmental impact assessment is specified in the RB *Operational* Plan. A summary of the traffic frequency and train data is provided in the table below (Table 3-3).

Table 3-3. RB traffic frequency on the Kabli-EE/LV section and train data

RB traffic frequency on the Kabli-EE/LV section	Train pairs/day				Train speed, km/h	Train length, m	Number of train carriages
Year	2031	2036	2046	2056			
Passenger trains							
- High-speed trains	10	10	12	15	249	400	16
- Night trains	1	1	1	1	200	400	16
- Local trains	14	14	18	20	200	200	8
Freight trains							
- Trains for bulk and liquid goods	0	0	1	2	120	1050	48
- Intermodal trains (container transport)	5	5	7	10	120	1050	48
Total:	30	30	39	48			

In order to get an idea of the average interval between passenger and freight trains on the section in question over the years, calculations have been made based on the data provided in the operating plan (Table 3-4).

Table 3-4. Average interval between trains on the RB Kabli-EE/LV border section

Average train interval	Year			
	2031	2036	2046	2056
Passenger trains per hour:	2,78	2,78	3,39	4
Passenger train interval (minutes):	21,6	21,6	17,7	15

Freight trains per hour:	0,28	0,28	0,44	0,67
Frequency of freight trains (minutes):	214	214	136	89
Trains per hour (total):	**3,06**	**3,06**	**3,83**	**4,67**
Interval (minutes):	**19,6**	**19,6**	**15,4**	**12,84**

4 ENVIRONMENTAL USE

4.1 Use of energy

Description of energy use during construction

The exact energy consumption during construction depends on the work methodology chosen by the builder and the tools used. Energy consumption during construction mainly comes from transporting building materials to the construction site and removing waste from the construction site. To minimise this impact, it is important to ensure that construction materials are delivered as close as possible from the construction site. It is also important to reuse and recycle waste and soil at the place of origin or in its immediate vicinity, if possible within a radius of 50 km. In addition to the proximity principle, economic considerations must also be taken into account.

The use of construction machinery on site has a minor impact on energy consumption. In order to minimise this impact, it is important to use newer and more energy-efficient equipment, with preference given to electric and hybrid machines.

The third component of energy consumption during construction is the daily transport of people to and from the site. To minimise this impact, it is important to provide accommodation for workers within a 50 km radius of the site. Logistics for workers coming from further afield should be organised so that as many people as possible are transported to and from the site at the same time, i.e. the transport capacity should be at least 85%.

Description of energy use during operation

Energy consumption during operation phase will certainly be significant. On the one hand, this is due to the frequency of train traffic. At the time of preparing the EIA, the predicted train frequency is available[35] (see chapter 3.5). It is also known that passenger trains will be electric trains.

At the time of preparing the EIA, it is known that diesel locomotives will be used for shunting at freight stations (there are no freight stations on the railway section under consideration) and for maintenance work on the main line (track repairs, snow removal, etc.) and, at the beginning of the RB's period of use, possibly to a limited extent on the main line (up to 10% of freight trains)[36]. Consequently, the use of diesel trains will not have a significant impact on energy consumption.

On the other hand, energy consumption for electric trains depends on the energy consumption of specific rolling stock. The average energy requirement of electric trains is 94 kWh. At maximum, i.e. when travelling at full speed, this increases to 170 kWh. For example, the average energy consumption of a train travelling from Tallinn to Pärnu is estimated at 973 kWh per trip.[37]

Energy consumption can be reduced by travelling at a constant average speed throughout the journey and slowing down and accelerating smoothly at stations. Based on the above, the RB operating plan recommends different optimal speeds for different types of switches. It is also known that the braking energy of electric locomotives is accumulated and fed back into the train when it accelerates. In addition, it makes sense to collect the kinetic energy generated by the gravitational movement of

[35] R*ail Baltica: Preparation of the Operational Plan of the Railway. Final Study Report. 15 November 2018*

[36] RB county-wide spatial planning SEA report, 2017

[37] *Rail Baltica: Preparation of the Operational Plan of the Railway. Final Study Report. 15 November 2018 (*Rail Baltica operational plan. Final report, 15 November 2018)

trains on downhill sections of the track, which electric locomotives can store and use when travelling uphill.

To minimise energy consumption, it is important that diesel train engines comply with modern standards and that electric motors are as efficient as possible.

4.2 Use of materials

Material use is particularly important during the construction phase. During the use phase, the maintenance plan must be followed to ensure optimal, justified and environmentally friendly material use. During the design phase, it is possible to consider project solutions with different material costs and the use of different materials in the construction of the railway.

The table below (Table 4-1) shows the specifications and excavation volumes for the materials on the section of the railway being assessed.

Table 4-1. Material quantities and excavation volumes (Source: RB value engineering for the Kabli-EE/LV border section)

Material	Quantity m^3, in total	Reuse on site, m^3	Removal from site, m^3
Ballast (granite aggregate)	30 484	0	0
Ballast base layers and frost protection layer (construction sand, construction gravel, crushed stone)	384 858	0	0
Embankment and reinforced soils (fill sand, backfill and fill material)	316 118	0	0
Other fillers (landscaping and ecoducts)	273 960	250 800	0
Excavation	250 800	250 800	0

For an overview of the use of construction minerals, see chapter 4.3.3.

All excavated material will be used at the Rail Baltic site, for example, in the construction of ecoducts and the planning of slopes. The disposal of excavated material as waste is not appropriate in section EIA9. For more information on waste generation, see chapter 4.4.

4.3 Use of natural resources

4.3.1 Use of water

Water use during the construction of RB is related to the drainage of surface water and groundwater from the construction site and, during the operational phase, the drainage of the railway structure by means of ditches, drains and culverts.

The use of groundwater during the construction and operation of the RB is rather indirect and related to the domestic water needs of the support structures.

Rainwater and drainage water drainage

The railway crosses areas that are drained and land improvement systems maintained by the state. See chapter 5.6 for more details.

When preparing the railway embankment design and selecting construction materials, the need to ensure the functioning of land improvement systems and the preservation of the natural water regime on both sides of the embankment shall be taken into account. The embankment shall be constructed in layers of draining material. The layers shall be levelled and compacted. A protective layer with a minimum thickness of 0,30 m shall be formed at the top of the embankment. Ditches shall be constructed on both sides of the embankment to drain surface water.

In the case of smaller water bodies (ditches, collector ditches, streams), the project design provides for culverts of a suitable size to ensure the continuity of water flow, which will maintain the water regime in the area and the functioning of land improvement systems. The culverts are designed to ensure water passage even under extreme natural conditions with higher flow rates (e.g. heavy rain, spring snowmelt). During the design process, the condition of existing ditches (including the need for cleaning) and the capacity of land improvement systems to (continue to) receive water from watercourses have been analysed. In accordance with the RB design guidelines, it is the designer's responsibility to ensure the functionality of existing land improvement systems.

Issues related to the reconstruction of land improvement systems (design conditions, necessary permits) are handled by the Land and Spatial Planning Board (MaRu). Pursuant to Section 28 (1) of the Land Improvement Act, a person wishing to construct a facility must submit to MaRu the design conditions, building permit and operating permit applications necessary for the reconstruction of land improvement systems. Agriculture and Food Board (previously, the design conditions for land improvement were issued by the Agriculture and Food Board) in its decision no. 6.1-1/14118 of 23 March 2021 granted Rail Baltica design conditions for the reconstruction of land improvement systems related to the construction of the railway line. During the design process, the necessary preliminary work will be carried out to determine the condition of the artificial recipients and hydrological calculations will be made to determine the water volumes. A land improvement project will be prepared for the project section and submitted for review to MaRu, which is responsible for the functioning of land improvement systems. In addition to the land improvement project, the basic design of the RB railway and the basic designs of related structures that affect land improvement systems and their artificial recipients are coordinated with MaRu. MaRu checks the RB construction designs for different sections and structures.

Pursuant to Section 53 (8) of the Land Improvement Act, water collected outside the land improvement system, i.e. in this case additional water from the construction site of the railway section, may only be discharged into the artificial recipient or drainage ditch of the land improvement system after the reconstruction of the land improvement system, the land improvement system has been granted a permit for use by MaRu. State supervision of the project solution and construction work ensures the continued functioning of land improvement systems and their artificial recipients.

All culverts designed for watercourses intersecting the railway section in question, including drainage ditches, are listed and shown on the location plan in the chapter 3.3.2.2.

4.3.2 Land use

The construction of the railway and related structures directly precludes the current use of the land under the railway structures, including forest management, agricultural use or residential construction. An estimated 110 ha of forest land (area to be cleared) falls directly under the railway structures on the section of the RB Kabli-EE/LV border.

4.3.3 Use of construction minerals

For the construction of Rail Baltic, construction minerals are needed as fill material for the construction of the railway and railway maintenance roads, for the reconstruction of roads intersections the railway and for the construction of embankments for ecoducts. The railway requires embankments, embankment protection layers and ballast to be constructed from fill materials. Fill material is needed for the construction of the railway embankment, maintenance tracks and roads crossing the railway. A marginal amount of materials is needed for the construction of road surfaces (asphalt) crossing the railway, taking into account the entire project. The maintenance tracks to be constructed will have a gravel surface.

A total of *approx.* 1 091 913 m^3 of material is required for the construction of this section of the railway. The exact volumes of construction materials required for the construction of the section in question are specified in the chapter 4.2.

The construction materials (sand, gravel, dolomite/limestone) required for the construction of the RB structures will be procured by the construction company from quarries with environmental permits in accordance with the quality requirements specified in the construction project. Higher quality material (granite aggregate) that meets the requirements of standards EN13450, EN13285 and EN13242 must be imported from outside Estonia. *Approximately* 329 600 m^3 of such material is required, which accounts for approximately 30% of the total material requirement.

Based on current knowledge, the excavated material from the construction of the railway can be reused on site, thereby reducing the need for additional mineral resources and waste generation.

The following table shows the calculated quantities of construction minerals required and the estimated quantities available in quarries. The same available resource has not been counted twice or overlapped in other railway sections.

Table 4-2. Required calculated quantities and estimated available product volumes (m^3) on the Kabli-EE/LV border section

	Required quantity	Available	Quarries
Granite aggregate	30 484	0	Imported from abroad
Intermediate layer (crushed stone, construction sand and construction gravel)	384 858	309 716	Riisselja, Riisselja II, Lepplaane, Selja II, Soomra, Soomra II
Embankment and fill (sand and excavation)	590 078	13 369 250	All quarries
Excavation	250 210	250 210	-

The railway section and its displacement area do not pass through any registered deposits. The closest deposits to the railway section are the Kiusumetsa (3,7 km), Massiaru (4 km), Krundi (5 km) and Urissaare (7 km) sand deposits. The quarries listed in the table (**Error! Reference source not found.**), w hich are possible sources of construction material for the construction of the intermediate layer (Lepplaane sand quarry and Riisselja, Riisselja II, Selja II, Soomra and Soomra II gravel pits) are located approximately 35–60 km from the railway section.

For lower quality fill material, the use of crushed stone aggregate may also be considered, according to studies conducted by TalTech and IDOM[38,39]. Crushed stone could be used as a base layer (as a frost protection layer or soil cover) if the material is mixed with quartz sand to ensure better water permeability and frost resistance[40].

During the railway operation phase, there may be a need to use construction minerals during the reconstruction of structures, but in this case, the quantities of construction minerals are expected to be marginal compared to the construction phase. These quantities will be specified on a case-by-case basis during the preparation of the relevant reconstruction projects.

4.3.4 Use of soil

The construction of the Rail Baltic railway line will require fill and topsoil. This is necessary for the construction of the railway and related infrastructure and other structures, as well as for landscaping. The construction of the railway will also require the renovation of existing infrastructure and demolition work, during which the existing topsoil will be removed. The excavated material (including topsoil) is fully reusable on site.

The volumes of material required for the work and the soil to be removed during the work (excavated material) are specified in the chapter 4.2.

4.4 Waste generation

Waste generated during construction

The output generated during construction is the excavated soil from the construction of the railway. According to current knowledge, all excavated soil will be reused on the Rail Baltic site (e.g. for the construction of ecoducts and the planning of slopes). The disposal of excavated soil as waste is therefore not relevant in section EIA9 – soil removed during construction work that is used on the same site for land filling or similar purposes is not considered waste within the meaning of the Waste Act.

During construction, a small amount of packaging materials and construction material residues will also be generated, but these quantities are marginal. In order to prevent and reduce the environmental

[38] Technical suitability and economic justification of limestone aggregate and ash from the Eesti Energia Estonia mine as base material or stabiliser for the Rail Baltic embankment and side roads. TalTech 2019

[39] Suitability of crushed limestone from the Eesti Energia Estonia mine for the construction of the RB railway line and roads. TalTech 2019

[40] Technical suitability and economic justification of crushed limestone and ash from the Eesti Energia Estonia mine as base material or stabiliser for the Rail Baltic embankment and side roads. 2019

impact of this waste, it must be collected separately, sorted and recycled in accordance with waste management requirements.

Waste generated during operation phase

The effects during operation phase depend, on the one hand, on the rolling stock that will be used on the railway. Hazardous waste (e.g. waste oil, used lubricants, etc.) is generated during the maintenance of trains. Hazardous waste is collected at the maintenance unit in accordance with the requirements and handed over to a competent handler.

Hazardous waste may be released into the environment in the event of accidents involving (diesel) trains (e.g. possible fuel and oil leaks). In the event of accidents and incidents, the instructions to be drawn up must be followed and the leaked substances must be removed from the environment as quickly as possible to prevent further spread of pollution.

In order to minimise the impact of waste management, leak-proof equipment that is well maintained and in good condition shall be used, and the maintenance plan shall be followed when maintaining the railway. Various materials are generated as waste during railway maintenance work. For example, practically all elements replaced during contact network maintenance work (copper cables, aluminium and steel elements, etc.), as well as electronic waste, plastics, etc., can be reused. Waste must be collected separately and handed over to a licensed waste management company for further treatment in accordance with the requirements. Where possible, the proximity principle should be taken into account when selecting a waste disposal site.

4.5 Application of circular economy principles in relation to Rail Baltic

From a circular economy perspective, the aim of Rail Baltic is to create an efficient rail transport service with the lowest possible environmental impact but with the longest possible service life and resource efficiency, enabling operational cost savings and environmental benefits, as well as greater reuse, repair or recycling of the materials used.

The following circular economy principles and tools can be applied to the construction of Rail Baltic:

- Maximum reuse of excavated material from the construction of Rail Baltic in order to minimise on-site construction waste; use of surplus materials from the construction of Rail Baltic for other purposes, such as quarry restoration;
- Maximum use of waste or production residues as construction materials. For example, in certain cases, oil shale ash can be used as a filler when mixed with higher quality materials. Its use significantly reduces the environmental impact of railway construction, as it reduces the need to open new quarries and extract mineral resources, as well as the need to store by-products from the oil shale industry. The use of oil shale residues as an alternative construction material also helps to achieve several national objectives, such as the use of natural resources in a manner and to an extent that ensures ecological balance; sustainable and efficient use of land resources based on the principles of the circular economy, with minimal losses and minimal waste; preservation of multifunctional and coherent landscapes; ensuring the existence of habitats and communities necessary for the survival of viable populations of

species; a healthy and supportive external environment; a 40% level of waste recycling[41,42,43,44] (the level set out in the strategic documents is a national target). To a limited extent, oil shale ash can also be used to stabilise soil fillers, and compost produced from waste and converted into a product can be used in landscaping.

- implementation of environmentally friendly public procurement in construction, whereby products or services with a lower environmental impact are procured. For example, products with a longer service life, produced in an energy-efficient manner and from safer materials, which are easier to recycle and reuse, can be dismantled, etc.
- Implementation of resource-efficient solutions, such as the use of LED lighting at stops, the use of as many automatic systems as possible in the operation of Rail Baltic, etc.

The following circular economy principles and tools can be implemented during the operational phase of Rail Baltic:

- Implementation of environmental management systems (ISO 14001, EMAS, etc.) in the daily work of Rail Baltic. An environmental management system is a system for controlling, reducing and preventing the environmental impact of an organisation's activities, thereby improving its competitiveness. By implementing an environmental management system, Rail Baltic will improve its environmental and economic performance and reduce risks and costs related to the environment, occupational health and safety;
- Regular energy efficiency, life cycle assessment and other audits are carried out during operation to reduce Rail Baltic's own environmental impact and increase efficiency.
- Rail Baltic, as a built railway infrastructure, can be used for the large-scale transport of residual and waste materials for reuse and recycling, both within the country and between countries. This will make it possible to increase the amount of waste materials that can be recycled.

When dismantling the railway, the principles of the circular economy must also be taken into account and as much of the materials generated as possible must be reused or recycled as close as possible to where they were generated.

4.6 Generation of pollutants

4.6.1 Pollutants in the aquatic environment

According to the Environmental Board, no significant impact on the aquatic environment has been identified in connection with the existing railway lines, and no regular monitoring of pollutants in the aquatic environment is carried out on the basis of railway operation phase (except for special studies to identify the consequences of accidents, if necessary). Based on this, it is also unlikely that the normal use of the planned RB railway line (mainly new rolling stock and minimal use of diesel trains) would

---

[41] Estonian national strategy for sustainable development "Sustainable Estonia 21". Adopted on 14 September 2005

[42] Estonian Environmental Strategy until 2030. Adopted on 14 February 2007

[43] Basic principles of soil policy until 2050. Ministry of the Environment. Adopted on 6 June 2017

[44] National Development Plan for the Use of Oil Shale 2016–2030. Ministry of the Environment (2015)

result in significant pollution of the water environment or soil and, through this, an adverse impact on water quality.

A study by the Road Administration[45] shows that semi-natural stormwater treatment systems are planned for roads with a daily traffic frequency of over 15 000 vehicles. It can therefore be concluded that roads with lower traffic frequency do not have an environmental impact that needs to be mitigated by construction measures. There are no intersections with the RB railway section in question where the road traffic frequency exceeds 15 000 vehicles per day. Therefore, it is unlikely that the combined impact of the railway and road traffic at road intersections will have a significant adverse effect, and therefore no stormwater drainage systems are planned at road intersections.

During the railway operation phase, environmentally friendly weed control measures will be used for railway maintenance and vegetation control, and the use of currently common herbicides and the associated release of pollutants into the aquatic environment will be avoided.

4.6.2 Pollutants in the ambient air

The construction and operation of the planned railway section will generate air pollutants.

During the construction phase, the main pollutants will be dust (PM_{sum}, fine particles PM_{10} and particularly fine particles $PM_{2.5}$). Dust generation is primarily associated with the demolition of buildings located in the railway line and associated infrastructure area and the handling of construction materials and waste (transport, loading, storage, transfer). Dust generation and dispersion are also possible through erosion (wind and soil erosion from earthworks, ditch banks, roads). Vehicles, machinery and equipment used in construction activities emit pollutants into the ambient air when fuel is burned during their operation. Vehicles and machinery also spread dust (particles, fine particles) around the construction site when moving.

Emissions during operation phase are related to the movement of rolling stock on the railway and emissions generated during the use and maintenance of infrastructure. When diesel trains run on the railway, pollutants and dust are emitted from the combustion of fuel, which is related to friction during movement and the wear and tear of locomotive brakes, wheels and rails. Pollutants from fuel combustion are also released into the ambient air from machinery and equipment used for railway maintenance and from vehicles moving on railway-related infrastructure. As 100% of passenger train traffic is planned to be electrified, pollutants from fuel combustion are not relevant in this case.

A more detailed overview of the air pollutants and emission sources associated with the planned activity is provided at Table 4-3.

Table 4-3. Pollutants with a potentially significant impact arising from the construction and operation of the railway line and their sources

Pollutant	Construction phase	Source during construction	Operational stage	Source during the operational phase
Particulate matter (PM_{sum}) Fine particles (PM_{10})	+	Dust (PM_{sum}) carried by the wind during longer dry periods and the	0	No sources

[45] Expert assessment of the Road Administration's rainwater discharges based on self-monitoring data and commissioned water monitoring studies. OÜ Maves, job number 19101. December 2019

Pollutant	Construction phase	Source during construction	Operational stage	Source during the operational phase
Particularly fine particles ($PM_{2.5}$)		fine particles and particularly fine particles in its composition. However, mainly particles with a large grain diameter. Source: Uncovered areas, demolition and construction work, erosion, dust stirred up by the wheels and tracks of vehicles involved in construction activities		
Fine particles (PM_{10})	+	The main pollutants are ambient air pollutants contained in exhaust gases from the combustion of fuels used in construction activities in internal combustion engines. Source: vehicles, machinery, mechanisms and equipment with internal combustion engines during operation.	+	Vehicles, machinery, mechanisms and equipment with internal combustion engines used in railway maintenance. Emissions are very short-lived.
Particularly fine particles ($PM_{2.5}$)				
Carbon monoxide (CO)				
Nitrogen dioxide (NO_2)				
Sulphur dioxide (SO_2)				
Volatile organic compounds (VOC)				
Polycyclic aromatic hydrocarbons (PAH)				
Heavy metals (Cd, Zn, Pb)				

4.7 Noise

Noise is generated during both the construction and operation of railways.

During the construction phase, noise is generated by construction machinery and mechanisms. Noise is generated both at the railway site and on access roads (primarily from vehicles transporting construction materials). The exact level of noise during construction cannot be reliably predicted. Such noise is associated with almost all construction activities and ceases once the railway section construction is completed.

Noise during operation is primarily related to the movement of rolling stock on the railway. Rail traffic noise and noise dispersion have been assessed on the basis of the predicted traffic frequency for 2056, which is up to 36 passenger train pairs and up to 12 freight train pairs per day (see chapter 3.5 for more details). The results of the noise modelling are presented in section 8.12.

4.8 Vibration

Vibration is generated during both the construction and operation of railway.

Construction work causes temporary vibration, for example during soil compaction, movement of heavy machinery, etc.

The mechanism of vibration caused by railway traffic is as follows: vibration caused by the mass of a moving train is transmitted to the wheels, the wheels transmit the vibration energy to the rails and sleepers, and the ballast under the railway tracks dampens the further spread of vibration, but some of it is still transmitted to the ground. Vibration can spread through the ground to buildings and, when transmitted to building structures, can cause the structures (windows, floors, walls) to vibrate.

4.9 Electromagnetic field

The assessment of electromagnetic field (EMF) levels and safety takes into account unique operating conditions that may result in intense EMF. The most intense EMF is the electric field generated by high-voltage power lines and the magnetic field caused by strong currents in power lines.

EMF emitted into the environment by RB infrastructure may be caused by situations where:

1. the functions of components involve strong currents and high voltages (power lines and infrastructure related to power loads, especially at an operating frequency of 50 Hz);
2. radio frequency effects are used to perform the functions of components (induction heating, inductive power transfer, etc.);
3. the functions of components are related to radio communications (operating radio communication equipment, small devices with wireless data transmission functions (including IoT devices).

The network frequency EMF emissions of Rail Baltic in relation to the operating frequency of transport lines (50 Hz), which is also the frequency of the power supply network, depend on the voltage and current levels used and the geometric layout of the transport lines.

4.10 Light

The construction of the planned Rail Baltic railway and its structures will be accompanied by artificial light. During the construction period, light will be generated by the illuminating of construction sites and the movement of construction machinery.

No intersections or objects with lights are planned for this section. Therefore, during operation phase, light will only be generated by the headlights of moving trains in curves. As a result, areas that are currently unlit will be periodically illuminated by artificial light, which may cause light pollution.

5 DESCRIPTION OF THE ENVIRONMENT LIKELY TO BE AFFECTED

5.1 Settlements and land use

The railway line section runs in Pärnu County, Häädemeeste Parish, in a sparsely populated area near the Latvian border. Moving from north to south, the route passes through the villages of Penu, Majaka, Orajõe, Treimani, Metsapoole and Ikla.

The railway runs through uninhabited forest areas. The nearest households are located in the village of Penu on the banks of the Kabli River, in the village of Majaka on the banks of the Lemmejõe River and in the village of Metsapoole. There are five residential yards located 200-500 metres from the railway. More densely populated areas are located 2.5 km or more from the railway. The railway intersects with a couple of local roads and forest roads.

The table below (Table 5-1) shows the land use classes and soil types along the route. The railway section in question is predominantly forest land, with wooded areas covering 95% of the affected area. There are smaller areas of grassland (5%).

Table 5-1. Land use classes and soil types within the 50 m impact zone of the RB railway section

Land use[46]	Mineral soils[47], ha	Peat soils[48], ha	Total, ha	Proportion
Forest land	55	4,5	60,1	95%
Grassland	3	0	3	5%
Other land	0,1	0	<0,1	0%
Total	58,8	4	63	100%

5.2 Land use CO_2 balance

The reference situation, i.e. the current situation, examines the distribution of land use classes and soil types and the CO_2balance of the area covered by the RB railway corridor before the construction of the Rail Baltic infrastructure.

In the forest land category, it is assumed that normal forest growth occurs before the establishment of the RB (Estonian average 7.5 m^3 ha^{-1} per year[49]) and that dead wood and litterfall are in balance with decomposition, i.e. the CO_2 balance of dead organic matter is zero. The forest growth in the assessed area is associated with approximately 518 tonnes of CO_2 per year (Table 5-2). Under Estonian forest management conditions, forest mineral soils are mostly carbon storing systems. The mineral soils of the forest in the assessed railway corridor accumulate approximately 34 tonnes of CO_2 per year. The railway corridor area is largely covered by land improvement systems and is therefore affected by drainage. Drainage causes the decomposition of organic matter in peat soils, which is accompanied by CO_2 emissions. The annual CO_2 emissions from peat soils in forest land are approximately 6 tonnes before the construction of the RB.

[46] According to the Estonian topography database (Land and Spatial Planning Board, 2025)

[47] According to the Estonian soil map (Land and Spatial Planning Board, 2025)

[48] According to the Estonian soil map (Land and Spatial Planning Board, 2025)

[49] Aastaraamat Mets 2018 (2020). Madis Raudsaar, Kaia-Liisa Siimon, Mati Valgepea. Keskkonnaagentuur

According to statistical forest inventory data, biomass growth on grasslands is low (the grassland biomass in the railway section accumulates approximately 0,002 tonnes of CO_2 per year). There is no intensive economic activity on long-term grasslands and no additional nutrients are added to the soil, which is why it is assumed that there are no CO_2 emissions from mineral soils. The railway section is also not overlap with grassland peat soils.

Table 5-2. Land use CO_2 balance before RB construction (t CO_{2eq} per year, positive is emission, negative is sequestration)

Land use class	Biomass	Dead wood and litter	Peat soil	Mineral soil	Water area, settlement or undefined area	Total
Forest	-518	0	6	-34	0	-546
Grassland	-0,005	0	0	0	0	-0,005
Other land	0	0	0	0	0	0
Total	-518	0	6	-34	0	-546

5.3 Protected natural objects

5.3.1 Protected areas and individual protected natural objects

This chapter deals with protected areas (nature conservation areas, landscape conservation areas), limited conservation areas and individual protected natural objects located within the expected impact area of the RB railway section. Species' protection sites within the expected impact area of the RB railway section are described under the relevant protected species for which protection sites have been established (see chapter 5.3.3.2). Natura 2000 network SPAs and SACs are discussed in more detail in the Natura assessment section (Chapter 7).

An overview of protected natural objects is provided based on data from the Estonian Nature Information System (EELIS) as of 26 March 2025.

Laulaste Nature Conservation Area

The Laulaste Nature Conservation Area (KLO1000318) consists of several separate areas. The northern part of the nature conservation area is located approximately 1,5 km from the beginning of the railway section, and the southern part is located approximately 750 m away.

The conservation objectives of the Laulaste Nature Conservation Area are: to protect the habitat types listed in Annex I of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora – rivers and streams (3260), western taiga (9010*), Fennoscandian deciduous swamp woods (9080*); protection of species listed in Annex II to Council Directive 92/43/EEC, which are also Category II protected species, river lamprey (*Lampetra fluviatilis)*; protection of species listed in Annex I to Council Directive 79/409/EEC on the conservation of wild birds, which are also category I protected species. The protected area covers 1065.9 ha.

The Laulaste Nature Conservation Area is part of the Põhja-Liivimaa SPA and Laulaste SAC, which are included in the Natura 2000 network.

Kivikupitsa Landscape Conservation Area

The Kivikupitsa Landscape Conservation Area (KLO1000330) is located east of the railway. The nearest corner of the landscape conservation area is approximately 500 m from the railway (at the 6th kilometre).

The conservation objective of the Kivikupitsa Landscape Conservation Area is to protect: the integrity of the stone field, the habitats of protected species and forest habitats of high conservation value; habitat types listed in Annex I of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. These habitat types are: western taiga (9010*), Fennoscandian hemiboreal natural old broad-leaved deciduous forests (9020*) and coniferous forests on eskers and moraines (syrma forests – 9060); species listed in Annex I to Council Directive 79/409/EEC on the conservation of wild birds and which are also listed in categories II and III. The species listed in category III are the grey-headed woodpecker (*Picus canus)*, black woodpecker (*Dryocopus martius)*, *Ural* owl (*Strix uralensis)*, pygmy owl (*Glaucidium passerinum)*, red-breasted flycatcher (*Ficedula parva)* and hazel grouse (*Bonasa bonasia)*.

The Kivikupitsa Landscape Conservation Area is part of the Põhja-Liivimaa SPA and Kivikupitsa SAC, which are included in the Natura 2000 network (see chapter 7).

Lemmejõe limited-conservation area

The railway section crosses the Lemmejõe limited-conservation area (the railway crosses the Lemmejõe River). The conservation objective of the Lemmejõe limited-conservation area (KLO2000247) is to protect the habitat types listed in Annex I to Council Directive 92/43/EEC – rivers and streams (3260) – and the species listed in Annex II – otter (*Lutra lutra)*, river lamprey (*Lampetra fluviatilis)* and thick shelled river mussel (*Unio crassus)*. The conservation area covers 3,2 ha.

The conservation area is connected to the Lemmejõe SAC, which is part of the Natura 2000 network (see chapter 7).

Kiusumetsa limited-conservation area

The Kiusumetsa limited-conservation area (KLO2000242) is located east of the railway. The nearest corner of the conservation area is approximately 90 m from the railway (at km 5+200). The conservation objective of the Kiusumetsa limited-conservation area is to protect the habitats of species listed in Annex I of Council Directive 79/409/EEC and migratory bird species not listed in Annex I. The species whose habitats are protected are: black stork (*Ciconia nigra)*, honey buzzard (*Pernis apivorus)*, goshawk (*Accipiter gentilis)*, hazel grouse (*Bonasa bonasia)*, pygmy owl (*Glaucidium passerinum)*, *Ural* owl (*Strix uralensis)*, Eurasian scops owl (*Aegolius funereus)*, grey-headed woodpecker (*Picus canus)*, black woodpecker (*Dryocopus martius)*, white-backed woodpecker (*Dendrocopos leucotos)*, three-toed woodpecker (*Picoides tridactylus)* and red-breasted flycatcher (*Ficedula parva)*. The conservation area covers 1 439,2 ha.

The limited-conservation area is connected to the Põhja-Liivimaa SPA, which is part of the Natura 2000 network (see chapter 7).

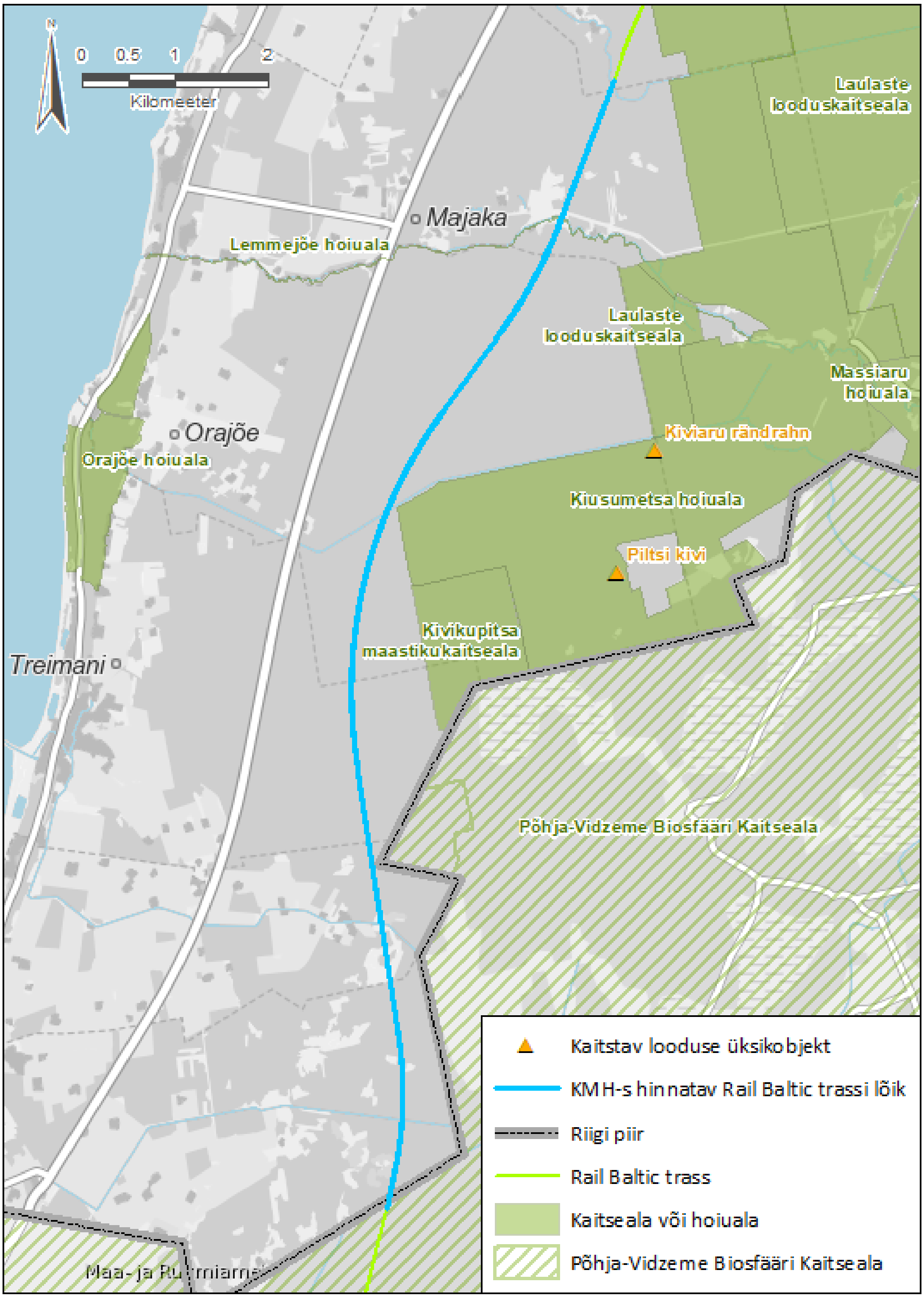


Figure 5-1. Protected natural objects[50]

[50] Base map: Land Board 23.07.2025; Estonian protected areas, conservation areas and protected natural objects: EELIS (Estonian Nature Information System), Environmental Agency 23.07.2025; Latvian protected areas: Dabas aizsardzības pārvalde (Latvian Nature Conservation Agency) 15.01.2025

Northern Vidzeme Biosphere Reserve

The Northern Vidzeme Biosphere Reserve (LV0000100, Latvian: *Ziemeļvidzemes biosfēras rezervāts*) is located in northern Latvia, with its northern border running along the Estonian-Latvian border. The aim of the biosphere reserve is to ensure the protection of landscapes, ecosystems, species and biodiversity in synergy with sustainable economic development. The reserve covers an area of 4 576 km^2.

In 2007, a landscape ecology plan was developed for the reserve, identifying landscape protection zones and distinguishing 42 landscape units. At the location where the proposed railway line crosses the Latvian border, a landscape protection zone has been designated. This area is part of the Salacgrīva Plain landscape. The Salacgrīva Plain is not classified among the landscapes of high aesthetic quality, and therefore no specific land use restrictions have been applied to this landscape unit.

The area east of the railway corridor is classified as a core zone of international importance consisting of forests and mires, and also functions as a biocenter buffer zone. The area to the south, where the Latvian and Estonian railway sections connect, is designated as an internationally significant forest corridor (Figure 5-2). The nearest landscape of local importance, the Salaca River Valley landscape, is located approximately 4 km east of the railway line[51]. The nearest landscape of national importance is "The Seaside and Livonian Coast", located approximately 5 km from the point where the railway line crosses the Latvian border[52].

[51] Limbaži municipality general plan under preparation, Study of valuable landscapes.

[52] Latvian Landscape Atlas and general plan being prepared for Limbaži Municipality.

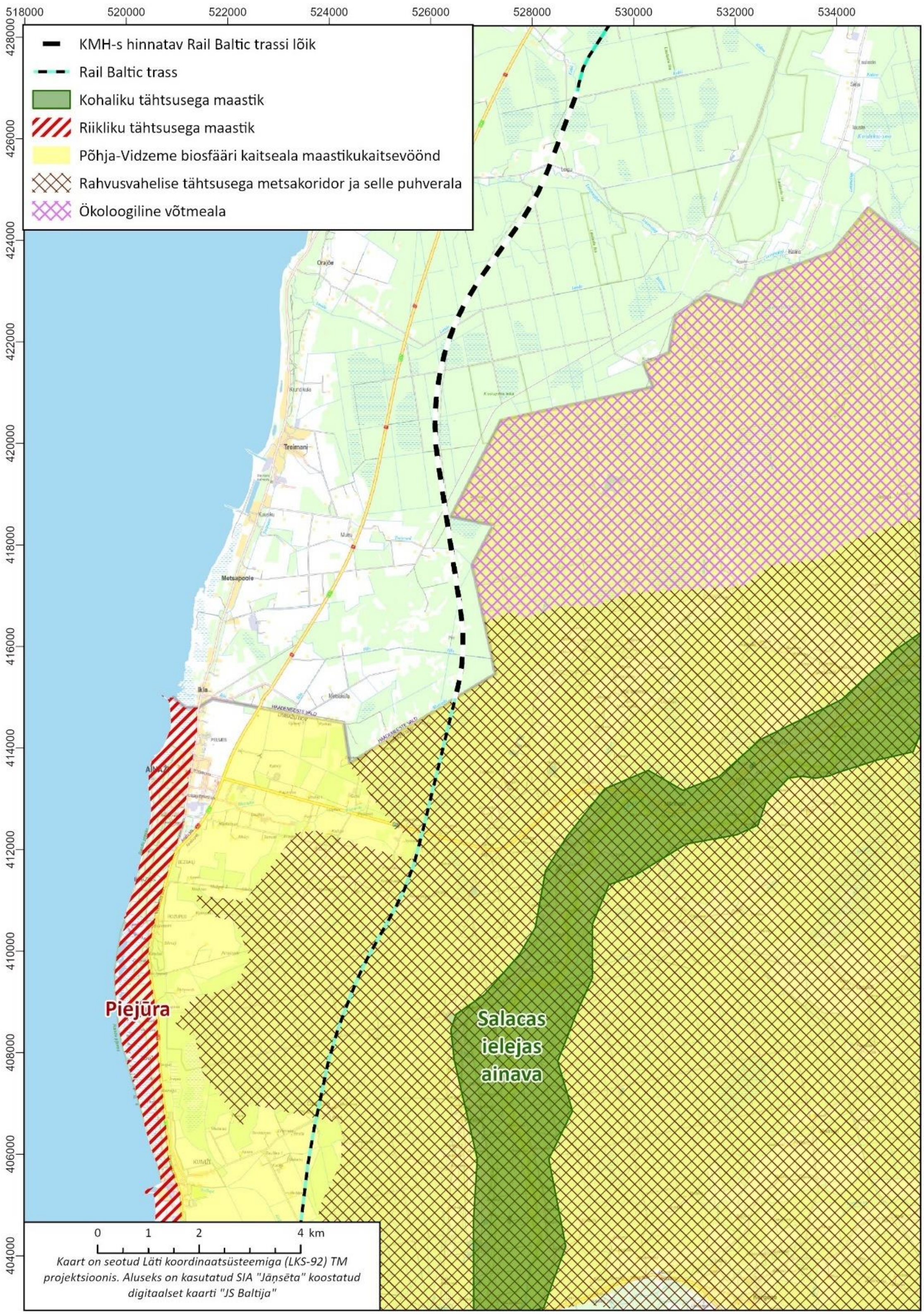


Figure 5-2. Landscape protection zones of the North Vidzeme Biosphere Reserve

The nearest **individual protected natural objects** are erratic boulders (Kiviaru erratic boulder and Piltsi stone), which are located more than two kilometres from the railway.

The nearest **protected area** listed in EELIS is the Metsaelupaikade Nature Conservation Area, parts of which are located 1,3-1,4 km from the railway.

5.3.2 Protected plant, fungus and lichen species

There are no protected plant, fungus or lichen species in the railway corridor or its immediate vicinity.

Approximately 430 m from the railway, there is a 4,6 ha site registered in EELIS as a habitat of category III protected plant species (*Neckera pennata*) and a category III protected plant species (*Megalaria grossa*) (spatially overlapping sites with registration numbers KLO9403281, KLO9701875, KLO9701896).

The habitats of other protected plant, fungus and lichen species registered in the railway section are located more than 500 m from the railway and are therefore outside the zone of likely impact.

5.3.3 Protected animal species

5.3.3.1 Mammals

No habitats of protected mammals have been registered in EELIS in the area of the railway section under consideration. The Lemmejõgi River, which is crossed by the railway, is considered to be a habitat of the otter (*Lutra lutra*), which is classified as a protected species in category III.

5.3.3.2 Birds

Of the bird species listed in protection category I, the nesting of black storks (*Ciconia nigra*) has been recorded within the species-specific range of movement on the section of the railway under consideration. Black storks move over a very large territory in search of food, which can exceed a radius of 25 km from the nest if necessary[53] . According to data collected in Estonia, the median of all data is 50% of the species' home range within a 4,8 km radius, 70% within a 7,5 km radius and 99% within a 14 km radius of the nest[54] . The typical range of the feeding area can be considered to be 10 km, and within this range there are two registered habitats of black storks in the impact zone of the railway section:

- Kiusumetsa black stork species' protection site (KLO3000504) 2,3 km east of the railway (nest is destroyed during logging in 2002 and habitat is uninhabited since then[55]);
- Black stork habitat in the Laulaste Nature Conservation Area and Põhja-Liivimaa SPA (KLO9128688) 3,5 km east of the railway (last inhabited in 2001 and nest destroyed in 2009 at the latest).

The reason for the long feeding flights is the scarcity of areas suitable for the species to find food (natural streams and rivers and wet meadows). The loss of feeding areas from our landscape is considered to be one of the main reasons for the decline in the species' population[56]. In total, there

[53] Action plan for the protection of the black stork (*Ciconia nigra)*. (Approved by order no. 1-1/18/105 of the Director General of the Environmental Board on 14 February 2018)

[54] BirdLife Estonia, Eagle Club, 2022. Analysis of the Estonian land bird population. Report on public procurement no. 239156

[55] Pajula and Kiristaja, 'Sookuninga Nature Conservation Area's Management Plan 2016–2025'.

[56] Ülo Väli et al., 'Black stork abundance, breeding success and survival in Estonia in 1991–2020', Hirundo 2, no. 34 (2021): 20–39.

have been two observations in the RB corridor area (in 2014 and 2016), where the species was feeding on the Loode stream.

Other recorded locations of bird species of protection category I are significantly further away (8.6 km and more).

Of the bird species in protection category II, the white-backed woodpecker (*Dendrocopos leucotos*) and the three-toed woodpecker (*Picoides tridactylus*) are listed in EELIS as occurring in the expected impact area of the railway section under consideration.

There are three habitats of the white-backed woodpecker registered in EELIS in the expected disturbance area of the railway section:

- habitat KLO9132840, which is crossed by the railway on its eastern edge,
- habitat KLO9132800 approximately 85 m west of the railway,
- habitat KLO9132839 approximately 650 m east of the railway in the Põhja-Liivimaa SPA and Laulaste Nature Conservation Area.

There are two habitats of the three-toed woodpecker registered in EELIS in the expected disturbance area of the section under consideration:

- habitat KLO9104088 approximately 460 m east of the railway,
- habitat KLO9104085 approximately 730 m east of the railway, in the Põhja-Liivimaa SPA and Kiusumetsa limited-conservation area.

The following species of **birds in protection category III** are listed in EELIS as found/living in the expected impact area of the railway section:

- black woodpecker (*Dryocopus martius*), KLO9132862, whose eastern edge is crossed by the railway,
- grey-headed woodpecker (*Picus canus*), KLO9132876, which spatially overlaps with the previous one,
- hazel grouse (*Tetrastes bonasia*) KLO9132881, which spatially overlaps with the previous ones, and KLO9113785 580 m away,
- the red-breasted flycatcher (*Ficedula parva*), KLO9113824, whose north-western edge is crossed by the railway, and KLO9113825 460 m away,
- Ural Owl (*Strix uralensis*), KLO9132877 430 m away.

Table 5-3. Habitats registered in EELIS located within 1 km of the RB railway section[57]

Species[58]	Environmental register code	Date of observation	Area within the 1 km buffer zone of the RB, ha		Total habitat area, ha
			Põhja-Liivimaa SPA	Total	
Three-toed woodpecker (*Picoides tridactylus*)	KLO9104085	2004	3,7	3,7	6,7
Kingfisher (Alcedo atthis)	KLO9136210	2025.03.20	-	1,5	12,8

[57] Luhamaa, H., 2025. Põhja-Liivimaa RB linnustik. Kabli- Eesti Vabariigi piir

[58] Species protected in the Põhja-Liivimaa SPA are printed in bold.

Species[58]	Environmental register code	Date of observation	Area within the 1 km buffer zone of the RB, ha		Total habitat area, ha
			Põhja-Liivimaa SPA	Total	
White-backed woodpecker *(Dendrocopos leucotos)*	KLO9132840	2022.03.25	-	33,7	33,7
	KLO9132839	2022.03.25	5.8	12,1	74,3
	KLO9113800	2024.05.11	-	5,5	5,5
Ural Owl (*Strix uralensis*)	KLO9113845	2005	1,2	1,2	10,4
	KLO9113847	2005	3,7	3,7	6,7
	KLO9132877	2022.03.25	-	4,1	4,1
Common buzzard (*Buteo buteo*)	KLO9113793	2005	-	0,1	5,5
Red-breasted flycatcher (*Ficedula parva*)	KLO9113829	2006	1,1	1,1	7,4
	KLO9113824	2005	-	13,5	13,5
Pygmy Owl (*Glaucidium passerinum*)	KLO9119006	2008.03.25	1,6	1,6	23,6
	KLO9113832	2022.03.31	6,7	6,7	59,5
Lesser Spotted Woodpecker (*Dryobates minor*)	KLO9113809	2005	-	0,08	5,5
Grey-headed Woodpecker (*Picus canus*)	KLO9132876	2022.03.25	-	33,7	33,7
Hazel grouse (*Tetrastes bonasia*)	KLO9132881	2022.03.25	-	33,7	33,7
	KLO9132880	2022.03.24	-	7,1	19,5
	KLO9113781	2004	1,2	1,2	10,4
Black woodpecker (*Dryocopus martius*)	KLO9132862	2022.03.25	-	33,7	33,7
	KLO9113810	2004	5.7	5,7	11,9
Mistle thrush (*Turdus viscivorus*)	KLO9132886	2022.03.25	4,8	4,8	14,3

Based on observations recorded in the Estonian Biodiversity Information System [59], in addition to the species mentioned above, the corncrake (*Crex crex*) has also been observed during the breeding season in the southern part of the Treimani River floodplain over the last 10 years. It should be noted that the area is generally sparsely populated and therefore there are few observers. As a result, many habitats of protected species may have been overlooked.

5.3.3.3 Fish

No habitats of protected fish species have been registered in EELIS on the railway line or in its immediate vicinity. The conservation objective of the Laulaste Nature Conservation Area and the Lemmejõe limited-conservation Area is to protect the river lamprey (*Lampetra fluviatilis*) and its habitats.

An assessment of the fish fauna in the watercourses was carried out on the railway section in 2025[60]. According to this, the Lemmejõgi River is a high-value habitat type, being a suitable spawning ground for trout and Cyclostomi. In addition to fish spawning grounds, the river also has nursery areas for young fish. There are no migration barriers in the river section, and the varied habitat structure allows the river section to be used as a wintering area for fish (including lamprey) and molluscs. The high value of the river section was also confirmed by the presence of various protected and important

[59]"eElurikkus", University of Tartu Natural History Museum and Botanical Garden, https://elurikkus.ee/

[60] Estonian Nature Conservation Centre, 2025. Possible impacts of the planned construction activities on watercourses and fish stocks in the section of the Rail Baltic route between Kabli and the Estonian/Latvian border

aquatic species and their different age groups in this section during monitoring carried out in May 2025.

5.3.3.4 Amphibians

No protected amphibian habitats have been registered in EELIS on the railway line or in its immediate vicinity.

A survey of amphibian habitats was carried out on the railway section in 2024[61] with the aim of identifying amphibian habitats and breeding areas in order to assess the need for passages and barriers. The results of the survey showed that the RB railway section is surrounded by ditched commercial forests and former farmland, where amphibians are present but do not occur in large numbers.

There are two areas of importance for amphibians in the region: a firefighting pond at km 6+170 on the railway section and the old riverbeds of the Lemmejõgi River (Figure 5-3). At the point where it crosses the railway section, the Lemmejõgi river has steep banks and a relatively fast flow, but is nevertheless suitable as a movement corridor for amphibians. Old river beds suitable for amphibians are located a few hundred metres west of the RB railway section.

The following species, all of which belong to nature conservation category III, were observed in both locations during field surveys: common toad (*Bufo bufo*), common frog (*Rana temporaria*) and pool frog (*Pelophylax lessonae*).

[61] OÜ Rewild, 2024. Amphibian habitats in Pärnu County on the RB DS3DPS3 section. Occurrence of amphibian breeding water bodies and assessment of habitats on the Rail Baltic route and necessary measures

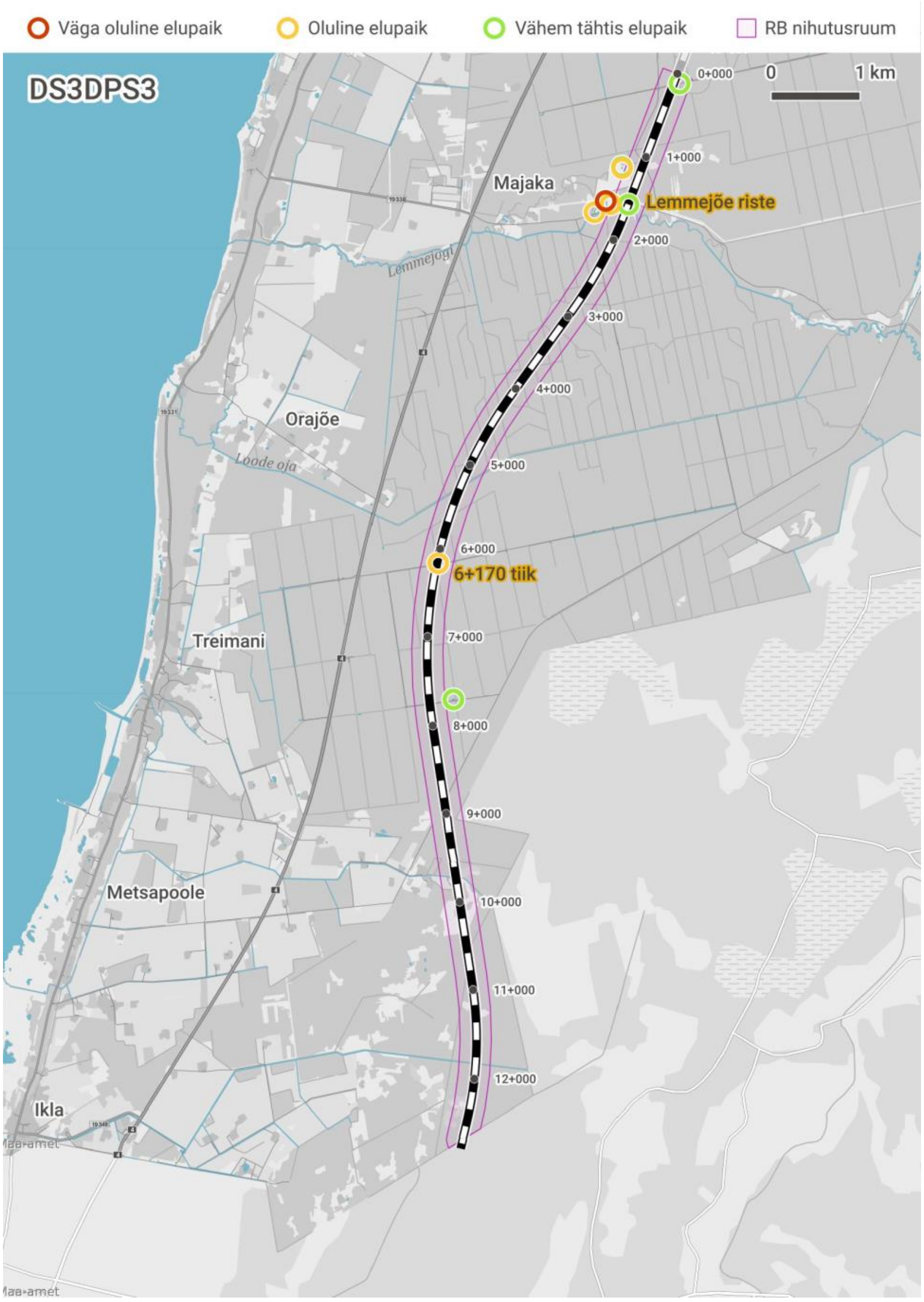


Figure 5-3. Amphibian habitats. Source: OÜ Rewild[62]

5.3.3.5 Reptiles

No habitats of protected reptiles have been registered in EELIS on the railway corridor or in its immediate vicinity. The expert also did not find any relevant observations in the public data of the PlutoF database (the closest individual observation was approximately half a kilometre from the railway corridor – grass snake (*Natrix natrix*)).[63]

---

[62] OÜ Rewild, 2024. Amphibian habitats in Pärnu County on the RB DS3DPS3 section. Presence of amphibian breeding water bodies and assessment of habitats on the Rail Baltic route and necessary measures

[63] PlutoF: https://plutof.ut.ee (02.04.2025)

5.3.3.6 Invertebrates

The Lemmejõgi River is home to the thick shelled river mussel (*Unio crassus*), a species in protection category II.

5.4 Cultural heritage

There are no cultural monuments or heritage conservation sites in the immediate vicinity of the railway section (the nearest registered monument is located approximately 3 km away)[64].

There are no other objects listed in the registers of the National Heritage Board (20th century architecture, rural construction heritage, military heritage) in the railway section corridor and its possible impact area[65]. No natural sacred sites have been identified in the section either.

The railway section does not pass through any valuable landscapes or milieu areas designated in the plans[66,67].

The railway intersects with the Riiselja-Ikla railway (213:RTR:001), which is listed as a cultural heritage object. In the 1920s, a narrow-gauge railway ran along the route, mainly for transporting timber from Laiksaare forests. The railway operated until 1972 or 1973. Less than 20% of the object or its original functionality has survived[68].

A cultural heritage survey was conducted as part of the Rail Baltic county-wide spatial plan SEA. To refine and supplement the cultural heritage survey, a preliminary archaeological survey was conducted[69], the results of which were taken into account when developing the railway corridor. The aim of the preliminary archaeological survey was to map the locations where a landscape inspection is necessary to determine the existence of historical monuments and the need for archaeological excavations. During the second stage of the preliminary archaeological survey of the Rail Baltic railway[70], the potential archaeological heritage sites identified in the first stage were examined in more detail and recommendations were made regarding the work to be carried out on sites of archaeological value.

The railway cuts through a traditional road in Treimani village, which connects the coast with a place called Kivikupitsa. During the second stage of the archaeological survey, it was found that the road was most likely completely destroyed as a result of drainage and clear-cutting. Due to the dense brushwood, thick undergrowth and damaged ground remaining on the clear-cut areas, it is not possible to find any remains of the road. Preliminary archaeological investigations did not reveal any need for additional and/or more detailed archaeological investigations.

---

[64] Register of Cultural Monuments, https://register.muinas.ee/ (07.03.2025)

[65] Register of Cultural Monuments, https://register.muinas.ee/ (07.03.2025)

[66] Draft comprehensive plan of Häädemeeste municipality (as of 15.12.2024), https://haademeestevald.kovtp.ee/koostatav-uldplaneering

[67] Pärnu County-wide spatial plan, https://www.riigiplaneering.ee/parnu-maakonna-planeering

[68] Estonian Nature Information System (27.03.2025)

[69] University of Tartu, Prof. Valter Lang, 2013. Report on the preliminary archaeological survey for the selection of the Rail Baltic railway route. Stage I

[70] Kriiska, A., et al, 2015, Final report on the second stage of archaeological preliminary surveys for the Rail Baltic route, Report on the archaeological base camp and detailed surveys on the Pärnu County sections of the Rail Baltic route in 2015

The area where the railway intersects with the Lemmejõgi River was investigated as a second potential cultural layer (old farmsteads on historical maps). As a result of the landscape survey, no cultural layers or finds of cultural value were discovered in the area, therefore more detailed research is not necessary in this area.

5.5 Geology and mineral resources

A geological survey has been carried out in the railway area for the preparation of a preliminary design[71]. Additional surveys have been carried out during the *value* engineering process[72,73,74].

The railway section is located on the accumulation plain (Pärnu lowland), at the foot of the Sakala uplands. The relief is predominantly flat with a slight rise towards the south along the entire railway section, sloping towards the rivers in the vicinity of rivers. The relief is characterised by moraine plains and sea and wind-formed landforms (dunes) that have replaced former lagoons. The absolute heights of the ground surface range from 12 to 16 m.

The quaternary deposits are dominated by moraine, with fine sand in places and peat in excessively wet areas. In the northern part of the railway section, there is an area with thin surface cover and exposed bedrock. The thickness of the quaternary sediments varies, remaining mostly below 1 m and below 2 m near the Latvian border. In the Treimani River valley, the quaternary sediments layer is up to 70 m thick. The bedrock consists of very fine-grained and fine-grained sandstone aleurolite with interlayers of clay[75].

The railway section corridor does not overlap or border any registered mineral deposits. The nearest deposits are the Kiusumetsa (3.7 km), Massiaru (4 km), Krundi (5 km), Urissaare (7 km), Nepste (16 km), Vangu (21 km), Võiste (24 km) and Tõitoja (27 km) sand deposits.

The nearest gravel deposits are Riisselja (approx. 35 km to the northeast) and Kõrsa (approx. 50 km to the north). The Kuiaru, Selja and Aluste sand and gravel deposits are located 55-75 km from the railway section EIA9, but the reserves in these deposits are practically exhausted[76].

The nearest dolomite deposits are located 70 km to the north (Valistre and Anelema).[77] Also worth mentioning in relation to construction dolomite is the Kobra deposit, for which an extraction permit has been applied for, and the Kaisma deposit area and the prospective Valistre area, which require geological exploration[78]. The nearest limestone deposits are even further north.

---

[71] Geological surveys for the preparation of a preliminary railway design, Reaalprojekt OÜ work nos. RB-GL-4, RB-GL-3, RB-GL-2 and RB-GL-1

[72] Obermeyer, 2021. Factual Report of Geotechnical Investigation Results Initial Investigations for Value Engineering Stage

[73] Obermeyer, 2023. Factual Report of Geotechnical Investigation Results Remaining First Stage Investigation Phase (for track)

[74] Obermeyer, 2023. Factual Report of Geotechnical Investigation Results Remaining First Stage Investigation Phase (for structures)

[75] Land and Spatial Planning Board. Estonian Geological Survey. OÜ Eesti Geoloogiakeskus. 2025. Geological base map of Estonia 1:50,000

[76] Estonian Geological Survey. 2020. Distribution, extraction and use of construction minerals in Pärnu County. Research report

[77] Application of mineral deposits, Land and Spatial Planning Board, 18 January 2025

[78] Estonian Geological Survey. 2020. Distribution, extraction and use of construction minerals in Pärnu County. Research report

5.6 Surface water

The railway section is located in the West Estonia river basin district. The railway section crosses the catchment areas of several watercourses flowing towards the sea. The larger watercourses intersecting the railway section are the Kabli River (Kabli Stream), Lemmejõgi, Loode Stream, Treimani River (Treimani Stream) and Ikla River (Figure 5-4). All these watercourses flow into the sea. In addition, drainage ditches intersect the railway. There are no inland lakes in the railway corridor or its immediate vicinity.

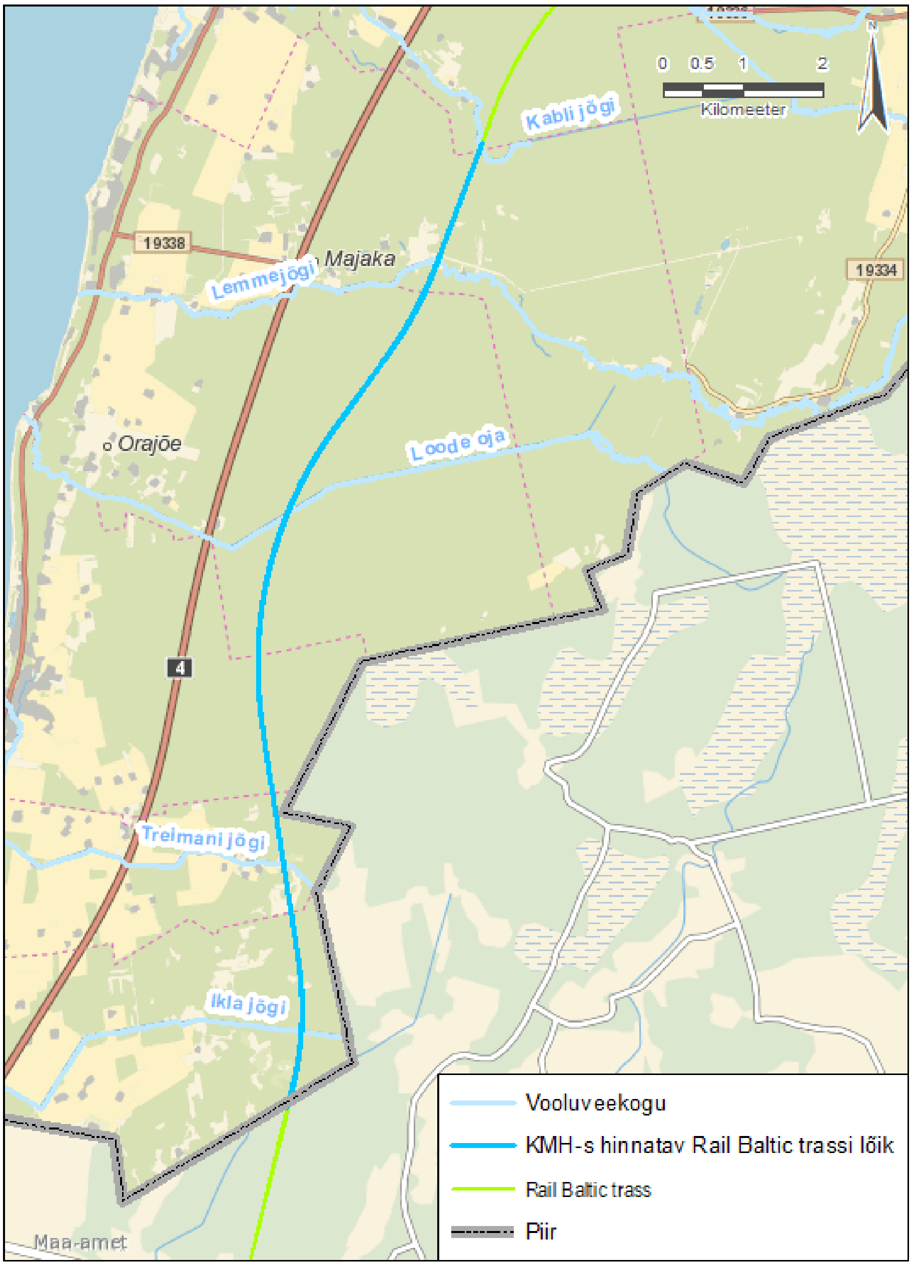


Figure 5-4. Watercourses intersecting the Rail Baltic railway section[79]

An overview of the most important water bodies is provided in the table below (Table 5-4).

[79] Base map: Land and Spatial Planning Board, 15 January 2025; Watercourses: EELIS (Estonian Nature Information System), Environmental Agency, 15 January 2025

Table 5-4. Major watercourses intersecting the railway section

Registration code	Water body code	Name	Type	Length, km	Usability
VEE1152000	1152000	Kabli River	natural stream	5,9	Not public or publicly accessible
VEE1152100	1152100	Lemmejõgi	natural river	2,2	Publicly accessible
VEE1152500	1152500	Treiman River	natural stream	7	Not public
VEE1152300	1152300	Loode stream	natural stream	10,3	Not public or publicly accessible
VEE1152600	-	Ikla River	collector ditch	7	Not public or publicly accessible

In 2025, a survey of watercourses was carried out on the railway section[80], which described the watercourses intersecting the railway section.

The Lemmejõgi River, in the section where it intersects with the RB meanders between high, fairly steep banks in a natural riverbed. There are signs that the river is gradually changing its course over time, which is normal and important for a natural river. In addition to the species recorded in the Lemmejõgi River during the study (river lamprey, brook lamprey, brown trout, minnow, ninespine stickleback and stone loach), the Lemmejõgi River also provides living and spawning conditions for several other fish species. Approximately 45% of the total brown trout reproduction potential of the Lemmejõgi River remains in this approximately 5 km long section of the river. The Lemmejõgi River is part of the Lemmejõe and Laulaste SACs, which are included in the Natura 2000 network.

The section of the Kabli River in the Rail Baltic railway area has been significantly altered and has a simple morphology, but still retains some ecological value. The gravelly areas near the culvert upstream of the RB intersection provide spawning grounds for several fish species, including, in theory, river lamprey, if the migration barriers downstream are removed. According to literature, the river experiences water shortages in summer.

The Loode stream is located in a straightened riverbed in the area where it intersects with the railway line. Based on catches made in May 2025, the typical fish species found in the RB section of the river included river lamprey, trout, minnow, ninespine stickleback and stone loach. The river lamprey was a mature specimen that had built a spawning bed in the gravelly section of the river. The presence of river lamprey indicates that the river section downstream is open to migration routes.

The Treimani River has been straightened along the Rail Baltic railway section, but it is hydro-morphologically valuable. Based on catches made in May 2025, trout, minnow and stone loach were found among the typical fish species in the RB railway section. There are few shelters in the stream (no fallen trees or large rocks).

According to a study conducted in 2025, the RB section of the Ikla River is not suitable for fish.

---

[80] Wildlife Estonia, 2025. Possible impacts of the planned construction activities on watercourses and fish stocks along the Kabli–Estonian/Latvian border section of the Rail Baltic route

Based on the 2023 status assessment[81], the Kabli River was in good status, the Lemmejõgi River and Loode streams were in moderate status, and the Treimani River was in poor status. The Ikla River is not included in the list of distinguished surface water bodies (water body management units used as a basis for the preparation of river basin management plans) and therefore no status assessment has been given.

The poor status of the Treimani River is related to physical and chemical quality indicators and nutrient loads. However, it has been noted that the assessment is affected by an unsuitable monitoring location. The moderate status of the Loode stream is also related to physical and chemical quality indicators. The reason for this is the low water level of the water body at the end of summer/autumn, which affects the monitoring results. The moderate status of the Lemmejõgi River is related to fish indicators. In the case of the Lemmejõgi River, the unsuitability of the monitoring site and the reference conditions has also been pointed out.

The river basin management plan for the West Estonia river basin district[82] sets the objective of maintaining or achieving good status for the above-mentioned water bodies. The programme of measures in the river basin management plans[83] sets out water body-specific measures only for the Lemmejõgi River, as the status of the other water bodies was assessed as good at the time the river basin management plans were drawn up. The measures are primarily related to reducing the pressure from agricultural activities. In addition, the measures are aimed at controlling the impact of beaver activity and monitoring compliance with fishing regulations.

The Lemmejõgi River, the Treimani River and the Loode Stream are included in the list of spawning and habitat sites for salmon, brown trout, salmon trout and grayling[84]. In accordance with the Nature Conservation Act, the construction of new dams and the reconstruction of existing dams to the extent that they raise the water level, as well as changes to the natural bed and hydrological regime of the water body, are prohibited in these water bodies.

The railway line largely runs through the area covered by land improvement systems (Figure 5-5). The regulating network of a land improvement system consists of watercourses for receiving excess water (drainage network) and artificial recipients and ditches connected to natural watercourses.

The railway corridor passes through the following regulating networks of land improvement systems:

- Räägu No. 516, code: 6115200030080,
- Räägu No. 516, code: 6115200020070,
- Orajõe (ÜP-174), code: 6115210010060,
- Liiva (TTP-312), code: 6115230030050,
- Liiva (TTP-312), code: 6115250020010,
- Kiviloo, code: 6115250030130,
- Poorita, code: 6115250030140.

[81] Environmental Agency, 2024. Updated interim assessment of the status of Estonian surface water bodies in 2023

[82] Ministry of the Environment, 2022. River basin management plan for the West Estonian river basin district 2022-2027

[83] Ministry of the Environment, 2022. Action programme for the river basin management plans for the West Estonia, East Estonia and Koiva river basins 2022-2027

[84] Regulation of the Minister of the Environment No. 73 of 15 June 2004 “List of spawning and habitat sites of salmon, brown trout, salmon trout and grayling”

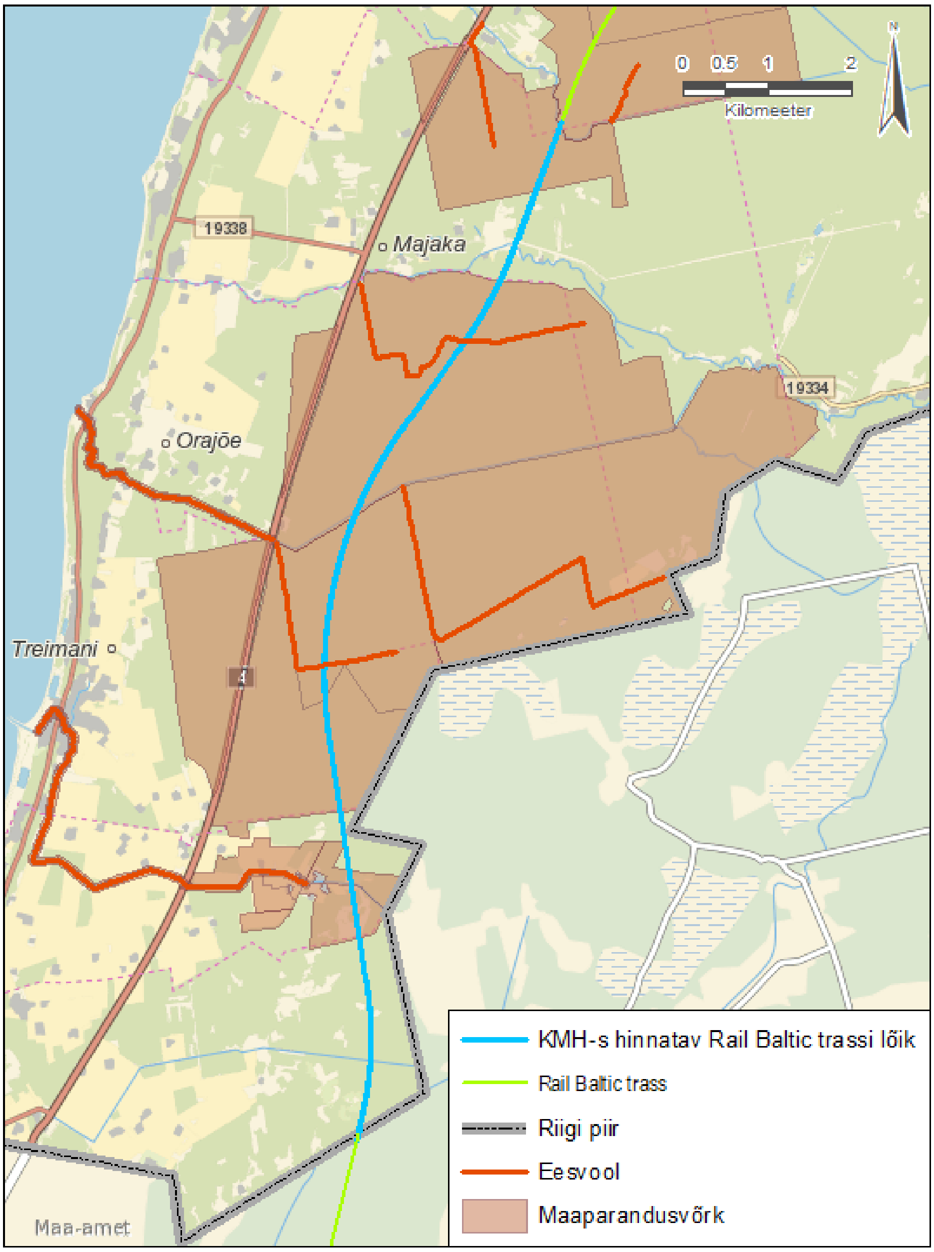


Figure 5-5. Location of the regulating network of land improvement systems and artificial recipients in the vicinity of the planned railway section[85]

The railway intersects with two artificial recipients of the land improvement system: Orajõe (ÜP-174) and Liiva TTP-312. These are open drainage channels with a catchment area of up to 10 km^2.

The Kabli River, Loode Stream, Treimani River and Ikla River are jointly used recipient which maintenance is arranged by the state, but only in the sections downstream of the railway corridor.

There are no flood risk areas on the section of the railway under consideration.

[85] Base map, restrictions map: Land and Spatial Planning Board 15 January 2025; spatial data for artificial recipients in the Land Improvement Systems Register, Land and Spatial Planning Board 15 January 2025

5.7 Groundwater

Due to the thin layer of quaternary sediments (see chapter 5.5), the first groundwater complex in most of the railway section is naturally unprotected from potential pollution[86]. In the Treimani stream gorge area, where the sediments layer is thicker, groundwater is on average relatively well protected.

The first groundwater body from the ground surface in the railway section is the Middle-Devonian groundwater body in the West Estonia river basin district (D_2_L) and, deeper, the Middle-Lower-Devonian groundwater body in the West Estonia river basin district (D_{2-1}_L). According to the West Estonia river basin management plan[87], both groundwater bodies are in good chemical and quantitative status.

Soil water is mostly close to the ground throughout the route. Groundwater level measurements carried out during preliminary studies showed that the water level in boreholes was 0,1-5,4 m below ground level[88] .

There are no groundwater intakes in the railway corridor or its immediate vicinity. The nearest registered drilled wells are located in Metsapoole village. The nearest of these is a 30 m deep well for domestic water supply (registration code PRK0052085) located in a protected groundwater area, which opens up the Middle-Devonian groundwater body in the West Estonia river basin district.

According to EELIS data, the nearest feeding zones of the drinking water intake are more than 2 km away from the railway section (Treimani klubi (7718), Lepanina hotell (6575)).

There are no approved groundwater resources in the vicinity of the railway section.

[86] Geological base map of the Land and Spatial Planning Board 1:50000, groundwater protection

[87] Ministry of the Environment, 2022. River basin management plan for the West Estonia river basin district 2022-2027

[88] Obermeyer, 2021. Factual Report of Geotechnical Investigation Results Initial Investigations for Value Engineering Stage; Obermeyer, 2023. Factual Report of Geotechnical Investigation Results Remaining First Stage Investigation Phase

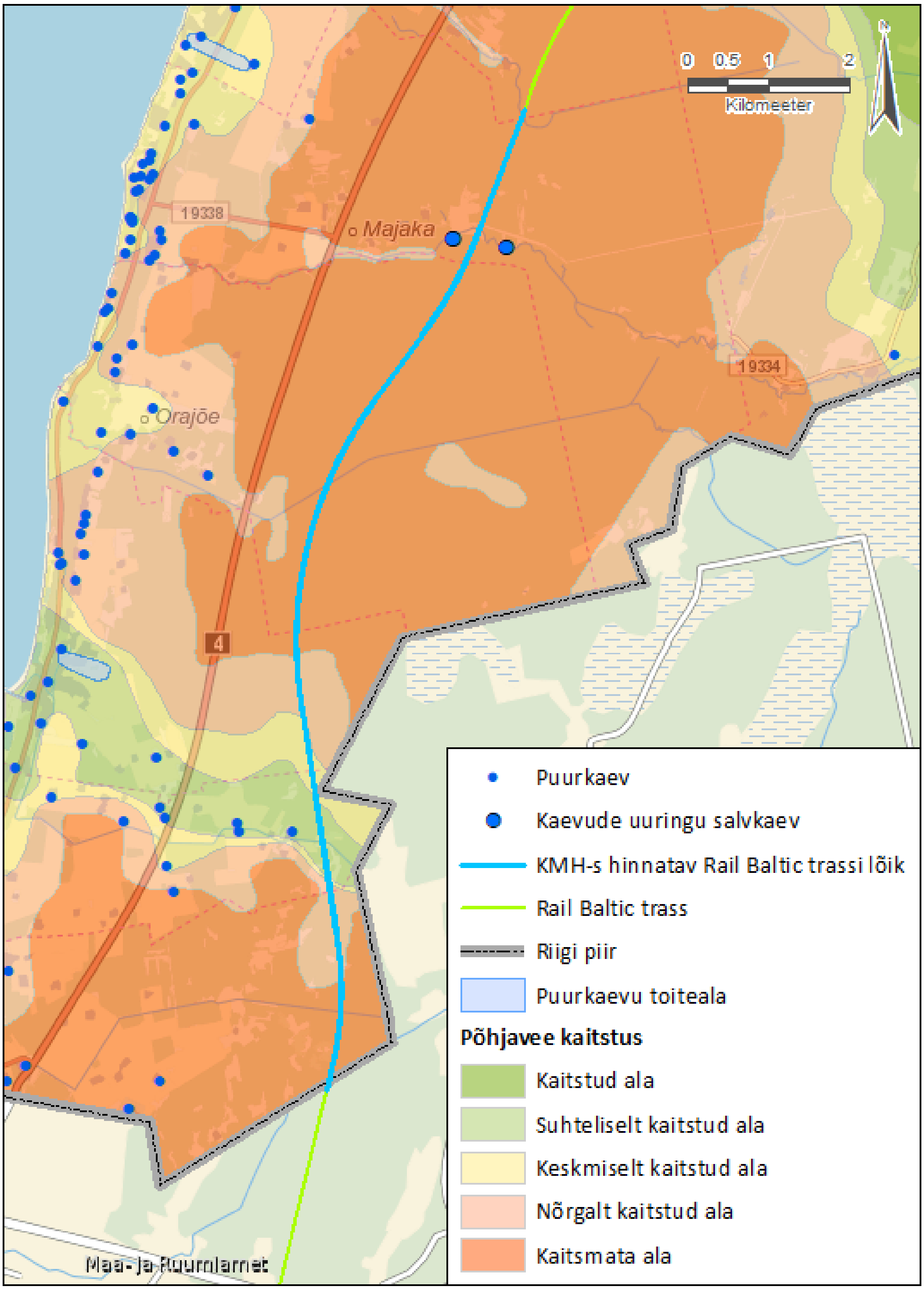


Figure 5-6. Groundwater protection in the area of the planned activity[89]

[89] Base map: Land and Spatial Planning Board 23.07.2025; Geological base map of Estonia, Groundwater protection, Estonian Geological Survey 2024

5.8 Green network and fauna

The railway section passes through forest areas that are part of the green network in south-western Estonia. A green network is a network of interconnected green spaces or natural areas that preserves the values and functions of natural ecosystems, ensures biodiversity and sustainable development, and links this with human activities. In order to achieve the objectives of the green network, it is necessary, among other things, to ensure the ecological coherence of the green network – that the structures function as a coherent network of habitats and movement routes for species and populations.

The green network of the region has been designated in the Pärnu County-wide spatial plan 2030+. According to the county-wide spatial plan, the railway section runs between the green network core areas (the railway corridor is cut out of the green network core area) and passes through several corridors connecting the green network core areas (Figure 5-7).

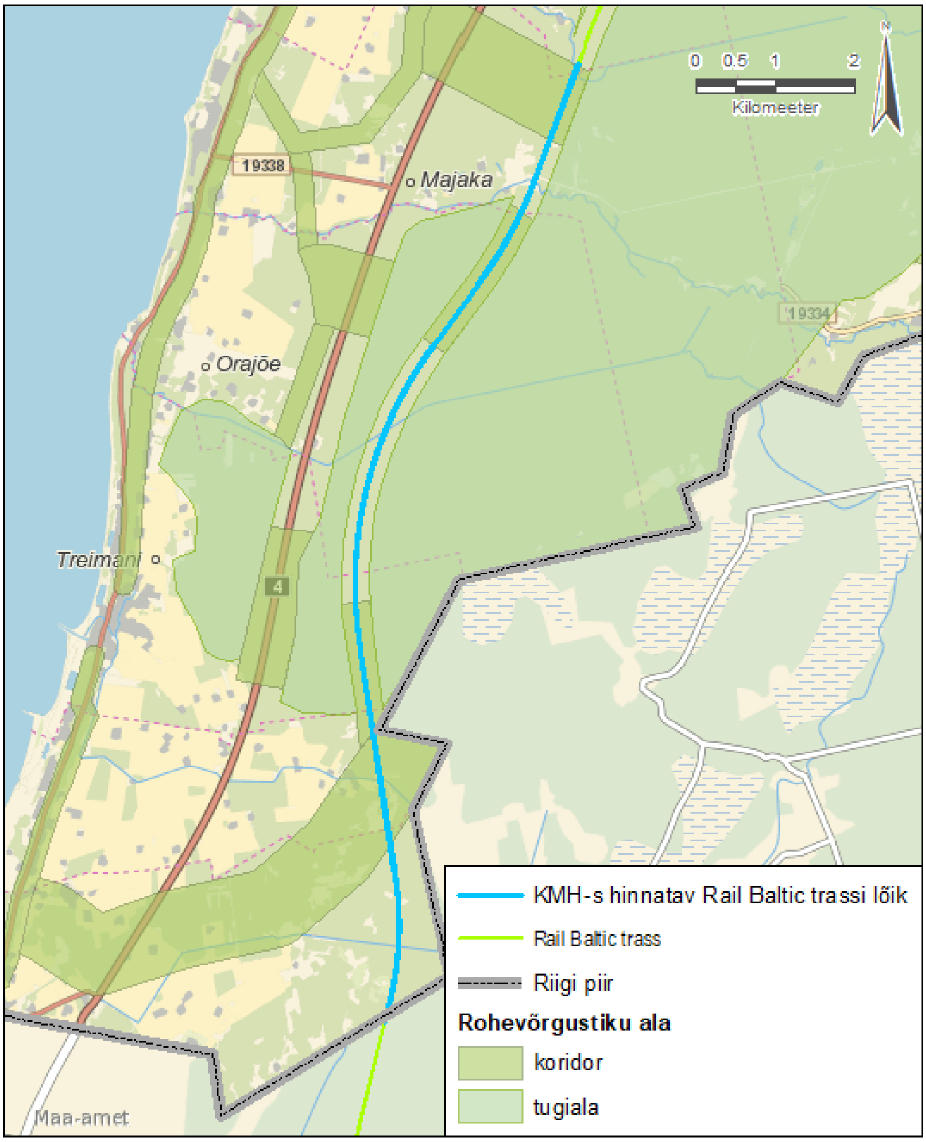


Figure 5-7. Location of the planned railway in relation to the green network of Pärnu County[90]

[90] Base map: Land and Spatial Planning Board 15.01.2025; Pärnu County green network: Pärnu County-wide spatial plan 2018

The green network planned in the county-wide spatial plan will be specified in the comprehensive plans of local municipalities. The comprehensive plans in force in Häädemeeste Parish were prepared before the county-wide spatial plan was adopted. The new comprehensive plan for Häädemeeste Municipality is being prepared at the time of this EIA. According to the draft comprehensive plan made public (as of 14 December 2023), changes have been planned to the green network, and according to this solution, the railway section in the northern and central parts will run through the green network core area (T7) and in the southern part along its edge, crossing the green corridor (K8), see Figure 5-8.

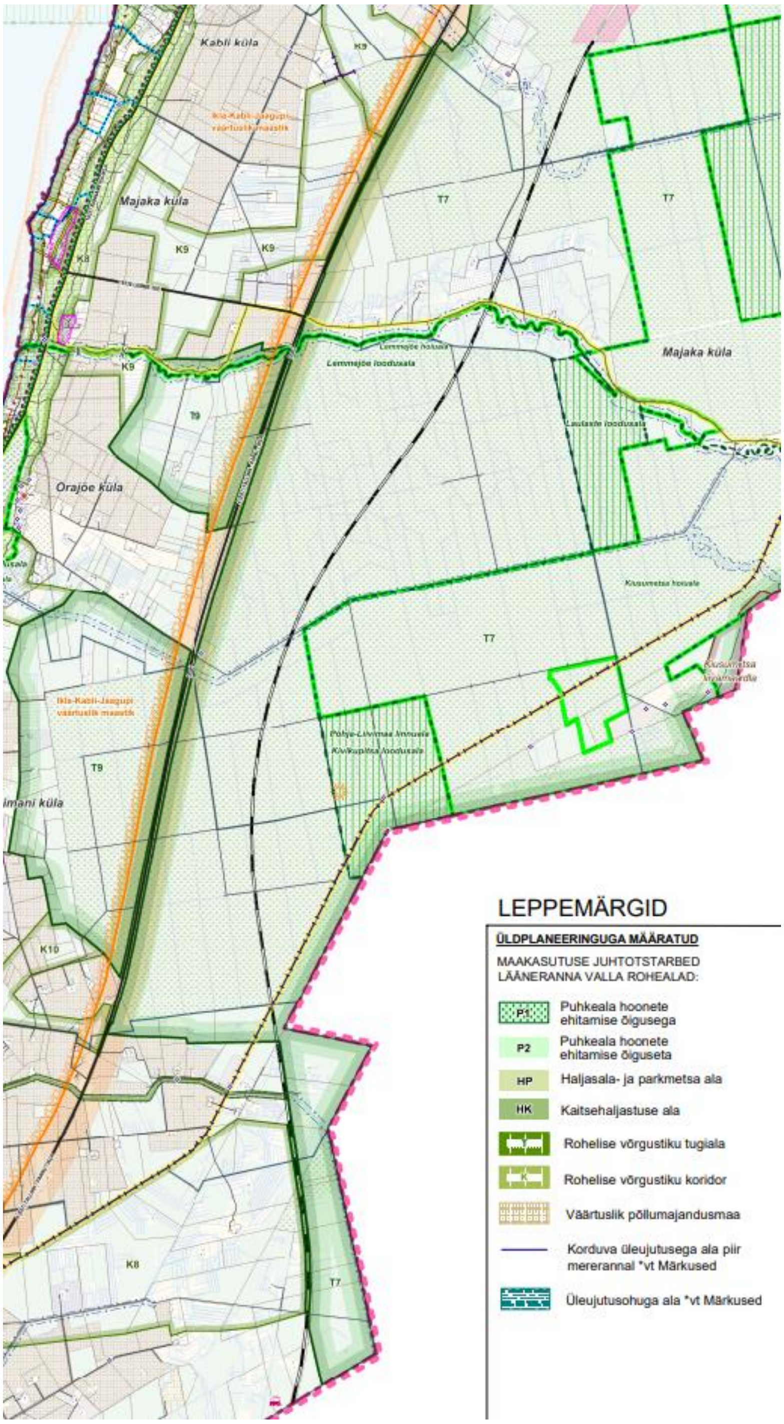


Figure 5-8. Excerpt from the draft Häädemeeste comprehensive plan (as of December 2024)

As part of the railway design and its EIA baseline studies, wildlife experts conducted fieldwork to identify areas of importance to mammals. Among other things, the movement of roe deer, elk, red deer, wild boar and foxes in the railway area was identified. The presence of brown bears in the northern part of the railway and wolves and lynxes in the southern part was also noted.

The railway section is also important for forest birds.

Watercourses are of great importance in terms of animal habitats and movement. Semi-aquatic mammals (including otters), bats, waterfowl, amphibians, fish and aquatic invertebrates are associated with watercourses. No major watercourses intersect with the section of the RB under consideration (see also section 5.6).

In the previous stages of railway planning (county-wide spatial plan, preliminary design), the issue of the connectivity of the green network and the habitats of the fauna associated with it has already been addressed and mitigation measures have been developed.

5.9 Ambient air quality and sources of pollution in the area

There is no known continuous monitoring of air quality in the area of the planned railway section (Kabli – EE/LV border). The nearest monitoring station measuring relevant air pollutants in the context of Rail Baltica (possible emissions of pollutants into the air during construction and operation) is located more than 60 km away in Tori village (Tahkuse monitoring station)[91]. The data from this station cannot be used to characterise the area of the planned activity, as the land use, activities and dispersion conditions in the area are different.

The ambient air quality in the area of the planned activity can be assessed based on known data on stationary emission sources located in the area and the pollutants they release into the ambient air. Within the framework of this EIA, an assessment was made of whether there are any significant stationary emission sources within 500 m of the railway line and associated infrastructure. The assessment was based on the emission source register of the KOTKAS environmental permit database[92]. As of July 2025, there are no significant local emission sources within a 500 m radius of the railway on the Kabli-EE/LV section. The nearest high-traffic road, main road no. 4 Tallinn-Pärnu-Ikla, is also more than 500 m away.

To provide an overview of the ambient air quality in the area, the ambient air pollution forecast for the whole of Estonia prepared as part of the national programme for the reduction of certain air pollutant emissions for 2020-2030[93] can be used. This is an assessment of ambient air quality in 2020 and 2030, assuming that measures to reduce air pollutants are implemented. The forecast provides an overview of five pollutants – sulphur dioxide (SO_2), nitrogen oxides (NO_X), particularly fine particles ($PM_{2.5}$) and volatile organic compounds (VOC) – and six different sectors (energy, industry, transport,

---

[91] Source: ohuseire.ee, as of 26.03.2025

[92] https://kotkas.envir.ee/registry/index?represented_id=&nav_tab=registry_emission_source (as of 30 June 2025)

[93] National programme for reducing emissions of certain air pollutants for 2020–2030. Estonian Environmental Research Centre OÜ under the supervision of the Ministry of the Environment, 2019. Approved by the Minister of the Environment on 29 March 2019 by order no. 1-2/19/276

use of organic solvents, waste and agriculture), including both local emission sources and diffuse emissions as well as known transboundary pollution[94].

Table 5-5. Average/maximum concentrations of ambient air pollutants in the combined impact of sectors in the railway section area in 2020 (source: National Programme for the Reduction of Emissions of Certain Air Pollutants for 2020–2030)

Air pollutant	Indicator	Concentration (µg/m³)	Maximum % of limit value	Limit value (µg/m³)[95]
Sulphur dioxide (SO_2)	24-hour maximum concentration	0,102 – 2,100	2	125
Particularly fine particles ($PM_{2.5}$)	1-year average concentration	0,414 – 0,955	3,8	25
Nitrogen oxides (NO_x)	1-year average concentration	0,047 – 1,330	3,3	40
Volatile organic compounds (VOC)	Maximum concentration in 1 hour	1,870 – 38,300	0,7	5000

The concentration ratio is graphically represented in the following figure (Figure 5-9).

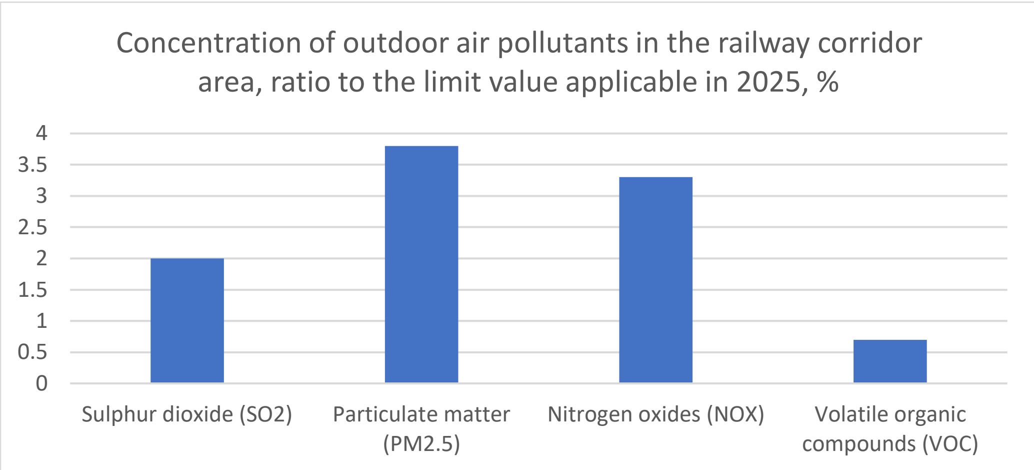


Figure 5-9. Concentration of ambient air pollutants in the railway corridor area, ratio to the limit value applicable in 2025

The concentration of ambient air pollutants in the assessed RB section is very low.

Limit values for ambient air quality have been established primarily for residential areas, taking into account particularly sensitive population groups. The purpose of establishing limit values is to avoid, prevent or reduce the adverse effects of pollutants on human health or the environment. According to §30 (4) of the Atmospheric Air Protection Act, air quality is not assessed in areas that are not accessible to the public and where there is no permanent settlement. The area of the planned activity is mainly located in an area where there is no permanent settlement. The planned railway runs through

[94] National Programme for the Reduction of Emissions of Certain Air Pollutants for 2020–2030. Update of the National Programme for the Reduction of Emissions of Certain Air Pollutants for 2020–2030. Annex I. Transboundary long-range transport of air pollutants. Tallinn, 2023.

[95] https://www.riigiteataja.ee/akt/106032019012?leiaKehtiv

a sparsely populated area dominated by forest land with isolated fields and scattered households. There are five residential yards within 200-500 metres of the railway line. There are also households located along access roads away from the railway, which are used, among other things, for construction transport.

5.10 Noise and vibration levels

To the knowledge of the EIA expert, no mapping of existing noise or vibration levels has been carried out in the location of the railway section. The railway line runs mainly through forest land with no significant existing noise sources.

The main source of noise in the area is the Tallinn-Pärnu-Ikla road. Noise maps have been prepared for the northern sections of the road, where traffic frequency is significantly higher than in the area of the railway section.

6 METHODOLOGICAL BASIS AND STUDIES USED IN THE ENVIRONMENTAL IMPACT ASSESSMENT

6.1 Prediction of significant environmental impact

The environmental impact assessment is based on the Environmental Impact Assessment and Environmental Management System Act[96] and the EIA programme approved by letter No. 16-6/24-06617-035 dated 29 May 2025 (Annex 1 to the report).

The EIA report for the railway section is a continuation of the SEA report for the county-wide spatial plan[97]. The EIA supplements and clarifies the assessments and mitigation measures presented in the SEA report, primarily in relation to the more detailed design of the railway and additional knowledge about the environmental conditions in the area concerned. The EIA compares and clarifies technical alternatives in the corridor already selected in the county-wide spatial plan and does not consider new alternatives for the location of the railway.

The EIA report was prepared in accordance with the requirements set out in § 20 of the KeHJS and, based on this, Regulation No. 34 of the Minister of the Environment of 1 September 2017 "Detailed requirements for the content of environmental impact assessment reports". In addition, relevant methodological guidelines were used in conducting the EIA, such as the environmental impact assessment handbook[98] , Natura assessment guidelines[99], etc.

The EIA was carried out in accordance with the requirements of the relevant legislation in force in Estonia and the European Union. The significance of the impacts was determined primarily on the basis of the standards set out in the legislation and, in the absence thereof, on the basis of expert opinion.

The EIA assessed the direct, indirect and cumulative, as well as short-term and long-term impacts of the planned activity on the natural and socio-economic environment. The scope of the EIA is primarily the impacts that manifest themselves through changes in the natural environment.

The expected environmental impacts of the planned activity, which are assessed in the EIA, and the corresponding assessment methods are listed in the EIA programme.

The assessment methods used to predict, assess and describe the impacts are in line with standard EIA practice. The EIA was mainly carried out as a qualitative assessment in cooperation with a group of experts. The assessments were based on, among other things, the analysis of existing data and background material (including previous studies and assessments), spatial analyses, computer modelling, fieldwork, expert assessments (including the involvement of sectoral experts) and consultations with stakeholders.

The Rail Baltic railway is divided into nine sections on Estonian territory, for each of which a railway project EIA was initiated. At the time of conducting this EIA for section 9, the environmental impact assessments for sections 1-7 have been completed and the EIA reports have been found to comply

---

[96] Electronic State Gazette: https://www.riigiteataja.ee/akt/110102024009?leiaKehtiv

[97] Rail Baltic county-wide spatial plan materials, including the SEA report with annexes, are available from the planning database (PLANK), https://planeeringud.ee/plank-web/#/planning/detail/10102130

[98] Põder, T., 2017, Environmental Impact Assessment. Handbook

[99] NGO Association of Environmental Impact Assessors, 2019. Guidelines for conducting Natura assessments in implementation of Article 6 (3) of the Habitats Directive in Estonia

with the requirements[100]. As the RB railway sections are largely planned on the same principles, this EIA is also based to a significant extent on the results of the EIAs for other sections (EIA experts depending on the section: Skepast & Puhkim OÜ and Estonian, Latvian & Lithuanian Environment OÜ).

In accordance with the KeHJS, the purpose of the EIA is to identify the significant effects of the planned activity. An environmental impact is *significant* if it can be expected to exceed the carrying capacity of the environment, cause irreversible changes to the environment or endanger human health and well-being, cultural heritage or property.[101]

Direct impact manifests itself in the immediate consequences of the activity at the same time and place as the activity. Both the impacts associated with the operation and those associated with emergency situations are taken into account.

Indirect effects arise through cause-and-effect relationships between environmental elements. They may occur away from the site of the activity and their effects may become apparent over time.

The EIA report presents measures planned to prevent and mitigate significant adverse environmental impacts associated with the implementation of the planned activity, as well as proposals for monitoring measures.

A register of mitigation measures was compiled during the SEA of the county-wide spatial plan carried out in the previous stage (Annex III-6 to the SEA report approved in 2017). During the EIA, the register of mitigation measures will also be updated and supplemented, taking into account the project solution and the circumstances clarified during the EIA.

6.2 Studies

The environmental impact assessment took into account the relevant sectoral analyses and baseline studies carried out during the county-wide spatial planning and design stages, including:

- Natural value study (Rewild OÜ, 2013-2014)
- Cultural heritage study (Hendrikson & Ko OÜ, 2013)
- Archaeological values survey (University of Tartu, 2013)
- Settlement structure survey (Hendrikson & Ko OÜ, 2014)
- "Report on the preliminary archaeological survey for the selection of the Rail Baltic railway route. Stage I" (University of Tartu, lead author Prof. V. Lang, 2013-2014)
- Final report on the second stage of archaeological preliminary studies for the Rail Baltic railway, Report on the archaeological base camp and detailed studies on the Rail Baltic railway sections in Pärnu County (Kriiska, A., et al, 2015)
- Strategic environmental assessment of the Harju, Rapla and Pärnu county-wide spatial plans for the 1435 mm Rail Baltic railway line. Fauna survey. Need for and location of mitigation measures (OÜ Rewild, 2015)

[100] The materials for the environmental impact assessments of Rail Baltic are available in the TTJA document register, https://ttja.ee/eraklient/rail-baltic/keskkonnamojude-hindamine-kmh

[101] KeHJS § 2^2; Electronic State Gazette: https://www.riigiteataja.ee/akt/130122015018?leiaKehtiv

- Geological surveys for the preparation of a preliminary railway design (Reaalprojekt OÜ, 2015-2017)
- Technical feasibility of Rail Baltic at-grade wildlife crossings (Rewild OÜ and Hendrikson & Ko OÜ, 2017)
- Study on the security of supply of construction materials needed for the construction of Rail Baltic (Teede Tehnokeskus AS, 2017)
- Inventory of known locations of protected plant, fungus and lichen species adjacent to the Rail Baltic railway line (Nordic Botanical, 2018)
- Technical suitability and economic justification of limestone aggregate and ash from the Eesti Energia Estonia mine as base material or for stabilisation of the Rail Baltic embankment and side roads (TalTech Institute of Civil Engineering and Architecture, Institute of Geology, Institute of Business Administration and Innovation and Entrepreneurship Centre Mektory, 2019)
- *Study on climate change impact assessment for the design, construction, maintenance and operation of the Rail Baltica* railway (Hendrikson & Ko OÜ, 2019)
- Distribution, extraction and use of construction minerals in Pärnu County. Research report (Estonian Geological Survey, 2020)
- *Factual Report of Geotechnical Investigation Results Initial Investigations for Value Engineering Stage* (Obermeyer, 2021)
- *Hydrological site investigations* (Obermeyer, 2021)
- *Topographical survey* (Obermeyer, 2021)
- *Factual Report of Geotechnical Investigation Results Remaining First Stage Investigation Phase (for track)* (Obermeyer, 2023)
- *Factual Report of Geotechnical Investigation Results Remaining First Stage Investigation Phase (for structures)* (Obermeyer, 2023)
- Special requirements for fences and overhead lines on the Rail Baltica DS3DPS3 section (OÜ Rewild, 2024)
- Habitats of amphibians in Pärnu County on the RB DS3DPS3 section (OÜ Rewild, 2024)
- Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border. (Keskkonnaagentuur Viridis OÜ, 2024)

The following additional studies or expert assessments were carried out during the preparation of the EIA report:

- Noise impact assessment for Rail Baltica high speed rail stretch from Kabli to Latvian border (EIA9) (SIA ELLE/ ELLE OÜ, 2025)
- Impact of drainage systems associated with the construction of the Rail Baltic railway line on the Mērnieku dumbrāji SAC in the Republic of Latvia and on the artificial recipients of land improvement systems in Estonia on section 9: Kabli-Estonian/Latvian border. Expert assessment (Entec Eesti OÜ, 2025)

- Possible impacts of the planned construction activities on watercourses and fish stocks in the section of the Rail Baltic railway between Kabli and the Estonian/Latvian border. Expert assessment (Wildlife Estonia, 2025)
- Description and assessment of birdlife on the Rail Baltica railway section "Kabli–Estonian/Latvian border" and input for Natura appropriate assessment (Heikki Luhamaa, 2025)
- Expert conclusion on the impact of Rail Baltica construction on Natura 2000 site "Mērnieku dumbrāji" (SIA ELLE, 2025)
- Mapping of boreholes and dug wells within the railway route impact area (ELLE OÜ, 2025)
- Inventory of otters in Kabli River (Meel, R., 2025)

6.3 Assessment of cross-border impact

Cross-border impact may occur in the current RB Kabli-Latvian border section. The need to assess the impact on values located in the Republic of Latvia has been consulted with the relevant authorities of the Republic of Latvia on several occasions prior to the preparation of the EIA programme. An overview of the extent of the potential impact, the areas of impact and the impact assessment methodology in Latvia was submitted to the Republic of Latvia in the EIA programme in accordance with the cross-border environmental impact procedures.

In the Republic of Latvia, the environmental impact assessment is carried out by the Environment State Bureau. The Bureau submitted several overviews of the planned activities and the opinion on the environmental impact assessment programme to the relevant authorities for publication and made the programme available to the public. The Bureau aggregated the opinions and proposals and forwarded them to the Estonian party.

The main content of the proposals submitted was the need to assess the impact on the Natura site located in Latvia and its conservation objectives, as well as on a number of bird species in the potential impact area of the railway. The Natura appropriate assessment and expert evaluations is carried out by licensed experts in the relevant field in Latvia, in accordance with Latvian legal requirements (including those relating to Natura assessment) and established methodologies in Latvia. The results of the assessments will be submitted directly to the relevant Latvian nature and environmental protection authorities for their opinion. The results of the assessments will be taken into account when developing avoidance and mitigation measures. The conclusions and overall assessment will be presented in this report.

6.4 Difficulties encountered in the impact assessment

No significant difficulties requiring mention arose in the environmental impact assessment. Uncertainties related to the assessment or its underlying data are referred to in the relevant sections of the impact assessment.

7 IMPACT ON NATURA 2000 SITES

7.1 Principles of the Natura assessment

A Natura assessment must be carried out as part of the EIA procedure. The Natura assessment is an assessment of the impact of plans and projects on the Natura 2000 network of sites of Community importance for the conservation of natural habitats and of wild birds (European Parliament and Council Directive 92/43/EEC) and the Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council) on the Natura 2000 network of internationally protected areas (nature and bird areas).

The first stage of the Natura assessment is a screening. The purpose of the preliminary Natura assessment is to determine whether the planned activity is likely to have a significant adverse effect on a Natura site and whether an appropriate assessment is necessary.

If a significant impact cannot be ruled out, the next stage is a appropriate assessment, the purpose of which is to assess the impact of the activity on the conservation objectives of the site and to determine whether it affects the integrity of the Natura 2000 site, taking into account possible mitigation measures.

The Natura assessment was based on the European Commission's guidelines[102] and relevant national guidance documents[103] .

7.2 Results of the Natura screening

The results of the screening are presented in the EIA programme (see Annex 1 to the EIA report).

The Natura screening was carried out for the following Natura 2000 network sites located in the potential impact area of the railway section: Põhja-Liivimaa Special Protection Area (SPA) or the bird site (EE0040344 as here and afterwards the Euroepan code of the Natura sites), Lemmejõe Special Area of Conservation (SAC) or the habitat area (EE0040342), Laulaste SAC (EE0040309), Kivikupitsa SAC (EE0040317), Kabli SAC and SPA (EE0040305), Orajõe SAC (EE0040340), Metsapoole SAC (EE0040330) and Mērnieku dumbrāji SAC (LV0522000, located on Latvian territory).

The summary conclusions of the screening are presented in the table below.

Table 7-1. Summary of the results of the Natura screening

SPA or SAC	Screening conclusion
Põhja-Liivimaa SPA (EE0040344)	The screening concludes that significant adverse effects on the following conservation objectives of the bird area can be ruled out: Greater white-fronted goose, lesser white-fronted goose, taiga bean goose, whooper swan and common crane. Based on the available information, significant adverse effects on other conservation objectives of the bird area cannot be ruled out. An appropriate assessment is necessary.

[102] European Commission, 2021. Commission Communication. Assessment of plans and projects relating to Natura 2000 sites. Methodological guidelines on the provisions of Article 6(3) and (4) of Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. 28.09.2021. C(2021) 6913.

[103] Association of Environmental Impact Assessors, 2019. Guidelines for conducting Natura assessments in the implementation of Article 6(3) of the Habitats Directive in Estonia.

SPA or SAC	Screening conclusion
Lemmejõe SAC (EE0040342)	Based on the available information, significant adverse effects on the conservation objectives of the nature reserve cannot be ruled out. An appropriate assessment is necessary.
Laulaste SAC (EE0040309)	Based on the screening, significant adverse effects on the forest habitat types (old natural forests and swamp and bog forests) designated as conservation objectives for the nature reserve can be ruled out. Based on the available information, significant adverse effects on other conservation objectives of the nature reserve (rivers and streams, thick-leaved riverine vegetation, riverine mires, otters) cannot be ruled out. An appropriate assessment is necessary.
Kivikupitsa SAC (EE0040317)	Significant adverse effects on the conservation objectives and integrity of the site have been ruled out. A Natura appropriate assessment is not necessary.
Kabli SPA (EE0040305)	Significant adverse effects on the conservation objectives and integrity of the bird area are excluded. No Natura appropriate assessment is required.
Kabli SAC (EE0040305)	Significant adverse effects on the conservation objectives and integrity of the nature reserve are excluded. No Natura appropriate assessment is required.
Orajõe SAC (EE0040340)	Significant adverse effects on the conservation objectives and integrity of the site are excluded. No Natura appropriate assessment is required.
Metsapoole SAC (EE0040330)	Significant adverse effects on the conservation objectives and integrity of the site are excluded. No Natura appropriate assessment is required.
Mērnieku dumbrāji SAC (LV0522000)	Based on the available information, significant adverse effects on the conservation objectives of the site cannot be ruled out. An appropriate assessment is necessary.

7.3 Results of the Natura appropriate assessment

Based on the results of the screening, a Natura appropriate assessment was carried out for the Põhja-Liivimaa SAP, the Lemmejõe SAC and the Laulaste SAC.

The full Natura appropriate assessment is presented in Annex 2 to the EIA report. The main results and conclusions of the Natura appropriate assessment are summarised further below.

In addition, as part of the cross-border impact assessment, a Natura appropriate assessment of the Mērnieku dumbrāji SAC was carried out in the Republic of Latvia according to Latvian regulations, a summary of which is presented in the cross-border assessment chapter (see chapter 8.25). Full report in Latvian will be attached to the EIA report in the frame of the cross-border environmental impact assessment.

7.3.1 Lemmejõe SAC

The conservation objectives of the Lemmejõe SAC (EE0040342), for which a Natura appropriate assessment was carried out, are: habitat type: rivers and streams (3260) and species: european otter (*Lutra lutra*), river lamprey (*Lampetra fluviatilis)* and thick shelled river mussel (*Unio crassus)*.

The section of the RB railway under consideration crosses the Lemmejõgi river that forms the Lemmejõgi SAC approximately 5,1 km upstream from the river mouth. The crossing is planned as a relatively long and high railway bridge. Both the preliminary design and the value engineering solutions provide for the bridge to cross the river without the need to construct bridge piers in the water. The river habitat of the Lemmejõgi river may be adversely affected by construction activities on the riverbed during the construction period. Indirectly, through habitat change, the impacts may also affect the riverine landscape and vegetation.

The impact of the alternatives to the planned activity (preliminary design solution and value engineering solution) is equivalent. No adverse cumulative impact with other activities that could be amplified by the construction of the railway was identified in the assessment.

For all of the above-mentioned conservation objectives, the Natura appropriate assessment concluded that any adverse impact can be avoided by implementing mitigation measures. The necessary mitigation measures are presented in the Natura assessment report (Annex 2) and in the list of measures (Annex 3).

The implementation of mitigation measures will prevent adverse effects on the conservation objectives, integrity and coherence of the Lemmejõe nature site.

7.3.2 Laulaste SAC

The conservation objectives of the Laulaste SAC (EE0040309), for which an appropriate assessment was carried out, are: habitat type rivers and streams (3260) and species otter (*Lutra lutra*), river lamprey (*Lampetra fluviatilis)* and thick shelled river mussel (*Unio crassus)*.

Similar to the Lemmejõe SAC, the possible adverse impact of the RB railway section is related to the Lemmejõe habitat. Lemmejõgi river is crossing the southwestern part of the Laulaste SAC for a length of approximately 277 m. This section of the Lemmejõgi river is located approximately 1.9 km upstream from the RB intersection. As there is no direct contact with the RB railway on this section, the connection between the design and construction of the railway and the Laulaste nature reserve and the corresponding impact is indirect. The impact may manifest itself through changes in the water quality of the river, which is a conservation objective, or through the impact on the functions of species that are conservation objectives, in particular the ability of species to move between different parts of the Lemmejõgi river, which is their habitat, in the river or on its banks.

The impact of the alternatives to the planned activity (preliminary design solution and value engineering solution) is equivalent. No adverse cumulative impact with other activities that could be amplified by the construction of the railway was identified in the assessment.

For all of the above-mentioned conservation objectives, the Natura appropriate assessment concluded that any adverse impact can be avoided by implementing mitigation measures. More specifically, the implementation of measures applicable to the Lemmejõe SAC also ensures the protection of the Laulaste SAC. The necessary mitigation measures are set out in the Natura assessment report (Annex 2) and in the list of measures (Annex 3).

The implementation of mitigation measures will prevent any adverse impact on the conservation objectives, integrity and coherence of the Laulaste nature site.

7.3.3 Põhja-Liivima SPA

The Põhja-Liivimaa SPA (EE0040344) covers a total area of 19 194,9 ha and its conservation objectives are to protect 31 bird species and their habitats. Approximately 178 ha of the bird site, or less than

1%, falls within the direct impact area of the assessed RB section (within a radius of one kilometre from the railway line).

An appropriate Natura assessment found that the RB railway and the adjacent area are not important as feeding or breeding grounds for bird species in the Põhja-Liivimaa bird site, and the activities planned under the project solution will not have an adverse impact on the habitats and populations of the bird site. In order to avoid adverse effects on the conservation objectives of the Põhja-Liivimaa bird site, the construction of infrastructure must not extend into the bird site during further design and planning of works.

However, there is a potential risk of individuals of species designated as conservation targets (e.g. hazel grouse, owls) being killed in collisions with power lines or fences. To reduce the risk of bird mortality, measures to mark fences and overhead lines are provided for as part of the project solution. Mitigation measures are presented in the Natura appropriate assessment report (Annex 2) and in the list of measures (Annex 3).

The impact of the alternatives to the planned activity (preliminary design solution and value engineering solution) is equivalent. No adverse cumulative effects with other activities that could be amplified by the construction of the railway were identified during the assessment.

The implementation of mitigation measures will prevent any adverse impact on the conservation objectives, integrity and coherence of the Põhja-Liivimaa SPA.

7.4 Summary of the results of the Natura assessment

With the implementation of the mitigation measures presented in the Natura assessment, adverse effects on the conservation objectives and the integrity and coherence of the Lemmejõe SAC, Laulaste SAC, Põhja-Liivimaa SPA and the Mērnieku dumbrāji SAC are excluded.

8 ASSESSMENT OF THE EXPECTED SIGNIFICANT ENVIRONMENTAL IMPACT

8.1 Impact on climate

The impact of Rail Baltica on the climate can be described primarily through the assessment of its carbon footprint, i.e. CO_2 emissions. There are no uniform rules at European Union level for assessing the carbon footprint of activities, products or services, but depending on the nature and purpose of the project or activity, various internationally recognised methodologies can be applied.

The land use sector plays an important role in achieving the European Union's climate targets[104], which is why land use emissions are also relevant in the RB project. A similar methodology has been used as in other sections of the Estonian RB[105] for assessing CO_2 emissions.

In other areas, elements of the aforementioned methodologies are applied based on the availability of source data and the activities with the highest expected emissions (land use change during the construction phase, transport of construction materials, energy consumption of on-site road construction works; energy consumption and modal shift during the operational phase).

The aim of this work and, more broadly, of carbon footprint assessment for projects is not to provide a comprehensive life cycle analysis, as the exact project data are not known at the planning stage. Therefore, the carbon emission estimates presented are approximate, indicating the order of magnitude of emissions associated with the construction and operation of Rail Baltic.

8.1.1 CO_2 emissions from land use change

An overview of existing land use is provided in Chapter 5.1 and the CO_2 balance related to land use is provided in Chapter 5.2.

Land use, land use change and forestry (LULUCF) is the only net CO_2 sink in Estonia[106]. It is therefore important to assess how the conversion of this land will affect the greenhouse gas (GHG) emissions balance in Estonia. During the railway construction phase, land use will be converted to transport land, which is classified as the land use category *'Settlements'* according to the IPCC methodology[107]. This report examines two types of land conversion: forest land converted to settlements and grassland converted to settlements.

During the construction phase, it is assumed that all biomass and dead organic matter (dead wood and litter) in the entire railway corridor will be removed, resulting in immediate CO_2 emissions. The felled wood can be recycled into wood products, which would partially offset the CO_2 emissions from the cleared forest land. Soil emissions are assessed based on the IPCC assumption that soil disturbance, removal and relocation are accompanied by CO_2 emissions over a period of 20 years. Soil and topsoil excavated during the construction of the railway can be reused as fill material for the railway, or for

[104] European Commission policy on land use, land use change and forestry (LULUCF) and the LULUCF Regulation (Regulation (EU) 2018/841)

[105] E.g. EIA for the construction project of the Rail Baltic railway line section "Rapla and Pärnu county border – Tootsi". Skepast & Puhkim OÜ, 2023

[106] Greenhouse gas emissions in Estonia 1990-2018: national inventory report (Estonia, 2020)

[107] 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Agriculture, Forestry and Other Land Use

the restoration of nearby quarries, meaning that only part of the organic carbon stored in the removed soil will be mineralised.

The total emissions resulting from land use change in the Kabli – Estonian/Latvian border section of the railway are estimated at 22 718 t CO_2 eq. The share of emissions from forest clearing in this section is nearly 99%, with the remainder coming from grassland. CO_2 emissions from other land categories are not estimated.

Table 8-1. Total emissions associated with land use change in the RB Kabli – Estonia/Latvia border section (t CO_2eq)

Land use class	Biomass	Dead wood	Varis	Mineral soil	Peat	Total
Forest land	15 709	597	109	4400	1652	22 466
Grassland	0	0	0	252	0	252
Total	15 709	597	109	4652	165	22 718

Carbon from wood products derived from deforestation is considered immediate oxidation according to IPCC guidelines, i.e. it is assumed that carbon in deforested wood is not stored for a longer period of time but is emitted immediately into the atmosphere. However, the Ministry of the Environment[108] has encouraged taking into account the carbon potentially bound in wood products. According to statistical forest inventory data, the average timber stock in Estonian forests is 206 m^3 /ha[109] , which means that approximately 12 381 m^3 of timber could be removed during logging within the boundaries of the estimated railway corridor. By maximising the value of this amount of wood in various wood products, it is possible to store approximately 10 927 tonnes of CO_2 in wood.[110] However, the carbon stored in wood products will be released over time.

8.1.2 CO_2 emissions from the transport of construction materials and construction work

The construction of the Rail Baltic infrastructure will require various mineral resources and construction materials, more than half of which are fill materials. An estimated total of 0,9 million m^3 of materials will be needed to construct the section in question (see chapter 4.2). Most of the mineral resources required for the construction of the railway are available in Estonia[111, 112]. Of the materials required 3,4% is high-quality material, granite aggregate, which meets the requirements of standards EN 13450, EN13285 and EN13242 and will be imported from abroad. The works on the section of the railway in question will generate approximately 0,3 million m^3 of excavated material, which, according

[108] Letter No. 12-3/20/3835-2 of the Ministry of the Environment dated 11 September 2020 in the document register of the Environmental Board (Proposals for a methodology for assessing the climate impact of Rail Baticu – response to the letter from OÜ Skepast&Puhkim)

[109] Yearbook Forest 2018 (2020). Editors: Madis Raudsaar, Kaia-Liisa Siimon, Mati Valgepea. Environmental Agency

[110] Carbon from wood products derived from *deforestation* is considered immediate oxidation according to IPCC guidelines, i.e. it is assumed that carbon in deforested wood is not stored for a longer period of time but is emitted immediately into the atmosphere. The Ministry of the Environment has

[111] Study on the security of supply of construction materials needed for the construction of Rail Baltic. Final report. Road Technology Centre, 2017

[112] Ministry of Climate, 2025, Overview of the security of supply of construction minerals by county, https://kliimaministeerium.ee/energeetika-maavarad/maavarad/ehitusmaavarad#parnu-maakond (20.08.2025)

to current knowledge, can be reused in its entirety at the site, thereby reducing the need for additional mineral resources and waste generation.

More specifically, approximately 54 871 t of granite aggregate will be required as ballast for the construction of the section of the railway in question. The total emissions from the transport of granite (both sea and road transport) are 4884 t CO_2 eq. If all other materials are transported from a distance of up to 50 km, their road transport is estimated to emit 1382 t CO_2 eq into the atmosphere. As the excavated material is used entirely on site, no emissions related to its removal can be identified. This means that the total carbon emissions associated with the transport of construction materials for the railway section are 6266 t CO_2 eq.

The construction of the railway line involves extensive earthworks, which are expected to result in significant carbon emissions. Accurate estimation of the emissions associated with this activity requires detailed data on the machinery used, including both the technical parameters of the machines and their operating hours. To estimate conservative emissions, it is possible to use the average emission factor for the type of route (in this case, the construction of a new double-track railway) and the length of the railway (the section of railway in question is 12,7 km)[113] . Based on these assumptions, the soil work on the railway section in question will result in emissions of approximately 7463 t CO_2 eq.

In summary, the total emissions from the transport of construction materials and earthworks in the section under consideration are approximately 13 729 t CO_2 eq.

For the lower quality fill material layer, the use of limestone aggregate produced from waste rock obtained from an oil shale enrichment plant could be considered, among other options. The limestone aggregate should be transported to the section of the railway in question from Ida-Viru County (it is expected that a combination of rail and road transport could be used). Based on calculations carried out on other railway sections[114], the use of crushed rock would not provide a significant advantage in terms of greenhouse gas emissions compared to conventional fill materials.

8.2 Impact on protected natural objects

8.2.1 Impact on protected natural objects and individual protected natural objects

This chapter provides an assessment of the impact on protected areas, limited-conservation areas and individual protected natural objects located within the expected impact area of the RB railway. Descriptions and locations of protected areas and individual objects in relation to the RB are provided in section 5.3.1.

The impact assessment for species' protection sites within the expected impact area of the RB is provided for the relevant protected animal species for which the species' protection site have been established (see chapter 8.3).

The impact on Natura 2000 network areas is presented in Annex 2 to the EIA report (Natura assessment report) and summarised in Chapter 7.

---

[113] Tuchschmid, M. et al., 2011. Carbon Footprint and environmental impact of railway infrastructure.

[114] E.g. EIA for the construction project of the Rail Baltica railway section "Rapla and Pärnu county border – Tootsi". Skepast &Puhkim OÜ, 2023

Laulaste nature conservation area

The Laulaste nature conservation area is located within the Laulaste SAC (Habitats Directive) and the Põhja-Liivimaa SPA (Bird Directive). The impact on the conservation values of the nature conservation area, which are also the conservation objectives of the Natura sites, is discussed in more detail in the Natura assessment chapter (see chapter 7).

The nature conservation area consists of several separate parts, the nearest of which is located approximately 750 m from the railway. Due to the distance, significant direct impacts (loss or damage to habitats, changes in the water regime, edge effects, etc.) on the conservation area resulting from the construction and use of the railway are excluded. The construction of a large animal passage (Loigu ecoduct BR2686) is planned near the Laulaste conservation area, which will support the preservation of connectivity with the areas west of the railway.

The conservation objectives of the area are also the conservation objectives of the Laulaste SAC and the Põhja-Liivimaa SPA and are discussed in more detail in the Natura assessment referred to above.

Kivikupitsa landscape conservation area

Due to the distance of the Kivikupitsa landscape conservation area from the railway (500 m and more), no significant direct impacts such as habitat loss or damage, changes in the water regime, etc. are expected from the construction and operation of the railway.

Disturbance to bird species for which the landscape conservation area has been designated may be possible. The territory of the Kivikupitsa landscape conservation area is part of the Põhja-Liivimaa SPA, which is included in the Natura 2000 network. The impact on the conservation values of the landscape conservation area, which are also the conservation objectives of the SPA, is discussed in more detail in the Natura assessment referred to above. The black woodpecker is not a conservation target in Põhja-Liivimaa SPA. The habitats of the black woodpecker in the Kivikupitsa landscape conservation area listed in EELIS are located 700 m or more from the railway, and the disturbance can therefore be considered moderate or weak.

Lemmejõe limited-conservation area and Kiusumetsa limited-conservation area

The railway section crosses the Lemmejõe limited-conservation area (the railway crosses the Lemmejõe river). The limited-conservation area is linked to the Lemmejõe SAC, which is part of the Natura 2000 network, and the impact of the area is described in full in the Natura assessment (see chapter 7 and Annex 2).

Similarly, the impact of the Kiusumetsa limited-conservation area has been taken into account in the Natura appropriate assessment of the Põhja-Liivimaa SPA (see chapter 7 and Annex 2).

Individual protected natural objects

Due to the distance of the nearest individual protected natural objects (erratics) from the railway (more than two kilometres), no direct or indirect impact of the railway on individual protected natural objects is foreseeable.

8.2.2 Impact on protected plant, fungus and lichen species

There are no registered habitats of protected plant, fungus or lichen species in the railway corridor or its immediate vicinity that could be significantly adversely affected.

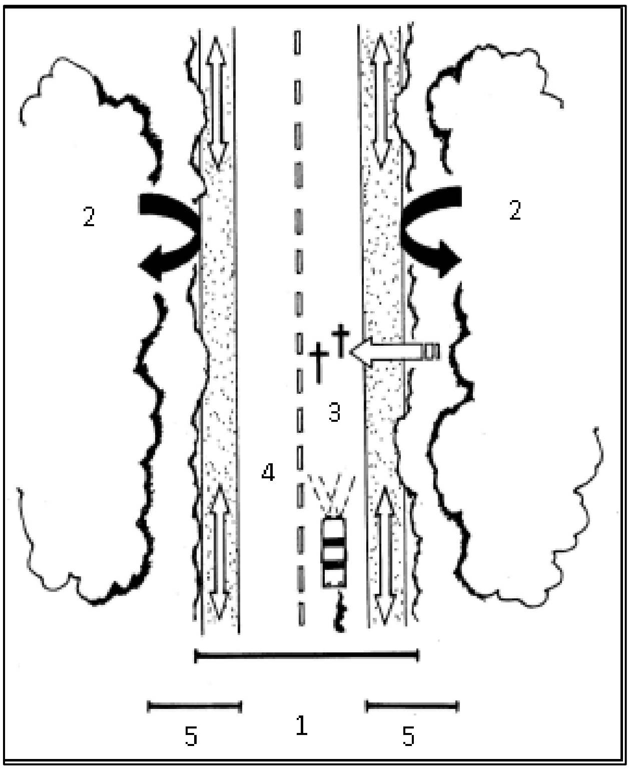
The nearest known habitat is approximately 430 m from the railway, where the species identified during the survey are the *Neckera pennata* and the *Megalaria grossa*. The species grow in an old mixed forest (VEP No. 210450) that has been inventoried as a valuable habitat, on tree trunks. The construction of the railway is not expected to cause any changes in the water regime or other direct or indirect significant impacts on the habitat at this distance.

8.2.3 Impact on protected animal species

The impact on fauna, including protected animal species, is described in the chapter 8.3 (Impact on fauna).

8.3 Impact on fauna

The impact on fauna is manifested through habitat loss, habitat fragmentation, disturbance and possible direct mortality. The impact is caused by construction activities, railway infrastructure (contact lines, fences, railway embankments, etc.), as well as train traffic and maintenance of the railway and its infrastructure. Disturbances such as noise, vibration, light pollution and changes in the water regime are also important.



1. loss of natural habitats (direct destruction of habitats under the planned infrastructure)

2. barrier effect (interruption of free movement)

3. animal deaths in traffic

4. disturbance and pollution

5. ecological edge effect on infrastructure margins (human settlement and alien species spreading along the railway corridor)

Figure 8-1. Diagram of direct impacts of transport (Source: *COST 341. Habitat Fragmentation due to Transportation Infrastructure*[115])

The size of the impact area in terms of disturbance and habitat fragmentation depends on the specific solution, local conditions, species characteristics and the sensitivity of the disturbed objects. In

[115] European Commission: Directorate-General for Research and Innovation, *COST Action 341 – Habitat fragmentation due to transportation infrastructure – The European review,* Publications Office, 2003

practice, it is not possible to agree on clear limit values. Therefore, in the case of fauna, it is generally not possible to specify specific limit values for determining significant impact. There are also no legislative standards. It is almost impossible to predict the extent of specific impacts, but it is important to monitor the extent of impacts and the effectiveness of measures during monitoring:

- In the case of mortality, the impact area is mainly considered to be the immediate vicinity of the railway (fences and the area between them). The impact of mortality is significant if the population starts to decline steadily or disappears completely due to individuals killed on the railway (or during its construction).
- The impact of disturbance is significant if individuals permanently avoid habitats suitable for them or if reproductive success declines and there is a clear link with the distance from the railway.
- The significance of habitat loss and deterioration is very difficult to assess. The extent of habitat loss that results in a population no longer being viable depends on the specific species and the quality of the habitat at the site. Therefore, there are no defined thresholds and the assessment of significance is based on expert opinion.
- Similar to habitat loss, the impact of habitat fragmentation depends on many factors. The barrier effect is significant when the movement of individuals between suitable biotopes is impeded and, as a result, the viability of populations decreases and/or genetically isolated subpopulations emerge.

The impact assessment takes into account the measures provided for in the Rail Baltic county-wide spatial plan SEA and those specified in the additional studies carried out in the project section:

- The wildlife survey compiled by Lauri Klein[116] is presented as an annex to *Value* Engineering.
- The study "Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border"[117] was carried out in 2024 to refine the previous wildlife study. The study analysed and clarified the number of ecoducts and animal underpasses in the EIA9 (DPS3) section and provided an assessment of whether the locations of the ecoducts proposed in the preliminary design and value assessment analysis stage are suitable.
- In 2025, Remek Meel compiled an inventory of otter on the Kabli River[118].
- The 2024 study "Habitats of amphibians in Pärnu County on the RB DS3DPS3 section"[119] specified important amphibian habitats and breeding areas on the section, both in the area directly affected by the railway and 500 m from the railway axis, in order to assess the need for passages and barriers.
- The 2024 study "Special requirements for fences and overhead lines on the Rail Baltica DS3DPS3 section"[120] analysed the need to make fences and overhead lines more visible to

[116] Klein, L., 2021. Design Priority Section 3. Annex 4. VE DPS3 Implementation of EIA studies: New mitigation measures

[117] Environmental Agency Viridis OÜ, 2024. Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border

[118] Meel, R, 2025. Saarma inventory. Kabli River.

[119] OÜ Rewild, 2024. Work No. 2024-10-2. Amphibian habitats in Pärnu County on the RB DS3DPS3 section

[120] OÜ Rewild, 2024. Work no. 2024-8-2. Special requirements for fences and overhead lines on the Rail Baltica DS3DPS3 section

birds, to build railway boundary fences higher than the standard height (i.e. 2.5 m) and to dig the boundary fence into the ground.

- A bird survey conducted by Heikki Luhamaa in 2025,[121] , particularly in the Põhja-Liivimaa bird site.
- A study conducted in 2025 on the potential impacts on watercourses and fish[122].

8.3.1 Impact on mammals

According to various sources, there are approximately 70 mammal species in Estonia. Of these, 22 species are protected. Protected areas located near the railway section in question, where the aim is to protect mammal species, are the Lemmejõe limited-conservation area and the Laulaste nature conservation area (the protected mammal species is the otter). There is no reliable data on the presence of other protected mammal species (including bats and the northern birch mouse) in the area[123] , but based on an analysis of the suitability of the habitat, their presence is likely.

Otter. The Lemmejõe limited-conservation area and Laulaste nature conservation area overlap with the Lemmejõe and Laulaste SACs, and the impact on otters has been assessed as part of the Natura assessment (see Annex 2 and section7), so it is not repeated here. When implementing the mitigation measures provided for in the Natura assessment, it is important to avoid adverse effects on the otter. According to the Biodiversity Database[124], the otter has also been found in the Kabli river, where an additional otter survey was carried out during this SEA. The results of the survey show that the Kabli river is part of the coastal otter territory, but the animals mainly inhabit the coastal section of the river. The Kabli river is a short and biologically poor stream that begins at the intersection of forest ditches. Active traces of otters are found only in the coastal section of the river, with animals moving upstream only seasonally, mostly in spring. The river in the railway corridor crossing is relatively natural and has varied banks. Otters rarely move in the Kabli river planned railroad crossing area, as this is the outskirts of their territory, and this section of the river is therefore more important during the spring flood period when frogs spawn. In summer, the animals do not usually move upstream along the river from the coast. As this section of the river is not an important habitat or feeding ground for otters, no significant adverse impact on the otter population is anticipated.

Bats. No bats have been recorded or specifically studied in the area. However, given the ecological nature of the area, their presence is very likely, especially near water bodies.

The impact of railways on bats is mainly expressed in two ways. One is the disruption of bat flight corridors – bats flying low through a busy railway corridor simply fly into trains and are killed. The second, more difficult to mitigate impact is noise, light and vibration pollution. All three of these phenomena associated with the technological world have a repellent effect on bats and can create a barrier even when there is no physical barrier. In the long term, both types of impact described above lead to the fragmentation of bat feeding areas and a decline in their quality of life or the direct death of individuals.

---

[121] Luhamaa, H., 2025

[122] Estonian Nature Conservation Centre, 2025. Possible impacts of the planned construction activities on watercourses and fish stocks in the section of the Rail Baltica route between Kabli and the Estonian/Latvian border

[123] EELIS database

[124] eElurikkus database https://elurikkus.ee/

The most dangerous sections for bats are those where there are open feeding areas on both sides of the railway, between which bats are currently believed to make their low-altitude night-time feeding flights – the wet forests, shrubbery and meadows around the Kabli and Lemmejõe rivers and the mixed forests between them, as well as the swampy and excessively wet deciduous and mixed forests along the Estonian-Latvian border and the meadows and shrubbery along the Treimani river. In the border area, there are also areas where one side of the railway is a feeding ground and the other side provides shelter in tree hollows or old buildings. The construction of the railway will involve clear-cutting, which may create and alter flight corridors for bats. Rivers and streams intersecting the railway line have a separate impact, as their water surface and low grassy banks are valuable feeding grounds for bats. Where such water bodies intersect the railway line, the railway bridge must be designed in such a way that it does not become an obstacle to bats during their feeding flights. However, transport infrastructure, including the railway line itself, forms a completely separate impact class, as its corridor often forms a warm island in the middle of the cooler surrounding landscape and, as it attracts insects, it also attracts insectivorous animals. This threat also applies to bats along the entire length of the railway line, which in this case would be killed by trains when feeding along the railway corridor. Unfortunately, no effective mitigation measures have been developed to address this threat.

The northern birch mouse. The distribution of the northern birch mouse has been studied very little in Estonia, so its situation in the railway section must be assessed based on the suitability of its habitat. As the mouse lives in meadows, wooded meadows, bog edges and gardens in summer and seeks shelter in damp forests in winter, it can be assumed that suitable habitats for the species are present throughout the entire section. particularly suitable are the wet forests, shrubbery and meadows around the Kabli and Lemmejõe rivers and the mixed forests between them, the swampy and excessively wet deciduous and mixed forests along the Estonian-Latvian border, and the meadows and shrubbery along the Treimani river. The impact assessments and mitigation measures for the northern birch mouse are similar to those for other climbing animal species (squirrel, marten).

Large mammals. All large mammals are important game animals. Although large mammals are not protected in Estonia, the country plays an important role in maintaining European populations of large predators. These species are protected throughout Europe. These are species with high space requirements that inhabit a wide variety of habitats. Therefore, when assessing the impact of railways, it is important to consider not only the immediate impact area but also the location of habitats and populations of over a large area. Large mammals are species with a developed sense of space, which travel long distances and are relatively well adapted to changes in habitat configuration. Over time, the railway tends to become the boundary of the home range of territorial species.

The planned high-speed railway will have an adverse impact on mammals, primarily through habitat loss, fragmentation and disturbance. To ensure both railway traffic and animal safety, the entire railway line will be fenced. This will prevent animals moving on the ground from crossing the railway. The decline in habitat quality near the railway is also important for disturbance-sensitive species. Noise may be relatively high for a short time when trains pass, but it is quiet between trains.

Depending on the movement requirements of different mammal species, the extent of the impact also varies greatly. The movement range of large mammals and bats extends to kilometres, while that of small mammals may be less than 100 m. In general, the railway may have an adverse effect on mammal populations up to a distance of 5 km.

In some places, the planned high-speed railway will be less than 1 km away from the busy main road No. 4 Tallinn-Pärnu-Ikla (the so-called Via Baltica), which has a similar effect on populations. According to data from 2024, the average traffic volume on the road is 4 919 vehicles per day.[125] Ecoducts and underpasses for animals have been planned for Rail Baltica, taking into account animal migration routes and green networks in the area. However, no similar ecoducts have been built on Via Baltica, and the area between the two roads will become significantly less suitable as a habitat due to the combined impact of the road and railway. The comprehensive special plan being prepared by Häädemeeste Municipality ([126]) includes measures to reduce conflict points, which are relevant for the further renovation of the road and will help to mitigate the combined impact of the road and railway in the future:

- When reconstructing main roads, care must be taken to ensure that there is at least one passage suitable for small game per kilometre.
- Fencing should only be used when absolutely necessary and in combination with wildlife crossing solutions at different levels.
- Where traffic density exceeds 5 000 vehicles per day, multi-level wildlife crossings should be preferred to ensure that animals can cross the road safely.
- For small animals, ensure shoreline paths under bridges or tunnels next to bridges, higher than the water level in the stream.

Mortality

The impact on mortality is significant if the population begins to decline steadily or disappears due to individuals killed on the railway.

During the construction phase, the preparation and clearing of the route is particularly dangerous for mammals. Nestlings and hibernating animals may be killed during excavation work. Care must be taken when felling old trees and demolishing buildings in order to protect protected bats, and in the case of otters, on the banks of watercourses.

Many mammals can be killed on the railway in collisions with trains. The faster the train is travelling, the greater the risk. Mammals are most often involved in accidents in habitats suitable for them and in important migration corridors. The mortality of mammals moving on the ground can be effectively reduced by means of barrier fences, which have also been implemented in the design of the RB. However, it is likely that some small and micro mammals (e.g. squirrels and marten, which are able to climb over fences) will be killed by trains.

Bats can fly over fences. Although bats are skilled flyers, their speed is relatively low (usually up to 20 km/h) and when crossing roads, they often fly close to the ground (less than 5 m above the ground), entering a particularly dangerous zone (the height of RB contact lines is 5,5 m). Transport infrastructure also affects bats through its attraction effect. Railway corridors often become warm corridors during the day, forming heat islands in the middle of the cooler surrounding landscape. The warmer corridor attracts insects, which in turn attract insectivorous animals. When flying along the railway, bats can be caught in the turbulence of high-speed trains and die from barotrauma (sudden changes in air pressure). Bat deaths are more likely in habitats suitable for them, such as railway tunnels and around water bodies. No bats have been recorded in the area directly affected by the RB,

[125] https://teeregister.mnt.ee/reet/home (accessed on 11 July 2025)
[126] https://haademeestevald.kovtp.ee/koostatav-uldplaneering (accessed on 11 July 2025)

but they are likely to occur sporadically throughout the forest areas. It is expected that bats will also use the RB corridor for feeding, which means that their death on the railway cannot be ruled out.

The impact of the construction of the RB on mammal mortality in the section under consideration will be short-term and insignificant if tree felling and clearing are avoided during the breeding season. To prevent mortality during operation, the railway is equipped with a fence and rebound areas. Bats, squirrels and martens may be killed on the railway.

Mitigation measures to prevent or significantly reduce the impact are in place and are described in more detail in the mitigation measures chapter 10.

Disturbances

Disturbances caused by the railway include noise, vibration and light. Construction and maintenance work also involve the presence of people and machinery. The area is generally sparsely populated and quiet. Therefore, the addition of RB disturbances will reduce the quality of the living environment.

The spread of noise and vibration is influenced by the terrain, vegetation and weather. If the railway is surrounded by forest, noise spreads less. Many mammals hear ultrasounds (high frequencies) better than humans, but as the noise generated by trains overlaps with the human hearing range, it is appropriate to use measurements and standards adapted to humans (the impact of noise has been assessed in section 8.12). The noise spectrum of fast trains overlaps relatively little with the hearing range of small mammals (including bats), and therefore the impact of railways on them is rather moderate. Most mammals become accustomed to railways over time.

The impact of railways is expected to be lower than that of roads, as the noise is not continuous. The most significant disturbances to mammals are caused by the presence of people and machinery during construction and later during maintenance work. The construction of new public roads will also increase traffic in general. The impact will be greater in areas where there is not normally any daily movement of people or vehicles, which is the case for almost the entire length of the section under consideration.

Light pollution is also associated with railways. As traffic on the railway is relatively sparse, the disturbance caused by train lights is minor. No stationary lighting is planned for the sections of railway between stops, and no stops are planned for this section.

The overall impact of disturbance to mammals during construction is relatively high (significant landscape change, presence of people and machinery), but short-term. During operation, the impacts will be moderate, as trains do not run continuously and maintenance work is infrequent and temporary. There will be cumulative effects with roads, especially the Pärnu-Ikla road, which in some sections is closer than 1 km to the planned railway and the cumulative effect of which may be significant.

Loss of habitats and decline in habitat quality

During the construction of the railway, habitats located directly under the railway and objects associated with the railway will be destroyed. The size and description of the area to be cleared are provided in Chapter 8.6. The impact of temporary roads and storage sites associated with construction cannot be assessed due to a lack of information on their size and location.

The quality of habitats adjacent to the railway will be impaired by disturbances and possible pollution during the construction phase. With the implementation of mitigation measures, the risk of pollution from construction techniques is minimal. As the RB is planned as an electric railway, there will be no problems related to exhaust gases. No accumulation of heavy metals or other toxic compounds has been observed in areas adjacent to the existing railways, and it can therefore be concluded that there will be no significant impact from the RB. It is important to limit the use of herbicides in railway maintenance, as the filling material used on railways differs significantly from soil and the compounds used to control plants decompose much more slowly than in soil. Toxic compounds accumulate in the food chain, putting predators at greater risk.

In addition to the planned railway, the Via Baltica, forest clearing, land improvement and, to a lesser extent, mining also affect the quality of mammal habitats in the area. There may be significant cumulative impacts on mammal habitats in the area between the planned railway and the existing Via Baltica road, particularly in the village of Orajõe, where the RB railway and Via Baltica are less than 1 km apart. The RB has been planned with mitigation measures – ecoducts, underpasses and embankments in most of the culverts to be constructed. The significant impact will be mitigated if similar measures are planned for the Via Baltica in the future.

The overall impact on the quality of mammal habitats during construction is relatively high (significant landscape change, disturbance), but short-term and mainly local. Habitats located under the railway and related structures will be permanently lost. As the registered habitats of protected mammal species are not affected by the RB, the impact on habitat loss and quality is insignificant. During the period of use, the impact on habitats adjacent to the railway is moderate. The railway corridor will create new habitats for several species groups, and the impact is therefore partly positive.

Habitat fragmentation and barrier effect

The impact of the RB on mammals is likely to be most significant through habitat fragmentation. The planned railway crosses the green network in several places. The RB will fragment several large forest areas that have so far been largely unaffected by human activity and are important habitats for large mammals. The RB will create both physical and behavioural barriers, and the railway is likely to become a boundary between the home ranges of territorial species.

The preliminary design was based on the principle that the fence is intended to prevent not only people but also large mammals from entering the railway. Animals as large as a badger would have been able to pass through the fence along the entire length of the railway. This would have posed a risk of them being killed on the railway. The value engineering design solution has been supplemented so that all animals are prevented from accessing the railway as much as possible. The lower part of the fence has double barriers along the entire section, which also prevent small mammals (shrews, voles, etc.) from passing through. Mammals that are able to climb well, such as squirrels and martens, and bats that can fly are able to cross such a fence. The planned fence will therefore form an absolute barrier to mammals moving on the ground. It is therefore important to create suitable passages for all mammals to cross the RB railway. According to experts, to avoid a barrier effect, it is sufficient to plan passages for large mammals at intervals of 5-8 km. The recommended distance between small and medium-sized wildlife tunnels in natural habitats is 900-1000 m.

The RB VE solution includes three ecoducts specifically designed for large mammals in section 3: Loigu (here and below, the distance is measured from the Kabli end of the section: 3+031), Treimani (8+442) and Piiri (10+520). In addition to the ecoducts, conditions will be created for animals to pass under the Loigu tee-Lemmejõe railway bridge (1+550), under which a riverbank path for large mammals has been planned on both sides of the river. [127]

[127] Environmental Agency Viridis OÜ, 2024. Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border

During the EIA assessment, it was proposed to enlarge the Räägu animal crossing to at least 3x3 m to make it passable for medium-sized game animals or to resolve the Kabli River crossing (0+020) with a bridge with a clearance of at least 3 m, allowing animal passage on both sides of the river. In addition, bank paths are planned for most of the culverts along the railway (a total of 21 culverts, 18 of which will have bank paths) and special small animal tunnels (9 tunnels). The animal passages have been designed based on the recommendations of wildlife experts. The value engineering design solution will restrict the movement of mammals to a certain extent, but will not create a significant barrier for them.

Although bats are able to fly over the RB railway, the railway corridor will become a behavioural barrier for many species, as they avoid crossing open areas and stay away from artificial light. It is important for bats to maintain the connectivity of the green network, especially along established migration routes. The planned ecoducts are suitable for bats that avoid open areas to cross the railway. The ecoducts and the tall vegetation that will grow on them can also be used by climbing mammals (squirrels, marten, northern birch mouse) for safe railway crossing.

The barrier effect of the RB on mammal habitats will be evident both during construction and during operation phase. A number of measures have been planned to mitigate this, and no significant impact is expected. The effectiveness of the passages needs to be confirmed during monitoring. A moderate impact will occur when large forest areas are divided into smaller parts. The region's roads, especially Via Baltica, also fragment habitats. The combined impact with other sections of the RB is also important. As a fenced railway, the RB separates the mammal populations of Western Estonia and the Väinamere islands from the rest of the mainland. The impact is mitigated by the construction of animal passages.

Conclusion

Effective measures have been taken in the form of railway fences to prevent mammal mortality. Disturbances to mammal species are more significant during the construction period, but these are relatively short-term and temporary. During operation, the impacts are moderate, as trains do not run continuously and maintenance work is infrequent and temporary. There are cumulative effects with roads, especially the Pärnu-Ikla road, which in some sections is closer than 1 km to the planned railway and with which the cumulative impact may be significant. Habitats located under the railway and related structures will be permanently lost. As the RB does not affect the registered habitats of protected mammal species, the impact on the loss and quality of habitats is insignificant. During the period of use, the impact on habitats adjacent to the railway will be moderate. Animal passages are planned to mitigate the fragmentation of habitats and the barrier effect (see measures in the chapter 10). The effectiveness of the passages needs to be confirmed during monitoring.

8.3.2 Impact on birds

A bird survey was conducted on the railway section in 2025[128] to determine the impact of the railway construction on birds and protected bird species. There are no significant migratory bird gathering sites in the impact area of the railway section under consideration, so it can be assumed that the strongest impact will be on the feeding areas and nesting sites of breeding birds.

---

[128] Luhamaa, H., 2025 Põhja-Liivimaa RB linnustik. Kabli- Eesti Vabariigi piir.

The impact on protected bird species has also been assessed in the Natura assessment (Annex 2 to the report), as many species are conservation targets in the Põhja-Liivimaa SPA located in the region.

Protected species are listed in section 5.3.3.2. With the exception of the common kingfisher, all of these species are forest species. Most of their habitats are located within a zone of up to 1 km from the railway and are therefore not affected by the construction of the RB. The establishment of the RB will have a significant impact in only four locations: overlapping habitats KLO9132876 (grey-headed woodpecker), KLO9132881 (hazel grouse), KLO9132862 (black woodpecker), KLO9132840 (white-backed woodpecker) and KLO9113824 (red-breasted flycatcher), KLO9113800 (white-backed woodpecker) and KLO9132877 (Ural owl). The impact on protected species is assessed below together with other bird species.

The most significant factors affecting birds are habitat loss and deterioration in the railway corridor and its vicinity, fragmentation of habitats of species requiring large areas (e.g. birds of prey and galliformes), collisions of large birds flying low in forests (galliformes, olws) with infrastructure (including fences and overhead lines) and trains, and disturbance during the mating and nesting season due to noise and human presence. Thanks to their ability to fly, most birds are able to fly over the RB railway, but there are species whose movement may be impeded by fenced railways and open railway lines.

The greatest impact on birdlife generally occurs during the construction phase, when the route is cleared and there is a risk to the lives of individuals and loss of habitats. Construction also involves a lot of people and machinery, which disturb birds in the vicinity of the railway. It is therefore important to avoid clearing and noisy construction work during the bird nesting season. During operation, the impact on birds is moderate and mainly manifests itself in noise from trains and maintenance work and in the barrier effect. When crossing railways and using infrastructure as a habitat, birds may be killed in accidents (collisions with trains, power lines and fences), but the impact on the viability of populations is not expected to be significant.

Measures to mitigate impacts directly related to birdlife include marking boundary fences and power lines along the entire section covered by the value engineering design. The barrier effect is reduced primarily by ecoducts designed for mammals, but also suitable for birds. The quality of surrounding habitats and feeding areas will be preserved by avoiding the use of herbicides and implementing water protection measures.

Mortality

During the construction of the RB, the greatest threat to birds is forest clearing and the clearing of the railway line if this is carried out during the bird nesting season. Eggs (embryos) and nestlings are at risk of death. It is therefore important that these activities are not carried out during the bird nesting period (see chapter 10 for more details). It should be noted that some species (including protected cormorants) begin nesting as early as March and some species may still have chicks in August.

During the period of use, birds may be killed in direct collisions with trains or by becoming entangled in fences or power lines.

The birds most commonly killed in collisions with trains are owls and other birds of prey, corvidae and galliformes. Birds of prey use railway infrastructure for resting and hunting, and they often feed on carcasses found on the railway, thus putting themselves at risk. As the RB is enclosed by fences, carcasses are rarely found on the railway. Many birds are killed when they cross the railway in the safety zone between the contact wires and the tracks. Almost all birds that cross the railway in the safety zone are forest birds, such as capercaillie (the height of the RB contact lines is 5,5–5,8 m). The faster the train is moving, the more difficult it is for birds to notice the danger and escape in time.

Wire mesh fences are dangerous to low-flying birds. In Estonia, the western capercaillie, black grouse, hazel grouse and European nightjar are particularly at risk. In connection with power lines, birds face a significant risk of death from electric shock if they use power poles to rest, hunt or nest. Large or medium-sized species with poor maneuverability or limited visibility (galliformes, various anseriformes, storks, gruiformes, etc.) and birds of prey, especially young birds, are prone to becoming entangled in power lines. If the height of the line in a forested area is lower than the trees (such as RB contact lines), most birds will fly over it. Forest birds flying lower are used to maneuvering between branches and, if the overhead lines are sufficiently visible (marked accordingly), they are able to avoid them. The marking of fences and power lines in the current RB section is planned for the entire length of the section.[129]

Open hollow metal posts can be deadly traps for birds nesting in the area. Adult birds can enter the openings and build nests there. Often, chicks are unable to leave nests built in such metal posts and perish. As a mitigating measure, the posts are to be closed.

The impact of RB during construction on bird mortality in the section under consideration is short-term and insignificant, provided that forest clearing and track maintenance are avoided during the bird nesting period. During operation, birds of prey, galliformes and corvidae are particularly vulnerable to collisions with trains and infrastructure. Mitigation measures include marking fences and electric wires along the entire section. The impact on bird mortality is expected to be moderate when mitigation measures are implemented. The impact is long-term.

Disturbances

The most significant disturbances for birds are the movement/presence of people and machinery, changes in the landscape, increased overall noise levels, light pollution, etc. The extent of the impact of disturbances is estimated to be species- and landscape-specific. With regard to disturbances during operation phase, studies have generally found that railways do not significantly affect the overall abundance of birds, but cause changes in species composition, for which there are currently insufficient studies.[130]

Birds are generally most sensitive to humans during the nesting period, in the vicinity of their nests and to movements near their nesting sites. Disturbances during construction are relatively greater for birds than during operation and affect nesting success. It is therefore justified to maintain a buffer zone around nests and avoid disturbance during the breeding season.

In general, the significance of disturbance from roads (including railways) correlates with a certain noise level. Noise models adapted to human hearing cannot be applied one-to-one to all bird species, as birds' hearing sensitivity differs from that of humans. Railway noise is not continuous like on busy roads, but only occurs when trains pass by. As a result, railways disturb birds less than roads[131] . Most bird species are able to adapt to the daily disturbances caused by rail traffic over time. According to the environmental register, the 750 m disturbance zone in the section under consideration includes

[129] Rewild, 2024. Special requirements for fences and overhead lines on the Rail Baltica DS3DPS3 section

[130] Falcão Rodrigues, L., Mata Estacio, C., Herranz Barrera, J., Santamaría Figueroa, A.E., Malo Arrázola, J.E., 2024. High-speed railway infrastructure leads to species-specific changes and biotic homogenisation in surrounding bird community. PLoS ONE 19, e0301899. https://doi.org/10.1371/journal.pone.0301899

[131] Wiącek, J., Polak, M., Filipiuk, M., Kucharczyk, M., and Bohatkiewicz, J. 2015. “Do Birds Avoid Railroads as Has Been Found for Roads?” Environmental Management 56 (3): 643–52.

the habitats of the Eurasian pygmy owl, common buzzard, lesser spotted woodpecker, grey-headed woodpecker, white-backed woodpecker, Ural owl, hazel grouse, black woodpecker, and red-breasted flycatcher. The impact of protected species has also been assessed in the Natura assessment and is not repeated here.

Train lights may disturb birds, especially on outer curves. Light disturbance affects owls, which use the railway infrastructure for resting and feeding at night, and bright lights blind them. They may take flight when a train approaches and collide with the train, power lines or fences.

In order to minimise disturbance caused by construction, work should be avoided during the logging moratorium in areas where the forest is at least 60 years old, to allow local species to nest. Although this could be monitored along the entire railway, in practice it should be implemented at least on the section between Lemmejõe river and Loode stream. This is where the railway passes through the most important areas of older forest.[132]

Loss of habitats and decline in habitat quality

During the construction of the railway, habitats directly under the railway will inevitably be destroyed. In addition, areas required for access roads and material storage will be affected. As no information on temporary roads and storage sites was available at the time of the EIA, their impact cannot be assessed. The route was selected based on the principle of minimising the impact on valuable habitat types and habitat complexes. Several bird feeding areas are directly affected by the railway section under consideration. The forests are already heavily affected by drainage and logging, and therefore few high-quality habitats (e.g. old forests) that could be affected by the RB have survived.

Light conditions and microclimate will change in areas immediately adjacent to the railway, creating an edge effect that may make the area attractive to insectivorous birds, for which better feeding opportunities outweigh the disturbance caused by the railway. The construction of a railway may affect the water regime, which in turn affects the abundance and availability of food sources (e.g. amphibians) for birds.

The quality of bird habitats may be affected by pollution from various chemicals. Birds of prey at the top of the food chain are particularly sensitive to pollution, as toxic compounds accumulate along the food chain, for example in the case of heavy metals. Insects, amphibians, fish and other animals that are food for birds are sensitive to herbicides and other environmental toxins.

The railway passes through several areas designated as habitats for protected species in EELIS. Although the areas will be reduced by the railway corridor, this cannot be considered a significant impact on birdlife, as there are sufficient suitable habitats for the species in question. The abundance of species in favourable condition is not generally threatened by a lack of habitats, and their abundance is not declining, so compensation for the destruction or damage of each individual's habitat is not necessary or justified under the species protection objectives set out in the Nature Conservation Act. These are species that also breed successfully in commercial forests, so it is very likely that they will find a new suitable habitat in the nearby commercial forest.

[132] Luhamaa, H., 2025. Põhja-Liivimaa RB linnustik. Kabli- Eesti Vabariigi piir.

Table 8-2. Habitats of the protected species directly affected by the RB railway

Species	KR_ code	Impact	Significance of impact	Reason
Red-breasted flycatcher (*Ficedula parva*)	KLO9113824*	Decrease in suitable habitat area	Not significant	Nearly half of the habitat is already unsuitable (clear-cut)
	Territories on the banks of the Kabli river and Loode stream			Makes up <0.1% of the Estonian population
Ural owl (*Strix uralensis*)	KLO9132877	Increased noise disturbance	Not significant	Makes up <0.1% of the Estonian population
Grey-headed woodpecker (*Picus canus*)	KLO9132876	Decrease in suitable habitat area	Not significant	Makes up <0.1% of the Estonian population
	2024. a. territoorium			
Hazel grouse (*Tetrastes bonasia*)	KLO9132881	Decrease in suitable habitat area	Not significant	Makes up <0.1% of the Estonian population
Black woodpecker (*Dryocopus martius*)	KLO9132862	Decrease in suitable habitat area	Not significant	Makes up <0.1% of the Estonian population Species with increasing numbers
White-backed woodpecker (*Dendrocopos leucotos*)	KLO9132840	Decrease in suitable habitat area	Not significant	Makes up <0.1% of the Estonian population Species with increasing numbers
	KLO9113800	Decrease in suitable habitat area		
Corn crake (*Crex crex*)	Treimani river floodplain	Decrease in suitable habitat area	Not significant	Makes up <0.1% of the Estonian population Opportunistic and mobile species in relation to its breeding area.

* The data on the occurrence of the species dates from 2005 and may no longer be accurate.

To mitigate the impact, plan the railway corridor to be as narrow as possible when passing through the habitats of protected species. These areas overlap with KLO9132876, KLO9132881, KLO9132862 and KLO9132840 at the northern end of the railway section from the border of Orajõe village to Loode stream.[133]

As there is no significant impact on species, follow-up monitoring is not required.

During the period of use, the impact on habitats bordering the railway will be moderate if measures to mitigate the impact are implemented. The impact will be long-term but moderate. The negative aspects associated with forest management (drainage, lack of old stands) are important in terms of

[133] Luhamaa, H., 2025. Põhja-Liivimaa RB linnustik. Kabli- Eesti Vabariigi piir.

cumulative effects. Cumulative effects with other sections of the RB will affect species with a wide range of movement.

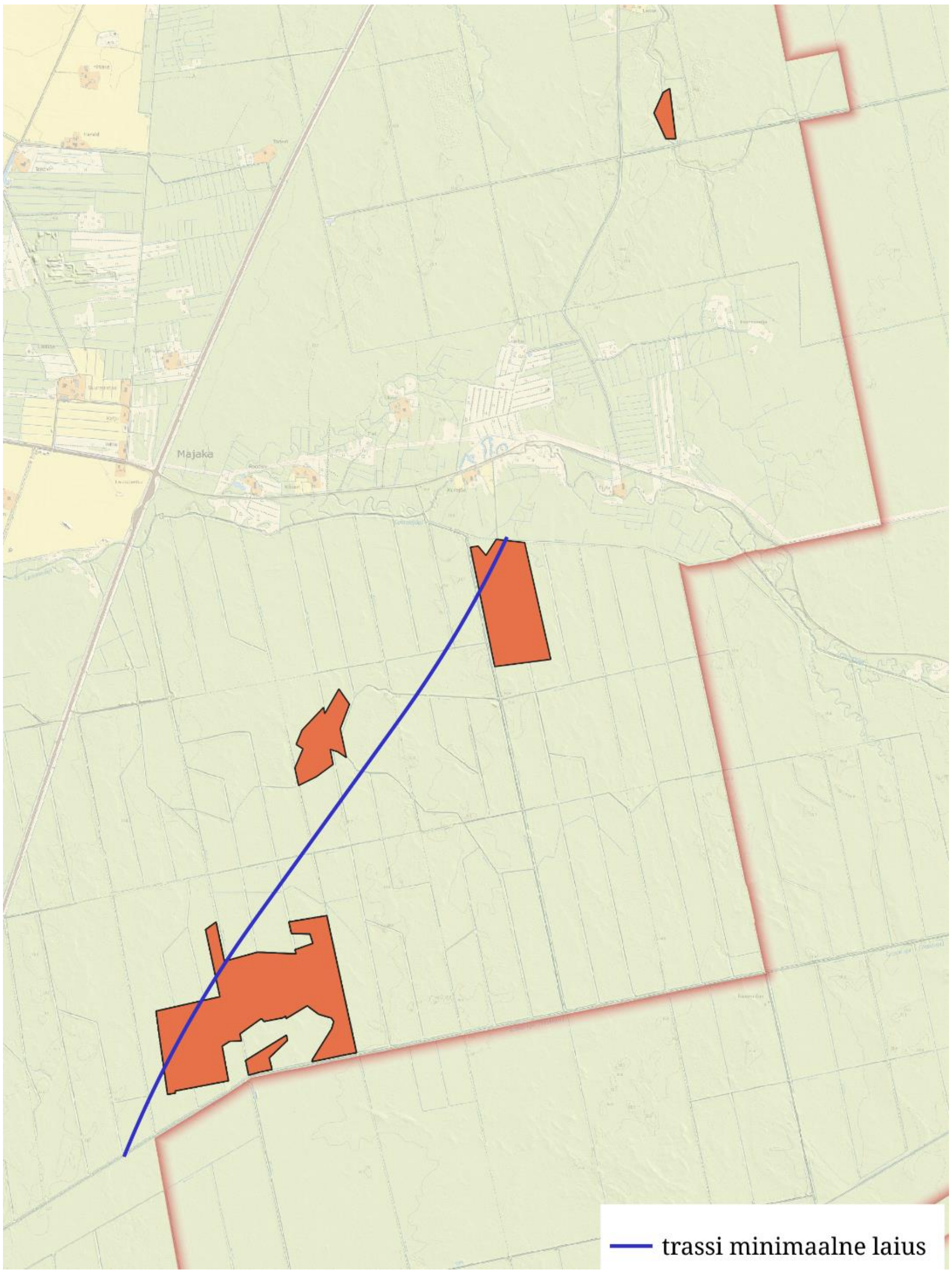


Figure 8-2. Habitats of the protected birds and recommendation for the minimal width of the corridor.[134]

Habitat fragmentation and barrier effect

Linear infrastructure objects divide the landscape into smaller habitat fragments. Depending on their width and traffic frequency, they have a greater or lesser fragmenting effect. The fragmenting effect is increased by RB boundary fences and power lines. The planned railway may potentially separate populations on either side of the railway, thereby reducing their viability. Local species extinction may occur, resulting in a reduction in biodiversity. The section of the railway under consideration cuts

[134] Luhamaa, H., 2025. Põhja-Liivimaa RB linnustik. Kabli- Eesti Vabariigi piir.

through the core area of a green network that is important for many bird species. In addition, it has a local impact on the habitats of specific species.

A minimum of 50 metres wide right of way is required for the construction of the railway. For this section of the RB, this means that a total area of approximately 110 ha of forest will have to be cleared. The loss of forest of this size cannot be directly considered a significant factor for any of the species found here. The fragmentation of habitat complexes into smaller parts will have a significant impact on the quality of habitats. The total species/individual capacity of the smaller forest habitats that are formed is lower than in the original large habitat complex due to the increase in the proportion of less suitable edge areas. At the same time, the forests here are already densely fragmented by roads and clearings.[135]

The fragmentation of bird habitats is mitigated to some extent by the construction of ecoducts.

Conclusion

The forest landscape in the railway corridor and the surrounding area is heavily influenced by human activity. The population density of protected species is low due to the lack of old forests. The area is not important as a feeding or habitat for species associated with SPA. Some protected bird species whose habitats are located in or in the immediate vicinity of the railway corridor are affected. All of these species are relatively numerous and the potential impact on populations is marginal (1-2 pairs in a population of at least several thousand). Furthermore, all of these habitats/species are currently threatened by forestry activities in the area, and the construction of the RB railway will not cause any significant change in the suitability of the area.[136]

8.3.3 Impact on amphibians

A survey of amphibian habitats was carried out on the railway section in 2024[137] with the aim of identifying amphibian habitats and breeding areas and determining the need for mitigation measures. The assessments presented below are mainly based on this baseline survey.

In relation to the railway, amphibians may be affected by the loss or fragmentation of habitats and the death of individuals as a result of the construction of the railway.

Fragmentation of habitats

Amphibians require different habitats at different stages of their life cycle: breeding waters, feeding areas and wintering grounds. Amphibians move up to several hundred metres on a daily basis, with breeding migrations typically covering up to a few kilometres and young animals dispersing up to 10 km away. The railway section passes through commercial forests and overgrown former farmland, and there are feeding areas suitable for amphibians throughout the entire section. It is important that there are no insurmountable barriers between the different habitats of amphibians.

The railway is a partial barrier for amphibians, fragmenting their habitats. The adverse impact can be mitigated by ensuring that amphibians can cross the railway at sufficient intervals along the entire section (by constructing passages).

---

[135] Luhamaa, H., 2025. Põhja-Liivimaa RB linnustik. Kabli- Eesti Vabariigi piir.

[136] Luhamaa, H., 2025. Põhja-Liivimaa RB linnustik. Kabli- Eesti Vabariigi piir.

[137] OÜ Rewild, 2024. Amphibian habitats in Pärnu County RB DS3DPS3 section. Occurrence of amphibian breeding water bodies and assessment of habitats along the Rail Baltic route and necessary measures

The VE solution provides for 21 culverts, 18 of which are also designed as animal passages (a bank path is planned next to the watercourse), and 9 additional tunnels are planned as separate animal passages. The impact of the mitigation measures is expected to be insignificant.

Loss of habitats

Loss of habitat important for amphibians is anticipated in one location – at km 6+170, a firefighting pond, which is a breeding site for amphibians. To compensate for the adverse impact, a replacement water body must be created in the vicinity to replace the pond that will be eliminated during the construction of the railway. Detailed proposals for the creation of a replacement water body have been made in a study of amphibians, which are described in more detail in the chapter on measures.

An important breeding area for amphibians is also located in the old riverbed of the Lemmejõgi River at km 1+500–1+700, which is located a few hundred metres from the railway, but care must be taken to ensure that the impacts associated with the RB do not spread there. In the Lemmejõe floodplain, the work site must be kept as narrow as possible and planned away from old river beds that are important for amphibians. In the Lemmejõe crossing area, the structure of the natural river bank must be preserved.

There are sufficient drainage ditches in the landscape surrounding the railway, so that if they are altered to some extent during the construction of the RB, amphibians are expected to find alternative ditches in the same area.

Mortality

Amphibians may die primarily as a result of damage to their breeding waters or due to construction transport. To prevent the death of amphibians, no excavation work may be carried out in water bodies during their breeding season. The pond located on the existing RB railway must be drained and filled in between 1 August and 14 October, when amphibians do not breed or hibernate.

The risk of amphibians being killed can be highlighted on Mustikametsa road, which is located next to a pond that serves as a habitat for amphibians, and on Loigu road, which is located next to the old channels of the Lemmejõgi river. These roads are likely to be used for construction transport. Installing temporary barriers along the road would prevent amphibians from moving freely to their breeding sites, which is not reasonable in this case. Amphibians move around more during the dark, so a temporary restriction on construction transport during the amphibian activity period could be implemented as a mitigation measure.

During the railway's operation, amphibians may be killed on the railway. To mitigate this significant adverse impact, the RB railway is restricted by amphibian barriers.

Conclusion

No significant adverse effects are expected from the construction and operation of the railway when mitigation measures are implemented. Compared to the preliminary design, the VE solution takes into account the proposals made by experts regarding mitigation measures, so that the VE solution has a lower impact on amphibians than the preliminary design.

The mitigating measures are described in more detail in the chapter 10.

8.3.4 Impact on fish

An assessment of the fish fauna in watercourses was carried out in 2025 on the railway section[138]. The fish species identified during the survey by river are listed in the chapter 5.6.

The impacts on fish fauna may include significant loss of habitat and deterioration of habitat quality, as well as, to a lesser extent, disturbance or even mortality during the construction period. A barrier effect in the usual sense is not relevant for fish fauna.

Conclusion

The study concluded that of the watercourses outside the Natura areas, the section of the Ikla river at the intersection of the railway line and the watercourse is insignificant for fish, the section of the Kabli river is probably insignificant, a significant section on the Loode stream, and a significant to very significant section on the Treimani stream. The section of the river downstream of the impact area is insignificant for fish in the Ikla river, significant in the Kabli river, and very significant in the Loode and Treimani streams. The section of the river upstream of the area affected by the works is insignificant for fish stocks in the Ikla river, probably insignificant in the Kabli river, and important in the Loode and Treimani streams.

During the construction phase of the railway, the construction of bridges or culverts over watercourses may be considered a significant impact factor, as this may locally alter the physical quality of the river habitat and may be accompanied by the creation of migration barriers in the river, temporary reduction in flow rates, and habitat impoverishment in watercourses. As a result of the works, a reduction in the structural diversity of watercourse habitats can be predicted, including a decrease in the amount of wood falling into the riverbed.

Train traffic and infrastructure maintenance during the railway's operational phase will have a predominantly minor and insignificant impact on fish stocks. Previous experience has shown that the passage of road and railway bridges over the river and the presence of structures there do not pose a significant problem for fish stocks. Maintenance work on the railway may reduce the amount of wood entering the water from the banks, resulting in a decline in the diversity of habitat structures in the riverbed.

No significant adverse effects on fish are expected if appropriate measures are implemented.

8.3.5 Impact on invertebrates

Invertebrates include taxa with a wide variety of behavioral patterns and needs. 95-99% of the world's animal species are invertebrates and they play a very important role in the ecosystem. They include insects, arachnids, mollusks, crustaceans, various worms, and others. Species-specific conservation measures are generally difficult to identify for them, and their protection is achieved through habitat conservation. The impact of infrastructure has been studied most extensively in relation to insects (butterflies, beetles, hymenoptera). The RB route includes diverse biotopes, including habitats valuable to invertebrates, such as meadows, natural forests, wetlands, etc.

Of the protected invertebrates, the thick-shelled river mussel has been identified as a species of conservation interest, and its impact has been addressed in the Natura assessment (Annex 2 to the

---

[138] Wildlife Estonia, 2025. Possible impacts of the planned construction activities on watercourses and fish in the section of the Rail Baltic railway between Kabli and the Estonian/Latvian border

report). The thick-shelled river mussel is a conservation objective in the Lemmejõe SAC and the Laulaste SAC. The presence of other protected invertebrates in the railway section has not been confirmed, but as this is a large natural area, it is likely.

During the construction phase, when the route is cleared and soil is removed, a large proportion of the invertebrates living there are likely to be killed. During the construction of the RB, habitats located directly under the route will be destroyed. The nests of protected *Formica*-species must be relocated before construction begins (as for August 2025 this work in the area is finished).

During the construction of the RB, the soil structure will be altered over a large area, resulting in a significant change in the living environment for invertebrates. Even in later stages of construction, invertebrates are at risk of colliding with vehicles or being run over or simply buried under soil or construction materials. During operation, invertebrates may be killed in collisions with trains or during maintenance work by mowers and vehicle wheels.

Invertebrates are very sensitive to environmental pollution. It has been observed that there are fewer invertebrates in the immediate vicinity of roads than further away. The impact of railways is smaller, as there are fewer vehicles and the pollution load is expected to be even lower due to electric locomotives.

Railway corridors often have a positive impact on insects, especially in landscapes with strong human influence. A semi-natural community open to the sun develops in the area adjacent to the railway, which is a preferred habitat for butterflies, dragonflies, bumblebees, etc.

Roads form impassable or significant barriers, especially for invertebrates (moles, beetles, etc.) that move in the soil and on the ground. Butterflies and many other insects can fly, but they often only move short distances from one flower to another and avoid crossing unsuitable areas (including roads). Roads and railways with less traffic do not pose a significant obstacle to some butterfly species, but more sedentary species may avoid crossing them, creating a barrier effect. The RB barrier effect on invertebrates is mitigated by ecoducts and small animal tunnels.

Conclusion

A significant number of invertebrates will probably be killed during the construction of the section under consideration, but this impact will be temporary. During the service life of the RB, the impact on invertebrate mortality will be small. The habitats of invertebrates will be destroyed during the construction of the railway embankment, but over time, new habitats will emerge in the railway corridor, which in some places may even be of higher quality than the original ones. The RB section in question will create a significant barrier to movement for certain groups of invertebrates. The barrier effect is partially mitigated by ecoducts and small animal tunnels. Watercourses are passable for aquatic organisms if the natural bed is restored and the normal flow velocity is maintained.

8.4 Impact on the green network

The railway section passes through forest areas that are part of the green network in south-western Estonia. According to the Pärnu county-wide plan, the railway section runs between the fragments of the green network and passes through several corridors connecting the green network areas (see chapter 5.8). According to the new comprehensive special plan for Häädemeeste municipality, which is currently being prepared, the railway section runs through the green network support area in the northern and central parts and along its edge in the southern part, crossing the green corridor. Regardless of the exact spatial form and definition of the elements of the green network in the various levels of planning, it is relevant to consider in the impact assessment that the railway section runs mainly through forest areas that form a coherent whole.

The greatest impact on the green network associated with the construction of a fenced railway is the barrier effect, which reduces the connectivity of the green network by fragmenting it. The fenced railway corridor will be a barrier to movement for most mammals and will also hinder the spread of many other species.

The mesh size of the fence to be built around the railway is larger in the preliminary design and can be passed through and crossed by animals up to the size of a badger. In the value engineering solution, the lower part of the railway corridor will be fenced with a small mesh fence, which will become an insurmountable barrier not only for large mammals but also for most small mammals. Only climbing animals (martens, squirrels) will be able to cross it. At the same time, the mortality of small mammals would be higher in the preliminary design.

The impact of the barrier effect will be mitigated and the connectivity of the green network will be ensured by animal crossings, including ecoducts, built on the railway.

The preliminary design envisaged two ecoducts for the railway section, in accordance with the solution provided for in the Pärnu county-wide plan. The ecoducts will create connectivity between the western and eastern parts of the green network separated from the railway corridor. One ecoduct will create connectivity in the northern part and the other in the southern part, in the green network corridors specified in the Pärnu county-wide plan. The ecoducts are planned to be built in the forest landscape. In addition to the ecoducts, the preliminary design provides for 18 combined culverts, on which dry embankments with natural soil will be constructed. The culverts will ensure connectivity in the green corridors (at the southern and northern ends of the railway section) where no ecoducts are planned. The culverts will primarily serve amphibians, semi-aquatic mammals and small birds.

During the preparation of the value engineering design solution, additional fieldwork and analyses were carried out by biodiversity experts and proposals were made to modify the ecoduct solution. The value engineering design solution provides for three ecoducts and 27 underpasses (culverts with embankments and animal tunnels) on the railway section. The ecoducts ensure connectivity in the three southern green network corridors, while connectivity in the northernmost corridor is ensured by animal underpasses, as this area is particularly rich in small and medium-sized game.

The ecoducts and various underpasses have been designed using the best available information and planned for locations (taking into account the limitations arising from technical solutions) where, according to the assessment of biodiversity experts, they will function[139,140,141]. The proposed solutions will significantly reduce the adverse effects on the connectivity of the green network. However, there will be adverse effects on the green network compared to the current situation, as green corridors will be fenced off and animals will have to adapt to ecoducts and underpasses. It may take time for wildlife to get used to the changed conditions and actively use the passages.

---

[139] Obermeyer, 2021, Design and design supervision services for the construction of the new line Pärnu – Estonian/Latvian border (No. RBR 2018/28), Design Priority Section 3, Annex 4. VE DPS3 Implementation of EIA studies: New mitigation measures

[140] Environmental Agency Viridis OÜ, 2024, Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border

[141] OÜ Rewild, 2024, Amphibian habitats in Pärnu County on the RB DS3DPS3 section, Occurrence of amphibian breeding water bodies and assessment of habitats on the Rail Baltic route and necessary measures

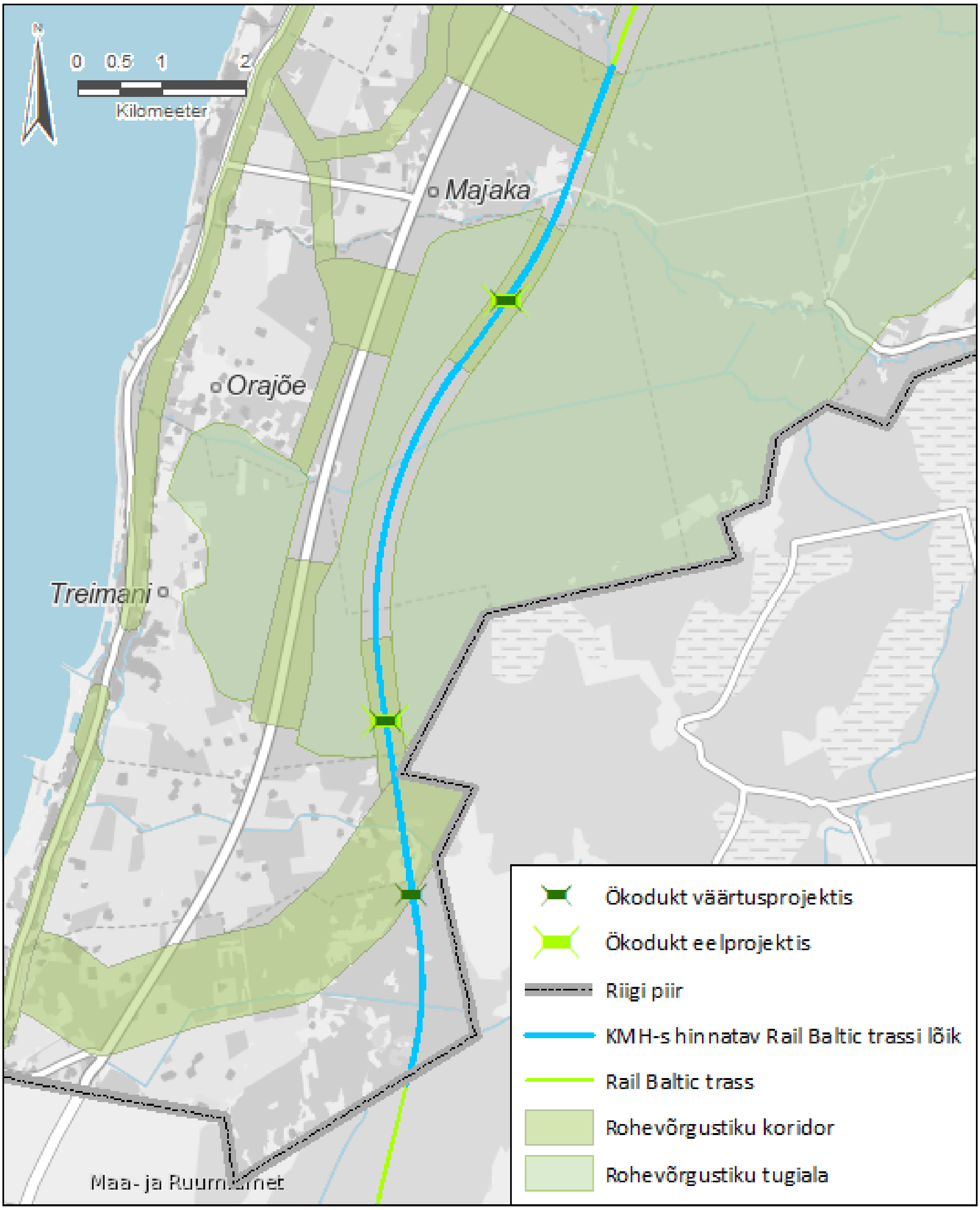


Figure 8-3. Ecoducts planned to ensure the connectivity of the green network[142]

The construction of railways in green network areas will result in the loss of natural or near-natural communities in the cleared areas, which will reduce the proportion of areas supporting biodiversity that are characteristic of green networks in the region. In accordance with the county-wide spatial plan, a total of approximately 73 ha of forest areas will be cleared in green network areas, which covers 0.027% of the county green network and 0,25% of the green network located in the territory of

[142] Base map: Land and Spatial Planning Board 23.07.2025; Pärnu County green network: Pärnu County-wide spatial plan 2018

Häädemeeste municipality. The reduction in green areas due to clearing is a significant adverse impact but considering the extent of the green network in the area, the reduction in area is relatively small.

The reduction in forest areas will take place during the construction phase of the railway, but the impact of their loss, i.e. their continued absence, will continue during the operational phase of the railway.

In addition to the reduction of natural areas in the green network, the area adjacent to the railway will also be affected, primarily in the form of various disturbances to wildlife. As a result, the quality of green areas in the vicinity of the railway corridor as green network areas will decrease. Since train traffic is not continuous, the disturbance is not continuous either, and most species will become accustomed to it.

Conclusion

The construction and operation of the railway will have a significant adverse impact on the connectivity and functioning of the green network, which will be mitigated by appropriate mitigation measures (different types of animal crossings) provided for in the project. The mitigation measures have been developed based on input from biodiversity experts. In the preliminary design solution, the direct barrier effect on green corridors is somewhat smaller due to the larger mesh size of the fence, but in the value engineering design solution, the rate of animal deaths on the railway along green corridors is lower and the number of planned animal crossings is higher. Overall, the preliminary design and value engineering design solutions have a similar impact on the green network.

8.5 Impact on vegetation and habitats

Loss of vegetation and habitats

The direct immediate impact on vegetation will be manifested through the loss of existing vegetation cover in the railway corridor and in the area of objects associated with the railway (crossings, maintenance and access roads, ecoducts, electrical infrastructure). Vegetation in the railway corridor will either disappear completely (removed from under structures) or change in areas (so-called service land) that are maintained and kept open.

Most of the railway section is covered by forests. The forests remaining in the railway corridor can be considered semi-natural vegetation, as these are commercial forests where humans have shaped their age and structure through logging, forest drainage and other factors. There are no natural or so-called primeval forests on the railway route or in the area of related structures.

According to EELIS data[143], there are no valuable habitats mapped in the railway corridor clearing areas. The nearest valuable habitat (VEP No. 117039) is located approximately 300 m from the railway. There are also no Natura forest habitat types inventoried in or adjacent to the clearing area.

The clearing of forest is necessary for the construction of the railway and related infrastructure. A total of 110 ha of forest will be cleared in the area of the railway corridor and other objects. The majority of the forest areas to be cleared are commercial forests with relatively low natural value, but which nevertheless have significant ecological value depending on their stage of development. The impact of clearing is discussed in more detail in the chapter 8.6.

[143] as of 26.03.2025

The banks of the Lemmejõgi river have been mapped as habitat type 6450 (floodplain meadows). The railway crosses the habitat, which is registered in EELIS as an area of 26,4 ha and whose nature conservation status has been assessed as class C (moderate or poor). In reality, the habitat is largely overgrown with bushes and trees (on-site observations carried out on 26 June 2025), including forest land registered in the forest register. The area therefore has no increased nature conservation value. The Lemmejõe limited-conservation area, which borders the habitat, includes sections of the river, but not the riverbanks, and the floodplains are not designated as a conservation objective for the nature reserve.

The railway crosses the Lemmejõe River via a bridge, and according to the value assessment, approximately 1 ha (*ca* 4%) of the habitat registered in EELIS is located under the railway embankment. During construction, a wider area is expected to be temporarily affected (movement of machinery, storage of materials, work zone). No significant impact is expected on the part of the habitat located next to the railway infrastructure, as the Rail Baltic embankment and service roads do not prevent contact between the floodplain and the river, which is a prerequisite for the natural formation of floodplain meadows. As the habitat is not of high nature conservation value or status, it is disappearing as a result of natural processes (afforestation) it has not been set as a priority for the restoration of natural values, and the estimated extent of habitat loss is relatively insignificant, so no additional measures are needed to compensate for the area covered by the railway land acquisition.

Changes in the water regime

The indirect impact on vegetation will be felt in areas where there is no clearing or direct loss of vegetation cover under the infrastructure, but the impact will be felt through other aspects of the railway construction. A possible impact is a change in the water regime in areas adjacent to the railway corridor.

The aim of the railway design is to preserve the existing water regime in the vicinity of the railway to the greatest extent possible. Existing drainage ditches will be directed through culverts from the railway embankment. As the drainage material is well-drained and mostly lined with side ditches, it will not cause swelling in front of the embankment, but may have a slight draining effect in areas bordering the soil. Some drainage effect in the area may also be associated with the fact that the existing drainage systems are in poor condition in places, and the drainage ditches to be reconstructed and the artificial recipients to be cleaned with the construction of the RB will improve drainage conditions in the railway area and may locally lower the water level.

There are no bog habitats adjacent to the railway that could be significantly affected by changes in the water regime.

Most of the forest land bordering the railway has already been drained or covered by drainage systems. In areas with well-drained soils and drained bog soils or drained peat soils, the impact of the railway and its side ditches on the water regime is small and limited in scope, and therefore moisture conditions for vegetation will not change significantly. The railway will not have a significant additional drainage effect and the types of forest communities will not change as a result of its construction.

Changes in wind regime

The clearing of the railway corridor will create an open corridor *approximately* 50 m wide in the forest landscape, which will affect the wind regime in the forest areas adjacent to the railway corridor. The impact of clearing on the wind regime is discussed in more detail in the chapter 8.6 (Impact on the landscape).

Conclusion

The construction of the railway will have an adverse impact on vegetation and habitats, primarily due to the occupation of forest land associated with the railway. The construction of the railway is not expected to have a significant adverse impact on habitats of high nature conservation value or on communities adjacent to the railway. The environmental impact is similar for both alternatives.

8.6 Impact of deforestation

The railway section in question mainly runs through forest areas, which cover approximately 90% of the railway corridor. This includes forest land that has been cleared, i.e. areas that have recently been clear-cut.

The deforestation under the structures is necessary for the construction and operation of the railway. The width of the railway corridor to be cleared is mostly between 40 and 80 metres. In connection with the construction of crossings and ecoducts, ditches and other railway-related infrastructure, the clearing area is wider in some places. The total area of forest to be cleared for the construction of the railway section is approximately 110 ha.

The forests to be cleared are almost entirely commercial forests, most of which have been managed relatively intensively. Approximately 70% of the forests have also been drained.

There are no valuable habitats listed in EELIS within the clearing area. The clearing area also does not overlap with any known habitats of protected plant, fungus or lichen species. The logging area overlaps to a small extent with the locations of protected bird species listed in EELIS, and the impact on birdlife has been taken into account in the assessments of the impact on fauna and Natura areas.

According to the forest register[144], more than half of the forests to be cleared are classified as growth types dominated by birch, with some spruce and aspen. In some places, there are also growth types dominated by blueberry, where the main tree species are also predominantly birch or spruce. Other growth types are less common. Birch-dominated forests account for approximately 60% of the forests to be cleared, with some spruce, alder and aspen forests also present. Similar forest types are also found adjacent to the corridor to be cleared.

The age structure of the forests varies from young stands to mature forests, which is typical of commercial forests. There are few old forests in the clear-cut areas. However, from a forest management and long-term ecological perspective, the current age of the forest is not important when assessing its impact, as commercial forests have different values during their development cycle, but logged areas are removed from forest management and no longer have any ecological value. At the same time, the impact of clear-cutting older commercial forests is not significantly greater than that of young forests, as these areas are also expected to be cleared in the future through regeneration felling. From an ecological point of view, the values of commercial forests are therefore not comparable to the ecological values of natural forests.

The deforestation of forest areas has a significant adverse impact. However, as the railway passes through an area with large forest stands, the loss of forest land is relatively moderate compared to the total forest area in the region. The area to be cleared in Häädemeeste municipality accounts for less

[144] Environmental Agency, extract from the Forest Register 30.04.2025

than 0.5% of the total forest area and less than 0.05% of the total forest area in the county. The clearing of the RB railway will not significantly affect the forest cover or the overall landscape of the area.

The railway corridor opened up by deforestation may also affect the wind regime in the forest areas adjacent to the railway corridor. The width of the corridor to be cleared is comparable to the width of a normal clear-cut area. However, as the railway corridor is long, unfavourable wind conditions may cause a wind corridor effect, where the wind blows along the railway corridor. This effect may occur in the section in question mainly in the case of southerly and northerly winds. As storm winds tend to blow from the west, the wind corridor effect is unlikely to be very strong. Even with winds blowing perpendicular to the corridor, a corridor *approximately* 50 m wide may cause additional wind shear and wind breakage on the leeward side, but this will mainly occur in storm-heavy growth types and especially in spruce. Therefore, changes in wind regime may cause windthrow at the edges of the railway corridor, but mainly in the form of individual tree windthrow (mainly spruce) and, less frequently, breakage in storm-damaged forest types. As westerly storms dominate, damage will be greater on the eastern edge of the corridor. Very extensive and/or frequent forest damage is unlikely. The impact of wind damage is expected to be localised and scattered, and the impact on forest stands will be relatively minor. The damage mentioned above can also be considered as damage to forest management and does not have a significant adverse impact on vegetation cover and forest ecosystems.

An assessment of the combined impact of deforestation along the entire RB railway is presented at chapter 9.2.

8.7 Impact on the spread of alien species

There are no known areas of alien species distribution in the planned railway corridor.

The nearest known colony of Sosnovski hogweed is located on the Latvian border, more than a kilometre away from the planned railway, and there is no connection that would allow the railway to facilitate the spread of the species from there. Nevertheless, as a precautionary measure, it is appropriate to check the area closest to the existing colony before construction work begins to ensure that hogweed has not spread to the railway construction site. If the species is found, appropriate measures must be taken to prevent the spread of alien species seeds.

Railways can contribute to the spread of alien species in two ways: by actively spreading species via trains or by facilitating the spontaneous spread of species along the railway corridor.

Small animals can hide on and in railway rolling stock and travel hundreds or even thousands of kilometres. Plant seeds can also spread with trains and the goods they carry. Therefore, it cannot be ruled out that new alien species will enter Estonia along with the new railway line.

The railway corridor provides a means of transport for many different species, which can spread to new areas along the railway lines. Railway embankments create a specific substrate and a new 'free' growing area, which can also be colonised by alien plant species. Several alien species have already spread along railways in Estonia: warty-cabbage, hairy galinsoga, cheatgrass, ragweed (mostly common ragweed and perennial ragweed). As the substrate is continuous over a long area, this facilitates the spread of species along the railway embankment. The spread of alien species in the corridor is hindered to some extent by interruptions (stations, bridges, ecoducts, etc.).

During railway construction, the spread of alien plant species with the topsoil must be prevented. To ensure this, locally sourced (previously stripped from the area) topsoil or controlled topsoil must be used in landscaping work related to railway construction.

It is also important to maintain the species-rich community characteristic of the area around the railway in order to control alien species.

Conclusion

From the point of view of the spread of alien species, the impact of the planned railway can be assessed as slightly unfavourable, as the railway corridor and embankments create a potentially suitable environment for the spread of alien species. There are no differences between the project solutions (alternatives) considered in this respect.

8.8 Impact on groundwater

8.8.1 Impact on the groundwater level in the area

Railways may affect groundwater movement and levels if they form a water barrier or drainage (including ditches). As railway embankments are constructed from drainage material, the impact of drainage depends on the depth of the drainage and the filtration properties of the water layer. The greatest decrease in groundwater level occurs in groundwater with a high filtration coefficient in the case of a drain (or ditch) deeper than the groundwater level. The groundwater level decreases most at the location of the ditch and decreases with distance from it. The effect of the decrease is the distance from the ditch to the groundwater level, which does not change with the construction of the railway.

No solutions for railway side ditches were designed in the preliminary design and value engineering design of the railway section under assessment. The final depths and parameters of the ditches will be determined during the preparation of the basic design. Considering that the railway is not planned to be sunk in any area of the Kabli-EE/LV border section and that the railway embankment is 2-3 m high (compared to the existing ground level) (Figure 8-4), it can be assumed that the bottom of the railway side ditch is planned to be higher than the quaternary (surface water) groundwater level. The depths of the side ditches to be constructed are compatible with the existing ditch network in the area and therefore no additional lowering is expected anywhere.

The impact on the groundwater level during construction and use will be similar.

Due to the partially lower railway embankment (Figure 8-4), the preliminary design solution has a greater impact on the groundwater level than the value engineering design solution, but the difference is minimal.

For the impact of RB on the water levels of wells in the vicinity, see chapter 8.8.3.

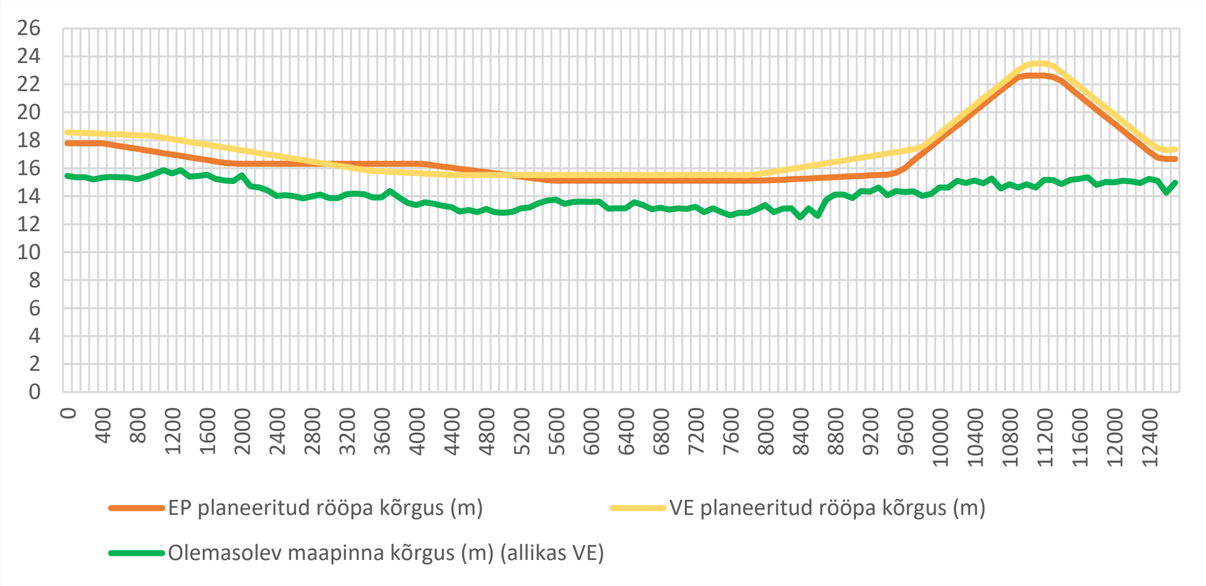


Figure 8-4. Height of the preliminary design and value engineering design embankments compared to the existing ground level

8.8.2 Impact on groundwater quality

Impacts associated with construction activities

The railway section in question is mostly located in an area with unprotected groundwater (see chapter 5.7). However, the construction of the railway is not expected to involve any activities that would pose a risk of groundwater pollution under normal conditions. This risk may be associated with accidents involving machinery and equipment used in construction work (e.g. fuel leaks). If the likelihood of accidents is minimised by using equipment in good working order and complying with occupational safety and precautionary measures, no significant adverse impact on groundwater quality is anticipated.

Two grade-separated intersections are planned for the railway section (Loigu tee/Lemmejõe railway bridge and Metsapoole road viaduct). In the project solution for the value assessment, both structures are planned on low foundations, on pile foundations in the preliminary design. Vibration caused by pile driving or drilling debris may temporarily and locally increase the amount of suspended solids if the limestone is friable. There is no limestone in the area of the planned route. Therefore, no increase in the level of suspended solids in the groundwater surrounding the planned activity area is anticipated.

In terms of the impact of construction activities on groundwater quality, the value engineering solution, which involves low foundations at the crossings, is somewhat more favourable. The preliminary design solution entails a low risk of impact on groundwater quality during drilling. Neither alternative will have a significant adverse impact on groundwater quality during construction. Value assessment in the case of sub-alternative 3 for the Metsapool viaduct (no viaduct will be built), there will be no impact on groundwater quality during construction.

Impacts associated with railway use

Rail traffic will not result in additional groundwater abstraction that could have a significant environmental impact. The risk of pollutants entering the groundwater is similar to that during the construction phase and only occurs in emergency situations. The adverse impact of herbicides used in railway maintenance on groundwater is not considered significant if they are used in accordance with the requirements.

The impact of the railway on groundwater quality can be assessed as neutral, i.e. no impact, under normal conditions. There are no differences in the impact on groundwater quality between the preliminary and value engineering designs.

8.8.3 Impact on the water level and water quality of wells

During this EIA, drinking water wells located within the expected impact area of the railway line were mapped. There are two wells in the railway area (Table 8-3), both of which are unregistered dug wells. There are no boreholes within the railway's impact area (200 m on both sides of the railway).

Table 8-3. Data and impact assessment for wells located near the RB railway section

Type of well	Location, cadastral unit	Distance from the RB railway, m	Impact assessment on the water level of the well	Impact assessment on the water quality of the well
Dug well	Majaka village, Kurejõe 21301:001:0229	240	No impact, as the well is located outside the RB impact area	No impact, as the well is located outside the RB impact area
Dug well	Majaka village, Tiidu 21303:002:0034	400	No impact, as the well is located outside the RB impact area	No impact, as the well is located outside the RB impact area

Drainage has a minor and local impact on the groundwater level. The construction of the railway on the section in question is not expected to cause a decrease in the groundwater level (see chapter 8.8.1). The railway drainage does not reach the wells, therefore the railway structures do not affect the water level in the wells.

No change in groundwater quality is expected as a result of the planned activity (see chapter 8.8.3). Consequently, the impact on the water quality of wells is neutral, i.e. non-existent, for both alternatives.

Based on the assessment, the planned activity will not significantly affect the groundwater level and quality, and according to the EIA, there is no need to monitor groundwater and drinking water wells.

8.8.4 Compliance of the activity with the objectives of the river basin management plan

The overall objective of the river basin management plan for the Western Estonian water basin[145] is to achieve good status for all groundwater bodies, and bodies in good status must not be allowed to deteriorate.

As the planned activity does not have a significant adverse impact on the quality or quantity of groundwater or threaten the status of water bodies, the construction and use of the railway will not have an adverse impact on the achievement of the objectives of the river basin management plan. Based on the planned activity, there is no need to derogate from the objectives of the groundwater basin management plans.

8.9 Impact on surface water

The larger watercourses intersecting the railway are the Kabli River (Kabli Stream), Lemmejõgi, Loode Stream, Treimani River (Treimani Stream) and Ikla River (see chapter 5.7). A baseline study was conducted to map the impact on surface water, including fieldwork[146].

Of these, the Lemmejõgi River is part of the Lemmejõe and Laulaste nature reserves belonging to the Natura 2000 network. As a result, the impact on the Lemmejõgi River as a water habitat and on the species found there has been further assessed in the Natura appropriate assessment (Annex 2 to the EIA report).

8.9.1 Impact on surface water quality

The impact on surface water quality can be divided into impact during construction and impact during operation phase.

During construction, no significant amount of wastewater (excess water) that would need to be discharged into water bodies is generally generated in the construction area. As the groundwater is close to the surface in some places along the railway, it may be necessary to pump excess water from the excavations created during construction and discharge it into the receiving water body. When draining water from excavations during construction work, it must be taken into account that the discharge of pollutants into the receiving water body is only permitted in the cases and under the conditions specified in the Water Act, provided that this does not cause environmental hazards. Provided that the requirements for the discharge of wastewater into the receiving water body are complied with during construction work and appropriate water protection measures are implemented in water bodies and their shore zones, there will be no significant negative impact on surface water. The need for excess water drainage can be reduced to some extent by planning the construction work (taking into account the spring snowmelt period, avoiding work during heavy rainfall, etc.).

The construction work includes the construction of bridges and culverts crossing watercourses intersecting with the railway line. A railway bridge crossing the watercourse is planned for the

---

[145] River basin management plan for the West Estonia river basin district 2022–2027. https://kliimaministeerium.ee/sites/default/files/documents/2022-10/L%C3%A4%C3%A4ne-Eesti%20vesikonna%20veemajanduskava%202022-2027.pdf (23.07.2025)

[146] Wildlife Estonia, 2025. Possible impacts of the planned construction activities on watercourses and fish stocks in the section of the Rail Baltic route between Kabli and the Estonian/Latvian border

Lemmejõgi river. Culverts are planned for other watercourses, including drainage ditches. The construction of culverts in particular is generally accompanied by disturbances in the water body and temporary deterioration of the water body's condition (sediment movement, increased suspended solids and, in some places, changes to the bottom and banks of the watercourse). Such impact on water quality is expected to be short-term and relatively local. To reduce the impact, soil should be prevented from entering and being washed into the river. This can be achieved by carrying out work during low water periods and, if necessary, using screens to prevent the downstream transport of suspended matter and sediments.

No wastewater is generated during railway operation and no pollutants are discharged directly into surface water bodies. The main factor affecting surface water is precipitation, which is discharged into the nearest watercourses via railway side ditches. However, most precipitation infiltrates into the railway soil and, in general, ditches with grassy slopes are sufficient to prevent possible pollution from the railway from entering the receiving water bodies. In order to reduce the amount of suspended solids entering natural water bodies, flow retarders are also provided in the longitudinal ditches of the railway before they enter the watercourse. These consist of a section of the ditch that is approximately 1 metre wider and deeper, where the water flow slows down and a significant part of the suspended solids settle at the bottom of the ditch.

In addition, the use of herbicides to control vegetation on the railway may affect surface water bodies. To avoid adverse effects, the use of herbicides should be avoided in the vicinity of watercourses. Specific weed control methods and/or chemicals used for this purpose must be specified in the railway maintenance plan based on the best available knowledge and practices at the time of the railway's use, the legislation in force at the time and environmental protection requirements.

Overall, no significant adverse impact on surface water quality is expected from the construction and operation of the railway. There is no significant difference between the solutions proposed in the preliminary and value engineering designs.

8.9.2 Impact on surface water movement

In the case of the railway bridge planned for the Lemmejõgi river, no bridge piers are planned to be built in the water (the supporting structures will be located on dry land). The construction of the bridge is not expected to cause any significant changes to the riverbed or the river's flow regime.

The river in the railway crossing area is winding and there are clear signs that the river will change its course over time. Meandering has resulted in the formation of old river meanders, which together with the floodplain form an important part of the habitat of several species, providing different functions at different stages of life. The formation and disappearance of river meanders in the floodplain is an important indicator of the favourable hydro-morphological status of the river, and the construction of the railway must not significantly impede the formation of meanders. At the same time, the meandering of the Lemmejõgi river has a potential impact on the railway embankment and service roads in the form of bank erosion, which must be taken into account in the design and construction of the railway embankment.

For smaller natural water bodies and ditches, the project solution provides for culverts to ensure the preservation of the water regime. Culverts crossing the railway embankment will be designed with sufficient dimensions to ensure the functioning of land improvement systems, the connectivity of drainage ditches and water reception capacity.

Existing drainage systems will be used to drain rainwater and excess water. The functioning of drainage systems will be ensured during the construction of the railway. The design takes into account the capacity of drainage systems to receive water. If necessary, drainage systems must be cleaned to ensure their proper functioning.

No surface water will be extracted during construction or operation of the railway.

Overall, the construction and operation of the railway are not expected to have a significant adverse impact on the quantity or movement of surface water. There is no significant difference between the solutions proposed in the preliminary and value engineering designs.

8.9.3 Compliance of the activity with the objectives of the river basin management plan

The overall objective of the Western Estonia River Basin Management Plan[147] is to achieve good status for all surface water bodies, and water bodies in good status must not deteriorate.

As the planned activity does not have a significant adverse impact on the quality of surface water or the hydromorphology of surface water bodies, nor does it threaten the status of water bodies, the construction and use of the railway will not have an adverse impact on the achievement of the objectives of the river basin management plan. Based on the planned activity, there is no need to derogate from the objectives of the river basin management plans for surface water bodies.

8.10 Impact on soil

The impact of the planned railway section on soil will be felt during both the construction and operational phases. The impact will be more extensive during the construction phase, when large-scale soil works will be carried out. During the operational phase, the impact may be felt primarily in connection with possible accidents/incidents.

Soil stripping and covering

The existing topsoil will be stripped from the ground at the base of the railway and associated structures (crossings, culverts, ecoducts, etc.) for their construction. The impact is generally irreversible – soil that has become the base for structures or their immediate surroundings cannot be restored to its original state. The removed topsoil is reused on site to the maximum extent possible. As the removed valuable topsoil is used for a specific purpose, its quantity as a natural resource is not reduced.

There is no valuable agricultural land in the section of the railway under consideration that would be damaged by the construction of the railway.

Changes in soil structure

The movement of vehicles and construction machinery in the railway construction zone also causes soil compaction, which may be accompanied by soil densification and subsidence. Soil densification may in turn affect the soil water regime. The extent of soil compaction and subsidence depends on the properties of the soil, the mass of the soil body and changes in the groundwater level. In areas where

---

[147] River basin management plan for the West Estonian river basin district 2022-2027. https://kliimaministeerium.ee/sites/default/files/documents/2022-10/L%C3%A4%C3%A4ne-Eesti%20vesikonna%20veemajanduskava%202022-2027.pdf (23.07.2025)

construction work disturbs the natural structure of the soil but where the soil is not covered with a hard surface (e.g. areas adjacent to railway lines and roads), the situation improves over time, usually within a couple of vegetation periods.

In order to reduce the extent of soil damage, the area of land used for construction work must be limited and activities outside the site must be avoided. This must be taken into account when storing construction materials and waste, moving machinery, storing and maintaining machinery, storing other equipment and auxiliary materials, selecting the location of temporary structures during construction, etc. If temporary storage areas outside the site are necessary, preference should be given to areas with hard surfaces or already damaged soil.

Risk of erosion

Both the removal of existing vegetation and the disruption of the natural structure of the soil can cause other soil degradation processes, such as erosion. The risk of erosion is primarily associated with the removal of soil from the slopes of earthworks and ditch banks, but it is also possible in areas where clearing is carried out (soil and wind erosion). The risk of erosion is greater on higher slopes (especially on earthworks crossing railways) and at a time when no measures have yet been taken to secure them. No very extensive high slopes are planned in the section under consideration and therefore no significant risk of erosion is foreseen. Erosion during the construction phase can be reduced by preventive measures (smoothing layers, starting slope stabilisation work and compaction immediately after completion of the embankment).

During the railway operation phase, the risk of wind and soil erosion is low, as the areas affected by construction work will be cleaned up and landscaped. The project takes into account that the slopes will be covered with a layer of topsoil and grass seed will be sown. Higher slopes (2.5 m and above) will be covered with geotextiles, coconut fibre mats or grass mats, as appropriate, to prevent erosion. The bottoms and slopes of ditches shall also be reinforced. The implementation of appropriate erosion control measures shall prevent soil erosion from slopes and ditch banks.

Pollutants and pollution risk

No pollutants are directly introduced into the soil during the construction and operation of the railway line. The impact on the soil is related to the movement of machinery on the railway and other infrastructure (roadways, parking areas). During railway operation, solid particles are released into the environment, and oil and fuel residues, windscreen washer and coolant fluids, and residues of de-icing and snow removal agents may leak from railway maintenance machinery and vehicles travelling on roadways and in car parks. Rainwater and snowmelt carry these substances into the soil or water environment, including suspended solids, petroleum products, polycyclic aromatic hydrocarbons (PAHs), chlorides from road salt and heavy metals. However, the amount of pollutants reaching the soil in this form is negligible and the impact remains insignificant.

The impact on soil is also related to the entry of weed killers used for vegetation control into the soil. The impact is mainly limited to the railway and its immediate vicinity. If the requirements and restrictions established for the work are complied with and the spraying remains within the boundaries of the railway, the impact will remain insignificant.

The risk of soil contamination is mainly related to emergency situations, such as possible fuel leaks. During the construction phase, the risk of accidents is mainly related to the machinery and equipment used in construction. This accident risk can be minimised by organisational measures. During the operational phase, the accident risk is related to rolling stock and freight, but also to the maintenance of infrastructure objects. The possibility of accidents is discussed in chapter 8.18.

Conclusion

The construction of a railway has an adverse impact on the soil, but the extent of this impact is limited to the railway line and the land on which it is built and its immediate surroundings. The impact can be mitigated by environmental measures. There is no difference in the significance of the impact when comparing the solutions of the preliminary and value engineering designs.

8.11 Impact on the relief

The RB railway section runs mainly through flat forest terrain. The impact of the railway on the relief is mainly due to the construction of the railway embankment, grade separations and ecoducts.

No changes to the relief will be made outside the railway-related structures, and the impact on the relief will therefore be purely local, i.e. related to the specific objects mentioned above.

Temporary changes are also possible in the working areas surrounding the railway corridor during construction, but the affected areas will be restored upon completion of the construction work.

There are no significant differences between the preliminary design and the detailed design solution. The height of the railway embankment is relatively similar. The main difference is that the detailed design provides for the construction of one additional ecoduct. Therefore, the impact of the value engineering design on the relief in the specific location is greater. The intersections with roads and water bodies are planned in the value engineering design in a similar manner to the preliminary design.

The impact on the relief can be somewhat reduced by abandoning the construction of the Metsapoole viaduct.

Changes in the relief will in turn have an impact on the soil and water regime, which has been addressed and taken into account in the relevant subchapter.

Conclusion

The construction of the railway will cause changes to the relief, but the associated impact is local and, from a broader perspective (in the sense of the KeHJS), insignificant. The relief, which is generally characteristic of the area and predominantly flat, will remain unchanged.

8.12 Impact of noise

The noise associated with the planned activity can be divided into two categories: noise during railway construction (construction noise) and noise associated with railway use (train traffic).

Impact during construction

Construction activities will cause a temporary increase in noise levels in the area. This is caused by the transport of construction materials and waste, the operation of various stationary and mobile machinery, the use of construction tools, etc. Such noise is associated with almost all construction activities and ceases after the completion of the railway section. Due to the nature of the activity, the exact noise level during construction cannot be predicted. It can be assumed that the work will be carried out and the noise level will increase mainly during the day, which will reduce the disturbance perceived by residents. No noise limits have been set for construction activities during the day.

Assessment of impact during operation phase

Noise during operation phase is primarily related to train traffic on the railway.

To predict noise levels, noise dispersion modelling was carried out as part of this EIA. The calculations were performed using IMMI 2024, specialised noise assessment software.

The noise dispersion from train traffic was calculated using the Dutch calculation method SRM II to ensure comparability of results (uniform methodology) with other noise studies for RB railway sections. To take into account differences with the CNOSSOS-EU calculation method used for strategic noise mapping and possible uncertainty, a correction factor of +2 dB was added. This conservative approach avoids underestimating noise levels.

When determining train traffic intensity, the base year for calculations was set at 2056, when the planned maximum traffic frequency on the railway has been reached, i.e. the worst possible situation. It was assumed that trains run around the clock. The traffic frequency and daily distribution of trains used to calculate noise levels are presented in the table below (Table 8-4).

Table 8-4. Daily distribution of trains

Train type	Train pairs per day			Number of train carriages
	07-19	19-23	23-07	
Express trains	12	3	0	16
night trains	0	0	1	16
local trains	13	5	2	8
intermodal freight trains	2	4	4	48-58
trains for bulk and liquid goods	0	1	1	48-58

The speeds of different train categories were calculated as follows:

- high-speed train: 249 km/h;
- night train: 160 km/h;
- local (regional) passenger train: 200 km/h;
- freight trains: 120 km/h.

Car traffic noise was also taken into account in the modelling to determine the combined impact. The dispersion of noise from road traffic in the environment was calculated on the basis of the French national standard XP S 31-133 and the NMPB-Routes-96 calculation method.

The daily traffic volume and heavy traffic share on the Tallinn-Pärnu-Ikla main road were determined according to the results of the 2024 traffic census[148] . On the section 180,472-191,395 km, the average annual traffic volume was 4919 vehicles per day, of which 35% was heavy traffic. Based on a traffic survey, the average daily traffic volume on Loigu road was estimated at 67 vehicles per day, including 3 trucks, according to[149] . The Vanaraudtee road (Metsapoole viaduct) is expected to be used primarily for transporting forest material, and the average daily traffic volume was estimated at 1 vehicle per day when distributed over the year.

[148] Teede Tehnokeskus AS, 2025. Traffic census results for 2024. https://www.transpordiamet.ee/liiklussageduse-statistika

[149] Teede Tehnokeskus AS, 2025. Local road 2130022 Loigu tee traffic survey

Equivalent noise level maps (LpA,eq) have been prepared for noise propagation. Noise dispersion has been modelled at a height of 2 m above ground level. The calculation method used does not take into account tall vegetation, and therefore the calculated noise dispersion may be somewhat overestimated in forested areas, i.e., noise propagation on the map spreads further than in reality.

Noise dispersion was assessed for both the preliminary design and the value engineering solution. No noise barriers were developed in the preliminary design. During the value engineering noise study, a total of two noise barriers with a total length of 1562 m were proposed for the section to protect residential buildings. The impact modelling carried out as part of the EIA was based on the technical solution of both projects (including the vertical position of the railway, i.e. the height at different sections) and assessed noise dispersion in both cases without the installation of noise barriers in order to then specify the locations and extent of noise reduction measures.

Noise standards

Noise in the outdoor environment must comply with the noise standards established for the protection of human health and well-being. The noise standards used in Estonia are set out in the regulation of the Minister of the Environment[150] . Noise standards for outdoor noise are set separately for daytime (07:00-23:00) and night-time (23:00-07:00) and are divided into limit values and target values:

- noise limit value – the maximum permissible noise level, the exceeding of which causes significant environmental disturbance and requires the implementation of noise reduction measures.
- noise target value – the maximum permissible noise level in areas covered by new comprehensive spatial plans.

According to the Atmospheric Air Protection Act, noise standards depend on the category of land use, which is based on the main purpose of land use as specified in the comprehensive spatial plan. The maximum permissible equivalent noise levels for traffic noise are presented in the table below by category.

Table 8-5. Traffic noise standards

Category	Time	Limit value (dB)	Target value (dB)
Category I – areas of recreation facilities, i.e. quiet areas	Day, Ld	55	50
	Night, Ln	50	40
Category II – areas of educational institutions, health care and social welfare institutions and residential buildings, green areas	Day, Ld	60/65[1]	55
	Night, Ln	55/60[1]	50
Category III – areas of centres,	Day, Ld	65/70[1]	60
Category IV – areas of public buildings	Night, Ln	55/60[1]	50

[1] permitted on the roadside of noise-sensitive buildings

According to the draft of the new comprehensive special plan for Häädemeeste municipality (version to public display), no land use designation has been made for the areas surrounding the railway. Based

[150] Regulation No. 71 of the Minister of the Environment of 16 December 2016 "Ambient noise standards and methods for the measurement, determination and assessment of noise levels"

on this, it has been assumed that there are no new noise-sensitive areas planned for the forest land surrounding the railway.

Regardless of the intended use of the cadastral unit, the yards of all existing residential buildings within the impact area are considered category II areas, i.e. residential areas.

Noise-sensitive areas, i.e. residential buildings and their yards, are located in two areas close to the railway – in Majaka village and Metsapoole village. In other residential areas of the region, the noise level remains below the target value for traffic noise (55 dB during the day and 50 dB at night), which means that no significant noise pollution can be expected.

In Majaka village, three residential areas are most affected by noise: Kurejõe (21301:001:0229), Tiidu (21303:002:0034) and Ülase (21303:002:0432).

According to the calculations, both the preliminary design solution and the value engineering design solution (Figure 8-5 and Figure 8-6) would exceed the daily limit value for traffic noise (60 dB) in the vicinity of the residential buildings in Kurejõe and Tiidu without the implementation of mitigation measures.

The night-time limit value (55 dB) is not exceeded. As the noise levels of the preliminary design and the final design are similar, the night-time noise map is presented here only for the final design (Figure 8-6).

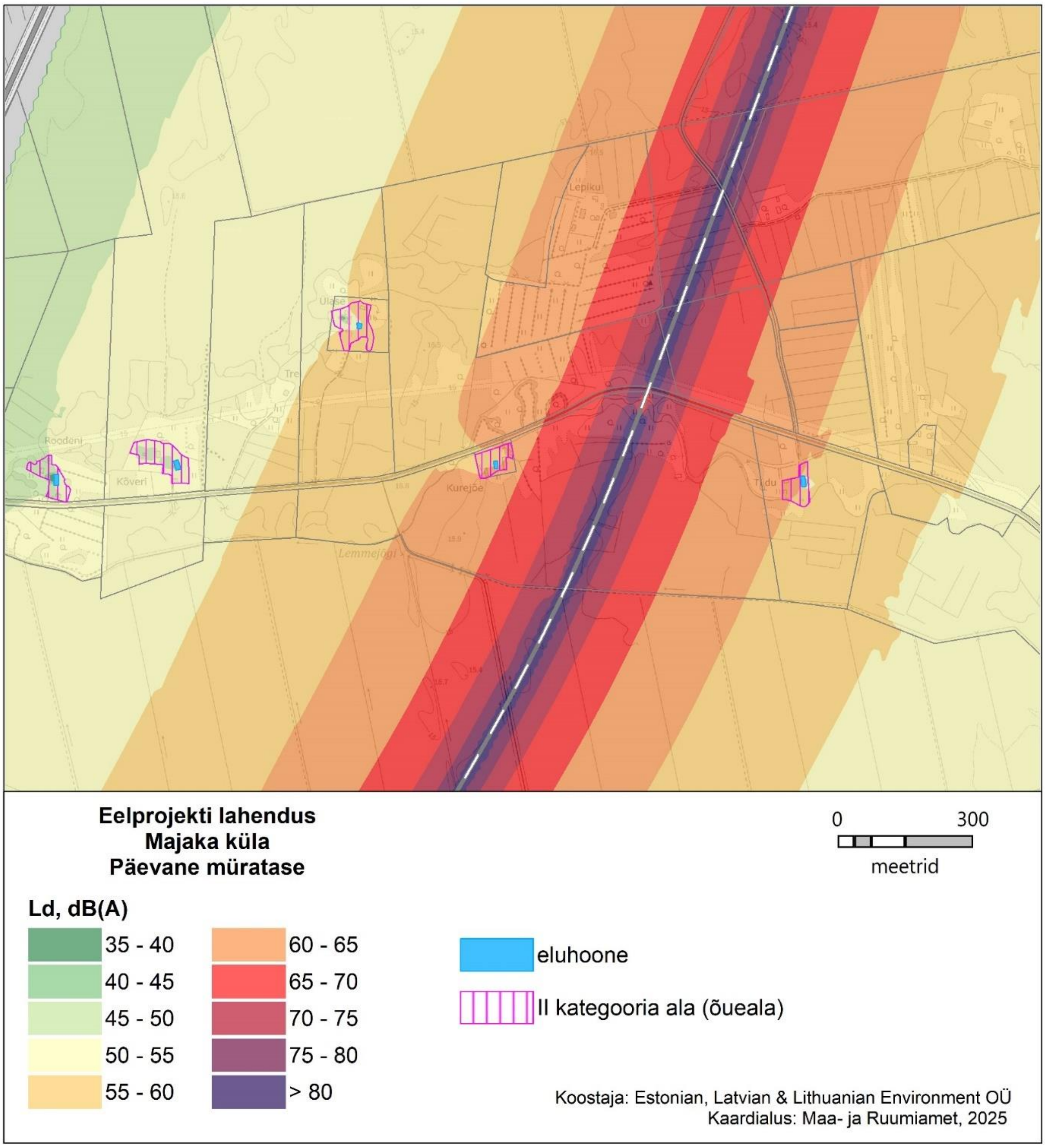


Figure 8-5. Daytime railway noise levels in Majaka village according to the preliminary design solution

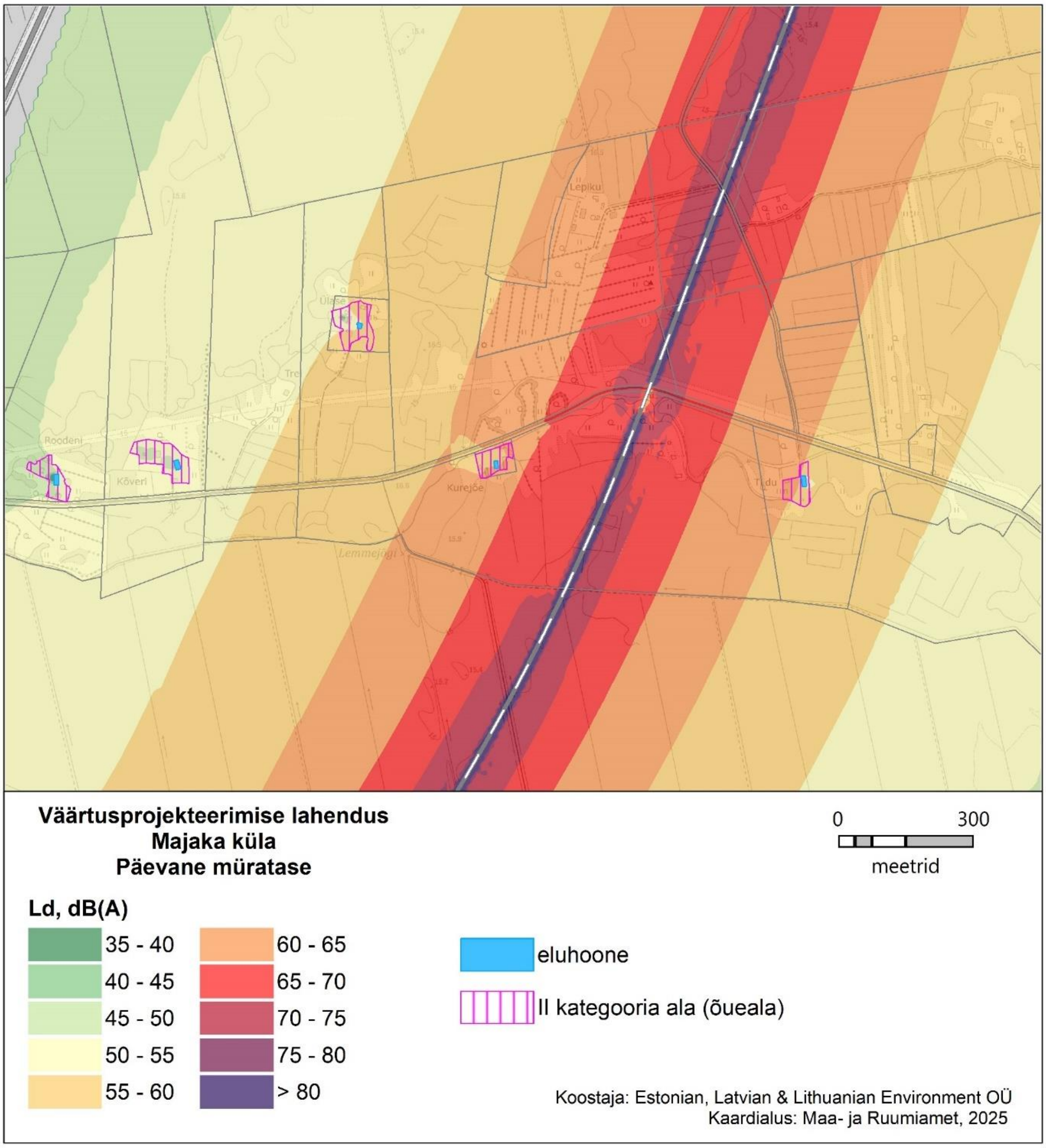


Figure 8-6. Daily railway noise level in Majaka village according to the value engineering solution

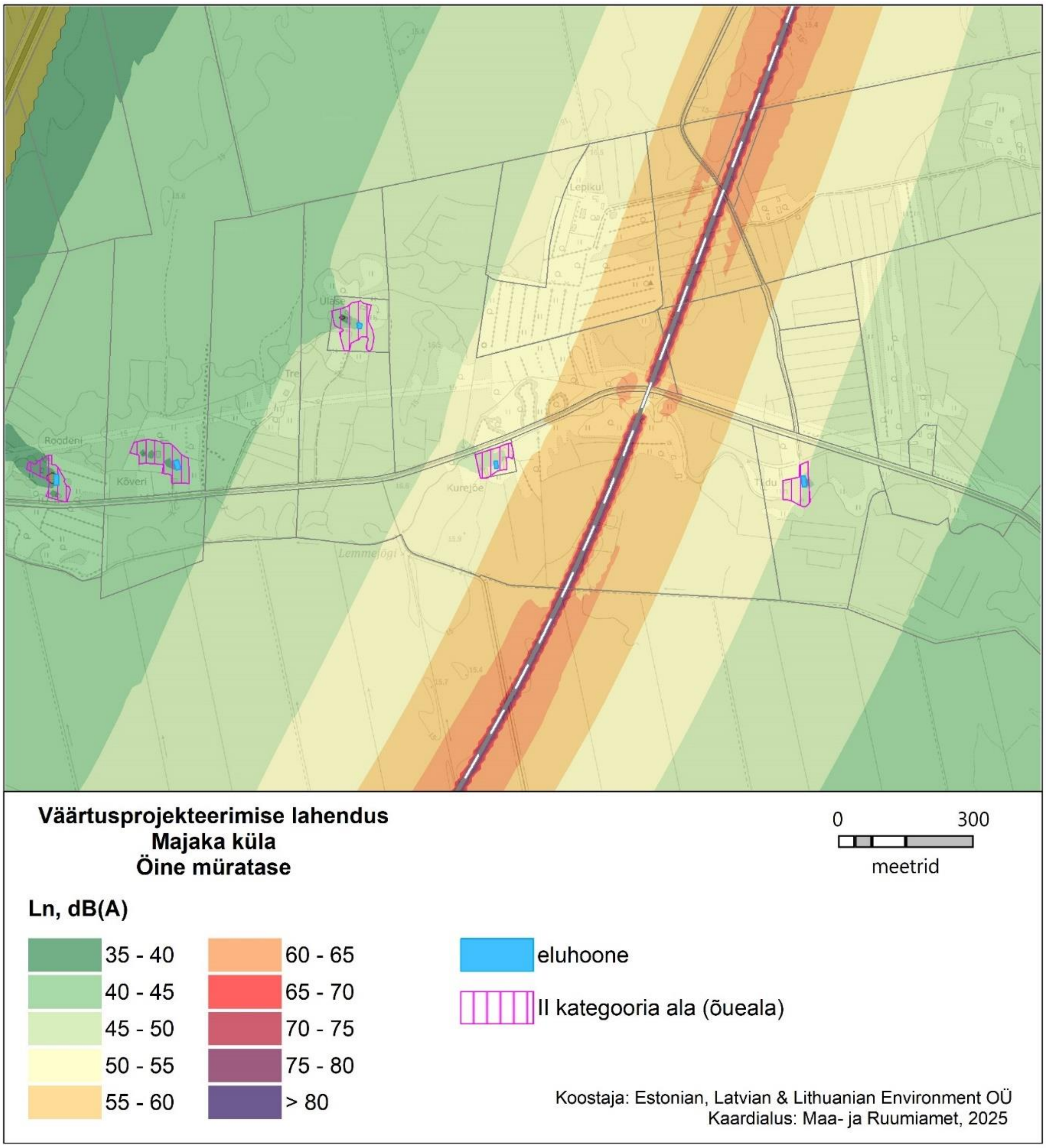


Figure 8-7. Night-time railway noise level in Majaka village according to the value engineering solution

Noise pollution can be mitigated by installing noise barriers.

By installing noise barriers on both sides of the railway in Majaka village, compliance with noise standards will be ensured and significant adverse effects will be avoided (Figure 8-8). In order to comply with the noise limits for existing residential buildings, it is necessary to construct a noise barrier approximately 250 m long to the east of the railway and a noise barrier approximately 400 m long to the west of the railway. In order to achieve stricter noise target values applicable to new noise-sensitive areas, the parameters of the necessary noise barriers are more than twice as high.

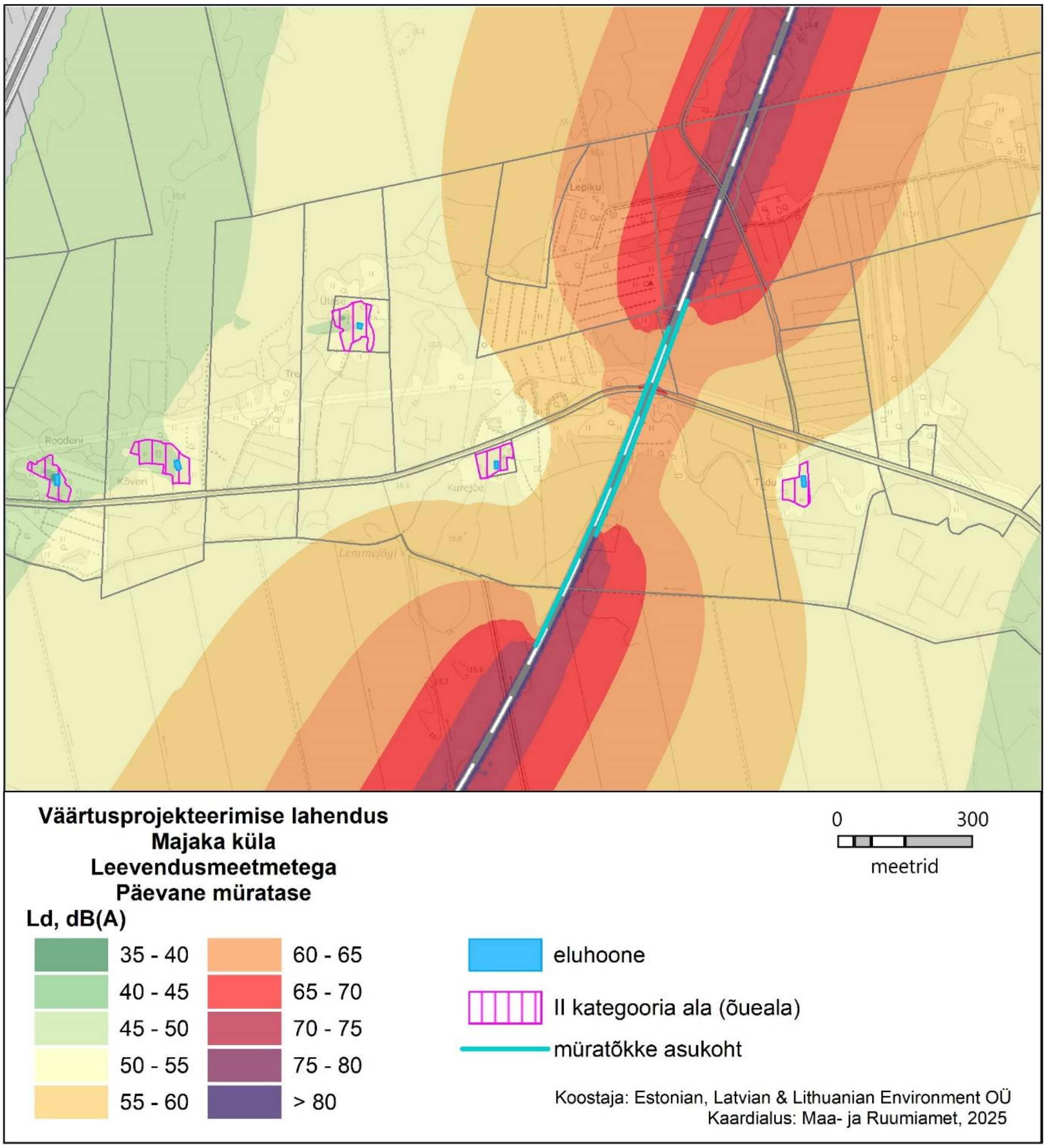


Figure 8-8. Daily railway noise level in Majaka village, value engineering solution with noise barriers

In Metsapoole village, five residential areas are most affected by noise: Eegi (21303:006:0428), Kiviloo (21303:006:0445), Kallase (21303:006:0196), Printsi (21303:006:0432) and Lootuse (21303:006:0028). According to the preliminary design solution, without mitigation measures, the daily traffic noise limit would be exceeded at the Eegi and Kiviloo residential buildings (Figure 8-9).

The limit value for the night-time assessment period would not be exceeded.

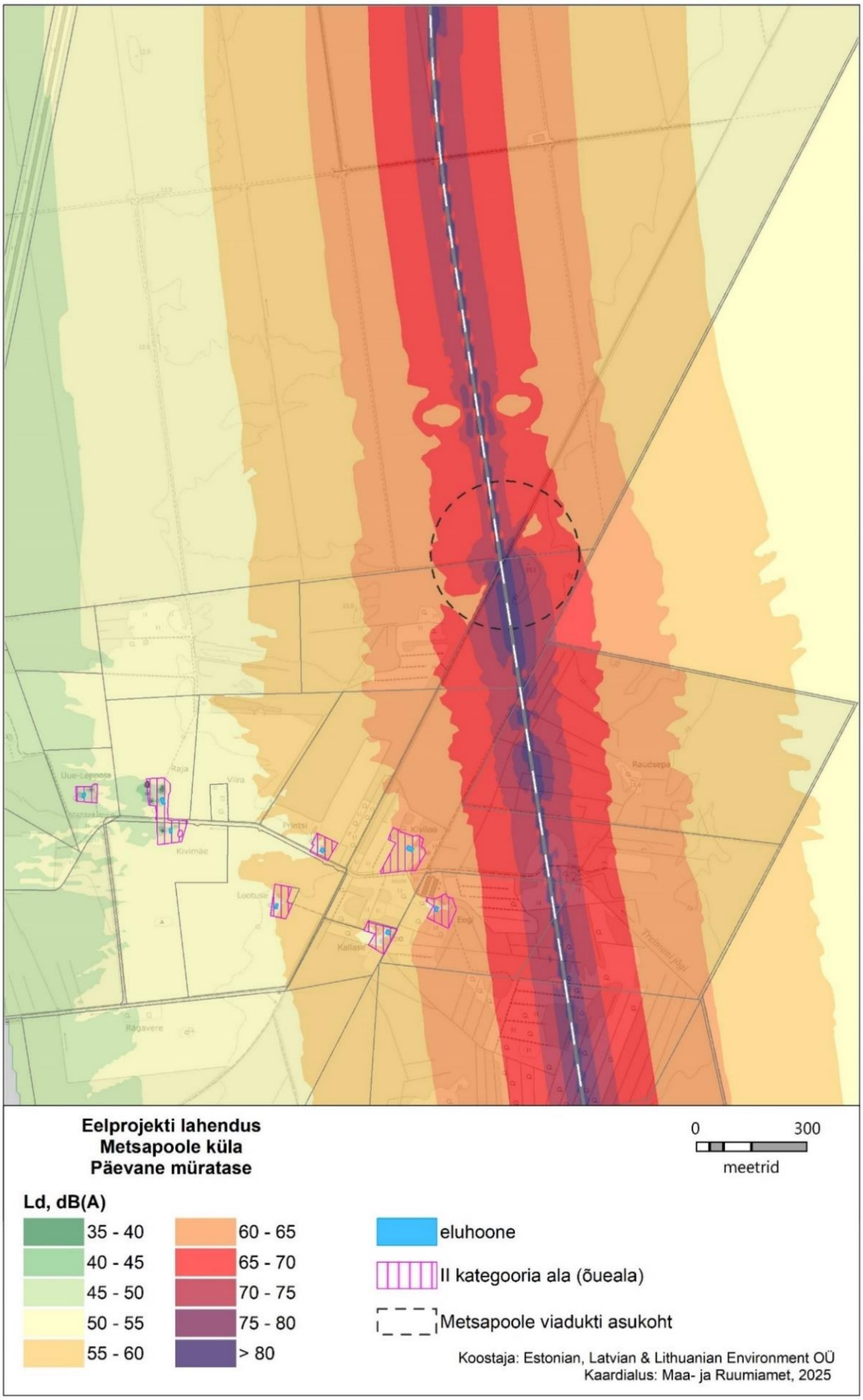


Figure 8-9. Daily railway noise level in Metsapoole village in the preliminary design solution

In the case of the value engineering alternative, the noise level in Metsapoole village was modelled with two alternative locations for the Metsapoole viaduct (two-level intersection) (Figure 8-10 and Figure 8-11) and also in a situation where the viaduct in Metsapoole village is not built (Figure 8-12).

The location of the intersection has a minor impact on the noise level at the nearest residential buildings. Similar to the preliminary design, the calculated noise level in the nearest courtyards during the day would reach 60 dB without noise barriers for all alternatives, which is the traffic noise limit set for residential areas. The area exceeding the limit value is slightly smaller for alternative 1 (due to the noise-reducing effect of the viaduct) and slightly larger for alternative 2 and in the absence of a viaduct. However, this difference can be considered marginal, and noise reduction measures will need to be implemented in Metsapoole village in order to avoid significant impact on residents, regardless of which alternative is implemented.

None of the alternatives exceed the limit value at night. As the noise levels of the preliminary design and all alternative design solutions are similar, the night-time noise map is only presented for the solution without a viaduct (Figure 8-13).

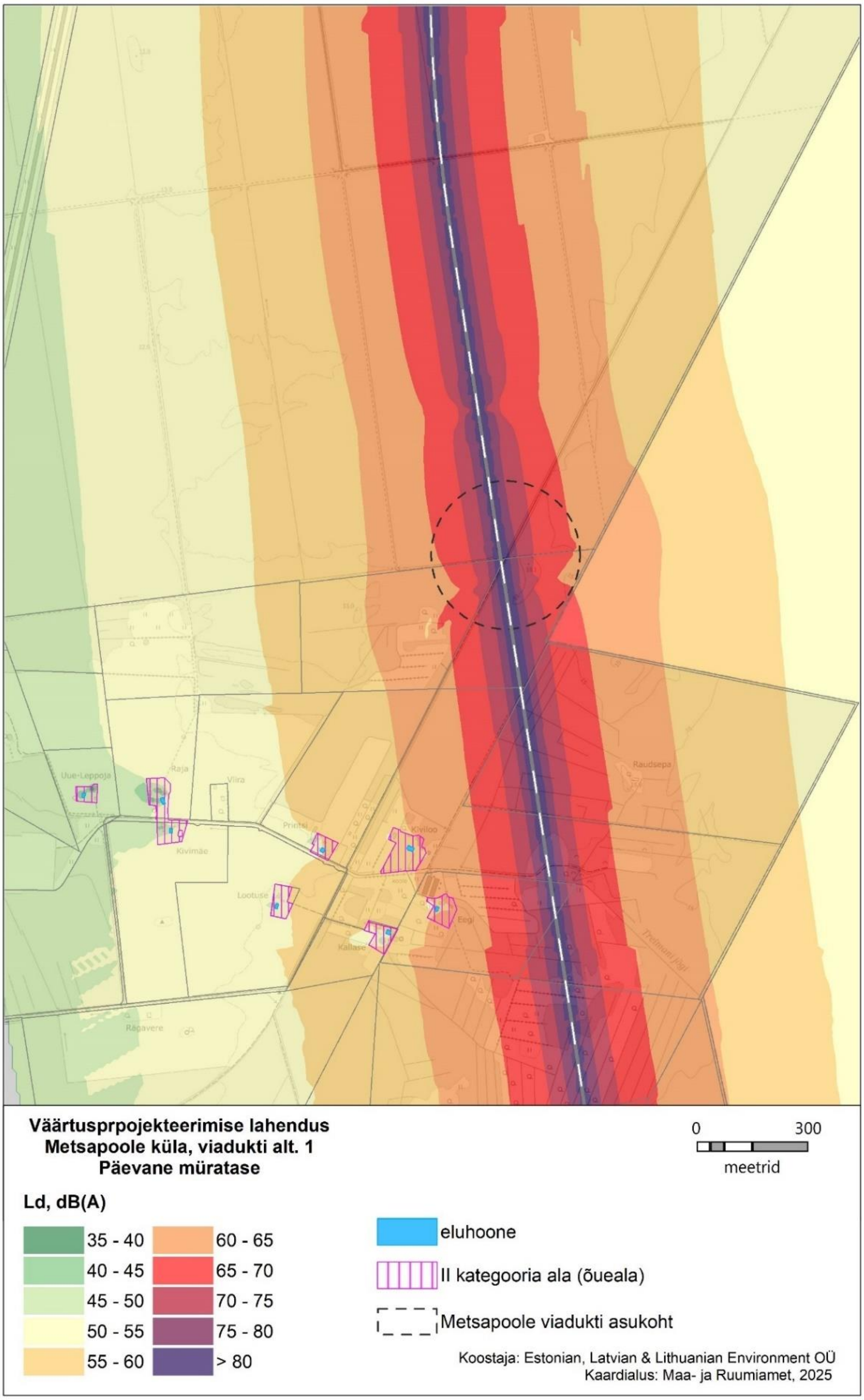


Figure 8-10. Daytime railway noise levels in Metsapoole village with the value engineering design solution, viaduct alternative 1

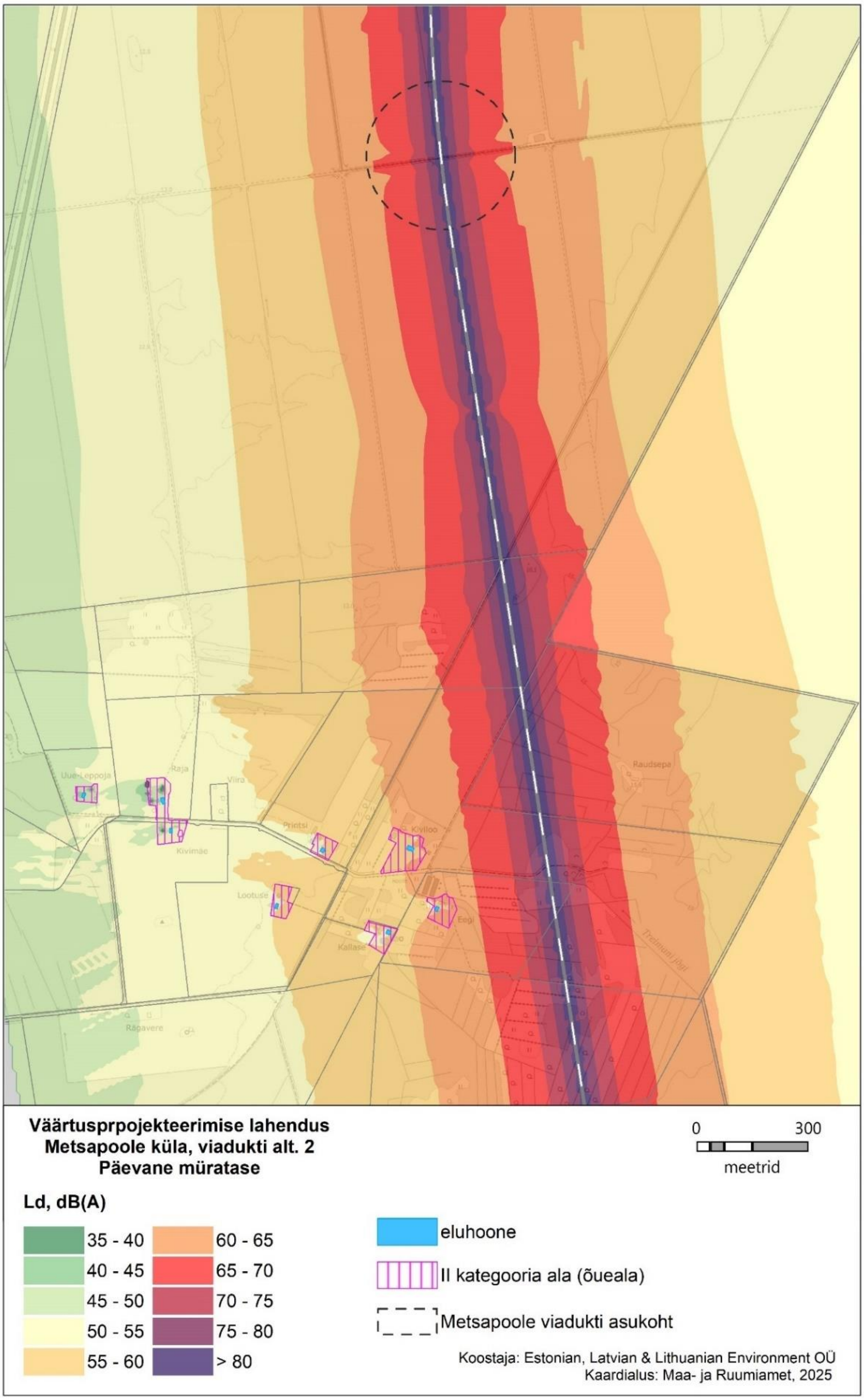


Figure 8-11. Daily railway noise level in Metsapoole village in the value engineering solution, viaduct alternative 2

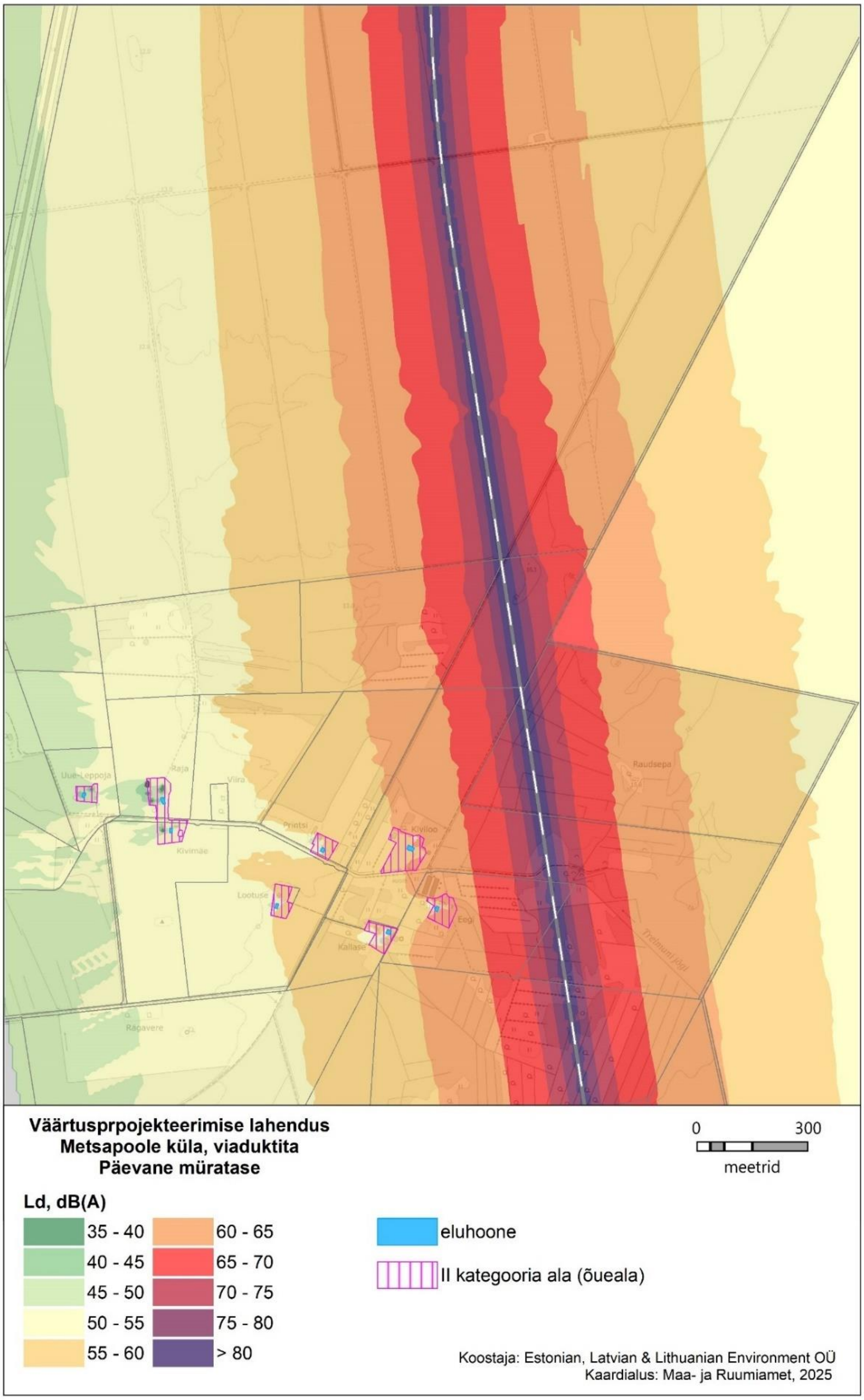


Figure 8-12. Daytime railway noise level in Metsapoole village in the value engineering solution, without viaduct

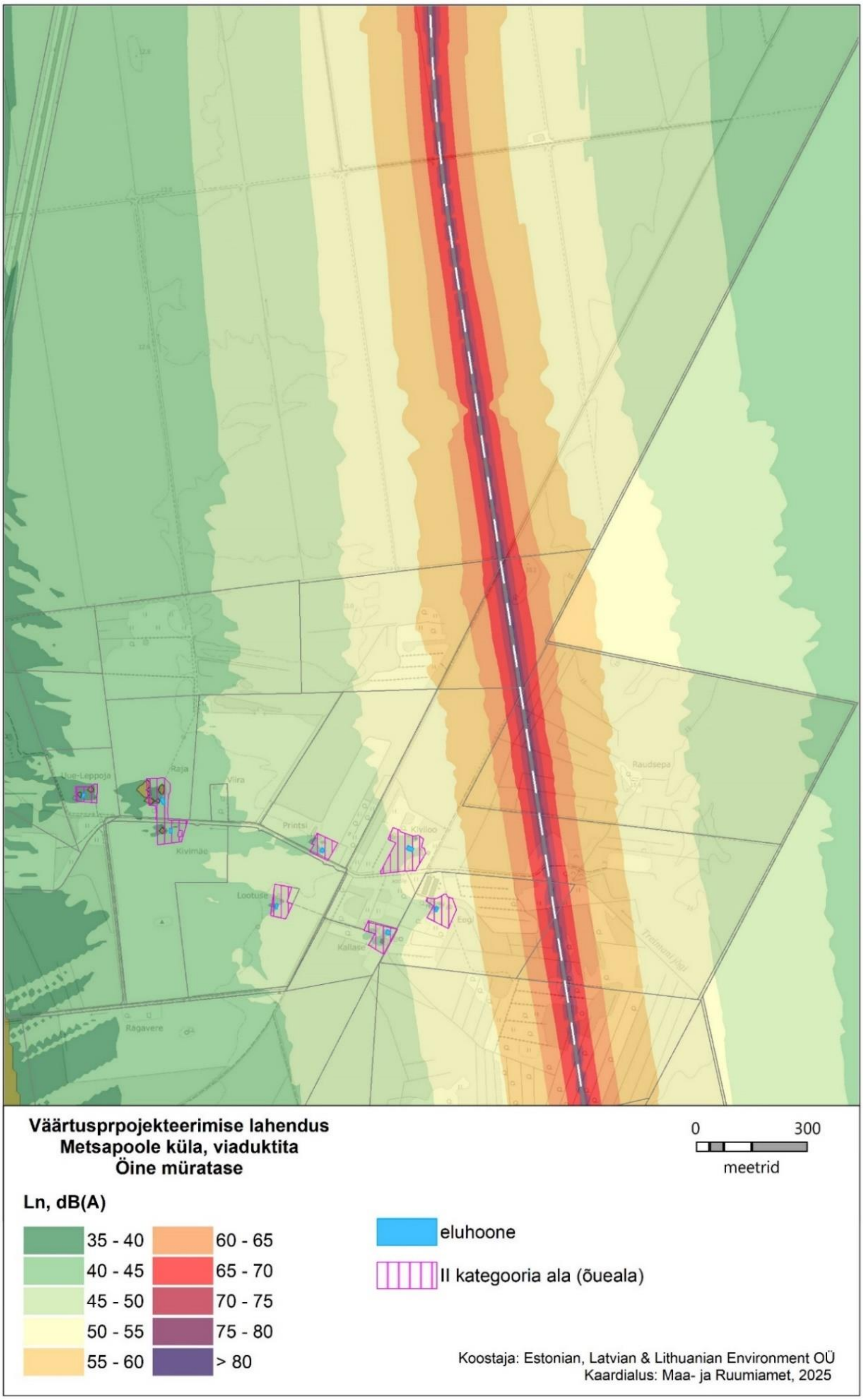


Figure 8-13. Night-time railway noise level in the value engineering solution, without a viaduct

Noise pollution can be mitigated by installing noise barriers. By installing a noise barrier approximately 500 m long in Metsapoole village, compliance with the noise standards (limit values) for existing residential buildings will be ensured and significant adverse effects will be avoided. In order to achieve stricter noise standards, i.e. noise target values, it is necessary to construct a noise barrier approximately 700 m long and 3 m high.

A noise barrier with these parameters is sufficient to ensure compliance with noise standards both when constructing the Metsapoole viaduct in both alternative locations and when not constructing the viaduct.

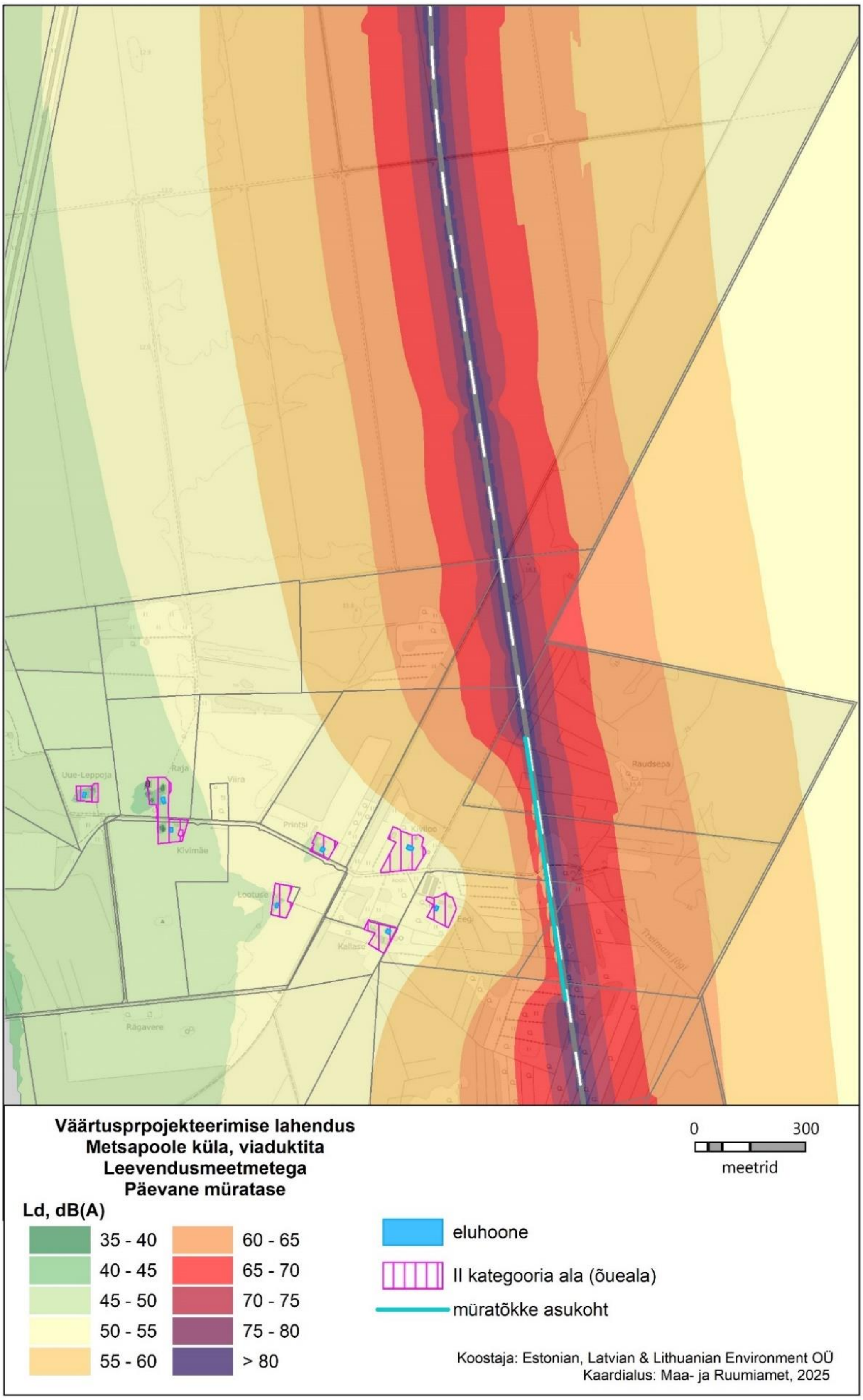


Figure 8-14. Daily railway noise level in Metsapoole village, value engineering design solution without a viaduct, with noise barriers

The following table shows the noise from RB railway traffic at the buildings closest to the railway with and without noise barriers.

Table 8-6. Railway traffic noise levels in the yards of the nearest residential buildings

Cadastral unit	Railway section, km	Noise level without mitigation measures, dB		Noise level with mitigation measures, dB	
		Day, Ld	night, Ln	day, Ld	night, Ln
Tiidu, 21303:002:0034	1,60	61	51	55	45
Kurejõe, 21301:001:0229	1,75	64	54	54	44
Kiviloo, 21303:006:0445	9,60	62	52	55	44
Eegi, 21303:006:0428	9,77	63	53	55	44

The maps showing the combined impact of rail and road traffic in the value engineering solution (without the Metsapoole village viaduct) with mitigation measures, i.e. noise barriers, are presented below.

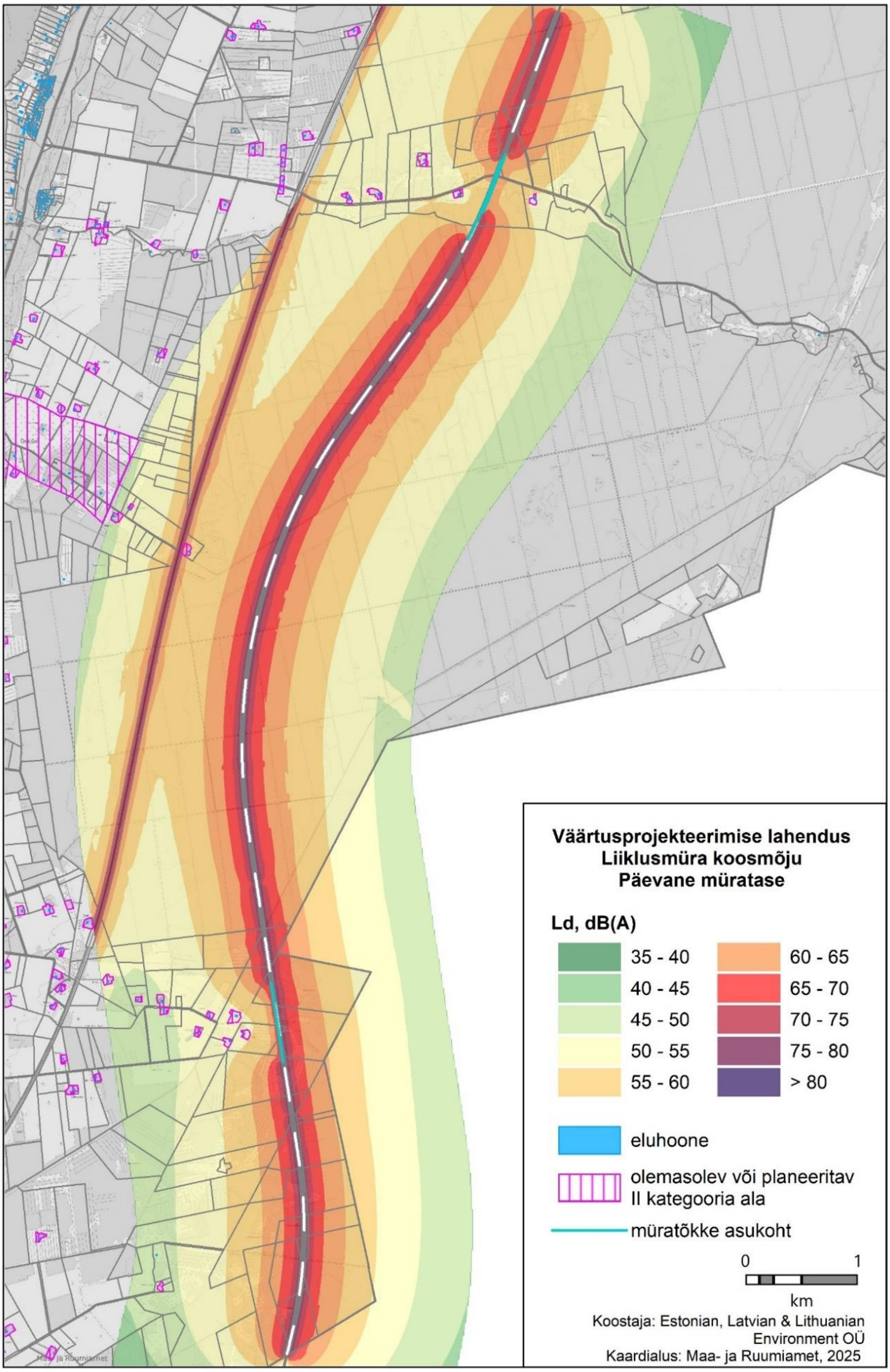


Figure 8-15. Daytime traffic noise combined impact value engineering solution with mitigation measures

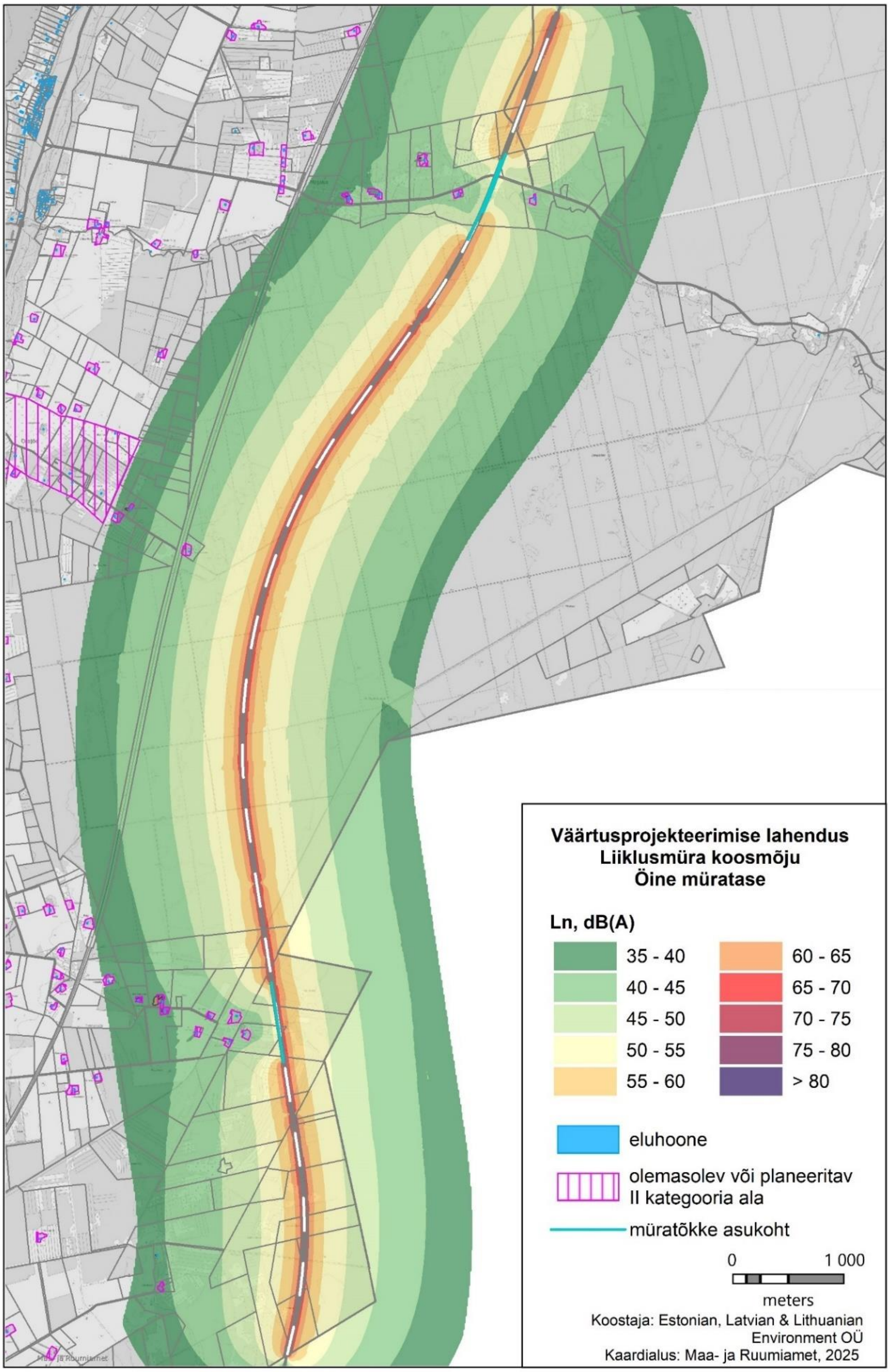


Figure 8-16. Combined impact of night-time traffic noise, value engineering design solution with mitigation measures

Conclusion

The construction and operation of the railway will increase noise levels in the area. The results of noise level modelling showed that, given the projected frequency of railway traffic, the applicable noise limits would not be met without mitigation measures in the residential buildings closest to the railway (four households), and that noise barriers would need to be installed.

The preliminary design did not include noise barriers, but the value engineering noise study proposed noise barriers for the section to protect the residential buildings. Therefore, the value engineering design solution has a more favourable impact in terms of noise. As a mitigation measure, it is important to avoid the adverse impact of increased noise levels when installing noise barriers in all alternatives considered in the EIA report.

8.13 Impact of vibration

Vibration levels are regulated by Regulation No. 78 of the Minister of Social Affairs[151]. This regulation establishes general vibration limit values for residential and public buildings. For the purposes of the Regulation, general vibration is defined as mechanical oscillation that is transmitted to a standing, sitting or lying person via supporting surfaces.

An overview of the limit values for vibration levels for daytime and night-time periods is provided in the table (Table 8-7).

Table 8-7. Vibration standard levels. Vibration acceleration limit values Lav (dB), av (m/s²)

Buildings and rooms	Operating time - day (07-23)		Operating time - night (23-07)	
	a_v (m/s²)	L_{av} (dB)	a_v (m/s²)	L_{av} (dB)
Existing				
Living rooms, group rooms and bedrooms in residential buildings, communal accommodation and care facilities, pre-school childcare facilities	0,0126 (2,0¹)	82 (2,0¹)	0,00883 (1,4¹)	79 (1,4¹)
Educational institutions' teaching rooms	0,0126 (2,0¹)	82 (2,0¹)	none	none
Offices and administrative buildings	0,0252 (4,0¹)	88 (2,0¹)	none	none
Planned				
Living rooms, group rooms and bedrooms in residential buildings, communal dwellings and care institutions, pre-school childcare facilities	0,00883 (1,4¹)	79 (1,4¹)	0,00631 (1,0¹)	76 (1,0¹)

¹ base curve coefficient – a multiplier by which the numerical values of the base curve of vibration acceleration must be multiplied

[151] Regulation No. 78 of 17 May 2002 "Limit values for vibration in residential and public buildings and methods for measuring vibration". https://www.riigiteataja.ee/akt/110061?leiaKehtiv

Impact during construction

During the construction period, vibrations are mainly caused by construction machinery, mechanisms and vehicles.

There are various options for reducing vibration during construction (if necessary), such as choosing construction technology and/or construction machinery that generates lower vibration levels.

The condition of roads used for transporting construction materials is important in terms of vibrations caused by construction traffic, especially heavy vehicles.

A road in poor condition causes more vibration in the surrounding area than a road in good condition. When planning construction work, the possible transport routes should be identified in order to assess the technical condition of the roads used for transporting construction materials. If necessary, the quality of roads should be improved to reduce the impact of vibrations.

As the choice of construction machinery and technology is made by the contractor and the transport routes for construction materials are not known, it is not possible to give a more precise assessment. However, it can be concluded that, provided that the requirements of the legislation are complied with, no significant adverse effects of vibration are likely to occur during the construction period.

Impact during operation

The assessment method takes into account the possible discomfort that may be caused by vibrations from train traffic.

The assessment of damage caused by vibration is first necessary for existing residential buildings located in risk areas where vibration has not been assessed previously or when planning new buildings. There are no residential buildings or other buildings subject to vibration limits or where vibration disturbance could occur in the section of the railway's impact area (up to 100 m).

In order to demonstrate the extent of the vibration impact associated with the planning of new railway tracks, vibration mapping will be carried out with the aim of showing the extent of the potential risk area so that, if necessary, additional studies can be carried out and appropriate measures to reduce vibration can be selected.

In other sections of the RB project, the vibration standards are met at a distance of 23 m from the railway[152]. Therefore, no on-site investigations have been carried out to describe the ground conditions in the section of the railway under consideration, as there are no vibration-sensitive buildings in the potential impact area (up to 100 m on either side of the railway). Consequently, it was not necessary to perform vibration calculations to determine whether vibration reduction measures are necessary on the section of the railway in question.

As vibration-sensitive buildings are located more than 100 m from the planned railway, they will not be affected by vibrations from the railway. Consequently, in the section of the railway under consideration, the vibration limit values established by Regulation No. 78 of the Minister of Social Affairs of 17 May 2002 are met at the nearest vibration-sensitive buildings, and there is no need to implement additional vibration mitigation measures in railway design.

[152] Skepast and Puhkim, 2023. Environmental impact assessment (EIA) of the construction project for the section of the Rail Baltic railway line between Rapla and Pärnu County border – Tootsi. Report

8.14 Impact on ambient air quality

During construction, the quality of ambient air may be affected by dust stirred up from the construction site and unpaved roads during the handling of bulk materials and the movement of transport vehicles. Emissions of pollutants contained in the exhaust gases of construction machinery used may also have an impact.

During operation phase, the ambient air quality may be potentially affected by pollutants in the exhaust gases of railway maintenance machinery. As 100% of passenger train traffic is planned to be electrified, pollutants from fuel combustion are not relevant in this case. The following is an assessment of the emissions generated, their dispersion and their impact on ambient air, broken down by stage.

8.14.1 Impact during construction

For information on pollutants generated during construction and their sources, see chapter 4.6.2.

The main potential sources of air quality impact during construction are pollutants in exhaust gases from the combustion of fuels in internal combustion engines of construction machinery and airborne particles at the construction site during the loading of materials (soil and other material from site clearing, and from the loading and handling of loose material used in the construction of the railway embankment) airborne particles, including fine particles, at the construction site. Emissions are limited in time to the construction period and cease after its completion.

The generation and spread of dust (particulate matter, fine particulate matter and particularly fine particles) associated with construction activities is generally limited to the immediate vicinity of the construction site. This is also demonstrated by similar impact assessments. To assess the impact during construction, an assessment of pollutant emissions and modelling of pollution levels from both material handling and internal combustion engines of construction machinery was carried out as part of the EIA assessment for RB 7[153]. The assessment considered, among other things, the number of possible rainy days in Estonia, as solid particles are mainly released during dry periods.

The assessment carried out can be extended to the work carried out in this section.

The results are summarised in the table below (Table 8-8). No significant adverse impact on ambient air quality is expected during construction. The highest calculated concentrations of PM_{10} and $PM_{2.5}$ particles will occur in the vicinity of the construction site and storage areas for construction materials, therefore a relatively greater impact is expected in the immediate vicinity of the railway track – at the construction site and work site in the railway corridor.

[153] Environmental impact assessment of the Tootsi–Pärnu section of the Rail Baltic railway line. ELLE OÜ, 2024.

Table 8-8. Calculation results for ambient air pollutant emissions and dispersion and impact assessment[154]

Pollutant	Maximum concentration (µg/m^3)	Calculation period/detection period	Pollutant concentration in relation to air quality standards, %
Nitrogen dioxide (maximum concentration)	60,0	Year/1 h	30,0
Nitrogen dioxide (average concentration)	1,5	Year/calendar year	3,7
Carbon monoxide (maximum concentration)	175,7	Year/8 h	1,8
Fine particulate matter PM_{10} (maximum concentration)	15,1	Year/24 h	30,2
Fine particulate matter PM_{10} (average concentration)	5,6	Year/1 h	14,0
Particularly fine particles $PM_{2.5}$ (average concentration)	1,6	Year/1 h	6,6

The emission and spread of pollutants into the ambient air during the construction of railways and related infrastructure can be limited by organisational and technical measures. Dusty construction materials and waste must be moistened during handling (transport, loading, unloading, temporary storage) to prevent/reduce dust formation and dispersion. Moistening is particularly important during dry periods with no precipitation for a long time. Closed vehicles must be used to transport easily dusty materials, or the load must be covered with a load cover to prevent the spread of dust. During periods without precipitation, dust control measures should also be carried out on uncovered roads leading to the construction site and on construction sites themselves, if necessary. Hard-surfaced areas of the construction site and vehicles and machinery used for work should be cleaned periodically to remove any dust that has accumulated.

In addition to traffic load, traffic-related air pollution is also related to the nature of traffic and the technical condition of vehicles. To reduce negative impacts, speed limits should be imposed on roads leading to the construction site if necessary. It is also important to clean roads of dust accumulating at the roadside and, if gravel roads are used, to carry out dust control (depending on weather conditions). Attention must be paid to the technical condition of vehicles, machinery and equipment – they must be in working order and comply with applicable standards.

[154] Based on the analogy of the Rail Baltic Tootsi-Pärnu section.

Odours

Certain types of work (e.g. surface treatment of infrastructure objects associated with railway tracks, removal of asphalt pavement, refuelling of machinery and equipment) may involve the generation, emission and dispersion of odorous substances, which may cause odour nuisance. The presence of odorous substances is considered a significant environmental nuisance if the presence of odorous substances exceeds the proportion of odour hours in the total number of hours in a year (the odour nuisance level at the receptor is 15% or more of the odour hours in a year)[155] .

Considering that the location of construction works changes and that the occurrence of odorous substances is related only to specific activities and the time of their performance, which are predominantly short-term, the occurrence of odorous substances exceeding the proportion of odour hours per year and, therefore, **significant odour nuisance during construction works is not expected**.

Based on previous experience, no significant odour nuisance is known to have occurred during the construction of other infrastructure (roads, viaducts, etc.).

8.14.2 Impact during operation phase

For information on pollutants generated by railway operations and their sources, see chapter 4.6.2.

To assess the impact during operation phase, an assessment of pollutant emissions and modelling of pollution levels were carried out during the EIA assessment of section 7 of the RB[156] . The analogy in section 7 can also be used in this section. *Approximately* 10% of freight trains on the Rail Baltica railway line are planned to be diesel-powered during the first 5–7 years of operation[157]. The remaining freight trains and all passenger trains are planned to be electrified. In addition, diesel locomotives will be used for shunting at stations and for maintenance work on the main line (track repairs, snow clearance, etc.). Pollutant emissions may be caused by electricity generation, which does not affect emissions from the railway or the impact on the surrounding area.

Considering the estimated traffic frequency of freight trains, one train per day is expected to be powered by diesel locomotives during the first 5-7 years of operation. This is a very small proportion. The frequency of vehicles used for maintenance is also likely to remain low.

Literature sources also refer to some possible emissions of air pollutants associated with electric train traffic, such as particle emissions from brakes and train wheels and rail wear during braking, but these remain at insignificant levels.

No literature source concludes that railway use can be a source of odour-causing substances. Similarly, railway use does not cause dust pollution.

Most of the roads planned as part of the railway section are intended for local use or for servicing the railway infrastructure, and their daily traffic volume is low. As the intensity of road use is low, no deterioration in air quality is expected, even in combination with other roads in the area. Air pollution from roads can be reduced by ensuring calm and smooth traffic and, if necessary, by regularly cleaning

---

[155] Procedure for assessing the presence of odorous substances, requirements for assessment and disturbance levels for odorous substances RT I, 29.12.2016, 51 https://www.riigiteataja.ee/akt/111072023018?leiaKehtiv (entry into force 04.10.2024)

[156] Environmental impact assessment of the Tootsi–Pärnu section of the Rail Baltic railway line. ELLE OÜ, 2024.

[157] Rail Baltic county-wide spatial planning SEA report. Approved report. Hendrikson & Ko OÜ, 2017; *Rail Baltica: Preparation of the Operational Plan of the Railway. Final Study Report. ETC Transport Consultants GmbH, COWI AS and IFB, 2018*

roadsides of dust. On unpaved roads, dust control measures must be taken during dry periods without precipitation.

There is no combined impact on ambient air quality with local emission sources, as there are no local emission sources in the area of the planned activity (see also section 5.9).

The quality of ambient air may also be affected by accidents on the railway, which may result in higher concentrations of pollutants being released into the environment and, depending on the goods being transported, the spread of unpleasant and irritating odours. The impact of possible accidents must be mitigated by risk assessment and compliance with relevant safety requirements. The risk assessment must be carried out in cooperation with the Rescue Board.

There are no differences in the significance of the impact on ambient air in the comparison of project solutions.

The national air pollution reduction programme[158] states that the construction of Rail Baltic is expected to increase the use of public transport and achieve energy savings through the partial shift of freight transport from road to rail, reducing fuel consumption and emissions of pollutants (SO2, PM2.5, NOX and LOÜ) emissions. In the long term, Rail Baltica could therefore have a positive impact on ambient air quality.

Overall, the impact on ambient air quality remains neutral for both alternatives when using rail.

8.15 Impact of electromagnetic fields

The environmental impact assessment of RB analysed the levels of electric, magnetic and electromagnetic fields (EMF) of three different types of electrified infrastructure on the railway section. The potential impact of electromagnetic fields on the environment can be examined through the impact of the electromagnetic environment:

- living nature, including the effect of electromagnetic fields on the basic functions of organisms, both individually and on the material structure of living organisms as a whole
- other artificial systems, including radio communications and systems sensitive to electromagnetic fields.

The impact of EMF has been assessed in section 6 of the RB[159] and this assessment can also be extended to the present section. The impact on living organisms has been most studied and established in the context of humans. In general, a response or sensitivity to certain functions (e.g. the nervous system) at significantly lower EMF levels is considered to be the primary effect. Stronger radiation can lead to the destruction of cells and tissues. To ensure that electromagnetic fields are safe for humans, Estonia has implemented national regulations that set limit values for:

- Levels of electric, magnetic and electromagnetic fields safe for human health in public, living and recreational areas are established by Regulation No. 38 of the Estonian Minister of Social Affairs of 1 June 2002 "Limit values for non-ionising radiation in living and recreational areas, residential buildings and public buildings, classrooms and measurement of non-ionising

[158] National Programme for the Reduction of Emissions of Certain Air Pollutants for 2020–2030. Annex 1. Ministry of the Environment, 2019

[159] Environmental impact assessment (EIA) of the construction project for the section of the Rail Baltica railway line between Rapla and Pärnu County border – Tootsi. Skepast ja Puhkim OÜ, 2023

radiation levels"[160] (Regulation 38). The regulation is based directly on European Union (EU) Council Recommendation 1999/519/EC, which in turn refers to the action levels (ALs) developed by the International Commission on Non-Ionising Radiation Protection (ICNIRP);

- EMF levels and their control in the working environment are regulated by Regulation No. 44 of the Government of the Republic of Estonia of 1 July 2016 "Occupational health and safety requirements for workplaces exposed to electromagnetic fields, limit values for exposure to electromagnetic fields and application values, and the procedure for measuring electromagnetic fields"[161] (hereinafter referred to as Regulation 44). The Regulation is based on EU Directive 2013/35/EU. The Directive and the Regulation lay down limit values for human exposure to electromagnetic fields, i.e. standards based on biophysical and biological considerations, in particular on scientific evidence of short-term and acute direct effects, including thermal effects and electrical stimulation of tissues.

This EIA report relies on the limit values established in Regulation No. 38 with regard to the impact of EMF. The maximum permissible intensities of electric, magnetic and electromagnetic fields are presented as limit values established on the basis of basic restrictions. Basic restrictions are basic values above which there may be a potential impact on human health.

The assessment and measurement of radiation affecting the human body is complex or even impossible and depends on many factors. Based on the basic restrictions, limit values have been developed for the intensity of electric, magnetic and electromagnetic fields in which it is unlikely that the basic restrictions will be exceeded for humans. This also means that EMF intensities below the limit values may have an effect on health.

The limit values for non-ionising radiation established by Regulation No. 38 are presented in the table below (Table 8-9). Compliance with the regulation in Estonia is monitored by the Health Board.

Table 8-9. Limit values for non-ionising radiation

Frequency	Electric field strength, V/m	Magnetic flux density, µT
1 – 8 Hz	10 000	$4 \cdot 10^4/f^2$
8 – 25 Hz	10 000	5 000/f
25 – 800 Hz	$2{,}5x10^5/f$	5 000/f
0,8 – 3 kHz	$2{,}5x10^5/f$	6,25
3 – 150 kHz	87	6,25
0,15 – 1 MHz	87	$0{,}92/f_M$
1 – 10 MHz	$87/ f_M^{0,5}$	$0{,}92/f_M$
10 – 400 MHz	28	0,092
400 – 2000 MHz	$1{,}375\ f_M^{0,5}$	$0{,}0046\ f_M^{0,5}$
2 – 300 GHz	61	0,20

Note: f_M denotes frequency in MHz, where 1 MHz = 106 Hz; f denotes frequency in basic units Hz.

[160] https://www.riigiteataja.ee/akt/163816 (effective date of entry into force: 01.06.2002)

[161] https://www.riigiteataja.ee/akt/107042016004?leiaKehtiv (effective as of 01.01.2019)

Areas where transmission lines operate at a frequency of 50 Hz are unsuitable for permanent human habitation:

- the electric field strength exceeds 5000 V/m or
- the magnetic flux density exceeds 100 µT.

Areas where the electromagnetic field level exceeds the specified limits are considered to have a potential physiological or biological effect on humans if they are exposed to it continuously. The establishment of residential buildings, the use of residential buildings or other forms of permanent presence in this area should be avoided. Short-term exposure to EMF levels exceeding the limit values is not considered dangerous.

The following conclusions have been reached regarding EMF intensity and expected effects:

- At a distance of 10 m from the track axis or the edge of the platform (in the case of a station with a platform), EMF levels are expected to remain below 2.5% (but not exceeding 6.5%) of the limit values. EMF levels relative to the limit values are very low, making it highly unlikely that EMF of this strength could have a significant impact on the environment or be harmful.
- At a distance of 15 m from the track centre or the edge of the platform (in the case of stations with platforms), EMF levels are expected to remain below 1% (but not exceeding 3.6%) compared to the limit values. EMF levels relative to the limit values are very low, so it is very unlikely that EMF of this strength could have a significant impact on the environment or be harmful;
- Intense EMF may occur in the immediate vicinity of RB traction substations, especially in the vicinity of connections between traction substations and railways. The operational frequency of EMF can be reduced by the geometric arrangement of connection conductors. EMF levels at high frequencies can be reduced by shielding equipment that causes high emissions. EMF levels relative to the limit values are very low under other conditions, so it is very unlikely that EMF of this strength could have a significant impact on the environment or be harmful.
- The radio communication technologies expected to be used for the RB infrastructure functions are not expected to pose an increased risk to facilities or explosive devices, provided that they are located at least 10 m away from RB tracks and/or other infrastructure elements.

It is reasonable to ensure periodic monitoring of EMF levels during RB operation in order to prevent prolonged exposure to higher EMF levels due to accidental deviations or inappropriate construction/maintenance/repair measures.

There are no differences between the alternatives in terms of EMF levels, as the RB electrical infrastructure must be designed and constructed in accordance with applicable legislation, norms and standards and good practice.

8.16 Impact of light pollution

The area significantly affected by light pollution is usually located in the vicinity of the light source but also depends on the type and intensity of the light source and the surrounding environment. The impact of light pollution is greater during the construction period when construction work is carried out in areas where there is no existing artificial lighting and no movement of machinery, and therefore no artificial lighting. Such areas are prevalent along the railway section in question, as the area is sparsely populated and the railway mainly runs through forests. This has a disturbing effect on animal and bird species in the vicinity of the railway, especially during the breeding and rearing season (see also the impact on fauna in chapter 8.3).

In some areas (e.g. near roads), lighting already has an impact, which means that additional lighting resulting from the construction of Rail Baltica will not have a significant impact. However, the current situation will change in some places, as the planned road crossings with the railway will be elevated above the railway, which means that light sources (vehicles, possible street lighting) will be located higher above the ground. At the same time, it should be noted that there are no legal limits or limit values for light pollution. Light pollution should therefore be considered more as a nuisance.

Light pollution is possible in railway corridor areas where continuous lighting is provided during hours of darkness for safety or other reasons. This is mostly the case at stations and stops. No stations or stops are planned for the section under consideration.

The impact of train lighting is noticeable along the railway, especially in curves. In unlit areas, the light from a train travelling at high speed in the dark can be unexpected and disturbing. However, with regular train traffic, both people and animals become accustomed to the light caused by trains. In residential areas, noise barriers have been designed along the railway line to prevent any light from trains reaching residential buildings.

Construction site lighting may also disturb residents in the vicinity, especially if construction work is carried out late in the evening or at night. On the other hand, construction site lighting is a precautionary measure to ensure occupational safety. Additional lighting is necessary if required by occupational health and safety standards and/or construction technology requirements. In order to minimise any adverse effects on residential areas and animal and bird species in the vicinity of the railway line, construction work and the movement of machinery should be avoided in the late evening and at night where possible.

In terms of light pollution, there are no differences between the alternatives in terms of impacts during construction and operation, and these do not need to be assessed separately.

The impact of lighting during the operational phase on the section of the railway under consideration is long-term and, in the absence of mitigating measures, the assessment is insignificant. The impact during the construction phase will cease upon completion of the construction works (the impact is short-term) and is therefore not significant.

8.17 Impact on material use and waste generation and management options

The impact of material use and waste generation can be divided into three stages: railway construction, operation and decommissioning.

In all stages, it is important to ensure sustainable material use and waste management in accordance with the waste hierarchy:

- reducing the amount of materials through accurate planning;
- reducing the amount and hazardousness of waste generated;
- reusing and recycling materials;
- creating systems for sorting and preparing waste for reuse;
- (construction and demolition) waste management.

The impact of waste and its treatment options is not limited to railway-related objects and activities, but extends significantly further and depends on how and how far the waste is transported from the place of origin. In this context, the proximity principle, the requirements of the waste management hierarchy and economic considerations must be taken into account. The combined effect of these three factors determines the exact size of the impact area. Where possible, waste should not be transported for further treatment more than 50 kilometres away.

Impacts during construction

The main material and waste flows arise during construction. A table of the quantities of the main materials used for railway construction is provided in the chapter 4.2. The chapter 4.3 provides the calculated quantities of construction resources required. As the resources used are a significant cost, it can be assumed that the RB railway will be constructed with as little waste as possible, avoiding the waste of soil resources.

According to the waste management hierarchy, waste prevention is the most important priority. When constructing a railway, it is therefore important to plan the volume of construction materials required very accurately in order to reduce the amount of surplus construction materials that become waste in accordance with the Waste Act if they are left over after the construction of Rail Baltic.

Another important principle of waste management that must be followed when constructing railways is waste reuse. In order to ensure efficient waste reuse, it is reasonable to establish at least one temporary waste collection point on each railway construction section to collect and sort construction waste. It should be noted here that, pursuant to Section 37(3)(3) of the Nature Conservation Act, the storage of waste is prohibited within a 50-metre-wide coastal restriction zone. Lightweight packaging and other materials must be collected in containers, while other materials may be stored in piles at a sufficient distance from each other to prevent mixing. The method of waste collection must be based on the nature and safety of the waste. The collection of waste by type must be guided by the requirements of the Waste Act and the local government's waste management regulations. Larger quantities are expected for the following types of waste: soil unsuitable for construction, stones, filling materials, metal and wood.

Materials sorted at the place of origin can be sent for reuse, thereby reducing harmful environmental impacts and helping to meet the objectives of the waste management hierarchy.

The adverse impact during construction can be reduced by using waste materials such as oil shale ash, limestone screenings, etc. in the construction of the railway embankment and maintenance roads.

Impacts during operation phase

The quantities of materials used during the service life and their impacts are rather insignificant when operating in accordance with the maintenance plan in a sustainable and environmentally friendly manner.

Most waste is generated during infrastructure maintenance work and the replacement of structures/equipment. The volume and type of waste depend on the infrastructure operator's requirements for infrastructure maintenance. However, the volume of waste generated is expected to be small and the impact insignificant.

Where possible, waste sorting should be ensured to enable the reuse of recycled materials.

In the event of accidents and emergencies, instructions shall be drawn up to prevent the spread of pollution and the waste generated shall be removed from the environment as quickly as possible.

The waste holder is obliged to handle the waste in its possession in accordance with the established requirements or to transfer it to a person authorised to handle it[162].

Considering the above and the fact that the waste management sector as a whole is well regulated, the environmental impact of waste generation and recycling options can be considered insignificant from a comprehensive project perspective, provided that these requirements are met.

Closure impacts

If it should ever become necessary to dismantle the railway line in the future, a significant amount of waste will also be generated at this stage. Additional material use is expected to be marginal during the dismantling phase.

Waste generated during the dismantling of the railway must be transferred to a waste management company with the appropriate permit or registration in accordance with § 19 (4) of the Waste Act.

- Metal is sent for recycling and used in the manufacture of new metal products.
- Soil, stones and fillers can be reused in their pure form in construction projects.
- If soil, fillers and stones have been mixed together for any reason, the material can be reused, for example, to fill a quarry within a reasonable distance.
- Clean, unimpregnated and unpainted wood can be used in local heating systems on the basis of a registration certificate. Contaminated wood is sent to a company with an environmental permit for energy use, based on the proximity principle.

Conclusion

Considering the recommendations for the reuse of materials, including waste, it can be assumed that the overall impact of material use and waste generation is insignificant. There is no significant difference between alternatives 1 and 2 in terms of this impact aspect.

8.18 Impact associated with accidents

Accidents are possible both during the construction phase and during the operation of the railway.

The risk of accidents during the construction phase is mainly related to the equipment and machinery used in construction. In the event of an accident, soil or water pollution may occur if substances hazardous to the environment leak. To prevent this, precautions must be taken when using environmentally hazardous substances (e.g. fuels) and preparedness for action in the event of accidents must be ensured. The responsibilities and obligations arising from construction activities with regard to the prevention and avoidance of hazards are set out in the alliance agreements. Under normal working conditions, where equipment and mechanisms are in good working order and all safety and environmental requirements are complied with, the likelihood of emergency situations arising during construction is low.

During the railway operation phase, emergency situations are mainly related to railway traffic, including transported goods. Accidents and incidents are most likely to occur at locations where the railway crosses roads, footpaths or animal migration routes. The entire length of the Rail Baltica section

[162] Waste Act, § 28 (1).

is enclosed by a barrier and crossings with roads are grade-separated, which practically eliminates the risk of people (including vehicles) and animals entering the railway and collisions.

The prevention of other types of railway accidents depends mainly on work organisation and general railway safety measures. Railway safety is regulated by the Railways Act (RdtS) and its subordinate acts. According to Section 35 (2) of the RdtS, the railway infrastructure manager and the owner or holder of the railway infrastructure are obliged to ensure safe traffic on their railway infrastructure and to maintain it in a condition that ensures railway safety.

The transport of dangerous chemicals is also possible on the RB railway, including the railway section in question. Pursuant to Section 111 (1) of the RtdS, the transport of dangerous goods by rail may only take place under the supervision of a safety adviser who meets the requirements of Section 13 of the Chemicals Act. The transport of dangerous goods is based on the requirements of Appendix C (RID) to the International Convention concerning the Carriage of Goods by Rail (COTIF) or the Agreement on International Goods Transport by Rail (SMGS).

At the time of preparing the RB project and conducting this EIA, the list of chemicals to be transported by rail in the future, their chemical and physical properties, quantities and transport frequencies are not known. Therefore, it is not possible to assess the likelihood of chemical accidents or their consequences. However, considering the safety measures implemented on the railway, the risk of accidents involving dangerous substances can be considered minimal. An important part of the railway safety management system is the management of risks associated with the transport of chemicals by rail. The safety management system will be established before the transport of chemicals begins on the Rail Baltica railway.

In order to ensure rapid response and action in the event of accidents or emergencies, including access to remote areas, a parallel track is provided along the entire length of the Rail Baltica railway, which can also be used by emergency services in the event of accidents or emergencies.

There are no dangerous or accident-prone facilities in the vicinity of the railway section that would increase the potential consequences of accidents and/or whose danger zones would extend to the railway.

There are no significant differences between the preliminary design and the detailed design in terms of the impact of accidents.

8.19 Impact on people's mobility

The impact on people's mobility can be divided into two categories: the impact resulting from possible changes to the road network and/or barriers created by the railway, and the impact resulting from the provision of rail connections.

Impact on the road network and people living in the vicinity of the railway

The impact on people's mobility will occur both during construction and during operation.

During construction, temporary disturbances and inconveniences may occur and the usual routes of local residents/landowners may change. Disruption caused by temporary traffic arrangements during construction can be mitigated by carrying out the construction work appropriately and informing the public of the traffic arrangements.

The impacts of railway use are permanent. The railway is fenced off for safety reasons and access is prohibited to people and vehicles. Official crossings or overpasses must be used to cross the railway.

The railway section in question passes through a very sparsely populated area. The railway does not cut through residential areas or population centres where the barrier created by the railway could cause significant changes in the movement patterns of residents. The railway also acts as a barrier to people moving around in forest areas (e.g. hunters, hikers, berry and mushroom pickers), but this is not expected to be a significant problem in this area. People's usual routes will adapt to the restrictions on movement, and the change cannot be considered to have a significant impact.

The railway section does not cross any national roads or other roads with significant traffic.

The most important intersection is with the local Loigu road (road no. 2130022), which connects the households (primarily Tiidu, Vallimäe, Rajakuninga) east of the railway with the Tallinn-Pärnu-Ikla highway. The railway project provides for the construction of a railway bridge over Loigu road and the Lemmejõgi river running alongside it. This will preserve the existing access for residents along Loigu road and will not lengthen their journey. The railway will close the connection between Loigu road and Räägu road (road no. 2130021), but this will not affect access to registered properties. All residential buildings along Räägu tee will remain west of the railway, where they will retain their connection to the Tallinn-Pärnu-Ikla highway.

The railway also crosses several forest roads that provide access to forest land. As a general rule, no crossings will be built at the intersections of forest roads and the railway, but all registered properties located along forest roads will remain connected to the rest of the road network either to the east or west of the railway, as follows:

- Liidiku road (2130509) – connection with Kabli-Massiaru tee (eastern section) and the Tallinn-Pärnu-Ikla highway (western section) is maintained.
- Ruuli road (2130507), Kiviaru road (2130505), Mustikametsa road (2130502) and Utu road (2130504) – connectivity with Loigu road and Laiksaare-Massiaru-Teaste road (eastern section) and Tallinn-Pärnu-Ikla highway (western section) will be preserved.

The route may be slightly longer on some forest properties.

However, according to the Rail Baltic county-wide spatial plan, a grade-separated junction is also planned for one forest road and private road connection – Vanaraudtee road (road no. 7560543), which does not have significant traffic in the current or forecast situation. At the value engineering stage, two alternative locations for the grade-separated intersection have been considered, as well as abandoning the intersection altogether. Considering that the Metsapoole viaduct would primarily be used for transporting forest material (periodic, clearly unpredictable transport) and the connections to the existing road network will be maintained on the corresponding forest land even if the connection at the railway location is closed, abandoning the viaduct would not have a significant adverse impact.

Based on the above, connectivity with the existing road network will be ensured for the affected households and properties, and no significant adverse impact on people's mobility is anticipated on the railway section. There are no significant differences between the preliminary design and the value engineering design in terms of mobility, nor is there a strong preference for any of the Metsapoole viaduct sub-alternatives.

Impact on people's mobility

The high-speed railway will connect larger cities – Tallinn, Pärnu, Riga and more distant centres – with fast and convenient transport links. Local stops are also planned, which will create opportunities for domestic train lines, increasing people's mobility and improving access to jobs and services.

There are no local stops on the section of railway under consideration, but the section is part of the overall railway network and its construction is essential for the functioning of international train traffic. The nearest local stop (Häädemeeste) is planned approximately 5 km from the start of the section and can also be used by residents of villages to the south when combining modes of transport.

The planned activity will therefore have a positive impact on people's mobility.

Conclusion

The construction and use of the railway will not have a significant adverse impact on people's mobility. There are no significant differences between the preliminary design and the value engineering design in terms of mobility.

8.20 Impact on human health, well-being and property

Impact on human health

The impact on human health may be felt primarily in the immediate vicinity of the railway. The section of railway under consideration runs through a very sparsely populated area. There are a total of five residential areas located in the vicinity of the railway, i.e. 200-500 m from the railway.

The impact on human health may manifest itself through changes in other environmental elements – through noise pollution, deterioration of ambient air quality, deterioration of drinking water quality, and electromagnetic fields. The relevant standards for the protection of human health are established in legislation. The environmental impact assessment is based on the assumption that compliance with the standards will not result in any significant adverse effects on human health.

The impact of railways on ambient air quality is discussed in the chapter 8.14. The impacts of railway construction and operation are insignificant in both alternatives and no adverse effects on human health are anticipated.

The impact of the railway on noise levels is discussed in chapter 8.12. Noise affects health when limit values are exceeded for long periods and/or continuously. Noise barriers are planned to prevent significant noise disturbance at the residential buildings closest to the railway (in Majaka village and Metsapoole village). When constructing noise barriers, it is important to avoid noise disturbance at residential buildings.

The impact of the railway on groundwater is discussed in chapter 8.8. The planned activity will not affect the water level or quality of the groundwater layers that are the source of drinking water for registered boreholes. There are no known unregistered boreholes or dug wells within the impact area of the RB railway section.

The propagation of electromagnetic fields and their impact are discussed in chapter 8.15. The levels of electric, magnetic and electromagnetic fields that are safe for human health in public, residential and recreational areas are established by the regulation "Limit values for non-ionising radiation in residential and recreational areas, residential buildings and public buildings, study rooms and measurement of non-ionising radiation levels".[163] The electromagnetic field strengths during the operation of the RB remain significantly below the established limit values and no adverse effects on residents are foreseeable.

[163] Regulation of the Minister of Social Affairs No. 38 of 21 February 2002, https://www.riigiteataja.ee/akt/163816?leiaKehtiv

In summary, the construction and operation of the railway will not have a significant adverse effect on human health.

There are no significant differences between the preliminary and final project solutions from the point of view of human health. The locations of noise barriers were not specified in the preliminary design stage, but in order to ensure compliance with noise standards, the installation of noise barriers is necessary as a mitigating measure for all assessed alternatives.

Impact on human well-being

The impact of high-speed rail on human well-being can be divided into two categories: the impact on people living near the railway and the impact on people using the railway.

The impact on the well-being of people living near the railway is mainly through railway noise (see chapter 8.12), changes in the landscape (views) (see chapter 8.24) and movement barriers (see chapter 8.19). These impacts are discussed in more detail in the relevant subsections. In preparing the project solution, attention has been paid to both reducing noise pollution and ensuring mobility.

The broader impact on people's well-being can be considered positive due to the convenient and fast train connections. Train traffic is expected to increase people's mobility and improve access to jobs and services.

There are no significant differences between the preliminary and value engineering design solutions.

Impact on personal property

Negative impact on the value of real estate may result from the effects of railway use, partly also from restrictions on land use in the protection or restriction zone of the railway and related structures. The expropriation of real estate for the purpose of constructing the railway and related structures cannot be considered a direct negative impact on the value of the real estate, as fair compensation is guaranteed by agreement between the parties or through the compulsory expropriation process. Land acquisition for railway construction will be carried out in accordance with the project's land division plan, and the Estonia Land and Spatial Planning Board will negotiate and conclude agreements with landowners.

The impact on people's property was already taken into account when selecting railway alternatives during the preparation of the RB county-wide spatial plans. Preference was given to the route alternative that would have the least impact on residential land, which could potentially have a negative impact on property values. There are no residential buildings in the railway relocation area (350 m wide corridor) in the section under assessment.

The residential land closest to the railway may experience some indirect negative impact if environmental disturbances increase. The main impact is noise disturbance, which will be mitigated by noise barriers. The visual impact can be reduced by the forest land between the residential areas and the railway. However, it is important to note that property values are also strongly influenced by other factors (the condition of buildings, the availability of communications, the development of the area and the availability of local services, the activity of the property market, etc.). In the planned section, is not currently an active real estate market, and the establishment of a railway connection may rather increase the attractiveness of the southern Pärnu County region as a whole.

The railway corridor and its surroundings are mainly covered by forest land. In the case of forest and agricultural land, the impact on the value of real estate may primarily result from longer access routes and fragmentation of real estate. After the construction of the railway, the existing forest roads will remain connected to the road network (see chapter 8.19).

There are no significant differences between the preliminary and value engineering design solutions.

Conclusion

The impact on human health, well-being and property is insignificant.

8.21 Impact on land use

Change in land use

In the railway section under consideration, the impact on land use is primarily related to the occupation of forest land and the reduction of its area and integrity (forest land covers nearly 90% of the section of the railway corridor under consideration). The total area of forest to be cleared for the construction of the railway section is approximately 110 ha. Almost all of the forest to be cleared is commercial forest.

The impact on the land covered by the railway and related structures is irreversible. Fair compensation must be ensured for the expropriation of real estate.

Forestry activities will continue to be possible in the areas surrounding the railway. The indirect impact on the forestry use of the land will result from the so-called cutting through of land parcels and forest roads or tracks. All registered properties adjacent to forest roads will remain connected to the road network east or west of the railway, as appropriate (see chapter 8.19 for more details).

There is no direct or indirect impact on residential land along the railway.

Impact on planned land use

No plans have been established or are being prepared in the railway corridor or its immediate vicinity that would be hindered or rendered impossible by the construction of the railway. The railway section under assessment does not interfere with any detailed plans that have been established. The draft comprehensive special plan for Häädemeeste municipality, which is currently being prepared, does not include any land use in the vicinity of the railway corridor that would be directly affected by the planned railway (e.g. new residential areas that would be significantly affected by noise). The areas bordering the railway are included in the green network, the impact on which is discussed in more detail in chapter 8.4.

Conclusion

The impact on land use is primarily due to the acquisition of forest land, for which the landowner will be compensated. The adverse effects on other aspects of land use are insignificant. There are no significant differences between the preliminary design and the value engineering design solutions.

8.22 Impact on mineral resources

The railway does not cross any registered mineral deposits, nor are there any mineral deposits in the immediate vicinity of the railway. The construction of the railway line will not have a direct impact on the preservation of mineral resources and will not impair access to them.

The impact on mineral resources will therefore primarily result from resource consumption. The construction of the Rail Baltica railway line and associated additional structures will lead to a sharp increase in the demand for construction materials, including construction minerals, in Pärnu County. The estimated quantities of construction minerals required for the construction of the railway in the section under consideration and the estimated volumes of available mineral resources are presented in chapter 4.3. The estimated volumes of local mineral resources available in the area cover the needs of the railway section. Higher quality material will need to be imported from outside Estonia.

Estonia has sufficient reserves of construction minerals, but their location and availability vary depending on the type and location of the mineral resource. Industrially important carbonate rocks, such as limestone (calcareous and dolomitic), are mainly located north of the Pärnu–Peipsi lake line. Sand and gravel are found throughout Estonia, but their geological origin and location vary.[164]

The overview of the security of supply of construction minerals by the Ministry of Climate[165] has been prepared taking into account the needs of the largest infrastructure contractors in the country (Transport Administration, Rail Baltic Estonia OÜ, Eesti Raudtee AS, State Forest Management Centre), the needs of local governments and the private sector, and trends in past extraction volumes.

The greatest need in Pärnu County is for fill material (sand, gravel, and limestone) and high-quality construction sand. According to an overview of the security of supply of construction minerals in Pärnu County, the security of supply of construction sand in Pärnu County is critical. The reserves of fill sand, gravel, and dolomite are also critical.[166] Therefore, geological surveys are necessary to identify additional reserves[167]. The addition of new mining concessions would alleviate the situation in the future. Potential quarries that could be used to supply the RB section under assessment are listed in chapter 4.3.

There are reserves of construction gravel and low-quality dolomite in Pärnu County for the construction of the Rail Baltica infrastructure. There are no reserves of high-quality dolomite in Pärnu County, which means that crushed stone produced from high-grade construction limestone must be transported to the site from outside the county. [168]

Research completed by the Estonian Geological Survey in 2020 is discussed in this EIA program (Annex 1).

The security of supply in Pärnu County as a service area can also be improved by strengthening the security of supply in the peripheral areas of the service area. According to the study, abandoned quarries in Järva, Lääne and Viljandi counties are suitable for this purpose[169]. In addition, the use of alternative construction materials and recycled waste can be considered.

---

[164] Ministry of Climate, 2025, Overview of the security of supply of construction minerals by county, https://kliimaministeerium.ee/energeetika-maavarad/maavarad/ehitusmaavarad#parnu-maakond (20.08.2025)

[165] Ministry of Climate, 2025, Overview of the security of supply of construction minerals by county, https://kliimaministeerium.ee/energeetika-maavarad/maavarad/ehitusmaavarad#parnu-maakond (20.08.2025)

[166] Ministry of Climate, 2025, Overview of the security of supply of construction minerals by county, https://kliimaministeerium.ee/energeetika-maavarad/maavarad/ehitusmaavarad#parnu-maakond (20.08.2025)

[167] Estonian Geological Survey, 2020. Distribution, extraction and use of construction minerals in Pärnu County. Research report.

[168] Ministry of Climate, 2025, Overview of the security of supply of construction minerals by county, https://kliimaministeerium.ee/energeetika-maavarad/maavarad/ehitusmaavarad#parnu-maakond (20.08.2025)

[169] Study on the security of supply of construction minerals required for the construction of Rail Baltica. Summary of the study, section 3.4. Skepast&Puhkim OÜ, work no. 2017-0043. Tallinn, 19 April 2017

8.23 Impact on cultural heritage

There are no cultural monuments or heritage conservation areas on the railway section or in its immediate vicinity, nor are there any other objects or areas of high cultural value that could be significantly adversely affected (see chapter 5.4).

The railway crosses the route of the former Riiselja-Ikla railway (213:RTR:001), which is listed as a cultural heritage object. In its current state, a dirt road runs along the site of the former railway (partly as a private road and partly as a forest road registered as Vanaraudtee road). The intersection with the road is planned as a two-level crossing, where the forest road connection will be carried over the railway as a new viaduct. Alternatives to the construction of a viaduct are also being considered at this location. In both solutions, the road would be interrupted on the former railway embankment and the heritage site would be destroyed, at least in the area directly under the railway structures. However, considering that the heritage site has not been preserved in its original form and the crossing only covers a small part of the former railway line, the EIA expert does not consider this to have a significant impact within the meaning of the Heritage Conservation Act.

Archaeological preliminary investigations carried out on the section of the railway did not reveal any finds of cultural value or areas that would require more detailed archaeological investigations. The Heritage Conservation Act stipulates that even outside cultural monuments and their protection zones soil work must consider the possibility of finding objects of cultural value and archaeological cultural layers. In such cases, the contractor is obliged to suspend work and notify the National Heritage Board of the find. Thus, the Heritage Conservation Act also provides for the protection of cultural heritage that has not been identified by previous research but becomes apparent during construction.

Conclusion

The construction and use of the railway section is not expected to have a significant adverse impact on cultural heritage, including archaeological heritage. The impact on cultural heritage object crossing the railway is somewhat greater in the case of alternative 1 for the location of the Metsapoole viaduct, but the difference in impact between the alternatives can be considered marginal.

8.24 Impact on landscape and views

The Rail Baltica railway is a large-scale project that will significantly and irreversibly change the existing landscape. The railway runs through forest land, and the construction of the railway will bring about significant changes to the landscape, including the clearing of forests.

The railway section does not pass through valuable landscapes and there are no valuable viewpoints along its route that could be damaged by the construction of the railway. Assuming that the landscape around the railway will remain largely similar to what it is now, the changes in the section under consideration will generally not be noticeable, as the remaining forest stands will separate the railway from roads and residential areas. The railway will be visible to a limited extent, mainly from local roads crossing the route and/or in the forests surrounding the railway in the event of clear-cutting.

The railway may also be visible from the nearest residential buildings, depending on the presence or absence of tall vegetation. In this case, the change in the landscape may disturb residents. As the settlement in the railway section area is sparse, views are possible from individual households.

To mitigate noise pollution caused by the railway, the project provides for noise barriers along the sections passing residential buildings (in Majaka village and Metsapoole village), which will also alter the existing landscape and potentially obscure views. The locations of the noise barriers were not specified in the preliminary design stage, but in order to ensure compliance with noise standards, noise barriers will need to be installed for all of the assessed alternatives. During the preparation of the RB design guidelines, both the technical and aesthetic/visual aspects of the noise barriers have been considered, including their integration into the surrounding environment, in order to ensure formal and stylistic unity along the entire RB railway. Noise barriers will be located approximately 200-350 m from the nearest residential areas, and existing forest patches in the relevant viewing directions will be preserved to reduce the visual impact.

8.25 Cross-border impact

As part of the environmental impact assessment of the Rail Baltica railway section "Kabli–Estonian/Latvian border", a cross-border impact assessment was carried out in Latvia (Annex 5). The RB railway continues from the state border in a logical manner with the Latvian section of the RB, for which an environmental impact assessment has already been carried out in Latvia.

The purpose of this transboundary EIA was to identify and assess the potential impacts that are significant from the Latvian perspective in order to establish measures to prevent or mitigate these impacts, if necessary. The assessment was based on the expected impacts identified during EIA screening and by the Latvian authorities during the transboundary environmental impact assessment consultation process, which included relevant proposals for impact assessment made during the Latvian participation.

Based on the geography, ecology and settlement of the Latvian border area, it was concluded that the transboundary impact assessment should focus on the Natura 2000 network and nationally protected natural sites and species, including impacts resulting from changes in the hydrological regime or changes in the landscape of the border area.

The Latvian territory bordering the Estonian railway section is largely uninhabited – there are no settlements, dwellings or other socially sensitive land uses in the immediate vicinity of the border. Therefore, impacts related to human health and well-being, such as the impact of noise and vibration or deterioration of air quality, are not relevant in this specific context from the point of view of transboundary assessment. There are no significant adverse transboundary environmental effects on human health and well-being.

Other potential cross-border impacts (e.g. impact of barrier effects on wildlife and ecological connectivity; changes in mobility and accessibility; impact on local air quality; cumulative impacts of the development of linear infrastructure) have already been thoroughly assessed as part of the environmental impact assessment for the Latvian section of Rail Baltica. Measures to mitigate these impacts have also been proposed and integrated into the relevant Latvian RB project planning documents. As the railway line continues smoothly across the border, it will not bring any new impacts to Latvian territory that have not already been identified or addressed and for which mitigation measures have not been proposed.

Therefore, the scope of the transboundary environmental impact assessment is limited to those environmental aspects that are new or distinctive in a transboundary context and are not covered by the Latvian environmental impact assessment documentation. This approach ensures that transboundary cooperation efforts are targeted, effective and avoid duplication.

The transboundary impact assessment was carried out in Latvia in accordance with the legal framework there and by licensed experts in the relevant fields. Detailed assessment reports in Latvian will be included in the EIA report for the transboundary impact assessment process for the Latvian authorities to take a position.

The most important part of the cross-border impact assessment is the Natura appropriate assessment of the Mērnieku dumbrāji SAC which is located in Latvia. **Full Natura 2000 appropriate assessment reports are included in the cross-border EIA report as Annex 5, Estonian summary of the appropriate assessment is provided in Annex 2 to the EIA report.**

The Natura assessment reports do also cover the conservation values of the area that are not directly related to the conservation objectives of the Mērnieku dumbrāji nature area (species of national importance, including birds and habitats identified during fieldwork carried out for the assessment).

As a result of the impact assessment, it was concluded that the forest habitats on the railway side of the Mērnieku dumbrāji SAC, and thereby the protected species, may be adversely affected, in particular, by a change in the water regime associated with the possible drainage of the Metsapoole viaduct and railway embankment if the viaduct is built in location alternative 1/sub-alternative 1 (named as Alternative 1 in the Mērnieku dumbrāji Natura appropriate assessment reports). The adverse impact of the viaduct can be avoided by changing the location of the Metsapoole viaduct by shifting its location about 1 kilometre to the north or cancelling the viaduct (named as Alternative 2 in the Mērnieku dumbrāji Natura assessment).

No adverse impact on protected bird species has been identified, except for the risk that hazel grouse (Tetrastes bonasia) may be killed in the fence when the RB is constructed. This risk is mitigated by the same measures that are aiming at avoidance mortality by colliding with the fences that are being implemented to avoid adverse impacts on various bird species that were identified on the Estonian territory. The necessary mitigation measures are presented in the Natura appropriate assessment report (Annex 2 to the report) and in the list of measures (Annex 3 to the report).

In the context of transboundary impact, the railway section under assessment is also located near the North Vidzeme Biosphere Reserve (*Ziemeļvidzemes biosfēras rezervāts*). The purpose of the biosphere reserve is to ensure the protection of landscapes, ecosystems, species and biodiversity. The area where the railway crosses the national border is part of the Salacgriva Plain landscape unit, which is not considered to be of high aesthetic value and is not subject to specific land use restrictions. There are no landscapes of national or local importance designated in the plans in the section where cross-border impact may occur. The nearest valuable landscape of national importance is located approximately 5 km from the point where the railway crosses the Latvian border. The nearest area of local importance (Salatsi river valley landscape) is located approximately 4 km from the intersection of the railway and the border of the Republic of Latvia.

The assessment of cross-border impact concluded that the visual impact of the railway on the landscape in the section near the Latvian-Estonian border is insignificant. The railway borders on extensive sparsely populated forest landscape in Latvia, which obscures the visibility of the railway infrastructure. The nearest valuable landscapes are located at a sufficient distance and there are no significant view corridors towards the railway.

In terms of landscape ecology, the impact of the railway is moderately negative, mainly due to landscape fragmentation, but this impact does not exceed the similar impact of railway development in Latvia, which has already been taken into account in the relevant environmental impact assessments.

Overall, therefore, there will be no significant adverse cross-border impact that has not been taken into account previously.

9 CUMULATIVE IMPACT OF THE RAIL BALTIC SECTIONS LOCATED ON ESTONIAN TERRITORY

The subject of this EIA is approximately 12,7 km long section of the 213 km long Rail Baltica railway located on Estonian territory.

Several potentially significant environmental impacts associated with the Rail Baltic railway will primarily manifest as a result of the construction of the entire railway (from Estonia to the Lithuanian-Polish border) and cannot be assessed in the context of this section alone. Such impacts have been previously assessed for the entire Estonian section in the SEA of the Rail Baltic county-wide spatial plans.

During the EIAs of the railway sections (this assessment and assessments for other sections), the cumulative impact of the railway route has been further addressed to the extent necessary for making decisions on the granting of operating permits. This EIA is based on previous analyses. Where necessary, the assessments are updated and refined, taking into account information on the more detailed railway solution that has become available during the design process. This chapter addresses topics relevant to the impact of the section "Kabli – Estonian/Latvian border": impact on climate, impact on animal population connectivity, use of mineral resources and deforestation.

9.1 Cumulative impact on climate

9.1.1 Impact of the construction phase

The cumulative impact of the construction phase is primarily due to changes in land use (land acquisition for railway infrastructure) and the transport of resources and materials required for railway construction.

The following (Table 9-1) shows the emissions resulting from changes in land use for all sections of the railway in Estonia, taking into account that the railway construction affects a corridor approximately 50 m wide. Emissions for the Kabli–EE/LV border section are based on calculations made within the framework of this EIA, while data for the Pärnu–Kabli section are estimates. Data for other sections are based on estimates provided in the EIA for the respective sections.

Table 9-1. Cumulative emissions from land use change on the Estonian section of the Rail Baltica railway (t CO_{2eq})

Railway section	Length of the section (km)	Land use				Total (t CO_2 eq)
		Forest	Arable land	Grassland	Wetlands	
Ülemiste – Kangru	15,8	12 738	4545	348	13	**17 644**
Muuga – Soodevahe	12	3109	1801	140	0	**5050**
Kangru – Harju and Rapla county border	19,2	20 083	6999	69	2008	**29 159**
Harju and Rapla county border – Hagudi	16,6	13 085	8351	494	0	**21 930**
Hagudi – Rapla and Pärnu county border	39,3	50 769	11 533	191	1244	**63 737**

Railway section	Length of the section (km)	Land use				Total (t CO_2 eq)
		Forest	Arable land	Grassland	Wetlands	
Rapla and Pärnu county border – Tootsi	15,8	25 558	3638	73	39	**29 308**
Tootsi – Pärnu	36,7	44 519	1905	262	1373	**48 059**
Pärnu – Kabli	45,32	77 108	678	158	37	**77 981**
Kabli – EE/LV border	12,7	22 466	0	252	0	**22 718**
Total	**213,42**	**269 435**	**39 450**	**1987**	**4714**	**315 586**
%	**100**	**85**	**13**	**1**	**1**	**100**

The largest share (85%) of the total estimated CO_2 emissions associated with land use change is accounted for by deforestation, followed by conversion of agricultural land to railway land (13%). The entire railway corridor overlaps only a small area of grassland and wetlands, so the emissions associated with changes in land use are 0,5% and 1,5% respectively.

The table below (Table 9-2) shows the total or cumulative estimated CO_2 emissions associated with land use change, transport of construction materials and on-site construction work for the Rail Baltica railway sections in Estonia.

Table 9-2. Cumulative emissions during the construction phase of the Estonian section of Rail Baltica (t CO_{2eq}; positive values indicate emissions, negative values indicate CO_2 sequestration)

Railway section	Length of the section, km	Land use change	Transport of construction materials	On-site construction work	Wood products	Total emissions (excluding wood products)
Ülemiste – Kangru	15,8	17 644	10 663	9 258	-5891	37 565
Muuga – Soodevahe	12	5 050	*	7 449	-1673	*
Kangru – Harju and Rapla county border	19,2	29 159	12 560	11 303	-9 509	53 022
Harju and Rapla county border – Hagudi	16,6	21 931	5 157	9 752	-6 473	36 839
Hagudi – Rapla and Pärnu county border	39,3	63 736	8 251	23 087	-24 255	95 074
Rapla and Pärnu county border – Tootsi	15,8	29 307	4 176	9 282	-11 891	42 765
Tootsi – Pärnu	36,7	48 058	6 366	37 486	-21 328	91 910
Pärnu-Kabli	45,32	77 981	*	*	-38 799	*
Kabli – Estonian-Latvian border	12,7	22 718	6 266	7 463	-10 972	36 447
Total	213,42	315 584	53 439**	115 080**	-130 746	484 103**

* Emission estimates will be refined based on construction project data in subsequent reports

** Based on the currently available data

The cumulative emissions from the construction of the entire Estonian RB infrastructure are approximately 484 103 t CO_2 eq, of which land use change accounts for approximately 65%, transport of construction materials 11% and on-site construction work 24%.

If the wood harvested in the project area is converted into wood products, it will be possible to store approximately 130 746 tonnes of CO_2 in wood.

9.1.2 Impact of the use phase

Emissions from the railway use phase result from train traffic. The projected volumes and emissions associated with train traffic are presented in the table below (Table 9-3). The emission calculations are based on two simplified energy consumption scenarios with the aim of showing the difference in the climate impact of fossil and renewable electricity use:

- railway consumes 100% renewable electricity produced from solar, wind, hydro and/or biomass energy;
- railway consumes 50% renewable electricity and 50% non-renewable, i.e. fossil (oil shale) electricity.

Using 100% renewable electricity, the annual CO_2 emissions of RB rail traffic would be approximately 36 times lower than when using a mix of renewable and fossil electricity.

Table 9-3. Estimated train traffic volumes and CO_2 emissions during the operational phase of Rail Baltica (RE – renewable electricity; FE – fossil electricity)[170]

Type of train traffic / Year	2035	2045	2055
Passenger trains			
Passengers per year	1 089 000	1 178 000	1 263 000
100% RE: emissions, t CO_{2eq}	229	248	266
50-50% TE-FE: emissions, t CO_{2eq}	8 186	8 854	9 493
Freight trains			
Freight transport volume, t per year	5 800 000	6 400 000	7 000 000
100% RE: emissions, t CO_{2eq}	591	652	713
50-50% RE-FE: emissions, t CO_{2eq}	21 791	24 045	26 299
Total			
100% TE: t CO_{2eq}	820	900	979
50-50% TE-FE: t CO_{2eq}	29 976	32 899	35 792

When assessing the overall impact of the use phase on the climate, the expected modal shift, i.e. the partial shift of passengers and freight transport from other modes of transport to rail, must also be taken into account. The construction of Rail Baltica will add a new connection for both passengers and freight between important destinations in the Baltic States (primarily passenger traffic) and further afield in Europe (primarily freight traffic). Replacing existing modes of transport, especially road transport, with lower CO_2 emission modes will reduce greenhouse gas (GHG) emissions.

The modal shift and the associated CO_2 emissions are treated as a conversion of passenger transport by road and air and freight transport by road to passenger and freight transport by rail and the associated CO_2 emissions. The accompanying CO_2 emissions (in CO_2 equivalents) for the entire Estonian

[170] Ernst & Young, 2017. *Rail Baltica Global Project Cost-Benefit Analysis. Final Report.* The passenger and freight train routes take into account the maximum possible distance of the RB Estonia route, which is from Ülemiste to the Latvian border (200 km) for passenger trains and from Muuga to the Latvian border (206 km) for freight trains.

RB section have been calculated in the EIAs for other RB sections, and as there have been no significant changes in transport volume forecasts, the results of previous analyses have been used as a basis here[171].

The analyses take into account that the modal shift will mainly take place at the expense of car users. The estimates concluded that, in almost all of the scenarios analysed, the modal shift in passenger transport will be accompanied by a reduction in greenhouse gas emissions in the projected amount, i.e. the total impact of the use phase on the climate will be positive. The reduction in emissions is greater if trains use 100% renewable energy. Similar conclusions were reached when analysing the projected scenarios for freight transport.

Assuming that the Rail Baltic electric railway will use 100% renewable energy, the GHG emissions associated with the construction of RB (land use change, transport of construction materials and on-site construction work) would be offset by the potential GHG emission reduction achieved by the modal shift in approximately 12–13 years. If the Rail Baltic railway will use a combination of fossil and renewable energy, it will take approximately 17–22 years to offset the emissions from the RB construction phase.

At the same time, it should be emphasised that this is a simplified estimate, as the volumes of passenger and freight transport, distances and energy consumption scenarios depend on many additional factors (state subsidies, changes in fuel excise duties, the introduction of possible road usage charges and/or carbon taxes, the convenience of rail use, travel routes and time factors, etc.), the impact of which cannot be accurately predicted. Among other things, the extent of the positive impact of the modal shift depends on how quickly the vehicle fleet in Estonia is renewed and how strongly the state encourages people and companies to purchase less polluting vehicles, i.e. how much CO_2 emissions from road transport are reduced in the long term. The realisation of Rail Baltic's passenger transport potential also depends on state support and measures to encourage passengers to switch from cars to trains. A large modal shift from road transport requires fast and convenient connections between train stations and major local destinations, without the need for private cars.

9.2 Impact on the connectivity of animal populations

The construction of a new 213 km long infrastructure will create a barrier effect and interrupt existing animal movement and migration routes. The barrier effect of the railway will be increased by the fencing of the railway.

The corresponding impacts on animal populations have been taken into account in the environmental impact assessments for all sections of the railway. At the same time, measures to reduce the barrier effect have been planned for all assessed sections of the railway. These include passages for large animals (ecoducts and underpasses), ensuring sufficient free space on river banks under bridges, and culverts adapted for animal passage. The measures have been planned based on the recommendations of biodiversity experts.

These measures, planned for the entire railway, will reduce the (cumulative) impact on habitat fragmentation and enable animals to cross the Rail Baltica corridor in the future.

[171] See, for example, the environmental impact assessment report for the construction project for the section of the Rail Baltica railway line between Rapla and Tootsi in Pärnu County.

9.3 Cumulative impact of deforestation

The cumulative impact of forest clearing has been assessed for the clearing area resulting from the project solution for all sections of the RB railway crossing the territory of Estonia. By the time of completion of this EIA, the approximate clearing volume for all sections has been determined. The estimated clearing volume for the RB railway is presented in the table below.

Table 9-4. Total forest clearing volume of RB railway sections

Section no.	Railway section	Length of the section (km)	Area of forest to be cleared, ha
1	Ülemiste - Kangru	15,8	51
2	Soodevahe - Muuga	12	28
3	Kangru – border between Harju and Rapla counties	19,2	119
4	Border between Harju and Rapla counties – Hagudi	16,6	63
5	Hagudi – border of Rapla and Pärnu counties	39,3	135
6	Rapla and Pärnu county border - Tootsi	15,8	80
7	Tootsi - Pärnu	36,7	287
8	Pärnu - Kabli	45,32	420
9	Kabli - Latvian border	12,7	110
	TOTAL	**213,42**	**1293**

The estimated deforestation area of the RB railway corridor in Estonia is 1 293 ha, of which the section "Kabli – EE/LV border" is approximately 110 ha, or 8,5%.

The cumulative (total) clearing area within Estonia is large, but it is spread over a 213 km long section. Therefore, the impact of clearing will be mainly local. The estimated average clearing area per kilometre of railway is approximately 6,07 ha. The clearing area also includes forest land without trees, i.e. areas of recent clear cutting.

On the section "Kabli – EE/LV border", the clearing area is 8.66 ha per kilometre of railway. This is significantly larger than the average for the railway as a whole. The reason for the larger clearing area is that the railway section in question runs mainly through forest land. The clearing area is also increased by several crossings and access roads to be built and three ecoducts.

The impact of clearing is moderate at the local and regional level, and the construction of the RB will not significantly affect the proportion of forest in the landscape. Compared to the total forest area in Estonia (*approx.* 2,3 million ha[172]), the clearing of the RB corridor accounts for only 0,056%.

[172] According to statistical forest inventory data, the forest area in Estonia was 2,334,000 ha in 2023

More important than the area to be cleared is the fact that the area to be cleared is located as a continuous linear feature, dividing both smaller forest areas and larger forest landscapes.

9.4 Cumulative impact of mineral resource use

Construction materials are needed as fill material for the construction of the railway and railway maintenance roads, for the reconstruction of roads crossing the railway and for the construction of embankments for ecoducts. The greatest need is for crushed stone, sand and gravel. The material must meet specific requirements. The requirements for crushed stone used as ballast are such that material of the required quality must be sourced from outside Estonia.

The cumulative impact of mineral resource use lies in its effect on the security of mineral resource supply. The necessary studies have been carried out to analyze security of supply and recommend solutions. Among other studies, the Ministry of Climate has compiled an overview of the security of supply of construction minerals by counties for 2025[173]. The assessment takes into account the construction minerals needed for the construction of the Rail Baltic railway. Similar analyses were also prepared by the Estonian Geological Survey in 2020[174, 175, 176].

Looking at the entire Estonian section of the Rail Baltic railway, the greatest need in Pärnu, Harju, and Rapla counties is for fill material (sand, gravel, and limestone) and high-quality construction sand. The security of supply of construction sand is critical in Pärnu County and well below the critical threshold in Rapla County. The security of supply of construction sand is guaranteed in Harju County. The security of supply of fill sand, gravel, and limestone is close to critical in Pärnu and Rapla counties, exceeding the critical threshold, but reserves are guaranteed in Harju County. The security of supply of construction gravel is also close to the critical threshold in Rapla County, but reserves are guaranteed in Harju and Pärnu Counties. The supply of low-quality limestone is guaranteed in all three counties. [177] In the case of critical or insufficient reserves of mineral resources, geological surveys are necessary to identify additional reserves[178]. The addition of new mining claims would alleviate the situation in the future.

There are no high-quality limestone and dolomite reserves in Pärnu County, and in Harju and Rapla Counties, reserves are well below the critical threshold, which means that crushed stone produced from high-quality construction limestone must be transported from outside the county. [179]

The security of supply in the Rail Baltic service area can also be improved as a whole by strengthening the security of supply in the peripheral areas of the service area. Abandoned quarries in neighbouring

---

[173] Ministry of Climate, 2025, Overview of the security of supply of construction minerals by county, https://kliimaministeerium.ee/energeetika-maavarad/maavarad/ehitusmaavarad#parnu-maakond (20.08.2025)

[174] Estonian Geological Survey, 2020. Distribution, extraction and use of construction minerals in Pärnu County. Research report.

[175] Estonian Geological Survey, 2020. Distribution, extraction and use of construction minerals in Harju County. Research report.

[176] Estonian Geological Survey, 2020. Distribution, extraction and use of construction minerals in Rapla County. Research report.

[177] Ministry of Climate, 2025, Overview of the security of supply of construction minerals by county, https://kliimaministeerium.ee/energeetika-maavarad/maavarad/ehitusmaavarad#parnu-maakond (20.08.2025)

[178] Estonian Geological Survey, 2020. Distribution, extraction and use of construction minerals in Pärnu County. Research report.

[179] Ministry of Climate, 2025, Overview of the security of supply of construction minerals by county, https://kliimaministeerium.ee/energeetika-maavarad/maavarad/ehitusmaavarad#parnu-maakond (20.08.2025)

counties (including Järva, Lääne, Viljandi, and Lääne-Viru counties) are suitable for this purpose. In addition, the use of alternative construction materials and recycled waste can also be considered.

Risks related to the security of supply of mineral resources include the scarcity of existing deposits, limited information about exploration areas, inaccuracy of conclusions based on the properties of mineral resources, opposition to mining, and the uncertainty of the time required for preparatory work. Risks can be mitigated primarily through optimal planning, communication of important information and constructive cooperation[180]. As the coordinator of the exploration and use of underground resources, the state must ensure that mineral resources are used sustainably and that sufficient supply of construction materials is guaranteed during the construction of the railway[181]. The Government of the Republic initiated thematic plans for mineral resources and strategic environmental assessment for Harju County, for Rapla County and for Pärnu County. The purpose of the thematic plans is to map and agree on areas for the exploration and extraction of construction minerals in order to contribute to security of supply until 2050 and to determine the priority of areas. The plans also aim to establish conditions and guidelines for mitigating the negative impacts of mining activities and for restoring mined areas.

[180] Road Technology Centre, 2017. Study on the security of supply of construction minerals required for the construction of Rail Baltica

[181] Basic principles of soil policy until 2050

10 MEASURES TO PREVENT, MITIGATE AND REMEDY ADVERSE ENVIRONMENTAL IMPACTS

This chapter describes mitigation measures, including an assessment of their expected effectiveness. Where appropriate, mitigation measures are presented separately for each impact area and are taken into account in the project design (design stage measures), construction measures and operational measures.

It should be noted that the planning of the RB railway has been ongoing for over 10 years and the planning of measures to mitigate adverse environmental impacts has been consistently continued in accordance with the risks identified at each planning stage. Significant adverse impacts have already been eliminated or reduced in the selection of the railway location during the RB county-wide spatial planning process. Measures have been specified and supplemented at each subsequent development and planning stage, and this process will continue with a reduction in uncertainty at subsequent stages. All construction and operational measures listed in the EIA report and the register of mitigation measures have been forwarded to the designer for the purpose of supplementing and refining the basic design.

The EIA does not mention measures that have already been implemented in previous stages (e.g. planning the railway corridor so that it does not pass through protected areas and habitats of important protected species). Measures that arise directly from legislation (e.g. requirements related to water protection or waste management) are also not listed.

The development of measures to mitigate adverse environmental impacts will not end with this EIA. Considering that the railway is planned to be in use for at least a hundred years, the uncertainty of measures to mitigate impacts during the service life is relatively high. At the same time, construction and railway technology are developing rapidly today, and new solutions with a smaller environmental footprint are becoming available at an ever-faster pace. Given the specific nature of technological developments, the measures are primarily aimed at identifying the significant adverse environmental impacts that must be avoided or reduced, with less detail on how this will be achieved. This will be clarified in subsequent stages of development.

The mitigation measures are described in the environmental impact assessment as follows:

- A more detailed and comprehensive description of the objectives and possible methods of the measures, together with references, is provided in the subchapters of this chapter.
- The need for and effectiveness of measures to prevent adverse effects on Natura sites are explained in addition to this chapter in the Natura appropriate assessment report (Annex 2).
- A brief description/overview of site-specific measures is provided in Annex 3 to the report, in the register of mitigation measures. The register of site-specific mitigation measures is not a separate document, but can only be used in conjunction with the chapter on mitigation measures in the EIA report.

In addition, detailed targeted baseline studies have been prepared to specify the content of the measures developed to prevent or reduce adverse effects on fauna. This report contains excerpts and/or summaries of these studies. Additional information contained in the baseline studies is available to the developer and designer.

The implementation of both mandatory and voluntary environmental measures is the responsibility of the developer through the preparation of the basic and detailed design, the organisation of a maintenance and monitoring plan, and organisational activities. Whether or not environmental measures are taken into account when issuing an activity permit is at the discretion of the decision-maker (KeHJS § 24). Based on the above, it is not the right or competence of EIA experts to designate those responsible for fulfilling the conditions and measures of different permits.

10.1 Measures to ensure the favourable conservation status of Natura 2000 sites

Measures related to Natura 2000 network areas are listed in the summary table of site-specific measures in Annex 3 to the report:

- In the Laulaste and Lemmejõe SACs, design and construction measures are planned to protect rivers and streams as habitats and also species such as the thick-shelled river mussel and the otter.
- In the Põhja-Liivimaa SPA, design and construction measures are planned to protect birds with the marking of fences and contact lines and against disturbances during construction.
- In the Mērnieku dumbrāji SAC in Latvia, measures to preserve the water regime and measures to mark fences and contact lines are planned for the design stage. More detailed overview of impacts and mitigation measures are presented in the Latvian Natura 2000 appropriate assessment and expert reports attached to this report (Annex 5).

The need for measures and their expected impact is described in more detail in the Natura assessment report (Annex 2 to the report).

10.2 Measures to be implemented during the design phase

10.2.1 Climate impact mitigation

Carbon mitigation measures will help minimise the environmental impact and greenhouse gas emissions associated with the construction and operation of Rail Baltic. The measures will be implemented along the entire RB railway.

The measures include the use of the best available techniques and low-impact construction solutions and avoiding unnecessary disruption to the natural environment during construction. For example, it is recommended to avoid deep excavation when constructing railway lines that overlap with wetlands (minimising the impact on the water regime) and to avoid large-scale excavation of topsoil.

Topsoil removed during railway construction should be stored on site for later reuse in landscaping.

These measures are effective and their implementation will reduce emissions associated with the construction of railway infrastructure in areas with high carbon stocks.

10.2.2 Preservation of valuable habitats

One of the first preventive measures in the development process was the selection of the preferred railway corridor in the county-wide spatial plan and the strategic environmental assessment, including the Natura appropriate assessment, which was part of it. The railway corridor had already been selected during the county-wide spatial plan for the preliminary design and EIA stage. The railway corridor has been selected so that it does not pass through protected areas or the habitats of important protected species. No protected or conservation areas or valuable habitats are located within the direct impact area of the section under consideration.

In order to preserve the biodiversity of water bodies and water-related species, it is important to preserve, to the greatest extent possible, the physical characteristics of the bottom of the water body, the chemical and optical properties of the water, the flow velocity, the natural surface of the banks, the trees and shrubs along the water body and the free air space above the water surface.

10.2.2.1 Maintaining surface water and groundwater regimes

The aim of the mitigation measure is to ensure the free movement of water even after the completion of the railway, taking into account both known extreme weather conditions and possible fluctuations in the flow regime due to climate change. To this end, sufficient culverts must be installed in the railway embankment at the intersections of larger water bodies to allow surface water to flow freely. Existing land improvement systems must be maintained in accordance with the requirements and recommendations of the relevant authorities and the needs of landowners. This measure is included in both the preliminary and value engineering solutions.

The water regime is critical for the formation of populations, and if it can be kept as unchanged as possible or improved, the measure will be effective in preserving the status of the water body and its species diversity.

10.2.2.2 Replacement of amphibian breeding water bodies

The railway section significantly affects the amphibian breeding water body located at km 6+170, which must be replaced with a new water body (Figure 10-1). The measure to replace the habitat with a frog pond (OJ073) is included in the project solution and is already under development. An expert opinion has been prepared for the restoration of the habitat[182] regarding the location of the new pond, which includes technical recommendations for the creation of a suitable water body. The replacement measure is effective.

[182] OÜ Rewild, 2024. Amphibian habitats in Pärnu County on the RB DS3DPS3 section. Occurrence of amphibian breeding water bodies and assessment of habitats on the Rail Baltic route and necessary measures

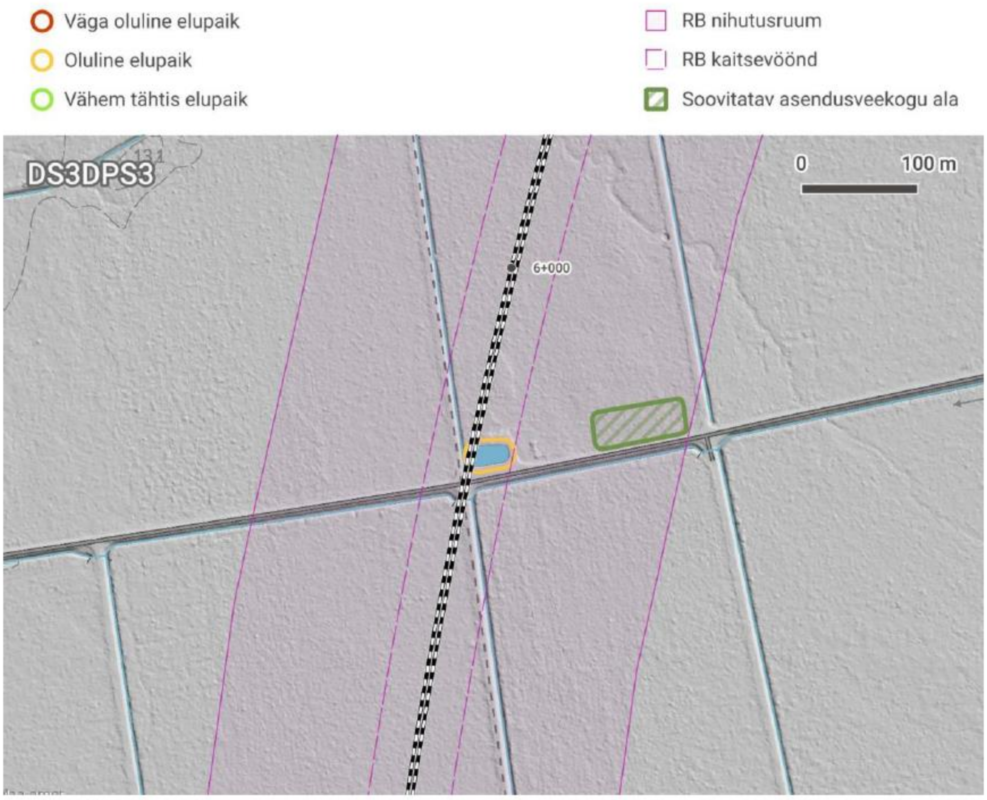


Figure 10-1. Location of the amphibian breeding water body in the railway corridor (kilometre 6+170) and recommended location of the replacement pond (source: OÜ Rewild, 2024. Amphibian habitats in Pärnu County on the RB DS3DPS3 section).

An important breeding area for amphibians is also located in the Lemmejõe floodplain – in old river channels at km 1+500-1+700, a few hundred metres downstream. No direct impact on this breeding area is anticipated, and measures to prevent indirect adverse effects are explained in the section on construction measures below.

10.2.2.3 Improvement of river habitat

In order to mitigate the overall adverse effects, it is recommended to implement measures to improve and restore the condition of the river habitat, including the addition of rock material with suitable fractions, gravel and, if necessary, wood to the riverbed, which will help to create habitats for aquatic life (spawning grounds, resting and feeding places). The creation of replacement habitats for habitats important for fish should be carried out under the guidance of an ichthyologist. As the activities involved in implementing the proposed measure largely coincide with those involved in creating/improving feeding grounds for black storks, the implementation of these measures must be considered comprehensively within the framework of the compensation plan for black stork feeding grounds. The plan will be drawn up after environmental impact assessments have been carried out for all sections of Rail Baltica in Estonia, once the cumulative impact on black storks has been determined.

To improve the habitat of the European otter, larger stones (resting places) may be added to the riverbed. Large stones placed in the riverbed also help other species, such as the black stork, to feed.

The measure is of medium effectiveness in terms of improving the condition of the entire habitat.

10.2.3 Fences and power lines

10.2.3.1 Fences

Fences are necessary to prevent animals and people from unexpectedly entering the route and to significantly reduce the likelihood of their death.

According to fieldwork data and green corridor analysis, wild boar, elk and roe deer, as well as burrowing animals, may be encountered in the forest areas along the Kabli-EE/LV railway section. In areas where elks may be present, fences with a height of 2,5 m above ground level are necessary. In forest areas where wild boars and other burrowing animals are present, the fence must be buried in the ground to a depth of at least 50 cm. As large ungulates and burrowing animals are present throughout the entire section, **the fence must be at least 2,5 m high above ground level and buried 50 cm into the ground along the entire section** (Figure 10-2).

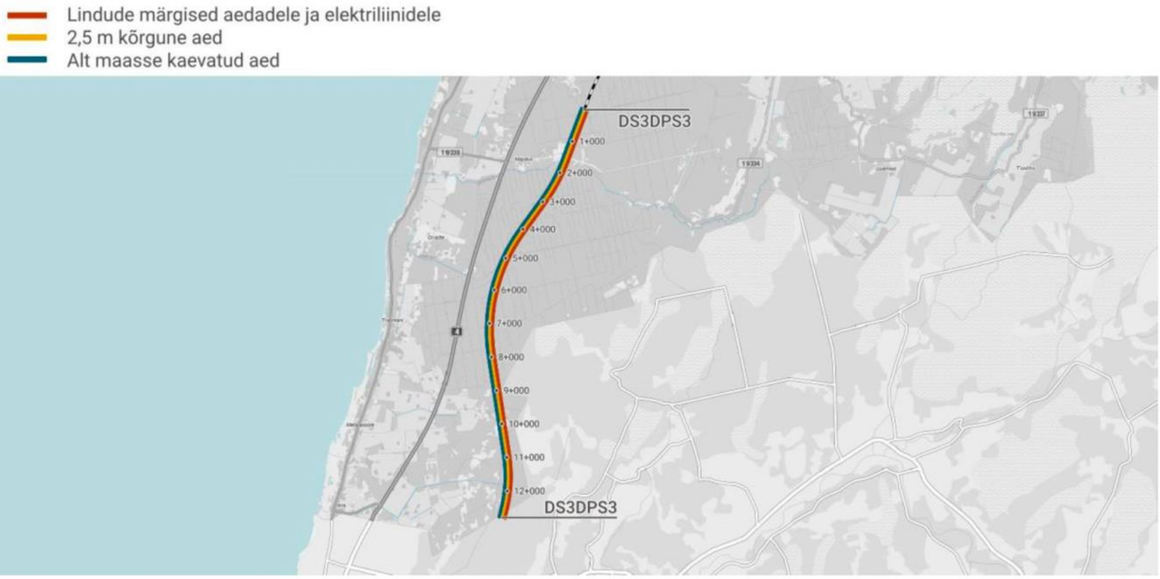


Figure 10-2. Need for special solutions on the RB DS3DPS3 section (Kabli-EE/LV border). (Source: Rewild, 2024. Rail Baltic DS3DPS3 section special requirements for fences and overhead lines)

To prevent amphibians and small mammals from entering the railway, a barrier fence is planned to be built to prevent amphibians from passing through – on both sides of the railway, there will be a metal strip at the bottom of the fence, 0,4 m above the ground and 0,2 m below the ground (see site-specific measures in Annex 3).

The construction of boundary fences will have at least three significant adverse effects, which in turn need to be mitigated:

- a barrier effect, which reduces population connectivity;
- the death of animals, especially birds, in collisions with fences;
- death of animals accidentally entering the route in collisions with trains, under train wheels or in whirlwinds caused by trains.

Fencing off the railway significantly hinders the movement of animals and the resulting barrier effect can lead to the extinction of populations, which is why boundary fences must always be used in conjunction with animal passages. The presence of passages also increases the effectiveness of accident prevention, as animals are less likely to try to climb over or under the fences. Animal passages mitigate the barrier effect and ensure the connectivity of populations on both sides of the railway. Animal passage measures are described in more detail below.

Wire mesh fences are dangerous for low-flying birds. Lower-flying forest birds are used to manoeuvring between branches and, if overhead lines are sufficiently visible (and marked accordingly), they are able to avoid them. **Fences and power lines are to be marked along the entire length of the section.**[183]

Plastic mesh strips are used on Estonian roadside fences, but these tend to deteriorate within a few years, making them an unsustainable solution. Special plastic markers may be suitable for marking the upper additional wire, but their resistance to Estonian weather conditions (UV, cold, etc.) must be ensured. Similar markers have been used in Estonia to make the fastening cables of posts and masts visible. If light-coloured (yellow or white) and dark-coloured (e.g. black) markers are used alternately, the fence will be more visible in different lighting conditions and against different backgrounds. A solution has been proposed for the Raplamaa railway sections, where diagonal wooden slats are added to the mesh fence and bright metal rectangles are added to the upper wires of the fence (Figure 10-3). The length of the wooden slats depends on the height of the fence.

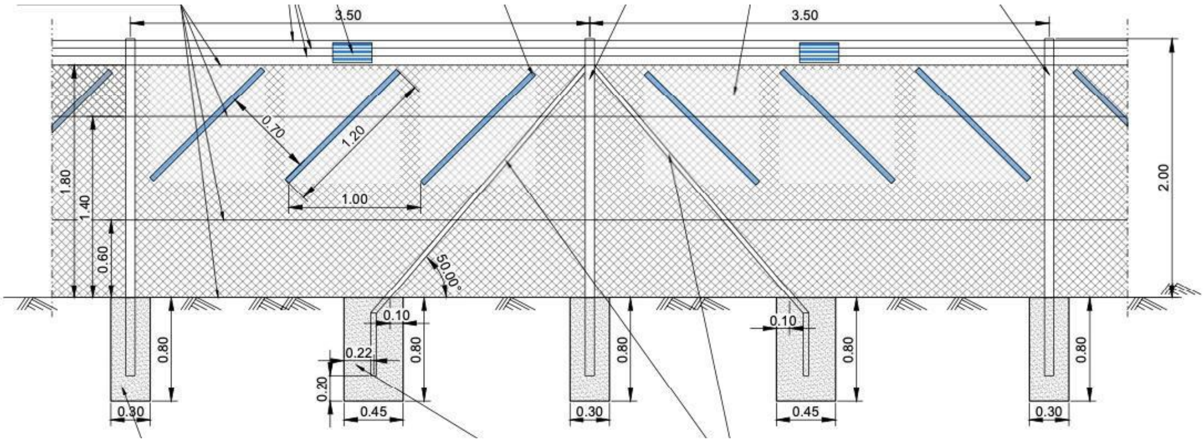


Figure 10-3. Fence solution visible to birds on project section DS1DPS5[184]

In summary, the following methods of marking boundary fences are suitable in the southern part of Pärnu County:

- wooden posts on a mesh fence;
- metal or durable plastic markers at the top of the fence;
- landscaping of fences;
- wooden fences;
- noise barriers.

Throughout the entire route, it must be ensured that **empty fence posts (and any other posts) are closed at the ends** to prevent birds from getting trapped.

[183] Rewild, 2024. Special requirements for fences and overhead lines on the Rail Baltic DS3DPS3 section. Special requirements – Need for and locations of fencing and overhead line marking and fence types on the Rail Baltica DS3DPS3 section from a wildlife perspective.

[184] Rewild, 2024. Special requirements for fences and overhead lines on the Rail Baltica DS3DPS3 section

10.2.3.2 Power lines

As it is not technically possible to bury railway contact lines underground, **marking overhead lines** is an appropriate measure to help reduce bird collisions with power lines. On the section of the railway in question, overhead lines are to be marked along the entire length of the section.

Birds like to use power line poles and lines for perching and nesting. **Special protective devices** must be used on railway contact lines in places where birds are not wanted and where electrical faults may occur. There are solutions that prevent birds from landing (spikes) and solutions that protect birds from possible electric shock (insulators). The use of such devices also protects the infrastructure from short circuits caused by climbing mammals (squirrels, martens, etc.) and saves these animals from death. When switching from overhead lines to cable lines, insulated transitions must be used to prevent electric shock.

No detailed information is currently available on the RB contact network (not part of the project being assessed) and measures related to the electrical infrastructure must be addressed within the relevant project.

The measures described are effective and ensure a significant reduction in the death of birds, including protected species.

10.2.3.3 Animal escape routes from the railway corridor

For animals that have entered the railway area for any reason, escape routes must be planned to allow them to leave the railway area, thus reducing the risk of accidents.

Large animals must be provided with an escape route from the railway at least every 500 m.

The height of the return area for large animals should be 1,6–1,9 m. The top and bottom of the return area should be as flat as possible and covered with soft soil. Tunnel entrances can be used as return areas. In the case of tunnels for small animals, the area above the tunnel entrance is suitable for a fallback area.

As the section provides for amphibian barriers, an embankment must be created at least every 100 m from the edge of the fence towards the railway, reaching the upper edge of the amphibian barrier. This will allow small mammals, amphibians and reptiles that have strayed between the fences to escape from the enclosure. This measure shall be implemented during the construction phase after the fences have been installed.

10.2.4 Animal passages

As fencing significantly restricts the movement of animals and the barrier effect it creates can lead to the decline of populations, it must always be used in conjunction with animal passages. The presence of passages also increases the effectiveness of accident prevention, as animals will not try to climb over or crawl through the fences as much.

No specific measures have been planned to prevent collisions with birds, bats and other flying animals, as the RB railway is largely bordered by forest, which acts as a guiding element. To reduce the mortality of bats, birds and insects, landscaping can be used to some extent to guide them towards safer flight paths and overpasses and underpasses, but this is often unsuccessful. Bats and other species often continue to use their established flight corridors even after changes to the landscape and fly over the railway in the danger zone. Special landscaping will only be carried out for ecoducts on the section of the railway under consideration.

The preliminary design solution provided for animals smaller than badgers to pass through the RB boundary fence and cross the railway tracks. In the intermediate design stages, fence openings were also considered as passages for larger groups of animals. In the value engineering design phase, passages at the same level were ruled out due to animal mortality and safety considerations.

Experts have estimated in several targeted studies that one passage every 5-8 km is sufficient for large animals on this section[185]. The value engineering design provides for three ecoducts and several passages under the railway in the form of bridges and tunnels on this section.

10.2.4.1 Underpasses for animals

As the section of the RB in question does not pass through densely populated areas, there is a fundamental need for amphibian passages throughout:

- In habitats that are very valuable for amphibians (around the Lemmejõgi River), passages must be built every 100 m and the railway must be blocked along its entire length.
- In habitats important for amphibians (around breeding waters, in damp forests, etc.), passages must be built every 250 m and the railway must be blocked along its entire length.

A certain variation in the distance between passages is permitted; they do not have to be exactly every 100 or 250 m. Rather, this distance serves as a guideline for how many passages there should be on a given section (Figure 10-4). When specifying the location of passages in the basic design phase, consideration must be given to the location of ecoducts, other wildlife passages, bridges, culverts and other multi-level crossings. In places where the planned passages are insufficient, amphibian tunnels with an opening of at least 0,5 m wide and 0,4 m high must be added[186].

[185] Environmental Agency Viridis OÜ, 2024. Analysis of ecoducts and small animal culverts on the Rail Baltica section Pärnu – Estonian/Latvian border

[186] OÜ Rewild, 2024. Amphibian habitats on the Pärnu County section of RB DS3DPS3. Presence of amphibian breeding water bodies and assessment of habitats on the Rail Baltic route and necessary measures

Figure 10-4. The need for animal passages and amphibian barriers based on amphibian surveys[187]

The intersection of the railway with the Kabli River must be resolved in such a way that there is a bank strip at least 2 m wide on both banks at the highest predicted water level, and individual stones are placed on it so that otters can eat their prey. Individual stones should also be placed under bridges in the water, in the shore zone, so that some of the stones remain above the water level even at the highest water level[188].

The railway section is currently densely covered with a drainage network and there are numerous small watercourses, which must be channelled under the railway. **In the VE phase, 18 culverts with shoreline paths (culverts with a combined function, designed to ensure the hydrological regime and allow the movement of animals) and an additional 9 tunnels for wild animals and amphibians are planned.**

[187] OÜ Rewild, 2024. Amphibian habitats in Pärnu County on the RB DS3DPS3 section. Presence of amphibian breeding water bodies and assessment of habitats on the Rail Baltic route and necessary measures

[188] Meel, R, 2025. Saarma inventory. Kabli River.

The culverts with banks and small animal tunnels are designed for amphibians and small and medium-sized mammals.

In the case of a combined tunnel, the dry shoreline path must be at least 1 m wide, but a wider path is preferable from the animals' point of view.[189] The height of the culverts and the dimensions of the shoreline paths are specified by wildlife experts on a location-specific basis, if necessary.

The minimum dimensions of a tunnel suitable for amphibians and reptiles are 0,5 (width) x 0,4 (height) m, when it is more than 20 m long, the measures must be increased. If tunnels for amphibians and reptiles are to be connected to tunnels for small and medium-sized game, the tunnel dimensions must be at least 2 x 2 m.

The bottom of the animal tunnel must be covered with a 10-15 cm layer of natural soil.

The measures are effective.

10.2.4.2 Ecoducts

All planned ecoducts are designed for locations where the railway crosses sensitive natural areas, with the aim of enabling wild animals to cross the railway. Green corridors are the most effective way to connect populations of different species (including plants, fungi and invertebrates) on either side of the railway. In order to allow as many species as possible to cross, ecoducts should be designed as a mosaic of different strips and patches (bare ground, stones, logs, grasses, shrubs, trees, small water bodies). Ecotunnels covered with tall vegetation are well suited for crossing railway lines for mammals, bats, forest birds and other species that avoid open areas (see also Table 10-1). Ecoducts are lined with stones, brushwood and tree trunks, which provide shelter for smaller animals and nesting sites for birds. Stones and wood warmed by the sun are ideal for reptiles. To ensure habitat diversity and improve the functioning of ecoducts, small water bodies suitable for breeding amphibians and beetles are created. An example of ecoduct landscaping is presented at Figure 10-5.

[189] Keskkonnaagentuur Viridis OÜ, 2024, Ökoduktide ja väikelooma truupide analüüs Rail Baltica lõigul Pärnu – Eesti/Läti piir

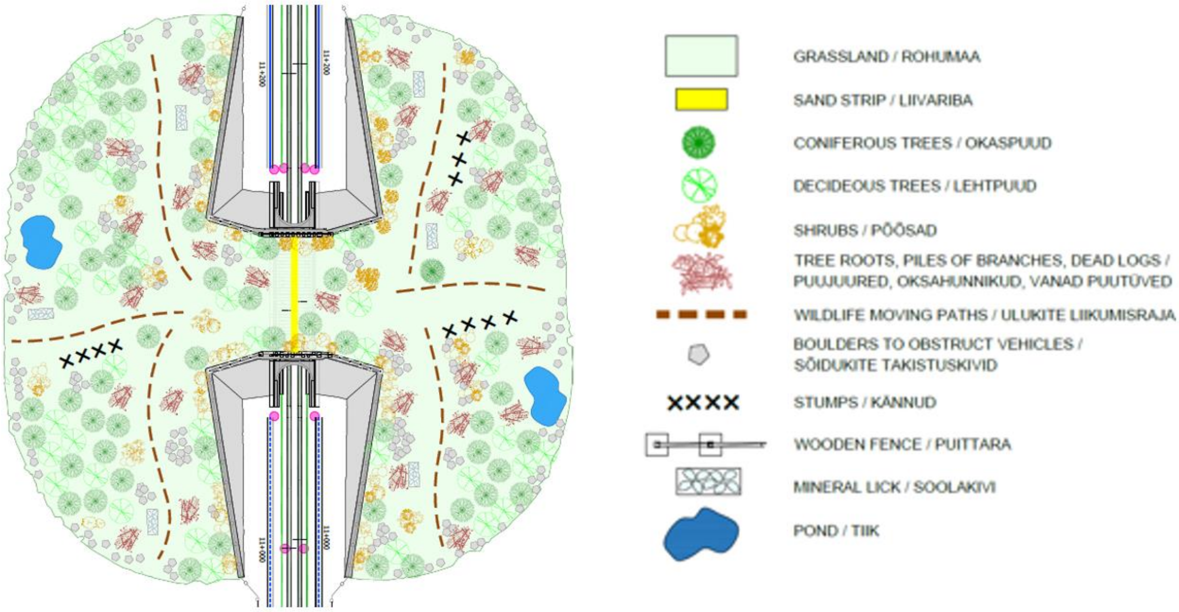


Figure 10-5. Example of landscaping an ecoduct in a forest landscape (Sanga ecoduct on the Tootsi-Pärnu section)

The effectiveness of ecoducts increases significantly over time. After construction, animals need time to adapt to and learn about the new landscape feature. Plants also need time to grow. RB ecoducts are planned to be constructed at least partially before the main route, so that animals can cross the route during construction and have time to adapt before train traffic begins. If all recommendations are followed when constructing ecoducts, all conditions will be met for maintaining the connectivity of different animal populations and the measure will be effective.

For the functioning of ecoducts and other large animal passages, it is important that a favourable and safe environment for animals is ensured in the passage area and on the connecting routes to the surrounding habitats. To this end**,** it is proposed to establish **a protection zone (restricted zone) with a radius of 500 m** around animal passages**.** There is currently no legal basis for establishing the restrictions necessary for the functioning of animal passages. In order to ensure the functioning of large animal passages, the state must create a legal basis for the implementation of appropriate restrictions. As the animal passages to be constructed are important for the functioning of the green network, it is possible to apply conditions related to the green network in the zone through comprehensive plans (local government administrative area). At the same time, hunting, logging and mining permits are issued by the Environmental Board.

The section of the railway under consideration is a very sparsely populated area and there is no significant pressure to build roads and buildings in the vicinity of the ecoducts, even if no direct restrictions are imposed in the ecoduct protection zone. However, clear-cutting is very likely and mining of mineral resources cannot be ruled out, which would temporarily reduce the functionality of the ecoducts.

Three ecoducts are planned for the railway section, which are described in Chapter 3.3.2.4 and listed in Annex 3 in the register of location-based measures.

A fourth ecoduct (BR2684 Räägu, location 0+220) has also been considered, but on the advice of wildlife experts, it has been replaced with an underpass measuring at least 3 x 3 m. Consideration may also be given to improving access to the Kabli River (location 0+020) by replacing the culvert with a bridge at least 3 m high, with a bank on both sides suitable for medium-sized game.

10.2.4.3 Dry shoreline paths along the waterbodies

Dry shoreline paths are used by semi-aquatic species and ensure their safe movement and rest. One such species is the otter.

On the Kabli-EE/LV section, a riverbank path is necessary in the Lemmejõe and Laulaste Natura 2000 sites, where otters are a protected species, although according to expert opinion, otters are mainly active in the lower reaches of the river. The Kabli stream may also be used as a habitat for otters to some extent.

Nevertheless, the railway crossing at Lemmejõe and Kabli oja must therefore be resolved in such a way that there is a dry shoreline path at least 2 m wide on both sides of the river at the highest predicted water level and individual stones are placed on the bank so that otters can eat their prey. Individual stones should also be placed under the bridge in the water so that some of the stones remain above the water level even at the highest water level.

10.2.4.4 Suitability of animal passages for different species groups

The suitability of animal passages in the section under consideration for different species and species groups is presented below, based on analyses carried out in other sections of the RB and relevant guidance materials.

Table 10-1. Suitability of different types of animal passages for different species and species groups[190,191]

Species group/species	Ecoducts L=60 m	Lemmejõgi crossing H=5 m	Large underpasses H=3 m	Low bridges H=1.5–3.0	Culverts with 1.0 m wide walkways	Small tunnels 2x2 m	Two-way tunnels 0.6x0.6 m
Ungulates							
Elk	+	+	-	-	-	-	-
Wild boar	+	+	+	(+)	-	-	-
Roe deer	+	+	+	(+)	-	-	-
Carnivora							
Bear	+	+	-	-	-	-	-
Wolf	+	+	-	(+)	-	-	-

190 Skepast&Puhkim OÜ, 2022. Environmental impact assessment (EIA) of the construction project for the Ülemiste-Kangru section of the Rail Baltica railway line. Report

191 Transport Administration, 2024. Guidelines. Road design

Species group/species	Ecoducts L=60 m	Lemmejõgi crossing H=5 m	Large underpasses H=3 m	Low bridges H=1.5–3.0	Culverts with 1.0 m wide walkways	Small tunnels 2x2 m	Two-way tunnels 0.6x0.6 m
Lynx	+	+	+	(+)	-	-	-
Fox	+	+	+	+	+	+	(+)
Common raccoon dog	+	+	+	+	+	+	(+)
Badger	+	+	+	+	(+)	+	+
Pine marten	+	+	+	+	+	+	(+)
European polecat	+	+	+	+	+	+	+
Least weasel	+	+	+	+	+	+	+
Stoat	+	+	+	+	+	+	+
Eurasian otter	(+)	+	+	+	+	(+)	(+)
Mink	(+)	+	+	+	+	(+)	(+)
Lagomorpha							
European hare	+	+	+	(+)	-	(+)	-
White hare (mountain hare)	+	+	+	(+)	-	(+)	-
Rodents							
Squirrel	+	+	+	-	-	(+)	-
Northern birch mouse	+	+	+	(+)	(+)	(+)	(+)
Brown rat	+	+	+	+	+	+	+
Mice	+	+	+	+	+	+	+
Beaver	(+)	+	+	+	+	(+)	(+)
European water vole	(+)	+	+	+	+	+	+
Insectivores							
Hedgehog	+	+	+	+	+	+	+
European mole	+	+	+	+	(+)	(+)	(+)
Shrews	+	+	+	+	+	+	+
Eurasian water shrew	(+)	+	+	+	+	(+)	(+)
Bats							
High-flying species	+	+	(+)	-	-	-	-
Family *Pipistrellus*	+	+	+	(+)	-	-	-
Low-flying species	+	+	+	+	+	(+)	-

Species group/species	Ecoducts L=60 m	Lemmejõgi crossing H=5 m	Large underpasses H=3 m	Low bridges H=1.5–3.0	Culverts with 1.0 m wide walkways	Small tunnels 2x2 m	Two-way tunnels 0.6x0.6 m
Birds							
Forest birds	+	+	+	(+)	-	-	-
Water birds	(+)	+	(+)	+	(+)	-	-
Reptiles	+	+	+	+	(+)	(+)	(+)
Amphibians	+	+	+	+	+	+	+
Fish	-	+	-	+	(+)	-	-
Invertebrates							
Flying species	+	+	+	(+)	-	-	-
Ground-dwelling species	+	+	+	+	(+)	(+)	(+)
Water-related species	-	+	(+)	+	(+)	-	-

10.2.5 Water protection measures

The water protection measures are also described in chapter 10.2.2.

In order to ensure the favourable condition of the Lemmejõgi river, activities related to the construction of the RB railway must not significantly affect the morphology of the Lemmejõgi River, including the significant reduction of the river's characteristic meandering. At the same time, the meandering of the Lemmejõgi River has a potential impact on the railway embankment and service roads in the form of erosion, which must be taken into account in the design and construction of the railway crossing and service roads. When designing the bridge and railway-related infrastructure, it must therefore be taken into account that the riverbed runs through a natural floodplain and that the riverbed may change location over time due to erosion. In order to prepare the final technical solution and assess the preservation of the water regime, additional studies/expert assessments must be carried out, if necessary, to ensure that the working project complies with the applicable legal and technical requirements.

During dry periods in current situation, there may be episodes in the lower reaches of the Lemmejõgi River where the water flow in sections of the river (e.g. downstream and upstream of Via Baltica) ceases and the river dries up. The reason for this is stated in the Lemmejõe Nature Conservation Area Management Plan as drainage ditches, which quickly direct precipitation water into the river and do not allow the flow to be balanced throughout the year. In order to improve the condition of the river habitat, consideration could be given to designing and constructing buffer ponds or pools for the drainage ditches along the RB railway, which would help to even out the flow of excess water into the river and thus stabilise the river's dynamics.

The measures are effective.

10.2.6 Reduction of disturbances

The most significant disturbance is **noise** from the railway, as it extends for hundreds of metres. Noise standards have been set to protect human health, and compliance with these standards must be ensured in residential areas. The need for noise mitigation was analysed by comparing noise calculations with the applicable noise standards. The noise assessment carried out as part of the EIA proposes the construction of noise barriers in two locations to protect residential areas along the railway line, one in Majaka village (on both sides of the railway) and the other in Metsapoole village. The parameters of the noise barriers are presented in Annex 3. The noise barriers must be constructed as sound-absorbing barriers. The parameters of the noise barriers may be specified in more detail during the further design of the noise barriers.

No noise barriers were planned in the value assessment noise study for the protection of wildlife. Wooden fences 2.5 m high have been designed for the ecoducts along the slopes of the ecoducts to prevent light and, to some extent, noise from reaching the ecoducts. The embankments of the ecoducts also dampen noise locally, resulting in less disturbance to animal movements on the ecoducts than is normally the case in the vicinity of railways.

No stationary lighting is planned for the section in question, so no measures to reduce light pollution are planned.

10.3 Measures to be implemented during the construction phase

Legislation sets out requirements that must be followed throughout the planning, construction and operation process. It is not practical to repeat the requirements of legislation in the EIA report. The laws are accessible to everyone and must be complied with. The restrictions arising from the law are listed below in cases where, based on the conditions of a specific section, the EIA expert has proposals on how to better ensure compliance with the requirements arising from the law.

Site-specific measures can be found in Annex 3 to the report.

10.3.1 Measures for the protection of wildlife

Otter, beaver, mink. As the general situation of these species in Estonia is favourable, they are very likely to live in watercourses crossing the railway section in question. Almost the entire railway section passes through deciduous or mixed forests, which are suitable habitats for these species. Before construction work begins (before clearing the forest), it must be ensured that there are no nests of the otter, beaver and mink at the intersections affected by the construction work. The nesting season for the otter is from 1 March to 30 June and for the beaver from 15 April to 31 July.

In addition, it should be noted that many habitats of Category II and III animal species are not registered, but **individual protection** must be applied regardless. This means that individuals of protected species (including amphibians) must not be intentionally killed, captured or disturbed during reproduction, rearing, hibernation or migration. It is also unethical to intentionally kill individuals of animal species that are not protected.

The risk of **amphibian** mortality can be identified on Mustikametsa road, which is located next to a pond that serves as a habitat for amphibians, and on Loigu road, which is located next to the old channels of the Lemmejõgi river. These roads are likely to be used by RB construction vehicles.

Installing temporary barriers along the road would prevent amphibians from moving freely to their breeding waters, which is not reasonable in this case. Amphibians move around more during the dark, so a temporary restriction on construction transport during the amphibian activity period could be implemented as a mitigation measure.

Location-based measures for water bodies important to amphibians are presented in Annex 3.

Birdlife. During the construction of the RB, the greatest threat to birds is the clearing of the railway line if this is carried out during the nesting season. Eggs (embryos) and nestlings are at risk of death. It is therefore important that this work is not carried out during the nesting season. It should be noted that some species (including protected cormorants) begin nesting as early as March and some species may still have chicks in August. The logging moratorium is applied on the whole route in time period of 15.04-15.07.

10.3.2 Water protection measures

When constructing the railway line, standard safety and precautionary measures must be observed. When constructing bridges over watercourses, the formation of dams, deepening, filling and narrowing of the watercourse at the crossing point must be prevented.

The bridges to be constructed must not affect drainage conditions during low water or high water conditions. It is recommended to leave a natural bank (bank strip) on both sides of the river. The bridge to be constructed must not obstruct the free movement of sediments and biota in the river. Excavation work must not cause a significant increase in sediment load in the watercourse. In order to mitigate adverse effects, it is appropriate, where justified, to implement restorative or compensatory measures for fish in at least the important river sections, including the addition of rock material with suitable fractions, gravel and, if necessary, wood to the riverbed in suitable locations under the guidance of an ichthyologist.

The following shall be taken into account when constructing bridges and culverts:

- The construction of bridges and culverts (e.g. excavation, clearing, heavy machinery, etc.) must not cause a significant increase in sediment load in the watercourse.
- Rivers/streams crossed by the railway line are important habitats and migration corridors for amphibians and semi-aquatic mammals.
- During low water, a bank strip must be maintained next to the riverbed under bridges or culverts for the migration of semi-aquatic and smaller mammals, even during construction. It is recommended to leave natural banks at least a couple of metres wide for small mammals, so that they remain flood-free for most of the time, even during construction.
- The movement of biota should be prevented for as short a period as possible.

10.3.3 Measures to protect the soil

Measures for soil protection during the construction phase are as follows:

- Valuable topsoil removed from the ground under the railway and associated infrastructure and other structures shall be used specifically for the same construction project or reused for other projects in order to prevent the destruction of topsoil.
- Topsoil must not be stored for more than two years in order to prevent the destruction of the microflora it contains. Excessive compaction of topsoil must also be avoided.

- Temporary offices, warehouses, asphalt plants, workshops, etc. during construction must not be located in places where pollutants can enter the soil directly and cause soil contamination.
- In order to reduce the extent of soil damage, the area of land used for construction work must be limited, avoiding activities outside the railway and road areas (when constructing crossings). If temporary storage sites are required outside railway land and road land, preference shall be given to areas with hard surfaces or already damaged soil.
- Storage sites for construction materials, waste and other materials necessary for the work must be such that the spread of hazardous substances contained therein and their entry into the soil is prevented.
- Transport and construction machinery in good working order and well maintained must be used for construction work. Leaks of fuel, lubricants and other hazardous substances from vehicles and machinery into the environment must be prevented.
- During construction work, construction machinery must not be stored, maintained (including washing) or refuelled in areas where hazardous substances may leak into the soil, especially in areas with poorly protected or unprotected groundwater. If this is unavoidable, the risk of pollution from construction equipment must be minimised, for example by using a geomembrane or other similar solution. Spills must be collected and treated immediately to prevent secondary pollution.
- If (construction) materials and waste enter the soil and outside the storage area (e.g. carried by wind, water or vehicle wheels), the scattered material and waste must be collected immediately and, if soil contamination occurs, it must be removed immediately. Littering around the construction site must be avoided.
- In order to limit the extent of soil damage during the construction phase, activities outside the railway protection zone (66 m) should be avoided if possible or, if absolutely necessary, remain within the limits of the railway relocation area – 350 m in sparsely populated areas and 150 m in the area bordering the Põhja-Liivimaa SPA (including the storage of construction materials and waste, the movement of vehicles and construction machinery, their storage and maintenance, the erection of temporary structures, etc.).
- If residual pollution is found during construction work, soil work must be suspended, the area where the pollution was found must be cordoned off, soil samples must be taken to determine the nature of the residual pollution and a decision must be made on the necessary measures. The findings must be documented and, if necessary, the Environmental Board must be notified.

The measures shall be effective and contribute to reducing the impact on the soil.

10.3.4 Measures for waste management planning

The largest amounts of waste are generated during construction and later during reconstruction work. Most of the waste generated is classified as recyclable raw materials or recyclable materials.

The recommendations for waste management during the construction and operation phases are summarised below.

- Preference should be given to the reuse of waste materials, such as excavated soil, at or as close as possible to the place of origin in order to reduce transport distances.
- Where possible, and if the quality and other requirements of the materials allow, secondary raw materials or by-products or waste from other processes should be preferred.

- Before construction work begins, a work organisation plan must be drawn up, which must specify the waste management procedures on the construction site.
- There must be a suitable and safe place for storing all types of waste on the construction site. Waste storage is not permitted in surface water protection zones or in areas with unprotected groundwater. If the latter is unavoidable, precautions such as a geomembrane or similar should be considered.
- Waste generated must be handled in accordance with the requirements established by the waste holder or transferred to a person authorised to handle it.
- An environmental management plan must be drawn up for the project, specifying the types of waste generated during construction and use and the procedures for their treatment. The plan should also consider measures to reduce and recycle waste.
- The environmental management plan should implement a hierarchy that prioritises sustainable processes such as reuse and recycling over landfill.
- Implementation of environmental management systems (ISO 14001, EMAS, etc.).
- Regular energy efficiency, life cycle assessment and other audits during operation to reduce the environmental impact of Rail Baltic and increase its efficiency.

The planned mitigation measures are effective in creating an efficient waste management system.

10.3.5 Measures to protect ambient air quality

The emission and spread of pollutants into the ambient air during the construction of the railway and related infrastructure can be limited by operational and technical measures. Dusty construction materials and waste must be moistened during handling (transport, loading, unloading, temporary storage) as necessary to prevent/reduce dust formation and dispersion. Moistening is particularly important during dry periods with no precipitation for a long time. Closed vehicles must be used to transport easily dusty materials, or the load must be covered with a dust-proof cover. During periods without precipitation, dust control measures should also be carried out on uncovered roads leading to the construction site and on construction sites, if necessary. Hard surfaces at the construction site and vehicles and machinery used for work should be cleaned periodically to remove any dust that has accumulated.

In addition to traffic load, traffic-related air pollution is also related to the nature of traffic and the technical condition of vehicles. To reduce negative impacts, speed limits should be imposed on roads leading to the construction site if necessary. It is also important to clean roads of dust accumulating at the roadside and, where appropriate, to carry out dust control on gravel roads (the need for this depends on the roads used and weather conditions). Attention must be paid to the technical condition of vehicles, machinery and equipment – they must be in good working order and comply with applicable standards.

The measures are effective.

10.4 Measures to be implemented during operation phase

10.4.1 Measures to reduce climate impact

During the operation phase, the use of 100% renewable energy for the operation of rolling stock is an effective measure. The implementation of this measure will enable the maximum decarbonisation of RB rail transport.

10.4.2 Measures to protect biodiversity

Pursuant to § 55 (6) of the Estonian Nature Conservation Act, it is prohibited to intentionally disturb protected animal species during reproduction, rearing of young, hibernation and migration. Pursuant to § 55 (6)[1] of the Nature Conservation Act, it is prohibited to intentionally destroy or damage the nests and eggs of all naturally occurring birds or to remove nests and intentionally disturb them, especially during the breeding and rearing season. Accordingly, **major maintenance, repair and reconstruction work** must **be avoided during the breeding season of protected mammals, reptiles, amphibians, fish and invertebrates and all naturally occurring birds.** Noisy maintenance and repair work shall not be carried out during the bird nesting period from 15 April to 15 July. The measure is intended as a general measure. Site-specific temporal restrictions are listed in the register of mitigation measures (Annex 3).

Experts on species groups shall be involved in the planning of large-scale maintenance, repair and reconstruction work in RBs to identify which species occur/nest in the work area and its immediate vicinity and assess/determine where and for how long site-specific restrictions need to be imposed.

During operation phase, railway rolling stock and maintenance equipment must be regularly inspected and maintained to prevent fuel and oil spills. Care must also be taken to ensure that no hazardous substances leak from freight wagons. Freight wagons must be checked before the train leaves the station.

The use of chemical herbicides must be avoided. The target group of the measure is amphibians and organisms associated with water bodies (fish, invertebrates), but the measure also has a beneficial effect on birds and mammals, as amphibians and various aquatic organisms are their food source. Chemical herbicides have a harmful effect on various groups of living organisms. As railway ballast differs significantly from soil, chemical compounds take much longer to break down. Plant toxins can accumulate in the soil and leach into water bodies, where they can accumulate through the food chain. It is therefore important to avoid the use of chemicals to control vegetation growth on railways. Herbicides must not be used in water bodies (including culverts) that cross RBs or in amphibian breeding waters within a radius of 50 m.

To protect fish, excessive use of chemicals in railway maintenance must be avoided. The use of chemicals in railway maintenance must be coordinated with the Environmental Board. In order to mitigate negative impacts, it is appropriate to implement, where justified, restorative or compensatory measures for fish, at least in important river sections, including the addition of rock material with suitable fractions, gravel and, if necessary, wood to the riverbed in suitable locations under the guidance of an ichthyologist.

Maintenance of animal passages, including game tunnels and culverts. During operation phase, animal passages must be maintained so that there is free access to the entrances of tunnels and culverts (mowing vegetation, removing debris and sediment, etc.). Water culverts must be regularly cleaned of branches and other debris that has accumulated there to prevent blockages. Care must be taken to ensure that the bottom of the culvert and the animal passageways are covered with a natural layer, which must be renewed if necessary.

The protective zone of the ecoduct extends 500 m from the centre of the ecoduct, where conditions for use apply to ensure the functioning of the ecoduct. Activities restricted in the ecoduct protection zone will be regulated by legislation in the near future. The conditions will also be specified in an expert assessment, if necessary. Among other things, the restrictions concern, for example, forest clearing and logging, mining, hunting, and the construction of buildings.

When maintaining and repairing viaducts and ecoducts, it must be checked whether bats, birds or other animals are using them for nesting or shelter. If animals are present, maintenance and repair work must be scheduled for a period when they are not present to avoid them being trapped and killed. The main nesting period for birds is 15 April to 15 July. Bats do not use bridges as shelters in the Estonian climate during the winter period (1 November to 30 April). During warmer periods, it is advisable to consult a species expert for certainty.

Checking and maintaining fences. Fences and barriers for amphibians must be checked regularly. Particular attention should be paid to ensuring that gates in fences are not left open, as animals can escape onto the railway through them. Maintenance workers (including subcontractors) must be instructed accordingly. Gates can be equipped with special sensors or automatic closing mechanisms.

The boundary fence must be checked regularly to ensure that animals cannot enter the railway corridor through a broken fence. Any broken parts must be repaired immediately. Visual inspections must be carried out at least once a month and at least once a year (in spring), the fence must be checked more thoroughly to ensure that there are no openings through which animals can access the railway. During a thorough inspection, the following must be checked:

- check that the posts are firmly in the ground;
- check that the wires and mesh are sufficiently taut and properly secured;
- check that the amphibian barrier is properly secured and there are no gaps;
- check that there are no gaps at the bottom of the fence;
- check that all gates close tightly;
- check that the devices for making the fence visible to wildlife are still in place and working.

Any deficiencies must be rectified as soon as possible.

Ensure that empty fence posts (and any other posts) are closed at the ends to prevent birds from getting trapped.

The specific methods, rotation, and intensity of railway **landscaping** and maintenance of surrounding areas are set out in the RB environmental management plan. Impacts to be avoided when planning mowing work:

- In the area immediately adjacent to the railway (up to *approx.* 2 m from the outer rail), a vegetation-free or low-growing zone must be ensured. There must be no flowering plants that could attract insects and birds that feed on them, etc., to the danger zone, where they could be sucked into the train due to turbulence.
- More distant open areas should preferably be mowed 1-2 times during the vegetation period to ensure a variety of flowering plants and the development of a species-rich grassland habitat.

- During maintenance, vegetation should be mowed at least twice during the growing season on the outer side of the walls guiding amphibians to prevent amphibians and other animals from climbing over the barrier.

During railway operation, it is necessary **to regularly remove animal and bird carcasses** from the railway area, which is important to prevent the death of birds of prey, which may feed on carcasses found on the railway, especially during the winter period. Large animal carcasses must be removed as soon as possible and no later than within 24 hours.

If **alien species** are found in the area before or during the construction phase, their monitoring and control must continue during the operational phase.

10.5 Measures to prevent accidents and reduce their consequences

Organisational preventive measures are important for avoiding accidents. Such measures are laid down in the legislation in force. Railway safety issues are regulated by the requirements of the Railway Act (RdtS). According to § 35(2) of the RdtS, railway infrastructure operators and other railway infrastructure owners are obliged to ensure safe traffic on their railway infrastructure and to maintain it in a safe working order. Railway undertakings and other railway vehicle owners are obliged to ensure the safety of railway transport and the compliance of the railway vehicles they use with the applicable safety, maintenance and other requirements (RdtS § 35 (3)). These persons are required to comply with the requirements of the railway technical operating rules and all environmental, fire safety, occupational safety, occupational health and health protection rules and requirements. RdtS § 40 (1) obliges railway undertakings to establish a safety management system. An important part of the railway safety management system is the management of risks associated with the transport of chemicals by rail. The safety management system shall be established before the start of the transport of chemicals on the Rail Baltica railway.

According to the Rescue Act, rescue operations on land are the responsibility of the Rescue Board. Rescue operations also include all possible railway accidents. Among other things, the Rescue Board analyses its rescue capabilities and response times. If necessary, the Rescue Board must supplement these analyses, taking into account, among other things, RB rail traffic.

The recommended mitigation measures are effective in minimising the impact.

10.6 Measures to mitigate adverse environmental impacts

As a measure to mitigate the impact (compensation measure), the replacement of the breeding water body for amphibians is planned, as described in the chapter 10.2.2.2. No other compensation measures are foreseen in the section. The measure is effective.

11 PROPOSALS FOR ENVIRONMENTAL MONITORING

Based on the main areas of potential adverse effects identified in the impact assessment, the EIA report presents proposals for monitoring the construction and operation phases of the planned activity.

The proposed monitoring measures are presented in annex 4 of the EIA report.

The monitoring activities are divided into three stages according to the time of occurrence:

- Preliminary monitoring, i.e. monitoring before the start of construction work on the facilities. The aim is to record the existing status and corresponding reference values for subsequent monitoring stages and/or the need to implement measures during construction.
- Monitoring during construction. The aim is to identify reactions to construction activities and the completion of the structure and, if necessary, to implement additional measures.
- Follow-up monitoring, i.e. monitoring after completion of the railway. The aim is to identify reactions to the completion of the structures and the commissioning of the railway, to assess the effectiveness of the mitigation measures implemented and, if necessary, to develop additional measures.

When developing monitoring measures, it has been taken into account that the type of indicators to be monitored and the duration of monitoring should be proportionate to the nature, location and scale of the planned activity and the expected environmental impact.

Accordingly, the monitoring measures set out in this section primarily concern fauna (including protected bird species), the aquatic environment and noise. At the same time, other sections of the RB provide for monitoring in additional areas (e.g. electromagnetic field monitoring), the results of which may provide relevant additional information on the entire route.

Observations collected as part of **national monitoring** can also be used in part to analyse the impact of the railway. Among other things, the data collected during national monitoring must be used to the maximum extent possible to analyse the impact of the RB on the viability of animal populations and the status of surface water bodies.

A monitoring plan shall be drawn up specifying the timing, duration, location, methodology, frequency, indicators to be measured and other necessary parameters. The monitoring plan shall form part of the RB environmental management plan and it is recommended that a monitoring plan be drawn up for the entire RB route.

The monitoring plan needs to be reviewed regularly to take into account previous monitoring results and increases in the intensity of RB use. When reviewing the monitoring results, it is necessary to regularly analyse whether the frequency, duration, location and scope of monitoring specified in the monitoring plan are appropriate, including whether monitoring needs to be increased (if the trend in the status of the monitored environmental element shows a significant deterioration) or whether it can be reduced (the status of the environmental element is at least good and is not changing). Where necessary, e.g. in the event of changes in the requirements of relevant legislation, the identification of significant impacts, etc., the list of components to be monitored or the methodology shall be adjusted.

The results of monitoring shall be stored and their processability and availability to experts and authorities shall be ensured. The data collected through monitoring must enable analysis of the impact of the RB railway on the state of the affected environmental element, assessment of the effectiveness and adequacy of the mitigation measures implemented, and, where necessary, recommendations for further mitigation of the adverse impact of the RB.

Competent experts in the relevant fields who, in addition to the methodology for monitoring the status, are familiar with the principles of impact analysis shall be involved in the preparation and review of the monitoring plan and the analysis of the monitoring results.

When assessing monitoring results, in addition to the effects of RB use, other factors and general trends (e.g. the overall status of species) should also be taken into account and based on the potential effects of RB. If no adverse effects/trends or links with RB are identified, it is appropriate to decide whether monitoring should be continued, reduced or discontinued.

The above principles apply to all monitoring proposals set out in the Annex (Annex 4) to this report.

Additional explanations are provided below regarding **the monitoring of animal passages**, which it was not technically feasible to include in the overview table of monitoring measures.

Monitoring of large animal passages determines which species use the passages and to what extent, in order to assess the functioning of the passages for the target species and make any necessary improvements (e.g. restricting human access, changing landscaping, etc.).

The main purpose of wildlife passages is to ensure the connectivity of populations in order to maintain their viability.

Monitoring must include all large carnivore passages constructed in the section under consideration (the Loigu, Treimani and Piiri ecoducts and the underpass at the Lemmejõe/Loigu road junction).

Monitoring of large animal passages must be carried out annually for the first five years after completion of the structures (including the fencing) and every five years thereafter. Observations must be carried out in each season (spring, summer, autumn, winter), taking into account the functional characteristics of the target groups using the passages.

The purpose of monitoring is to identify the species that use the passages. An additional objective is to assess the condition of the passages in order to carry out additional maintenance or repair work if necessary.

Monitoring of large mammals must provide answers to the following questions:

- Which species use the passage?
- What is the abundance of different species in the passage and its surroundings, using a standard abundance index?
- What is the abundance of different species in the vicinity of the structure within a radius of 200–1000 m (depending on the species group), using a standard abundance index?
- Are there suitable habitats (including feeding sites, shelter, breeding sites) for the species using the passage and in its vicinity? Are microhabitats specifically created for the passage (e.g. ponds, stump rows, etc.) functioning?
- Do animals have free access to the passage and do guiding structures and landscape design facilitate the use of the passage?
- Are there any disturbances at the passage that prevent its intended use?

Suitable methods for monitoring the passage of large animals include trail cameras and sand strips for detecting tracks. In snowy winters, the tracks of larger animals can also be read from the snow. Ultrasound detectors and infrared cameras are suitable for detecting bats. Telemetry devices can be used to monitor the passage of individuals.

The biggest cost items in monitoring are labour and transport costs. It is therefore advisable to use (automatic) permanent monitoring devices as much as possible. Automatic data recording and regular data transmission via mobile communication to the monitoring organiser and monitor should be preferred. In order to keep monitoring and maintenance costs low, it is advisable to consider providing a permanent power supply for the monitoring equipment to reduce the need for battery replacement, etc.

Traffic cameras must be installed on ecoducts at their narrowest and highest points, next to the sand strip to be constructed for monitoring purposes. The best location for cameras on ecoducts is at the ends of the sand strip, but they can also be installed on (wooden) fences, for example. At a minimum, the cameras should cover the sand strip area and have a short enough response time to capture animals crossing the sand strip. The aim is for the cameras to record all animals crossing the sand strip. In an ideal solution, the cameras would have as wide a field of view as possible, which could be achieved by placing two cameras at both ends of the sand strip so that the viewing sectors cover the entire visible area of the ecoduct.

The number of cameras depends on the size of the passage. The minimum number of cameras is two, but there could also be four (two at each end of the sand strip) or even six (with one additional camera at each end of the ecoduct) or eight (in which case there would be 4 cameras at the sand strip of the ecoduct, directed perpendicular to the ecoduct, and 4 cameras at the mouths of the ecoduct, directed along the ecoduct, so that the entire width of the ecoduct would be covered).

Monitoring of the passage of amphibians, reptiles and small mammals must clarify:

- Which mammal, amphibian and reptile species use the passage?
- What is the abundance of different species in the passage and its variation in the vicinity, using a standard abundance index?
- What is the abundance of different species in the vicinity of the structure within a radius of 200–500 m (depending on the species), using a standard abundance index?
- Are there suitable habitats (including feeding sites, shelters, breeding sites) for target species at the passages and in their immediate vicinity?
- Do target species have free access to the passage and do guiding structures and landscape design facilitate the use of the passage?
- Are there any disturbances at the passage that prevent target species from using it?

Monitoring of small animal passages may be organised as stratified random sampling so that all passages are monitored at least once during the first five years after the railway (including the fencing) is built. Later, monitoring may be carried out up to three times less frequently. The necessary monitoring frequency can be determined on the basis of the results of the first five years of monitoring.

Observations shall be carried out in each season (spring, summer, autumn, winter), taking into account the specific characteristics of the target groups using the passages. The use of passages for amphibians is best assessed during the spring migration period, but not exclusively.

Cameras and tracking using ink pads or fine sand strips are suitable for assessing the use of passages (tunnels) installed for small mammals. For example, pitfall traps installed at the entrance to the tunnel are suitable for identifying species. Telemetry devices can be used to monitor the use of passages by individuals.

When monitoring the use of passages by both large and small animals, any deficiencies in the passages should also be recorded in order to find solutions to eliminate them. After the deficiencies have been eliminated, the passage should be monitored at an intensity that allows determining whether the change has achieved its objective.

Before starting monitoring, a monitoring plan must be drawn up, specifying the monitoring objectives, monitoring methodology, details of data storage and exchange, etc. The monitoring plan shall be coordinated with species group specialists and the Environmental Board.

The organiser of the monitoring should keep abreast of developments in the field of biodiversity monitoring in order to implement new cost-effective monitoring methods where possible. If necessary, changes may be made to the methodology, but it is important to ensure that the monitoring objectives are achieved and that the data series is continuous. Comparability between different years and monitoring sites must be ensured.

12 COMPARISON OF ALTERNATIVES

Based on the EIA programme that has been found to comply with the requirements, this EIA report discusses two consecutive stages of design as alternatives for the construction of the railway: the preliminary design solution (alternative 1) and the value engineering solution (alternative 2). The reason for comparing consecutive and interrelated design stages is that the final project solution must be at least as good as or better than the solution presented in the preliminary design in terms of environmental impact.

The alternatives are described in chapter 3.3.

The comparison of alternatives does not include the so-called zero alternative (the planned activity is not implemented), because in the context of the railway section in question, this is not a realistic alternative – the RB railway must be built in its entirety and it is not possible to abandon one section of it separately. International agreements have been concluded at national level for the implementation of the Rail Baltica project, RB county-wide spatial plans have been established and construction work on the northern sections of the Rail Baltica railway has already begun. The zero alternative has been considered to the extent necessary in the strategic environmental assessment of the RB county-wide spatial plans.

The following (Table 12-1) provides an overview of the comparison of the preliminary design and value engineering design solutions based on the results of the environmental impact assessment.

Table 12-1. Comparison of alternatives by impact area

Impact	Preliminary design (alternative 1)	Value engineering design (alternative 2)
Impact on climate	Not comparable, indirectly can be assessed as equivalent[192]	
Impact on protected natural objects (excluding Natura areas)	equivalent	
Impact on Natura areas	equivalent	
Impact on fauna and green network		better
Impact on vegetation	equivalent	
Impact of deforestation	not comparable, indirectly can be assessed as equivalent[193]	
Impact on the spread of alien species	equivalent	
Impact on groundwater		better
Impact on surface water	equivalent	
Impact on soil	equivalent	
Impact on relief	equivalent	

[192] The impact on climate is based on indicative estimates, the accuracy of which does not allow for a reliable detailed comparison of project solutions.

[193] The extent of deforestation required for the construction of the railway was not specified in the preliminary design stage.

Impact	Preliminary design (alternative 1)	Value engineering design (alternative 2)
Impact on noise		better (conditionally)[194]
Impact on vibration	equivalent	
Impact on ambient air quality	equivalent	
Electromagnetic impact	equivalent	
Impact on light pollution	equivalent	
Impact of material use and waste generation	equivalent	
Impact of accidents	equivalent	
Impact on people's mobility	equivalent	
Impact on human health, well-being and property	equivalent	
Impact on land use	equivalent	
Impact on mineral resources	not comparable, indirectly can be assessed as equivalent[195]	
Impact on cultural heritage	equivalent	
Impact on landscapes	equivalent	

A comparative analysis highlights the fact that the value engineering solution improves the preliminary design solutions, based, among other things, on additional environmental studies and recommendations from experts. This improvement contributes to the overall reduction of the expected environmental impact. **In areas where the preliminary design and value engineering solutions are not generally equivalent (most impact areas), the value engineering solution is more favourable from an environmental impact perspective.**

A road bridge is planned for the forest road crossing the railway in Metsapoole village in both the preliminary design and the value engineering design solutions. During the impact assessment, two alternative locations for the Metsapoole viaduct were identified. The option of not building a road bridge was also considered. The corresponding alternatives have been taken into account **as sub-alternatives to alternative 2.** The alternatives of the Metsapoole viaduct are addressed throughout the EIA report and separately in this chapter only if significant differences between the alternatives became apparent in the context of the relevant impact aspect.

The environmental impact of the sub-alternatives differs primarily in terms of their impact on Natura areas. Sub-alternative 1 (original location of the viaduct) has an adverse impact on the Mērnieku dumbrāji SAC, which must be mitigated by additional measures. Sub-alternative 2 (construction of the viaduct to the north) or sub-alternative 3 (no construction of the viaduct) would not have any such adverse impact.

---

[194] The preliminary design does not include noise barriers, which were only developed at the value engineering stage. However, noise barriers are necessary in any project solution to ensure compliance with noise limits.

[195] The volume of mineral resources required for the construction of the railway was not specified in the preliminary design stage.

13 OVERVIEW OF THE PUBLICATION OF THE EIA REPORT

An overview of the results of the public display and participation process will be added after the draft environmental impact assessment report has been made available for public display.

14 SUMMARY

Planned activity and its objective

Rail Baltic is a railway infrastructure project aimed at constructing a double-track, 1435 mm gauge, electrified high-speed railway (with a project speed of 249 km/h) on the route Tallinn – Pärnu – Riga – Kaunas – Lithuania/Poland border. The construction of the railway and related infrastructure will allow the Baltic countries, including Estonia, to be integrated into the European rail network and will create opportunities for better movement of people and goods.

To facilitate the implementation of the Rail Baltica project in Estonia, county-wide spatial plans have been adopted in Harju, Rapla and Pärnu counties. The county-wide spatial plans establish a north-south railway corridor approximately 213 km long on Estonian territory. Both international travel terminals and local stops are planned along the route.

The section of the railway assessed in this environmental impact assessment (EIA) runs in the southern part of Pärnu County from Kabli to the border between the Republic of Estonia and the Republic of Latvia and is approximately 12,7 km long.

Initiation and implementation of environmental impact assessment

A strategic environmental assessment (SEA) was carried out during the preparation of the Rail Baltica county-wide spatial plans, which assessed the overall environmental impact of the Rail Baltic project and a joint SEA report was prepared for the three county-wide spatial plans. First, a preferred railway route option was selected, which was then subjected to a detailed environmental impact analysis and the necessary environmental impact mitigation measures were developed. These measures have been taken into account in the development of the project solutions for the railway sections.

Although the SEA of the county-wide spatial plans has been carried out thoroughly, it is reasonable to assess and specify the environmental impact also at the design stage and for each section of the railway in order to ensure that the environmental impact is taken into account sufficiently and that the interested parties are better involved. The railway passing through Estonian territory has been divided into nine sections for the purposes of environmental impact assessment. The EIA for the section of the Rail Baltic railway section between Kabli and the Estonian/Latvian border was initiated by Decision No. 1-7/24-184 of the Consumer Protection and Technical Regulatory Authority on 7th June 2024.

Location and environment likely to be affected

The railway section under discussion is located in Häädemeeste municipality in Pärnu County and extends from Kabli stream to the border of the republic. The settlement density in the area of the section is very sparse. Residential areas are located within the immediate impact zone of the railway in only two villages (Majaka and Metsapoole).

The railway section is located on the coastal plain of the Liivi Bay. The natural conditions of the area are characterized by clay-sandy soil, wet areas that have been intensively drained, and relatively small rivers and streams flowing from east to west. The railway runs north-south, mainly through forest land that is part of the green network in southwestern Estonia.

The use of environment

The use of the environment of the Rail Baltic railway lies in the need to use large quantities of construction materials. Construction materials are needed as backfill for the construction of the railway and its maintenance roads, for the reconstruction of roads crossing the railway, and for the earthworks for ecoducts. The construction of the railway requires fill material for the embankment, the protective layer of the embankment and the ballast. For the construction of railway maintenance tracks and roads crossing the railway, fill material is needed for the embankment and the construction of the gravel surface. The construction materials (sand, gravel, dolomite/limestone) required for the structures, will be supplied by the construction company from quarries with environmental permits. Materials of higher quality will also need to be imported from outside Estonia. Based on current knowledge, the extracted material from the construction can be reused on site, thereby reducing the need for additional mineral resources and waste generation. During the railway's operational phase, the need for natural resources is expected to be insignificant compared to the construction phase.

Impact on Natura 2000 sites

In terms of the Natura 2000 network, there are six Special Areas of Conservation (SACs)(Kabli, Kivikupitsa, Laulaste, Lemmejõe, Metsapoole and Orajõe SACs) and two two Special Protection Areas (SPAs)(Kabli and Põhja-Liivimaa SPAs) in the vicinity of the planned activity. In addition, the Mērnieku dumbrāji SAC, located in the Republic of Latvia, lies within the impact zone of the railway section.

As a result of the first stage of the Natura assessment, i.e. the screening, adverse environmental impact of the construction and operation of the railway on the Kabli, Kivikupitsa, Metsapoole and Orajõe SACs and the Kabli SPA were ruled out. Adverse impact on the forest habitat types designated as conservation objectives for the Laulaste SAC were also ruled out.

The second stage of the Natura assessment, i.e. the appropriate assessment, was carried out for the Lemmejõe and Laulalaste SACs and the Põhja-Liivimaa SPA. As part of the cross-border impact assessment, an appropriate Natura assessment was carried out for the Mērnieku dumbrāji SAC.

Lemmejõe and Laulaste SACs

The conservation objectives of both the Lemmejõe (EE0040342) and the Laulaste (EE0040309) SACs, for which a Natura appropriate assessment was carried out, are habitat types – rivers and streams (3260) – and species – otter (*Lutra lutra*), European river lamprey (*Lampetra fluviatilis*) and thick-shelled river mussel (*Unio crassus*).

These habitats and species are associated with the Lemmejõgi river, which is crossed by the railway section in question 5,1 km upstream from its mouth. The relevant section of the river is located in the Lemmejõgi SAC. The Lemmejõgi river crosses the Laulaste SAC approximately 1,9 km upstream from the RB intersection, and is therefore primarily subject to indirect impacts.

The Lemmejõgi river crossing is planned as a relatively long and high railway bridge, the pillars of which will not be built in the water (river bed). Adverse effects on the river habitat and for the otter may occur through construction activities in the river bed during the construction period. Indirectly, through habitat change (change in water quality, habitat connectivity), the impact may also affect the European river lamprey and thick-shelled river mussel.

In relation to all conservation objectives and impact aspects, the Natura appropriate assessment concluded that potential adverse impacts can be avoided by implementing mitigation measures.

Põhja-Liivimaa SPA

The conservation objectives of the Põhja-Liivimaa SPA (EE0040344) are to protect 31 bird species and their habitats.

Less than 1% of the bird area falls within the direct impact zone of the assessed RB section (within a radius of one kilometre from the railway line). Natura appropriate assessment found that the RB route and the adjacent area are not important as feeding or nesting sites for bird species in the Põhja-Liivimaa SPA. However, there is a potential risk of individuals of species designated as conservation objectives (e.g. hazel grouse, owls) being killed in collisions with power lines or fences. To reduce the risk of bird mortality, measures to mark fences and overhead lines are included in the value engineering design solution. In order to avoid adverse impacts on the conservation objectives of the Põhja-Liivimaa SPA, further design and planning of the construction of infrastructure must avoid the construction site extending into the SPA.

Mērnieku dumbrāji SAC

Mērnieku dumbrāji SAC (LV0522000) is located in Latvia, in the Limbaži municipality of the Ainaži district. The western and southern borders of the protected area are directly adjacent to the Republic of Estonia. The area has been established to protect both protected species (excluding birds) and habitats. The habitat types designated for protection in the area are western taiga (9010*), Fennoscandian hemiboreal natural old broad-leaved deciduous forests (9020*) and Fennoscandian deciduous swamp woods (9080*). The conservation objectives for species include the white-backed woodpecker (*Dendrocopos leucotos*), black stork (*Ciconia nigra*), black woodpecker (*Dryocopus martius*), hazel grouse (*Bonasa bonasia*), the Eurasian three-toed woodpecker (*Picoides tridactylus*) and the drooping woodreed (*Cinna latifolia*).

The main threats to the conservation objectives of the Mērnieku dumbrāji SAC are considered to be the reconstruction of drainage systems and local forest roads. These activities carry a risk of deteriorating the quality of forest habitats that depend on the water regime. The forest habitats along the railway line in the SAC, and thus the protected species, may be adversely affected by changes in the water regime associated with the possible drainage of the Metsapoole viaduct and the railway embankment. The impact can be avoided by changing the location of the Metsapoole viaduct, abandoning the viaduct and/or regulating the drainage of excess water from the viaduct and the railway.

The bird population may be adversely affected by the risk of species individuals being killed in collisions with the infrastructure. To reduce the risk of bird deaths, measures to mark fences and overhead lines are provided as part of the project solution.

Conclusions of the Natura appropriate assessment

With the implementation of the mitigation measures proposed in the Natura appropriate assessment, adverse effects on the conservation objectives of the Lemmejõgi SAC, Laulaste SAC, Põhja-Liivimaa SPA and Mērnieku dumbrāji SAC, as well as on the integrity and coherence of the sites, are ruled out.

Impact on climate

The impact of Rail Baltic on the climate can be described primarily through the assessment of its carbon footprint, i.e. CO_2 emissions. The estimated total emissions during the construction phase of the Kabli-EE/LV section are 136 447 tonnes of CO_2 equivalent, of which 62% is due to land use change, 17% to the transport of construction materials and 20% the construction works onsite. Emissions from land use change are mainly caused by deforestation.

In contrast, the Rail Baltica project will have a positive climate impact during the operational phase, as the partial shift of passenger and freight transport from road to rail will significantly reduce greenhouse gas emissions from the transport sector.

Impact on protected natural objects

Within the Kabli-EE/LV border railway line impact zone there are the Laulaste Nature Conservation Area, Kivikupitsa Landscape Conservation Area, Lemmejõgi Limited-Conservation Area and Kiusmetsa Limited-Conservation Area. The territories of the nature conservation and limited-conservation areas overlap with the Natura 2000 sites discussed above.

The Laulaste nature conservation area consists of several separate parts, of which the nearest part lies approximately 750 m from the railway. Due to the distance, significant direct impacts (loss or damage to habitats, changes in the water regime, edge effects, etc.) on the protected area resulting from the construction and operation of the railway are ruled out. The construction of an ecoduct (Loigu ecoduct) is planned in the area of the Laulaste nature conservation area, which will support the preservation of connectivity with the areas located west of the railway. In other aspects, the impacts are related to the Lemmejõgi river, which is subject to a Natura appropriate assessment.

Due to the distance of the Kivikupitsa landscape conservation area from the railway (500 m and more), no significant direct impacts such as habitat loss or damage, changes in the water regime, etc. are expected from the construction and operation of the railway. Disturbance to bird species for which the Landscape Conservation Area has been designated may be possible. The impact on these conservation values, which are also conservation objectives for the Põhja-Liivimaa SPA, is discussed in more detail in the Natura assessment referred above. The black woodpecker is not a conservation objective for the Põhja-Liivimaa SPA. The habitats of the black woodpecker listed in EELIS in the Kivikupitsa landscape conservation area are located 700 m or more from the railway, and the disturbance can therefore be considered moderate or weak.

The railway section crosses the Lemmejõgi limited-conservation area (the railway crosses the Lemmejõgi river). The limited-conservation area is connected to the Lemmejõgi SAC, which is part of Natura 2000 network, and the impacts on the area are described in full detail in the Natura appropriate assessment. Similarly, the impacts on the Kiusumetsa limited-conservation area have been taken into account in the Natura appropriate assessment for the Põhja-Liivimaa SPA.

To summarize, the assessment did not identify any significant adverse impacts on protected areas and limited-conservation areas. There are no individual protected natural objects in the railway's impact zone.

Similarly, there are no habitats of protected plant, fungus or lichen species in the railway corridor or its immediate vicinity that could be subject to significant adverse impacts. Protected animal species are discussed below in the section on fauna.

Impact on fauna

The impact on fauna occurs through habitat loss, habitat fragmentation, disturbance and potential direct mortality. The impact is caused by construction activities, railway infrastructure (contact lines, fences, railway embankments, etc.), as well as train traffic and maintenance of the railway and its infrastructure. Disturbances include noise, vibration, light pollution and changes in the water regime. The size of the impact zone in terms of disturbance and habitat fragmentation depends on the specific design, local conditions, species behaviour, and species sensitivity to disturbance within their habitats. In terms of mortality, the impact area is mainly considered to be the immediate vicinity of the railway (fences and the area between them).

The impact on wildlife during construction is short-term and insignificant if deforestation is avoided during the breeding season of animals and the nesting season of birds.

Significant disturbance to the European mink (protection category III) may occur during the construction of watercourse crossings, but this impact is short-term and temporary. Before the construction of the Lemmejõgi crossing, a species expert must be consulted to verify that there are no mink dens on or in the immediate vicinity of the construction site.

During the construction of the railway, habitats directly under the railway will inevitably be destroyed. The route has been selected based on the principle of minimizing the impact on valuable habitat types and habitat complexes.

After the construction of the railway, a barrier effect will occur. In order to ensure both railway traffic and animal safety, it is planned to fence the entire length of the railway section. The purpose of the fences is to reduce collisions between trains and animals and to prevent animals from being killed on the railway. However, the fences also prevent animals from crossing the railway. To mitigate this, various types of animal crossings are planned for the railway section, including ecoducts suitable for large animals (Loigu, Treimani and Piiri). No significant adverse impact is expected with the implementation of mitigation measures, but the extent of the impact needs to be verified during monitoring.

Of the bird species in the protection category I, two black stork nesting sites have been registered in the railway section within the species-specific mobility range, both of which have collapsed and have not been inhabited for at least the last eight years.

The habitats of the white-backed woodpecker and the Eurasian three-toed woodpecker, which are listed in protection category II, are present in the railway corridor area. The habitats of bird species listed in protection category III have also been registered in the railway corridor. Mitigation measures to reduce the impact on protected species and other forest birds include avoiding clearing and noisy construction work during the bird nesting period, as well as keeping the width of the route and service infrastructure as narrow as possible in areas bordering important habitats.

Certain bird species may be entangled in railway fences or power lines. To prevent collisions with the railway infrastructure, additional markings are used to warn forest grouses and other bird species living in the vicinity of the railway.

The use of railways also causes disturbances, primarily noise. Railway noise is not continuous like on busy roads, but only occurs when trains pass by. As a result, railways disturb birds less than roads. According to the environmental register, the habitats of the Eurasian pygmy owl, common buzzard, lesser spotted woodpecker, grey-headed woodpecker, white-backed woodpecker, Ural owl, hazel grouse, black woodpecker and red-breasted flycatcher are located within the expected disturbance zone (750 m) of the section under assessment. Most bird species are able to adapt to the daily disturbances caused by rail traffic over time.

The loss of an important habitat for amphibians is foreseeable in one location (a water supply pond is located on the planned route). To compensate for the adverse impact, a replacement water body will be created in the vicinity. As with other species groups, the railway is a barrier fragmenting the habitat of amphibians. To mitigate significant adverse effects, barriers for amphibians and suitable passages (culverts, tunnels) will be provided.

A significant number of invertebrates will probably be killed during the construction of the section in question, but this impact will be temporary. Protected wood ants must be relocated before construction work begins. During its lifetime, the RB will have a minor impact on invertebrate mortality.

In addition to the planned railway, the quality of habitats in the area is affected by the Via Baltica road running parallel to Rail Baltic, forest clearing, land improvement and, to a lesser extent, mining. The cumulative impact can be highlighted in particular in the area between the planned railway and the existing Via Baltica road, especially in the village of Orajõe, where these routes are less than one kilometre apart. RB has been designed with various types of animal passages to mitigate the barrier effect. The cumulative impact will be mitigated if similar measures are planned for Via Baltica in the future.

Impact on the green network

According to the Pärnu county-wide plan, the railway section runs between the different detached parts of the green network core areas and crosses several corridors connecting the green network core areas.

According to the new comprehensive spatial plan for Häädemeeste municipality (draft version), the railway section runs through the green network core area in the northern and central part and along its edge in the southern part, crossing the green corridor.

The construction of a railway in the green network areas will result in the loss of natural or semi-natural habitats in the deforested areas, which will reduce the proportion of areas characteristic of the green network. The reduction in green areas has significant impact, but considering the extent of the green network in the area, the reduction is relatively small.

The greatest impact on the green network associated with the construction of a fenced railway is the barrier effect, which reduces the connectivity of the green network by fragmenting it. The fenced railway corridor is a barrier to mobility for most mammals and also hinders the spread of several other biotic groups. The barrier effect will be mitigated and the connectivity of the green network will be ensured by animal passages, including ecoducts, built on the railway. Mitigation measures have been developed based on the input of biodiversity experts.

The construction of the planned railway section will therefore have a significant adverse impact on the green network in the area, which has been largely mitigated. The overall connectivity of the green network will be maintained when all mitigation measures are implemented.

Animal passages will follow animal movement corridors and the locations and dimensions of passages have been significantly refined in the value engineering compared to the preliminary design, based on additional studies conducted as part of the impact assessment and in connection with other plans and projects.

Impact on vegetation, including deforestation

The impact of the railway on vegetation is most direct and strongest in terms of the loss of existing vegetation cover along the railway line and in the areas of other railway-related objects (service roads, crossings, ecoducts, new and rerouted roads, electrical infrastructure). In the railway corridor, vegetation will either disappear completely (removed from under structures) or change in areas that are maintained and kept open (so-called service land).

The railway section in question mainly passes through forest areas, which cover approximately 90% of the railway corridor. The construction and operation of the railway requires the clearing of forest under the structures. The total area to be deforested is approximately 110 ha. Almost all of the area consists of commercial forests, most of which have been managed relatively intensively. Approximately 70% of the forests have also been drained. The age structure of the forests varies from young stands to mature forests, which is typical of commercial forests. There are few old forests in the areas to be cleared. There are no natural old-growth forests in the railway line or other structures.

The clearing of forest areas will have a significant adverse impact. However, as the railway passes through an area with large forest stands, the loss of forest land is moderate compared to the total forest area in the region. The area to be deforested accounts for less than 0,5% of the forest area in Häädemeeste municipality and less than 0,05% of the forest area in the county. The clearing of the RB route will not significantly affect the forest cover or the overall landscape of the area.

There are no valuable habitats listed in EELIS within the area to be defrosted. The area also does not overlap with any known habitats of protected plant, fungus or lichen species.

The habitat type Northern boreal alluvial meadows (6450) or “floodplain meadow“ has been mapped on the banks of the Lemmejõgi river. The railway crosses a habitat that is registered in EELIS as an area of 26,4 ha and whose nature conservation status has been assessed as class C (moderate or poor). In reality, the habitat is largely overgrown and forested, including areas registered as forest in the forest register. As the floodplain meadows habitat has not maintained its high nature conservation value and the extent of the area subject to impact is relatively small, compensation for the area covered by the railway is not necessary.

The indirect impact on vegetation will be present in areas where there is no deforestation or direct loss of vegetation cover due to infrastructure, but the impact will be felt through other factors caused by the construction of the railway. The main potential impact factors are changes in the water regime and wind regime in areas bordering the railway corridor and other structures.

As the railway section in focus is in some parts excessively wet, it is necessary to drain the embankment, which may have a limited draining effect on the areas adjacent to the railway. When constructing the railway (including the preparation of the construction project), the aim is to preserve the existing water regime in the vicinity of the railway as much as possible. The drainage ditches of the existing land improvement systems will be directed through culverts via the railway embankment.

There are no wetlands adjacent to the railway that could be significantly affected by changes in the water regime. Most of the forest land adjacent to the railway has already been drained or is covered by drainage systems. Some additional drainage effect in the area may be associated with the fact that the existing drainage systems are degraded in some places and the drainage ditches to be reconstructed and the artificial recipients to be cleaned during the construction of the RB will improve drainage conditions in the area. However, there will be no significant additional drainage impact from the railway, and the establishment of the RB will not change the types of forest communities. The planned activities will also not cause significant changes in the water regime or changes in the vegetation cover and the condition of populations on the few grasslands adjacent to the railway area.

The railway corridor opened up by deforestation may affect the wind regime in the forest areas adjacent to the railway corridor. As the railway corridor is long, unfavourable wind conditions may cause a wind corridor effect, where the wind blows along the railway corridor. This effect may occur in the section under consideration mainly in the case of south and north winds. As storm winds tend to blow from the west, the impact of the wind corridor is unlikely to be very strong. Changes in wind regime may cause windthrow at the edges of the railway corridor, but this will mainly take the form of individual trees (mainly spruce) being blown over and, less frequently, broken in storm-damaged forest types. The impact of wind damage is expected to be localised and scattered, and the impact on forest communities will be relatively minor. The damage mentioned above can also be considered as forest management damage and does not have a significant adverse impact on vegetation cover and forest ecosystems.

Impact on the spread of alien species

There are no known areas of alien species habitats in the planned railway corridor.

The railway corridor will enable many different species to move along the railway to new areas. To reduce this risk, the spread of alien plant species with topsoil must be prevented during the construction of the railway. In order to control alien species, it is also important to preserve the species-rich community characteristic of the area surrounding the railway.

Impact on groundwater

The railway section passes through an area with mostly unprotected groundwater. There are no boreholes near the railway line, and the nearest dug well is located approximately 240 m from the line. No activities are planned during the construction and operation of the railway that would, under normal circumstances, pose a risk of contamination of groundwater and drinking water wells. If the probability of accidents is minimised by taking precautions, no significant adverse impact on groundwater quality is expected.

The construction and use of the railway will not involve groundwater abstraction that could have a significant impact on the groundwater level. Considering that the railway is not planned to be built in a cavity in any part of the section and that the railway will be built 2-3 m above ground level, it can be assumed that the bottom of the railway side ditch will be planned above the Quaternary (surface water) groundwater level and no lowering of the groundwater level is expected in the area. The depths of the side ditches to be constructed will be adapted to the existing ditch network in the area.

As the planned activity will not have a significant adverse impact on the quality or quantity of groundwater or threaten the status of water bodies, the construction and operation of the railway will not have an adverse impact on the achievement of the objectives of the river basin management plan.

Impact on surface water

The larger watercourses intersecting the railway are the Kabli river, Lemmejõgi river, Loode stream, Treiman river and Ikla river. All of these watercourses flow into the sea. In addition, drainage ditches intersect the railway. There are no lakes in the railway corridor or its immediate vicinity.

During construction, no significant amount of effluent (excess water) that would need to be discharged into water bodies is expected to be generated in the construction area. As the surface water is close to the ground in some places along the railway, it may be necessary to pump excess water from the trenches created during construction and discharge it into the receiving water body. Provided that the requirements for effluent discharge into the receiving water body are complied with during construction and appropriate water protection measures are implemented in water bodies and their riparian zones, there will be no significant negative impact on surface water.

No effluent is expected from the use of the railway and no pollutants are discharged directly into surface water bodies. The main factor affecting surface water is stormwater, which is discharged into the nearest watercourses via the railway side ditches. However, most precipitation infiltrates into the railway soil and, in general, grass-covered ditches are sufficient to prevent possible contamination from the railway from entering the receiving water bodies. To reduce the amount of flotate entering natural water bodies, flow swales are provided in the railway longitudinal ditches before they enter the water body. These are sections of the ditch that are approximately 1 meter wider and deeper, where the water flow slows down and a significant part of the flotate settles at the bottom of the ditch.

In addition, surface water bodies may be affected by the use of herbicides for vegetation control on the railway. To avoid adverse effects, the use of herbicides should be avoided in the vicinity of watercourses. Specific weed control methods and/or chemicals used for this purpose must be specified in the railway maintenance plan based on the best available knowledge and practices at the time of the railway's use, the legislation in force at the time, and environmental protection requirements.

A bridge is planned to cross the Lemmejõgi river, with no piers in the water and no impact on the river's hydro-morphology. For smaller water bodies, the project design includes culverts to ensure that the water regime is maintained. During the construction of the railway, the functioning of land improvement systems will be ensured and the capacity of upstream watercourses to receive water will be taken into account.

As the planned activity will not have a significant adverse impact on surface water quality or the hydro-morphology of surface water bodies, nor will it threaten the condition of water bodies, the construction and operation of the railway will not have an adverse impact on the achievement of the objectives of the river basin management plan.

Impact on soil

The impact of the planned railway section on soil will be evident during both the construction and operational phases.

For the construction of the railway and related structures, the existing topsoil will be removed from the ground. The removed topsoil will be reused on site to the maximum extent possible. Construction activities could also cause soil compaction and potential soil contamination due to accidents. The construction phase will therefore have a significant adverse impact on the soil. However, the impact will be local, limited to the area of the construction works, and mitigated by environmental measures.

The operational impact of the railway on the soil is related to the risk of erosion (possible soil washout from embankments and ditch banks) and the risk of hazardous substances entering the soil during the use and maintenance of the railway and other infrastructure. The risk of soil contamination is mainly related to emergency situations and the likelihood of impact is low. The impact on soil is also related to the release of weed control agents into the soil. If the requirements and restrictions established for the operations are complied with, the impact will remain insignificant. The impact is mainly limited to the railway and its immediate vicinity.

Impact on relief

The impact of railway construction on relief results primarily from the construction of railway embankments, grade-separated intersections and ecoducts. The impact on relief is local and, from a broader perspective (in terms of Environmental Impact Assessment and Environmental Management System Act), insignificant.

The relief characteristic of the area, which is predominantly flat, will remain largely unchanged.

Impact on noise

The noise associated with the planned activity can be divided into two categories: noise during the construction of the railway (construction noise) and noise associated with the use of the railway (train traffic).

Construction activities will cause a temporary increase in noise levels in the area. This is expected to be caused by the transport of construction materials and waste, the operation of various stationary and mobile machinery, the use of construction tools, etc. Such noise is associated with almost all construction activities and will cease after the completion of the railway section.

Noise during operation phase is mainly related to train traffic on the railway. Noise emitted into the ambient air must comply with traffic noise standards established for the protection of human health and well-being. To predict noise levels, computer modelling of noise dispersion was carried out for both the preliminary design and the value engineering design.

In terms of noise sensitivity, residential buildings and their outdoor areas are located in the vicinity of the railway line in two locations – in Majaka village (residential buildings are located on both sides of the railway line) and in Metsapoole village (residential buildings are located west of the railway line). By installing noise barriers along the railway in these locations, compliance with noise standards is ensured at the maximum predicted traffic frequency and significant adverse effects are avoided. In other residential areas of the region, even without additional mitigation measures, noise levels will remain below the target value for traffic noise, which means that no significant noise disturbance can be expected.

Impact on vibration

There are no residential buildings or other buildings within the railway's area of influence (up to 100 m from the railway) for which vibration limits have been set or where vibration-related disturbances/damage could occur.

No additional vibration mitigation measures are required on this section of the railway to ensure compliance with vibration standards.

Impact on ambient air quality

The use of railways does not cause significant emissions of pollutants affecting ambient air quality. During construction, pollutant emissions are related to exhaust gases from internal combustion engines, dust and fine particles emitted from earthworks and dispersed in the vicinity of the construction site.

If all necessary environmental and work management measures are implemented during the construction and operation of the railway, vehicles, machinery and equipment that comply with emission standards are used in good condition, and any accidents are dealt with swiftly and appropriately, the impact on ambient air quality will be negligible.

Electromagnetic field impact

With regard to the intensity and expected impact of electromagnetic fields (EMF), it has been concluded that at a distance of 10 m from the centre of the track, EMF levels are mostly below 2,5% of the limit values (but not exceeding 6,5%) and at a distance of 15 m from the track axis levels are mostly below 1% (but not exceeding 3,6%). EMF levels are very low in relation to the threshold values, and it is therefore very unlikely that EMF of this intensity could have a significant impact on the environment or be harmful.

The radio communication technologies expected to be used for the RB infrastructure functions are not expected to pose a risk to high-risk installations or explosive devices, provided that they are located at least 10 m away from RB tracks and/or other infrastructure elements.

Impact on light pollution

The impact of light pollution is in general local. The relative impact of light pollution is increased by the fact that there is no artificial lighting in the area at the moment.

Light pollution during the construction period will have a disturbing effect on animal and bird species in the vicinity of the line, especially during the breeding and raising of offspring. In order to reduce the potential adverse impact on both the residents of the area and the species present in the vicinity of the railway line, construction work and the movement of machinery should be avoided in the late evening and at night. The impact during construction is short-term (ending with the completion of construction work) and therefore not significant.

No stops requiring continuous lighting are planned for the section in question. During railway operation, light from passing trains may cause disturbance. However, with regular train traffic, both people and animals become accustomed to the light caused by trains. Due to the relatively sparse train schedule, the disturbance is not continuous and allows species to continue their activities in their habitat after a short, limited disturbance. The trees surrounding the track significantly reduce the effect of light. Noise barriers also shield the light from the trains near residential buildings.

Impact on material use and impact of waste generation

The main material and waste flows are expected to stem from railway construction. The impact assessor assumes that during railway construction, materials will be used with minimum losses and waste generation, and that the waste of mineral resources will be avoided. Adverse impacts during construction can be reduced by using wherever possible waste materials such as oil shale mining waste chippings, limestone sieves, etc. in the construction of the railway embankment and maintenance roads.

According to the waste management hierarchy, waste prevention is the most important aspect. When constructing a railway, it is therefore important to plan the volume of construction materials required with great accuracy in order to reduce surplus materials that will become waste in accordance with the Waste Act.

Another important principle is the reuse of waste. Materials sorted at the place of origin can be sent for recycling, thereby reducing harmful environmental impacts and helping to meet the objectives of the waste management hierarchy. To this end, it is reasonable to establish at least one temporary waste collection point for each construction site, where construction waste can be separately collected.

The quantities of materials used during the railway operational phase and its impact is rather insignificant in the case of sustainable and environmentally friendly operation in accordance with the maintenance plan. The waste holder is obliged to handle the waste in its possession in accordance with the established requirements or to transfer it to a person authorized to handle it. In the event of accidents and emergencies, instructions must be drawn up to prevent the spread of pollution and the waste resulting from such incidents must be removed from the environment as quickly as possible.

Waste generated during the dismantling of the railway must be transferred to a waste management company with the appropriate permit or registration in accordance with the Waste Act.

Considering the above and the fact that the waste management sector as a whole is well regulated, the environmental impact of waste generation and recycling options can be considered insignificant.

Possibility of accidents

The risk of accidents during the construction phase of the railway is primarily related to the equipment and machinery used in construction. In the event of an accident, soil or water pollution may occur if substances hazardous to the environment leak. To prevent this, precautions must be taken when using environmentally hazardous substances and readiness to respond to accidents must be ensured. Under normal operating conditions, where equipment and machinery are in good working order and all safety and environmental requirements are met, the likelihood of accidents during construction is low.

During the railway operation phase, emergency situations are mainly related to railway traffic, including transported goods. Accidents and incidents are most likely to occur at locations where the railway crosses roads, pedestrian paths or animal migration routes. The entire length of the Rail Baltica section is enclosed by a barrier and crossings with roads are on two levels, which practically eliminates the risk of people (including vehicles) and animals crossing the railway and collisions. The prevention of other types of railway accidents depends mainly on work procedures and general railway safety measures. Railway safety is regulated by the Railways Act and its subordinate acts.

The transport of dangerous chemicals is also possible on the RB railway. At the time of the preparation of the RB project and the completion of this EIA, the list of chemicals to be transported by the railway in the future, their chemical and physical properties, quantities and transport frequencies are not known. However, considering the safety measures implemented on the railway, the risk of accidents involving hazardous substances can be considered minimal. The management of risks associated with the transport of chemicals is an important part of the railway safety management system. The safety management system will be established before the transport of chemicals begins on the Rail Baltic railway.

Impact on people's mobility

During the construction of the railway, temporary disturbances and inconveniences may arise due to changes in the usual routes of local residents/landowners.

The railway will be fenced off and crossing it at the same level will be prohibited. This will create a local barrier to movement, e.g. in forests or fields, but due to the very sparse population of the area, this impact will not be significant. Official two-level crossings or overpasses must be used to cross the railway. The railway section does not cross any national roads or other roads with significant traffic. The most important intersection is with the local Loigu road, where a railway bridge is planned to be built over the road. This will maintain the current access for residents along Loigu Road and will not lengthen their journey. As a general rule, no crossings will be built at intersections with forest roads, but all properties adjacent to forest roads will remain connected to the rest of the road network either to the east or west of the railway. A grade-separated crossing is also planned for one forest road and private road connection (Vanaraudtee road), for which various solutions are being considered (two alternative viaduct locations and abandoning the viaduct). After the construction of the railway, access to all households and registered properties will be ensured by the existing or newly constructed road network. In summary, the construction and operation of the railway will have a negligible impact on the mobility of people living in the vicinity of the railway.

The planned activities will have a positive impact on people's broader mobility. The fast railway will connect larger cities – Tallinn, Pärnu, Riga and more distant centres – with fast and convenient transport links. Local stops are also planned, which will create opportunities for domestic train lines, increasing people's mobility and improving access to jobs and services. There are no local stops on the section of railway under consideration, but the section is part of the overall railway network and its construction is essential for the functioning of international train traffic. The nearest local stop (Häädemeeste) is planned to be located approximately 5 km from the start of the section and will also be used by residents of villages to the south when combining modes of transport.

Impact on human health, well-being and property

The railway section in question runs through a very sparsely populated area. The limit values for air quality, noise levels, drinking water quality and electromagnetic field strength established in legislation for the protection of human health will not be exceeded in connection with the planned activity. Noise barriers are planned to prevent noise levels from exceeding the limits and causing significant noise disturbance in the residential buildings closest to the railway (in Majaka village and Metsapoole village).

The impact of high-speed rail on human well-being can be divided into two categories: the impact on people living near the railway and the impact on people using the railway. The well-being of people living near the railway may be affected primarily by noise disturbance, changes in the landscape (views) and barriers to movement. In preparing the project solution, attention has been paid to reducing noise pollution and ensuring mobility, and no significant impact is anticipated. The broader impact on people's well-being can be considered positive due to the convenient and fast train connections. Rail traffic is expected to increase people's mobility and improve access to jobs and services.

Negative impacts on property values may result from the effects of railway use, partly due to restrictions on land use in the railway protection zone. The expropriation of land for railway construction cannot be considered a significant adverse impact on property values, as fair compensation must be provided in the event of expropriation. In the case of forest and agricultural land, the impact on the value of real estate may also result from longer access routes and fragmentation of real estate, but after the construction of the railway, the connection of existing forest roads to the road network will be maintained.

Overall, the impact on human health, well-being and property is insignificant.

Impact on land use

In the railway section under consideration, the impact on land use is primarily related to the occupation of forest land and the reduction of its area and integrity (forest land covers nearly 90% of the section of the railway corridor under consideration). The impact on the land under the railway and related structures is irreversible. Fair compensation must be ensured for the expropriation.

Forestry activities will continue to be possible in the areas surrounding the railway. All registered properties adjacent to forest roads will remain connected to the road network east or west of the railway, allowing forestry activities to continue in the areas surrounding the railway.

No plans have been established or are being prepared in the railway corridor or its immediate vicinity that would be impeded or rendered impossible by the railway. The railway section under assessment does not interfere with land use planned in comprehensive plans or detailed plans.

Impact on mineral resources

The railway section and its relocation area do not cross any registered mineral deposits. The mineral deposits closest to the railway section (Kiusumetsa, Massiaru and Krundi sand deposits) are located 3,7-5 km from the route. The construction of the railway route will therefore have no direct impact on the preservation of mineral resources and will not impair access to them.

The impact on mineral resources will primarily result from resource consumption. The construction of the Rail Baltica railway line and related additional structures will cause a sharp increase in the demand for construction materials, including construction minerals, in Pärnu County. Potential quarries supplying the railway (Lepplaane sand quarry and Riisselja, Riisselja II, Selja II, Soomra and Soomra II gravel quarries) are located approximately 35–60 km from the railway section. The environmental impact of the extraction of construction minerals will be assessed during the application process for an environmental permit for the use of deposits/mining areas. The security of supply of construction minerals will be ensured at the national level.

Impact on cultural heritage

There are no heritage conservation areas, cultural monuments or other important objects listed in the registers of the National Heritage Board in the railway corridor of the railway section under consideration or in the potential impact area. No natural sacred sites have been identified on the railway section.

Preliminary archaeological surveys carried out on the route did not identify any finds of cultural value or areas that would require more detailed archaeological investigation.

The railway crosses the former Riiselja-Ikla railway line, which is registered as a heritage site and currently has a dirt road running along it. The heritage site has not been preserved in its original form and the crossing only covers a small part of the former railway line.

Therefore, the construction and use of the railway section is not expected to have a significant adverse impact on cultural heritage, including archaeological heritage.

Impact on landscapes and views

The Rail Baltic railway is a large-scale project that will significantly and irreversibly change the existing landscape. The railway runs through forest landscape and the construction of the railway will significantly change the characteristics of the landscape, including the clearing of forest. The railway section does not pass through valuable landscapes and there are no valuable viewpoints along the route that could be damaged by the construction of the railway.

Assuming that the forested landscape around the railway is preserved, the changes in the section under consideration are in general not visible from the route. The railway is visible to a limited extent, mainly from local roads crossing the railway and/or from the forests surrounding the railway in the event of clear-cutting. As the settlement in the area of the railway section is sparse, it is possible to see the railway from individual households, but there are also patches of forest in the relevant viewing directions, which, if preserved, will reduce the visual impact.

Cumulative impact of Rail Baltic sections

The subject of this EIA is a section of approximately 12,7 km of the 213 km long Rail Baltic railway line located on Estonian territory. Several potentially significant environmental impacts associated with the Rail Baltic railway will result primarily from the construction of the entire railway (from Estonia to the Lithuanian-Polish border) and cannot be assessed in the context of this section alone. Such impacts have been previously assessed for the entire Estonian section in the SEA of the Rail Baltic county-wide spatial plans. The cumulative impact of the railway route has been further assessed in the EIA of the railway sections to the extent necessary for making decisions on the granting of activity permits. The areas of cumulative impact relevant to the impact of the section "Kabli – Estonian/Latvian border" are identified below.

<u>Cumulative impact on climate</u>

The cumulative emissions from the construction of the entire Estonian RB infrastructure are approximately 484 103 t CO_2eq, of which land use change accounts for approximately 65%, transport of construction materials 11% and on-site construction work 24%.

During the operational phase, however, the Rail Baltica project will have a significant positive impact on the climate, as the partial shift of passenger and freight transport from road to rail will significantly reduce greenhouse gas emissions from the transport sector. The reduction in emissions will be greater if trains run entirely on renewable energy. In this case, the emissions from the construction phase of the RB would be offset in an estimated 12–13 years. If the RB railway starts to use a combination of fossil and renewable energy during the operational phase, it will take approximately 17–22 years to offset the emissions from the construction phase of the RB.

Cumulative impact on animal populations

The railway line as a whole may have a greater impact on animal populations than the local impact of individual sections of the line on certain species or habitats. The barrier effect caused by the 213 km long new infrastructure, which interrupts existing animal movement and migration routes, is significant. The impact of the barrier effect on animal populations has been taken into account in the environmental impact assessments for all railway sections. Measures to reduce the barrier effect have also been planned for all assessed railway sections. These include passages for large animals (ecoducts and underpasses), ensuring sufficient free space on river banks under bridges crossing rivers, and culverts adapted for animal passage. These measures, planned for the entire route, will reduce the (cumulative) impact on habitat fragmentation and enable animals to cross the Rail Baltic corridor in the future.

Cumulative impact of deforestation

The total area of forest clearing related to the RB route in Estonia is estimated at 1293 ha, of which the estimated section accounts for approximately 110 ha, or 8,5%. The total area of forest clearing within Estonia is large, but it is spread over a 213 km long section. On average, *ca* 6 ha of forest is cleared per kilometre.

The impact of deforestation is mainly local, with little regional impact, and the proportion of forests in the landscape is not significantly affected by the construction of the RB. Compared to the total forest area in Estonia, the clearing for the RB route accounts for only 0,056%. More important than the area to be cleared is the fact that the area to be cleared is located as a continuous linear feature, which divides both smaller forest areas and larger forest landscapes.

Cumulative impact of mineral resource use

The construction of Rail Baltic requires construction materials for the construction of the railway and railway maintenance tracks, the reconstruction of roads crossing the railway, and the construction of embankments for ecoducts. The greatest demand is for crushed stone, sand and gravel. The material used must meet specific requirements. The requirements for crushed stone used as ballast are such that material of the required quality must be supplied from outside Estonia.

The combined impact of the use of mineral resources lies in its effect on the security of supply of mineral resources. In addition to Rail Baltica, other important consumers of construction minerals (the Transport Administration, the State Forest Management Centre, construction companies, etc.) must also be taken into account in order to ensure security of supply. The necessary studies have been carried out to analyse security of supply and recommend solutions. The reserves of carbonate rock for construction purposes in Pärnu County are sufficient for the production of lower quality gritstone, but security of supply needs to be improved with higher quality limestone. The security of supply of mineral resources in Pärnu County could be improved by adding new mining areas and/or transporting mineral resources from outside the county. In addition, the use of alternative construction materials and recycled waste could be considered.

As the coordinator of the search and exploitation of mineral resources, the republik must ensure that mineral resources are used sustainably and that sufficient security of supply of construction minerals is guaranteed during the construction of the railway. The Government of the Republic of Estonia has initiated thematic spatial plans for mineral resources in Harju, Rapla and Pärnu counties. The aim of the thematic spatial plans is to map and agree on areas for the exploration and extraction of construction minerals in order to contribute to ensuring security of supply until 2050 and to determine the priority of the areas.

Cross-border impact

The RB railway section between Kabli and the EE/LV border runs parallel to the Latvian border in its southernmost part and, in the closest places, the railway corridor extends to the border. The RB railway continues from the state border logically with the Latvian section of the RB, for which an environmental impact assessment has already been carried out in Latvia.

As part of the environmental impact assessment, a cross-border impact assessment was carried out in Latvia in areas of potential significant adverse impact. The impact on the nature site of Mērnieku dumbaraji was assessed, as well as on the species and habitats identified as conservation objectives, and on species and communities of national importance. The impact on valuable landscapes in Latvia was also assessed. The impact assessment was carried out by licensed experts in Latvia, who prepared reports to be submitted to the Latvian authorities and the public for their opinion.

The impact assessment found that the landscapes of local and national importance in Latvia are located at a sufficient distance from the railway to exclude any significant adverse impact on the landscapes. The Salatsi river valley, which is of local importance, is located *approximately* 4 km to the east, and the coast of the Gulf of Riga, which is of national importance, is located approximately 5 km to the west. The visual impact of the railway is insignificant, as there are no significant settlements on the Latvian side of the border that could be affected by the railway. The railway runs through a forested landscape where the railway infrastructure is not visible from a distance.

More specifically, of the bird species identified as conservation objectives for the Mērnieku dumbaraji SAC and, more broadly, of the species living in the Vidzeme Biosphere Reserve whose habitats are located within the railway's area of influence, the hazel grouse was considered to be the most affected. Specifically, the need to reduce bird mortality due to collisions with infrastructure or trains was highlighted. To avoid adverse effects, mitigation measures have been planned for the entire railway section, which are sufficient to prevent adverse effects. No significant impact on other bird species has been identified.

The conservation objective of the Mērnieku dumbrāji SAC, which is to protect forest habitats and thus protected species, may be adversely affected primarily by changes in the water regime associated with the possible drainage of the Metsapoole viaduct and the railway embankment. In the area bordering the Mērnieku dumbrāji SAC, the existing drainage ditches have become overgrown and have ceased to function. The area has a hydrogeologically restored near-natural water regime, characterized by seasonal changes in water levels. Seasonal changes ensure the distribution of moist forest types with rare species in the nature reserve, which is also a conservation objective of the Natura area. The assessment concluded that, considering the worst-case scenario, the draining effect of the railway and/or the planned Metsapoole viaduct on the railway side of the nature reserve cannot be ruled out. The greatest predicted drainage effect is in the case of the viaduct value engineering design solution. However, the drainage of the railway route (taking into account a 1,5 m deep drainage ditch at the edge of the embankment) also has an unfavourable drainage effect. In order to avoid adverse effects, the design and subsequent construction must ensure that the water regime of the Mernieku dumbaraji

SAC, which is characterised by alternating wet and dry periods, is maintained even after the construction of the viaduct and the drainage of the railway embankment. Adverse effects can be avoided by changing the location or shape of the Metsapoole viaduct, abandoning the viaduct and/or implementing technical measures to regulate the drainage of excess water from the viaduct and the railway (a drainage solution that mimics natural water level fluctuations). If appropriate measures are implemented, adverse effects will be prevented.

In summary, the construction and operation of the railway will not have any significant adverse cross-border effects that have not been taken into account previously.

Mitigation measures

The EIA report describes measures for preventing, avoiding, reducing, mitigating and compensating for adverse environmental impacts, including an assessment of the expected effectiveness of the measures.

The report does not list all measures that have already been implemented in previous stages (e.g. planning the railway corridor so that it does not pass through protected areas and habitats of important protected species) or that arise directly from legislation (e.g. requirements related to water protection or waste management). The focus is on so-called additional mitigation measures, which have been developed in the section in question primarily for the protection of fauna and flora, the protection of the aquatic environment and soil, and to ensure appropriate noise levels. A list of administrative measures that need to be implemented and are also related to other impact areas is also provided.

Where relevant, mitigation measures that have been taken into account in the project design (design stage measures), construction measures and operational measures are highlighted separately.

A register of site-specific mitigation measures is provided in the annex to the EIA report. The measures set out in the EIA report and the register of mitigation measures form the basis for the further development and refinement of the railway section project.

Monitoring measures

The EIA concluded that, similar to mitigation measures, monitoring measures are necessary in the section under consideration, primarily in the areas of fauna, the aquatic environment and noise. Depending on the area, monitoring must be carried out either during the construction period, the operational period or both.

Based on the description of the monitoring measures presented in the EIA report, a monitoring plan shall be drawn up to determine the exact details of the monitoring, specifying the timing and duration of the monitoring, the location, methodology, frequency, measurable indicators and other necessary parameters. It is recommended to draw up a uniform monitoring plan for the entire RB railway.

The monitoring plan needs to be reviewed regularly to take into account previous monitoring results and increases in the intensity of use of the RB. When reviewing the monitoring results, the frequency, duration, and scope of the monitoring specified in the monitoring plan should be analysed regularly to ensure that they are appropriate. Experts in the relevant field shall be involved in the preparation and review of the monitoring plan and the analysis of the monitoring results. Based on the monitoring results, additional mitigation measures shall be developed and implemented as necessary.

Alternative options for the planned activity

The environmental impact assessment considers two consecutive design stages as alternatives to the planned activity: a preliminary design solution (alternative 1) and a value engineering design solution (alternative 2). The EIA is based on the principle that the solutions proposed in the value engineering design must be at least as good as or better than those proposed in the preliminary design in terms of their environmental impact.

The value engineering solution for the railway section was prepared in close cooperation between environmental experts, the designer and the developer in order to find suitable solutions to avoid adverse environmental impacts and to identify the most effective mitigation measures. For example, measures to ensure the movement of wildlife, preserve the quality of habitats and prevent wildlife from entering the railway have been designed in cooperation with wildlife experts, and the locations and dimensions of noise barriers have been determined in cooperation with noise experts.

As many of the solutions are the result of various alternatives that have been considered, the value engineering design is more favourable than the preliminary design in terms of environmental impact. However, the solutions in the preliminary and value engineering designs are largely equivalent in terms of impact. The impact of the value engineering design is lower, particularly on wildlife (fauna and green network).

A road bridge crossing the forest road is planned at the border of Metsapoole and Treimani village in the preliminary design and value engineering design solutions. During the impact assessment, two alternative locations for the Metsapoole viaduct were identified. The option of not building a road bridge was also considered. The corresponding alternatives have been taken into account as sub-alternatives to alternative 2. The environmental impact of the sub-alternatives differs mainly in terms of their impact on Natura 2000 sites. Sub-alternative 1 (original location of the viaduct) has an adverse impact on the Mērnieku dumbrāji SAC, which must be mitigated by additional measures. Sub-alternative 2 (construction of the viaduct to the north) or sub-alternative 3 (no construction of the viaduct) would not have any such adverse impact.

Conclusions

To summarise, the construction and operation of the railway will have adverse effects on both people and the natural environment. The implementation of the environmental measures integrated into the RB value engineering solution and the additional environmental measures set out in the EIA report will prevent significant adverse environmental effects.

15 MATERIALS USED

Environmental legislation of the Republic of Estonia.

Eesti Geoloogiateenistus, 2020. Ehitusmaavarade levik, kaevandamine ja kasutamine Pärnu maakonnas. Uurimistöö aruanne

Eesti Keskkonnastrateegia aastani 2030. Vastu võetud 14.02.2007 https://www.riigiteataja.ee/aktilisa/0000/1279/3848/12793882.pdf

Eesti Keskkonnauuringute Keskus. Eesti õhuseire kvaliteet. ohuseire.ee

Eesti Loodushoiu Keskus, 2025. Rail Balticu trassi „Kabli–Eesti/Läti piir" lõigu kavandatava ehitustegevuse võimalike mõjude kohta vooluveekogudele ja kalastikule

Eesti Ornitoloogiaühing, Kotkaklubi, 2022. Üle-eestiline maismaalinnustiku analüüs. Riigihanke nr 239156 aruanne

Eesti säästva arengu riiklik strateegia "Säästev Eesti 21". Vastu võetud 14.09.2005

Estonian, Latvian & Lithuanian Environment OÜ, 2024. Rail Baltic raudteetrassi Tootsi – Pärnu lõigu keskkonnamõju hindamine

ETC TransportConsultants GmbH, COWI AS and IFB, 2018. *Rail Baltica: Preparation of the Operational Plan of the Railway. Final Study Report.*

European Commission: Directorate-General for Research and Innovation, 2003. *COST Action 341 – Habitat fragmentation due to transportation infrastructure – The European review*, Publications Office

Euroopa Komisjon, 2021. Komisjoni teatis. Natura 2000 aladega seotud kavade ja projektide hindamine. Metoodilised suunised elupaikade direktiivi 92/43/EMÜ artikli 6 lõigete 3 ja 4 sätete kohta. 28.09.2021. C(2021) 6913

Euroopa Komisjoni maakasutuse, maakasutuse muutuse ja metsanduse sektori (LULUCF) poliitika ja LULUCF määrus (Regulation (EU) 2018/841)

Falcão Rodrigues, L., Mata Estacio, C., Herranz Barrera, J., Santamaría Figueroa, A.E., Malo Arrázola, J.E., 2024. *High-speed railway infrastructure leads to species-specific changes and biotic homogenisation in surrounding bird community. PLoS ONE 19, e0301899*. https://doi.org/10.1371/journal.pone.0301899

Hendrikson & Ko OÜ, 2017. Rail Baltic maakonnaplaneeringute SEA aruanne

Häädemeeste valla üldplaneeringu eelnõu, https://haademeestevald.kovtp.ee/koostatav-uldplaneering

IPCC Guidelines for National Greenhouse Gas Inventories (2006). Volume 4. Agriculture, Forestry and Other Land Use

Kasvuhoonegaaside heitkogused Eestis 1990-2018: riikliku inventuuri aruanne (2020)

Kelprojektas. Eelprojekt RB-EP-01-RW-EL Seletuskiri.

Keskkonnaagentuur Viridis OÜ, 2024, Ökoduktide ja väikelooma truupide analüüs Rail Baltica lõigul Pärnu – Eesti/Läti piir 1. osa - DPS2 lõigus kavandatud ökoduktidega seonduva täpsustamine

Keskkonnaagentuur, 2025. Eesti looduse infosüsteem (EELIS)

Keskkonnaagentuur, 2024. Eesti pinnaveekogumite seisundi 2023. aasta ajakohastatud vahehinnang

Keskkonnaagentuur, 2023. Aastaraamat. Mets 2021

Keskkonnaagentuur, 2020. Aastaraamat. Mets 2018

Keskkonnaministeerium, 2022. Lääne-Eesti vesikonna veemajanduskava 2022-2027

Keskkonnaministeerium, 2022. Lääne-Eesti, Ida-Eesti ja Koiva vesikondade veemajanduskavade meetmeprogramm 2022-2027

Keskkonnaministeerium, 2019. Teatavate õhusaasteainete heitkoguste vähendamise riiklik programm aastateks 2020–2030.

Keskkonnaministeerium, 2017. Maapõuepoliitika põhialused aastani 2050.

Keskkonnaministeerium, 2015. Põlevkivi kasutamise riiklik arengukava 2016–2030.

Keskkonnaotsuste Infosüsteem KOTKAS. https://kotkas.envir.ee/registry/index?represented_id=&nav_tab=registry_emission_source

Klein, L., 2021. Design Priority Section 3. Annex 4. VE DPS3 Implementation of EIA studies: New mitigation measures

Kriiska, A., et al, 2015, Rail Balticu trassi arheoloogiliste eeluuringute II etapi lõpparuanne, Aruanne arheoloogilisest baasleirest ja detailuuringutest Rail Balti Pärnumaa trassilõikudel 2015. aastal

Limbaži valla koostamisel olev üldplaneering, Väärtuslike maastike uuring

Luhamaa, H., 2025. Põhja-Liivimaa RB linnustik. Kabli- Eesti Vabariigi piir

Maa- ja Ruumiamet, 2025. Geoportaal

Maa- ja Ruumiamet, Eesti Geoloogiateenistus, OÜ Eesti Geoloogiakeskus, 2025. Eesti geoloogiline baaskaart 1:50 000

Meel, R, 2025. Saarma inventuur. Kabli jõgi

MTÜ Keskkonnamõju Hindajate Ühing, 2019. Juhised Natura hindamise läbiviimiseks loodusdirektiivi artikli 6 lõike 3 rakendamisel Eestis

Muinsuskaitseamet. Kultuurimälestiste register, https://register.muinas.ee/

Must-toonekure (*Ciconia nigra*) kaitse tegevuskava. (Kinnitatud Keskkonnaameti peadirektori 14.02.2018 käskkirjaga nr 1-1/18/105)

Obermeyer, 2023. *Factual Report of Geotechnical Investigation Results Remaining First Stage Investigation Phase*

Obermeyer, 2021, *Design and design supervision services for the construction of the new line Pärnu – Estonian/Latvia border (No. RBR 2018/28), Design Priority Section 3, Annex 4. VE DPS3 Implementation of EIA studies: New mitigation measures*

Obermeyer, 2021, *Design Priority Section 3, Value Engineering Report*

Obermeyer, 2021. *Factual Report of Geotechnical Investigation Results Initial Investigations for Value Engineering Stage*

OÜ Maves, 2019. Eksperthinnang Maanteeameti sademevee väljalaskudele võttes aluseks omaseire andmed ja tellitud veeseire uuringud. Töö number 19101

Pajula ja Kiristaja. „Sookuninga looduskaitseala kaitsekorralduskava 2016-2025“.

PlutoF: https://plutof.ut.ee

Põder, T., 2017. Keskkonnamõju hindamine. Käsiraamat

Pärnu maakonnaplaneering, https://www.riigiplaneering.ee/parnu-maakonna-planeering

Rail Baltica: Preparation of the Operational Plan of the Railway. Final Study Report. 15th November 2018 (Rail Baltica ekspluatatsioonikava. Lõpparuanne, 15.11.2018)

Reaalprojekt OÜ, 2018. Ehitusgeoloogilised uuringud raudtee eelprojekti koostamiseks, töö nr RB-GL-4, RB-GL-3, RB-GL-2 ja RB-GL-1

Rewild OÜ, 2024. Kahepaiksete elupaigad Pärnumaal RB DS3DPS3 lõigul, Kahepaiksete sigimisveekogude esinemine ja hinnang elupaikadele Rail Baltic trassil ning vajalikud meetmed

Rewild OÜ, 2024. Rail Baltica DS3DPS3 lõigu aedade ja õhuliinide erinõuded. Aedade ja õhuliinide märgistamise ning aiatüüpide vajadus ja asukohad Rail Baltica DS3DPS3 lõigul loomastiku seisukohalt

Skepast&Puhkim OÜ, 2023. Rail Balticu raudteetrassi lõigu „Rapla ja Pärnu maakonna piir – Tootsi“ ehitusprojekti keskkonnamõju hindamine (KMH). Aruanne

Skepast&Puhkim OÜ, 2022. Rail Balticu raudteetrassi lõigu „Ülemiste-Kangru“ ehitusprojekti keskkonnamõju hindamine (KMH). Aruanne

Skepast&Puhkim OÜ, 2017. Rail Balticu ehitamiseks vajalike ehitusmaavarade varustuskindluse uuring. Uuringu kokkuvõte, ptk 3.4., töö nr 2017-0043. Tallinn.

Systra SA „Design Guidelines for Rail Baltic / Rail Baltica Railway“

TalTech, 2019. Eesti Energia Estonia kaevanduse lubjakivi killustiku ning tuha tehniline sobivus ja majanduslik põhjendatus Rail Baltic muldkeha ja kõrvalteede alusmaterjalina või stabiliseerimiseks.

Tartu Ülikool, prof. Valter Lang, 2013. Aruanne arheoloogilise eeluuringu kohta Rail Baltic raudteetrassi valikul. I etapp

Tartu Ülikooli Eesti Mereinstituut, 2020. Piirkondlike kalapüügipiirangute ning kalade piirmõõtude kaasajastamine

Tartu Ülikooli loodusmuuseum ja botaanikaaed. eElurikkus andmebaas, https://elurikkus.ee/

Teede Tehnokeskus AS, 2025. Kohaliku tee 2130022 Loigu tee liiklusuuring

Teede Tehnokeskus AS, 2025. Liiklusloenduse tulemused 2024. aastal. https://www.transpordiamet.ee/liiklussageduse-statistika

Teede Tehnokeskus, 2017. Rail Balticu ehitamiseks vajalike ehitusmaavarade varustuskindluse uuring. Lõpparuanne

Teeregister. https://teeregister.mnt.ee/reet/home

The European Rail Traffic Management System; Euroopa Liidu standardite süsteem raudteede signalisatsiooni juhtimiseks ja koostalituse tagamiseks; https://www.era.europa.eu/domains/infrastructure/european-rail-traffic-management-system-ertms_en

Transpordiamet, 2024. Juhend. Teede projekteerimine

Wiącek, J., Polak, M., Filipiuk, M., Kucharczyk, M., and Bohatkiewicz, J., 2015. *Do Birds Avoid Railroads as Has Been Found for Roads? Environmental Management* 56 (3): 643–52.

Ülo Väli et al., 2021. Must-toonekure arvukus, sigimisedukus ja ellujäämus Eestis aastatel 1991–2020, Hirundo 2, nr 34 (2021): 20–39

ANNEXES

Annex 1. **Summary in English of the Compliant EIA programme**

Annex 2. **Natura appropriate assessment report (available in Estonian)**

Annex 3. **Table of mitigation measures (available in Estonian)**

Annex 4. **Table of monitoring measures (available in Estonian)**

Annex 5. **Cross-border impact assessment materials in Latvian and in English**