

Environmental Impact Assessment for the
implementation of the Limbaži Wind
Power plants park and associated
infrastructure project in Limbaži
municipality

SUMMARY

November 2024

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Introduction

The Environmental Impact Assessment (hereinafter - EIA) has been prepared for the proposed activity: implementation of the wind power plant (hereinafter - WPP) park Limbaži and its related infrastructure project in Salacgrīva and Viļķenes parishes of Limbaži municipality, proposed by Ltd "Latvijas vēja parki" (hereinafter - LVP), registration No. 40203415150, legal address: Pulkveža Brieža street 12, Rīga, LV-1010 (JSC Latvenergo is 100% shareholder).

EIA assesses a total of 37 WPP sites. The EIA report provides an explanation of the analysis of all the WPP locations that determine the feasibility of this WPP park.

Decision No 5-03/7/2023 of the State Environmental Bureau (hereinafter - SEB) on the application of the EIA procedure to the proposed activity of LVP was adopted on 15 August 2023. EIA Programme No 5-03/7/2023 (as amended on 10 January 2024 by No 5-02-1/3/2024 and No 5-02-1/61/2024. 2024. of. 20 November) is issued on 12 September 2023.

According to EU Directive 2023/2413, the planning, construction and operation of renewable energy installations, including WPPs, their connection to the grid and the associated network and storage assets themselves are of overriding public interest and serve public health and safety, in order to promote the use of renewable energy (RE). The implementation of RE projects is a prerequisite for achieving the EU and Latvian climate goals.

According to the amendments to the Cabinet of Ministers Regulation No 350 of 19 June 2018 "Regulations on Lease and Development Rights of Public Land", LVP has been established to implement the Ordinance and its overall strategic objective is "to implement strategically important wind park projects to achieve the objectives included in the Latvian National Energy and Climate Plan 2021-2030 and further progress towards climate neutrality by promoting energy independence".

The EIA report has been prepared by Ltd Enviroprojekts, involving experts from various fields. The report provides detailed information on the Proposed Action itself, the existing state of the environment, the impact on natural values in and around the area of the Proposed Action, as well as alternatives and their assessment. In accordance with the terms of the programme issued by the SEB, the report also provides information on monitoring requirements, assessment methods, etc.

1. Description of the proposed site and justification for the choice (Chapters 1 and 3 of the EIA Report)

Up to 20 WPPs are planned to be installed in the area of the proposed operation, with a maximum rated capacity of 8 MW per WPP. The total area of the study area for the construction of the WPP Park is 1894 ha.

The proposed action also includes and the EIA assessed the infrastructure related to the functioning of the WPP park: construction and operation of power transmission lines, transformer substations, Battery energy storage systems (hereinafter - BESS), assembly and maintenance yards and access roads.

The installation and maintenance sites will be located in the forest areas of JSC "Latvia's State Forests" (hereinafter - LVM). LVM, as the manager of Latvia's strategic asset - land - is actively involved in achieving the goals set out in the Latvian National Energy and Climate Plan 2021-2030 to strengthen energy independence and economic development. In addition to the requirements for protected forest areas, LVM has identified land units under its management where it is justified to carry out WPP park surveys.¹

Based on the data from the Nature Data Management System (hereinafter - NDMS) "Ozols", the Proposed Action is not planned in Natura 2000 sites and microreserves. The nearest NATURA 2000 site is the Nature Reserve "Vitrupe ieleja", which is located 0.8 km from the boundary of the land units and the distance to the nearest WPP is 0.9 km. The Nature Park "Salacas ieleja" is located 1.6 km from the boundary of the land units, the distance to the nearest WPP - 1.8 km. The proposed activity is located within the North Vidzeme Biosphere Reserve (hereinafter - NVBR) (Neutral Zone) (part of the study area is also within the Landscape Protection Zone, but no WPPs are proposed). More detailed information on the natural values of the area is provided in Chapter 6.4 of the EIA Report. The site of the proposed activity has a well-developed infrastructure: regional road P12, local roads V143, V142 and V138, existing road network of LVM, in the wider vicinity - the main national road A1.

High-voltage 110 kV transmission lines run along the area of the Proposed Action, which economically justifies the construction of the WPP near the electricity connection, also reducing the area to be deforested by shortening the new connection line.

Locating WPPs in predominantly forested areas reduces the impact of flicker, noise and landscape changes on farmsteads and inhabitants. There are 42 farmsteads in the study area of the planned WPP park.

LVM has determined that no WPP parks will be established on LVM land²:

- in towns and villages and up to 800 m around them and residential and public buildings;
- in nature conservation areas where the construction of wind farms is incompatible with the laws and regulations of the Republic of Latvia;
- in areas where the purpose of forest land management is nature conservation and LVM has additionally established protection for preserved environmental values, as well as in forest areas important for recreation of the population, etc;
- where cultural monuments are located.

The location of the WPP study area and the 37 WPP assessed in detail in Limbaži municipality are presented below (Figure 1. (EIA Report figure1. 1)).

¹ <https://www.lvmgeo.lv/data>

² <https://www.lvm.lv/business-partners/land-purchase-and-lease/facility-parks>

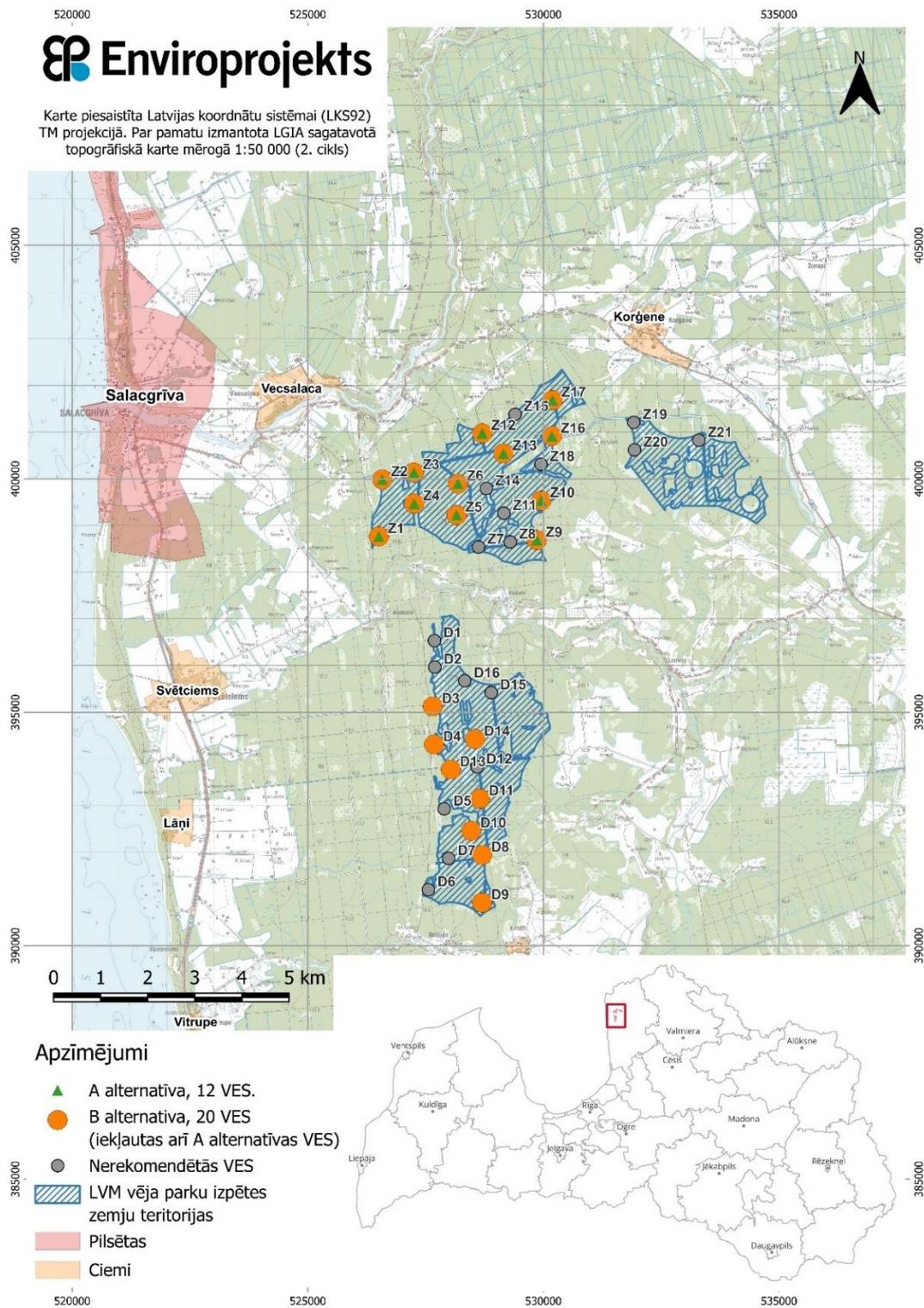


Figure 1. (EIA Report figure 1. 1.) *Limbaži Wind power plant Park LVM wind park study area and location of the 37 WPPs evaluated in Limbaži municipality*

The rationale for the location of the proposed Limbaži WPP Park was determined, inter alia, by the following factors:

- the possibility to transfer the generated electricity to the transmission infrastructure of JSC Augstsprieguma tīkls (hereinafter - AST);
- restrictions, requirements and minimum distances set out in legislation and sectoral guidelines:

- For WPPs with a capacity greater than 2 MW, the distance from the nearest planned wind power plant and wind park boundary to residential and public buildings shall be at least 800 m (Cabinet of Ministers' notice 30.04.2013. No 240), see Figure 3.2.2 of the EIA report;
 - The construction of WPPs is allowed outside towns and villages in the industrial development area, technical development area, agricultural area and on forest land as defined in the spatial plans of the two municipalities concerned, provided that the distance from residential and public buildings to the nearest planned boundary of the WPP and wind farm is at least 800 metres (Law on the Procedure for the Construction of Facilitated Energy Supply Structures to Promote Energy Security and Independence), see Figure 3.2.2 of the EIA Report;
 - Siting of WPP is prohibited in specially protected nature territories - NATURA 2000 territories (Cabinet of Ministers 16.03.2010. not. No.264) and micro-reserves (Cabinet of Ministers No. No 940);
 - in order to protect bird species and other natural values from the impact of WPP, the conditions and minimum permissible distance for the siting of WPP shall be determined in accordance with the results of the EIA (Cabinet of Ministers No. No 240);
 - in the zone of visual perception of state protected cultural monuments, the impact of WPPs and wind farms on the landscape must be assessed, taking into account the specific situation and the specificity of the cultural monument (Cabinet of Ministers' Decision of 30.04.2013 No. 240) (see Figure 6.5.3 of the EIA Report for a map of the cultural heritage sites located in the area adjacent to the Proposed Action);
 - WPP are not allowed in the protection zones around land-based navigational aids for national defence and military maritime surveillance aids. The maximum width of the protection zone around navigational aids for national defence on land is 15 km from the centre of the object (Law on Protection Zones);
 - if the wind farm's WPP will be located up to 16 km from the navigation aid, or the beacon's outermost zone of influence, an in-depth analysis and assessment of the impact of the WPP on the operation of the beacon (*Guidelines for Assessing the Potential Impact of Wind Turbines on Surveillance Sensors*) is required;
 - additionally, restrictions in operational, sanitary and safety protection zones along linear and associated objects - gas pipelines, gas supply installations and structures, gas warehouses and storage facilities, electronic communications networks and radio monitoring points, electricity networks, heat networks, optical telescopes and radio telescopes, state and public use railway lines, public use roads, etc. must be taken into account.
- an assessment of the climatic conditions and wind parameters in the area to assess the efficiency of the WPP.

The proposed activity is a direct result of the overall strategic objectives of JSC “Latvenergo” set by the Cabinet of Ministers in establishing LVP in 2022, and the choice of the Limbaži WPP site is based on the possibility of concluding a development agreement, the proximity of the power transmission line and other factors listed above.

As the Estonian territory is located within 13.2 km of the nearest WPP under assessment, the impacts are described for those aspects that affect these areas.

The location of the proposed activity in relation to other wind farms in the immediate vicinity in the north of Latvia for which EIAs have been carried out or are in various stages of preparation is presented in Figure 2 (Figure 3.2.4 of the EIA Report). The assessment of the cumulative environmental impacts of wind farms is based on publicly available information on these wind parks. The nearest wind park is Aloja,

located approximately 25 km from the area of the Proposed Action. According to the information available on the website of the SEB, the decision on the necessity of the environmental impact assessment for the wind park "Aloja" was adopted on 28 August 2023 and the Environmental Impact Assessment Programme was issued on 14 September 2023. Up to 31 new generation WPPs are planned to be installed in the wind park. No cumulative environmental effects are expected between the two wind farms.

The other wind farms in northern Latvia and southern Estonia are located more than 50 km away, where no cumulative environmental effects are expected to occur. The nearest wind farm in Estonia, in the municipality of Valga, is located more than 70 km from the area of the Proposed Action.

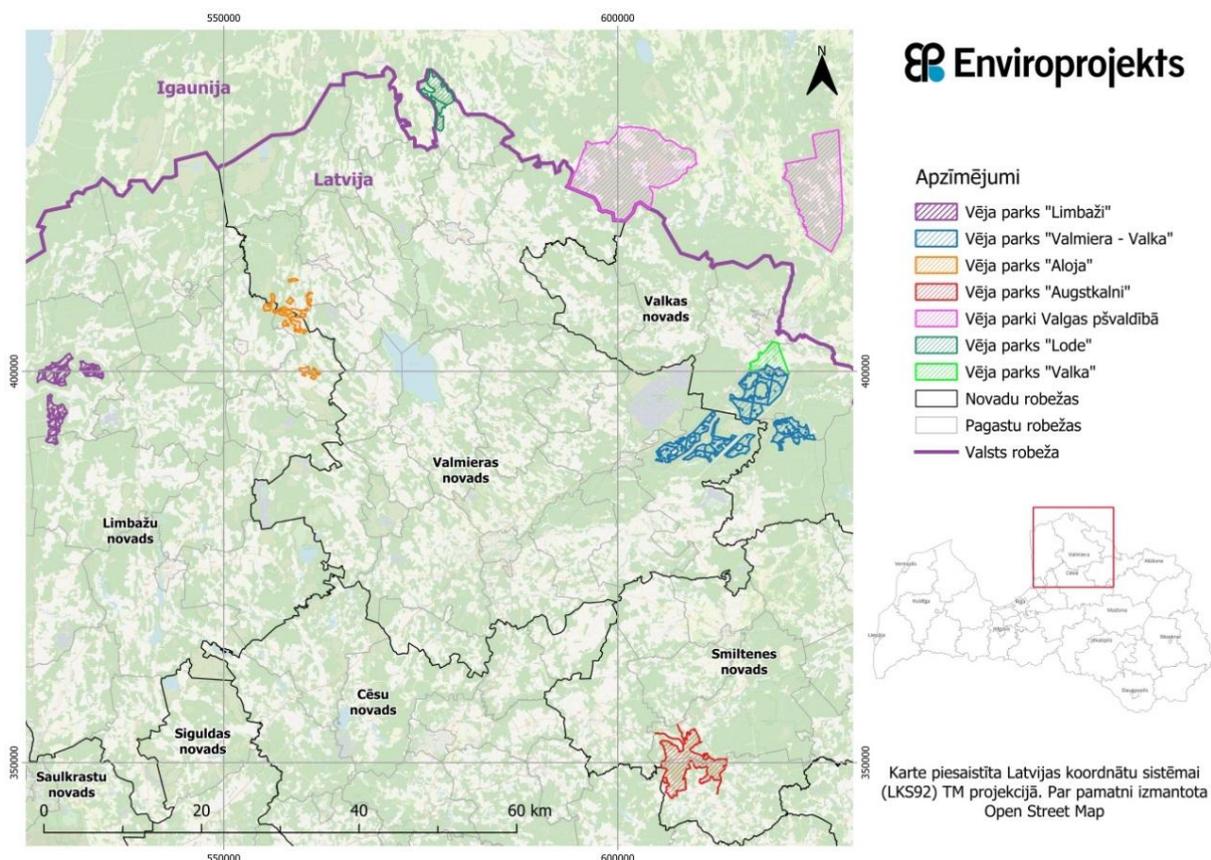


Figure 2. (Figure 3.2.4 of the EIA Report) *Location of the proposed activity in relation to other wind parks in the vicinity*

2. Siting of the WPP park and alternatives for WPP siting (Chapter 4 of the EIA Report)

During the EIA, the boundaries of the areas investigated and surveyed in relation to *the area of LVM study lands* were different, determined by the environmental area assessed, e.g:

- in assessing the impact of the Proposed Action on protected habitats, the site was surveyed by visiting and/or assessing the site of the Proposed Action and the areas of potential impact: the proposed location of the WPP and the area up to 150 m around it, potential access roads and the area up to 150 m along them, and potential electricity cable routes and the area along them;
- the ornithofauna study area covers a 3 km zone around all WPP assessed;
- the Landscape Assessment Study Area is a 10 km zone around the maximum possible outer boundary of the wind farm (from the outer WPP);
- noise and flicker have been assessed to the extent that the likely effects of the Proposed Action have been calculated.

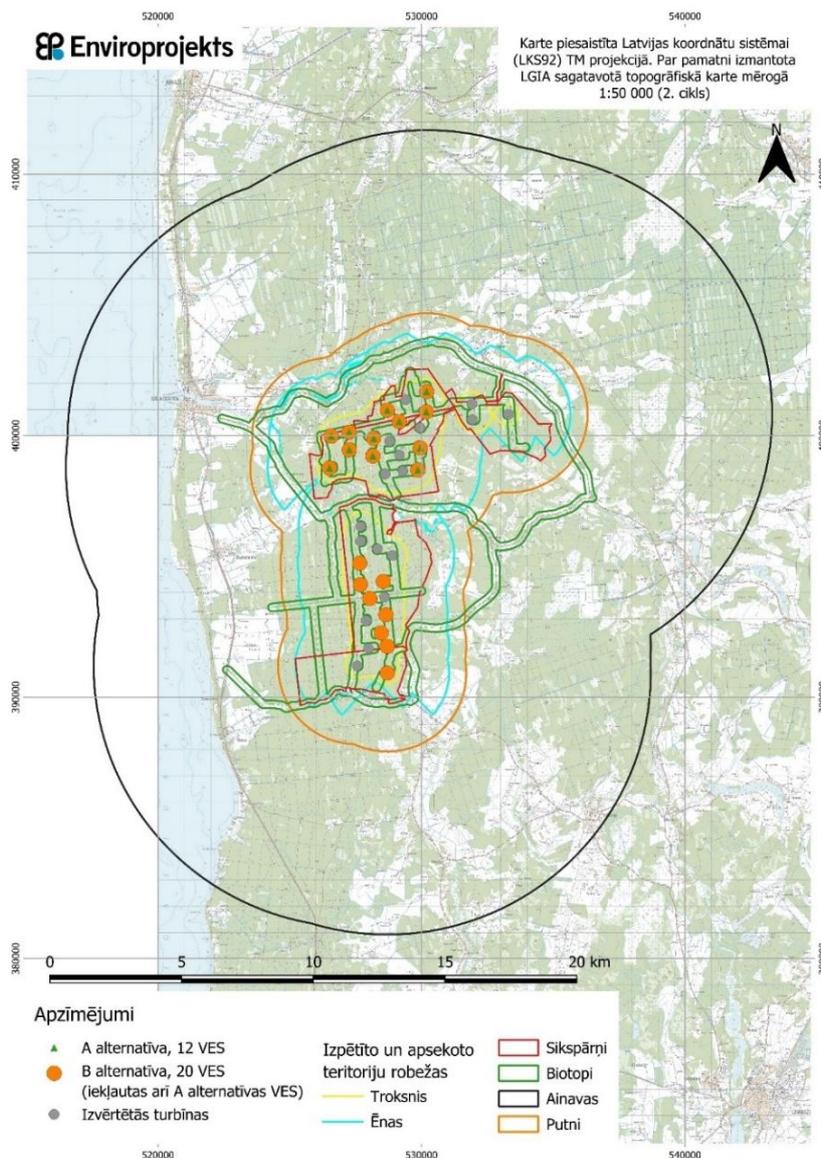


Figure 3. (Figure 4.1.2 of the EIA Report) *The boundaries of the surveyed and investigated areas in relation to the LVM study area and the 37 WPP assessed*

Location alternatives for the Proposed Activity assessed in the EIA Report

Following the EIA programme, 37 potential WPP sites were assessed for their environmental impacts. From those assessed, for the construction of the 17 WPPs it was concluded that significant adverse changes are expected as a result of the implementation of the Proposed Action: impacts on bird species, habitats or landscape, see the relevant subsections in Chapter 7 of the EIA Report "Assessment of the significant environmental effects of the Proposed Action and its possible alternatives" and the summary in Chapter 8 of the EIA Report, Tables 8.1 and 8.4.

Overall, taking into account the recommendations of an ornithologist, a species and habitat expert, a landscape expert, a bat expert and a hydrologist for the location and operational conditions of the WPP, it was concluded in June 2024 that up to 22 WPPs could be built. Enviroprojekts Ltd, together with certified nature experts, recommends the abandonment of part of the originally planned WPP in order to mitigate the impact not only on the species (including plants, birds and bats) present in the area of the Proposed Action, but also to reduce the impact on the landscape from the viewpoint of the cultural heritage sites (see Chapter 7 of the EIA Report). The assessment of the final alternatives also takes into account the guidance of the Publications Office of the European Union on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC and has been subject to a two-stage assessment: 1) site screening (to exclude significant impacts on Natura 2000 to the maximum extent possible) and 2) assessment (to exclude negative impacts on Natura 2000, their integrity and connectivity).³ The assessment of alternatives and the siting of the final WPPs also assesses cumulative impacts from certified expert opinions and EIA expert assessments.

In October of 2024, following the supplementary expert opinions, the assessment of the WPPs to be implemented was revised and significant environmental impact factors - impacts on natural values if the Proposed Action is implemented on the proposed site - were identified for three additional WPPs: Z6, Z8 and Z11. WPP Z6 was retained as it was moved to the location proposed by the experts, where an additional survey was carried out. After further assessment, the alternative locations defined above have 12 WPPs in Alternative A and 20 WPPs in Alternative B.

Alternatives for the location of the WPP (Figure 4.1.7 of the EIA Report, and Tables 4.2.2 and 4.2.3):

Alternative A: In the northern part of the WPP Park study area (12 WPPs);

Alternative B: WPP without exclusionary restrictions throughout the study area (20 WPP).

Table 1. (Table 4.1.1 of the EIA Report) *Chronology of the study of the Limbaži WPP Park*

Chronology of WPP site investigations	WPP park configuration
Initial feasibility phase	45 potential WPP sites identified and investigated. After consultation with certified experts and the Nature Conservation Agency (hereinafter - NCA), 8 WPP were excluded from further investigation after the first preliminary assessment.
2024, situation at the start of the year	37 WPPs are examined in more detail in the EIA procedure: 15 WPPs were identified as having significant environmental impacts and were excluded from detailed study due to the constraints identified (37 - 15 = 22 WPP). 22 WPPs are being promoted for potential installation.
	It was decided to group the 22 selected WPPs into two alternative ones: Alternative A in the northern part of the study area and Alternative B in both the northern and southern parts of the WPP area*

³ <https://op.europa.eu/en/publication-detail/-/publication/2b6c4b16-e867-42da-b604-f67ee6fe60c3>

	<p><i>* The northern and southern parts are separated by the natural boundary of the Svētupe River: The WPP and the area north of the Svētupe are assumed to be the northern part and the area to the south the southern part.</i></p>
	Alternative A - 14 WPP: in the W part of the study area
	Alternative B - 22 WPP: 14 WPPs in the N part of the study area + 8 WPPs in the D part of the study area.
2024, in summer	Due to the scenic impact of both alternatives A and B, which originally assessed the height of all WPPs at 300 m, some WPPs have been reduced in height to 250 or 275 m in two different ways, resulting in adjusted alternatives A and B and their complementary alternatives A' and B'.
2024, September 2009	Additional assessment of habitats, vascular plants and moss and lichen species in the northern part of the site (Alternative A), as well as assessment of a new AST and power line.
2024, October 2009	Impact on habitats identified; expert recommendation: abandon 2 more WPPs in N (and relocate WPP Z6).
Intermediate result	37 WPPs assessed in detail: exclusion restrictions for 17 WPPs (20 remain).
	Alternative A - 12 WPP: in the W part of the site
	Alternative B - 20: both parts of Z+D*
	* Significant preconditions have been identified for 8 WPPs in Part D, which can only be decided after further assessment of vascular plant, moss and lichen species and the development of a solution for the connection to the AST, as well as additional freshwater impact studies for the power line crossing over the Svētupe River.
Result	<p>Recommended Alternative A for construction - 12: Z</p> <p>In total, 12 WPPs are recommended for construction in the N part of the park with reduced height (compared to alternative A'). The EIA report considers the recommendation for a WPP park of this size as part of the assessment of the proposed development alternative B, as a total of 20 potential WPP sites have been identified in the study area N and D. Of the 20 identified potential WPP sites, 8 sites in Part D are subject to significant pre-conditions: assessment of additional vascular plant, moss and lichen species and development of a solution for the AST connection, as well as additional freshwater impact studies for the power line crossing over the Svētupe River.</p>

3. Assessment of the existing environmental status of the site (Chapter 6 of the EIA Report)

3.1. *Hydrogeological, hydrological and engineering geological conditions and geological structure*

The area of the proposed activity is located in the eastern part of the Baltic artesian basin. According to the LVGMC database "Boreholes" and cartographic information, groundwater aquifers associated with Quaternary sediments and rocks of the Upper Devonian, Middle Devonian and Lower Devonian sedimentary complex are distributed in and around the area of the proposed WPP (Table 6.1.1 of the EIA Report).

Often, the sand layers associated with groundwater are only a few metres thick. Groundwater provides water supply for the individual sector and is widely used in homesteads (wells). Groundwater is sourced at depths between 0.35 and ~10 m from the surface (the further from the sea, the greater the depth). Groundwater levels are influenced by rainfall. Water quality is most often affected by human activities. Groundwater is mainly associated with sandy Upper Pleistocene Baltic Ice Lake sediments (lgQ3ltv). The groundwater aquifer associated with alluvial deposits (aQ4ltv) is mainly composed of variously grained sands distributed in the valleys of watercourses (Salaca, Vitrupe, etc.). In the depressions and depressions between the hills, the marsh sediments (bQ4) also contain water.

During the operation of the WPP park, potential impacts on hydrogeological and hydrological conditions are related to the possible drainage effect of the side ditches. No significant adverse impacts on the water quality of groundwater, surface water, groundwater and water abstraction points are expected from the implementation of the Proposed Action as there are no contaminated or potentially contaminated sites in the area of the Proposed Action, and construction activities will be monitored during construction.

According to the Water Management Act, the territory of the Proposed Action falls within the Gauja river basin district. According to the information from the drainage cadastre of the State Enterprise "Real Estate of the Ministry of Agriculture" and the Cabinet Regulation No 397 of 3 July 2018, the territory of the Proposed Action is located in two large river basins: the small river basin between Gauja and Salaca (large river basin code 53) and the Salaca large river basin (large river basin code 54), which are divided into several drainage basin districts.

According to the "Flood Risk and Flood Hazard Maps" prepared by the LVGMC, the area of the Proposed Development is not located within a flood risk area of national importance. The nearest flood risk area is located approximately 60 km south of the Proposed Development: Ādaži district, at the mouth of the Gauja River in the Gulf of Riga.⁴

Drainage systems

The WPP Park study area is largely located in an area used for forestry, with a dense network of shared watercourses and drains⁵, providing groundwater recharge and allowing economic activities to take place in these areas. The lifetime of the drainage system network and structures is expected to be up to 50 years. During this period, the drainage network and structures must be regularly maintained, renovated and reconstructed.

Protection zones for watercourses, existing drainage and drainage facilities

According to the TIAN of Salacgrīva town with rural territory of Salacgrīva municipality and the TIAN of Limbaži municipality, the following surface water protection zones have been established in the vicinity of the area of the Proposed Activity:

⁴ [Flood risk and flood hazard maps \(lvgmc. lv\)](#)

⁵ <https://www.melioracija.lv>

- Salaca protection zone: in rural areas - 100 m wide strip on each bank, in Salacgrīva - 10 m wide strip on each bank, in Vecsalaca - 100 m wide strip on each bank;
- Vitrupe protection zone - 100 m wide strip on each bank;
- Svētiems - 10 m wide on each bank,
- Korge protection zone - 50 m wide strip on each bank;
- Vedamurga buffer zone - a 50 m wide strip on each bank;
- Ungenurga Protection Zone - a 50 m wide strip on each bank;

For other watercourses and water bodies in the territory of Salacgrīva town and countryside - 10 m wide strip on each bank.

The construction of associated infrastructure (access roads, assembly yards, cable routes) as part of the Proposed Action could map the buffer zones around the Korge, Vedamurga and other small watercourses where infrastructure is to be constructed.

Geological structure and engineering geological conditions

The area of the proposed activity is partly located in the Metsapole Plain of the Central Latvian Lowlands and the Vidzeme Coastal Plain. The surrounding area of the Limbaži WPP Park is characterised by relatively flat topography. The absolute elevation of the terrain on the site and in the immediate vicinity varies between 25-40 m a.s.l.

The southern regions of Vidzeme are part of the ancient Eastern European platform. The geological section here distinguishes between two elements characteristic of ancient platforms: the crystalline basement rock and the sedimentary cover. The surface of the crystalline basement rock is 700-800 m below sea level.⁶ According to the tectonic zoning⁷, the crystalline basement rock corresponds to the Estonian-Latvian monocline of the Baltic syncline. The basement fault is cut north-south from Tūja to Ainaži by the Salacgrīva tectonic fault.

Quaternary sediments form an almost continuous blanket of uneven thickness, consisting of layers of different age, genesis and composition. They cover the eroded surface of pre-Quaternary rocks. The thickness of the Quaternary sediments varies from 6 to 35 m (decreasing towards the west). However, in river valley cuts, the Quaternary sediments can be up to 90-100 m thick.

Engineering geological conditions and modern exodynamic processes

The engineering geological conditions of the area of the proposed operation will be assessed in an engineering geological study to be carried out during the construction phase of the WPP. The description of the engineering geological conditions in the EIA report is therefore based on publicly available geological information.⁸

The assessment of the potential hazard from hazardous geological processes concluded that no hazardous modern exodynamic processes, such as karst or sufosia, landslides, slumping, gully formation, or active aeolian processes are present in the area of the Proposed Development. Swamping and fluvial erosion are possible in small areas in the vicinity of the proposed development.

Erosive or accumulative river activity in the area of the Proposed Action is not pronounced and mainly affects the banks of the Salaca, Svētupe and Vitrupe rivers, which are located outside the territory of the WPP Park and do not pose geological risks to the WPP Park.

⁶ Ivanova O. and Nulle I., 2003. A structural map of the surface of the base clitter at a scale of 1 : 500 00

⁷ Brangulis, A. J., Kuršs, V., Misāns, J. & Stinkulis Ģ. 1998. Geology of Latvia. 1:500 000 scale geological map and description of pre-Quaternary sediments.

⁸ Yushkevich V. , Polivko I. , Tracevski G. Report on 1:200 000 scale complex geological and hydrogeological mapping in the southern part of sheet O-35-XXI (North-Latvian mapping group), 1962. -1964. g. Geological Board, Riga, 1964.

Potential swamping processes are limited to isolated locations and are not expected to develop during the construction and operation of the WPPF.

According to V.Nikulin's Latvian seismic zoning⁹ the area of the proposed activity is located north of the Svētupe seismogenic zone (ST), where future earthquakes with an intensity of 6 magnitude at epicentre (on the MSK-64 scale) may occur (Figure 6.3.5 of the EIA Report).

3.2. Nature values

Specially Protected Nature Areas

The study area and its surroundings include several Specially Protected Nature Areas (SPNAs) and micro-reserves, species sites and their areas, biotopes of European Union importance and trees of special conservation concern. The Proposed Action is located within the territory of the North Vidzeme Biosphere Reserve (Neutral Zone) (part of the Proposed Action study area is also located within the Landscape Protection Zone, but no WPPs are planned to be located there). An overview of the nature values is summarised in Figure 6.4.1 of the EIA Report, and a map of the SPNAs is provided in Figure 6.4.2.

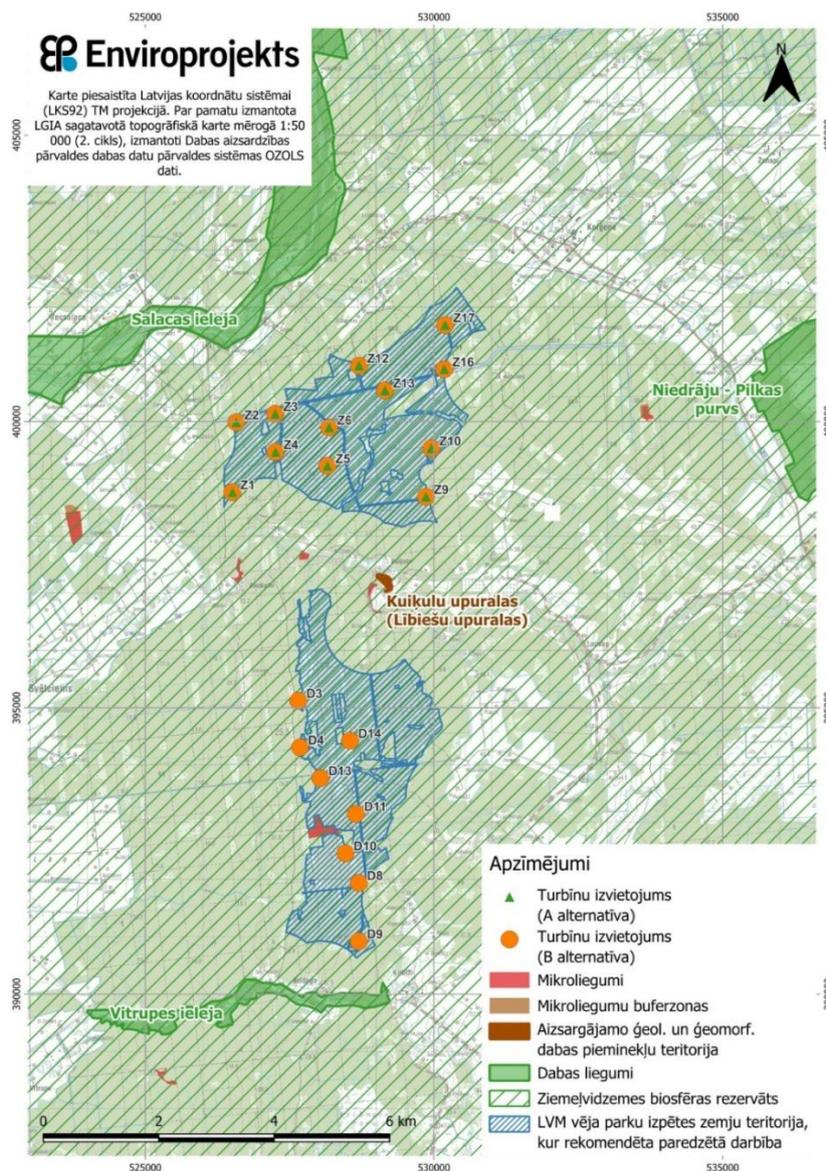


Figure 4 (6.4.2 of the EIA report) Protected areas in the vicinity of a potential WPP site

⁹ Nikulin, V. 2007. *Seismotectonic conditions and seismic hazard of Latvia*. University of Latvia, Riga.

There are 9 microreserves and 3 Natura 2000 sites within 3 km of the boundary of the LVM wind farm study area land units.

3 Natura 2000 sites in the vicinity of the LVM wind farm study area:

- Vitrupes ieleja (area code: LV0530500) 0,8 km from the border of the land units, distance to the nearest WPP - 0,9 km;
- Salacas ieleja (area code: LV0302200) 1,6 km from the border of the land units, distance to the nearest WPP - 1,8 km;
- Niedrāju-Pilka purvs (site code: LV0509800) 1,2 km from the border of the land units, distance to the nearest WPP - 5,3 km.

Characteristics of Natura 2000 sites

Vitrupe ieleja is an important site for the conservation of hillside forests and for the conservation of a rare species of Annex 2 of the EU Habitats Directive - the *Vertigo genesii*, for which the site is one of only four known in Latvia. Two protected plant species have been recorded in the area: the *Allium ursinum* and the *Lunaria rediviva*, and 9 protected invertebrate species. The hillside forests of the Vitrupe valley are one of the three sites of the *Helicigona lapicida* in the country. Many of the forest stands meet the criteria for key forest habitats.

Salacas ieleja is an important area for the protection of several EU Habitats Directive habitats: sandstone outcrops, undisturbed caves, hillside forests, oxbow lakes, stream channels and dry meadows on calcareous soils, etc. It has outstanding scenic value in many parts of the river, especially in the Skaņākalns area near Mazsalaca, downstream of Staicele, at Mērnīeku krāce and Sarkana cliffs. The area is also geologically significant: Pietraga Red Rocks, Daugēnu Rocks and Caves, Neļķu Rocks and Caves, Silmaču Rock and Caves, Swallow Rocks and Caves, Dzelveskalns Outcrops and Caves, etc.

Niedrāju-Pilka purvs is an important site for the conservation of the priority habitats of the EU Habitats Directive Annex 1 - raised bogs and swamp forests. A large number of protected bird species can be found: Black stork, Bean goose, Greater white-fronted goose, European honey buzzard, lesser spotted eagle, Black grouse, Hazel grouse, European golden plover, common gull, Whooper swan, etc.

An assessment of the impact of the planned construction of the WPP, access roads, transmission lines and transformer substations on the protected natural values in the nearby Natura 2000 sites is presented in Chapter 7.9 of the EIA Report.

Protected habitats and species of special conservation concern

In order to assess the impact of the Proposed Action on protected habitats, the site has been surveyed and investigated by visiting and/or assessing the potential impacts of the Proposed Action.

In the whole habitat study area, specially protected habitats cover approximately 7% of the total area, they are found scattered throughout the LVM wind farm study area (Figure 6.4.3 of the EIA report), forming also larger concentrations along small rivers (Vedamurga, Kulaurga, Urganurga, etc.), which in places correspond to the habitat *Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation 3260*. Along them, mainly occur *Alluvial forests with Alnus glutinosa and Fraxinus excelsior 91E0**, which cover the largest areas in the study area, i.e. 106.5 ha. There is also some *Fennoscandian hemiboreal natural old broad-leaved deciduous forests 9020** (17.6 ha) along the streams and in the NE part of the site. The second largest habitat group, which occurs most frequently in scattered patches throughout the site, is *Western Taiga 9010** (66 ha). Typically, habitats that are highly dependent on moisture conditions - *Bog Woodland 91D0** and *Fennoscandian deciduous swamp woods 9080** - are more concentrated in the north-eastern part of the study area, where adjacent areas are also surrounded by swamp habitats. Coniferous forest and swamp forest habitats also survive in small patches in other parts of the site. The area also has a fragmentary occurrence of *Fennoscandian herb-rich forests*

with *Picea abies* 9050 (13.6 ha). Along the Svētupe River, which corresponds to the biotope 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, there are also 9180* *Tilio-Acerion* forests of slopes, screes and ravines covering an area of 7.2 ha. Just to the south of the study area, to the east, next to the quarry, is the 2180 Wooded dunes of the Atlantic, Continental and Boreal region 4.3 ha in area.

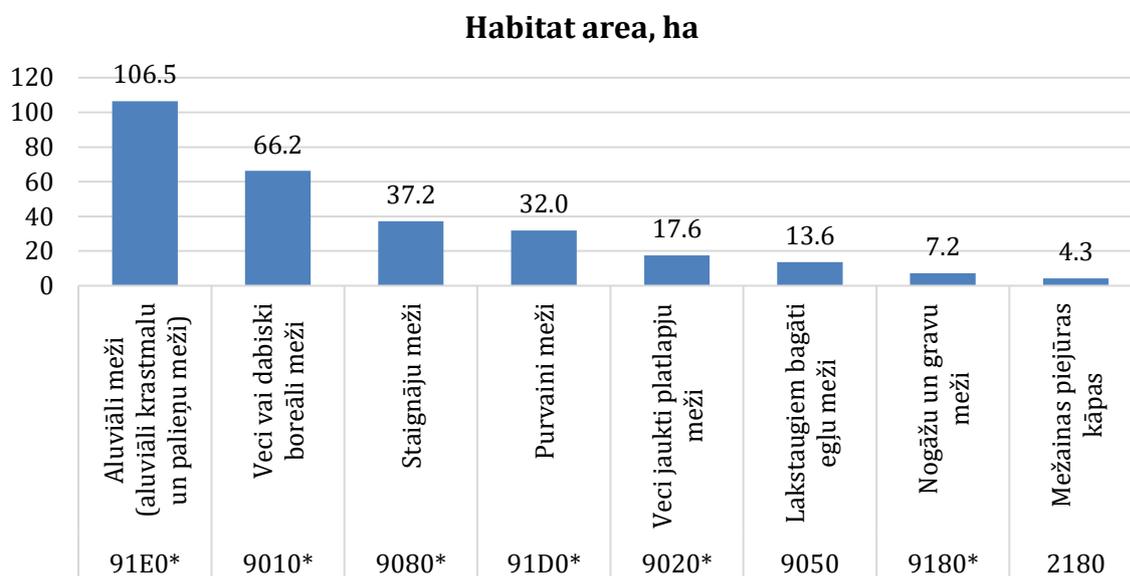


Figure 5 (Figure 6.4.3 in the EIA report). Habitat area in the area of LVM wind farm study lands of WPP park "Limbaži"

Specially protected species (BD II - species listed in Annex II to the European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora; SPA I, II - according to the number of the Annex to the Cabinet of Ministers Regulations on the list of protected species) found in the study area (northern part of the WPP park, where the impact of the Proposed Action on both forest and swamp habitats and on vascular plant, moss and lichen species is assessed), species for which a microreserve (MIR) is to be established are marked in EIA report Table 6.4.3, grouped in alphabetical order according to their Latin name and indicating their occurrence in the study area, as well as in Figure 3 of the expert opinion of 07.11.2024 attached as Annex 6). Where the name of a species in the scientific literature differs from the name used in the legislation on species conservation, this is indicated in brackets. The table includes only protected species and other rare species (e.g. specialist species of natural forest habitats) whose habitats are located in the area of potential impact of the northern part of the WPP Park.

The specially protected species of 6 vascular plants, 9 mosses, 1 invertebrate, 4 lichens and 3 fungi found in the site are noted in Table 6.4.3 of the EIA Report.¹⁰

The site survey also revealed new records of specially protected plant species: details of the records are given in the species habitat expert reports (Annex 6). Each site identified has a mapped habitat of EU importance or a designated habitat of a specially protected species.

¹⁰ Species names are used primarily according to the lists in the legislation; where the scientific name of a species has been changed, it is given in brackets.

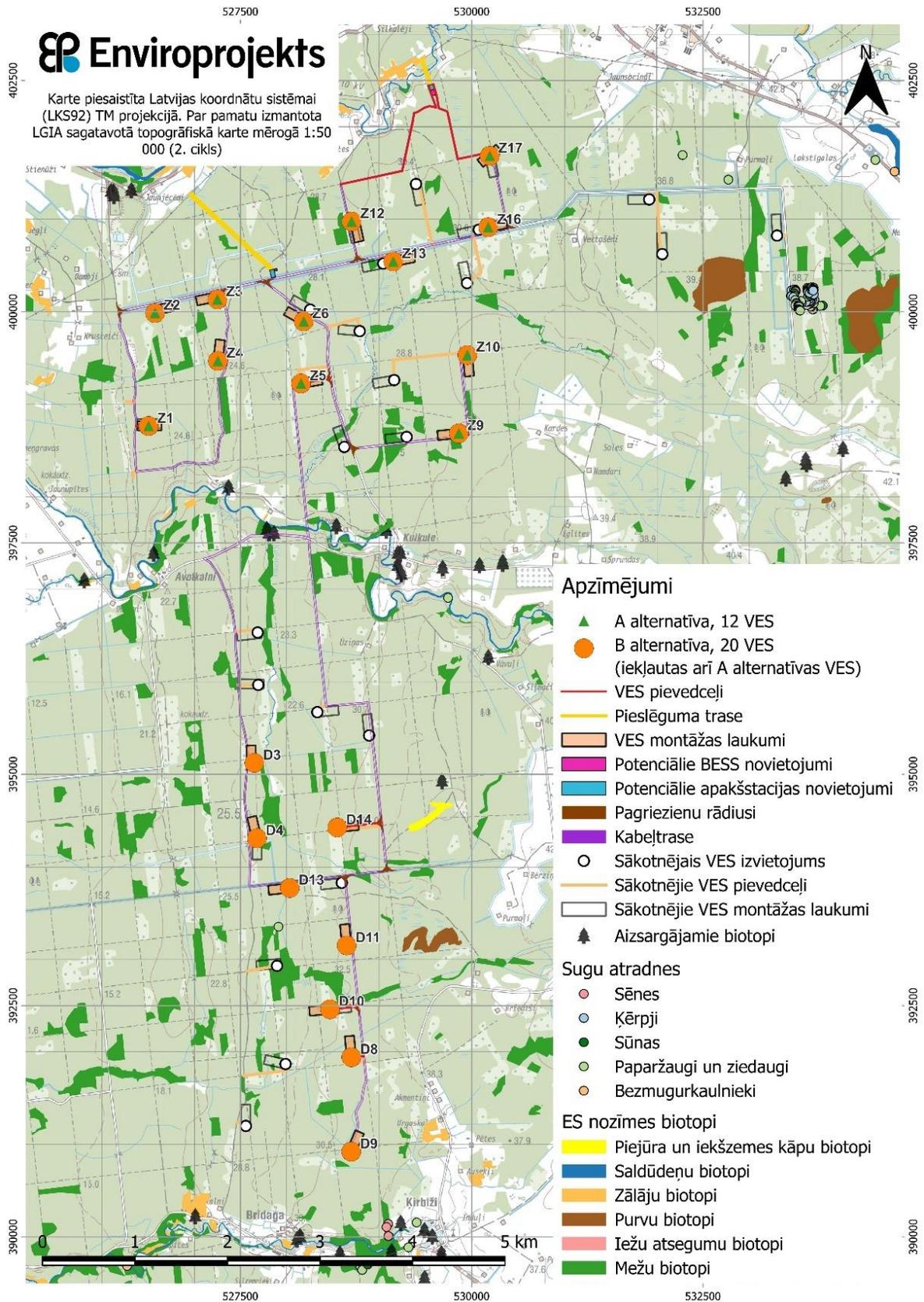


Figure 6 (6 .4.1 of the EIA report) Nature values in and around the Limbaži WPP Park

Bird species in the area

The process and methodology of the bird surveys are described in detail in the expert opinion on bird species attached to the EIA report, see Annex 6 of the EIA report.

The methodology used for the study of the bird species is attached in the opinion of the Certified Naturalist DU/2024/01 (Annex 6, Appendix "Methodology of the study"). The methodology was agreed with the Nature Conservation Agency on 30 September 2022.

The area of the proposed activity, the LVM wind farm study area and the study area including it have been surveyed and observations recorded 19 times on 13 dates in 2022 and 62 times on 46 dates in 2023, as well as in 2024 in a random manner, with particular attention paid to the survey of the vicinity of the observation of a Eurasian eagle-owl (near Korgene) in 2023 and the installation of passive acoustic monitoring devices.

A total of 54 species, 38 of which are protected species, were recorded during field surveys in the study area by a certified naturalist (Table 6.4.4 of the EIA Report). The ornithofauna of the area was characterised using expert, NCA, LVM, portal www.dabasdati.lv, NDMS "Ozols" and unpublished data. Detailed information on the surveys carried out in the area of the proposed WPP park and a list of the bird species recorded are summarised in Annex 6 of the EIA report.

Field work has been carried out in the study area of the Proposed Action in 2022, 2023 and 2024 to assess the impact of the Proposed Action on nesting and passage ornithofauna.

Information on the protected bird species found in the area and the bird species assessed in the context of the EIA is provided in Table 6.4.4 of the EIA Report, while the impact assessment and recommended mitigation recommendations are provided in Chapter 7.6.2 of the EIA Report.

Bat species in the area

Bat species in the study area were surveyed following the EUROBATS guidelines "On compliance with bat conservation requirements in wind farm projects"¹¹ and the Latvian adapted "Guidelines for assessing the impact of wind power plants on bats"¹². Bat species were surveyed using the following approach:

- seven times a season, with two (May, June, July) or four (August, September) nights of counting each month;
- the timing of the surveys was chosen according to the bats' biological cycle (reproduction, migration, mating);
- bat activity was recorded at 8 fixed observation stations D1-D8 and three routes (M1-M2);
- the monitoring stations and routes have been selected to survey bat activity in habitats similar to those in which the WPP is planned to be located;
- all ultrasound detectors at the stations are located in clearings in forests (e.g. clearings).

A total of 5619 recording files were obtained from 8 recording stations in the planned area of the WPP Park, of which 2824 files contain bat sound recordings with a total of 3242 individual bat passes recorded (Table 6.4.6 of the EIA).

¹¹ <https://tethys.pnnl.gov/sites/default/files/publications/EUROBATS-2015.pdf>

¹² https://lvafa.vraa.gov.lv/files/materials/applications/2020/171/Vadlinijas_WPP_xsparni_fin.pdf

All the counts resulted in a total of 248 bat call files with 309 recorded bat flights (Table 6.4.7 of the EIA report). Four species of bats reliably identified to species, as well as the calls of bats belonging to the noctule group, were recorded along the routes.

A total of seven bat species were identified in the analysis of bat calls. Some records cannot be traced back to the species with certainty, but can be assigned either to the species group *Myotis* (ecologically mostly a 'thicket' group) or to the species group 'nictaloids', which includes bat species of the genera *Nyctalus*, *Vespertilio* and *Eptesicus* (all 'roost' species).

The overall average bat activity at all 8 stations in the 7 censuses in the planned wind park area is 6.73 passes per hour. The results can be compared with other bat species surveys carried out in 14 other potential WPP using identical methodology. The overall bat activity recorded in the Limbaži WPP Park is assessed as high, as it is well within the fourth quartile (Table 6.4.7 of the EIA Report). This result was also to be expected, as the expert assessments carried out so far for the planned wind farms were carried out in more open and less suitable areas for bats.

Mammals

Within the framework of the EIA, an expert on the species group "mammals" (LVMI Silava lead researcher J. Ozoliņš, NCA certificate No.160) prepared an assessment of the impact of the WPP on terrestrial non-flying mammals. Almost all species of terrestrial non-flying mammals found in Latvia occur in the area, with the exception of the dormouse, whose distribution is restricted to some known localities outside the study areas. An overview of the species, together with their relative importance, is provided in Table 6.4.9 of the EIA Report.

The information provided in the report is based on data obtained within the framework of the monitoring of the status and damage caused to large wild mammal populations (ungulates, carnivores), which the LVM institute "Silava" has been carrying out for some species for 20 years, visiting the area in different seasons and meteorological conditions. The study area and its surroundings have been visited and mammal occurrences recorded on numerous occasions in the framework of several projects, which are listed in the expert's report (report attached as Annex 6 to the EIA).

Observations in the vicinity of the WPP parks studied by the expert (WPP Limbaži and WPP Valmiera-Valka) show that up to 10% of the Latvian brown bear population has visited the wind park areas so far.¹³

Brown bears are a species for which little or no scientific research in Europe has examined the impact of wind farms. Their dispersal in Latvia has been N-S, with the highest population densities and most successful breeding currently occurring in northern Vidzeme. The proportion of the population of other mammals, both specially protected and economically exploited, in the area where the wind farms are planned to be established does not exceed 1% of the total population and range of Latvia.

3.3. Landscape and heritage assessment

Landscape characteristics

In terms of landscape, the study area of the Proposed Action falls within the Northern Vidzeme and the Maritime area. In terms of geomorphological zoning, the study area of the Proposed Action falls within the Metsepole Plain of the Central Latvian Lowland and the Vidzeme Coast of the Maritime Lowland. These conditions determine the flat (average altitude about 25 m) topography, the main contributors to which

¹³ <https://www.silava.lv/images/Petijumi/2023-Lacu-monitorings/2023-Lacu-monitorings-Parskats.pdf>

are the river valleys: Salaca, Korge and Svētupe, which divide the WPP massifs in the A-R direction; also, Jaunupe and Vitrupe.

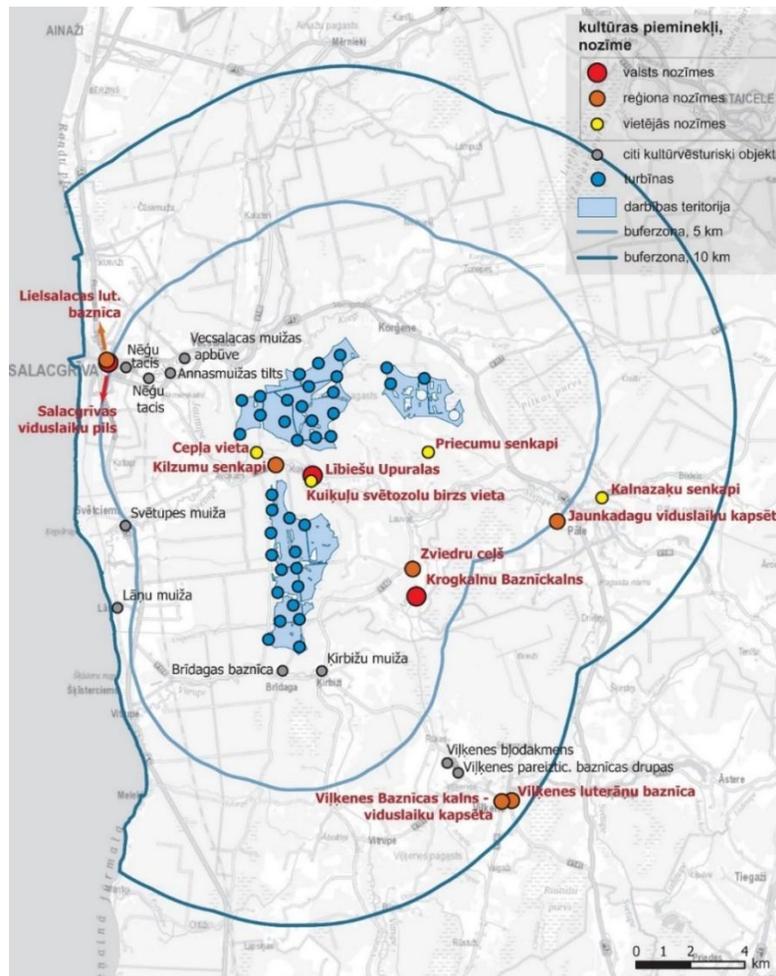


Figure 7. (Figure 6.5.3 of the EIA Report) *Tourism and recreational facilities and routes and maximum WPP location pattern in the study area. Basic: Ltd Jāņa sēta*

Characteristics of cultural heritage

According to the cartographic information of the information system "Heritage"¹⁴ there are 16 cultural monuments in the study area. Of these, 11 are archaeological monuments and 5 are monuments of art. As the monuments are located indoors - in three churches - the churches are indicated in the cartographic material.

In terms of status, 4 monuments are of national importance, 8 monuments are of regional importance and 4 monuments are of local importance (Table 6.5.1 of the EIA Report).

Other sites or objects of cultural or historical importance within the study area have also been identified (Table 6.5.2). They include four churches or their ruins, three manor complexes, an industrial heritage site and an archaeological (cult) site. Closer sites are assessed in depth.

Tourism and recreation opportunities in the area

¹⁴ <https://karte.mantojums.lv/>

The study area contains several tourist attractions, is crossed by hiking routes of European and regional importance, has several rivers used for water tourism (Salaca, Svētupe, Jaunupe, Vitrupe), as well as several other types of recreational sites and areas (Figure 10 (Figure 6.5.3 of the EIA Report)).

Sights and recreational opportunities in the operational area

Two nature trails maintained by the LVM are located in the study area relatively close to the proposed WPP: Ķirbiži forest nature trail and Niedrāju-Pilka purvs footbridge. Further afield are sites such as the Manor Stone and Sarkanās klintis. Recreational opportunities include mushroom picking and other natural resource gathering, fishing, physical activity (jogging, Nordic walking, cycling, etc.), walking, sunbathing, relaxing by the water, etc.¹⁵

Water tourism

The Latvian water tourism route website "Upesoga" includes four watercourses in the study area: Jaunupe, Salaca, Svētupe, Vitrupe.¹⁶ When contacting the Salacgrīva boat rental company "Lāču laivas", it was found out that apart from the Salaca, boating on other rivers is very dependent on the water level and the cleanliness of the river (presence of obstacles) and is therefore not so popular. Boating is also offered on the Korgē, but this is aimed at a very small group of people and only a few takes advantage of this opportunity.

Hiking/cycling routes

Seafront: Part of the European Long Distance Hiking Route E9 in the Baltic States. In Latvia, it stretches along the entire coastline. As the study area also includes the shore of the Gulf of Riga, this also implies the presence of the Jurtakas. It stretches for 29 km in the study area. The closest location to the wind park - in Salacgrīva, near the Salaca Bridge - Jūrtaka is 5.3 kilometres from the planned WPP (Z2).

Green railway "Ainaži-Valmiera". Green railways are cycling and hiking routes along former railway lines in Latvia and Estonia. The 20.8 km study area includes the route of the Ainaži-Valmiera green railway, which has a total length of 84 kilometres. The WPP will be located up to 9.9 km away from the route in this section.

EuroVelo13 cycle route: the EuroVelo13 or Iron Curtain cycle route is located in the study area. EuroVelo13 is part of the EuroVelo network of European cycling routes. In Latvia, it mostly follows the coastline, and in the study area it also follows the roads closest to the Gulf of Riga for 28.7 km.

3.4.Noise assessment

The planned locations of the individual WPPs are mainly forest stands or clearings from recent years. The nearest rural farmsteads are >800 m from the nearest WPP (see Figure 6.7.1). The noise-regulated areas are certain areas close to detached houses and, in the settlements of Kuikule, Kirbiži and Korgēne, the detached house regulated areas. The settlement Kuikule is ~1.5 km from the nearest WPP, Ķirbiži is ~1.2 km from the nearest WPP, the settlement Korgēne is ~2 km from the nearest WPP. Throughout the planned WPP area, which is quite large, there are some small apparently private quarries. There are three lightly used local roads in the area: V143 - 111/11, V142 - <100/27, V138 - <100/17, further away - municipal road P12 - 770/6 (total cars/day / freight transp. %). The A1 and the railway are ~4.5 km further

¹⁵ Institute for Social, Economic and Humanitarian Studies (VIA HESPI) 2022. *Monitoring of visitors to specially protected areas. Report on the survey results.*

¹⁶ <https://upesoga.lv/lv/marsruti/>

away and do not affect this WPP park. All roads are in or around the WPP area, local roads have low traffic volumes and their traffic noise does not affect the noise pollution of farmsteads exposed to the WPP.

There are no businesses within the planned area of the WPP that generate noise from their activities that would add to the noise generated by the WPP at the individual farmsteads. Other industrial sites are located in the surrounding settlements, but all of them are outside the area of the proposed WPP park.

The existing noise level in the area of the proposed WPP is determined by traffic noise on nearby roads, which is modelled to assess the existing noise situation in the area of the proposed WPP park. The proposed Rail Baltica route is 3.5 km from the nearest recommended WPP. According to the noise modelling maps for the Rail Baltica route¹⁷, the calculated limit to which the noise level of the railway without noise abatement measures exceeds 45dB (A) at Night in the recommended railway alignment option is no closer than 2.8 km to the nearest recommended WPP. This distance is approximately 3.4 km, taking into account noise abatement measures.

3.5. Air quality assessment in the WPP area

Construction equipment and transport for the construction of the WPP will cause insignificant, local, temporary and episodic air pollution, which will be localised in the construction zone, which is not located in the immediate vicinity of a residential area. The construction process, such as the use of machinery and access roads, including gravel roads, can cause air pollution with dust particles_{PM10} and _{PM2.5}, as well as nitrogen dioxide, and the concentration limit values for these substances are set by Cabinet of Ministers Regulation No 1290 of 3 November 2009 "Regulations on Air Quality". Air quality in the study area of the WPP Park has been assessed in the light of Cabinet Decision 02. 04. 2013. 182, which requires an official statement from the LVGMC on the existing pollution levels (background concentrations of air pollutants) for the area of potential impact of the polluting activity for which air quality standards are in force.

The existing pollution levels are described in the letter No 4-6/1433 of the LVGMC of 26 September 2024 (Annex 2) on the concentrations of air pollutants in the potential area of influence of the activity, excluding the contribution of the polluting activity. The area of potential effect for the determination of background concentrations is the area around the location of the polluting activity at a distance equivalent to the 20 highest emission source heights, but not less than 2000 m.

Table 2. (6.8.2 of the EIA Report) *Annual mean background concentrations ($\mu\text{g}/\text{m}^3$) in the area of the proposed activity*

Viela	Annual average concentration ($\mu\text{g}/\text{m}^3$)
PM ₁₀	13.90
PM _{2.5}	7.78
Carbon monoxide (CO)	307.45
Nitrogen dioxide (NO ₂)	5.83

The concentrations of pollutants in the vicinity of the area of the Proposed Activity are low and do not even approach the limit values for pollutants specified in the Cabinet of Ministers Regulations, as shown in the figures included in the EIA Report (Figures 6.8.1 to 6.8.4 of the EIA Report). The existing air quality in the area of the proposed activity is good and there is no need to develop measures to improve air quality; the highest concentrations of air pollutants are in the vicinity of major settlements and roads.

¹⁷ <https://edzl.lv/projekta-norise/izpete>

4. Significant environmental effects of the proposed activity and its possible alternatives (Chapter 7 of the EIA Report)

Member States should support the accelerated development of renewable energy projects in cooperation with local and regional authorities by identifying and defining land, surface, underground and marine or inland water areas required for the installation of renewable energy plants for the production of energy from renewable sources and related infrastructure to ensure the achievement of the 2030 renewable energy target and to support the achievement of the climate neutrality target by 2050 at the latest in accordance with Regulation (EU) 2021/1119.

4.1. Deforested areas

The exact size of the total deforested area will be determined during the construction design phase, and the maximum possible area will be estimated during the EIA.

The approximate area to be deforested if the recommended alternative A is implemented will be up to 46.64 ha, of which approximately 25.30% will be young stands, 35.08% middle-aged stands and 31.65% mature stands (calculations in Table 3 (EIA Report 7. 1. 1. table 2)); 5.90% of the deforested area is currently clear-cut.

However, under Alternative B, the deforested area will be up to 69.05 ha. Of which 30% are young stands, 34% middle-aged stands and 25% mature stands (estimates in Table 4, EIA Table 7.1.2); 4% of the deforested area is currently clear-cut.

Table 3. (Table 7.1.1 of the EIA Report) *Total deforested area under Alternative A*

Alternative A							TOTAL (ha)
	New yield (ha)	Middle-aged stand (ha)	Briestaudze (ha)	Adult stand (ha)	Overgrown stand (ha)	Deforestation (ha)	
Total	11,80	16,36	14,76	0,73	0,24	2,75	46,64
%	25,30	35,08	31,65	1,57	0,50	5,90	

Table 4. (Table 7.1.2 of the EIA Report) *Total area to be deforested under Alternative B*

Alternative B							TOTAL (ha)
	New yield (ha)	Middle-aged stand (ha)	Briestaudze (ha)	Adult stand (ha)	Overgrown stand (ha)	Deforestation (ha)	
Total	20,41	23,42	16,98	2,75	2,45	3,04	69,05
%	29,56	33,91	24,60	3,98	3,55	4,40	

According to the Central Statistical Office, in 2024 there will be 3 607 thousand ha of forest land in Latvia¹⁸, so the area deforested by LVP for the WPP park Limbaži in alternative A will be approximately 0.0013%, while in alternative B approximately 0.0019% of the total forest area in Latvia. The impact is assessed as not significant.

¹⁸https://data.stat.gov.lv/pxweb/lv/OSP_PUB/START_NOZ_ME_MEP/MEM010/table/tableViewLayout1/

4.2. Noise and vibration levels

Assessment and significance of changes in noise levels

The planned location of the WPP is a large area (about 45 km²) in the municipalities of Salacgrīva and Vilķenes parish; there are about 20 farmsteads in the vicinity of the WPP park.

An overview of the noise propagation forecast is attached in Annex 7 of the EIA Report.

No potential problems with exceedances of noise limits are expected as a result of the noise calculations: five conclusions are listed below.

1. Calculation of the noise level in the homestead areas in the existing situation (traffic noise): the permissible noise level in the homestead areas at all times of the day is complied with in accordance with the Cabinet of Ministers Regulation No 16 of 7.01.2014 "Noise assessment and management procedure".
2. In the existing situation (traffic noise), all settlements meet the WHO guidelines for road traffic noise of <53 dBA recommended daily LDV values. (Compendium of WHO and other UN guidance on health and environment, 2022 update.)
3. Calculation of the noise level at night when operating 12 WPP with 2 BES and AST units (Alternative A): compliance with the permissible noise level in the homestead areas at all times of the day is ensured, in accordance with the Cabinet Regulation No 16 of 7.01.2014 "Noise Assessment and Management Procedure".
4. Calculation of the noise level at night when operating 20 WPP with 2 BESS and AST units (alternative B): compliance with the permissible noise level in the homestead areas at all times of the day is ensured, in accordance with the Cabinet Regulation No 16 of 7.01.2014 "Noise Assessment and Management Procedure".
5. In some farmsteads (Alternative B), the WHO guideline for WPP noise is not met, with a daily LDV value of <45 dBA. (Compendium of WHO and other UN guidance on health and environment, 2022 update.)

In order to comply with the daily_{ADI} values recommended in the WHO guidelines, Alternative B for WPP D8 includes mitigation measures: select WPP models with noise emissions that comply with the WHO recommendations, install WPPs with the lowest possible noise emissions or aerodynamically improved wings.

Assessment and significance of low-frequency noise

There are no laws and regulations in Latvia that set limit values for low-frequency noise. For the assessment of low-frequency noise in this EIA, the Danish limit values and the procedure for setting them for WPP development projects have been used as a basis. The cumulative low-frequency (10-160 Hz) noise level from WPP in residential buildings must not exceed 20 dB at wind speeds of 6 m/s and 8 m/s. The predicted low-frequency noise of the WPPs has been calculated for all 37 WPPs initially assessed at the same time, fully covering the two alternatives assessed in more detail, using the Wind Pro software with up-to-date data from WPP manufacturers on the latest models for which low-frequency noise measurements have been made¹⁹: see Annex 7. The results obtained do not exceed the Danish limit values (Figure 7.2.2 of the EIA report).

¹⁹ WindPRO 3.6.366 by EMD International A/S, SIA "Environment" licence (client) No 8797.

Large national epidemiological studies on the public health effects of low-frequency noise from WPP have been carried out in Denmark, analysing the effects of WPP noise on cardiovascular disease, pregnancy and diabetes. The results of the studies have been published in 2018 at ^{20 21,22,23}. These studies, which analysed public health aspects in the vicinity of all Danish WPPs (up to 40 WPP heights) where ~615 000 people lived during the reporting period, were carried out in a total area of ~650 000. The original hypotheses that noise from WPPs, including low frequencies, would have a negative impact on public health have not been confirmed. The authors note that some observations suggest that potentially higher relative risk factors could be observed in areas where the ambient noise level from the WPP is above 42 dB(A) and the indoor low-frequency noise level is above 15 dB(A).

The low-frequency outdoor noise modelled in this EIA does not reach even the lowest indoor level in any of the nearby developments mentioned in all these studies: 15 dB(A).

Assessment and significance of changes in vibration levels

During operation, the imbalance and friction of the rotating parts cause vibrations that are undesirable not only from an environmental point of view, but above all for the operation of the WPP itself, so they are minimised in the design of the WPP. The main sources of vibration in a WPP are the generator, gearbox and bearing systems. The vibration of these rotating parts can also cause the nacelle and tower to vibrate. At high wind speeds, the level of vibration can be increased by imbalances in the WPP parts due to wind pressure and turbulent flows.

Short-term effects may arise from vibrations caused by construction machinery during construction.

The level of vibration caused by WPPs and their impact on nearby areas in Latvia are not limited by regulatory limits. Until 30 June 2010, vibration limit values were laid down in Cabinet Regulation No 341. No new laws and regulations setting vibration limits have been issued since 30 June 2010, when these provisions expired. These regulations set lower vibration limits for operating theatres and wards in medical and rehabilitation facilities (night period), where the weighted vibration acceleration could not exceed 0.028 m/s². In living areas, the weighted vibration acceleration must not have exceeded 0.04 m/s² at night and 0.07 m/s² during the day.

A comparison of the results of the measurements of vibration from WPPs with the vibration limits in force in Latvia until 30 June 2010 shows that the vibration levels in the immediate vicinity of WPPs are higher than the former limits, but at a distance of 300 m from the WPP, the vibration levels are significantly lower than the lower limit value for operating theatres and wards in medical and rehabilitation institutions (at night). Although no studies have been carried out on the vibration levels of the WPPs assessed in this EIA, given that the limit values for the mechanical parts of the WPPs are set independently of the capacity of the WPP, there is no reason to believe that the vibration levels of the proposed WPPs will approach the limit values that were in force in Latvia at the time and will cause any perceptible discomfort outside the former WPP protection zones. Therefore, the Proposed Action, which does not foresee any WPP within 800 m of any human dwelling, cannot by a large margin cause vibration that would disturb people.

²⁰ A. H. Poulsen et al., Long-term exposure to wind turbine noise and redemption of antihypertensive medication: A nationwide cohort study. *Environment International* 121 (Pt.1), September 2018

²¹ A. H. Poulsen et al., Pregnancy exposure to wind turbine noise and adverse birth outcomes: A nationwide cohort study, *Environment International* 167, September 2018

²² A. H. Poulsen et al., Long-term exposure to wind turbine noise at night and risk for diabetes: A nationwide cohort study, *Environmental Research* 165, April 2018

²³ A. H. Poulsen et al., Short-term nighttime wind turbine noise and cardiovascular events: A nationwide case-crossover study from Denmark, *Environment International* 114, March 2018

4.3. Flicker

Effects of the flicker effect

The flickering effect is caused by the movement of the rotor wings as they periodically block out the sun and create moving shadows on the ground, on the surface of objects and on the person, who may experience subjective discomfort from this rhythmic alternation of sun and shadow. However, the only objective adverse effect on human health found in the literature is that for epileptics, lighting changes of 3-60 Hz can cause seizures. Modern high-power wind rotors, however, produce much slower flicker: typically, in the range of 0.2-1 Hz.

There are no laws and regulations in Latvia that set out how the flicker effect should be assessed and limited. Similarly, in other EU countries, flicker exposure targets are set in guidelines rather than in legislation, since flicker is recognised and defined as a nuisance, but there is no scientific evidence of its effects on public health.

Effects of the Flashing Shadow

In total, the shadow duration target of 10 hours per year is exceeded (11-33 h) in 12 dwellings: See Annex 8 of the EIA worksheet "Shadows with distance attenuation" (shaded red) and the summary in Table 7.3.2, which also indicates the main shadow casting WPP on each house that is causing these exceedances and the times of the year and day when the specific WPP should be stopped during sunny periods to prevent these exceedances.

The total shadow duration exceedances (EIA Tables 7.3.2 and 7.3.3) are only 124.3 hours in Alternative A and 192.4 hours in Alternative B, which would correspond respectively to a 1.4% annual shutdown of WPP 1 in Alternative A, or a 0.1% annual shutdown of the entire WPP fleet, and a 2.2% annual shutdown of WPP 1 in Alternative B, or a similar 0.1% annual shutdown of the entire WPP fleet. However, the WPPs will have to be shut down for about three times less time overall, because (Table 7.3.2 of the EIA) shutting down Z2 reduces the shadow duration for 4 houses at a time, D8 for 3, Z9 and Z16 for 2 each, so the required WPP shutdown will reduce the annual lifetime of the WPP fleet by a negligible amount.

4.4. Impact on air quality

During the construction of the WPP, construction equipment and vehicles will cause insignificant local, temporary and episodic air pollution, which will be localised in the construction zone, which is not located in the immediate vicinity of a residential area.

During construction, the following have been identified as air pollutants:

- Dust. This pollutant is caused by construction activities such as excavation, drilling and the movement of machinery. These activities can produce dust particles of different sizes, from coarse to fine.
- Diesel exhaust gases from heavy machinery and equipment powered by diesel engines. The main pollutants emitted by diesel-powered machinery are nitrogen oxides, PM particulates, including PM₁₀ and PM_{2.5}.

The overall level of risk of impacts is low according to the IAQM guidelines used²⁴. The construction process of the WPP, including the movement of vehicles involved in the construction process, will have a negligible

²⁴ <https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf>

impact on the health, property and ecosystem of the population. Localised dust abatement measures (e.g. road dusting for nearby farmsteads) should be considered during construction.

Overall, the air pollution from the construction process is assessed as insignificant, with negligible environmental damage and a more significant consequential benefit from the constructed renewable energy facility, which will not cause air pollution in future operation.

4.5. Impact on nature values

Habitats and SP species

The factors identified as threatening nature values in relation to protected plant species sites, protected freshwater, grassland, marsh and forest and swamp habitats are the direct destruction of protected habitats as a result of the construction of the WPP and associated infrastructure, the fragmentation of habitat areas by power plant assembly/operation areas and access roads, and the potential drainage impacts that may arise from ditching around assembly areas and access roads where necessary for drainage.

Measures to avoid and minimise potential impacts on nature values are already identified in the EIA, by assessing the initial location of the WPP and infrastructure and providing planners with information on the identified nature values, possible alternative locations for the WPP and associated infrastructure, as well as explaining the basic principles for planning the location of the WPP in order to avoid impacts on nature values.

The construction of the WPP Park Alternative B, which includes the WPP in the southern part of the WPP Park, is not recommended at this stage, as it has not been subject to an assessment of vascular plant, moss and lichen species and the development of a solution for the AST connection, as well as an additional impact study on freshwater for the power line crossing over the Svētupe River. The information to assess the residual effects of the Proposed Action is incomplete.

The residual impacts on protected natural values resulting from the construction of the WPP Park Alternative A after the application of mitigation measures are summarised in Table 7.6.3 of the EIA Report. One of the largest areas of habitats and species habitats affected is related to the construction of the 1A A and 1A R connection, forming the road to the substation. Even the lower impact Alternative 1A A will be moderately adverse at the local scale and insignificantly adverse at the regional scale, creating a new linear opening in the forest and associated impacts on the microclimate and hydrological regime of habitats and species habitats. In the case of the implementation of the Connection Alternative 2A, the **Proposed Action will have overall minor adverse effects at local and regional scale**: some individuals of species and small areas of species habitats and protected habitats will be destroyed, but **there will be no adverse effects on species populations and the conservation status of habitats**.

Additional recommended measures to protect other natural assets during construction:

- Large-sized (>25 cm) fallen trees in the paths of roads and building sites should be moved to the nearest stand.
- If ecological trees are felled in clearings during construction, they should be moved to the nearest stand as far as possible.
- The use of imported black earth should be avoided to prevent the introduction of seeds of invasive species.

Effects on birds

In the WPP Park area, the main impacts are collisions, habitat destruction, habitat use limitation (due to noise and flicker) and barrier effects.

Clashes

In the literature, the most prominent impact of the construction of WPP parks is the death of birds as a result of collisions. It is also pointed out that there is no place where birds cannot be traumatised or fatally struck by a WPP structure - rotor or tower - and no bird species (at least within Europe) that cannot be so struck.²⁵

Most literature identifies the most vulnerable species to collisions as soaring birds: diurnal birds of prey, especially White-tailed eagles and storks, as well as migratory birds, are considered to be significant victims of collisions.²⁶ The second group of species assessed as being at risk of collisions are birds of prey, more specifically, Western capercaillies: this group is more likely to be involved in collisions with fixed infrastructure objects, including the mast of a WPP.^{27,28}

Some of the protected species found in the study area mainly stay at or slightly above tree height, at least during the breeding season: mainly woodpeckers, but also shrikes, and to a lesser extent pigeons and European nightjar. This could quite plausibly be seen as one of the main reasons for their relatively low collision rates with WPP rotors, while at the same time it should be noted that within the EU most WPP parks are established in different habitats rather than in a larger forested area. Technical parameters of WPPs, on the other hand, are much less covered in the studies, including information on the height of WPPs, their rotor diameter, the size of the fleet and the density of their deployment. **Primary** impacts should be addressed in areas of particular importance (large local populations, nesting sites or close to them), **avoiding the construction of specific WPPs. Secondary: through the use of mitigation technologies that** help avoid collisions.

Habitat destruction

The construction of infrastructure facilities - access roads, cable lines and installation sites - increases fragmentation in the WPP Park area, which may have complex impacts on both nesting species and their habitat quality, both by directly destroying or transforming habitats overlapped by the planned facilities and by altering the quality of the surrounding habitats. The presence of anthropogenic disturbance in the area could potentially increase during the technical work on the WPP. Given the location of the WPP Park site, an increase in the presence of visitors unrelated to the maintenance of the WPP Park cannot be excluded. The area was assessed during the survey as a relatively popular recreational and wildlife site, with a relatively well-developed hunting infrastructure.

To mitigate the impact of direct disturbance, deforestation and construction works should be organised outside the breeding season. **Construction work within 1000 metres of a rookery is strictly forbidden during the rutting period from 1 April to 15 May.** Where possible, this condition should be taken into

²⁵ Rydell, J., Ottvall, R., Pettersson, S., Green, M. 2017. *The effects of wind power on birds and bats*. Swedish Environmental Protection Agency, Sweden.

²⁶ Ibid,

²⁷ <https://doi.org/10.1002/ece3.6307>

²⁸ González, M. A. 2018. Female Cantabrian capercaillie dead by collision with wind turbine. Grouse News, 55

account up to a distance of 1500 metres from the roost. The **restriction applies to WPPs D8, D9, D10, D11, D12, D13, D14, D15, D16 and associated infrastructure.**

Barrier effect

Migratory birds with a WPP as an obstacle in their flight path will often choose to avoid it by flying over or around it, consuming more energy than they normally would in the absence of the WPP. The barrier effect is stronger in species that tend to avoid parks, mainly geese, swans and cranes; similar behaviour is also observed in nocturnally migrating prey birds.^{29 30}

Looking at the overall location of the WPPs, it can be characterised as a relatively narrow but long group of N-S aligned (especially if the recommendation to abandon the NE part of the three WPPs is accepted), overlapping at least relatively with the general migration direction from N-NW to SW or vice versa, depending on the direction of migration. The park is also divided into two parts by a watercourse, and there is a strip of at least 2 km between the WPP groups, which could potentially be used as a flight corridor. In view of the above, the **impact of the barrier effect** is expected **to be low** and the migratory flight paths that pass through the study area episodically are not expected to cause disproportionate energy losses to migratory bird species.

Noise pollution

Priority protected areas for a number of special-status owl species have been modelled within the planned wind park.³¹

For the priority protected areas identified in the Owl Conservation Plan, it is recommended to limit additional noise pollution from WPPs by choosing the quietest possible WPP model.

Priority Areas of Conservation Concern for owl species have been modelled in the area of the proposed wind park.³² Some of the Priority Areas identified in the Conservation Plan for *Glaucidium passerinum*, *Aegolius funereus*, *Strix aluco*, *Strix uralensis*, *Asio otus* and *Bubo bubo* also contain owl species and the Plan recommends limiting additional noise pollution from WPP in these areas by choosing the quietest possible WPP model. Due to the lack of studies on the effects of noise from WPPs on *Strix uralensis*, pre-construction monitoring of this species should be carried out to assess the potential noise disturbance from WPPs. This includes studying bird behaviour and adjusting the operation of the WPP to the observed data.

Taking into account the Latvian Owl Conservation Plan³³, where the noise threshold is set at 35 dB, and based on various studies on natural noise in forest environments, where 30-40 dB is considered typical background

²⁹ Rydell, J., Ottvall, R., Pettersson, S., Green, M. 2017. *The effects of wind power on birds and bats*. Swedish Environmental Protection Agency, Sweden.

³⁰ Pearce, Aaron & Metzger, Kristine & Brandt, David & Shaffer, Jill & Bidwell, Mark & Harrell, Wade. 2021. *Migrating Whooping Cranes avoid wind-energy infrastructure when selecting stopover habitat*. Ecological Applications. 31. 10.1002/eap.2324.

³¹ Avotiņš jun. A. 2019. *Conservation plan for the Barn Owl Glaucidium passerinum, the Short-eared Owl Aegolius funereus, the Barn Owl Strix aluco, the Barn Owl Strix uralensis, the Long-eared Owl Asio otus and the Barn Owl Bubo bubo*. Latvian Ornithological Society, Riga.

³² Avotiņš jun. A. 2019. *Conservation plan for the Barn Owl Glaucidium passerinum, the Short-eared Owl Aegolius funereus, the Barn Owl Strix aluco, the Barn Owl Strix uralensis, the Long-eared Owl Asio otus and the Barn Owl Bubo bubo*. Latvian Ornithological Society, Riga.

³³ Avotiņš jun. A. 2019. *Conservation plan for the Barn Owl Glaucidium passerinum, the Short-eared Owl Aegolius funereus, the Barn Owl Strix aluco, the Barn Owl Strix uralensis, the Long-eared Owl Asio otus and the Barn Owl Bubo bubo*. Latvian Ornithological Society, Riga.

noise, it can be concluded that a level of 40 dB, which corresponds to natural conditions, is unlikely to be harmful to owls. It can therefore be assumed that noise levels up to 40 dB will not have a significant impact on the owls' lifestyle and hunting efficiency. If it is possible to operate WPP in this range at night, this does not affect the ability of owls to hunt.

Risk assessment of the impact of the proposed action on bird species

The 500 x 500 m grid cell map used in the Species Conservation Plans for owls and woodpeckers was used to characterise the impacts. Given that birds are mobile creatures and their breeding sites vary from year to year, this allows for a more efficient and transparent characterisation of the WPP Park study area. The expert who carried out the risk assessment points out that cell boundaries are not absolute: local situations have to be taken into account, while the assessment provides a summary picture of the most important sites for birds in the area of the proposed activity.

The criteria used for the assessment are described in the expert opinion on birds (Annex 6 of the EIA report).

Alternative A of the proposed action (which is also part of Alternative B) has been eliminated as a low collision risk option provided that all WPPs are equipped with technological solutions that reduce the risk of accidental collisions (WPP containment chamber systems).

The southern part of Alternative B is assessed as an area of relatively low risk of collisions with soaring birds.

In the southern part of Alternative B, risks are posed to the Western capercaillie rookeries and potential rookeries on the periphery of the Proposed Action. If the known breeding ground (information provided by LVM, 2023 field data) is located at a relatively safe distance based on the literature, the potential breeding ground in the area south of the LVM Kulaurga quarry is located within the minimum recommended distance: 1 km. As a matter of maximum precaution, WPP D11 and D13 can only be installed after additional site investigation as part of the pre-construction monitoring, as the EIA studies and surveys have not identified the exact location of the roost but have identified indications that this is the case. The restriction of the operation of WPP D11 and D13 during the rutting period (suspension of WPP operation from 1 April to 15 May in the mornings between one hour before and four hours after local sunrise and in the evenings between one hour before and one hour after local sunset) should be adapted, but should be specified according to the results of additional surveys to be carried out during the pre-construction period.

Negative impacts on the breeding population of Ural owls are **potentially** expected throughout the Park (both under Alternative A and B). The application of owl protection measures (noise restrictions) should be assessed according to the results of the pre-construction monitoring: choose the quietest possible WPP design and solution.

Measures to mitigate impacts on bird species

During the construction of a WPP

It is recommended to abandon the construction of WPP Z19, Z20 and Z21 in the NE part of the WPP Park. This is based on the presence of nesting Eurasian goshawk at distances of less than 1000 m between these WPP, as well as the presence of a known Western capercaillie rookery and another potential rookery towards the D and SE of the WPP group, also at distances of less than 1 km. This recommendation has been taken into account.

WPP Z1 and Z2: Despite being located in habitats of relatively low value for protected birds, these WPP include a water body that has the potential to attract protected species such as Western marsh harrier,

osprey and black stork. If WPPs are built, mitigation measures are mandatory: WPP containment chamber systems, operating restrictions in line with pre-construction monitoring results, avoid risks of collisions with soaring birds. The condition for Z1 and Z2 has been taken into account (see Annex 12).

WPP D11, D12, D13, D14. These WPP are located along an already established road with a relatively high level of use and an active quarry, which are considered to be pre-existing negative factors for the Western capercaillie rookery adjacent to these WPP. If WPP are restricted by shutting down during the breeding season, the potential impact is relatively small. Ideally, if the proposed development does not allow the construction of these WPPs, this is a more optimal solution, but it does not mitigate the adverse impacts of the existing forest roads and gravel pit. The condition for D11, D13, D14 has been taken into account (see Annex 12). Construction of D12 is not recommended.

During construction and operation

Mitigation measures to be taken during the implementation of the Proposed Action are mainly aimed at avoiding collisions with sensitive species groups.

Planetary birds - Birds of Prey of the day and black storks

To significantly reduce the risk of collisions with diurnal birds of prey that have occupied breeding sites on the periphery of the Proposed Action site (mainly lesser spotted eagles) and may consequently pass through the WPP Park area or stay at low intensity in the vicinity of the peripheral WPP, **It is recommended to equip the WPP park with "smart camera systems" that** can reduce or stop the rotation of WPP (SOD or Shutdown on Demand type solution using cameras and bird identification software), groups of WPP or the whole park, if necessary (depending on the specifics of the solution). Based on the information available in the literature, this solution avoids a significant number of potential collisions, although different assessments are available in different literature.³⁴ A 65% reduction in collision risk for all diurnal raptor species using solutions that stop WPP operation is reliably estimated.³⁵ There are also solutions where these systems are equipped with specific deterrent solutions (audible or visual), which also reduce the risk of collisions in situations where the bird has already flown into the collision risk zone of the WPP rotor. These systems are constantly evolving and improving, and their efficiency is increasing.

In terms of the potential presence of soaring birds and therefore the risk of collisions, the affected WPP are located within the area of the identified breeding sites, however, due to the temporal variability of the breeding sites, it is recommended that all WPP are fitted with stop camera systems. If the solution for the WPP suspension camera system, which is being refined during pre-construction monitoring, does not ensure identification of raptors, a **solution for raptor protection** is recommended for **all WPPs**: Stop the WPP up to one hour before and after both local sunrise and sunset for the protection of soaring birds from 1 April to 1 October. The condition is partially taken into account as there are already camera solutions that are effective at dusk and the camera solution can be fine-tuned during pre-construction monitoring and there is no need for WPP shutdown, such as the dtbird solution³⁶ (see Annex 12).

Grouse: Western capercaillie

One of the mitigation measures to reduce the risk of collisions between Western capercaillie and rotor wings, as well as potentially reducing the risk of collisions between other species nesting in the forest, is

³⁴ Rydell, J., Ottvall, R., Pettersson, S., Green, M. 2017. *The effects of wind power on birds and bats*. Swedish Environmental Protection Agency, Sweden.

³⁵ Garcia-Rosa, P. B., & Tande, J. O. G. 2023. *Mitigation measures for preventing collision of birds with wind turbines*. Journal of Physics: Conference Series, 2626(1), 012072.

³⁶ <https://www.dtbird.com/>

the height condition of the lowest point of the WPP rotor wing: the lowest point must be at least the height of two mature trees of the surrounding forest. This condition is already considered to be fulfilled in the initial planning, since if the maximum height of the WPP is 300 m and the rotor diameter is 200 m, the lowest point of the rotor is at a height of about 100 m.

Taking into account the potentially high risk of the overall impact of the operation of the constructed WPP on the success of the Western capercaillie rut, the WPP located approximately 1 km away from the rookeries **(D8, D10, D11, D12, D13, D14, D15, D16) should be suspended during the rutting period**: it is recommended to suspend the operation of the **WPP** during the rutting period from 1. the following should be recommended for the period from 1 April to 15 May: in the mornings from one hour before local sunrise to four hours after local sunrise, and in the evenings from one hour before to one hour after local sunset. The condition for D8, D10, D11, D12, D13, D14 has been **partially** taken into account (see Annex 12) as the ornithologist has based the WPP restrictions on assumptions, so the need for them can be clarified during pre-construction monitoring and the suspension time can be reduced accordingly. D12, D15, D16 are not recommended at all, **and it should be noted that the southern part of the WPP is not recommended at all at present.**

Birds' active at night: owls

Protected owl species occur throughout the proposed WPP park, or their priority cells are located within 500 metres of the proposed WPP sites. The bird expert points out that the operation of the WPP should be limited throughout the year (owls are roosters) so that noise pollution levels are not exceeded.

In the absence of studies on the impact of sound from wind farms on birds, caution should be exercised, and further pre- and post-construction monitoring of birds should be carried out to assess the noise and disturbance impacts of WPPs. This includes studying bird behaviour and, if necessary, adjusting the operation of the WPP in line with the observed data if negative impacts from the WPP are detected.

To reduce the potential impact of noise pollution on the owl species present and potentially nesting, it is recommended to choose technical solutions with the quietest possible operation of the WPP system. Condition taken into account (see Annex 12).

Migratory birds

In order to significantly reduce the risk of collisions with large migratory birds (mainly *Anser sp.* and *Branta sp.* geese as well as swans), which may pass through the territory of the WPP park or stay at low intensity in the vicinity of the edge WPP during the migration period, it is recommended to equip the WPP park with camera system(s), which can, if necessary (depending on the specifics of the particular solution), slow down or stop the rotation of one or more WPP turbines or the turbines of the entire park. The literature also mentions the positive effect of radar applications in reducing collisions of migratory birds in wind farms, which have been installed even in strong migration routes.³⁷

Although the proposed WPP park is not considered to be located in a strong migratory flyway or bird concentration area based on survey information, it is likely to have a temporarily high presence of migratory birds.

³⁷ Cohen, E. B., Buler, J. J., Horton, K. G., Loss, S. R., Cabrera-Cruz, S. A., Smolinsky, J. A., & Marra, P. P. 2022. *Using weather radar to help minimize wind energy impacts on nocturnally migrating birds*. Conservation Letters, 15(4).

To reduce potential collisions during migration periods, it is recommended to apply solutions based on camera technology to all WPP in the park area, which limit the operation of WPP. This solution has the potential to reduce bird strikes with WPP during daylight hours, in difficult visibility conditions and at night.

Recommended **solution for migratory bird conservation for all WPP**: The WPP is to be suspended for up to one hour before and after both local sunrise and sunset for the protection of migratory birds in flocks (15 February to 15 May and 1 September to 15 November), if this cannot be remedied by a camera solution to be specified during pre-construction monitoring. Condition taken into account (see Annex 12).

None of the recommended solutions exclude collisions of passerines, which in exceptional cases with different infrastructure or buildings can reach extremely high levels in terms of mortality, but should be considered as exceptional cases.³⁸³⁹ At the same time, however, it should be noted that even existing estimates, based mainly on counts of dead birds under WPP, reliably find only a small number of dead birds.⁴⁰ The numbers of passerine mortalities recorded so far range from 100 to a few hundred.⁴¹ At the same time, the impact of these collisions on passerine populations is considered to be negligible, given their rapid recovery during the breeding season (one or more breeders, many young, high population densities to a greater or lesser extent).

Effects on bats

The recorded bat activity in the area of the Proposed Action is significantly higher than in other similar areas surveyed using identical methodologies, due to the fact that in other areas forests covered a relatively small part of the surveyed area but are considered to be one of the most suitable habitats for bats. Potential spontaneous concentrations of bats foraging at different locations in the forests may increase the risk of otherwise low collisions with the planned rotors. This is particularly important during migration, when overall bat activity and species numbers increase.

The highest risk of bat mortality in the planned area of the WPP Park is in July-September, i.e. during bat dispersal and migration. In May-June, the increased risk is mainly associated with one species: the northern bat. Bat activity in May is generally low, with the exception of one station that may have a colony of northern bats nearby.

Based on bat activity, it is not possible to distinguish night hours when bat mortality risks would be lower, except for morning hours in autumn (September and October) when activity/migration is close to zero. The greatest risk of bat mortality at WPP is in the 2nd-8th hour after sunset.

The development of a wind park is permitted subject to the following restrictions and conditions on the operation of the WPP:

1. WPPs are not installed in the vicinity of the Stienūži IV and Stienūži V quarries. Minimum distance from water: 200 m from the projection of the WPP wing, but more if possible.
 - Currently, the nearest planned WPP Z2 is at least 400 m away, so this condition is met.
2. Monitoring of bats is ensured in the first and second year after the start of operation of the WPP. The monitoring methodology is developed and standardised by a bat species expert certified

³⁸ Newton, I. 2023. *The migration ecology of birds*. Elsevier.

³⁹ Rydell, J., Ottvall, R., Pettersson, S., Green, M. 2017. *The effects of wind power on birds and bats*. Swedish Environmental Protection Agency, Sweden.

⁴⁰ Nilsson, A. L. K., Molværsmyr, S., Breistøl, A., & Systad, G. H. R. 2023. *Estimating mortality of small passerine birds colliding with wind turbines*. Sci Rep, 13(1), 21365.

⁴¹ <https://lfu.brandenburg.de/sixcms/media.php/9/Voegel-Uebersicht-Europa.xlsx>

by the NCA according to the site specifics and the 2022 Guidelines for assessing the impact of wind power plants on bats in Latvia.

- Bat monitoring in the first and second year after the start of operation of the WPP is included as a mandatory measure to be implemented after the start of operation of the WPP (see Chapter 12).

3. At the northern WPP (Z1-Z21), automatic shutdown or non-start of the WPP shall be ensured from 1 July to 30 September for at least the first eight hours after sunset or until sunrise in summer when the length of night is less than 7 hours if:

1. the wind speed at the height of the WPP tower (nacelle) does not exceed 6 m/s,
- 2) rainfall does not exceed 1 mm/h,
- 3) air temperature above +60C.

In north-eastern Latvia, especially in September, the nights are getting colder, but bat activity continues. In this study, bat activity in September was also observed at night, when air temperatures were only +6...+80C.

4. At the southern part of the WPP (D1-D16), automatic shutdown or non-start of the WPP shall be ensured from 1 May to 30 September for at least the first eight hours after sunset or until sunrise in summer when the length of night is less than 7 hours if:

1. the wind speed at the height of the WPP tower (nacelle) does not exceed 7 m/s,
- 2) rainfall does not exceed 1 mm/h,
- 3) the air temperature is above +60C.

Depending on the results of the monitoring, which would or would not confirm increased bat activity and/or mortality at the constructed WPPs, the **WPP operating restrictions could be reviewed** after the first and second years of post-construction monitoring - **removed altogether, relaxed or strengthened**, in particular: the period during which WPP operating restrictions are required could be extended or reduced, or the wind speed threshold at which WPP operation is allowed could be changed.

WPP D12 is not recommended as it is to be installed at a site where extremely high bat activity was observed, indicating a very likely proximity to a colony. It would be preferable not to install this WPP at all, and it would also be preferable not to install WPP D11, where high bat activity has also been observed. If WPP **D11** were to be installed, **post-installation monitoring would be mandatory**.⁴²

Other solutions to mitigate the impact on bats can also be used in the design of the WPP, in consultation with a certified bat expert: for example, smart monitoring systems equipped with ultrasonic sensors and artificial intelligence technologies detect the presence of bats in real time and stop the operation of the WPP. Smart technologies are also used elsewhere in Europe and provide both effective bat protection and increased electricity generation, such as Fleximaus.⁴³

⁴² D11 is located in the southern part of the park, the construction of WPP Park Alternative B, which includes the WPP in the southern part of the park, is currently not recommended

⁴³ <https://www.fleximaus.de/?lang=ne>

Effects on mammals

The construction of the WPP parks (both "Limbaži" and "Valmiera-Valka") will not significantly change the status of specially protected species at national level. Local and wider indirect and cumulative impacts on wild mammals (up to 10 km away from the study area of the Proposed Action) are expected, the consequences and spatial limits of which are currently unknown and unpredictable.

As the construction and operation of wind farms may have impacts on wild non-flying mammal communities, the consequences and territorial limits of which are unknown and unpredictable, the expert recommends the following measures:

- Leave the intensity and seasonal cycle of other existing economic activities unchanged in the area of the WPP parks and their immediate surroundings. The above applies to logging (if not directly related to the installation of WPP), reforestation, all types of stand management, restoration of drainage systems, hunting pressure, game feeding, nature tourism pressure and agriculture in farmland adjacent to forests. Of course, this does not apply to fighting forest fires, windstorms and forest pests. Action is needed to avoid cumulative disturbance effects and to separate the potential impacts of WPPs from the background of other economic activities.
- Given that there are no assessments of the impact of WPP on non-flying mammals in Latvia based on wildlife studies or monitoring data, the expert does not propose mandatory monitoring requirements for the wind farm in question. The expert recommends that the controlling national authorities should require the developers of the North Latvian and Estonian border wind farms (Figure 3.2.4) to jointly initiate specialised monitoring of wild mammals in cooperation with the controlling national authorities and scientific institutions. This need is underlined by all the authors of the scientific publications used in the opinion. Monitoring is carried out in accordance with a monitoring programme developed and agreed with a certified expert.
- In case of negative impacts, mitigation measures to protect mammals.

Additional expert recommendations that are beyond the control of the Proponent, including measures to mitigate impacts on mammals, are presented in Chapter 7.6.7 of the EIA Report.

4.6. Impact on landscape and cultural monuments

Impact on the landscape

Part of the landscape study area is located in the nationally important scenic area⁴⁴ "Piejūra un Lībiešu krasts". Within the Landscape Study Area, it is a narrow strip between the shoreline of the Gulf of Riga and the main national road A1. The nearest location to the area of the Proposed Action is in the south of Salacgrīva (at Vidzemes Street 70) - 4.6 km. The most important part of the site, the coastal zone, would not be affected, except in the vicinity of Meleki, where the WPPs would be visible at a distance of 7.2 km and would be considered as background elements.

Visual impacts are expected in the landscape of the open fields (between the coastal forest and the A1 motorway) in the section from Šķīsterciema to Krūmiņu Street in Salacgrīva (see Figures 7.7.1 and 7.7.2 of the EIA) under Alternatives B and B'. The most scenically valuable places here are the area between Lāņu Manor Avenue and the forest to the N of Svētciems, where the open areas are enriched by individual oaks (indirect effects can be seen in Figure 7.7.3 of the EIA, which is located outside the NNAV). WPP could be described here as **prominent accents in the landscape**.

⁴⁴ Lakovsky, P. 2023. Latvian Landscape Atlas. *Landscape maps. National landscapes*. Institute of Agri-Resources and Economics.

The most significant landscapes or landscape elements in the area of the Proposed Action and/or the landscape study area are:

- river landscapes (Salaca, Svētupe, Vitrupe, Jaunupe), including:
 - Lībiešu Upuralas and the surroundings of Kuiķule,
 - Sarkanās klintis,
 - lamprey pots in the Salaca;
- coastal landscape;
- landscapes of small rivers (Vedamurga, Kulaurga, Ārupīte, etc.)
- Lake Primma and Lake Kliķu;
- Niedrāju-Pilka purvs;
- Randu pļavas.

The high value viewpoints and distances to the nearest WPP in the study area and their visibility are listed in Table 7.2 of the EIA Report.

According to the visibility model (Figure 7.7.4-7.7.7 of the EIA), a 300 m high WPP would be visible in 26.3% of the total landscape study area, or 143.6 km² out of 544.9 km², if all 37 assessed were built. It should be noted that they would be less visible under Alternatives A/A' or B/B', particularly in remote locations from the area of the Proposed Development, and only to a limited extent.

Building on the Landscape Policy Plan: ***in the light of the EU's climate neutrality objectives, the priority actions of the Plan are activities that contribute to moving towards climate neutrality, such as planning and developing green infrastructure networks at different spatial scales, in particular in urban areas. Landscape assessment at regional and local scales is an important task for landscape management, in order to identify areas of landscape value and conditions for their use in different scales of spatial development planning documents, which should be taken into account in the planning and construction of energy supply and other large-scale industrial facilities. In line with the objectives of the European Green Deal and Latvia's energy independence, landscape assessment at regional and local scales should take into account that energy independence and security are equally important and should be taken into account alongside tourism and environmental protection.***

Impact on cultural heritage

There are a number of heritage assets within the study area (Chapter 6.5.2 and Figure 6.5.3). The impact of the Proposed Action on cultural heritage has been assessed for the closest cultural monuments to the site of the Proposed Action, as well as for other sites of cultural and historical significance, through individual assessments and in particular the significance of the Proposed Action for potential changes to the landscape.

According to the cartographic information of the information system "Heritage" there are 16 cultural monuments in the study area, 11 of them - archaeological, 5 - art monuments. As the monuments are located indoors - in three churches - the churches are indicated in the cartographic material.

Summary of objects:

Location of the oven. Predicted impact visually high but with localised effects. The site is not identified as a high value viewpoint. Due to overgrowth on the site, the WPP will not be visible from the Caple site, the nearest WPP Z1 will affect the available view of the Caple site from the south-east. Recommendation: do not deforest the site.

Kilzumu Ancient Cemetery (Swedish Cemetery). Estimated impact negligible. The site is not identified as a high value viewpoint. The view to and from the monument is not compromised. It could be threatened by deforestation in and around the monument. The upper part (wings) of WPP Z5 would be visible from the steep bank of the Svētupe River within the monument protection zone. Preserve the existing forest within the monument and, according to the forest transparency model (developed by Estonian researchers), preserve the forest in a 70 m zone around the boundary of the monument.

Lībiešu upuralas. Expected impact high. The site has also been identified as a high-quality viewpoint of Limbaži. The main view (high quality landscape) from the floodplain is impaired by the WPP Z7 blades. The view of the southern outcrop from the floodplain will be impaired by WPP D16, which will have the top of the tower visible. Taking into account the recommendations of landscape experts and consultations with the municipality of Limbaži, the originally planned location/height of the WPP was changed. 1) Do not provide for the construction of WPP Z7, 2) Do not provide for the construction of WPP D1, D2, D15, D16, 3) Reduce the height of D8, D9, Z8, Z9, Z11. Retain tree cover above the cave itself. Develop the viewpoint above the outcrop on the D side (at the site of the Kuiķuļi Holy Oak Grove) by clearing overgrowth. Z7, Z8, D1, D2, D15, D16 - no construction recommended; Z9, D8, D9 - reduced height recommended; all WPPs in the southern part are currently not recommended unless additional surveys for mosses, lichens and vascular plants are carried out.

Kuiķuļu svētozolu birzs. Expected impact - medium. The WPP will not be visible from the monument, but a significant part of the tower and blade will be visible a few metres away. For restrictions and planned WPP, see above under information on Lībiešu upuralas.

Priecumu senkapi. Estimated impact - negligible. The WPP will not be visible from the monument, but will be visible from the buffer zone. No recommendations.

Krogkalni baznīckalns. The site is not identified as a high value viewpoint. The WPP will not be visible from the site itself, but will be visible from the buffer zone. For example, a public view from the Zeltiņi-Untes municipal road westwards will show the towers of seven WPPs and the blades of another WPP. No recommendations.

Zviedru ceļš. Estimated impact negligible. The site is not identified as a high value viewpoint. The site of the monument is not affected. Although the WPP will be visible from the buffer zone, given the nature of the monument, no harm will be caused to the surrounding landscape. No recommendations.

Salacas pilskalns. Estimated impact negligible. From the edge of the mound closest to the Salaca River, the upper parts of several WPP will be visible, and the blades of several more will be visible. Visibility will increase during the leaf-free period. WPP Z1 and D1 will be the most visible. Also, Z4, Z9, Z5 in the leaf-free period. WPP D2, D4, D10 will show blades or parts of blades. Taking into account the importance of the site, if possible - adjust the planned location of WPP Z1; reduce the height of WPP D1 or do not envisage its construction (taken into account: D1 is not recommended).

The church of Bridaga. Expected impact medium. While the view of the church is not affected by the WPP, the WPP D6 visible from the church to the NW significantly alters the landscape. Near the church you will be able to partially see WPP D9. Re-positioning or no-build of D6. WPPs are not currently recommended for the southern part.

Ķirbiži Manor and its buildings. Estimated impact negligible. The most valuable view, the view of the estate, will not be affected. However, it will affect the view from the estate. From the front of the Manor House you can see through the trees the gondola and wings of WPP D9 and the wings of D8. During the leafless period, the wings of several WPP (D11, D12, D14, D15) will be visible. Currently, tree planting around the

perimeter of the estate (along Vitrupi) suppresses visual intrusion. Reduce the height of WPP D9. WPPs are not currently recommended for the southern part.

Vecsalaca manor house. Estimated impact negligible. As the development is located in a park, the WPPs will not actually be visible when surrounded by trees. No recommendations.

Annasmuiža Bridge. Expected impact medium. The upper parts of several WPPs will be visible from the vantage point. WPP Z4 will be the most visible. During the leaf-free period, approximately 2/5 of the WPP Z2, Z3 nacelle and wings and Z1 wings will be visible through the trees. The WPP Z12 and Z13 blades will be visible for a short while. Given the importance of the potential viewpoint, Limbaži Municipality, at the request of the LVP, has expressed its views on the impact of the proposed WPP on this viewpoint. The municipality has not expressed any conditions to mitigate the impacts of the proposed WPP from this perspective.

4.7. Impacts on Natura 2000 sites in the vicinity of the WPP Park

As mentioned in Chapter 6.4.1 of the EIA Report and summarised in Table 7.9.1, there are 3 SPNA in the vicinity of the proposed wind farm that are included in the single European network of SPNAs Natura 2000 (Figure 6.4.2 of the EIA Report):

- Vitrupes ieleja, (area code: LV0530500) 0,8 km from the border of the land units, distance to the nearest WPP - 0,9 km;
- Salacas ieleja, (area code: LV0302200) 1,6 km from the border of the land units, distance to the nearest WPP - 1,8 km;
- Niedrāju-Pilkas purvs, (area code: LV0509800) 1,2 km from the border of the land units, distance to the nearest WPP - 5,3 km.

Taking into account that the planned construction of the wind farm does not directly affect any Natura 2000 sites, it can be concluded that the implementation of the recommended alternative A will not have direct or indirect negative impacts on adjacent areas, including specially protected Latvian or EU habitats in specially protected nature areas - Natura 2000 sites. The implementation of the proposed action is not expected to exacerbate the negative impacts identified in the Natura 2000 sites - drainage and changes in species composition due to vegetation succession.

Based on the impact assessments and calculations carried out, it can be concluded that, as no significant adverse effects are expected on the habitats and species protected by Natura 2000 sites, no significant effects are expected on:

- the objectives of establishing and protecting the Natura 2000 sites referred to above;
The objectives for the creation and protection of the sites are summarised in Table 6.4.2 and neither the habitats nor the species listed as objectives for creation will be affected.
- factors that have already affected these areas prior to the implementation of the Proposed Action;
Factors affecting nature values prior to the implementation of the Proposed Action, such as: grassland overgrowth, succession, agricultural activities, diffuse pollution of surface waters from agricultural and forestry activities, erosion, forestry activities, invasive alien species, etc., summarised in Table 6.4.2, the Proposed Action will not increase the impact of these factors on nature values in Natura 2000 sites.
- the importance of Natura 2000 sites for the coherence of the national and biogeographical network.

Summarising the assessment of impacts on Natura 2000 sites, it can be concluded that no specific mitigation measures are currently identified as necessary in accordance with the Cabinet of Ministers Regulation of 19 April 2011 No 300 "Procedure for assessing impacts on a Specially Protected Nature Area of European Importance (Natura 2000)".

Overall, the experts concluded that:

- 1) The Proposed Action is not expected to have a direct impact on plant species and habitats of Natura 2000 sites; it will not result in fragmentation of species and habitats, or alteration of characteristic structures and functions;
- 2) no significant adverse effects on the ecological functions, integrity, conservation and use objectives of Natura 2000 sites are expected from the Proposed Action.

5. Transboundary assessment (Chapter 9 of the EIA report)

In the context of transboundary impacts, the Republic of Estonia has been identified as the country likely to be affected by the proposed action. Estonian territory is no closer than 13.2 km to the nearest assessed WPP.

Overview of transboundary impacts of the Ministry of Climate of the Republic of Estonia

An overview of the transboundary impacts of the Ministry of Climate of the Republic of Estonia and how they have been taken into account in the preparation of the EIA for Limbaži WPP-Park is presented in Table 5 (Table 9.1 of the EIA Report).

Table 5. (Table 9.1 of the EIA) *Overview of transboundary impacts of the Ministry of Climate of the Republic of Estonia*

No.	Aspects of transboundary impacts to be taken into account in the EIA by the Ministry of Climate of the Republic of Estonia	Posted by	Explanation of how this has been assessed in the EIA report
1.	The proposed action may affect: - movement of game, - noise pollution, - the local population, - power grid stability	Ministry of Economic Affairs and Communications of the Republic of Estonia	An expert opinion on mammals is provided for game. The noise assessment is presented in Chapter 7.2. No transboundary effects have been identified. The local population in the Republic of Estonia is not expected to be affected. The stability of the electricity grid in the Republic of Estonia is not expected to be affected.
2.	The nearest WPPs are likely to be closer than 5 km from the shore of the Gulf of Riga. The coastline up to 5 km away is an important bird migration corridor for both breeding and migratory birds. The EIA report should necessarily assess the impact of the Proposed Action on birds, bats and green corridors (<i>green network</i>), nature conservation values, including the assessment of cumulative impacts. Provide for impact assessment (monitoring) and, if necessary, mitigation measures	Estonian Environmental Administration	The nearest WPP is about 6 km from the Gulf of Riga. According to the methodology for assessing the impacts of birds and wind farms, currently under development ⁴⁵ , the area closest to the seaward edge of 500-1000 m is considered to be the most important for migration. The design of the WPP Park meets the main conditions: the WPP towers are not located less than 500-1000 metres from the shoreline of the Gulf of Riga, the WPP towers are not planned in areas where long-term feeding or roosting sites of migratory birds have been identified or are known in the past. The impacts on the different aspects of nature conservation values are assessed in general in Chapter 7.6 of the EIA. The effects on bats are assessed in Chapter 7.6.4 of the EIA.

⁴⁵ https://lvafa.vraa.gov.lv/projects/1-08_74_2022

Since 27.09.2004, the "Convention on the Transboundary Effects of Industrial Accidents" has been in force, establishing transnational cooperation in the field of industrial accidents. The quantity and hazardousness of chemical substances at the site of the Proposed Activity do not reach the limit values specified in this Convention; therefore the provisions of this Regulation are not applicable to the construction of the Limbaži WPP Park and its associated infrastructure.

6. Socio-economic benefits (Chapter 14 of the EIA report)

The construction and operation of the planned WPPs may have both positive and negative socio-economic consequences, both within the area of the Proposed Action and in the national context. Positive effects include investment in the economy, direct and indirect growth in the number of jobs involved, financial benefits from land leases to the property owner on whose land the WPPs are built, increased energy supply on the market, reduced carbon dioxide emissions, contribution to national energy policy objectives. There may be negative impacts on tourism and recreational resources and on the value of real estate for some residents. As the socio-economic consequences of WPP have not been widely studied in Latvia, the information in this report is largely based on the results of studies in other countries.

Attracting investment is an important factor influencing the development of the economy, and the construction of a WPP should be evaluated in the same way as any other investment that contributes to economic growth in terms of attracting investment. It is expected that several dozen (the exact number to be implemented is not known before and after the completion of this EIA) The total cost of the construction of the WPPs could reach, respectively, tens of millions of EUR, which is a significant investment project.

In the context of employment, the WPP construction proposal is linked to the creation of jobs both during the construction process and during operation. Demand for additional labour will be related to the construction and operation of the WPP itself, as well as to indirectly related activities such as mining for road construction, cement and concrete production, and transport.

In terms of qualitative socio-economic damages, the negative impacts on properties in the vicinity of the WPP development areas are likely to be medium-term (three to five years after the WPP starts operation) and not significant in the long term.

On the other hand, the quantifiable socio-economic benefits and losses for all alternatives show a significant overall net present value and an internal rate of return well above the socio-economic discount rate of 5% used in the calculations, which means that the long-term socio-economic benefits offset the short-term negative impacts (losses), including the short-term net present value (NPV). In terms of GHG emissions. In terms of socio-economic returns to the development of the WPP, Alternative A performs slightly better, with a total net present value of EUR 89 398 054 and an internal rate of return of 18.66%. (Annex 11 to the EIA).

7. Comparison of the alternatives envisaged and justification of the chosen alternative (Chapter 8 of the EIA Report)

As part of the EIA for the proposed action, the alternatives for the location of the WPP park have been assessed and the technological alternatives have been evaluated: height alternatives, three different heights of the WPP.

The implementation of each of the alternatives evaluated will allow the achievement of the objective of the Proposed Action: the installation of new WPPs with a maximum rated capacity of 8 MW per plant.

A summary, taking into account the assessments of an ornithologist, a species and habitat expert, a landscape expert, a bat expert, a hydrologist and an assessment of physical impacts, of the 37 WPP locations is given in Table 8.1. The red colour is used for the WPPs and environmental impact areas where significant adverse effects have been identified, the yellow colour for the WPPs and environmental impact areas where adverse effects have been identified and the green colour for the environmental impact areas where no adverse or significant effects have been identified (see Annex 12 of the EIA Report for conditions and constraints for the recommended WPPs).

Impacts assessed in relation to the existing situation in the area of the proposed activity and the expected situation depending on the alternative to be implemented: species and habitats, bats, birds, landscape, cultural history, tourism and recreation, Natura 2000, noise, low frequencies, flicker, hydrology, environmental risks and accidents, vibration and climate.

The impacts of the development scenarios have been given a conditional numerical characterisation, summarised in Table 8.3 of the EIA Report.

Overall, the comparison and analysis of the alternatives for the location and height of the WPP in Table 8.4 concludes that **Alternative A can be recommended for construction: 12 In the northern part of the WPP construction study area**, see Figure 8.

For the eight WPPs in the southern part of the study area of Alternative B, the following essential preconditions have to be fulfilled: assessment of additional vascular plant, moss and lichen species and development of a solution for the connection to the AST, as well as an additional study of the impact on freshwater for the power line crossing over the Svētupe River. Information to assess the residual effects of the Proposed Action on species and habitats is incomplete for Alternative B.

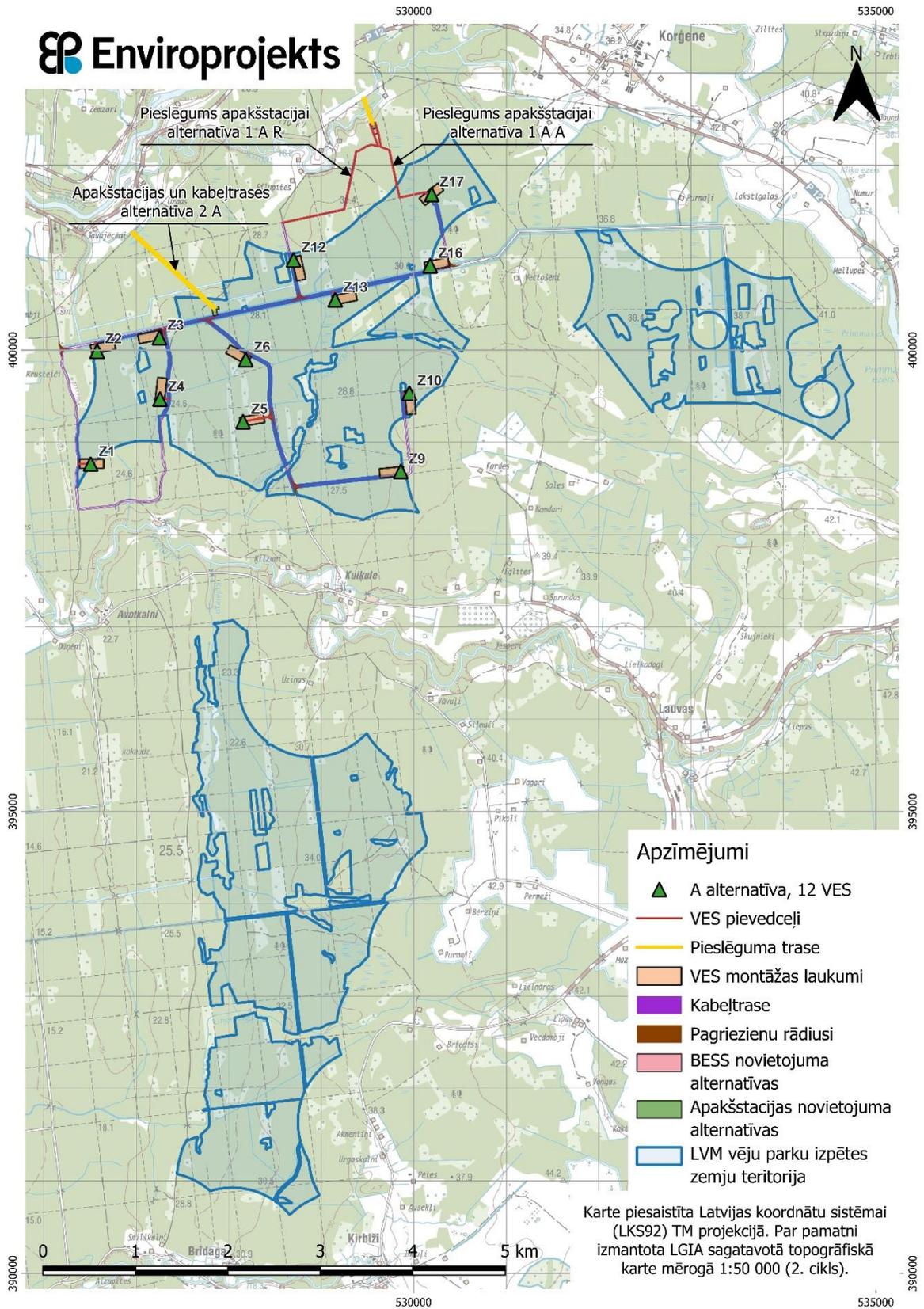


Figure 8. (Figure 8.1 of the EIA report) Recommended location of the proposed activity - Limbaži WPP park

8. Further conditions for environmental monitoring of the proposed activity (Chapter 12 of the EIA Report)

The EIA assesses the potential impacts of the proposed WPPs. Impacts such as flicker effects, noise pollution, safety risks, impacts on habitats and specially protected plant species and the hydrological regime of the site can be predicted with a high degree of accuracy by assessing the scale of the Proposed Action and using calculation methods.

The impact of the WPP on wild bird and bat populations has been assessed during the nature study, and the significance of the impact has been assessed. Given the uncertainty of the results of the scientific studies, it is practically impossible to assess the precise impact of the proposed WPP on individual populations of ornithofauna and bats, therefore the impact of the proposed WPP on these animal groups should be further assessed through monitoring and, if necessary, additional mitigation measures not specified in this report.

Bird monitoring

Population monitoring should be planned and initiated prior to the construction of the WPP Park in order to obtain an assessment of the baseline status of the site's birds.

Population monitoring of protected species

Monitoring is required to detect any changes in the population present and to assess any potential impacts within the WPP Park. In order to adequately assess species populations, their changes and possible causes, and to make these data comparable between different areas of the WPP, all monitoring should follow a common framework. For the results to be useful for assessing the impact of the WPP, rather than just describing possible changes in the populations of the monitored species, a comparable control area without the impact of the WPP is also needed.

In order to meet this condition, at least in the current situation, monitoring in the area should be planned after the final technical design (similar to the studies for the preparation of the planning opinion, based on the distances indicated in the study methodology around the sites of the Proposed Activity or landfills where displacements are likely). This would provide an objective "zero" assessment of the pre-construction status of the area that would be considered to be affected by the Proposed Action and its bird populations. As this area will be reliably different from the study area used for the opinion, it is not possible to make an objective judgement on the extent to which these landfill sites will differ before the final technical design is available. A fixed monitoring study area, defined as the study area in two distance bands, is essential for population estimates within it (or at least population estimates) and for the planning section for a rational arrangement of monitoring stations to obtain unbiased results.

Monitoring, similar to the survey, is planned for the main potentially affected groups of protected species in the study area following the methodology used in the survey. However, if the monitoring authorities consider that a group of species should not be monitored or, on the contrary, should be monitored for species that have not been studied before (e.g. on the basis of information that may be expressed in the forthcoming WPP study guidelines), the experts may take this into account and not monitor or, on the contrary, monitor these species or groups of species, provided that this is comparable in the long term, including with other aspects of monitoring and the original study.

Monitoring shall be carried out during the pre-construction, construction and operational periods. Monitoring should be carried out annually during the pre-construction and construction periods, and every

second year during the operational period, covering at least five breeding seasons; where possible, it is recommended that monitoring is carried out throughout the operational period. However, the consultant considers that the monitoring programme should be agreed with the NCA and its necessity and duration should be assessed.

The annual monitoring recommended during the pre-construction and construction periods is mainly justified to allow for local extinctions and recolonisations.

The difference in the monitoring period from the approach of monitoring for five consecutive years during the operational period, which has been more common in Latvian practice so far, is based on the generation turnover time, which for example for diurnal birds of prey is rounded off by about ten years per generation. At the same time, it should also be noted that population-level impact assessment would require monitoring data on at least three generational changes.

Monitoring of dead birds

Given that a very important aspect in the assessment of direct impacts is the determination of the number of birds killed in collisions (including not only protected species) and potentially also the cause of death (physical collision, barotrauma, bird death unrelated to the operation of the WPP), at the same time, the literature^{46 47} suggests that due to the inaccuracy of observer counts, the limited findability under different circumstances, and the presence of scavenged remains, it is recommended that automatic camera systems or similar solutions that detect traumatised or dead birds are used for this monitoring point.^{48 49}

Bat monitoring

Monitoring of bats should be ensured in the first and second years after the start of operation of the WPP. The monitoring methodology is developed and standardised by a bat species expert certified by the NCA according to the site specifics and the 2022 Guidelines for assessing the impact of wind power plants on bats in Latvia. The monitoring methodology includes:

1. acoustic monitoring by installing automatic ultrasonic detectors in the nacelles of at least five WPP and/or on the lower wing leading edge level to continuously record bat activity from at least 1 May to 30 September. The placement of WPP recorders shall be random. The number/location of WPP and detectors to be included in the monitoring shall be agreed with a certified bat expert before installation;
- 2) counts of bat fatalities at least at those WPP where acoustic monitoring is carried out (the number of WPP to be surveyed may be increased where possible). The search for dead bats must be carried out by trained searchers, together with the monitoring of the effectiveness of the search and the timing of the disappearance of the carcasses. Monitoring should be carried out 2 or 3 years after the installation of the WPP, depending on the degree of overgrowth.

To facilitate the search for dead bats, it is advisable to create a vegetation-free ground surface around the base of the WPP within a radius of at least 50 m or to ensure regular grass cutting during the monitoring period (if the area is not reforested). There is no need to create a 50 m buffer zone around the WPPs that will be installed in forests, in addition to deforestation.

⁴⁶ Rydell, J., Ottvall, R., Pettersson, S., Green, M. 2017. The effects of wind power on birds and bats. Swedish Environmental Protection Agency, Sweden.

⁴⁷ Perrow, M. R. 2017. Wildlife and Wind Farms, Conflicts and Solutions: Potential Effects. Onshore.

⁴⁸ Ibid,

⁴⁹ <https://doi.org/10.3390/jimaging7120272>