ENVIRONMENTAL IMPACT REPORT

OF THE PROJECT CONSISTING IN THE CONSTRUCTION OF THE "ŻELECHOWO" WIND FARM WITH A TOTAL CAPACITY OF UP TO 56 MW, ALONG WITH ACCESS ROADS, ASSEMBLY YARDS, MV, CONTROL AND TELECOMMUNICATION CABLE NETWORK, TRANSFORMER STATIONS IN THE AREA OF THE WIDUCHOWA COMMUNE, LOCATED NEAR THE LOCALITY OF ŻELECHOWO

Investor:

ENERTRAG Krajnik sp. z o.o.
Al. Jana Pawła II 15/4
70-445 Szczecin

Author:

Tomasz Zapaśnik, MA

Contractor for the ornithological and chiropterological part:

LANIUS Inwentaryzacje i Ekspertyzy Przyrodnicze Paweł Pluciński

Gdynia, July 2014

Table of contents

Appendices

Appendix No. 1: Topographic map 1:10,000 – location of the planned wind farm

Appendix No. 2: Topographic map 1:50,000 – the location of the planned wind farm in relation to the area-related legal forms of nature protection

Appendix No. 3: Topographic map 1:50,000 – location of the planned wind farm at the background of the proposed territorial legal forms of nature protection (based on the environmental survey of the Zachodniopomorskie Voivodeship)

Appendix No. 4: Orthophotomap 1:10,000

Appendix No. 5: Sozological map 1:25,000

Appendix No. 6: Example diagram of a wind turbine

Appendix No. 7: Bird and bat monitoring results and impact assessment on these animal groups

Appendix No. 8: Impact of the power plant complex in terms of noise immission – graphical presentation

Appendix No. 9: Pictures

Appendix No. 10: Map with wind farms (existing and planned) in the neighborhood

Appendix No. 11: Decision No. GNG:7624/3/2010 of the Head of Widuchowa Commune of November 8, 2012

1. Introduction

This report has been prepared at the request of ENERTRAG Krajnik sp. z o.o. with its registered office in Szczecin and refers to a project involving the construction of the "Żelechowo" wind farm with a total capacity of up to 56 MW, including access roads, assembly yards, MV cable network, control and telecommunication networks, and transformer stations in the Widuchowa municipality, located near Żelechowo.

A decision on environmental conditions was issued for the planned project – Decision No. GNG:7624/3/2010 of the Head of Widuchowa Municipality dated November 8, 2012.

It is necessary to change the decision on environmental conditions due to the change of technical parameters of wind turbines. The change in parameters consists of an increase in the height of the wind turbine and an increase in sound power by 0.5 dB(A). In addition, the application includes two new plots of land – 302 and 305 within the cadastral district of Żarczyn. The road system has also changed.

1.1. Legal basis for the document

Pursuant to the Act of October 3 2008 on providing access to information on the environment and its protection, public participation in the environmental protection and on environmental impact assessment (consolidated text, Journal of Laws 2013, item 1235), performance of a planned project that may have a significant impact on the environment is allowed only after obtaining a decision on environmental conditions.

The types of projects likely to have significant impact on the environment are specified in the Ordinance of the Council of Ministers of November 9, 2010 on projects likely to have significant impact on the environment (Journal of Laws 2010 No. 213, item 1397, as amended).

Pursuant to the above mentioned Ordinance, the planned project has been classified as a project likely to have significant impact on the environment as per § 3 section 1 point 6 letter b of the Ordinance: plants using wind energy for the generation of electricity other than those mentioned in §2 section 1 point 5 with a total height of not less than 30 m.

The Head of Widuchowa Commune having consulted relevant authorities, i.e. National District Sanitary Inspector in Gryfino (opinion PS-N-NZ/4011-7/31/13 of March 5, 2013), and Regional Director for Environmental Protection in Szczecin (decision WOOŚ-TŚ-4240.36.2013.AC of March 8, 2013), imposed an obligation to conduct

environmental impact assessment by way of decision GNG:6220.1.2013 of April 19, 2013.

1.2. Purpose and scope of the document

This report was prepared for the purposes of the administrative procedure for the issuance of a decision on environmental conditions. Its purpose is to assess the impact of the proposed project on the environment, human health, and historical monuments.

Pursuant to Article 66 of the Act of October 3, 2008 on providing access to information on the environment and its protection, public participation in the environmental protection and on environmental impact assessment, the report on environmental impact assessment should include:

1. a description of the planned project, and specifically:
    a) the characteristics of the entire project and the conditions of land use during the construction and operation or use stages,
    b) main characteristics of the production processes,
    c) the expected types and quantities of pollutants resulting from the operation of the planned project;
2. a description of the environmental components covered by the scope of the expected environmental impact of the planned project, including the environmental components protected under the Act of April 16, 2004 on Nature Conservation;
3. a description of the monuments protected under the regulations concerning monument protection and care for monuments, located within the impact range of the planned project and its immediate neighborhood;
4. a description of the foreseen effects on the environment in the event that the project is not undertaken;
5. a description of the options analyzed, including:
    a) the applicant's proposed option and a reasonable alternative option;
    b) the most environmentally-friendly option with the reasons for their selection;
6. a specification of the anticipated environmental impact of the analyzed options, including in the event of a major industrial accident, as well as a possible cross-border impact on the environment, and in the case of a road in the Trans-European road network, also determining the impact of the planned road on road safety;
7. a justification for the applicant’s proposed option, indicating its impact on the

environment, in particular on:

a) people, plants, animals, fungi and natural habitats, water and air,
b) the earth's surface, taking into account soil mass movements, climate and landscape;
c) tangible property;
d) monuments and cultural landscape covered by the existing documentation, in particular by the register or records of monuments;
e) the interaction between the elements referred to in items a-d;
f) road safety for a road in the Trans-European road network

8. a description of forecasting methods applied by the applicant and a description of forecast significant environmental impacts of the planned project, including direct, indirect, secondary, cumulative, short-, medium- and long-term, permanent and temporary impacts on the environment, resulting from:
   a) the existence of the project,
   b) the use of environmental resources,
   c) emissions;
9. a description of anticipated actions aiming at prevention, limitation or natural compensation of negative impacts on the environment, in particular on the objectives and the subject of protection of the Natura 2000 site and on its integrity;
10. for roads which are projects that may always have a significant impact on the environment
    a) defining assumptions for
       – rescue surveys of monuments identified which are located in the area of the planned project, as discovered during the construction works;
       – the program of securing existing monuments against the negative impact of the planned project and protecting the cultural landscape;
    b) analysis and evaluation of possible threats and damages to the monuments protected under the provisions on the protection and care of monuments, in particular archaeological monuments, in the vicinity or within the direct range of the impact of the planned project;
11. if the planned project involves the use of installation, a comparison of the proposed technology with the technology complying with the requirements referred to in Article 143 of the Act of April 27, 2001 – Environmental Protection Law;
12. indication whether it is necessary for the planned project to establish the limited use area within the meaning of the provisions of the Act of April 27, 2001 –

Environmental Protection Law, and determination of the boundaries of such area, restrictions on land use, technical requirements for civil structures and ways of using them; it does not apply to projects involving the construction of a national road;

13. graphical presentation of the matters;
14. presentation of the issues in the cartographic form in the scale corresponding to the subject and detailed scope of the issues being analyzed in the report, also enabling a comprehensive presentation of the conducted analyses of the environmental impact of the project
15. analysis of potential social conflicts related to the planned project;
16. presentation of a proposal for the monitoring of the environmental impact of the planned project during its construction and operation or use, especially on the objectives and the subject of protection of the Natura 2000 site and on its integrity.
17. description of difficulties resulting from technological deficiencies or gaps in current knowledge which have been encountered while preparing the report;
18. a non-technical summary of the information contained in the report, in relation to each element of the report;
19. the name of the person(s) preparing the report;
20. source of information providing the basis for the preparation of the report.

The environmental impact report for the project should take into account the impact of the project at the stages of its execution, operation or use, and decommissioning.

1.3. Documentation and literature used

The following studies, literature, and documentation, among other things, were used in preparing this report:

- Report on the environmental impact of the project involving the construction of a wind power plant complex, together with the accompanying technical infrastructure, in the area of Żarczyn – Żelechowo in the Widuchowa Commune; EKOZAPAS POŚ, Kosakowo 2010;
- Natural value assessment of the Widuchowa municipality (general report); Wildlife Conservation Office in Szczecin; Szczecin 2006;
- Environmental valuation of the Banie Municipality (general report); Nature Conservation Office in Szczecin; Szczecin 1998;
- Reports on the environmental status in Zachodniopomorskie Voivodship; Voivodship Inspectorate of Environmental Protection in Szczecin;
- Hydrogeological Map of Poland – Banie sheet; Polish Geological Institute;
- Detailed Geological Map of Poland – Banie sheet; Polish Geological Institute;
- Poradniki ochrony siedlisk i gatunków Natura 2000 – podręcznik metodyczny [Guidebooks for protection of Natura 2000 habitats and species – methodical guidebook.]; Ministry of Environment
- Przewoźniak A., Gromadzki M. 2002. Expert opinion on environmental and landscape conditions for the location of wind turbines in the northern (Baltic Coast) and central part of the Pomeranian Voivodship;
- Electromagnetic fields in the environment – description of sources and survey results; Chief Inspectorate for Environmental Protection; Warsaw, August 2007
- Environmental impact forecast in the strategic environmental impact assessment (for draft local spatial development plan of Widuchowa Commune in area of Żelechowo localicty, designating areas for location of a wind farm together with technical infrastructure and impact zones; Szczecin, September 2010.
- Draft guidelines for forecasting environmental impacts of wind farms (authors: Maciej Stryjecki, Krzysztof Mielniczuk)
- Ingielewicz R. Zagubień A. 2000. Uciążliwości hałasowe elektrowni wiatrowych. Zielone Planeta 1(52): 17-21.

The literature used during the assessment of the project's impact on birds and bats is listed in Appendix 7.

2. Description of the planned project

Project data, including, primarily, the technical parameters, provided in this

report are approximate and indicative.
This is due to the fact that the decision on environmental conditions, for which the report was prepared, is issued before the construction project is prepared. For this reason, the technical parameters of the project may vary slightly at the final stage of the investment process.

2.1. Basic data of the project (option requested by the investor)

The proposed project will involve the construction of a wind turbine complex, together with the accompanying technical infrastructure, in the area of Żarczyn-Żelechowo in the Widuchowa Municipality (Poviat of Gryfino). The project will enable the generation of electricity from wind.

Up to 16 wind turbines are planned as part of the project. The total nominal capacity of all turbines will not exceed 56 MW. The characteristics of the wind turbine are as follows:

- Rotor diameter: up to 130 m (3 blades up to 65 m each);
- Conical steel-tube solid-wall tower.
- Tower height: from 100 to 140 m;
- Total turbine height: up to 200 m;
- Maximum noise level of a single turbine: 107 dB (it will be possible to adjust the sound power level);
- Tower colors: white or gray.

An example shape of a wind turbine is shown in the attached diagram (appendix 6 to the report).

The tower core of each wind turbine will be placed on a foundation. Only after thorough structural calculations (performed at the stage of preparing the building permit design – after obtaining the decision on environmental conditions) can their target size and shape be determined. It is estimated that the foundation area will be approximately 500m^2. The standard depth of the foundation is approx. 3-3,5 m from the existing ground level (depending on local subsurface conditions). The target depth of the foundations will be determined at the stage of preparing the building permit design (after the structural calculations). Where strata of high plasticity clay are present, lime and cement columns, or another solution indicated by the designer, may be used to ensure structural stability. The foundations will be made of reinforced concrete, and the wind turbine tower structures will be attached to them using pre-tensioned concrete beams or bolted connections. In the proposed method of construction of the foundation above ground

level, the foundation will stick out, probably as a round structure with a diameter of several meters (the remaining foundation, with a larger diameter, will be invisible – hidden under the surface of the ground and covered with a layer of soil).

The control of the wind turbines will be implemented using special software that continuously monitors all the sensors connected for the values being measured, analyzes the results and, based on them, creates the control parameters for the turbine. Remote monitoring will include, but not be limited to, key parameters (temperature monitoring, wind direction and speed monitoring, hydraulic monitoring). A control monitor at the PC will allow observation and control of all operating data as well as control of functions such as run-up, shutdown and orientation into the wind (yaw system). The farm will also be equipped with remote data monitoring. The transmission of data and signals will take place via an Internet connection.

In addition to the wind turbines, the proposed project will consist of the following basic accompanying elements:

- GPO substation to raise voltage from MV to 110 kV; basic elements of the substation will be:
  - 110 kV outdoor switching station,
  - outdoor MV equipment,
  - technological building with MV switching station, protections, auxiliaries, communication, control and supervision system, heating and lighting,
  - 15/0.4 kV transformer station (0.4 kV backup power supply),
  - site lighting;
  - water drainage from transformer stands,
  - communication network,
  - fencing with an entrance gate, gatehouse and greening the area,
  - lightning protection and surface grounding system.
- MV power cables (up to 30 kV) – running in the ground, connecting individual turbines; the cables will be laid in a trench approx. 1-2 m deep (or deeper, if technologically justified);
- telecommunications infrastructure, enabling operational supervision (laid in a trench about 1-2 m deep (or deeper, if technologically justified); the trench will be shared with the power line);
- access roads made of crushed-stone aggregate – the designed width of the roads will be about 4.5 - 5 m; the surface of the access roads is designed as follows

  - top layer approx. 5 - 10 cm (recycled concrete rubble or crushed stone)
  - subbase approx. 40 - 50 cm (recycled brick rubble, concrete rubble or crushed stone)
  - nonwoven geotextile fabric

  reconstruction of existing public roads (mainly construction of exits) may be necessary;
- assembly/process yards at each wind power plant – constructed in a similar manner as roads; approximate dimensions of a single yard 25 x 50 m.

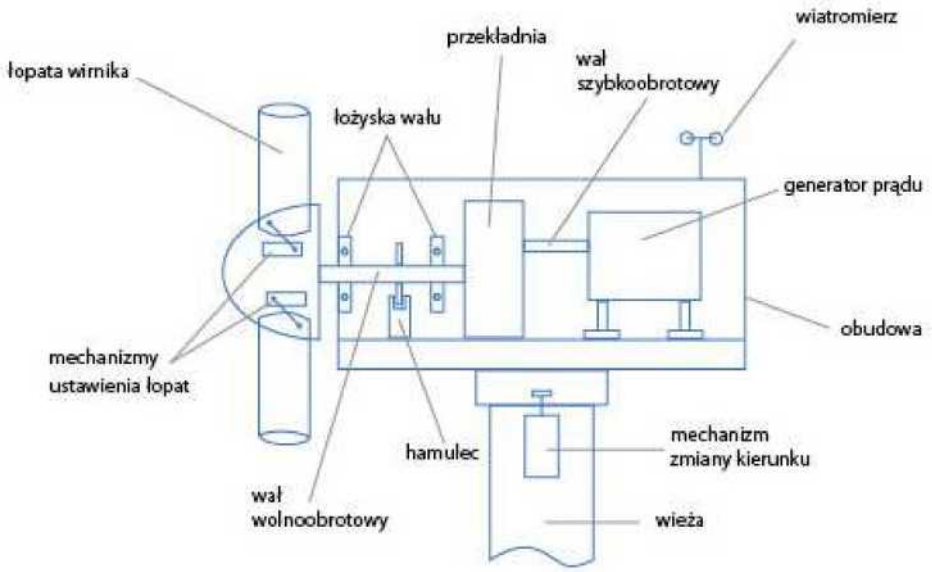
The planned project will be located on the following parcels:

- Cadastral district of Żelechowo – plot No.: 779
- Cadastral district of Żarczyn – plots No.: 294/1, 289, 297, 298, 299, 302, 304, 305, 306, 308, 310, 313.

The wind turbines will be installed on plots of land:

- cadastral district of Żarczyn – plots no: 294/1 (2 units), 289 (7 units), 310 (7 units).

The essence of wind turbine operation is the conversion of kinetic energy of the wind into mechanical energy, and ultimately into electricity. The conversion of wind energy into mechanical energy takes place in the rotor, which is thus the most important part of the wind turbine. In the case of geared power plants, the rotor sits on the shaft through which the generator is driven. The generator, in turn, generates electricity. A gearless wind turbine, on the other hand, has a multipole generator that rotates with the movement of the rotor. A simplified schematic of a geared wind turbine is presented in Fig. 1.



PL	EN
łopata wirnika	rotor blade
łożyska wału	shaft bearings
przekładnia	gear box
wał szybkoobrotowy	high-speed shaft
wiatromierz	anemometer
generator prądu	power generator
obudowa	housing
mechanizm zmiany kierunku	yaw mechanism
wieża	tower
hamulec	brake
wał wolnoobrotowy	low-speed shaft
mechanizmy ustawienia łopat	blade pitch control mechanism

Figure 1. Example diagram of a wind turbine

The current generated in the generator will be transmitted through a transformer (the transformer raises the voltage to the value required by the grid; it is located in each tower, in its immediate vicinity, or one common transformer is installed for several power plants) to the medium voltage grid. At this stage, the connection point to the national power system is unknown. Connection to the NPS will require the construction of a high voltage transformer station (GPO).

2.2. Characteristics of project options

The purpose of the options analysis is to answer the question of whether the selected solution best meets the project objective with the least negative environmental impacts.

The purpose of the analyzed project is to increase the production of "clean" energy – energy produced without the emission of solid and gaseous pollutants into the air. Annual energy production is expected to reach about 96,000 MWh (investor estimates).

While analyzing the project options, one should not forget about the overriding principle

of sustainable development, which is seen as an essential component of sustainable development of societies on our continent. The principle of sustainability dictates that social, economic and ecological rationales be treated equally.
Following the principle of sustainable development, first of all different locations were subjected to analysis of options (technical parameters such as height, propeller span, etc. in the case of projects like wind parks are of secondary importance). All considerations that make up the principle of sustainability were taken into account here. The analysis initially excluded locations that were unfavorable:

- for social reasons – localizations in the very close proximity of human settlements or areas with scattered buildings; wind park location in the very close vicinity of human settlements (including the location of wind turbines between individual buildings) could lead to the violation of permissible noise levels in the environment, and thus have a negative impact on human health (protection against noise covers areas of residential development – including farmsteads, areas of development connected with permanent or long-time stay of children and young people, areas of nursing homes, areas of hospitals, recreation areas outside of the city, areas of single-family residential development with craft services);
- for ecological reasons – locations within the boundaries of legal forms of area-related nature protection whose purpose of protection clearly collides with the planned project (nature reserves important for birds, landscape parks, protected landscape areas, Natura 2000 special bird protection areas, local nature conservation sites attractive for birds, etc.), locations in the vicinity of known large concentrations of birds or within the boundaries of delineated supra-local ecological corridors;
- for economic reasons – locations for which the owners of the land would not agree or the cost of the possible lease/purchase of the land would be too high for the investor.

As a result of the analysis, a site in the area of Żarczyn-Żelechowo in Widuchowa Municipality was selected for further evaluation. The selected location meets the criteria cited above. It should also be noted that a local spatial development plan was passed – adopted by Resolution No. VIII/58/2011 of Widuchowa Commune Council dated June 17, 2011 on the local spatial development plan for Widuchowa Commune in the area of Żelechowo, which allocates areas for the location of a wind farm together with the technical infrastructure and impact zones.

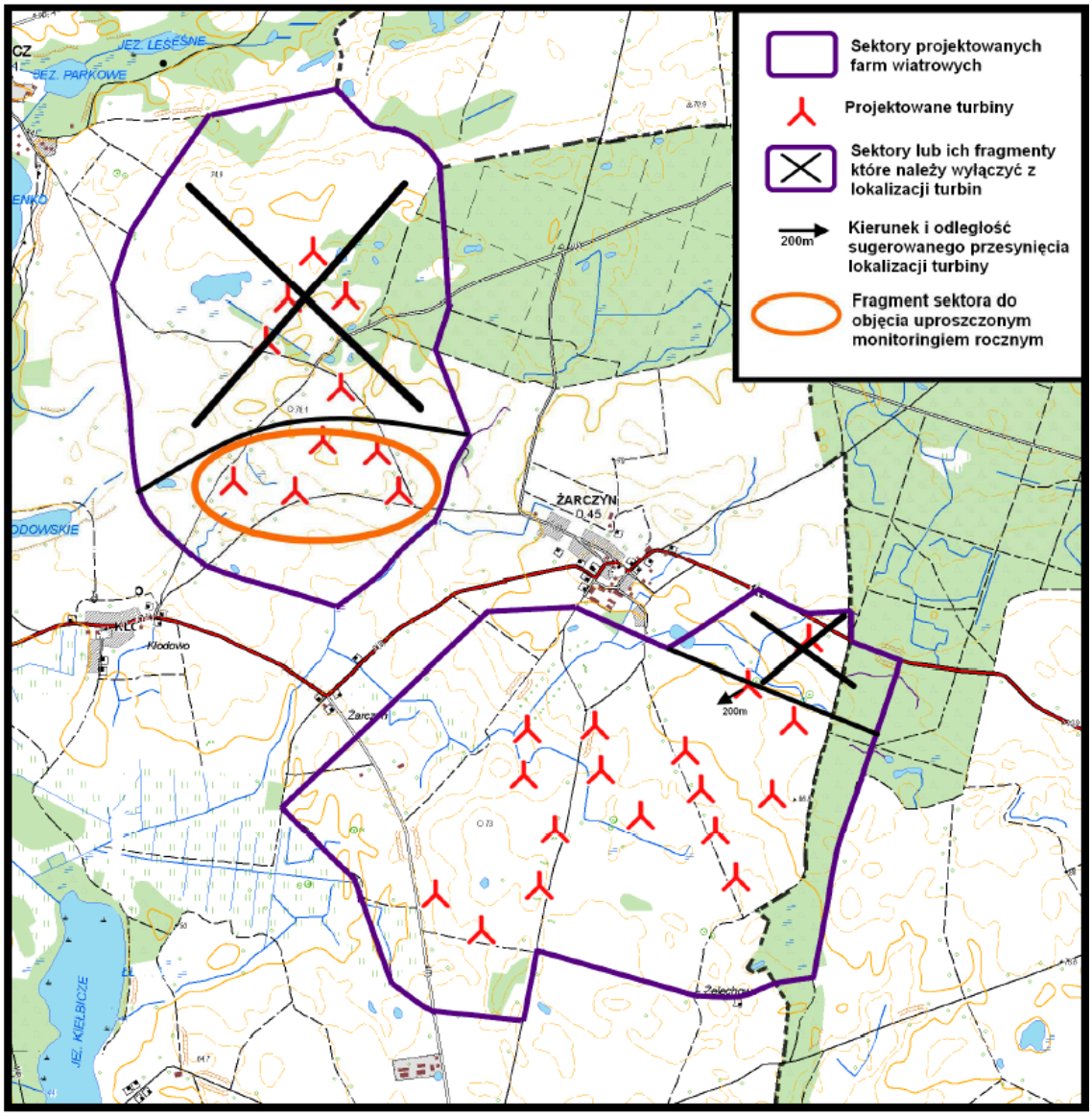
It should be emphasized that initially the investor was considering a different project option – the construction of two groups of wind turbines was planned: south of Żarczyn

(the Żelechowo sector) and north-west of Żarczyn (the Lubicz sector) (Fig. 2). Annual bird and bat monitoring was conducted throughout the site. The monitoring data analysis excluded location of half of the turbines in the northern part of the farm (north-west of Żarczyn in the Lubicz sector).

Moreover, it was necessary to conduct additional monitoring on the southern part of the so-called Lubicz farm.

Taking the above into account, the investor decided to implement a rational alternative option – consisting in construction of a wind farm south of Żarczyn (option assessed in detail in this report).

The implementation option proposed in this report addresses the conclusions and recommendations from the analysis of bird and bat monitoring data.



PL	EN
Sektory projektowanych farm wiatrowych	Sectors of planned wind farms
Projektowane turbiny	Designed turbines
Sektory lub ich fragmenty które należy wyłączyć z lokalizacji turbin	Sectors or parts thereof that should be excluded from turbine locations
Kierunek i odległość sugerowanego przysynięcia lokalizacji turbiny	Direction and distance of suggested turbine location shift
Fragment sektora do objęcia uproszczonym monitoringiem rocznym	Fragment of sector to be covered by simplified annual monitoring

Figure. 2. Original project option and marked fragments of sectors that should be excluded from the location of turbines and fragments requiring additional monitoring

In the further part of the report the option consisting in execution of the projects and works, which were characterized in section 2.1 “Basic data on the project”, was analyzed in detail. The starting point was the assumption that if a significant negative impact of the project on the environment is documented, the investor will abandon the project or will look for further alternative solutions.

It should be noted here that the environmentally preferable option will be presented at the end of the report. This approach seems logical, taking into account the fact that in the case of wind farms the most beneficial option can be indicated only after the analysis of the results of the monitoring of birds, bats, habitat analysis of the site and after the calculation of noise immission.

The basic option for the analysis of environmental conditions is the option involving no project implementation – referred to as the "Zero Option". If the Zero Option is implemented, the proposed wind turbine complex would not be constructed. The area would continue to be used exclusively for agriculture (no investment interest in other directions). The acoustic climate of the surrounding area (mainly farmland) would not change. At the same time, the production of the so-called clean energy – energy produced without the emission of solid and gaseous pollutants into the air and without the consumption of fossil fuels – would not increase.

Given the constantly increasing demand for electricity, it can be assumed that if the project is abandoned, the energy would be produced using conventional methods (the most common in Poland) – in a power plant or a combined heat and wind plant, where coal is the fuel. Therefore, with the "Zero Option", a balance of the environmental costs of energy production must be provided.

The average coal parameters are as follows:

- net calorific value: 23,000 kJ/kg
- ash content: 18.8%
- sulfur content: 0.6%

In the case of electricity production in a power plant, the gross fuel chemical energy unit consumption is 10,190 kJ/kWh (the value of the fuel chemical energy unit consumption for electricity production was adopted from the ENERGOPOMIAR study "Analysis of the Development of Indicators of Fuel Chemical Energy Consumption in Utility Power Plants and Combined Heat and Power Plants"). To produce 96,000 MWh, the following volume of fuel chemical energy is needed:

$$96{,}000 \text{ MWh} \times 10{,}190 \text{ kJ/kWh} \times 10^{-3} = 978{,}240 \text{ GJ}$$

For this purpose, coal is needed in the following amount:

$$978{,}240 \text{ GJ} : (23{,}000 \text{ kJ/kg} \times 10^{-3}) = 9{,}968 \text{ tons}$$

The amount of generated waste is:

- SO_2 emissions (installation without flue gas desulphurization): 459.4 tons
- NO_2 emissions: 169.1 tons
- NO2 emissions: 96,574.6 tons
- dust emissions: 25.6 tons
- captured ash: 5,619.3 tons
- slag: 1,490 tons

Given the amount of waste generated in the process of electricity production by conventional methods, on a broad spatial and temporal scale it can be assessed that the Zero Option is a less ecological solution and is associated with negative environmental effects (e.g. greenhouse effect).

It is important to emphasize that often, coal-fired units that are worn out need to be replaced with new generating capacity. Some of them will be based on coal, which will still be the main source of energy in Poland in the next few decades (Polish Energy Policy until 2030). However, the dwindling resources of this fuel, the growing costs of its extraction and above all the necessity to implement the energy and climate policy of the European Union cause the need for dynamic development of alternative energy sources.

It should be pointed out here that Poland has been obliged by the European Union to produce energy from renewable sources (RES). Poland has to reach 15% of energy from RES in the balance of energy consumed in 2020. Currently, the share of renewable energy in the overall balance of energy production is only about 6%.

3. Characteristics and condition of the natural environment in the area of the planned project location

3.1. Structure and condition of the abiotic environment

3.1.1. Location, topography, geologic structure and soil resources

The proposed wind farm is located in the eastern part of Widuchowa Municipality – it is situated between Żarczyn and Żelechowo (Gryfino Poviat, Zachodniopomorskie Voivodeship).
According to physicogeographic division of Poland presented by J. Kondracki (J. Kondracki "Podział regionalny Polski" 1998), the area of the planned project is located within mesoregion Pojezierze Myśliborskie (314.41), which is a part of macroregion Pojezierze Zachodniopomorskie (314.4) and subprovince Pojezierze Południowobałtyckie (314).

The surface of Widuchowa Municipality was shaped by the Pomeranian glaciation (Pomeranian stage). Moreover, in the process of shaping the area of the municipality, an important role was played by the pre-Quaternary topography (Jaskowiak-Schoeneichowa 1979).

The proposed wind farm is located within an undulating moraine upland with associated fluvioglacial formations. The upland is hilly. The hilly upland is enriched by numerous forms characteristic of areal deglaciation. The most common forms are depressions left by lumps of dead ice. An esker hill about 1 km long and 5-7 m high (extended in NE-SW direction) was also described within the farm. The postglacial channel of the Kiełbicze Lake is located at the western border of the farm – the upland descends towards it along a long slope.

No detailed geotechnical documentation was prepared for the area of the proposed wind farm. Information on geological structure comes from the Detailed Geological Map of Poland (Banie sheet), published by the Polish Geological Institute.
The land surface is covered by Quaternary sediments. On the surface there is definitely mostly boulder clay. Their thickness is estimated to be at least several meters. The hollows left by dead ice are littered with Holocene formations – low peats. These are mainly peats: reed, wood, bryophyte and sedge peats or intermediate types. Their thickness is relatively small.

The esker dike between Żarczyn and Żelechów is built of diagonally interlayered sands with gravels (5-7 m thick) and thin clay cover (0.5-1.5 m).

The soil cover is predominantly made up of podzolic and pseudo-podzolic soils. Second place is occupied by leached brown soils. Small areas are occupied by degraded black soils and gray soils and soils of organic origin. The soils within the farm mostly belong to class 4 (very good for rye).

There are no documented mineral deposits within the area of the proposed wind farm. According to the environmental valuation of the Widuchowa Municipality the raw material resources occurring in the area of the municipality include: easily accessible Quaternary deposits of aggregate, lacustrine chalk, gyttjas and peat. Lignite deposits lie deeper, but under current conditions their exploitation is unprofitable. There are prospect for natural gas and small oil deposits in the area of the municipality, but their depth exceeds 3000 m. Moreover, peat deposits – organic raw materials – are numerous in the area of the municipality (also within the area of the wind farm). These are mainly deposits of the low and mixed peat type – under present conditions their potential exploitation is a threat to the environment and a great loss for the preservation of valuable landscape and habitat values.

3.1.2. Surface water and groundwater

Within the area of the designed farm there are small water ponds (water fills small depressions left by lumps of dead ice). Besides, the surface hydrographic objects include small-size drainage ditches (some of them are filled with water only periodically – during intense rainfall and snowmelt). Water quality in ponds and drainage ditches was not tested. Due to the nature of these facilities, it can be considered poor quality (such facilities are characterized by virtually no resistance to contamination).

The proposed wind farm is located in the Oder river drainage basin – the Oder river flows approximately 10 km away from the wind farm.

The nearest lake is Lake Kielbicze (area: 71.6 ha; maximum depth: 4.5 m), located approximately 2 km from the proposed wind farm.

Groundwater in the area of Widuchowa depends on the geomorphological structure of the subsoil. Hydrographically, its area is included in the South Pomeranian Region (Malinowski 1999), where the shallowest groundwater is found in Miedzyodrze (0 to 2 m) and other river valleys. Upland areas are characterized by water levels of 10 - 15 m, and in areas of moraine hills from 5 to 30 m.

In the area where the wind turbines are located, groundwater lies at different depths. Shallow water tables are to be expected in depressions in the area. At elevations,

groundwater occurs deeper – several meters below the land surface.

In the area of the designed project there are two recognized usable aquifers: tertiary and quaternary.

The main usable aquifer is the Quaternary aquifer. According to the explanations to hydrogeological map of Poland (Banie sheet), in the area of wind turbine location, it is located at the depth of 50 - 100 m. Its thickness is in the range of 10-40 m. The potential capacity of the drilled well is from 10 to 30 m3/h. The degree of threat to the main usable aquifer is low – an area of moderate aquifer resistance with no sources of contamination. Water quality is average (Class II – average quality, water requires simple treatment).

Due to the nature of the project, the characterization of deeper aquifers was omitted in the report.

The proposed wind farm is located outside of groundwater intake protection zones (the nearest municipal water intake is located in Żelechowo, approximately 1.7 km from one of the planned wind turbines – no indirect protection zone was established for this intake).

The proposed wind farm is located outside of the boundaries of major groundwater reservoirs.

3.1.3. Climatic conditions

According to Woś (1993), the Widuchowa Municipality lies within the VI – Western Pomeranian climatic region of Poland, as defined in the light of the frequency of different weather types. It is characterized by a very high number of warm days. There are, on average, more than 256 of these days per year, accounting for more than 70 percent of the total number of days per year. However, there are fewer days with cold weather, including both windy and windless weather (Prawdzic, 1963).

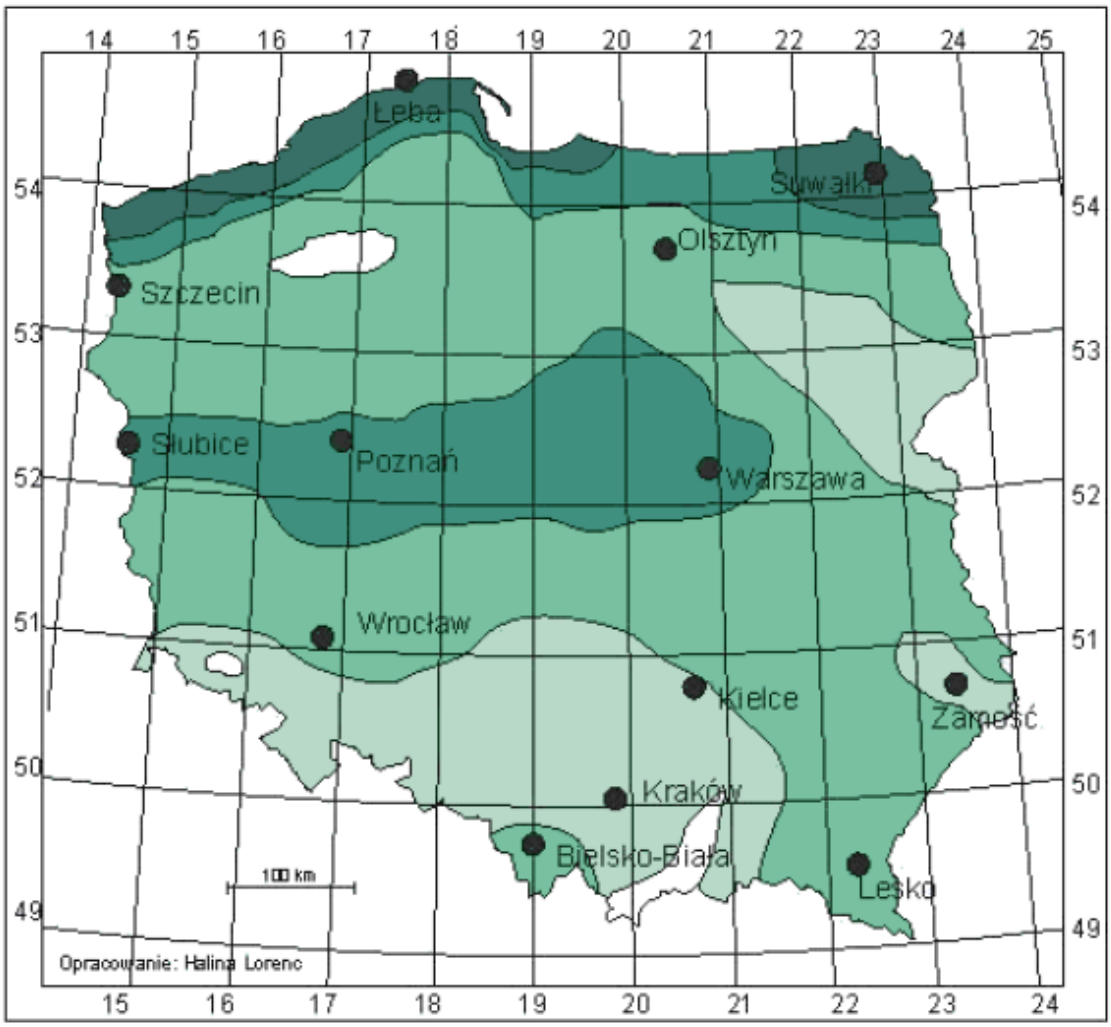
The climate of the commune is influenced by the presence of large bodies of water: the Baltic Sea and the Szczecinski Lagoon, and the climate conditions show many features of the Atlantic climate. Winters here are mild and short, the summer period is also mild and quite long (Prawdzic, 1963). Average annual temperatures vary between 8.2 and 8.6°C. The warmest areas are the southern areas of the commune, belonging to the Myśliborski Lake District. The warmest month is July with temperatures ranging from 17.3°C in the east to 18.6°C in the west. January is the coldest, with temperatures ranging from -1°C in the west to almost -2°C in the east. Amplitudes of average monthly

temperatures are small, ranging from less than 19°C in the northern part to almost 20°C in the southern and eastern parts (Wiszniewski, 1973).

The growing season is about 225 days – it begins in late March and early April and ends in the first decade of November and is one of the longest in Poland. The level of precipitation (for the Widuchowa station) averaged for 1961-2000 amounts to 538 mm and is close to the average precipitation in Poland. The maximum level of precipitation falls in June and July and the lowest is in February.

The average number of days with frost in May ranges from 0.2 to 1.8, which is about 9% of the growing season days. The average number of days with frost in September ranges from 0.0 to 0.3. During the year, the number of days with snow cover ranges from 40-50 days (Woś, 1993).

The area of the proposed wind farm is located in a zone with wind energy conditions (Figure 3).



Strefy:
I - Wybitnie korzystna
II - Bardzo korzystna
III - Korzystna
IV - Mało korzystna
V- Niekorzystna

Ośrodek Meteorologii

Aktualizacja mapy na podstawie okresu obserwacyjnego 1971-2000

PL	EN
Warszawa	Warsaw
Kraków	Kraków
Opracowanie:	Prepared by:
Strefy	Zones
Wybitnie korzystna	Extremely favorable
Bardzo korzystna	Very favorable
Korzystna	Favorable
Mało korzystna	Not very favorable
Niekorzystna	Unfavorable
Aktualizacja mapy na podstawie okresu obserwacyjnego	Map update based on the observation period
Ośrodek Meteorologii	Meteorology Center

Figure 3. Wind energy zones (mesoscale)

3.1.4. State of ambient air

The current state of atmospheric pollution in the area of Karlino Commune (letter of June 2014 of the Voivodeship Inspectorate for Environmental Protection in Szczecin) is as follows (the concentrations given are annual average concentrations; permissible levels of substances in the air were determined based on the Ordinance of the Minister of the Environment of August 24, 2012 on the levels of certain substances in the air):

- SO_2: 3.0 μg/m^3 – the permissible level of substances in the air for reasons of plant protection is 20 μg/m^3;
- NO_2: 8.0 μg/m^3 – the permissible level of substances in the air for the protection of human health is 40 μg/m^3;
- Suspended particulate matter PM10: 24,0 μg/m^3 – acceptable level of substance in the air for the protection of human health is 40 μg/m^3;
- Particulate matter PM2.5: 14,0 μg/m^3 – acceptable level of substance in the air for the protection of human health is 25 μg/m^3;
- C_6H_6: 0.8 μg/m^3 – permissible level of substances in the air due to protection of human health is 5 μg/m^3;
- CO: 200 μg/m^3 – not standardized on a calendar year basis

The condition of atmospheric air should be assessed as good – the average annual concentration of substances in the air has not been exceeded.

3.1.5. Acoustic climate

The values of permissible sound levels (equivalent, designated as L_{Aeq}) in the environment are specified in the Ordinance of the Minister of Environment of June 14, 2007 on permissible noise levels in the environment (Journal of Laws 2014.112, consolidated text). The Polish legal requirements for environmental noise protection refer to two times of the day separately:

- 16 hours during daylight hours, between 6 a.m. and 10 p.m;
- 8 hours at night from 10 p.m. to 6 a.m.

The limit values depend on the urban function of a given area. The lowest levels are set for areas requiring intensive noise abatement and the highest levels are set for areas where noise abatement is not a critical issue. The adopted basis for the categorization of land – its urban function – clearly indicates the close relationship between protection of environment from noise and spatial development. It follows from the ordinance that permissible levels of noise in the environment are determined mainly in residential areas (standalone or accompanying e.g. craft services) and areas that are subject to special

noise protection (areas of hospitals, buildings associated with permanent or temporary residence of children, nursing homes, recreation and leisure areas).

There are no developed areas within the planned wind turbines subject to noise protection. The nearest acoustically protected area is approximately 820 m away from the wind turbine.

The areas planned for the location of the wind farm are currently used for agricultural purposes. Acoustic conditions are determined here by:

- traffic noise associated with vehicle traffic on roads in the vicinity of the planned project (provincial road No. 122 with low traffic intensity and local roads with negligible traffic intensity, including access roads to agricultural land);
- seasonal noise from farm machinery during field work.

3.2. Structure of the biotic environment

The structure of the biotic environment is determined by current land use. The individual wind turbines will stand within arable land (aerial photo in Appendix 3). Agrocenoses are artificial ecological systems created by humans to maximize crop yields. Cereals, rapeseed, corn and vegetables are grown in the arable fields. In addition to the typical species of arable crops, one should mention here segetal plant communities (referred to as the weeds of arable crops). These are annual plants – persisting until the fields are plowed.

Access roads to the wind turbines will also run mostly through arable land.

Permanent vegetation remains only on the balks and shoulders of dirt roads.

The following plant species were recorded within agricultural lands, shoulders of communication routes and wastelands: *Ranunculus auricomus* – goldilocks buttercup, *Potentilla anserina* – silverweed, *Geum urbanum* – colewort, *Succisa pratensis* – devil's-bit, *Papave rhoeas* – common poppy, *Campanula patula* – spreading bellflower, *Artcium tomentosum* – woolly burdock, *Galium mollugo* – hedge bedstraw, *Heracleum sphondylium* – hogweed, *Dactylis glomerata* – orchard grass, *Deschampsia caespitosa* – tufted hairgrass, *Oenothera biennis* – common evening-primrose, *Alopecurus pratensis* – meadow foxtail, *Rumex acetosella* – red sorrel, *Urtica dioica* – common nettle, *Equisetum arvense* – field horsetail, *Rumex crispus* – curly dock, *Lotus corniculatus* – common bird's-foot trefoil, *Trifolium pratense* – red clover, *Trifolium repens* – white clover, *Trifolium campestre* – hop trefoil, *Vicia sativa* – common vetch, *Daucus carota* – wild carrot, *Cirsium arvense* – creeping thistle, *Lathyrus pratensis* –

meadow vetchling, *Anthriscus sylvestris* – cow parsley, *Matricaria discoides* – pineappleweed, *Casella bursa-pastoris* – shepherd's purse, *Poa trivialis* – rough bluegrass, *Raphanus raphanistrum* – wild radish, *Plantago major* – broadleaf plantain, *Taraxacum officinale* – dandelion, *Artemisia vulgaris* – common mugwort, *Convolvulus arvensis* – field bindweed, *Silene alba* – white campion, *Carduus crispus* – welted thistle, *Bromus tectorum* – downy brome, *Lolium perenne* – perennial ryegrass, *Iris pseudacorus* – yellow flag, *Juncus conglomeratus* – compact rush, *Almaria officinalis* – garlic mustard, *Impatiens parwiflora* – small balsam, *Achillea millefolium* – yarrow, *Tanacetum vulgare* – common tansy, *Myosotis arvensis* – field forget-me-not, *Bromus erectus* – erect brome.

Within the drainage ditches, the following were recorded: *Lemna minor* – common duckweed, *Equisetum fluviatile* – Water horsetail, *Carex fusa* – smooth black sedge, *Carex leporina* – Eggbract sedge, *Juncus effusus* – soft rush, *Polygonum anphibium* – longroot smartweed, *Cardamine pratensis* – cuckooflower, *Phragmintes communic* – common reed.

None of the species mentioned above are legally protected under the Ordinance of the Minister of the Environment of January 5, 2012 on species protection of plants (Journal of Laws No. 0, item 81).

Small areas within the projected farm are occupied by wastelands. They have developed in small terrain depressions. A characteristic feature is the presence of hydrogenic vegetation and scrub communities. Due to the fact that the planned wind turbines (and accompanying infrastructure) will be constructed outside these facilities, a detailed floristic survey of these facilities was omitted during the field work (they are located outside the project location and outside the range of works related to its implementation).

The proposed wind farm borders on a small forest complex to the east (the construction works of the wind farm will not disturb the forest vegetation, therefore no detailed survey of the vegetation was conducted).

Due to the nature of the planned project and its potential environmental impact, it was necessary from the environmental point of view to conduct annual monitoring of birds and bats – these are the groups of animals most exposed to the potential impact of the planned project.

3.2.1. Birds

Annual bird monitoring was conducted in the area of the proposed wind farm from April 20, 2009 to April 19, 2010.

In addition, due to the change in technical parameters of the power plant, field surveys were conducted during the spring migration, breeding, post-breeding and fall migration periods of the 2013 season (March 1 to November 30, 2013).

Bird monitoring results are presented in Appendix 7 of the report.

3.2.2. Bats

Annual bat monitoring results are presented in Appendix 7 of the report.

3.3. Landscape

The concept of landscape is not unambiguous, and its definition varies depending on the scientific discipline from the point of view of which this concept is considered. The term landscape is commonly understood as the appearance of the Earth's surface. In conservation and ecology, landscape means many separate elements (such as trees, fields, rivers, buildings, roads, etc.) that together form a whole. Many professionals (including landscape architects) view landscape as a synthesis of natural, cultural and visual environments. Thus, the landscape forms a natural and cultural whole and is a resource of visual and aesthetic values created as a result of the interaction of natural and anthropogenic factors.

The appearance of the landscape in the area of the planned wind farm location is determined primarily by the basic elements of terrain morphology and land use. The proposed wind farm is located within an undulating moraine upland with associated fluvioglacial formations. The topography is slightly undulating, sometimes hilly. The area is used for agricultural purposes – there are arable fields (cereals, rapeseed, corn and vegetables are grown on the arable fields). The landscape is diversified by relatively few depressions with hydrogenic and scrub vegetation. In addition, the landscape is diversified with forest areas adjacent to the proposed wind farm area on the east.
The immediate area of the planned wind farm does not stand out in terms of landscape values compared to other parts of the Zachodniopomorskie Voivodeship.

The landscape in the area of the proposed project is presented in the photographs in Appendix 9 to the report.

Looking at the landscape in a broader perspective – at the scale of the entire municipality

– it should be assessed that there are areas with enhanced landscape values here. In the environmental valuation it was assessed that the area of Widuchowa Municipality is very attractive and varied in terms of landscape. The diversity of the landscape is due to the landform features and vegetation cover.

The western areas of the municipality along the Oder river present a typical open landscape of a large river valley with its numerous backwaters, oxbow lakes and channels. Especially in spring and autumn, during high water levels, the backwaters merge with each other filling the entire valley.

The ground moraine zone extends eastward from the Oder Valley. The moraine surface is dissected by glacial river valleys. Smaller streams have created numerous erosion cuts in the edge zone; their length ranges from 2 to 5 km and they have steep slopes. The edge zone is systematically drained by small watercourses, and the groundwater is based at the level of the Oder water, hence in the zone of 2-3 km from the river bank there are only few water-filled depressions. The zone of depressions located east of Route 31 looks different, where impermeable ground and relatively flat terrain will allow for the formation of numerous ponding water, bogs, lakes and marshes. Currently, the water level in this area has been lowered due to the impact of land reclamation and a prolonged hydrological drought. Many of the ditches are deprived of water during the summer. The remaining moraine area consists of numerous hills separated by depressions, often filled with water. Most water bodies are concentrated in this area.

One of the most interesting landscapes is the central part of the municipality consisting of wetlands formed in the valleys of former glacial rivers. They are an important hydrographic element, especially when the climate is continentalized and groundwater levels are lowered. The long-term effect of drainage activities is the lowering of groundwater level, which leads to soil drying and disappearance of hydrogenic habitats as well as unfavorable transformations of vegetation. In the environmental valuation it was proposed for these areas to create a landscape-nature complex.

The project area is located outside of the boundaries of legal forms of nature protection (and their buffer zones) established to protect landscape values (e.g. landscape parks, protected landscape areas). The nearest landscape park (Krajobrazowy Park Doliny Dolnej Odry) is located about 12 km away.

3.4. Degree of transformation of the area as a result of human activity

The immediate area designated for the location of the wind turbine complex has been virtually completely transformed as a result of longstanding, agricultural human activity.

Within the area of the proposed wind farm, almost all of the arable land is used for agriculture – cereals, rapeseed, corn and vegetables are grown on the arable fields. The effect of agricultural activity is practically complete eradication of the original vegetation (the natural vegetation was beech forests) and the formation of a "plow layer" in the case of soils.

The area is crisscrossed by roads, mainly providing access to agricultural fields.

4. Areas legally protected in terms of nature in the area of the planned project

The planned wind farm is practically adjacent to the Las Baniewicki Natura 2000 site (it should be emphasized that it will be implemented outside of its boundaries).

Further away there are:

- "Dolina Dolnej Odry" Natura 2000 site (SPA) – at a minimum distance of about 3 km
- "Dolna Odra" Natura 2000 site (SAC) – at a minimum distance of about 5 km

The location of the turbine in relation to the legal forms of area-related nature protection is presented on the topographic map in the scale of 1:50,000 (Appendix No. 2 to the report).

Natura 2000 site "Las Baniewicki" PLH320064 (SAC)

The area of 611.5 ha in total is designated under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and is proposed for establishment to protect the natural habitats (ecosystems) of Annex I and the plant and animal populations and habitats (except birds) of Annex II of the Directive. Until a notified Natura 2000 site is potentially denied approval by the European Commission, it is treated as a designated Natura 2000 site.

The area is a dense complex of fertile deciduous forests with a fairly uniform broadleaved nature. In the local depressions riparian forests develop on small areas, in the north-western part, there are areas which are more difficult to classify syntaxonomically and to diagnose the habitat, referring to inland acid oak forests (probably, however, it is the influence of the acidification of the habitat due to the former higher share of coniferous species in the forest stand).

Within the area 3 types of habitats from Annex I of Council Directive 92/43/EEC were identified:

- Old river beds and natural eutrophic water reservoirs with communities of *Nympheion, Potamion*;
- Sub-Atlantic broadleaved forest (*Stellario-Carpinetum*)
- Willow, poplar, alder and ash riparian forests *(Salicetum albo-fragilis, Populetum albae, Alnenion*).

More than 56% of the area consists of well-developed habitats of fertile broadleaved forests, mostly sub-Atlantic broadleaved forests – a habitat poorly represented in the N2000 network approved by the European Commission so far. The forests have good conservation prospects, characterized by species richness of flora. As much as 107 ha are habitats developed in a typical way (state A). The remaining area of the site consists of similar broadleaved forest habitats, but degraded by the breeding of mixed stands with coniferous or geographically alien species (northern red oak, hybrid black poplar). The greening of forest management, however, contributes to a gradual improvement in the composition of tree stands and with time we should rather expect an increase in the area of protected habitats.
The site contributes significantly to the achievement of appropriate representativeness within the Natura 2000 network for the habitats of sub-Atlantic broadleaved forests, whose resources are concentrated in the Zachodniopomorskie Voivodeship.

Due to the forest nature of the area, threats are largely related to forest management. The problem is to adjust the composition of tree stands to the potential of the habitat, not only in terms of production, but also ecologically and geographically (many areas are occupied by tree stands including coniferous or geographically alien species). For the purpose of keeping xylobionts it is necessary to maintain adequate numbers of old and dead trees in the forest.

In accordance with Article 33(1) of the Act of April 16, 2004 on Nature Conservation, it is prohibited to undertake actions which, separately or in combination with other actions, may have a significant negative impact on the conservation objectives of Natura 2000 site, including in particular it may:

- deteriorate the condition of natural habitats or habitats of species of plants and animals for which the Natura 2000 site was designated;
- negatively affect the species for the protection of which the Natura 2000 site was designated;
- deteriorate the integrity of the Natura 2000 site or its connections with other

areas.

It should be emphasized that the prohibitions do not apply only to areas within the boundaries of Natura 2000 sites, but they also refer to actions taken outside the boundaries of the Natura 2000 sites.

If there are necessary requirements of an overriding public interest, including those of a social or economic nature, and in the absence of alternative solutions, it is possible to carry out projects which may have a negative impact on natural habitats as well as plant and animal species for the protection of which the Natura 2000 site was designated, after consent granted by relevant authorities and following appropriate requirements and criteria specified in the Act on Nature Conservation.

"Dolina Dolnej Odry" Natura 2000 site PLB320003 (SPA)

The area selected on the basis of the Directive No. 2009/147/EC of the European Parliament and of the Council of November 30, 2009 on the conservation of wild birds (the so-called Birds Directive), established by the Ordinance of the Minister of the Environment of January 12, 2011 on Natura 2000 special protection areas for birds (Journal of Laws 2011.25.133 as amended) in order to protect the populations of birds from Annex I of the Directive, together with their habitats as well as regularly occurring migratory species.

The area includes the Oder Valley with the surface area of 61,648.4 ha between Kostrzyn and Szczecin Lagoon (length of approx. 150 km) together with Lake Dąbie.
Lake Dąbie is a shallow, delta reservoir (5600 ha, max. depth 4 m), with a diversified coastline. It is supplied by rainwater, river water and sea water (backwater phenomenon). The lake and the Oder River stream are separated by the following islands: Czapli Ostrów, Sadlińskie Łąki, Mienia, Wielka Kępa, Radolin, Czarnołęka, Dębina, Kacza and Mewia. The south-eastern shore of the lake is adjacent to meadows and wetlands of Rokiciny, Sadlińskie and Trzebuskie Łęgi. Aquatic vegetation is richly represented in Lake Dąbie. The banks are occupied by a wide strip of rushes (mainly reeds and club-rush), behind which riverside herbs develop. Large areas are occupied by riparian forests and willow bog bushes. The interiors of large islands are covered with alder trees and ash alder riparian forests. In the estuary section the Oder River has two main branches – the Eastern Oder and the Regalica. The area between the main branches (channels) (Międzyodrze) is a flat plain with numerous lakes and smaller channels, it is marshy, with periodically flooded meadows and fragments of riverside riparian forests.

The area below Cedynia is called the Freienwald Basin, within which the so called

Rozlewisko Kostrzyneckie is of particular importance to birds. On the German side, the Lower Oder Valley National Park stretches along the Oder River. In the central and southern parts of the area, fragments of forest adjacent to the valley with the highest density of birds of prey were included.

The following bird species covered by Article 4 of Directive 2009/147/EC occur in the Natura 2000 site:

- Eurasian bittern *Botaurus stellaris*.
- little bittern *Ixobrychus minutus*
- great egret *Egretta alba (Ardea alba)*
- black stork *Ciconia nigra*
- white stork *Ciconia ciconia*
- tundra swan *Cygnus bewickii (Cygnus)*
- whooper swan *Cygnus cygnus*
- smew *Mergus albellus (Mergellus)*
- European honey buzzard *Pernis apivorus*
- black kite *Milvus migrans*.
- red kite *Milvus milvus*.
- white-tailed eagle *Haliaeetus albicilla*
- western marsh-harrier *Circus aeruginosus*
- hen harrier *Circus cyaneus*
- Montagu's harrier *Circus pygargus*
- lesser spotted eagle *Aquila pomarina*
- western osprey *Pandion haliaetus*
- spotted crake *Porzana porzana*
- little crake *Porzana parva*
- corn crake *Crex crex*
- common crane *Grus gru*s
- ruff *Philomachus pugnax*
- wood sandpiper *Tringa glareola*
- common tern *Sterna hirundo*
- little tern *Sternula albifrons*
- black tern *Chlidonias niger*
- eagle owl *Bubo bubo*
- short-eared owl *Asio flammeus*
- European nightjar *Caprimulgus europaeus*

- kingfisher *Alcedo atthis*
- bluethroat *Luscinia svecica*
- aquatic warbler *Acrocephalus paludicola*
- barred warbler *Sylvia nisoria*
- red-breasted flycatcher *Ficedula parva*
- red-backed shrike *Lanius collurio*
- boreal owl *Aegolius funereus*
- pintail *Anas acuta*
- common teal *Anas crecca*
- Eurasian wigeon *Anas penelope*
- mallard *Anas platyrhynchos*
- gadwall *Anas strepera*
- greater white-fronted goose *Anser albifrons*
- greylag goose *Anser anser*
- taiga bean goose *Anser fabalis*
- tawny pipit *Anthus campestris*
- golden eagle *Aquila chrysaetos*
- grey heron *Ardea cinerea*
- common pochard *Aythya ferina*
- tufted duck *Aythya fuligula*
- greater scaup *Aythya marila*
- cocommon goldeneye *Bucephala clangula*
- dunlin *Calidris alpina*
- white-winged tern *Chlidonias leucopterus*
- stock dove *Columba oenas*
- mute swan *Cygnus olor* black woodpecker *Dryocopus martius*
- middle spotted woodpecker *Dryocopus medius*
- coot *Fulica atra*
- oystercatcher *Haematopus ostralegus*
- great black-backed gull *Larus marinus*
- Mediterranean gull *Larus melanocephalus*
- little gull *Larus minutus*
- Savi's warbler *Locustella luscinioides*
- black-tailed godwit *Limosa limosa*
- woodlark *Lullula arborea*

- smew *Mergus albellus*
- black-crowned night-heron *Nycticorax nycticorax*
- bearded reedling *Panurus biarmicus*
- European golden plover *Pluvialis apricaria*
- great crested grebe *Podiceps cristatus*
- common shelduck *Tadorna tadorna*
- barn owl *Tyto alba*
- northern lapwing *Vanellus vanellus*

In accordance with Article 33(1) of the Act of April 16, 2004 on Nature Conservation, it is prohibited to undertake actions which, separately or in combination with other actions, may have a significant negative impact on the conservation objectives of Natura 2000 site, including in particular it may:

- deteriorate the condition of natural habitats or habitats of species of plants and animals for which the Natura 2000 site was designated;
- negatively affect the species for the protection of which the Natura 2000 site was designated;
- deteriorate the integrity of the Natura 2000 site or its connections with other areas.

It should be emphasized that the prohibitions do not apply only to areas within the boundaries of Natura 2000 sites, but they also refer to actions taken outside the boundaries of the Natura 2000 sites.

If there are necessary requirements of an overriding public interest, including those of a social or economic nature, and in the absence of alternative solutions, it is possible to carry out projects which may have a negative impact on natural habitats and plant and animal species for the protection of which the Natura 2000 site was established, after consent granted by relevant authorities and following appropriate requirements and criteria specified in the Act on Nature Conservation.

Natura 2000 site "Dolna Odra" PLH320037 (SAC)

The area designated under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive), proposed for establishment to protect the natural habitats (ecosystems) of Annex I and the plant and animal populations and habitats (except birds) of Annex II of the Directive.

The area (of 30,458.09 ha) includes the Oder Valley (with two main channels: East Oder

and West Oder), stretching for approx. 90 km. The area is a mosaic including: wetlands with peat bogs and meadows flooded in spring, alder and riparian forests, old river beds, numerous river branches and islands. The Oder is a free-flowing river (according to the terminology of hydraulic engineers). A large proportion of the area is natural floodplains. The refuge also includes fragments of the Odra Valley edge zone with patches of xerophilic vegetation, including xerothermic swards and forests. The areas surrounding the refuge are used for agricultural purposes. Grassland management and cattle grazing are also practiced in a small section of the area. Numerous industrial plants are located in the vicinity of the refuge.

In total 21 habitats listed in Annex I of Council Directive No. 92/43/EEC were identified here. They include:

- 2330 Inland sand dunes with sandy grasslands
- 3140 Hard-water oligo- and mesotrophic reservoirs with underwater meadows of *Charetea*
- 3150 Old river beds and natural eutrophic water reservoirs with groups from *Nympheion, Potamion*
- 3260 Lowland and submontane rivers with groups of waders *Ranunculion fluitantis*
- 3270 Flooded muddy river banks
- 4030 Dry heaths (*Calluno-Genistion, Pohlio-Callunion, Calluno-Arctostaphylion*)
- 6120 Xeric sand calcareous grasslands (*Koelerion glaucae*)
- 6210 Xerothermic swards *(Festuco-Brometea*) – only grasslands with important orchid localities are prioritized
- 6410 Molinia meadows (*Molinion*) of variable moisture content
- 6430 Mountain herbs (*Adenostylion alliariae*) and riverside herbs (*Convolvuletalia sepium)*
- 6440 Alluvial meadows (*Cnidion dubii*)
- 6510 Lowland and mountain fresh meadows used extensively (*Arrhenatherion elatioris*)
- 9110 Acid beech forest (*Luzulo-Fagenion*)
- 9130 Fertile beech (*Dentario glandulosae-Fagenion, Galio odorati-Fagenion*)
- 9160 Sub-Atlantic broadleaved forest (*Stellario-Carpinetum*)
- 9170 Central European and subcontinental broadleaved forest *(Galio-Carpinetum, Tilio-Carpinetum)*
- 9190 Pomeranian acidophilus birch-oak forest*(Betulo-Quercetum*)

- 91D0 Swamp woods and forests *(Vaccinio uliginosi-Betuletum pubescentis, Vaccinio uliginosi-Pinetum, Pino*)
- 91E0 Willow, poplar, alder and ash riparian forests *(Salicetum albo-fragilis, Populetum albae, Alnenion*)
- 91F0 Oak-elm-ash riparian forests (*Ficario-Ulmetum*)
- 91I0 Thermophilous oak forests (*Quercetalia pubescenti-petraeae*)

The following plants and animals from Annex II of Council Directive No. 92/43/EEC occur in the area:

- Barbastelle *Barbastella barbastellus*
- Pond bat *Myotis dasycneme*
- Greater mouse-eared bat *Myotis myotis*
- European beaver *Castor fiber*
- Eurasian otter *Lutra lutra*
- Northern crested newt *Triturus cristatus*
- European fire-bellied toad *Bombina bombina*
- European pond turtle *Emys orbicularis*
- Atlantic salmon *Salmo salar*
- White-finned gudgeon *Gobio albipinnatus*
- Aspius *Aspius aspius*
- Spined loach *Cobitis taenia*
- European stag beetle *Lucanus cervus*
- Hermit beetle *Osmoderma eremita*
- Great capricorn beetle *Cerambyx cerdo*
- Lesser ramshorn snail *Anisus vorticulus*
- Twaite shad *Alosa fallax*
- Asp *Aspius aspius*
- Wolf *Canis lupus*
- Red deer *Cervus elaphus*
- European river lamprey *Lampetra fluviatilis*
- large white-faced darter *Leucorrhinia pectoralis*
- Large copper *Lycaena dispar*
- European weatherfish *Misgurnus fossilis*
- Grass snake *Natrix natrix cypriaca*
- Green snaketail *Ophiogomphus cecilia*
- Hermit beetle *Osmoderma eremita*

- Common spadefoot *Pelobates fuscus*
- Small pasque flower *Pulsatilla pratensis*
- Smooth newt *Lissotriton vulgaris*
- Thick shelled river mussel *Unio crassus*

The most important threats to the area are (according to the standard data form):

- Habitat changes caused by changes in farming (e.g. abandonment of pastoralism) leading, for example, to commencement of a succession process.
- Animal collection, poaching.
- Pollution of water and air and waste disposal.
- Regulatory works in the Oder River Valley leading to destruction of protected habitats.
- Expansion of the waterway (Szczecin - Schwedt - Hochenzaten Canal).
- Organic and chemical pollution of waters, which are the feeding grounds of the species, especially unfavorable runoff of biogens from agriculturally used areas surrounding the refuge (a high level of biogenic elements may lead to overgrowth of watercourses and water bodies, which will prevent the pond bat from feeding over the water surface and will contribute to changes in the species structure of entomofauna preferred by the species).
- Improperly performed regulatory works in the Oder River Valley leading to changes or destruction of the pond bat habitat.

In accordance with Article 33(1) of the Act of April 16, 2004 on Nature Conservation, it is prohibited to undertake actions which, separately or in combination with other actions, may have a significant negative impact on the conservation objectives of Natura 2000 site, including in particular it may:

- deteriorate the condition of natural habitats or habitats of species of plants and animals for which the Natura 2000 site was designated;
- negatively affect the species for the protection of which the Natura 2000 site was designated;
- deteriorate the integrity of the Natura 2000 site or its connections with other areas.

It should be emphasized that the prohibitions do not apply only to areas within the boundaries of Natura 2000 sites, but they also refer to actions taken outside the boundaries of the Natura 2000 sites.

If there are necessary requirements of an overriding public interest, including those of a social or economic nature, and in the absence of alternative solutions, it is possible to

carry out projects which may have a negative impact on natural habitats as well as plant and animal species for the protection of which the Natura 2000 site was designated, after consent granted by relevant authorities and following appropriate requirements and criteria specified in the Act on Nature Conservation.

5. Proposed areas for legal protection for natural reasons

The proposed forms of conservation were determined based on:

- Environmental valuation of the Widuchowa Municipality made by the Nature Conservation Office from Szczecin in 2006;
- Environmental valuation of the Banie Municipality made by the Nature Conservation Office from Szczecin in 1998;
- Environmental valuation of the Zachodniopomorskie Voivodeship made by the Nature Conservation Office from Szczecin in 2010.

The communal surveys are archival (especially the survey of the Banie Commune, made 16 years ago). The forms of nature protection proposed in the valuation have not been established to date. If established, all potentially implemented prohibitions will apply only within the boundaries of the proposed forms of nature conservation.

Due to the archival character of the municipal valuation, the report was based mainly on the proposed forms of nature protection included in the voivodeship valuation.

Within the area of the planned wind farm there is a local nature conservation site proposed to be established – "Oczko Żarczyńskie". The proposal for establishing a local nature conservation site is included in both the valuation of the Widuchowa Municipality and the voivodeship valuation.

Also at a distance of:

- about 100 m from one of the wind turbines there is a proposed area of protected landscape called Mokradła (however, most wind turbines are located at a distance greater than 1 km) – a proposal included in the municipal valuation, but not supported in the voivodeship valuation;
- about 150 m from one of the wind turbines there is a landscape-nature complex "Widuchowskie bagna" proposed to be established (most wind turbines are located at a distance of more than 1 km) – the proposal to establish the complex was included both in the communal and voivodeship valuation.

In the neighboring Banie Municipality, 16 years ago it was proposed to establish:

- "Las Baniewicki" Nature Reserve – the proposed nature reserve is located approximately 400 m from the nearest wind turbines;
- "Las Baniewicki" landscape-nature complex – the proposed complex is located approximately 1 km from the nearest wind turbine.

Both forms of nature conservation proposed in 1998 were upheld in the voivodeship valuation. They are also part of the "Las Baniewicki" Natura 2000 site, which was described in the previous chapter of the report. In the following chapter of the report, the impact assessment was made for the "Las Baniewicki" Natura 2000 site, assuming that the assessment remains valid for the proposed nature reserve and the proposed landscape-nature complex.

In Banie Municipality it was proposed in 1998 to establish several dozen of local nature conservation sites (as many as 68). Most of them have not been given a name. These mostly included small wetland depressions. At the boundary with Widuchowa municipality, there are two such objects. The proposal to establish them was upheld in the voivodeship valuation. The nearest wind turbine is approximately 300 m from one of the proposed local nature conservation sites.

The forms of nature conservation proposed to be created are shown on the topographic map, which is Appendix 3 to the report. The map includes only those proposed territorial forms of nature protection the proposal of which was upheld in the voivodeship valuation.

Proposed local nature conservation site "Oczko Żarczyńskie"

The purpose of establishing the local nature conservation site is to protect wetland, a breeding ground for amphibians and birds. According to the environmental survey of Widuchowa municipality it is a breeding place of amphibians: European fire-bellied toad, common frog, pool frog, grass frog and birds: red-necked grebe, bittern, grayleg goose, gadwall, duckhead, great reed warbler.

A threat to the site is a change in water relations.

The survey recommended to leave the area as it is (first of all, not to change the water conditions and not to take wood from the trees around the site).

Proposed protected landscape area — Wetlands

According to the Act on Nature Conservation, the protected landscape area includes

areas includes the areas protected because of a distinguishable landscape with various ecosystems, valuable due to its capability of meeting the needs of tourism and recreation or having the function of a wildlife corridor.

According to the environmental survey of the Widuchowa municipality, the purpose of establishing the protected landscape area should be to protect the landscape (hilly ground moraine forms and fragments of eskers and kemes in a mosaic with peat- and gyttja-lined depressions, often filled with water).

At the same time, the survey included the assessment of values:

- in terms of flora – local,
- in terms of ecosystems – local,
- in terms of spatial layout – local,
- in terms of their role in the landscape – local.

A threat to the area is drying – drainage, location of waste landfills, cutting down trees, liquidation of vegetated ecotones.

The survey recommended to leave the area as it is, prevent drainage and lowering of water levels by blocking drains in ditches.

Proposed landscape-nature complex "Widuchowskie bagna"
The purpose of establishing the complex is to protect a complex of wetlands with an exceptionally rich fauna of amphibians and birds.

According to the environmental survey of the Widuchowa municipality, it is a breeding place for amphibians: smooth newt, European fire-bellied toad, common frog, common toad, pool frog, water, moor and grass frog, reptiles: grass snake, viviparous lizard; birds: bittern, mute swan, cuckoo, wryneck, white stork, white-tailed eagle, great reed warbler, common pochard, common goldeneye, common crane, cuckoo, common merganser, western marsh-harrier, red kite, red-backed goose, grayleg goose, sand martin, European shrike, common grasshopper warbler, bearded reedling.

A threat to the site is a change in water relations.

The survey recommended to leave the area as it is (first of all, not to change the water relations).

Proposed ecological arables in Banie Commune, located closest to the assessed wind

farm

There are no data on detailed characteristics of ecological arables located along the border with Widuchowa Commune. Both proposed ecological arables include transitional peat bogs.

6. Description of monuments protected under old monuments law

On the basis of the local spatial development plan it was established that within the area of the wind turbines there are zones WII and WIII of archaeological site conservator protection.

The aim of the protection is to comprehensively document the relics of the prehistoric and early medieval settlement space by conducting archaeological rescue research ahead of the process of land development. The scope of the archaeological rescue research is each time determined by the Voivodeship Heritage Conservation Officer in the permit issued to the investor.

The archeological sites are common to the most of Poland territory and are above all of scientific and documentation value, rather than tangible, museum or collection value.

In the localities neighboring on the planned wind farm there are objects listed in the register of historic monuments:

- Żelechowo
  - filial Church dedicated to the Visitation of the Most Blessed Virgin Mary – registry No. A-102 of 25.10.2002;
  - churchyard – registry No. A-102 of 25.10.2002;
- Żarczyn
  - filial church dedicated to Saint Stanislaus Bishop and Martyr – registry No. A-991 of 01.08.1956;
  - churchyard – registry No. A-991 of 19.07.2012;

7. Detailed environmental impact assessment of the selected project option

The option consisting in construction of 16 wind power plants with the accompanying infrastructure was evaluated in detail.

7.1. Construction stage

During the construction stage:

- access roads will be constructed;
- foundations for individual wind turbines will be constructed;
- assembly/technical yards will be constructed;
- individual wind turbines will be located;
- low and medium voltage power cables will be laid;
- telecommunication infrastructure will be laid.

The characteristics of these farm components (including their technical parameters) are presented in Chapter 2 of the report.

The following equipment, e.g., is planned to be used during construction:

- mobile cranes;
- car sets – with semi-trailers or trailers;
- box trucks and self-unloading vehicles;
- special vehicles (concrete mixers, excavators, graders, scrapers, road rollers, drill rigs);
- passenger cars, transport cars.

At this stage, it is not possible to accurately estimate the amount of equipment used or, in the case of trucks, the frequency of their trips. These will depend on the selection of a contractor for the work and the final solutions adopted in the construction project. However, these data are of secondary importance to the environmental impact assessment as a whole.

The turbine structures will be transported to the site by road. This may involve the need to reconstruct the road network (mainly intersections and curves so that vehicles with long trailers can pass). The scale and type of possible alterations to the existing road system will be known when the transport company applies to the relevant road authorities for a transit permit – the road authorities will then determine the detailed route of the transit and how the roads will be adjusted. Experience shows that most often the adjustment of roads and intersections consists of appropriate profiling of road curves by temporary laying of road slabs and temporary demolition of parts of roundabouts (in such a way that a semi-trailer truck can pass through the middle of the roundabout). Construction of the road system within the wind farm itself has been determined at this stage.

Portable sanitary containers (TOI TOI) are planned to be set up for the use by people employed for construction works. Most likely, these containers will be moved as the work progresses (e.g., as one turbine is set up, the toilets will be moved to where the

next turbine is being set up). Container service and maintenance will be outsourced to an outside entity (it can be assumed that to a container rental company).

The material and equipment base will be significantly limited (excavators and cranes may be parked at the site; trucks will most likely drive to the "home" base for the night – the contractor has not yet been selected, so its location is unknown at this stage). As far as possible parts of the power plant, they will be stored on arable land in the place of construction of individual turbines and on temporary storage yards located in the farm area (as the works progress, the parts will be moved to the places of construction of individual turbines). During the construction stage, the farm area will most likely be guarded, as during the construction of other wind farms there were cases of theft of even already laid cables and devastation of turbines (spray painting). For this reason, it is also planned that temporary fencing may be constructed at the site.

The work is tentatively estimated to begin in 2015 - 2017. The deadline will depend on whether any appeals will be filed against the decision on environmental conditions, and the deadline for obtaining a building permit.

The construction stage will take several months (the construction period is extended by the time needed for the setting of concrete used for the foundations, which can take up to a month). The assembly of the structure itself is not time-consuming – in the case of steel towers it takes a few days for a single wind turbine, and in the case of prefabricated concrete towers about 2 weeks.

7.1.1. Ground surface and soil resources

At the construction stage, soil cover will be locally eliminated as a result of excavations for roads, cable networks and power plant tower foundations. The construction stage will also involve the transformation of near-surface geologic structures.

It is planned that foundations will be laid to a depth of approximately 3 - 3.5 m below the original ground level. It is assumed that the area of the foundation of a single wind turbine may amount to approximately 500 m^2 (only after detailed geological research and structural calculations performed at the stage of the construction design it is possible to determine their target size and the exact depth of the foundation).

Excavation of foundation trenches will require hauling of up to 750 m^3 of soil for a single wind turbine. An alternative to hauling may be to spread a topsoil layer of excavated material (or a portion thereof) around the turbine. In the case evaluated, this practice is acceptable as long as wetlands are not backfilled.

Soil resources of good and medium quality grades will be permanently lost during construction. Wind power plants are planned on arable land of class RIIIa and RIIIb (turbines No. 1, 2, 3, 6, 10, 11, 13, 15 and 16) and RIVa (turbines No. 4, 5, 7, 8, 9, 12 and 14). Each wind turbine will occupy a maximum area of approximately 500 m^2. It can be concluded that the area of the land occupied by the wind turbine will be the same as the area of the foundation on which the turbine will stand. The total foundation area will be approximately 8,000 m^2. In addition, assembly/process yards, each up to 1,250 m^2 in size, will be established during construction – the total area of the assembly yards will be up to 20,000 m^2. The total area of the new access roads will be approximately 49,000 m^2. On this basis, it is estimated that the following quantities of soil will need to be hauled away in connection with the construction of the farm:

- approximately 750 m^3 (foundation of a single power plant) x 16 (number of power plants) = 12,000 m^3
- approximately 49,000 m^2 of road x 0.5 m (depth) = 24,500 m^3
- up to 1,250 m^2 (assembly yard of a single power plant) x 0.5 m (depth) x 16 (number of power plants) = 10,000 m^3

The above figures are estimates. The exact dimensions of each structure will be determined at the stage of preparing the construction project. It should be noted that some of the fertile soil will be spread on farm fields where possible and used for foundation backfill.

The temporary transformation of the ground surface and removal of soil cover will be performed in the areas of cable trenches. In this case, after the cables are laid, the area will be restored to its previous condition.

During the construction of the wind park, physical transformation of the soil cover in the vicinity of the immediate wind turbine sites may also occur due to the use of heavy equipment and storage of structural members.

It is assessed that the impacts described above will not result in significantly adverse effects on the environment.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The road layout has changed in the option under investigation – the length of roads has increased, but the layout is more favorable as it does not cross the proposed "Oczko Żarczyńskie" ecological site. In the option for which the decision on environmental conditions was issued, the area of roads is about 43,600 m^2. This means that the amount of resulting soil to be exported in option 3 of the decision is lower by about 2,700 m^3.

7.1.2. Surface water and groundwater

Individual wind turbines will be located outside permanently wet areas – they will stand on agricultural land. However, no geotechnical documentation has been completed at this stage. Therefore, the possibility of groundwater seepage during excavation for foundations cannot be ruled out. If this is the case, temporary drainage of foundation excavations may be necessary. Excavation drainage may also be necessary in the event of heavy, prolonged rainfall. Two trench drainage methods will be possible:

- surface method;
- depression method.

The trench drainage method will be decided by the designer based on geological investigations. Water will be distributed to arable fields or taken to a treatment plant.

Whereas:

- location of turbines (outside of wetlands);
- a relatively shallow foundation (approximately 3 - 3.5 m);
- the relatively short time from excavation to pouring concrete;

it is estimated that the works related to the power plant foundation will not permanently disturb the water relations in the discussed area.

Also, access roads to the power plant and assembly yards will not be located on wetlands and their construction will mean interference in the soil layer to a depth of about 0.5 m (in case of unfavorable geological conditions there is a possibility of interference at greater depths). If it is necessary to cross a drainage ditch or watercourse, a culvert will be used to ensure free flow. This allows to assess that the construction of access roads and assembly yards will not contribute to the deterioration of water relations in the area of the planned wind farm and its vicinity.

During the construction stage, sanitary sewage will be collected in portable TOI-TOI toilets or similar type sanitary containers. Their exact location is not known at this stage. Most likely, these toilets will be moved as the work progresses (e.g., as one turbine is set up, the toilets will be moved to where the next turbine is being set up). Container service and maintenance will be outsourced to an outside entity (it can be assumed that to a container rental company).

Rainwater will not be collected in an organized manner – during rainfall, rainwater will be surface discharged into the ground.

The construction works will not pose any threat to the usable aquifers (according to the explanations to the hydrogeological map of Poland, in the area of wind turbine location,

the main usable aquifer is located at the depth of 50 - 100 m).
The works will be carried out outside the protection zones of water intakes and Major Groundwater Reservoirs.

Comparison of impacts with the planned option according to the decision on environmental conditions held by the applicant

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on surface water and groundwater will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.1.3. Ambient air

The operation of transport and construction equipment will be sources of air pollution. As a guideline, it can be assumed that diesel fuel consumption (at the construction site – disregarding the material delivery routes, which are currently unknown) for the wheel excavator, loader, bulldozer, trucks, concrete mixers and the crane will be approximately 200 L per day. The duration of the works associated with the construction of one windmill was determined approximately at 6 working days (taking into account the operation of heavy equipment). The total diesel consumption is estimated at 19200 L.

Approximately, the amount of exhaust fumes introduced (at the construction site – disregarding the routes of material transport, which are unknown) will be:

- NO_x - 0.768 Mg;
- PM10 - 0.096 Mg;
- SO_2 - 0.0008 Mg

The above-mentioned amounts of introduced pollutants are low and will not result in a noticeable change in atmospheric pollution in the area of the designed farm. The introduction of pollutants will be spread out over time and space – not all wind turbines will be built at the same time and in the same location.

The transport (of structural members and excavated material from foundations) will cause temporary deterioration of aerosanitary conditions (transport pollutants: exhaust fumes and dust) in the vicinity of the transport routes. It is not possible to accurately estimate of the amount of pollutants introduced during transport into the atmosphere at the construction stage because the exact transport route (e.g., the final destination for

disposal of excavated material from foundations) is not currently known. It can be assumed; however, that the deterioration of aerosanitary conditions will be limited territorially and it will be of short duration – limited only to the construction period and it will not affect the general level of air pollution.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on increased air pollution will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.1.4. Acoustic climate

The source of noise at the construction stage will be mainly construction machinery and equipment, such as the excavator, bulldozer, concrete mixer, lifting equipment and truck transport. The sound power level of example noise sources associated with construction activities is assumed to be:

- excavator, bulldozer: 90-105 dB(A);
- truck: 85-95 dB(A).

Although the construction stage is characterized by relatively high emissions of noise to the environment, it should be noted that its duration is relatively short. It can be assessed that the construction stage will not be a factor that could permanently threaten the acoustic environment. For work outside of urbanized areas, noise will not cause any annoyance to people.

Noise emitted to the environment during the construction of the wind farm is not subject to standards determining the acceptable level of noise in the environment, nevertheless the investor is obliged to minimize the negative impact of noise on the environment within the residential buildings located in the immediate vicinity of the proposed project (e.g. by limiting noise-disturbing activities to the daytime – to the extent permitted by the construction technology).

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the noise immission procedure is pending will be the same as for the option for which the applicant has obtained the decision on environmental constraints.

7.1.5. Vibrations

During the construction stage, there may be vibrations caused by operating construction machinery such as bulldozers and excavators. These are vibrations similar to those induced by heavy vehicle traffic.

However, the occurrence of vibrations will be short-term and will affect the area in the vicinity of access roads and in the area of construction works – according to estimates up to 50 m from the zone of construction works.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the vibration procedure is pending will be the same as for the option for which the applicant has obtained the decision on environmental constraints.

7.1.6. Waste

The construction stage will involve the generation of waste, which must be collected selectively and then managed in accordance with the Act of December 14, 2012 on Waste (Journal of Laws 2013, item 21).

The generator of waste resulting from the provision of construction services is the entity that provides the service, unless the contract for the provision of services concluded between the contractor and the investor provides otherwise. As the investor does not hold relevant permits for waste generation, nor does it carry out any activity in the scope of waste recovery or neutralization, the agreements concluded will not contain any provisions stipulating that the investor is the waste producer. In consequence of the foregoing, all formalities related to waste management (including the obligation to obtain relevant decisions and permits), will rest with the entity to which the construction service will be outsourced. At the time of the report, the companies responsible for the construction services and thus the waste generated had not been selected. Lack of knowledge in this area is irrelevant to the evaluation because, regardless of the choice made, contractors will be required to comply with applicable waste management laws.

As a result of construction works, the following types of waste may be generated (according to the classification in accordance with the Ordinance of the Minister of Environment of September 27, 2001 on waste catalog, Journal of Laws of 2001, No. 112, item 1206):

Table 1. Estimated amounts of waste generated during the construction stage

No.	Code	Waste type	Approximate quantity	Place and method of storage
15		Packaging waste; sorbents, wiping cloths, filter materials and protective clothing not specified in other groups		
15 01		Packaging waste (including separately collected municipal packaging waste)		
1	15 01 01	Paper and cardboard packaging	25 m^3	Portable container set up by the wind turbine under construction
2	15 01 02	Plastics packaging	65 m^3	Portable container set up by the wind turbine under construction
3	15 01 03	Wooden packaging	10 m^3	Portable container set up by the wind turbine under construction
4	15 01 04	Metal packaging	1 ton	Portable container set up by the wind turbine under construction
5	15 01 05	Multi-material packaging	3.0 m^3	Portable container set up by the wind turbine under construction
6	15 01 06	Mixed packaging waste	7 m^3	Portable container set up by the wind turbine under construction
15 02		Sorbents, filter materials, wiping cloths and protective clothing		
	15 02 03	Sorbents, filter materials, wiping cloths (e.g. rags, cloths) and protective clothing other than those mentioned in 15 02 02	3 m^3	Portable container set up by the wind turbine under construction
7		Waste from construction, renovation and demolition of civil structures and road infrastructure (including soil and soil from		

		polluted areas)		
17 01		Waste construction materials and components, as well as waste elements of road infrastructure (e.g. concrete, bricks, tiles, ceramics)		
8	17 01 01	Concrete waste and concrete debris from demolitions and renovations	40 m^3	Portable container set up by the wind turbine under construction
9	17 01 03	Wastes of other ceramics and equipment	1.5 m^3	Portable container set up by the wind turbine under construction
10	17 01 07	Mixture of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	7.0 m^3	Portable container set up by the wind turbine under construction
11	17 01 81	Waste from road alteration and modernization	**	Portable container set up by the wind turbine under construction
12	17 01 82	Waste not otherwise specified	7.0 m^3	Portable container set up by the wind turbine under construction
17 02		Waste wood, glass and plastics		
13	17 02 01	Wood	7.0 m^3	Portable container set up by the wind turbine under construction
14	17 02 03	Plastics	7.0 m^3	Portable container set up by the wind turbine under construction
17 04		Metallic and metal alloy waste and scrap		
15	17 04 05	Iron and steel	7.0 tons	Portable container set up by the wind turbine under construction
16	17 04	Cables other than those mentioned in 17	1 ton	Portable container

	11	04 10		set up by the wind turbine under construction
17 05		Soil and earth (including the soil and earth from polluted areas and dredging spoil)		
17	17 05 04	Soil and earth including stones, other than those listed in 17 05 03	46 500 m^3	Most of them are immediately taken away by truck
17 06		Insulation and construction materials containing asbestos		
18	17 06 04	Insulating materials other than those mentioned in 17 06 01 and 17 06 03	7.0 m^3	Portable container set up by the wind turbine under construction

** Quantity of waste dependent on arrangements made with road managers regarding the extent and manner of road reconstruction.

It should be noted that apart from waste 17 05 04 (Soil and stones other than those mentioned in 17 05 03), the amounts of waste generated will be small. It is difficult to accurately estimate the number of these, as it will depend on
among others the way of packing (securing) the turbine for the time of transport by the producer of turbines, on which the investor has no influence.

Provided that the rules for environmental protection and separate waste collection and transfer thereof to an authorized entity for recovery or disposal are observed, no negative impact on the environment is forecasted.

It should be noted that in accordance with the Act of December 14, 2012 on waste (Journal of Laws 2013, item 21) and the Ordinance of the Minister of the Environment of April 21, 2006 on the list of waste types, which can be transferred by the waste owner to natural persons or organizational units which are not entrepreneurs and on permissible methods of its recovery (Journal of Laws 2006 No. 75 item 527, as amended), some of the waste listed in the table may be transferred by the holder of waste to individuals or organizational units which are not entrepreneurs for their own needs.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The amount of generated waste will be comparable to the option for which the applicant has a decision on environmental conditions. There will be a slight increase in soil –

waste code 170504. There will be about 2,700 m^3 more waste of this code.

7.1.7. Flora and fauna

The impact on the biotic environment will be manifested mainly through the local elimination of vegetation cover, represented by agrocenoses and ruderal communities.

Placing individual wind turbines along with the routes of the related infrastructure within agricultural land currently occupied by farmland, in a few cases using mid-field roads, will not adversely affect the vegetation occurring in their vicinity. It will be subject to the same changes that occur today, that is, related to crop rotation.

Some tree and bush cutting may be unavoidable during the construction stage. This is primarily due to the need to rebuild some roads and construct exits. Unfortunately, at this stage the investor does not have a detailed design and is not able to indicate which trees and bushes will be cut down (this will only be possible after a geodetic delineation of the roads, which will take place at the construction design stage). However, tree felling should be reduced as much as possible.

With reasonable tree and shrub clearing, no adverse impacts to protected bird species are expected. Pursuant to Article 83 section 2c of the Act on Nature Conservation of April 16, 2004 (Journal of Laws of 2013, No. 627 as amended), the issuance of a permit for the removal of trees and shrubs within a public road lane should take place after a visual inspection for the presence of protected species in the trees.

Construction activities may cause periodic scaring of local fauna due to noise and increased human presence. This may lead to temporary emigration of some fauna species. The emigration will be temporary and it should be expected that it will occur to neighboring areas. Some species that are easily synanthropized and highly adaptable to changing environmental conditions will be unaffected by the construction stage. It should be pointed out that the scale of the impact in this case will depend on the time of conducting the works – the breeding period of birds is the least favorable. However, it should be emphasized that the conducted annual bird monitoring (Appendix No. 5 to the report) has shown that the area of the planned project does not constitute an above-average habitat for breeding avifauna.

It is assessed that the predicted impacts identified above will be mostly short-term and spatially limited. No significant loss of biodiversity is predicted as a result of construction works. It should be emphasized that the fauna, flora and vegetation sites indicated in the environmental survey of the Widuchowa Commune are located outside

the area of the planned works (the sites include wooded or wet areas which are excluded from the project).

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

Impacts on flora and fauna will be comparable to the option for which the applicant has a decision on environmental conditions. It should only be pointed out that the requested option increases the area of roads that are planned within the arable land. This option, however, does not allow the road to cross the proposed "Oczko Żarczyńskie" ecological site (running the road through the eastern border of the proposed ecological site involved removing a 5 m wide strip of vegetation – there are elderberry bushes and one oak tree in this place).

7.1.8. Legal forms of nature area protection

Characteristics of each area covered by legal protection are presented in Chapter 4 of the report.

Las Baniewicki Natura 2000 site

The "Las Baniewicki" Natura 2000 site is located outside of the planned wind farm area. However, the nearest turbine will be located only about 250 m from the border of Natura 2000 site, and one of the planned access roads on the section of about 150 m runs at the border of Natura 2000 site (in the option for which the decision on environmental conditions was issued the road ran at the border of Natura 2000 site on the section of about 650 m).

The most important threats to the Natura 2000 site (according to the Standard Data Form) are largely related to poor forest management.
It should be strongly emphasized that the construction stage does not involve any threats to the Natura 2000 site, as indicated in the standard data form.

During the field works, it was found that the arable field is plowed practically to the very border of the forest.

It has been assessed that the execution of the project will not result in the loss/destruction of valuable natural habitats within the boundaries of the Natura 2000 site. Works related to the construction of the wind farm will be carried out outside this Natura 2000 site – they will be carried out on agricultural land, characterized by low natural values. Earlier in the report it was indicated that the impact associated with the construction of the wind farm will be spatially limited – no change in habitat conditions in adjacent areas is

predicted, in particular:

- no physical destruction of habitats of natural value is expected – the wind turbines (and the accompanying infrastructure) will be built on agricultural land; valuable habitats within the Natura 2000 site are associated with forest areas, while the wind turbines will be built on arable land;
- no indirect impact on neighboring habitats is expected – first of all, there will be no change in groundwater relations, which, to a large extent determine the functioning of habitats within the boundaries of the Natura 2000 site;
- no indirect impact on neighboring habitats valuable from the point of view of nature is expected – the construction of the wind park is not associated with the introduction into the environment of substances that could contaminate the areas within the boundaries of the Natura 2000 site (primarily substances that pose a threat to the aquatic and groundwater environment).

The assessment of the impact on particular habitat types, for which the Las Baniewicki Natura 2000 site was designated, shows that a significantly negative impact on this area related to the construction stage can be ruled out – in particular it can be ruled out that the construction of the project will:

- deteriorate the condition of natural habitats or habitats of species of plants and animals for which the Natura 2000 site was designated;
- deteriorate the integrity of the Natura 2000 site or its connections with other areas.

Other area legal forms of nature protection

Due to the significant distance (minimum 3 km) of the works being conducted from:

- "Dolina Dolnej Odry" Natura 2000 site (SPA)
- "Dolna Odra" Natura 2000 site (SAC)

and the spatially limited impact associated with the construction stage, any negative impact on these area-related legal forms of nature protection can be ruled out. In particular, the risk of direct or indirect destruction of natural habitats should be excluded.

It should be emphasized that the wind turbines and access roads will be located on agricultural land and the construction works will cause neither direct nor indirect damage to natural habitats located outside the site.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact on territorial legal forms of nature protection will be comparable to the

option for which the applicant holds the decision on environmental conditions.

In the case of Natura 2000 site "Baniewicki Las", one of the planned access roads, in the option for which proceedings are underway, runs along a section of about 150 m at the border of Natura 2000 site, while in the option for which a decision on environmental conditions was issued, the road runs along the border of Natura 2000 site on a section of about 650 m.

7.1.9. Proposed legal forms of nature protection

Characteristics of each area proposed for legal protection are presented in Chapter 5 of the report.

It should be noted that despite the fact that new forms of nature protection were proposed 7 years ago, they have not been established to date. If established, all potentially implemented prohibitions will apply only within the boundaries of the proposed forms of nature conservation.

Proposed local nature conservation site "Oczko Żarczyńskie"

Wind turbines will be located outside of the boundaries of the proposed local nature conservation site (the nearest two turbines will be located at a distance of about 200 m from the boundaries of the area, however, most of the turbines will be located at a much greater distance – more than several hundred meters). One of the roads (for a distance of about 300 m) will run along the boundaries of the proposed local nature conservation site.

It has been assessed that the execution of the project will not involve any loss/destruction of valuable natural habitats within the boundaries of the proposed local nature conservation site. All works (except for road construction on the section of approx. 2–4 m) associated with the construction of the wind farm will be conducted outside the boundaries of the proposed local nature conservation site – the works will be conducted on agricultural land (arable land), characterized by low natural values. Earlier in the report it was indicated that the impact associated with the construction of the wind farm will be spatially limited – no change in habitat conditions in adjacent areas is predicted, in particular:

- no physical destruction of habitats of high natural value is expected – the wind turbines plants (and the accompanying infrastructure) will be built outside wetlands, wooded and forested areas;
- no indirect impact on neighboring habitats is expected – first of all, there will be no change in groundwater relations, which determine the functioning of habitats

within the boundaries of the proposed local nature conservation site;

- no indirect impact on neighboring habitats valuable from the point of view of nature is expected – the construction of the wind park is not associated with the introduction into the environment of substances that could contaminate the areas within the boundaries of the proposed local nature conservation site (primarily substances that pose a threat to the aquatic and groundwater environment).

Wetlands protected landscape area proposed for establishment

The protected landscape area proposed for establishment is outside of the boundaries of the proposed wind farm. However, the nearest wind turbine will be located approx. 100 m from the boundaries of the proposed protected landscape area. However, it should be noted that further wind turbines are located approximately 400 m away, and by far the majority of the wind turbines will be located more than 1 km from the boundary of the proposed protected landscape area.

A threat to the area is drying (drainage), location of waste landfills, cutting down trees, liquidation of vegetated ecotones. The environmental survey of the Widuchowa municipality recommended to leave the area as it is, prevent drainage and lowering of water levels by blocking drains in ditches.

It has been assessed that the execution of the project will not involve any loss/destruction of valuable natural habitats within the boundaries of the proposed protected landscape area. All works related to the construction of the wind farm, will be carried out outside the boundaries of the proposed protected landscape area – the works will be carried out on agricultural land (arable land), characterized by low natural values. Earlier in the report it was indicated that the impact associated with the construction of the wind farm will be spatially limited – no change in habitat conditions in adjacent areas is predicted, in particular:

- no physical destruction of habitats of natural value is expected – the wind turbines (and the accompanying infrastructure) will be built on agricultural land; valuable habitats within the boundaries of the proposed protected landscape area are associated with wetlands (mainly local nature conservation sites), while the wind turbines will be built on arable land;
- no indirect impact on neighboring habitats is predicted – first of all, there will be no change in soil and water relations, which determine the functioning of natural habitats within the proposed protected landscape area;
- no indirect impact on neighboring habitats valuable from the point of view of nature is expected – the construction of the wind park is not associated with the introduction into the environment of substances that could contaminate the areas

within the boundaries of the proposed local protected landscape area (primarily substances that pose a threat to the aquatic and groundwater environment).

It should also be emphasized that the ecological barrier (indicated in the environmental survey of the Widuchowa municipality) separating the wind park from the proposed protected landscape area is the paved road Wilcze–Żelechowo. This barrier affects mainly amphibians. In the case of birds, the areas in the immediate vicinity can be considered less attractive than the areas further inland.

Proposed landscape-nature complex "Widuchowskie bagna"

The landscape-nature complex proposed for establishment is located outside of the boundaries of the proposed wind farm. However, the nearest turbine will be approximately 150 m from the boundaries of the proposed complex.

A threat to the site is a change in water relations. In the environmental valuation of the Widuchowa Municipality it was recommended to leave the area in its present state (first of all, not to change the water relations).

It has been assessed that the execution of the project will not involve any loss/destruction of valuable natural habitats within the boundaries of the proposed protected landscape area. All works related to the construction of the wind farm, will be carried out outside the boundaries of the proposed complex – the works will be carried out on agricultural land (arable land), characterized by low natural values. Earlier in the report it was indicated that the impact associated with the construction of the wind farm will be spatially limited – no change in habitat conditions in adjacent areas is predicted, in particular:

- no physical destruction of habitats of natural value is expected – the wind turbines (and the accompanying infrastructure) will be built on agricultural land; valuable habitats within the boundaries of landscape-nature complex are associated with wetlands (mainly local nature conservation sites), while the wind turbines will be built on arable land;
- no indirect impact on neighboring habitats is predicted – first of all, there will be no change in soil and water relations, which determine the functioning of natural habitats within the proposed landscape-nature complex;
- no indirect impact on neighboring habitats valuable from the point of view of nature is expected – the construction of the wind park is not associated with the introduction into the environment of substances that could contaminate the areas within the boundaries of the proposed landscape-nature complex (primarily substances that pose a threat to the aquatic and groundwater environment).

It should also be emphasized that the ecological barrier (indicated in the environmental survey of the Widuchowa municipality) separating the wind park from the proposed complex is the paved road Wilcze–Żelechowo. This barrier affects mainly amphibians. In the case of birds, the areas in the immediate vicinity can be considered less attractive than the areas further inland.

Proposed ecological arables in Banie Commune

The ecological arables proposed for establishment are located in the neighboring municipality and two of them are approximately 300 - 500 m from the nearest wind turbine. One of the roads will run approximately 200 m from the proposed site.

A threat to these sites is a change in water relations.

It has been assessed that the execution of the project will not involve any loss/destruction of valuable natural habitats within the boundaries of the proposed local nature conservation sites. All works related to the construction of the wind farm, will be carried out outside the boundaries of the proposed local nature conservation sites – the nearest works will be carried out at a distance of approx. 200 m – on agricultural land (arable land), characterized by low natural values. Earlier in the report it was indicated that the impact associated with the construction of the wind farm will be spatially limited – no change in habitat conditions in adjacent areas is predicted, in particular:

- physical destruction of valuable habitats is not expected – the wind turbine (and accompanying infrastructure) will be constructed on agricultural land; valuable habitats within the boundaries of the local nature conservation sites are associated with wetlands;
- no indirect impact on neighboring habitats is expected – first of all, there will be no change in groundwater relations, which determine the functioning of habitats within the boundaries of the proposed local nature conservation site in the Banie municipality;
- no indirect impact on neighboring habitats valuable from the point of view of nature is expected – the construction of the wind park is not associated with the introduction into the environment of substances that could contaminate the areas within the boundaries of the proposed local nature conservation sites in the Banie municipality (primarily substances that pose a threat to the aquatic and groundwater environment).

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

Impacts on proposed area conservation forms will be comparable to the option for which the applicant holds a decision on environmental conditions. It should only be pointed out that the option applied for in the pending proceedings abandoned the crossing by the road of the proposed ecological site "Oczko Żarczyńskie" (running the road through the eastern border of the proposed ecological site involved liquidation of a strip of vegetation about 5 m wide – in this place there are elderberry bushes and one oak tree).

7.1.10. Human health and "comfort of living"

During the construction stage, the project's potential to impact both construction workers and nearby residents should be considered.

Impact on the health of construction workers

The number of people employed on construction will be variable (up to 50 people at a time) – depending on the stage of construction. The hazard posed to people employed will be primarily accidental – difficult or even impossible to predict. However, with strict adherence to health and safety regulations, accident hazards will practically be reduced to a minimum and will not be significant.

It should be noted that the works will be supervised by a site manager or works manager, and a health and safety plan will be drawn up prior to the commencement of work to ensure that conditions are in place to minimize the impact of the project on workers employed in its construction.

Impact on the health of local residents

At the construction stage the following factors may occur to affect the health of the bystanders (mainly residents of the surrounding municipalities):

- traffic noise and noise from the operation of construction equipment;
- emissions of transport pollutants (exhaust fumes, dust from roads) and pollutants associated with the operation of construction equipment;
- accident hazards (mainly traffic related);

Impacts to bystander health will be limited spatially (primarily to the roadway environment) and temporally (to the duration of the works).

Periodic environmental nuisances associated with the investment process are not subject to standardization in environmental regulations.

It is assessed that the construction stage does not pose any above-average risk to human health and life. Its annoyance is greatly reduced, both spatially and temporally.

Impact on "comfort of life"

"Comfort of life" is not defined in current law. For the purposes of this report, it can be assumed that the "comfort of live" is diminished by the nuisances associated with the project. During the construction stage, these nuisances will include noise, caused by increased construction vehicle traffic. These will be nuisances limited primarily to existing public roads. It should be emphasized that this will be a periodic phenomenon, accompanying virtually every construction project.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the proceedings are pending on human health and "comfort of life" will be the same as the in the option for which the applicant has obtained the decision on environmental conditions.

7.1.11. Cultural and tangible assets

On the basis of the graphic sheet of the draft local development plan, it was established that within the area of the designed wind farm there are zones WII and WIII subject to archaeological site conservator protection.

The aim of the protection is to comprehensively document the relics of the prehistoric and early medieval settlement space by conducting archaeological rescue research ahead of the process of land development. The scope of the archaeological rescue research is each time determined by the Voivodeship Heritage Conservation Officer in the permit issued to the investor. If the applicable regulations and conditions specified in the relevant permits are observed, accidental negative impacts on protected sites are excluded. It should be mentioned that the aforementioned archeological sites are common to the most of Poland territory and are above all of scientific and documentation value, rather than tangible, museum or collection value.

Objects protected for historical reasons (entered in the register of historical monuments or in the preservationist records) are located in the surrounding villages and are considerably distant from the proposed wind farm (at least several hundred meters). No adverse impacts to these facilities resulting from construction activities are anticipated.

Buildings in the surrounding villages will be located several hundred meters from the planned wind turbines, so no impacts related to the construction of the wind park are anticipated.

Any works related to temporary reconstruction of the road system required to transport the structures will be carried out at the investor's expense. The scale of the work cannot

be detailed at this stage as the route of the oversize vehicles is not known – this will be determined by the road managers. The work will most likely involve properly contouring curves and intersections so that vehicles with long trailers can pass freely. Once the structure has been transported, the road system will be restored at the investor's expense.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on cultural and tangible assets will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.2. Operation stage

During the operation stage of the project, electricity will be generated (kinetic energy of the wind will be initially converted into mechanical energy and then into electrical energy according to the scheme presented in Chapter 2.1 "Basic data on the project"). The investor estimates the production of electricity at the level of about 96 thousand. MWh per year.

During the operation period, it will be necessary to maintain the wind park. During the maintenance service the technical condition of the equipment will be checked and gear and hydraulic oils will be replaced. All service work will be performed by properly trained personnel.

The operation of the devices will be constantly supervised and controlled remotely – the transmission of data and signals will take place via the Internet.

With little or no wind, wind turbines use electricity to power their internal systems. Most often, a single turbine needs an average of 30 kW of power. This is a relatively small amount of energy that has no practical environmental significance.

7.2.1. Ground surface and soil resources

During correct operation of the wind turbine complex, there will be no impact on the ground surface and on soil resources which could result in negative effects in the environment.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on ground surface and soil resources will be the same as for the option for which the applicant has obtained a

decision on environmental constraints.

7.2.2. Surface water and groundwater

During the operation stage of the wind turbines and the accompanying infrastructure, there will be a local reduction in the infiltration of rainwater and meltwater into the ground. Rainwater and thaw water will run off on the surface of the power plant foundations and will soak into the ground in the immediate vicinity (no organized method of draining rainwater is planned). Therefore, impacts on groundwater (e.g., lowering of the groundwater table) should not be predicted.

Access roads and assembly yards of the power plant will be surface drained, which will not change water relations in the area.

In the case of GPO substations, sealed oil pits under the transformer bays will protect against possible contamination associated with oil spills. Drainage of the pit will be done, through an oil separator. Possible excess rainwater from the pits under the transformers will be collected by a specialized company licensed to collect, transport and dispose of this type of wastewater. The GPZ substation will not be connected to the water and sewer system.

No domestic or industrial wastewater is expected to be generated at the operation stage.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on surface water and groundwater will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.2.3. Ambient air

The operation of the wind turbines and their accompanying infrastructure will not involve any emission of gases, dust or odors into the atmospheric air.

Wind turbines are environmentally friendly devices in terms of air pollution – they reduce the emission of gaseous and particulate pollutants into the atmosphere in the power sector.

Annual energy production is estimated to be approximately 96,000 MWh. Producing such a volume of electricity with conventional methods (in a power plant) involves the emission of pollutants in following amounts:

- SO2 emissions (installation without flue gas desulphurization): 459.4 tons

- NO2 emissions: 169.1 tons
- NO2 emissions: 96,574.6 tons
- dust emissions: 25.6 tons
- captured ash: 5,619.3 tons
- slag: 1,490 tons

Thus, it can be concluded that the wind farm in question will contribute to the improvement of air quality, including climate quality, and thus will contribute to the implementation of the 1992 United Nations Framework Convention on Climate Change and the Kyoto Protocol.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the proceedings are underway on the state of atmospheric air pollution will be the same as in the option for which the applicant has obtained the decision on environmental conditions.

7.2.4. Acoustic climate

Noise assessment criteria

Permissible environmental noise modes generated by different groups of noise sources, expressed as the indicators $L_{Aeq\ D}$ and $L_{Aeq\ N}$, are given in Table 1 of the Annex to the Ordinance of the Minister of Environment of June 14, 2007 on permissible environmental noise modes (Journal of Laws of 2014, item 112, consolidated text). The indicators $L_{Aeq\ D}$ and $L_{Aeq\ N}$ are applied in determining and monitoring the conditions of environment use in relation to one day.

For noise emitted by plants, the indicator $L_{Aeq\ D}$ refers to a reference period equal to 8 consecutive least favorable hours of the day, and $L_{Aeq\ N}$ refers to a reference period equal to 1 least favorable hour of the night.

The limit values depend on the urban function of a given area. They have been divided into 4 classes. The lowest levels are set for areas requiring intensive noise abatement and the highest levels are set for areas where noise abatement is not a critical issue. The adopted basis for the categorization of land – its urban function – clearly indicates the close relationship between protection of environment from noise and spatial development.

In light of the above ordinance, acoustically protected sites include residential areas. No environmental noise normative values are provided for agricultural land as well as

production and service areas.

The permissible environmental noise modes generated by plants are shown in Table 2.

Table 2. Permissible environmental noise modes

No.	Type of area	Permissible noise level in dB			
		Roads or railway lines		Other structures and activities being the noise source	
		$^{L}Aeq\ D$ reference time interval equal to 16 hours	$^{L}Aeq\ N$ reference time interval equal to 8 hours	$^{L}Aeq\ D$ reference time interval equal to 8 least favorable consecutive hours during the day	$^{L}Aeq\ N$ reference period equal to 1 least favorable hour in the night
1	a. Protection zone "A" - health resorts	50	45	45	40
2	a. Single-family residential areas b. Residential areas associated with the permanent or temporary presence of children and youth c. Grounds of social care centers d. Hospital grounds within urban areas	61	56	50	40
3	a. Multi-family and collective occupancy housing areas b. Farmstead areas c. Recreation and leisure areas d. Housing and services areas	65	56	55	45
4	Areas in the downtown zone of cities with the population above 100	68	60	55	45

In practical application of environmental noise protection regulations, the area to be analyzed raises many doubts. The simplest criterion for determining the extent of the site analyzed in a particular case will be to determine the impact rage of a project being a source of noise emissions (Commentary to Article 115 of the Environmental Protection Law Act, [in:] Gruszecki K., *Prawo ochrony środowiska* [*Environmental Protection Law*]. *Commentary*, LEX, 2008, 2nd ed.). The 40 dB(A) noise isoline was assumed to be the maximum impact range of the project – this is the most restrictive value specified in the currently applicable regulations. In order to determine the actual noise limit within the project impact range, legal conditions (e.g. local spatial development plans) in the area between the noise source and the 40 dB(A) isoline were analyzed.

A local spatial development plan was approved for the direct area of the planned wind farm – adopted by Resolution No. VIII/58/2011 of Widuchowa Commune Council dated June 17, 2011 on the local spatial development plan for Widuchowa Commune in the area of Żelechowo, which allocates areas for the location of a wind farm together with the technical infrastructure and impact zones.
This plan does not include any attribute within the wind turbines that would qualify the site for noise protection. On the site boundaries, the plan provides for a homestead development attribute.

The 40 dB(A) equal-loudness contour extends beyond the boundaries of the aforementioned local plan, and to the south-west, covers a fragment of the local plan adopted by way of Resolution No. XXXIV/353/2010 of Widuchowa Commune Council dated November 9, 2010 on adopting a local spatial development plan for Widuchowa Commune in the area of Żelechowo. This plan also introduces the possibility of constructing wind turbines, and does not provide for acoustically protected areas within the range of the 40 dB(A) equal-loudness contour.
In addition, the 40 dB(A) equal-loudness contour includes areas for which there are no valid local plans. Therefore, a development analysis was conducted on these areas based on the actual land use and land records. It was determined that homestead development dominates within the range of 40 dB(A) equal-loudness contour in areas not covered by any plans.

The homestead development areas were marked on a graphic sheet with the results of noise immission calculations.

Calculation of sound level A in the environment

Reduction of noise emission to the environment

The sources of noise within the wind farm will be the wind turbines and the customer GPO substation.

The acoustic power level of the new substation will be approximately 80 dB (directly at the MV/110 kV transformer). Taking into account the low acoustic power level of the station, it can be estimated that the designed customer GPO substation will have no impact on the acoustic climate, nevertheless, it has been included in further calculations.

This report focuses on noise generated by wind turbines, which will shape the acoustic climate over a significant area.

In the area of the planned farm, in the option for which the investor applied, the

construction of 16 wind turbines with tower height from 100 to 140 meters is planned. The maximum acoustic power level of one wind turbine can be up to 107 dB(A) (at the least favorable wind speeds). It will be possible to adjust (lower) the sound power level by appropriately adjusting the blade angle of attack to the wind direction. Thus it will be possible to reduce the sound power level of the equipment at the expense of energy production.

For the purposes of this report, it was assumed, among other things, that each wind turbine operates continuously at its nominal capacity, which in practice does not happen. Such an assumption requires the occurrence of least-favorable wind speeds throughout the reference period.

In addition, the octave spectrum for the proposed turbines shown in Table 3 was assumed for the purpose of this report.

Table 3. Turbine octave spectrum adopted at the planned wind farm

f_{oct} [Hz]	63	125	250	500	1000	2000	4000	8000
L_{WA}[dBA]	88.1	95.1	98.5	101.1	100.9	98.0	93.2	83.7

Noise calculations were performed for a 100 m high tower.

The noise that is generated in a protected area as a result of a wind turbine is referred to as noise immission. The size of the immission is determined, in principle, by the equivalent sound level A and in special cases by the maximum sound level A. All phenomena occurring between emission (noise source) and immission (receiver) are referred to as propagation.

EMISSION + PROPAGATION = IMMISSION

We understand the term propagation as factors that affect the reduction or increase of the sound level A of noise in the immission area as a result of a sound wave propagation. These requirements include:

- distance between the noise source and the immission point;
- shielding of sound waves by natural and artificial obstacles;
- reflections and deflections of the sound wave on obstacles;
- sound attenuation by dense greenery, air and ground.

In the case of a wind turbine, the main factor affecting sound propagation is the distance between the turbine rotor and the immission point in the protected area.

Methods for calculating immission levels of noise in the environment
The substantive background for performing the noise propagation forecast from the study area is *PN-ISO 9613-2 Acoustics. Attenuation of sound during propagation outdoors. General computational method*. In accordance with Appendix No. 6 to the Ordinance of the Minister of Environment of November 4, 2008 *on the requirements for performing measurements of emissions and measurements of the amount of water consumed* (Journal of Laws No. 206, item 1291), noise calculation methods must be based on the model of noise propagation in the environment contained in *PN-ISO 9613-2* standard. The basic source data for the calculation of sound levels based on the above model, described in *PN-ISO 9613-2*, are acoustic powers of noise sources (installations and equipment).

The calculations of sound immission levels in the environment during operation of wind turbines were carried out based in SoundPLAN Essiential 3.0. The calculation model adopted in the program complies with *PN-ISO 9613-2*.

Wind turbines can be treated as a point source of sound, that is, one for which each linear dimension is less than half the distance between the geometric center of the source and the nearest point of observation. The second assumption of the model is that the turbine emits acoustic energy uniformly in all directions.

The parameter characterizing a point source of sound is the equivalent acoustic power level, $L_{WA,T,}$ expressed in dB, determined on the basis of measurements, which in the case of the planned wind turbines is up to 107 dB(A). The tower height was assumed to be 100 m. It should be noted that it will be possible to adjust (lower) the level of acoustic power by appropriately adjusting the blade angle of attack to the wind direction. Thus, the acoustic power level of the equipment can be reduced at the expense of energy production.

The main factor affecting the propagation of the sound wave on the path between the source and the observation point is sound absorption by the air, which is of practical importance for distances greater than 200 m. The adopted calculation model includes an adjustment for sound absorption in the air as well as other adjustments for the presence of greenery or sound attenuation by the ground. In the case under analysis, the soil factor G=1.00 was assumed, which is characteristic for the areas occurring in the vicinity of the designed wind turbines (porous soil, grass, fields).

Results of acoustic calculations
The results of the noise level calculations are shown graphically in the figure attached

as Appendix No. 8 to the report. Calculations were performed at an altitude of 4 m above sea level. In the figure, the projected acoustic impact range of the planned wind turbines is shown using noise isolines of 40, 45, and 50 dB(A).

With simultaneous operation of all 16 wind turbines included in the application, the permissible daytime or nighttime noise modes are not exceeded.
There are no acoustically protected areas at all within the boundaries of the 45 dB(A) isophone. Homestead development areas, for which the permissible noise mode is 55 dB(A) during the day and 45 dB(A) at night, dominate between the equal-loudness contours of 45 dB(A) and 40 dB(A).

A 100 m high tower and the maximum assumed sound power level of the wind turbine of 107 dB(A) were assumed for the calculations – according to data provided by the investor and the spectrum presented in Table 3. It should be emphasized that the results of noise immission may be distributed differently if these parameters are changed (for example, in general, the higher the tower, the smaller the impact on the acoustically protected areas). It is in the interest of the investor to perform additional calculations after selecting a specific turbine model.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The option for which the decision on environmental constraints was issued assumed the construction of a wind turbine with an acoustic power up to 106.5 dB(A). Calculations in the report prepared for the previous procedure were made without including the spectrum – they were overstated and less precise.

The current calculations give results comparable to those performed during the first administrative procedure.

7.2.5. Infrasound

Infrasound can be defined as sound or noise the frequency spectrum of which is between 1 Hz and 20 Hz. Therefore, it does not fall within the range of noise audible to humans.

In terms of sources, infrasound can be divided into two groups:

- natural – bolides, sea waves, large waterfalls, high winds, lightning, tornadoes;
- artificial – heavy motor vehicles, bridge vibrations, explosions, loudspeakers, pipelines, or wind turbines.

With regard to artificially produced infrasound, the term infrasound noise exists, and its

frequency ranges between 10 and 250 Hz.

Wind turbines, due to the nature of their operation and requirements regarding adequate wind power, are also a source of infrasound noise, which according to many common and untrue opinions reaches high levels and poses a threat to the environment.

The absence of harmful infrasound emissions from wind turbines is confirmed by research. Dr Ryszard Ingielewicz and Dr Adam Zagubień from the Koszalin University of Technology performed measurements and analysis of acoustic phenomena related to infrasound accompanying the operation of wind turbines. The measurements were performed on a wind farm composed of nine VESTAS V80 – 2.0 MW OptiSpeed wind turbines. Due to the lack of criteria for assessing infrasound noise in the natural environment, they concluded – using the criteria for workplaces – that the operation of wind turbines is not a source of infrasound levels that can be harmful to human health. Even more so because wind turbines are located at distances of several hundred meters from residential buildings. At a distance of 500 m, the values obtained reached a maximum of 82.7 dB (Lin) and 78.4 dB G and were practically close to background levels.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the infrasound immission procedure is pending will be the same as for the option for which the applicant has obtained the decision on environmental constraints.

7.2.6. Electromagnetic field

Introduction to the electromagnetic field theory

The electromagnetic field is a particular form of energy, composed of two inextricably linked components – an electric field and a magnetic field. The electromagnetic field is distinguished by its continuity of distribution in space, its ability to propagate in a vacuum, and its exertion of force on charged particles of matter.

The basic quantities that characterize the electromagnetic field include:

- f – field frequency [Hz];
- E – intensity of the electric component [V/m];
- H – intensity of the magnetic component [A/m].

The sources of electromagnetic field, occurring in the environment, can be divided into two types:

- natural (natural radiation from the Earth, Sun and ionosphere);
- artificial (electrical equipment, radio and television broadcasting stations, cell phone base stations, radiolocation equipment, radio navigation equipment).

Of particular interest, due to their universality, are artificial sources of 50 Hz electromagnetic field, mainly electrical devices. The specific nature of the electromagnetic field generated by such devices means that its electrical and magnetic components can be considered separately. A magnetic field accompanies every current flow, and an electric field occurs wherever there is an electric voltage.

Permissible values for physical parameters of electromagnetic fields in the environment

The permissible values for physical parameters of electromagnetic fields are defined in the Ordinance of the Minister of Environment of October 30, 2003 on admissible electromagnetic field levels in the environment and examination methods for maintaining these levels (Journal of Laws No. 192., item 1883).

This Ordinance differentiates permissible levels of electromagnetic fields for:

- areas designated for residential development;
- places that are accessible to the public (such areas include all agricultural and field crops areas – people can stay in these areas, do field work, locate facilities for business purposes, etc.).

In residential development areas, the 50 Hz electric field strength cannot exceed 1 kV/m, and the magnetic field strength cannot exceed 60 A/m.

In areas accessible to the public, the 50 Hz electric field strength cannot exceed 10 kV/m and the magnetic field strength cannot exceed 60 A/m.

Protection of people against electromagnetic fields

The protection of people and the environment against radiation of electromagnetic fields with a frequency of 50 Hz, generated by power substations and high voltage lines, is based on the designation of protection zones around these structures.

In the case of the magnetic component, the magnetic field strength cannot exceed 60 A/m for both residential areas and areas where people are temporarily allowed to stay.

There are two protection zones for the electrical component:

- first level protection zone – it includes areas where the electric field strength

exceeds 10 kV/m. It is forbidden for people to stay in this zone. This zone occurs only very close to high voltage components. Practically, only power sector workers performing works in the area inside the Main Power Supply Point, directly at the sources of radiation, can be in this zone;

- second level protection zone – it includes areas where the electric field strength is between 1 and 10 kV/m. People are allowed to temporarily stay in this zone. However, residential buildings, schools, hospitals, etc. cannot be located in this zone. For example, workshops, farm fields, etc. may be located in this zone.

Staying in areas where the electric field does not exceed 1 kV/m and the magnetic field does not exceed 60 A/m is not subject to any restrictions.

Further in the report the area where E > 10 kV/m or H > 60 A/m will be treated as level 1 zone, while the area where 1.0 kV/m < E < 10.0 kV/m and H < 60 A/m will be treated as level 2 zone.

Impact of the designed GPZ substation

For properly built (in accordance with applicable regulations) substations (GPZ), only areas inside the substation are classified as the 1st level protection zone. Outside, beyond the substation fence, in practice there is not even a level 2 protection zone.

The above statement is confirmed by research conducted in recent years, among others by Provincial Inspectorates of Environmental Protection. This statement is also confirmed by electromagnetic field calculations performed for more advanced projects of GPZ substations (those for which the investor held a detailed design of the substation at the stage of obtaining the decision on environmental constraints), presented in environmental impact reports prepared by EKOZAPAS Pracownia Ochrony Środowiska (e.g. the GPZ substation at the wind farm in Zaleskie, Ustka Commune, the GPZ substation at the wind farm in Wicko, Wicko Commune).

It is worth citing here the results of research conducted by the Voivodship Inspectorate of Environmental Protection, published in the work of the Chief Inspectorate for Environmental Protection "Electromagnetic fields in the environment – description of sources and research results" (2007). The study indicated that *"Higher magnetic field intensity levels are primarily applicable to measurements around sources of strong magnetic field, which include power lines and substations rated 110 kV and above. The highest value of the magnetic field intensity – 27.5 A/m, (which corresponds to 45.8% of the permissible standards defined for places accessible to the public) was measured in 2005 by the laboratory of the Mazovian Voivodeship Inspectorate of Environmental Protection for the power line with a rated voltage of 400 kV, Miłosna –*

Płock traction. In 2006, the highest value of magnetic field strength 12.9 A/m (21.5% of the permissible standards for places accessible to the public), was obtained for high-voltage 220 V and 110 kV traction...
...The highest measured value of electric field strength in 2005 was 5.03 kV/m (50.3% of the permissible standards for places accessible to the public), and in 2006 it was 4.85 kV/m (48.5% of the permissible standards for places accessible to the public). Both measured highest values of electric field strength were obtained by the Lublin WIOŚ laboratory for the 400 kV power line".

At the current stage (before obtaining the decision on environmental constraints and drawing up the building permit design of the substation), in order to assess the environmental impact of the planned GPZ substation, it is sufficient to analyze the presented information on electromagnetic field in terms of the location of the planned substation.

The designed substation will be a typical customer substation used in wind farms. The plot on which it will be built is currently agricultural land. Neighboring lands are used in the same manner. The nearest development is about 700 meters away. The above-mentioned data on electromagnetic field and the fact that the substation is located at a considerable distance from residential development guarantee that the planned GPZ substation does not pose a threat connected with electromagnetic radiation.

Impact of the designed wind turbines

Analyses, simulations and measurements carried out in Poland and globally have shown that high-voltage transformer stations along with overhead line outlets are the only components of wind turbine complexes capable of generating field levels that are significant from the point of view of environmental protection.

The main electromagnetic field sources directly associated with a wind turbine are the wind turbine generator and the output transformer. All of these wind turbine components operate at low voltage. Medium voltage, which is transferred to the cable network, is present only at the transformer output.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the electromagnetic field procedure is pending will be the same as for the option for which the applicant has obtained the decision on environmental constraints.

7.2.7. Vibrations

Vibration is low-frequency acoustic vibration propagating in solid media. The effects of vibration on human health are recognized, mainly in connection with vibration at workplaces in heavy industry. However, the Polish law lacks regulations concerning the impact of mechanical vibration on the environment or normative values defining the permissible values of vibration transmitted to the environment.

At the stage of the wind farm operation, very low-frequency vibration associated with the rotation of the turbine blades may penetrate into the environment. This vibration, once it penetrates the tower structure, can get into the ground and propagate in the nearest environment. However, it should be emphasized that present-day wind turbine constructions are equipped with specialized systems compensating and minimizing the impact of vibration on the environment. In addition, locating the wind turbines at a distance of several hundred meters from developed areas will make the vibration generated by operating wind turbines practically imperceptible and in no way harmful to people and buildings.

Given the considerable distance of the wind turbines from buildings and structures, it can be concluded that they will not have any noticeable impact on either the structure of buildings or human health. The propagation of vibration in the ground is greatly impeded, and its amplitude decreases significantly as the distance increases. Another important element resulting in a significant reduction of vibration amplitude is phase transition between the tower structure foundation and the native soil. In the vicinity of buildings located at a distance of several hundred meters from wind turbines, vibration caused by the turbines will practically not be measurable with modern measuring instrumentation.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the vibration procedure is pending will be the same as for the option for which the applicant has obtained the decision on environmental constraints.

7.2.8. Waste

In fact, the only materials that wear out during the operation of the equipment and require regular replacement during servicing will be gear oils and hydraulic oils. According to the classification in compliance with the Ordinance of the Minister of Environment of September 27, 2001 on waste catalog (Journal of Laws of 2001, No. 112, item 1206), gear oils are classified as waste with a code according to Table 4.

Table 4. Types of waste regularly generated in connection with the wind turbine operation

No.	Code	Waste type
13		Waste oils and liquid fuel waste (except for edible oils and groups 05, 12, and 19
13 01		Waste hydraulic oils
1	13 01 10*	Mineral-based non-chlorinated hydraulic oils
13 02		Waste engine, gear and lubricating oils
2	13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils

* means hazardous waste

A single wind turbine usually contains approx. 360 L (i.e. about 315 kg) of gear oil and approx. 300 L (i.e. 265 kg) of hydraulic oil.

The gear oil shall be replaced depending on the results of the inspection conducted (replacement intervals depend on the intensity of the turbine operation).
Hydraulic oil shall be replaced on average once every 5 years (depending on the intensity of the turbine operation).

The wind farm operator will outsource the gear oil change service to an external entity with appropriate permits and technical back-up facilities.

In addition, equipment may need to be replaced if turbine components fail or wear out. Also, the operation of the customer substation will be associated with the generation of a small amount of waste. The expected waste is presented in the table below:

Table 5. Types of waste expected to be generated irregularly in connection with the wind turbine operation

No.	Code	Waste type
16		Waste not included in other groups
16 02		Waste electric and electronic equipment
1	16 02 13*	Discarded equipment containing hazardous components([1]) other than those mentioned in 16 02 09 to 16 02 12
2	16 02 14	Used devices other than listed under 16 02 09 to 16 02 13
3	16 02 15*	Hazardous components or parts removed from discarded equipment
4	16 02 16	Components removed from discarded equipment other than those

* means hazardous waste

The amount of the above waste is difficult to estimate at this stage, as its generation will be the result of periodic repair and maintenance of equipment.

Pursuant to the Act on waste dated December 14, 2012 (Journal of Laws of 2013, item 21), the producer of waste generated as a result of the provision of services consisting in the construction, demolition and renovation of facilities shall be an entity rendering such a service, unless the Service Agreement provides otherwise. As the investor does not hold relevant permits for waste generation, nor does it carry out any activity in the scope of recovery or neutralization of hazardous waste, the agreements concluded will not contain any provisions stipulating that the investor is the waste producer. In consequence of the foregoing, all formalities related to the management of hazardous waste (including the obligation to obtain relevant decisions and permits), will rest with the entity to which the oil replacement service will be outsourced.

A service contractor has not been selected at the time of preparing this report. Lack of knowledge in this area is irrelevant to the evaluation because, regardless of the choice made, contractors will be required to comply with applicable waste management laws.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The amount of generated waste in the option for which the procedure is pending will be the same as in the option for which the applicant has obtained the decision on environmental constraints.

7.2.9. Flora and fauna

At the stage of operation of the wind turbine complex, there will be no negative impact on vegetation. Neither should negative impacts on animals moving on the ground be expected. In particular, it should be indicated that the planned project will not affect habitats valuable for fauna during its operation.

Due to the nature of the planned project, the potential impact on birds and bats is of the greatest significance. The assessment of impacts on these animal groups is crucial in issuing the project approval, and in this report, it was performed on the basis of monitoring studies.

7.2.9.1 Birds

The assessment of impact on birds is presented in the attached ornithological study (Appendix No. 7).

7.2.9.2 Bats

The assessment of impact on bats is presented in the attached chiropterological study (Appendix No. 7).

7.2.10. Landscape

Wind turbines are among the specific facilities. Their impact on the local landscape is undeniable and is primarily due to their very high altitudes. The wind turbine is a foreign element in the landscape. Its explicitly technical nature and height mean that it cannot be completely masked. In addition, wind turbine propellers are most often in motion, which attracts the human eye. Additionally, wind turbines, considered to be aviation obstacles, have the outer ends of their blades painted red, with the intended effect of improving visibility and thus ensuring landscape contrast of the wind turbine. Wind turbines are also visible at night because of a red light placed on top of the tower. The above mentioned features make wind turbines a kind of landscape dominant.

According to M. Gromadzki and M. Przewozniak (2002), the most important factors affecting the exposure of wind turbines in the landscape are:

- site topography;
- land use forms;
- the geometry of wind turbine arrangement and their distance from settlement units;
- wind turbine mast type (solid or truss) and turbine type;
- height of the wind turbine structure;
- colors of the structure.

The Expert Opinion on Ecological and Landscape Conditions (M. Gromadzki and M. Przewoźniak 2002) indicates that distances up to about 3 km from wind turbines are of significant importance for landscape, as at longer distances the wind turbine becomes less and less visible, which is mainly due to its narrow construction. In undulating landscape with diversified topography, a wind turbine disappears almost completely at a distance of about 6 km.
Our own observations indicate that in flat terrain, a wind turbine may be visible from greater distances (depending on the land development, including existing rows of trees and wooded areas, which significantly reduce visibility of the wind turbine).

In general, the impact of a wind farm on the surrounding landscape decreases as the distance from the project increases. On this basis, the following zones of the so-called "visual impact" of wind turbines for flat terrain were distinguished (http://www.wind-energy-the-facts.org/en/environment/chapter-2-environmental- impacts/onshoreimpacts.html; 23.08.2009):

- Zone 1 (within 2 km of the wind farm) – the wind farm is a dominant feature in the landscape. The rotational movement of the rotor is clearly visible and

perceived by people.

- Zone 2 (at a distance of 1 to 4.5 km from the wind farm in good visibility conditions) – wind turbines stand out in the landscape and are easy to spot, but are not necessarily a dominant element. The rotating movement of the rotor is visible and can attract people's eyes.
- Zone III (at a distance of 2 to 8 km from the wind farm, depending on weather conditions) – wind turbines are visible, but they are not an "imposing" element in the landscape. Under clear visibility conditions, the rotating rotor can be seen, but the turbines themselves appear relatively small against their surrounding.
- Zone IV (at a distance of more than 7 km from the wind farm) – wind turbines appear to be small in size and do not stand out in the surrounding landscape. The rotating movement of the rotor from such a distance is virtually imperceptible.

In hilly terrain these distances can be significantly lower, or higher depending on the location of the observation point and the location of the wind turbine. The wind turbines located outside the hills along the line of sight may not be visible, despite their close proximity. However, if they are located on the tops of hills, their visibility will increase.

An important, time-varying condition affecting the perception of wind turbines is the weather conditions, and most importantly the level of cloud cover (including cloud color and the direction of illumination of the wind turbine in relation to the observer). The wind turbines are much more visible in cloudless (blue sky), sunny weather.

The assessment of the impact of wind farms on the landscape (including the determination of the extent of their visibility) faces many difficulties. This is due to, among others, many variables that affect the visibility range of the wind turbine. In the case in question, the scale of expected visibility of wind turbines was assessed on the basis of landform and land cover profiles determined in the axis of selected views associated with conducting observations from the direction of selected municipalities and communication routes. The analysis performed allows the following conclusions:

- the wind park will be well visible from neighboring villages (Żarczyn, Żelechowo, Wilcze, Kłodowo) and the communication routes connecting them; the wind turbines will be well visible mainly from the outskirts of the village, as inside of the village, the visual barriers for the observers will be constituted by the existing buildings and high vegetation;
- the wind park will be clearly visible from some parts of the voivodeship road No. 122 and the poviat road between Wilcze and Żelechowo;
- visibility of the wind turbine will be considerably reduced by quite numerous forest complexes (map with a scale of 1:50,000 in Appendix 2); the fact that these

complexes are not dense and form a mosaic with open areas is also significant here;

- the wind turbines will not be visible in the Oder valley – the Oder river is more than 10 km away and at the height of the proposed farm it is screened by forests;

During the assessment of the impact of the wind turbine complex on the landscape, the following considerations were taken into account:

- the wind turbine complex will be located outside the boundaries of legal forms of nature protection established for the protection of landscape values, as well as their buffer zones (e.g. protected landscape areas, landscape parks, landscape-nature complexes); the nearest landscape park (Lower Oder Valley Landscape Park) is located at a distance of approximately 12 km – positive condition;
- the wind turbine complex will be located outside the borders of legal forms of nature protection proposed for nature protection – positive condition (nevertheless, the park will be located on the border of the proposed forms);
- the wind turbine complex will be located outside the borders of recreational and tourist resorts (including spas and resorts) – positive condition;
- the wind turbine complex will be located outside the boundaries of towns featuring outstanding historical values, where the wind turbines could disturb the perception of the outstanding panoramas of the landscape – a positive condition.

When assessing the impact of wind turbines on the landscape, it should be kept in mind that any such assessment is very complex and always partly subjective in nature, depending on personal feelings and preferences. Discussions on the aesthetics of the wind turbines allow finding both supporters of these types of projects (pointing to the simple, modern shape of the wind turbines) and staunch opponents (pointing to the size of the structures and their alien, technical character in the landscape). It should also be emphasized that so far the problem of assessing the impact of wind farms on landscape has not been legally regulated (first of all, there are no standards in this respect).

While assessing the impact of wind farms in terms of impact on landscape, it should be emphasized that, although the impact is long-term (the estimated lifetime of a wind farm is 20-30 years), the effects are fully reversible – when the farm is decommissioned (which, in technical terms, is not a complicated procedure), the landscape is restored to its previous condition.

To sum up the assessment of the impact of wind turbines on the landscape, it can be concluded that there are no formal contraindications to the construction of a wind

turbine complex at the proposed site. However, it should be remembered that the wind farm will be a significant element of landscape anthropization.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact on landscape will be comparable to the option for which the applicant has the decision on environmental constraints. A slight increase in the height of wind turbines will not have a significant impact on their perception in the landscape.

7.2.11. Legal forms of nature area protection

The characteristics of each area are presented in chapter 4. Their location in relation to the wind farm is shown in the topographic map attached as an appendix to the report.

Las Baniewicki Natura 2000 site

The previous chapters of the report have shown that the impact of the wind turbine complex will be limited territorially. The operation of the wind turbines:

- will not involve emissions of pollutants hazardous to the environment (including those posing a threat to the ground and water environment);
- will not involve significant changes in soil-water relations that affect the functioning of habitats of high natural value within the boundaries of the Natura 2000 site;
- will not cause any changes in the land use within the Natura 2000 site (which is a forest area);
- will not result in significant changes in land use in the vicinity of the Natura 2000 site (the current agricultural land use will be maintained).

Taking the above into account, no impact on the protection objective for which the Las Baniewicki Natura 2000 site was designated is forecasted. Operating wind turbines will not impact the habitats for the protection of which the area was designated.

The assessment of the impact on particular habitat types, for which the Las Baniewicki Natura 2000 site was designated, shows that a significantly negative impact on this area can be ruled out – in particular it can be ruled out that the functioning of the project:

- will deteriorate the condition of natural habitats for the protection of which the Las Baniewicki Natura 2000 site was designated;
- deteriorate the integrity of Natura 2000 Las Baniewicki site or its connection to other sites (the planned wind farm will be located outside the boundaries of ecological corridors ensuring the integrity of Natura 2000 network).

"Dolina Dolnej Odry" Natura 2000 site (SPA)

A detailed assessment of impact on birds was conducted in the ornithological study attached to the report. The assessment was based on annual monitoring data. The assessment of the impact on birds is provided in appendix 7 to the report.

The assessment shows that the implementation of the project option proposed in this report will not significantly affect the "Dolina Dolnej Odry" Natura site. It has been assessed that the operating wind turbines will neither impact the habitats nor the bird species for the protection of which the site was established.

The planned project will not impair the integrity of the "Dolina Dolnej Odry" Natura 2000 site or its connections with other areas. The planned wind farm will be located outside the boundaries of ecological corridors ensuring the integrity of Natura 2000 network.

"Dolna Odra" Natura 2000 site (SAC)

The Natura 2000 site is quite far from the planned project – about 5 km. Earlier in the report, it was assessed that the impact of the wind turbine will be spatially significantly limited (only the impact on the landscape will cover a larger area). Given a significant distance of the Natura 2000 site from the planned wind farm, any impact (direct and indirect) on natural habitats can be excluded.

The species for which the Dolina Dolnej Odry Natura 2000 site was designated include bats:

- Barbastelle *Barbastella barbastellus*
- Pond bat *Myotis dasycneme*
- Greater mouse-eared bat *Myotis myotis*

None of the bat species listed above were found during the annual bat monitoring (Appendix No. 7). On this basis, a negative impact of the planned wind farm on the bat species, for whose protection the "Dolna Odra" Natura 2000 site was designated, can be excluded.

Due to the project nature and the distance from the Natura 2000 site, a negative impact on other animal species (mammals, reptiles, amphibians, fish and invertebrates) can also be excluded.

The planned project will not deteriorate the integrity of the "Dolna Odra" Natura 2000 site or its connections with other areas. The planned wind farm will be located outside the boundaries of ecological corridors ensuring the integrity of Natura 2000 network.

It has been assessed that operating wind turbines will have no impact on either the habitats or species for whose protection the area was designated. Therefore, any impact on the "Dolna Odra" Natura 2000 site can be completely excluded.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on the legal forms of nature conservation for the areas will be the same as for the option for which the applicant has the decision on environmental constraints.

7.2.12. Proposed legal forms of nature protection

Characteristics of each area proposed for legal protection are presented in Chapter 5 of the report.

It should be noted that despite the fact that new forms of nature protection were proposed 7 years ago, they have not been established to date. If established, all potentially implemented prohibitions will apply only within the boundaries of the proposed forms of nature conservation.

Proposed local nature conservation site "Oczko Żarczyńskie"

Wind turbines will be located outside of the boundaries of the proposed local nature conservation site (the nearest two turbines will be located at a distance of about 200 m from the boundaries of the area, however, most of the turbines will be located at a much greater distance – more than several hundred meters). One of the roads (for a distance of about 300 m) will run along the boundaries of the proposed local nature conservation site.

It has been assessed that operation of the project will not involve loss/destruction of valuable natural habitats within the boundaries of the proposed local nature conservation site. Operation of the wind park will not involve the introduction of substances into the environment that could potentially pollute/contaminate the proposed local nature conservation site. In addition, it should be pointed out that newly constructed roads should not pose a threat to amphibians. It should be emphasized that these will be internal service roads. The traffic volume here will be negligibly low (a few travels per technical supervision month).

Wetlands protected landscape area proposed for establishment

The protected landscape area proposed for establishment is outside of the boundaries of the proposed wind farm. However, the nearest wind turbine will be located approx.

100 m from the boundaries of the proposed protected landscape area. However, it should be noted that further wind turbines are located approximately 400 m away, and by far the majority of the wind turbines will be located more than 1 km from the boundary of the proposed protected landscape area.

A threat to the area is drying – drainage, location of waste landfills, cutting down trees, liquidation of vegetated ecotones.

An earlier chapter of the report assessed that the impact of the wind turbine would be significantly limited spatially. Only the landscape impact will cover a larger area, as discussed in the next chapter of the report.
It has been assessed that the wind turbines in operation will have no impact on either the habitats or species occurring within the boundaries of the proposed protected landscape area, in particular, no change to the ground and water relations that determine the functioning of the natural habitats within the boundaries of the proposed protected landscape is predicted. In addition, it should be noted that the operation of the wind park is not associated with the introduction of substances into the environment that could contaminate areas within the boundaries of the proposed protected landscape area.

According to M. Gromadzki and M. Przewoźniak (2002), in the case of impact on landscape, distances up to about 3 km from the wind turbine are of significant landscape importance, because at longer distances, the wind turbine becomes less and less visible, which is mainly due to its narrow construction. In undulating landscape with diversified topography, wind turbines disappear almost completely at a distance of about 6 km.
It can be seen from the above that the proposed protected landscape area will be within the landscape impact of the wind park. An assessment of landscape impacts (including the nature of those impacts) is presented in the next chapter of the report. At this point it should only be emphasized that when assessing the impact of wind turbines on landscape, it should be kept in mind that each such assessment is very complex and always partly subjective in nature, depending on personal feelings and preferences. It should also be emphasized that so far the problem of assessing the impact of wind farms on landscape has not been legally regulated (first of all, there are no standards in this respect).

Given that:

- the wind park will be located outside of the borders of the protected landscape area (any prohibitions after the protected landscape area has been established will apply only within its borders);

- establishment of the protected landscape area was proposed 4 years ago and it has not been established so far so there are no legal contraindications to build a wind park.

Proposed landscape-nature complex "Widuchowskie bagna"

The landscape-nature complex proposed for establishment is located outside of the boundaries of the proposed wind farm. However, the nearest wind turbine will be located approx. 150 m from the boundaries of the proposed complex.

A threat to the site is a change in water relations. In the environmental valuation of the Widuchowa Municipality it was recommended to leave the area in its present state (first of all, not to change the water relations).

An earlier chapter of the report assessed that the impact of the wind turbine would be significantly limited spatially. Only the landscape impact will cover a larger area, as discussed in the next chapter of the report.
It has been assessed that the operating wind turbines will have no impact on either the habitats or species found within the boundaries of the proposed nature and landscape complex; in particular, no change is expected in the soil-water relations that determine the functioning of natural habitats within the boundaries of the proposed area. Furthermore, it should be noted that the operation of the wind park is not associated with the introduction of substances into the environment that could contaminate the areas within the boundaries of the proposed landscape-nature complex.

In assessing the impact on the landscape, it should be noted that the wind turbines will be highly visible from parts of the proposed landscape-nature complex. This is due to the very high height of the planned facilities and the shape of the terrain within the landscape-nature complex (these are marshy depressions).

When assessing the impact of wind turbines on the landscape, it should be kept in mind that any such assessment is very complex and always partly subjective in nature, depending on personal feelings and preferences. It should also be emphasized that so far the problem of assessing the impact of wind farms on landscape has not been legally regulated (first of all, there are no standards in this respect).

More on the impact of wind turbines on the landscape in the next chapter of the report.

Given that:

- the wind park will be located outside of the boundaries of the proposed

landscape-nature complex (any prohibitions after the complex has been established will apply only within its boundaries);

- the establishment of the complex was proposed 4 years ago and to date it has not been established

there are no legal objections to building a wind park.

Local nature conservation sites in Banie Municipality

Wind turbines will be located outside of the borders of the proposed local nature conservation sites (the nearest turbine will be located at a distance of approximately 300-500 meters from the borders of the land, however, most turbines will be located at much greater distances – more than several hundred meters).

It has been assessed that the operation of the project will not involve loss/destruction of valuable natural habitats within the boundaries of proposed local nature conservation sites in Banie Municipality. Operation of the wind park will not involve the introduction of substances into the environment that could potentially pollute/contaminate the proposed local nature conservation site.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on the proposed legal forms of nature conservation for the areas will be the same as for the option for which the applicant has the decision on environmental constraints.

7.2.13. Climate

The impact of wind turbines on the climate will be manifested by weakening of the wind force in the zone of propeller location, i.e. approximately 60-200 m above sea level. This follows directly from a law of physics: the kinetic energy of wind will be converted into mechanical energy for the generators.

Due to the height at which this phenomenon occurs, the climate impact of the wind turbine in the example described above will not be significant and can be almost completely ignored in the environmental impact assessment.

It is important to note that on an overall scale, the wind farm will positively impact the climate by reducing greenhouse gas emissions.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The climate impact of the option for which the procedure is pending will be the same as for the option for which the applicant has a decision on environmental constraints.

7.2.14. Human health and "comfort of living"

The main factors that could potentially affect human health are:

- noise – as shown in Section 7.2.4, acceptable noise levels during both daytime and nighttime hours will not be exceeded even if all 16 wind turbines covered by the application are in operation simultaneously. It should be noted that noise immission standards apply to the investor regardless of the final selection of the wind turbine model, therefore, no negative impact on human health is predicted.
- electromagnetic field – analyses, simulations and measurements carried out in Poland and globally have shown that high-voltage transformer stations along with overhead line outlets are the only elements of wind farms capable of generating field levels that are significant from the point of view of human health. In the case subject to assessment, the connection point to the national power system is unknown at the current stage.

  Neither has the investor provided information whether the connection to the NPS will require the construction of a high-voltage transformer station (the so-called GPO or GPZ). The high-voltage transformer station is not covered by the application for issuing a decision on environmental constraints, thus, is not included in this report. However, if the station is to be constructed, it should be assumed that legally permissible levels of electromagnetic field will be maintained and will not be a threat to human life or health.
- infrasound – as presented in Section 7.2.5, infrasound emitted by wind turbines is below the level audible to and sensed by humans. In addition, the location of the farm at a considerable distance from buildings and structures ensures that the potential impact of infrasound on human health is minimized. Therefore, infrasound is not expected to have an adverse effect on human health.

- vibration – as presented in Section 7.2.7, vibration caused by the operation of the wind turbines will not be sensed in the vicinity of buildings located at a distance of several hundred meters from the wind turbines.

Theoretically, one can consider an emergency situation – e.g. a construction disaster, fire, lightning strike, etc. As a result of such an emergency event, the wind turbine may tip over or a blade may fall off. The probability of such an event is very low, since the construction of the wind turbine will meet all standards in terms of load resistance (no case of a wind turbine tipping over has been reported in Poland so far). The wind

turbines will have a lightning protection system. In addition, a possible tipping over of wind turbines or falling off of blades will not threaten human settlements, which will be located at a safe distance.
It is also worth emphasizing that the wind turbines will be constructed outside areas at risk of flooding or landslides. No real earthquake risks exist either.

As emphasized earlier, the "comfort of life" is not defined in currently applicable legal regulations. For the purposes of this report, it can be assumed that the "comfort of life" is diminished by nuisances associated with a project implementation. In the case of wind farms, the "comfort of life" can be diminished by noise. However, the report shows that the noise mode will not exceed acceptable standards in this respect. There is often an allegation of interference with television and radio reception. However, it has not been proven (this phenomenon has not been observed on existing farms).

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on human health and the "comfort of life" will be the same as for the option for which the applicant has a decision on environmental constraints.

7.2.15. Cultural and tangible assets

At the stage of the wind turbine complex operation, there will be no negative impact on cultural and tangible assets.

The operation of wind turbines will not threaten buildings. In the vicinity of buildings located at a distance of several hundred meters from the wind turbines, vibration caused by the turbines will be practically imperceptible.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on cultural and tangible assets will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.3. Decommissioning stage

It is assumed that the planned wind turbines will operate over a period of approximately 20 to 30 years. There is a possible option to extend the service life of the wind farm by replacing the wind turbines with ones based on a more recent technology.

If the wind farm is completely decommissioned, it will be necessary:

- remove the wind turbines – it seems that the most reasonable form of their management will be scrapping/recycling (it will be necessary to manage waste gear oils and hydraulic oils, which constitute hazardous waste, in an environmentally safe manner);
- remove foundations – flat foundations should be demolished at least to an estimated depth of 1 m (foundation pits should be reclaimed);
- eliminate technical infrastructure, including access roads and assembly yards (the land will have to be reclaimed).

7.3.1. Ground surface and soil resources

If the project is decommissioned, the foundations, utility yards and access roads will be removed. Remediation (including restoration of the soil layer) will be required, leading to the restoration of the original agricultural use. The foundation pits will be recultivated by filling them with loamy sand (or other material), spreading soil substrate and introducing vegetation (most likely field crops).

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on ground surface and soil resources will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.3.2. Surface water and groundwater

The individual wind turbines will be sited outside of the wetlands. Foundation removal activities will not disturb water relations in the area in question. It is also estimated that the elimination of access roads and cable lines connecting individual wind turbines will not have a negative impact on surface waters and groundwater.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on surface water and groundwater will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.3.3. Ambient air

During the decommissioning stage of the wind park, there will be fugitive emissions to the atmosphere. Sources of pollution will be machinery used during demolition work and means of transportation. It can be estimated that emissions at the project

decommissioning stage will not exceed emissions at the construction stage.

Air emissions will be time-limited and sources of pollutants will have relatively low emissions. The overall assessment is that the decommissioning stage will not have a significant impact causing increased air pollution.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on increased air pollution will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.3.4. Acoustic climate

The source of noise at the decommissioning stage will be mainly construction machinery and equipment, such as the excavator, bulldozer, lifting equipment and truck transport. The sound power level of example noise sources associated with construction activities is assumed to be:

- excavator, bulldozer: 90-105 dB(A);
- truck: 85-95 dB(A).

Given the limited operation time of these equipment, it can be concluded that the acoustic nuisance occurring during the decommissioning stage will be short-lived and will not cause significant effects on the environment. It can be assessed that the project decommissioning stage will not be a factor that could permanently threaten the acoustic environment. For work outside of urbanized areas, noise will not cause any annoyance to people.

Noise emitted to the environment during wind farm demolition works is not subject to standards determining the permissible noise levels in the environment, however, the investor is obliged to minimize the negative impact of noise on the environment of the residential buildings located in the immediate vicinity of the works.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the noise immission procedure is pending will be the same as for the option for which the applicant has obtained the decision on environmental constraints.

7.3.5. Vibrations

At the project decommissioning stage, vibration will be caused by demolition works, in particular crushing of foundations. The nuisance of this work will be comparable to typical jackhammer work often conducted in developed areas. Due to the distance of the development from the wind turbine towers (several hundred meters), it is not expected that the demolition stage will have any negative impact on the structure of buildings and people.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the vibration procedure is pending will be the same as for the option for which the applicant has obtained the decision on environmental constraints.

7.3.6. Waste

The decommissioning stage will involve the generation of considerable quantities of waste, which must be collected separately and then managed in accordance with applicable regulations. Under current legislation, the generator of waste resulting from the provision of demolition services is the entity that provides the service, unless the contract for the provision of services concluded between the contractor and the investor provides otherwise. A service contractor has not been selected at the time of preparing this report. Lack of knowledge in this area is irrelevant to the evaluation because, regardless of the choice made, contractors will be required to comply with applicable waste management laws.

As a result of demolition works, the following types of waste may be generated (according to the classification in accordance with the Ordinance of the Minister of Environment of September 27, 2001 on waste catalog, Journal of Laws of 2001, No. 112, item 1206).

Table 6. Estimated amounts of waste generated at the decommissioning stage

No.	Code	Waste type	Approximate quantity	Place and method of storage
13		Waste oils and liquid fuel waste (except for edible oils and groups 05, 12, and 19		
13 01		Waste hydraulic oils		
1	13 01 10*	Mineral-based non-chlorinated hydraulic oils	approximately 4,800 l	Special leak-tight containers
13 02		Waste engine, gear and		

		lubricating oils		
2	13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	approximately 5,800 l	Special leak-tight containers
16		Waste not included in other groups		
16 02		Waste electric and electronic equipment		
3	16 02 13*	Discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12	**	Containers/bins
4	16 02 14	Used devices other than listed under 16 02 09 to 16 02 13	**	Containers/bins
5	16 02 15*	Hazardous components or parts removed from discarded equipment	**	Containers/bins
6	16 02 16	Components removed from discarded equipment other than those mentioned in 16 02 15	**	Containers/bins
17		Waste from construction, overhaul and dismantling of buildings and road infrastructure		
17 01		Waste construction materials and components, as well as waste elements of road infrastructure		
7	17 01 01	Concrete waste and concrete debris from demolitions and renovations	approximately 20,000 m3 (assuming the dismantling of foundations to a depth of 1 m and leaving a part of the roads)	Containers
8	17 01 81	Waste from road alteration and modernization	**	Containers
9	17 01 82	Waste not otherwise specified	**	Containers/bins
17 02		Waste wood, glass and plastics		
10	17 02 03	Plastics	**	Containers/bins
17 04		Metallic and metal alloy waste and scrap		

11	17 04 05	Iron and steel	approximately 6,000 t (one wind turbine with	Some part removed directly after
			steel structure weighs approximately 410 t)	dismantling or stored on the ground and some stored in containers
12	17 04 07	Mixed metals	**	Containers/bins
13	17 04 11	Cables other than those mentioned in 17 04 10	**	Containers/bins
17 06		Insulation and construction materials containing asbestos		
14	17 06 03*	Other insulation materials containing hazardous substances	**	Containers/bins
15	17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	**	Containers/bins
17 09		Other construction, overhaul and demolition waste		
16	17 09 03*	Other construction, overhaul and demolition waste (including mixed waste) containing hazardous substances	**	Containers/bins
17	17 09 04	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	**	Containers/bins

* means hazardous waste

** at the current stage, it is not possible to determine the amount of waste – it will depend on the method of conducting demolition works (e.g. which elements will be disassembled on site and which after handing over the wind turbine to the next entity); the amount of waste with particular codes will also depend on the qualification made by the company conducting demolition works

Provided that the rules for environmental protection and separate waste collection and transfer thereof to an authorized entity for recovery or disposal are observed, no negative impact on the environment is forecasted.

Some of the waste will be a valuable material (e.g. iron and steel) that can be transferred to a recycler for a fee.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The amount of generated waste will be comparable to the option for which the applicant has a decision on environmental conditions.

7.3.7. Flora and fauna

Impact on biotic environment will be similar to that at the construction stage – provided that the current agricultural land use is maintained in the remaining area during the operation of the farm. The impact will be manifested through:

- local damage to or removal of vegetation, represented mainly by agrocenoses, in places where equipment for demolition and temporary accumulation of dismantled elements of the wind park are located.
- migration of some fauna species due to noise and increased human presence. The migration will be temporary and it should be expected that it will occur to neighboring areas.

The above predicted impacts, taking into account the biotic structure of the immediate investment area, will be short-term and spatially limited. On an overall scale, they will not be significant and will not involve a significant loss of biodiversity.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on flora and fauna will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.3.8. Landscape

The decommissioning phase will have no lasting impact on the landscape. In case of decommissioning, the landscape will be restored to its original state (assuming that the appearance of the surroundings will not change significantly during the operation of the farm).

Comparison of the impact with the option for which the applicant holds the decision on environmental conditions

The impact of the option for which the procedure is pending on the landscape will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.3.9. Legal forms of nature area protection

Characteristics of each area covered by legal protection are presented in Chapter 4 of the report.

Las Baniewicki Natura 2000 site

The "Las Baniewicki" Natura 2000 site is located outside of the planned wind farm area.

The most important threats to the Natura 2000 site (according to the Standard Data Form) are largely related to poor forest management.

It should be strongly emphasized that the project decommissioning stage does not involve any threats to the Natura 2000 site, as indicated in the Standard Data Form.

It has been assessed that the decommissioning of the project will not result in the loss/destruction of valuable natural habitats within the boundaries of the Natura 2000 site. Works related to the demolition of the wind farm will be carried out outside this Natura 2000 site – they will be carried out on agricultural land, characterized by low natural values.

Other area legal forms of nature protection

Due to the significant distance (minimum 3 km) of the demolition work being conducted from:

- "Dolina Dolnej Odry" Natura 2000 site (SPA)
- "Dolna Odra" Natura 2000 site (SAC)

and the spatially limited impact associated with the decommissioning stage of the project, any negative impact on these area-based legal forms of nature conservation can be ruled out. In particular, the risk of direct or indirect destruction of natural habitats should be excluded.

Comparison of the impact with the option for which the applicant holds the decision on environmental conditions

The impact of the option for which the procedure is pending on the legal forms of nature conservation for the areas will be the same as for the option for which the applicant has the decision on environmental constraints.

7.3.10. Proposed legal forms of nature protection

Virtually all of the proposed areas for legal protection are outside the planned project site. Only in the case of the proposed ecological area "Oczko Żarczyńskie", one of the roads will pass directly by its boundary.

Impacts associated with the decommissioning stage will be similar in nature to those associated with the construction stage. It has been assessed that there will be no change in habitat conditions within the boundaries of the proposed forms of nature conservation during decommissioning of the project, in particular:

- no physical destruction of habitats of natural value is forecast;
- no indirect impacts on neighboring habitats are expected – first of all, there will be no change in soil-water relations, which most often determine the functioning of habitats within the boundaries of the proposed forms of nature protection;
- no indirect impact on neighboring habitats valuable from the point of view of nature is forecast – the decommissioning of the wind park is not associated with the introduction into the environment of substances that could contaminate the areas within the boundaries of the proposed forms of nature protection (primarily substances that pose a threat to the aquatic and groundwater environment).

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

Impacts on proposed area conservation forms will be comparable to the option for which the applicant holds a decision on environmental conditions. It is only necessary to point out that in the option for which the application was submitted within the pending procedure, it was decided that no road will run through the proposed ecological area "Oczko Żarczyńskie".

7.3.11. Human health

The decommissioning stage will have a similar impact to that at the construction stage. Impacts to human health will result primarily from truck traffic (removal of wind turbine structures from the area, hauling crushed concrete from foundation demolition and hauling soil to reclaim the foundation area). The following human health impacts may occur:

- traffic noise and noise from the operation of construction equipment;
- emissions of transport pollutants (exhaust fumes, dust from roads) and pollutants associated with the operation of construction equipment;
- accident risk.

With strict adherence to occupational health and safety regulations, any health risks for demolition workers (up to 15 people working at the same time) will be practically reduced to a minimum and will not be significant.

Impacts to bystander health will be limited spatially (primarily to the roadway

environment) and temporally (to the duration of the works).

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on human health will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

7.3.12. Cultural and tangible assets

The demolition works will leave no impact on cultural assets and no significant impact on tangible assets.

Comparison of the impact with the option for which the applicant holds a decision on environmental conditions

The impact of the option for which the procedure is pending on cultural and tangible assets will be the same as for the option for which the applicant has obtained a decision on environmental constraints.

8. Proposal of the most environmentally beneficial option

Chapter 2.2 of the report presents the project option that was originally intended by the investor – before the annual monitoring of birds and bats was performed.

This report assesses a reasonable alternative option – one in which a part of the farm north-west of Żarczyn (“Lubicz” sector) is abandoned (Fig. 2).

The option ultimately proposed for implementation incorporates the comments and recommendation of the proposed ornithologist and chiropterologist, including:

- resignation from one of the turbines planned for location in the north-eastern corner of the sector Żelechowo, by the planned local nature conservation site "Żarczyńskie Oczka" (Fig. 2),
- moving the turbine adjacent to "Żarczyński Oczek" to a distance of 200 m from the edge of the projected local nature conservation site (Fig. 2).

Given that the investor, at the consultation stage before submitting the application for the issuance of the decision on environmental conditions, implemented the recommendation resulting from the monitoring of birds and bats, it can be concluded that the finally proposed project option is also the most beneficial for the environment.

9. Diagnosis of potential significant impacts of the designed project on the environment and a description of forecasting methods applied

9.1. Impacts resulting from the existence of the project, including cumulative impacts

This section summarizes the assessment and divides impacts into direct, indirect, secondary, short-term, medium-term, long-term, permanent, and temporary ones.

Direct impact – impact associated with the construction, operation and decommissioning stages of the project. This impact is described in Section 7 of this report.

Indirect impact – this impact is described in Sections 7 and 2.2 of this report, where the amount of pollutants that will not be introduced into the environment in case of increased production of the so-called clean energy is presented.

Secondary impact – this impact was omitted in the report because no secondary environmental impacts are anticipated.

Short-term impact – impact associated with the construction and decommissioning stages of the project. This impact is described in Sections 7.1 and 7.3.

Medium-term impact – this impact was omitted in the report – it is assessed that the construction and decommissioning stages of the project will result in a short-term impact, and the operation stage will result in a long-term impact.

Long-term impact – impact associated with the operation of the project (a period of approx. 20 to 30 years). This impact is described in Section 7.2 of this report.

Permanent impact – this impact is described in Section 7.2 of the report. The wind turbines are assumed to operate continuously and therefore their environmental impact (e.g. noise emissions, landscape impact) will be permanent.

Temporary impact – this impact is described in Sections 7.1 and 7.3 of this report – it will be associated with construction and demolition works.

Cumulative impact

When assessing the cumulative impact, existing wind farms and wind farms planned for construction within a radius of up to 10 km from the assessed wind farm were analyzed.

When analyzing wind farm construction plans, first of all, already issued decisions on environmental constraints (or pending administrative proceedings in this respect) were taken into account.

Planned farms in the vicinity are marked on the map enclosed as Appendix No. 10 to the report. They have been numbered and basic information about each wind farm (as of July 2014) is provided below:

1. Widuchowa Commune – a wind farm planned near Żelechowo – an application for issuing a decision on environmental constraints for 8 wind turbines has been submitted.
2. Banie Commune – a wind farm planned in the area of several villages – a decision on environmental constraints for 46 wind turbines has been issued.
3. Banie Commune – a wind farm planned near Dłużyna – an application for issuing a decision on environmental constraints for 16 wind turbines has been submitted;
4. Banie Commune – a wind farm planned near Piaseczno – an application for issuing a decision on environmental constraints for 4 wind turbines has been submitted;
5. Chojna Commune – a wind farm planned near Grzybno – an application for issuing a decision on environmental constraints for 12 wind turbines has been submitted;
6. Widuchowa Commune – a wind farm planned near Bolkowice – a negative decision on environmental constraints for 9 wind turbines has been issued; an appeals procedure is pending;

Assessment of cumulative impact in terms of noise immission
A possible cumulative impact of wind farms in terms of noise immission can occur for two wind farms located at a relatively close distance of 1.5-2.5 km (depending on the turbines' placement, their height and acoustic power level). In this case, there may be noise accumulation (to the extent relevant to environmental noise protection, i.e., in the noise range greater than 40-45 dB).

In the case of the wind farm subject to assessment, a wind farm composed of 8 wind turbines is planned at a distance of approx. 1 km. Administrative procedure on issuing a decision on environmental constraints is pending for this farm.
If this farm is constructed, investors will be required to control the operation of the wind turbines in such a way as to meet noise immission standards.

Taking the above into account, it can be assessed that there will not be any possible

cumulative noise impact or it will not be significant from the point of view of environmental noise protection – in accordance with the Ordinance of the Minister of Environment of June 2007, 14 on permissible environmental noise modes.

Assessment of cumulative impact on birds

As part of works connected with identification of sources, paths and effects of cumulative actions, numerous onsite inspections were made, available literature was analyzed, community interviews were conducted and legislative acts concerning changes in the way of agricultural areas management in Widuchowa Municipality and neighboring Banie Municipality were analyzed. All undertakings and plans that could have a cumulative impact together with the Żelechowo project have been identified within the project. The dominant types of impacts were then identified, and these include disruption of local migration and flights as well as loss of feeding grounds for species with strong avoidance responses. A major pathway for potential accumulation was identified: the accumulation of impacts in space. The conditions of the nearest bird area under the Natura 2000 Dolina Dolnej Odry SPA were also analyzed in order to identify components of the structure and functions of the area at risk. On the basis of the collected data, a forecast of the intensity of the expected cumulative impacts was made in terms of a possible disruption of migration and a possible loss of feeding grounds of species, including in particular the species that are protected in the nearest SPA: Dolina Dolnej Odry.

The planned wind farms in the vicinity of the Żelechowo project (up to 10 km around the site) are distributed in the form of wind turbine clusters scattered fairly evenly across the agricultural landscape.

Groupings range from 2 to 16 turbines, usually several (4-7) turbines. Spaces without turbines are left between the groupings, which will allow migratory species to migrate freely. With such a distribution of wind turbines of individual projects in the landscape, even with the implementation of all the proposed wind farm projects, including discontinued ones, the cumulative effect on migration routes should not reach a significant level of impact. Given that the main migration direction in the region of Widuchowa Municipality is north-south and migration is concentrated within the Oder valley, projects located outside of the important bird area will have little impact on the migration of most species.

This arrangement of turbine groupings does not generate the so-called barrier effect, causing an increase in the energy expenditure of migrating birds forced to significantly adjust their flight trajectory and to stop and feed more frequently. Observations made in

the area of the wind farms already operating in the region: “Wysoka I”, “Wysoka II” and “Kamionka” – wind farms reported in as-built monitoring reports indicate that most of the migrating species with large body sizes, anseriformes, including geese, which are dominant in this group, do not show an evasive reaction towards operating turbines, often flying through in the light of working rotors. Data available in the Pomeranian Ornithological Database (electronic service) prove that large flocks of whooper swans (up to 300 individuals) and even tundra swans use the area of the operating wind farm (just below the turbines in operation), which undoubtedly proves the lack of the evasive reaction in these migrating birds. It should be emphasized that no dead migrating birds have been reported on any of these operating projects to date.

In summary, the construction of the Żelechowo wind farm, even if other projects being sources of similar impact are implemented in its vicinity (Widuchowa Commune, Banie Commune and Chojna Commune), will not result in the total impact of these projects on bird species migrations being significant.

The Żelechowo project is located in open agricultural areas, poor in valuable more natural landscape elements. These are large monocultures of hectares as part of relatively intensified agriculture. The abundance of similar land around the site and around other wind farm projects will not result in the loss of significant bird feeding grounds even if all wind farm projects in the area are implemented. The closest bird sanctuary – Natura 2000 SPA Lower Oder Valley – is also rich in open agricultural areas that serve as feeding grounds for breeding and migrating species, thus, areas of the Żelechowo project as well as other projects in its immediate vicinity are not key feeding grounds for the populations of species that are the subject of protection in the SPA Lower Oder Valley. If the recommendation to change the structure of cultivation (abandonment of maize cultivation) is implemented in all projects in the vicinity, their area (including the Żelechowo project area) will not be an attractive feeding ground for migratory species (anseriformes, cranes, lapwings). In conclusion, it should be considered that the potential cumulative impacts of the wind farm projects with respect to potential loss of feeding grounds will not be significant for the nearest Natura 2000 SPA “Dolina Dolnej Odry”. Therefore, there are no scientific grounds to assume that the implementation of the Żelechowo project and other wind farm projects planned in its vicinity may adversely affect the integrity of the Natura 2000 site or its functioning.

Cumulative impact on bats

All wind turbines planned in the vicinity of the Żelechowo project are located within a large area of intensive farming, poor in linear structures (watercourses, strips of wooded areas). These areas do not serve as ecological corridors through which bat species could

freely migrate, which is evident not only from the surveys at the Żelechowo site, but also from the adjacent areas (Banie site). The main concentration of bat migration, including the *Pipistrellus sp.*, takes place within the Oder Valley, far from the wind farm projects in Widuchowa Commune and Banie Commune.

Sources of food for bats in intensively used open agricultural areas are scattered, concentrated around ponds, flowering alleys, wetlands, etc. The occupation of open areas with a large-scale cropping system and poor landscape even if all planned projects in the vicinity of the Żelechowo project are implemented will not result in a significant loss of bat feeding grounds. As a result, the combined effect of the Żelechowo project and adjacent projects will be negligible for the functioning of bat populations in the region.

9.2. Impacts resulting from the use of natural resources

During the construction stage, natural resources such as sand, gravel, etc. will be used in relatively small amounts. The impact resulting from the use of natural resources cannot be assessed at this stage as the source of origin of the raw materials is unknown (the investor has no knowledge from which entity the raw materials will be purchased). Mineral resources, used during the construction stage, will come from legal gravel pits, which operate under issued administrative decisions (licenses).

During operation, the proposed project will not involve the use of natural resources. The operation of the wind farm will lead to a reduction in coal consumption – about 10,000 tons per year.

9.3. Impacts related to potential environmental contamination

As shown in Chapter 7, "Detailed Environmental Impact Assessment of the Selected Project option", the proposed wind turbine complex will not cause significant environmental impacts associated with potential environmental contamination.

The project will not be a source of gaseous or particulate emissions to air, soil, or water.

It is estimated that noise emission, with proper control of the wind turbine operation, will not lead to exceeding of acceptable standards in this respect.

9.4. Description of forecasting methods

The starting point in the environmental impact assessment for the proposed wind farm was a description of the state of the environment. For this purpose, annual monitoring of two animal groups most exposed to potential impacts – birds and bats – was carried

out (the monitoring methodology, including the equipment used, is described in the attached ornithological and chiropterological studies).

During the fieldwork, the method used included field mapping, which involves marking objects or phenomena identified in the field on a topographic map. Cartographic analyses were also conducted to determine, among other things, the boundaries of areas under legal protection or to identify other elements and objects of potential importance from the point of view of the planned project.

A description of the environmental condition is provided in Section 3 of this report and in the attached ornithological and chiropterological study.

The following forecasting methods were used in the environmental assessment:

- environmental analogies;
- mathematical modeling;
- expert evaluation.

Environmental analogy method

Experience from other existing wind farms was used here. The impact recorded at the existing farms was referred to the projected farm, but the impact was adjusted to include the environmental conditions and parameters of the planned project. It should be noted that western countries have much more experience with wind power. Effects on birds and bats, among others, have been described in numerous scientific publications.

A mathematical modeling method;

The mathematical model is based on mathematical formulas that describe the interrelationships between variables. This forecasting method was used to determine the impact resulting from noise immission.

The noise calculation method used during the assessment was based on the mathematical model of noise propagation in the environment contained in *PN-ISO 9613-2*. The calculations of sound immission levels in the environment during operation of wind turbines were carried out based in SoundPLAN Essiential 3.0. The calculation model adopted in the program complies with *PN-ISO 9613-2*.

Expert evaluation method

The expert forecasting method relied on the knowledge and experience of experts. Such modeling included descriptively expressed reasoning relationships, described and

programmed on the basis of the knowledge and experience of the experts being the authors of the report.

This determines how the environment will respond to specific impacts and the magnitude – and most importantly the significance – of the impacts. The expert forecasting used information from existing sources and data collected through monitoring. It should be noted that the expert method was combined with the method of evaluation by analogy.

10. Assessment of the possibility of transboundary environmental impact

A transboundary impact is defined in the Convention on Environmental Impact Assessment in a Transboundary Context, drawn up at Espoo on February 25, 1991, as any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party, caused by a planned activity, the physical origin of which is situated entirely or partially within the jurisdiction of another Party.

The assessment presented in Chapter 7 "Detailed Environmental Impact Assessment of the selected project option" showed that the impact of the planned project will be limited territorially. Therefore, the possibility of cross-border environmental impact must be excluded.

11. Accident potential analysis

11.1. Serious industrial accident potential analysis

The designed group of power turbines will not be classified as a plant with increased or high risk of the occurrence of serious industrial accidents according to the quality and quantity criteria set out in the Ordinance of the Minister of Economy of April 9, 2002 on the types and quantities of hazardous substances whose presence at a plant determines qualifying the plant as an increased risk plant or a plant with high risk of the occurrence of a serious industrial accident (Journal of Laws of 2002, No. 58, item 535, as amended). Therefore, there will be no risk of a serious industrial accident within the meaning of the Environmental Protection Law.

11.2. Accident potential analysis

Wind turbines have a number of protections. The occurrence of accident associated with

damage to any of the components and stopping the wind turbine operation is not associated with environmental risk. A hazard may result from a situation where a wind turbine overturns, a piece of the turbine (e.g., a propeller) breaks off, or oil spills.

If a wind turbine overturns or a portion of it detaches, people in the immediate vicinity of the turbine may be at risk. However, it should be emphasized that such a situation is highly unlikely. Also, the nearest developed areas are at a minimum distance of over 800 m.

When assessing hazards arising from an oil spill, the likelihood of such an event is also very low.

12. Proposed actions to prevent, reduce or compensate adverse environmental impacts

In order to protect the environment, the following solutions should be implemented and the following actions should be taken:

- during the construction stage:
  - limit the size of construction sites as much as possible;
  - in order to protect small animals (e.g. reptiles or amphibians), make foundations and lay cable lines as soon as possible after excavation; if small animals enter the excavation, bring them to the surface before pouring concrete or backfilling the excavation with soil;
  - equip construction sites with means for quick collection of possible oil spills;
  - the construction site should be equipped with portable toilet cabins (e.g. TOI-TOI type);
  - apply the principle of minimal environmental interference;
  - collect waste generated separately, store in places adapted for this purpose, and afterwards hand over to authorized entities for recovery or disposal;
  - use technically efficient equipment, certified machines and devices, including high-quality equipment, meeting the requirements for equipment used outdoors in terms of noise emission to the environment;
  - perform construction works involving noise emissions only during daylight hours – between 7:00 a.m. and 8:00 p.m.;
  - switch off machines and equipment when not in use (avoid idling);

  - conduct construction works that are a significant source of noise (first of all, excavation for foundations) outside of the bird hatching season;
- at the operation stage:
  - clean up the carcasses from the area of wind fields and the nearest neighborhood on a regular basis (in autumn and winter, every week);
  - change the cropping system – abandon maize in favor of less attractive foraging crops: cereals, rapeseed, root crops. Alternatively, strictly adhere to the obligation to clean up crop residues and plow stubble immediately after harvesting;
  - service works (change of gear and hydraulic oil) should be performed in favorable weather conditions, and while performing them, the area around the wind turbine should be equipped with substances enabling to quickly collect any accidental leakages;
  - conduct periodic inspection of the technical condition of the equipment to detect irregularities and prevent technical failures;
- at the decommissioning stage:
  - remove gear oils and hydraulic oils from the wind turbine before disassembly and subject them to recovery or disposal in accordance with applicable law;
  - disassemble used wind turbines and subject them to recovery or disposal in accordance with the applicable regulations (electrical and electronic parts must be separated from the construction of the wind turbine as hazardous waste and disposed of in accordance with applicable regulations);
  - recultivate land after removal of wind turbines and access roads and restore to agricultural production;
  - use technically efficient equipment, certified machines and devices, including high-quality equipment, meeting the requirements for equipment used outdoors in terms of noise emission to the environment;
  - perform demolition works involving noise emissions only during daylight hours – between 7:00 a.m. and 8:00 p.m.;
  - switch off machines and equipment when not in use (avoid idling);

The assessment made in the report showed that the project will not have a negative impact on Natura 2000 sites. Therefore, there is no need for the report to propose measures aimed at preventing or reducing negative impacts on Natura 2000 sites, including on their integrity and coherence.

13. Analysis of the necessity of establishing a limited use area

Pursuant to the regulations of the Environmental Protection Law, if the procedure concerning the environmental impact assessment, post-construction analysis or the ecological survey shows that – in spite of the use of the available technical, technological and organizational solutions – the environment quality standards outside of the premises of the plant or another facility cannot be met, a limited use area shall be established for wastewater treatment plants, municipal waste landfills, composting plants, communication routes, airports, power lines and substations, as well as radio communication, radio navigation and radio location systems.

In the case of the project under consideration, involving the construction of a wind turbine complex, there is no need to establish a limited use area.

14. Comparison of the proposed technology with the technology meeting the requirements of Article 143 of the Environmental Protection Law.

Pursuant to Article 143 of the Environmental Protection Law of April 27, 2001, the technology applied in newly commissioned systems and equipment should meet the requirements the determination of which takes into account, in particular:

1. use of substances with low hazard potential;
2. effective generation and use of energy;
3. ensuring rational water consumption and other raw materials as well as materials and fuel;
4. use of waste-free and low waste technology and possibility of waste recovery;
5. type, range and amount of emissions;
6. use of comparable processes and methods which have been effectively applied on industrial scale;
7. scientific and technical progress.

All wind farms are based on the same technology. Therefore, this chapter may be limited only to an analysis of whether the system for generating electricity from wind energy meets the requirements set out in Article 143 of the EPL.

Re: 1.

Substances with high hazard potential are not used in wind turbines. It is worth stressing that the designed group of power turbines will not be classified as a plant with increased or high risk of the occurrence of serious industrial accidents, according to the quality and quantity criteria set out in the Regulation of the Minister of Economy of April 9,

2002 on the types and quantities of hazardous substances whose presence at a plant determines qualifying the plant as an increased risk plant or a plant with high risk of the occurrence of a serious industrial accident (Journal of Laws of 2002, No. 58, item 535, as amended).

Re: 2.
Evaluating the effectiveness of electricity generation by wind turbines is difficult. In general, effectiveness cannot be estimated on the basis of "unused" wind, unlike conventional power plants where unused coal (i.e. generation of highly calorific waste) has an effect on reducing effectiveness from the environmental protection standpoint.
Wind turbines use a minimal (irrelevant from the environmental protection perspective) amount of energy to sustain their components.

Re: 3.
During their operation, wind turbines use virtually no water or other raw materials, materials or fuels.

Re: 4.
Wind turbines are low-waste devices. In fact, the only materials that wear out during the operation of the equipment and require replacement during servicing will be gear oils and hydraulic oils.

According to the Waste Act, waste oils should first be recovered by way of regeneration. Regeneration is any recycling process in which base oils can be produced by refining waste oils, in particular by removing contaminants, oxidation reaction products and additives present in waste oils.

If regeneration of waste oils is impossible due to the degree of their contamination, those oils should be subjected to other recovery processes. Only if regeneration or other processes of waste oil recovery are impossible, their disposal is allowed.

Re: 5.
The operation of wind turbines involves noise emission. The reach has been evaluated in the report (section 7.2.4) and shown in the graphic appendices. This reach can be assessed as local.

Electromagnetic field, infrasound and vibration emissions have no practical significance.

Re: 6.
All wind turbines are characterized by the use of the same process – kinetic energy of wind is converted into mechanical energy and ultimately into electricity. Due to the nature of the investment, comparable processes and methods cannot be considered.

Re: 7.
The scientific and technological progress in wind energy in recent years has been significant. Until recently, the capacity of existing wind turbines produced did not exceed 1 MW. Thanks to the progress, turbines manufactured today are more powerful (up to several MW) and are characterized by lower noise emission.

The turbines planned for installation are some of the most modern equipment available nowadays.

15. Analysis of potential social conflicts related to the planned project

Social conflict, as one of the basic concepts of sociology, refers to a social process occurring between individuals or groups as a result of conflicting interests and causing hostility between them. The aftermath of conflict is competition and struggle (in varying degrees of intensity) leading to the total defeat of one side (sometimes both) or trade-offs.

For the analyzed project, three basic groups can be distinguished among which a conflict may potentially arise:

- supporters of the project implementation – owners of the property on which wind turbines are going to be placed;
- potential opponents of the project – owners of properties adjacent to those on which the wind turbines will be built and residents of surrounding towns;
- a competitive investor planning to build a wind farm in the same (or adjacent) area.

Additionally, broadly defined environmental organizations should be mentioned at this point. Those involved in nature protection are often concerned about the impact of wind turbines on avifauna, chiropterofauna and the landscape.

The experience has shown so far that supporters of wind turbine construction (i.a. owners of property on which wind turbines are to be placed) rarely change their positive attitude towards the project. The financial factor is of major importance here – the

investor's purchase or long-term lease of land for wind turbines and roads. A major problem, however, is often to convince the rest of the community – people who will not directly benefit personally from the project.

What underlies the conflict is often ignorance about the planned project. Meetings with local communities held at various wind farm locations show that the most common concerns are raised by:

- potential health impacts of wind turbines – people are concerned about high levels of noise and radiation (often unspecified) and the illnesses they cause;
- potential impact of the wind turbine on the comfort of life – people are afraid of deterioration of landscape values, interference in radio and television reception, continuous disturbing noise (both day and night);
- potential impact of wind turbines on the natural environment – people are concerned about significant degradation of the landscape, killing and scaring off birds, scaring wildlife, etc.;
- potential decline in the value of the properties.

As demonstrated by this report, the concerns cited above will be mostly completely unfounded and without any factual basis. It should be borne in mind, however, that substantive arguments are not always able to convince 100% of the public.

16. Proposals of environmental impact monitoring of the planned project

During the construction stage, it is pointless to conduct monitoring. This is due to the fact that this period will be of short duration and will be characterized by a relatively minor and, in general, insignificant impact on the wider environment.

After completion of the investment stage it is recommended to conduct monitoring of the actual noise level in the environment as well as monitoring of the impact of the wind farm on birds and bats.

Monitoring of the actual noise level in the environment

To assess the changes of the acoustic climate caused by the operation of the wind turbines, it at least two measurement series are recommended:

- one series before commencing the project (or after completing the project, but with the wind turbines not in operation);
- second series after completing the Wind Farm and handing it over for commercial operation.

Measurement points should be planned in the vicinity of the outermost buildings in the

neighboring villages (however, measurements before and after the start of the farm operation should be conducted in the same points and possibly in the same conditions). Further measurements of the noise level in the environment, if any, should be made when new significant sources of acoustic nuisance appear in the area.

Monitoring of the farm impact on birds

The construction of the planned wind farm should require the commencement of post-construction monitoring. As a result of monitoring works after the construction of the wind farm, it will be possible to assess the actual project impact project on avifauna. Post-construction monitoring, as at most sites, should continue for at least 3 years in the next 5 years after the turbine start-up. The choice of years (e.g., in years 1, 2 and 3, or years 1, 3, 5) may depend on agreements made with the developer and environmental decision-making authorities (NWEA 2008).

The purpose of conducting faunistic post-construction monitoring will be:

- to formulate empirical assessment of the wind farm impact on the breeding, migrating, nomadic and wintering avifauna occurring within its area and in the immediate vicinity,
- to verify the project's potential impact assessment prepared at the pre-investment stage,
- to analyze the this wind farm's actual impact on birds in this part of Pomerania.

The observations and information collected during the works should be used to conduct an assessment of the scale of the threat to birds and to propose possible rescue or compensation measures.

Monitoring should be conducted by persons professionally prepared for research (researchers) or amateurs with good field preparation (in this case under the substantive supervision of a coordinator with appropriate qualifications for conducting ornithological research).

Studies conducted during post-construction monitoring should consist of the following basic modules:

- observations within the project area, being a replication of monitoring conducted at the pre-investment stage;
- observations outside of the turbine operating zone, replicating pre-investment studies;
- observing birds' behavior and their reactions to working or standing still wind

turbines;

- documenting all cases of collision victims.

A work breakdown framework is proposed for the planned project with the minimum number of field inspections necessary for proper evaluations.

Monitoring of farm impact on bats

After the farm start-up, a three-year post-construction monitoring should be carried out, based on the search for any killed bats and automatic registration of their activity at selected wind turbines, which will allow to estimate the current project impact on the chiropterofauna according to the methodology contained in the current national "Guidelines for assessing the impact of wind turbines on bats" and the studies by Brinkmann (2006) and Arnett (2005).

Should high bat mortality be recorded during any of the phenological periods, it should be considered whether to shut down selected turbines during the period of highest activity at night during low winds (less than 6 m/s).

17. List of difficulties arising from technical deficiencies or gaps in the contemporary knowledge that were encountered when preparing the report

When preparing the report and forecasting the environmental impact of the project, no other significant deficiencies or gaps in contemporary technical knowledge that would prevent the assessment were encountered. One can only point to a lack of standards for a landscape impact assessment.

18. Non-technical summary

Introduction

This report has been prepared at the request of ENERTRAG Krajnik sp. z o.o. with its registered office in Szczecin and refers to a project involving the construction of the "Żelechowo" wind farm with a total capacity of up to 56 MW, including access roads, assembly yards, MV cable network, control and telecommunication networks, and transformer stations in the Widuchowa municipality, located near Żelechowo.

A decision on environmental conditions was issued for the planned project – Decision No. GNG:7624/3/2010 of the Head of Widuchowa Municipality dated November 8, 2012.

It is necessary to change the decision on environmental conditions due to the change of technical parameters of wind turbines. The change in parameters consists of an increase in the height of the wind turbine and an increase in sound power by 0.5 dB(A). In addition, the application includes two new plots of land – 302 and 305 within the cadastral district of Żarczyn. The road system has also changed.

Description of the planned project

The proposed project will involve the construction of a wind turbine complex, together with the accompanying technical infrastructure, in the area of Żarczyn-Żelechowo in the Widuchowa Municipality (Poviat of Gryfino). The project will enable the generation of electricity from wind.

Up to 16 wind turbines are planned as part of the project. The total nominal capacity of all turbines will not exceed 56 MW. The characteristics of the wind turbine are as follows:

- Rotor diameter: up to 130 m (3 blades up to 65 m each);
- Conical steel-tube solid-wall tower.
- Tower height: from 100 to 140 m;
- Total turbine height: up to 200 m;
- Maximum noise level of a single turbine: 107 dB (it will be possible to adjust the sound power level);
- Tower colors: white or gray.

The tower core of each wind turbine will be placed on a foundation. Only after thorough structural calculations (performed at the stage of preparing the building permit design – after obtaining the decision on environmental conditions) can their target size and shape be determined. It is estimated that the foundation area will be approximately 500 m^2. The standard depth of the foundation is approx. 3-3,5 m from the existing ground level (depending on local subsurface conditions). The target depth of the foundations will be determined at the stage of preparing the building permit design (after the structural calculations). Where strata of high plasticity clay are present, lime and cement columns, or another solution indicated by the designer, may be used to ensure structural stability. The foundations will be made of reinforced concrete, and the wind turbine tower structures will be attached to them using pre-tensioned concrete beams or bolted connections. In addition to the wind turbines, the proposed project will consist of the following basic accompanying elements:

- Main Power Offtake Point substation designed to raise voltage from MV to 110 kV;
- MV power cables (up to 30 kV) – running in the ground, connecting individual turbines; the cables will be laid in a trench approx. 1-2 m deep (or deeper, if technologically justified);
- telecommunications infrastructure, enabling operational supervision (laid in a trench about 1-2 m deep (or deeper, if technologically justified); the trench will be shared with the power line);
- access roads made of crushed-stone aggregate – the designed road width will be approx. 4.5–5 m;
- assembly/technical yards at each wind turbine – constructed in a similar manner as roads; approximate dimensions of a single yard: 25 x 50 m.

The planned location of the project is shown on the maps attached to the report – Appendixes Nos. 1–4.

Characteristics and condition of the natural environment in the area of the planned project location

According to physicogeographic division of Poland presented by J. Kondracki (J. Kondracki "Podział regionalny Polski" 1998), the area of the planned project is located within mesoregion Pojezierze Myśliborskie (314.41), which is a part of macroregion Pojezierze Zachodniopomorskie (314.4) and subprovince Pojezierze Południowobałtyckie (314).

The proposed wind farm is located within an undulating moraine upland with associated fluvioglacial formations. The upland is hilly. The land surface is covered by Quaternary sediments. On the surface there is definitely mostly boulder clay. Their thickness is estimated to be at least several meters. The hollows left by dead ice are littered with Holocene formations – low peats. These are mainly peats: reed, wood, bryophyte and sedge peats or intermediate types. Their thickness is relatively small.

The soil cover is predominantly made up of podzolic and pseudo-podzolic soils. Second place is occupied by leached brown soils. Small areas are occupied by degraded black soils and gray soils and soils of organic origin. The soils within the farm mostly belong to class 4 (very good for rye).

The proposed wind farm is located in the Oder river drainage basin – the Oder river flows approximately 10 km away from the wind farm.
Within the area of the designed farm there are small water ponds (water fills small

depressions left by lumps of dead ice). Besides, the surface hydrographic objects include small-size drainage ditches (some of them are filled with water only periodically – during intense rainfall and snowmelt).

In the area of the planned project there are two recognized usable aquifers: Tertiary and Quaternary.

The main usable aquifer is the Quaternary aquifer. The proposed wind farm is located outside of the boundaries of major groundwater reservoirs.

The condition of atmospheric air in Widuchowa municipality is considered good.

There are no developed areas within the planned wind turbines subject to noise protection. The nearest acoustically protected area is approximately 820 m away from the wind turbine.
The areas planned for the location of the wind farm are currently used for agricultural purposes. Acoustic conditions are determined here by:

- traffic noise associated with vehicle traffic on roads in the vicinity of the planned project (provincial road No. 122 with low traffic intensity and local roads with negligible traffic intensity, including access roads to agricultural land);
- seasonal noise from farm machinery during field work.

The appearance of the landscape in the area of the planned wind farm location is determined primarily by the basic elements of terrain morphology and land use. The proposed wind farm is located within an undulating moraine upland with associated fluvioglacial formations. The topography is slightly undulating, sometimes hilly. The area is used for agricultural purposes – there are arable fields (cereals, rapeseed, corn and vegetables are grown on the arable fields). The landscape is diversified by relatively few depressions with hydrogenic and scrub vegetation. In addition, the landscape is diversified with forest areas adjacent to the proposed wind farm area on the east.
The immediate area of the planned wind farm does not stand out in terms of landscape values compared to other parts of the Zachodniopomorskie Voivodeship.
Looking at the landscape in a broader perspective – at the scale of the entire municipality – it should be assessed that there are areas with enhanced landscape values here. In the environmental valuation it was assessed that the area of Widuchowa Municipality is very attractive and varied in terms of landscape. The diversity of the landscape is due to the landform features and vegetation cover.
The immediate area designated for the location of the wind turbine complex has been

virtually completely transformed as a result of longstanding, agricultural human activity. Within the area of the proposed wind farm, almost all of the arable land is used for agriculture – cereals, rapeseed, corn and vegetables are grown on the arable fields. The effect of agricultural activity is practically complete eradication of the original vegetation (the natural vegetation was beech forests) and the formation of a "plow layer" in the case of soils.
The area is crisscrossed by roads, mainly providing access to agricultural fields.

Annual monitoring of birds and bats was conducted for the purposes of the report.

The species composition of bird species found in the 2009/10 season is shown in the table below:

Ordinal number	Generic and species name	Number of observations	Number of individuals observed (total)	Notes	Species listed in Annex I to the Birds Directive	Species according to the Polish Red Data Book of Animals	Species protection
1	Little grebe *Tachybaptus ruficollis*	1	1	A single individual on a lakelet in the area of maize crops during migration.			X
2	Butterbump *Botarus stellaris*	2	2	Sounds of a male at "Żarczyńskie Oczko".	X	X	(X)
3	Grey heron *Ardea cinerea*	5	6	Briefly in the western part of the Żelechowo sector.			
4	White stork *Ciconia ciconia*	1	1	Meadows on the western edge of the survey area (outside the turbine location zone).	X		X
5	Mute swan *Cygnus olor*	4	20	Few flying low and single individuals and flocks feeding in the remaining area.			X
6	Taiga bean goose *Anser fabalis*	33	7661	Local flights of small- to medium-sized flocks (6–200 individuals) throughout the survey area. Mass feeding and local flights in the			

				western part of the Żelechowo sector – maize stubble.			
7	Greater white-fronted goose *Anser albifrons*	2	26	In a mixed flock with the taiga bean goose.			
8	Mallard *Anas platyrhynchos*	5	17	Usually around a lakelet in maize crops. Single flights on the outskirts of the survey area.			
9	Common teal *Anas crecca*	3	180	In the area of a lakelet in maize crops during fall migrations.			
10	Red kite *Milvus milvus*	1	1	A single flight in the area of maize crops.	X	X	X
11	Black kite *Milvus migrans*	3	4	A single observation of a flight in the area of maize crops.	X	X	X
12	White-tailed eagle *Haliaeetus albicilla*	6	7	Usually flying by a forest edge and at "Żarczyńskie Oczko". Low flight (< 50 m) over stubble with feeding flocks of geese and common cranes.	X	X	X
13	Western marsh-harrier *Circus aeruginosus*	9	9	Single observations of usually low flights, mainly at "Żarczyńskie Oczko".	X		X
14	Hawk *Accipiter gentilis*	3	3	One found south of the survey area.			X
15	Sparrowhawk *Accipiter nisus*	1	1	A single observation of a low flight.			X
16	Common buzzard *Buteo buteo*	29	30	Often observed at lookouts and in active flight, usually at a non-collision ceiling (< 50 m).			X
17	Quail *Coturnix coturnix*	1	1	Heard during evening surveys.			X
18	Eurasian coot *Fulica atra*	3	5	It is observed in the area of "Żarczyńskie Oczko" and other mid-field lakelets.			(X)
19	Common crane *Grus grus*	53	2590	Regular flights and feeding of single individuals, small- to medium-sized flocks (2–50 individuals) on crops. Regular feeding of medium- to large-sized flocks on maize in the western part of the Żelechowo sector.	X		X
20	Lapwing *Vanellus vanellus*	20	297	Flight, feeding on crops, small- to medium-sized (8–60			X

				individuals) flocks usually resting. A likely attempt to nest in the fields at "Żarczyńskie Oczko". In high concentrations within corn crops (foraging, resting and flight).			
21	Black-headed gull *Larus ridibundus*	4	62	In high concentrations within corn crops (foraging, resting and flight).			X
22	Common wood pigeon *Columba palumbus*	8	63	Single observations of feeding and flock flights (up to 50 individuals). Flight usually at a non-collision ceiling.			
23	Cuckoo *Cuculus canorus*	3	3	Heard on the outskirts of the survey area.			X
24	Tawny owl *Strix aluco*	1	1	The edge of the former manor park in Żarczyn.			X
25	Great spotted woodpecker *Dendrocopos major*	4	5	Episodically on mid-field alleys.			X
26	European green woodpecker *Picus viridis*	1	1	A single individual heard in the south of the sector.			X
27	Skylark *Alauda arvensis*	168	221	Common throughout the area.			X
28	Woodlark *Lullula arborea*	1	1	A single individual heard in the south of the area.	X		X
29	Barn swallow *Hirundo rustica*	6	47	Foraging over fields, especially at harvest time, usually flight <50 m (one sighting at collision height).			X
30	House martin *Delichron urbica*	4	26	Foraging over fields, especially at harvest time, usually flight <50 m (one sighting at collision height).			X
31	White wagtail *Motacilla alba*	3	4	Single observations on the edge of the village of Żarczyn.			X
32	Yellow wagtail *Motacilla flava*	12	18	Common, especially in canola crops.			X
33	Whinchat *Saxicola rubetra*	4	4	Single observations in crops.			X
34	Common blackbird *Turdus merula*	6	6	Single observations in mid-field alleys and on the edges of trees and shrubs outside the forest.			X
35	Fieldfare *Turdus pilaris*	9	144	Flocks and single individuals throughout the survey area.			X

36	Marsh warbler *Acrocephalus palustris*	4	4	Single observations in Urtica brush.			X
37	Garden warbler *Sylvia borin*	5	7	On mid-field alleys.			X
38	Eurasian blackcap *Sylvia atricapilla*	2	2	On mid-field alleys.			X
39	Common whitethroat *Sylvia communis*	16	22	Single individuals throughout the survey area.			X
40	Lesser whitethroat *Sylvia curruca*	5	5	On mid-field alleys.			X
41	Icterine warbler *Hippolais icterina*	2	2	One pair on an alley in the western part of the survey area.			X
42	Long-tailed tit *Aegithalos caudatus*	1	2	Mid-field alley near the village of Żarczyn.			X
43	Great tit *Parus major*	14	30	Single individuals and small groups throughout the survey area.			X
44	Blue tit *Parus caeruleus*	11	19	Single individuals and small groups on roadside trees and shrubs.			X
45	Willow tit *Parus montanus*	1	1	In the area of mid-field alleys.			X
46	Red-backed shrike *Lanius collurio*	19	37	Single individuals and pairs numerous in the area of mid-field alleys throughout the survey area.	X		X
47	Great grey shrike *Lanius excubitor*	4	4	Single observations at the southern edge of the survey area.			X
48	Magpie *Pica pica*	3	3	Surroundings of the village of Żarczyn.			(X)
49	Jay *Garrulus glandaris*	8	11	Observed at edges of forests and trees and shrubs outside the forest, also in flight.			X
50	Raven *Corvus corax*	54	124	Common throughout the survey area.			(X)
51	Starling *Sturnus vulgaris*	9	990	Single individuals, medium- to large-sized flocks.			X
52	Eurasian tree sparrow *Passer montanus*	4	61	Single individuals and flocks in mid-field alleys.			X
53	Sparrow *Passer domesticus*	1	20	A small flock on the outskirts of the village of Żarczyn.			X
54	Chaffinch *Fringilla coelebs*	26	69	Single observations on the outskirts of trees and shrubs outside the forest.			X

55	Greenfinch *Carduelis chloris*	10	57	Single individuals, pairs, as well as flocks within alleys and crops.			X
56	Linnet *Carduelis canabina*	6	12	Single observations in mid-field alleys.			X
57	European goldfinch *Carduelis carduelis*	18	218	Small- to medium-sized flocks within shrubs, weedy areas and mid-field alleys.			X
58	Hawfinch *Coccothraustes coccothraustes*	1	3	A single observation on a mid-field alley.			X
59	Bullfinch *Pyrrhula pyrrhula*	8	42	Small flocks on mid-field alleys and trees and shrubs outside the forest.			X
60	Yellowhammer *Emberiza citrinella*	63	171	Common and numerous throughout the area.			X
61	Corn bunting *Emberiza calandra*	27	36	Single individuals and groups throughout the area.			X

In the survey area, as part of the year-long chiropterological monitoring, 6 species of bats were recorded. The serotine bat and the pipistrel are synanthropes and are considered non-threatened and numerous in the country. The daubenton's bat and the common noctula are also common species.
According to the data collected by T. Durr (2006), the mortality rate of the daubenton's bat and the serotine bat as a result of collisions with wind turbine components is extremely rare. On the other hand, the mortality rate of the pipistrel and the common noctula is significant. This is probably due to their high number in Central Europe (Durr's data comes mainly from Germany) and their flying method as the common noctula flies exceptionally high, even a few dozen meters above the ground.
Based on the monitoring conducted, it can be concluded that the areas of the surveys and the planned wind turbine location, with the exception of the close vicinity of the village of Żarczyn with the designed "Żarczyńskie Oczko" ecological area, permanent and temporary watercourses, trees and shrubs outside the forest and forest edges, are not of much importance for bats.

Areas legally protected in terms of nature in the area of the planned project
The planned wind farm is practically adjacent to the Las Baniewicki Natura 2000 site (it should be emphasized that it will be implemented outside of its boundaries).

Further away there are:

- "Dolina Dolnej Odry" Natura 2000 site (SPA) – at a minimum distance of about 3 km

- "Dolna Odra" Natura 2000 site (SAC) – at a minimum distance of about 5 km

The location of the turbine in relation to the legal forms of area-related nature protection is presented on the topographic map in the scale of 1:50,000 (Appendix No. 2 to the report).

Proposed areas for legal protection for natural reasons

The proposed forms of conservation were determined based on:

- Environmental valuation of the Widuchowa Municipality made by the Nature Conservation Office from Szczecin in 2006;
- Environmental valuation of the Banie Municipality made by the Nature Conservation Office from Szczecin in 1998;
- Environmental valuation of the Zachodniopomorskie Voivodeship made by the Nature Conservation Office from Szczecin in 2010.

The municipal surveys are archival (especially the survey of the municipality of Banie made 16 years ago). The forms of nature protection proposed in the valuation have not been established to date. If established, all potentially implemented prohibitions will apply only within the boundaries of the proposed forms of nature conservation.

Due to the archival character of the municipal valuation, the report was based mainly on the proposed forms of nature protection included in the voivodeship valuation.

Within the area of the planned wind farm there is a local nature conservation site proposed to be established – "Oczko Żarczyńskie". The proposal for establishing a local nature conservation site is included in both the valuation of the Widuchowa Municipality and the voivodeship valuation.

Also at a distance of:

- about 100 m from one of the wind turbines there is a proposed area of protected landscape called Mokradła (however, most wind turbines are located at a distance greater than 1 km) – a proposal included in the municipal valuation, but not supported in the voivodeship valuation;
- about 150 m from one of the wind turbines there is a landscape-nature complex "Widuchowskie bagna" proposed to be established (most wind turbines are located at a distance of more than 1 km) – the proposal to establish the complex was included both in the communal and voivodeship valuation.

In the neighboring Banie Municipality, 16 years ago it was proposed to establish:

- "Las Baniewicki" Nature Reserve – the proposed nature reserve is located approximately 400 m from the nearest wind turbines;
- "Las Baniewicki" landscape-nature complex – the proposed complex is located approximately 1 km from the nearest wind turbine.

Both forms of nature conservation proposed in 1998 were upheld in the voivodeship valuation. They are also part of the "Las Baniewicki" Natura 2000 site, which was described in the previous chapter of the report. In the following chapter of the report, the impact assessment was made for the "Las Baniewicki" Natura 2000 site, assuming that the assessment remains valid for the proposed nature reserve and the proposed landscape-nature complex.

In Banie Municipality it was proposed in 1998 to establish several dozen of local nature conservation sites (as many as 68). Most of them have not been given a name. These mostly included small wetland depressions. At the boundary with Widuchowa municipality, there are two such objects. The proposal to establish them was upheld in the voivodeship valuation. The nearest wind turbine is approximately 300 m from one of the proposed local nature conservation sites.

The forms of nature conservation proposed to be created are shown on the topographic map, which is Appendix 3 to the report. The map includes only those proposed territorial forms of nature protection the proposal of which was upheld in the voivodeship valuation.

Description of monuments protected under old monuments law

On the basis of the local spatial development plan it was established that within the area of the wind turbines there are zones WII and WIII of archaeological site conservator protection.

In the villages neighboring on the planned wind farm, there are objects listed in the register of historic monuments:

- Żelechowo
  - filial church dedicated to the Visitation of the Blessed Virgin Mary – registry No. A-102 of October 25, 2002,
  - churchyard – registry No. A-102 of October 25, 2002.
- Żarczyn
  - filial church dedicated to Saint Stanislaus Bishop and Martyr – registry No.

A-991 of August 1, 1956,
- churchyard – registry No. A-991 of July 19, 2012;

Detailed environmental impact assessment of the selected project option

Construction stage

The construction stage will be limited in space and time. The works will be conducted mainly in agricultural areas, several hundred meters away from residential development. The following typical nuisances associated with construction works are expected:

- noise associated with the operation of construction equipment;
- pollutant emissions associated with transportation of structures and construction materials.

The construction stage will additionally involve the generation of waste which will be managed in accordance with the applicable regulations.

No significantly adverse environmental impact associated with above-normal impacts is anticipated as a result of conducting the works.

The impact on the biotic environment will be manifested mainly through the local elimination of vegetation cover, represented by agrocenoses and ruderal communities.

Placing individual wind turbines along with the routes of the related infrastructure within agricultural land currently occupied by farmland, in a few cases using mid-field roads, will not adversely affect the vegetation occurring in their vicinity. It will be subject to the same changes that currently occur, i.e. related to crop rotation.

Some tree and bush cutting may be unavoidable during the construction stage. This is primarily due to the need to rebuild some roads and construct exits. Unfortunately, at this stage the investor does not have a detailed design and is not able to indicate which trees and bushes will be cut down (this will only be possible after a geodetic delineation of the roads, which will take place at the construction design stage). However, tree felling should be reduced as much as possible.

The report analyzed impacts in terms of the established area legal forms of nature protection and in terms of proposed area legal forms of nature protection. It has been demonstrated that there will be no adverse impact on legal forms of nature protection or legal forms of nature protection proposed in the environmental survey of the municipality.

On the basis of the graphic sheet of the draft local development plan, it was established that within the area of the proposed wind farm there are zones WII and WIII of archaeological site conservator protection.

The procedure in case it is necessary to enter into the zones is defined by the detailed

regulations, and they are sufficient to protect the sites against accidental destruction. Objects protected for historical reasons (entered in the register of historical monuments or in the preservationist records) are located in the surrounding villages and are considerably distant from the proposed wind farm (at least several hundred meters).

No adverse impacts to these facilities resulting from construction activities are anticipated.

Buildings in the surrounding villages will be located several hundred meters from the planned wind turbines, so no impacts related to the construction of the wind park are anticipated.

Operation stage

Electricity will be produced during the operation stage. The investor estimates the production of electricity at approx. 96,000 MWh per year. Producing such a volume of electricity with conventional methods (in a power plant) involves the emission of pollutants in following amounts:

- SO2 emissions (installation without flue gas desulphurization): 459.4 tons
- NO2 emissions: 169.1 tons
- NO2 emissions: 96,574.6 tons
- dust emissions: 25.6 tons
- captured ash: 5,619.3 tons
- slag: 1,490 tons

The report shows that, while the group of wind turbines is operated correctly, there will be no significantly adverse impacts on:

- ground surface and soil resources;
- surface water and groundwater;
- atmospheric air;
- vegetation;
- amphibians, reptiles, ground-moving mammals.

Wind turbines may impact

- birds,
- bats,
- acoustic climate,
- landscape.

These elements have been analyzed in detail in the report.

The report evaluates potential impact on birds and bats.
Most bird species found in the surveyed area are small- to medium-sized species which, due to their residence mainly in shrubs, forest edges and migration at relatively low ceilings (below 60 m) should not be significantly exposed to collisions with operating turbines.
Most of the medium- to large-sized bird species observed in the survey area, due to their usually observed low flight ceiling and evasive reaction (for geese), should not collide with operating turbines.
In the light of the observations collected during the 2013 season, it was estimated that changing the height of turbines from 50–150 m (the lowest and highest points of a rotating rotor) to 60–200 m would significantly reduce the collision hazard for most species using higher flight ceilings.
It is assessed that the project will not significantly deplete feeding grounds of birds using the area of the planned farm as it is surrounded by extensive agricultural areas equally attractive as feeding grounds.

In the survey area, as part of the year-long chiropterological monitoring, 6 species of bats were recorded. Based on the monitoring conducted, it was concluded that the areas of the surveys and the planned wind turbine location, with the exception of the close vicinity of the village of Żarczyn with the designed "Żarczyńskie Oczko" ecological area, permanent and temporary watercourses, trees and shrubs outside the forest and forest edges, are not of much importance for bats. The highest activity was observed in May (rapeseed and chestnut blossom), June, July and August, which suggests that bats use the area mainly as a feeding ground. In the light of the year-long surveys, the area of the planned wind farm does not appear to be colliding with any of major seasonal migration routes.
The use of the survey area by bats was limited to a low ceiling (0–40 m above ground level) of the air space, which is quite ordinary for domestic bat species, although in neighboring areas surveyed during the same period (northern part of the Lubicz project), the common noctula, *Nyctalus noctula*, was found to exceed the ceiling of 50 m.
When locating wind turbines in the surveyed area, areas where high bat activity was found should be excluded and a minor adjustment to the locations of 2 turbines should be made.

The report presents and discusses the results of acoustic calculations.
With simultaneous operation of all the 16 wind turbines included in the application, the permissible daytime or nighttime noise modes are not exceeded.

There are no acoustically protected areas at all within the boundaries of the 45 dB(A)

isophone. Homestead development areas, for which the permissible noise mode is 55 dB(A) during the day and 45 dB(A) at night, dominate between the equal-loudness contours of 45 dB(A) and 40 dB(A).

The report analyzes potential impacts arising from electromagnetic field emissions, infrasound, and vibration. It has been demonstrated that there will be no impacts in this respect that might adversely affect the health of local residents.

The landscape impact analysis performed in the report enables to draw the following conclusions:

- the wind park will be well visible from neighboring villages (Żarczyn, Żelechowo, Wilcze, Kłodowo) and the communication routes connecting them; the wind turbines will be well visible mainly from the outskirts of the village, as inside of the village, the visual barriers for the observers will be constituted by the existing buildings and high vegetation;
- the wind park will be clearly visible from some parts of the voivodeship road No. 122 and the poviat road between Wilcze and Żelechowo;
- visibility of the wind turbine will be considerably reduced by quite numerous forest complexes (map with a scale of 1:50,000 in Appendix 2); the fact that these complexes are not dense and form a mosaic with open areas is also significant here;
- the wind turbines will not be visible in the Oder valley – the Oder river is more than 10 km away and at the height of the proposed farm it is screened by forests;

The report emphasizes that when assessing the impact of wind turbines on the landscape, it should be remembered that any such assessment is very complex and always partly subjective in nature, depending on one's personal feelings and preferences. It was also emphasized that so far the problem of assessing the impact of wind turbines on the landscape has not been legally regulated (primarily there are no standards in this respect).

The report assesses that the project is not going to affect area legal forms of nature protection. The operation of the wind farm will not affect habitats or species protected within the aforesaid areas.

The report assesses that the project is not going to have a significant impact on the area legal forms of nature protection proposed in the natural survey of the municipality. An exception is the impact on the landscape.

The report assesses that the project is not going to have an impact on historic objects.

Decommissioning stage

Nuisances during the decommissioning stage will be similar to those during the construction stage. The most significant difference between the two stages comes from the need to dispose of the waste equipment when the project is decommissioned. Waste equipment will constitute waste and will be transferred to entities with appropriate administrative permits for waste management (recovery or disposal).

Proposal of the most environmentally beneficial option

The report assesses a reasonable alternative option – one in which a part of the farm north-west of Żarczyn (the so-called Lubicz sector) is abandoned (Fig. 2).

The option ultimately proposed for implementation incorporates the comments and recommendation of the proposed ornithologist and chiropterologist, including:

- resignation from one of the turbines planned for location in the north-eastern corner of the sector Żelechowo, by the planned local nature conservation site "Żarczyńskie Oczka" (Fig. 2),
- moving the turbine adjacent to "Żarczyński Oczek" to a distance of 200 m from the edge of the projected local nature conservation site (Fig. 2).

Given that the investor, at the consultation stage before submitting the application for the issuance of the decision on environmental conditions, implemented the recommendation resulting from the monitoring of birds and bats, it can be concluded that the finally proposed project option is also the most beneficial for the environment.

Diagnosis of potential significant impacts of the designed project on the environment and a description of forecasting methods applied

The assessment presented in the report shows that the proposed wind farm, in its overall assessment, is not going to have a significant impact on the environment or cause significant negative environmental impacts (provided that minimizing measures are implemented).

The starting point in the environmental impact assessment for the proposed wind farm was a description of the state of the environment.

The following forecasting methods were used in the environmental assessment:

- Environmental analogies
- Mathematical modeling
- Expert evaluation

The report also analyzes the cumulative impact. When assessing the cumulative impact, the existing wind farms and plans of their construction up to 10 km away were analyzed. Planned farms in the vicinity are marked on the map enclosed as Appendix No. 10 to the report.
The cumulative impact was assessed with respect to:

- noise;
- birds;
- bats.

The assessment performed indicates that a significant cumulative impact is not going to occur.

Assessment of the possibility of transboundary environmental impact
Therefore, the report rules out the possibility of a cross-border environmental impact.

Accident potential analysis
The report excludes the possibility of a major industrial accident.

Wind turbines have a number of protections. The occurrence of accident associated with damage to any of the components and stopping the wind turbine operation is not associated with environmental risk. A hazard may result from a situation where a wind turbine overturns, a piece of the turbine (e.g., a propeller) breaks off, or oil spills.

If a wind turbine overturns or a portion of it detaches, people in the immediate vicinity of the turbine may be at risk. However, it should be emphasized that such a situation is highly unlikely. Also, the nearest developed areas are at a minimum distance of over 800 m.

Proposed actions to prevent, reduce or compensate adverse environmental impacts
In order to protect the environment, the following solutions should be implemented and the following actions should be taken:

- during the construction stage:
    - limit the size of construction sites as much as possible;
    - in order to protect small animals (e.g. reptiles or amphibians), make

foundations and lay cable lines as soon as possible after excavation; if small animals enter the excavation, bring them to the surface before pouring concrete or backfilling the excavation with soil;
- equip construction sites with means for quick collection of possible oil spills;
- the construction site should be equipped with portable toilet cabins (e.g. TOI-TOI type);
- apply the principle of minimal environmental interference;
- collect waste generated separately, store in places adapted for this purpose, and afterwards hand over to authorized entities for recovery or disposal;
- use technically efficient equipment, certified machines and devices, including high-quality equipment, meeting the requirements for equipment used outdoors in terms of noise emission to the environment;
- perform construction works involving noise emissions only during daylight hours – between 7:00 a.m. and 8:00 p.m.;
- switch off machines and equipment when not in use (avoid idling);
- conduct construction works that are a significant source of noise (first of all, excavation for foundations) outside of the bird hatching season;

• at the operation stage:
  - clean up the carcasses from the area of wind fields and the nearest neighborhood on a regular basis (in autumn and winter, every week);
  - change the cropping system – abandon maize in favor of less attractive foraging crops: cereals, rapeseed, root crops. If necessary, one should strictly adhere to the obligation to clean up crop residues and plow stubbles immediately after harvest; maintenance works (gear and hydraulic oil change) should be performed in favorable weather conditions, and in the process, the area around the wind turbine should be equipped with substances enabling to quickly collect any accidental leakages;
  - conduct periodic inspection of the technical condition of the equipment to detect irregularities and prevent technical failures;
• at the decommissioning stage:
  - remove gear oils and hydraulic oils from the wind turbine before disassembly and subject them to recovery or disposal in accordance with applicable law;
  - disassemble used wind turbines and subject them to recovery or disposal in accordance with the applicable regulations (electrical and electronic parts must be separated from the construction of the wind turbine as

hazardous waste and disposed of in accordance with applicable regulations);
- recultivate land after removal of wind turbines and access roads and restore to agricultural production;
- use technically efficient equipment, certified machines and devices, including high-quality equipment, meeting the requirements for equipment used outdoors in terms of noise emission to the environment;
- perform demolition works involving noise emissions only during daylight hours – between 7:00 a.m. and 8:00 p.m.;
- switch off machines and equipment when not in use (avoid idling);

The assessment made in the report showed that the project will not have a negative impact on Natura 2000 sites. Therefore, there is no need for the report to propose measures aimed at preventing or reducing negative impacts on Natura 2000 sites, including on their integrity and coherence.

Analysis of the necessity of establishing a limited use area
The report shows that it is not necessary to establish a limited use area.

Comparison of the proposed technology with the technology meeting the requirements of Article 143 of the Environmental Protection Law.
Pursuant to Article 143 of the Environmental Protection Law of April 27, 2001, the technology applied in newly commissioned systems and equipment should meet the requirements the determination of which takes into account, in particular:

1. use of substances with low hazard potential;
2. effective generation and use of energy;
3. ensuring rational water consumption and other raw materials as well as materials and fuel;
4. use of waste-free and low waste technology and possibility of waste recovery;
5. type, range and amount of emissions;
6. use of comparable processes and methods which have been effectively applied on industrial scale;
7. scientific and technical progress.

All wind farms are based on the same technology. Therefore, the scope has been limited only to an analysis of whether the system for generating electricity from wind energy meets the requirements set out in Article 143 of the EPL.

It has been assessed that the requirements are met.

Analysis of potential social conflicts related to the planned project

For the analyzed project, two basic groups can be distinguished among which a conflict may potentially arise:

- supporters of the project implementation – owners of the property on which wind turbines are going to be placed;
- potential opponents of the project – owners of properties adjacent to those on which the wind turbines will be built and residents of surrounding towns;
- a competitive investor planning to build a wind farm in the same area.

Proposals of environmental impact monitoring of the planned project

During the construction stage, it is pointless to conduct monitoring. This is due to the fact that this period will be of short duration and will be characterized by a relatively minor and, in general, insignificant impact on the wider environment.

After finalizing the project stage, it is recommended to conduct monitoring of the impact of the wind farm on birds, bats and acoustic climate.

List of difficulties arising from technical deficiencies or gaps in the contemporary knowledge which were encountered when preparing the report

When preparing the report and forecasting the environmental impact of the project, no other significant deficiencies or gaps in contemporary technical knowledge that would prevent the assessment were encountered. However, it was pointed out that there are no standards for a landscape impact assessment.