

**Republic of Belarus**  
**Ministry of Transport and Communications**

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)**

Of

**Rehabilitation and Upgrading of National Road R46 Project**

Ministry of Education of the Republic of Belarus  
BELARUSIAN STATE UNIVERSITY  
Faculty of Geography and Geoinformatics

CONFIRMED

Dean of the Faculty of Geography and Geoinformatics

\_\_\_\_\_ D.M. Kurlovich

« \_\_\_\_\_ » \_\_\_\_\_ 2020

Head of the Research laboratory of landscape ecology,  
Cand. Sciences Geography, Associate Professor

S.I. Kuzmin

Responsible Investigator  
Senior Researcher

A.L. Demidov

Minsk, November 2020

## **Executive Summary**

The Belarussian Ministry of Transport and Communications (MTC) is planning the reconstruction of National Road R-46 Lepel-Polotsk – Russian Federation border (Yukhovichi) (hereinafter described as R-46 in this document), from kilometer (km) 1.700 to km 61.500. The project also includes construction of the Center for Maintenance Management (CMM), the Polotsk City bypass and the reconstruction of the bridge over the Western River Dvina at 0.329 km of the highway R-20 Vitebsk - Polotsk - the border of the Republic of Latvia (Grigorovshchina). The Asian Infrastructure Investment Bank (AIIB, or the Bank) is considering financing the project, i.e. “Rehabilitation and Upgrading of National Road R46 Project” . The implementing agency for the project is the Republican Unitary Enterprise for Motor Roads “Vitebskavtodor” (hereinafter referred to as RUE “Vitebskavtodor”).

The implementation of the planned activities is provided for by order of the President of the Republic of Belarus No. 09 / 222-34 P1052 dated 12.07.2017 and the state program for the development and maintenance of roads in the Republic of Belarus for 2017–2020, approved by the Decree of the Council of Ministers of the Republic of Belarus No. 699 of September 18, 2017.

The present Environmental and Social Impact Assessment (ESIA) has been carried out to address the environmental and social impacts of the proposed project, in compliance with the national regulations as well as the AIIB’s Environmental and Social Policy (ESP).

### **Project Background**

Government of Belarus plans to rehabilitate and upgrade the country’s road infrastructure and promoting the integration of the national road network into the wider region’s international transport corridors. The Government has developed the National Program for Development and Operation of Roads in the Republic of Belarus for the years 2017-2020, which was approved by the Council of Ministers in 2017. The National Road R46 is included as one of the top priority investments in the program.

The National Road R46 is part of the improvement and upgrading of the North-South Corridor which was initiated by the Governments of Belarus and Russia and will provide the shortest route between Minsk and St Petersburg. The North-South Road Corridor includes the M3 and R46 in Belarus and national roads 58K-284 and E95 in Russia. Russia is Belarus’ largest trading partner, and accounts for around 50 percent of Belarus’ exports. St Petersburg is Russia’s second largest city, with a population of 4.8 million, and its main port on the Baltic Sea. Improvement of the North-South Corridor will facilitate the flow of traffic from the Baltic region to Belarus and Russia and will promote the integration of the region’s economies. The upgrading of R46 is a priority for the Government and will allow the road to accommodate the expanding needs of the freight and passengers along the corridor, specifically international through traffic.

Currently, Polotsk is a regional transit center that connects several international roads. Besides the R46 that runs north to the border with Russia, National Roads R45 and R20 connect the city to the border with Lithuania (Kotlovka) and to the border with Latvia (Grigorovshchina), respectively. To prevent the rapidly growing mixed traffic from passing through and congesting the city of Polotsk, the project will finance construction of a new bypass, of around 10.5km in length, starting from km 61+500 of R46 and rejoining the R46 at km 67+470. The bypass will require the construction of a new bridge over the Western Dvina River with a span of around 300 meters and will also include strengthening of the existing Polotsk city bridge. The bypass will connect with R45 and R20 and facilitate the connection to other sea gate options of Belarus

in Baltic sea. The bypass will divert the international freight traffic and will reduce traffic in the city. This will reduce travel times and the cost of freight transport and will avoid further impacts on traffic in the city. It will also lower the risk of road accidents and reduce negative impacts on the environment.

### **Project Phases and Components**

The proposed project includes three phases. The Phase 1 will comprise rehabilitation of the prioritized section of National Road R46 with the length of around 59.8km, from Lepel city to Polotsk city, with the enhanced road safety measure and elimination of identified “black spots” in the road alignment, thus substantially reducing road accidents and construction of the CMM. The Phase 2 will include construction of the bypass of City Polotsk and a new bridge over Western Devina River. The Phase 3 will comprise strengthening of the existing city bridge, called Novopolotsk Bridge, with a span of 288 meters which currently is limited in use as it carries local traffic limited to loads of up to only 5 tons/axle (standard loading requires 11 tons/axle). Further details of these phases are presented below.

Phase 1- Component A. Rehabilitation of National Road R46, comprising: (i) field investigations, detailed designs, including technical and environmental and social (ES) aspects for the road and associated small bridges, and preparation of tender documents for the rehabilitation of the national road R46, section from Lepel to Polotsk; (ii) Rehabilitation of R46 Road, including construction of two lots of the road sections, 2 years of Defect Liability Period (DLP) and establishment of “Center for Maintenance Management”; (iii) Maintenance of road R46, including maintenance during construction (for 2 years) and maintenance during the first 2 years of DLP after construction; and (iv) full time on-site supervision on construction of R46 road and during the first 2 years of DLP.

Phase 1 - Component B. Technical Support and Project Management. This includes: (i) project Implementation support and Audits including : Project Management Consultant/Support to overall project management, implementation, procurement, ES monitoring and evaluation; support in the preparation of the follow-up phases of the Entire Project; Technical Audit/Review; and Financial Audit of the Project; (ii) institutional capacity building, including trainings and provision of essential equipment and facilities; and (iii) incremental operation cost.

24. Phase 2 and Phase 3 of Entire Project. Phase 2 of the Entire Project would include the following components: (i) field investigations, detailed designs, civil works and construction supervision of the bypass of Polotsk city, in length of about 10.5km. The bypass will include construction of a new bridge over the Western Dvina River with a span of about 300 meters; and (ii) project Implementation support, involving Technical Audit/Review, support in procurement and overall project management, implementation, monitoring and evaluation of ES aspects and institutional capacity building. Phase 3 of Entire Project would involve field investigations, detailed designs, civil work and construction supervision of strengthening of the existing Polotsk city bridge, called Novopolotsk Bridge with a span of 288 meters, which carries local traffic but is seriously limited to loads of up to only 5 ton/axle (standard is 11 ton/axle).

### **Objectives of the ESIA**

In order to address the adverse environmental and social impacts of this project and in compliance with the national regulations as well as AIIB’s ESP, Vitebskavtodor RUE has conducted the present ESIA for the entire project. This ESIA presents the assessment of the potential impacts on the environment and the social aspects and identifies the possible

mitigation measures to address these impacts. In addition to ESIA and to present detailed mitigation plans and their implementation mechanisms, three separate Environmental and Social Management Plans (ESMPs) are envisaged for the three phases of the project. For the Phase 1 of the project, the ESMP has been prepared and presented as an Appendix of the present ESIA. In addition, a supplementary ESIA will be carried out for the CMM prior to the implementation of Phase 1. The remaining two ESMPs will be developed for the Phase 2 and Phase 3 of the project when their respective designs are available.

This ESIA has been prepared on the basis of the Environmental Impact Assessment (EIA) report for the reconstruction of the national Road R-46, completed in January-February 2020 by the State Enterprise Bilgiprodor. During the preparation of the EIA in May-June 2020, the areas of influence of the proposed project activities in all three phases was surveyed by the staff of the Belarusian State University.

In addition to this ESIA, a standalone Stakeholder Engagement Plan (SEP) has been prepared for all phases of this project. This ESIA and its ESMPs will be implemented together with the SEP.

A Resettlement Planning Framework (RPF) has also been prepared to cover the entire project and to address any physical and/or economic displacement caused by the project, whether of a temporary or permanent nature.

### **Applicable Policies and Legislations**

The legal framework in the Country for environmental protection, nature management, conservation and restoration of biological diversity, natural resources and objects is established by the *Law of the Republic of Belarus "On Environmental Protection"* (as amended on 06/18/2019, as amended on 12/18/2019) and aims to ensure constitutional rights citizens on a favorable environment for life and health.

This Law prescribes, in Article 58, an EIA to be conducted for facilities, the list of which is defined in the Law of the Republic of Belarus "On State Ecological Expertise, Strategic Environmental Assessment and Environmental Impact Assessment" dated July 18, 2016 No. 399-3 (as amended by July 15, 2019 No. 218-3). This Law is aimed at ensuring environmental safety of the planned economic and other activities, as well as at preventing harmful effects on the environment.

AIIB's Environmental and Social Policy (ESP), including the Environment and Social Standards (ESSs) and the Environmental and Social Exclusion List will apply to this project. ESS 1 (Environmental and Social Assessment and Management) and ESS 2 (Involuntary Resettlement) are applicable. In accordance with AIIB's ESP, the project has been classified as Category B, since the environmental and social risks and impacts are relatively limited, reversible, localized, and will mainly occur during the construction phase.

### **Environmental and Social Baseline**

This section describes the existing state of the environment in the region of the proposed activity, including radiation conditions, the presence of minerals, background pollution of the atmosphere, noise exposure, the condition of water bodies and soil cover.

The project area is located in the territory of the Lepel, Ushach, Polotsk districts of the Vitebsk region and the cities of Polotsk and Novopolotsk.

**Air quality.** Background concentrations of pollutants in the air of the reconstruction area of the R-46 highway do not exceed the maximum allowable concentrations of pollutants in the air of settlements and places of public recreation approved by the Resolution of the Ministry of



Health of the Republic of Belarus. Based on this, it can be concluded that the existing level of air pollution does not pose a threat to public health.

**Noise.** Measurements of the noise level in two sections near the R-46 highway in the agricultural town of Gomel and Svyatitsa showed excess noise levels at a distance of at least 40 m from the axis of the road. Thus, the design decisions should include noise protection measures to ensure compliance with sanitary standards for noise factors.

**Water resources.** The section of the R-46 to be reconstructed crosses several rivers and water bodies, including the Vydritsa and Belchitsa rivers, the Turzhanka River, the Turovlyanka River, streams, channels and reclamation channels. The planned Polotsk bypass (Phase 2 of the proposed project) will cross the Western Dvina River, an international water body. In addition, there are several lakes in the area.

The concentrations of heavy metals, as well as nitrates and sulfates in the soil samples from the roadside did not exceed the standards. The surface water quality for most of the studied indicators (mineralization, pH, ammonium nitrogen, petroleum products, chlorides, zinc and lead) also does not exceed the standards. The excesses of the normative values for the copper content in some lakes of the area were recorded.

**Biodiversity.** The data on biological diversity obtained in the course of field studies were supplemented by information on the places of growth of wild plants and habitats of wild animals belonging to the species included in the Red Book of the Republic of Belarus, as well as information on the frequency and localization of car accidents involving wild animals.

The section of the R-46 road to be reconstructed passes both through open areas, which is mainly occupied by agricultural land, and through the territory of forestry enterprises. The vegetation of the study area along the R-46 road is represented by forest, segetal (weeds), residential, ruderal, meadow, coastal water and bog types. Forest vegetation along the to be reconstructed section of the R-46 highway is represented by both large forest tracts and small-contour plots of agricultural land. Among the forests along the R-46 highway, mainly pine forests grow on the elevated areas of the relief, while spruce forests grow on the lower sections. At the transitions from the hills to the lowlands, predominantly mixed and small-leaved forests are found, which include birch, aspen, and black alder.

According to the published data, no protected plant species exist within the project's area of influence (within 200 meters of the road). However, during the field investigations as part of the present ESIA, a plant species, sedge rhizomatous, was found within the area of influence of Phase 1 of the project; this species is listed in the Red Book of the Republic of Belarus. Similarly, in the vicinity of Plusy village and Mezjno-2 of Polotsk region, previously unknown growing places of a protected plant species - the open lumbago - were found within the area of influence of Phase 2 of the project (Polotsk City bypass). In addition, along the route of the bypass Option 2, a protected biotope exists namely Black alder and fluffy birch forests on excessively moistened soils and lowland marshes.

The key amphibian species found in various types of biotopes within the project area include grass frog, sharp-faced frog, lake frog, pond frog, edible frog, red-bellied toad, common garlic, common newt, comb newt. In addition, as a result of field studies, three habitats of the crested newt (*Triturus cristatus*), an animal belonging to species included in the Red Book of the Republic of Belarus (IUCN status is Least Concern), were found. The study also identified three areas of amphibian migration across the R-46.

Among the large mammals, European roe deer, wild boar, red deer, elk, and bears are found in the area. However, no registered habitats of animals listed in the Red Book of the Republic of

Belarus exist in the project area. Among the predators, fox, weasel, and forest polecat are found in the area and near water bodies, muskrat, river beaver, river otter, and American mink are found. Near the to-be-reconstructed section of the R-46 highway, beaver dams and traces of beaver activity were found on some watercourses and wetlands. The most abundant rodents on the agricultural lands of the area are the common vole, the red vole, the house vole, the field mouse, as well as representatives of the Squid order: common mole and shrews. These agricultural lands also support brown hare and white hare.

**Social and Socioeconomid aspects.** The project will directly affect 11 rural settlements and two cities - Polotsk and Novopolotsk. In the immediate vicinity of the planned activity, more than 30 rural settlements are located. About 200,000 inhabitants live in the directly affected urban settlements while more than 1500 live in the directly affected rural areas.

One of the unfavorable demographic trends in the Belarusian regions is the loss of economically active population. According to the report of the Ministry of Economy on the development of the economic and demographic situation in the country, the population of rural regions of Belarus will decrease by 500 thousand people by 2032. According to the forecast, this can lead to the fact that the number of districts with a critical level of population that ensure sustainable socio-economic development of the territory can increase from 51 districts in the current situation to 77 by 2032 - this is more than 60% of the country's territory.

The demographic situation in the Vitebsk region reflects the situation characteristic of the whole country. Demographic trends are becoming negative and are caused by a variety of factors of a social and economic nature. The population is gradually decreasing, mainly due to a decrease in the rural population, and according to the data of the Main Statistical Office of the Vitebsk region at the beginning of 2019 it amounted to 1,171.6 thousand (1.17 million) people.

Within a radius of up to 2 km from the area of implementation of the proposed project, there are immovable objects of historical and cultural values, which were given the status of historical and cultural values by the resolution of the Council of Ministers of the Republic of Belarus:

- a settlement of the culture of hatched ceramics (V-III centuries BC) - 2 km from the western outskirts of the village of Staroselye, Lepel district; at a distance of about 1 km to the west of the projected section of the R-46 highway;
- burial mound (X-XI centuries) - 1 km to the south from the village of Belchitsa, Lepel district; at a distance of about 600 m to the west of the projected section of the R-46 highway;
- burial mound (X-XII centuries) - near the village of Glinishche, Polotsk region, on the bank of the Belchanka river; at a distance of about 1.5 km to the west of the projected section of the R-46 highway;
- burial mound (XII-XIII centuries) - 2 km south-west of the village of Gomel, Polotsk region; at a distance of more than 1 km to the west of the projected section of the R-46 highway;
- mass grave (1941-1944) - the village of Gomel, Polotsk region; at a distance of about 320 m to the west of the projected section of the R-46 highway;
- a settlement (XI-XIII centuries) - on the northwestern outskirts of the village of Plussy, Polotsk region; at a distance of about 600 m to the east of the projected section of the R-46 highway;

- mass grave (1941-1944) - the village of Ekiman, Polotsk region; at a distance of about 1 km from the end of the projected section of the R-46 highway.
- - historical and cultural complex “Field of Military Glory” - 43.1 km of the road (left); at a distance of about 90 m from the highway
- – a memorial complex in memory of 580 dead and fallen partisans and partisans of the brigade of KE Voroshilov - km 43.2 of the highway (right); at a distance of about 55 m from the highway

All identified mounds and monuments are located at a distance of more than 200 m from the R-46 highway - outside the boundaries of the work and will not be affected during the reconstruction of the road section.

### **Potential Impacts and Mitigation**

The proposed project will generate socioeconomic benefits due to the improved condition for traffic on R-46, Polotsk city bypass and the bridge over the Western River Dvina. Regional connectivity and traffic safety are also expected to be enhanced. The primary economic benefits of the investment program are cost savings from vehicle operation, reduction in travel time, and lower transaction costs related to transportation. The primary environmental benefits relate to reduced vehicle emissions and improved road safety. These benefits will lead to sustainable development, economic growth as well as improvement of living standards and livelihoods of the local population. The project will also generate employment opportunities particularly during its construction phase.

The potential adverse impacts of the project’s construction phase include limited temporary and permanent land acquisition, habitat loss and tree cutting caused by the construction of Polotsk city bypass, soil and water contamination caused by release of waste effluents from construction sites, accidental leakage of fuels and chemicals, and waste effluents from camps and offices; noise and air emissions generated by construction machinery and vehicles; blockage of canals and drainage channels during the construction of bridges and culverts; impacts associated with borrow areas required to obtain fill material; generation of solid waste, spoil, debris, and asphalt scrapings; blockage of and damage to local roads and infrastructure; health and safety risks for construction workers as well as for local community; COVID-19 transmission risks; and impacts associated with influx of construction workers. Most of these impacts are localized, not wide-spread and temporary, except for the permanent land acquisition required for the Polotsk city bypass.

The potential adverse impacts associated with the operation and maintenance (O&M) of the project road include noise and air quality deterioration caused by the vehicular traffic, safety risks for the local population as well as for the O&M workers, and road hits for wildlife species.

Appropriate mitigation measures have been identified to address the above-described potential impacts of the proposed project. These include payment of compensation to the land owners for the land to be acquired for the project. The RPF has been prepared to guide the preparation and implementation of an Abbreviated Resettlement Plan (ARP) for R-46 to mitigate potential temporary and permanent land acquisition and other resettlement impacts. Other mitigation measures include tree plantation to compensate the tree felling; animal protection measures such as fencing and wild-life crossing; avoiding/protecting the identified protected areas and plants within the area of influence of the project, ensuring that no debris, spoil, or wastes are released in canals and channels; ensuring that the construction works do not block canals and channels; preparation and implementation of pollution prevention plan; preparation and implementation of waste management plan; undertaking measures to control soil erosion;

treating waste effluents released from camps and offices; implementing preventive measures to avoid leakage and spillage of chemicals and fuels; preparation and implementation of community and workers' health and safety plans; preparing and implementing code of conduct for workers and raising their awareness regarding gender issues including gender based violence, communicable diseases in general and COVID-19 in particular, and social norms in the areas. The proposed mitigation measures for the O&M phase include tree plantation along the road where possible/appropriate, road signage to increase safety of population and wildlife, awareness raising of communities along the road, preparation of safety plan for community and O&M workers, and availability of emergency equipment and vehicles.

With the help of above-described mitigation measures, the potential impacts of the project will be mostly addressed, and the significance of residual impacts is likely to be mostly low to negligible.

### **ESMP for Road R-46 (Phase 1 of the project)**

An ESMP for Road R-46 (Phase 1) has been prepared as part of the present ESIA, to provide implementation mechanism for the mitigation measures described above. The key elements of the ESMP include institutional setup, mitigation plan, monitoring plan, reporting and documentation mechanism, grievance redress mechanism, and capacity building.

The overall responsibility of environmental and social performance of the project and effective ESMP implementation will rest with RUE "Vitebskavtodor", which will establish the Project Implementation Working Group (PIWG) to lead the Project implementation. The PIWG will be headed by the Project Director (PD). An Environmental and Social (E&S) Specialist will be hired in PIWG under PD's supervision. The E&S Specialist will be responsible for overall environmental and social management for the project, supervising the environmental and social performance of the project, and oversee the Construction Supervision Consultant (CSC) and contractors. CSC and contractors will also engage dedicated on-site staff for E&S management.

The ESMP lists all the potential impacts, the mitigation measures to address these impacts, and implementing and monitoring responsibilities for these measures – associated with each key activity of the project. The contractor will be required to implement the ESMP, in addition to preparing the Construction ESMP (CESMP) based upon the ESMP and then implementing it.

Two types of monitoring, i.e. environmental quality monitoring (or effects monitoring) and compliance monitoring will be carried out during project construction phase. For the environmental quality monitoring, parameters like water contamination, dust and noise will be monitored by the CSC through a certified laboratory. Separate monitoring will be carried out for the implementation of the ARP.

Compliance monitoring will focus on the monitoring the compliance of various labor and environment, health and safety (EHS) requirements and implementation of mitigation measures identified in the ESMP and CESMP. Semi-annual Environmental and Social Monitoring Reports will be prepared by the PIWG and shared with AIIB. The Environmental and Social Monitoring Reports will focus on the implementation of the ESMP, CESMP and ARP. These reports will (i) verify the compliance to regulations, contract agreements, ESMP, and CESMP; (ii) summarize the monitoring results of environmental quality, capacity building and accidents; (iii) review the implementation of grievance redress mechanism (GRM) (described below); and (iv) recommend corrective actions or amendments in ESMP and CESMP.

### **ESMP Implementation Cost**

The ESMP implementation cost has been tentatively estimated as Euro 500,000. This includes

cost of capacity building and environmental quality monitoring.

### **Grievance Redress Mechanism (GRM)**

The project will establish two separate GRMs, one for the project affected persons (PAPs) and the other for project employees and workers. The Project's three-tiered GRM for the PAPs and employees will be in line with the requirements of the AIIB to provide an opportunity for an independent and impartial review of the submitted complaints.

All parties involved in GRM should adhere to a joint approach at all stages of project planning and implementation to assure those affected by the fact that there are almost no reasons for complaints. However, some people may still have legitimate grievances related to project activities. Many complaints arise from an inadequate understanding of project policies and procedures and can be quickly resolved by properly explaining the situation to the person who has the complaint.

Complaints not related to the activities or impacts of the project may not be resolved by the GRM and grieved party will be informed of this. There may be no charges or fees for the grieved party at any stage of the process. All grievances shall be recorded in a consolidated GRM journal which will be maintained by RUE "Vitebskavtodor".

**GRM for PAPs.** The GRM for PAPs will have three-tiers. The first tier will be established at the field level and for this purpose, a Grievance Redress Committee (GRC) will be formed, comprising staff of village council and a representative of the (PIWG/CSC. Persons affected by the project may contact any of them and they will be responsible for receiving and registering complaints.

If the complaint is not resolved at the first tier, then the matter can be escalated to the second tier at the regional level. At this level, the grievance committee would comprise representatives of the departments / divisions of the district executive committee who are directly concerned with the implementation of the project (at least one representative), the head of the district inspection of natural resources and environmental protection, and representatives each of PIWG and CSC.

If a complaint is not resolved at the second tier, the matter would be escalated to the third tier, managed by the PIWG. At this level, in addition to the PIWG and CSC representative, members of the Technical Council will be included in the grievance committee.

If the complainant does not agree or is not satisfied with the decision made, s/he has the right to directly to the Court of Law for a solution.

**GRM for Project employees.** In accordance with best practices, it is necessary to create a separate mechanism for dealing exclusively with complaints related to workers hired by contractors for construction work. Such complaints may include wage rates and unpaid overtime work, irregular and partial payments, lack / inadequacy of living quarters, lack of clean drinking water and the necessary sanitary and epidemiological conditions, as well as lack of medical care.

A complaints committee(s) will be created to deal with labor complaints, including members who are directly or indirectly related to construction work. The PIWG Manager will appoint an officer for each GRC to receive complaints and ensure that the complainant does not lose his/her job and is not afraid/compelled to withdraw the complaint before the formal hearing. To ensure an impartial and transparent hearing of complaints, hearings will be held in a non-threatening environment and will be open to all other workers on the site.

**Project-affected People's Mechanism.** In addition to the above-described GRMs, the Project-

affected People's Mechanism (PPM) has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from Project-affected people (PAP) who believe they have been or are likely to be adversely affected by AIIB's failure to implement its Environmental and Social Framework (ESF) in situations when their concerns cannot be addressed satisfactorily through Project-level GRMs or AIIB Management's processes.

### **Stakeholder Consultations and Disclosure**

**Consultations.** The stand-alone SEP provides guidance of constructive interaction between all stakeholders in the context of COVID-19 social restrictions that may arise. The stakeholder consultations were carried out while conducting the present ESIA, using the appropriate methods, including targeted emails, sending questionnaires through post, telephone calls, social media platforms (eg, viber), disseminating information through regional newspapers and at public places.

Trips with the purpose of holding meetings on the ground with affected and interested parties took place on May 27 and 28, 2020. Information about the Project was previously sent out and an agreement was reached with representatives of local authorities on informing and questioning interested and affected parties to the Project.

For district, city and rural executive committees, land users (organizations and individuals) of land plots planned for temporary or permanent allotment for reconstruction of the road and construction of an allotment in Polotsk, as well as land users whose plots are located in the area of the planned activity, questionnaires were developed. These questionnaires, as well as the minutes of the meetings, contain an assessment of the provisions of the Project, collected information on vulnerable categories of people, expressed during personal meetings with interested persons, concerns, wishes and suggestions.

Citizens interested in the implementation of the Project, supervisory bodies living in the vicinity of highways, public organizations, including environmental profile, enterprises and organizations that may be potentially affected by the acquisition of land under the Project, organizations involved in the implementation of the Project expressed their concerns, comments, suggestions, etc. by e-mail, in Google form and by phone.

During meetings with representatives of local authorities, the main design solutions were presented for the reconstruction of the R-46 highway, the construction of a Polotsk City bypass, the reconstruction of the existing bridge over the river Zapadnaya Dvina, as well as land and cadastral plans of the lands of interested and affected land users of the Lepel, Ushach and Polotsk regions. The main concerns and expectations of representatives of the administration and local residents related to the implementation of the Project were also obtained.

During the publication of information at the design stage, 97 questionnaires were sent to affected and interested parties and more than 60 telephone conversations were conducted (remote communication). Whereas to minimize potential negative impacts during the construction and operation phases and to fully and comprehensively take into account the opinions, concerns and suggestions of interested parties, questionnaires were distributed among the key stakeholders, mainly by e-mail.

**Disclosure.** This draft ESIA document and RPF (in English and Russian) were disclosed at

the websites of MTC<sup>1</sup> and AIIB<sup>2</sup> and the same will be done for the final versions. Their Executive Summaries will also be disclosed in Belarussian. This is done to ensure that Project-affected people and other stakeholders can provide feedback. The hard copies of the draft and final ESIA and RPF will also be available in the relevant government offices and other appropriate locations. This draft ESIA document and RPF (in English and Russian) were disclosed at the websites of and the same will be done for the final versions.

---

<sup>1</sup> <http://www.vitavtodor.by/regulatory/proekt-rekonstruktsiya-respublikanskoy-avtomobilnoy-dorogi-r-46/>

<sup>2</sup> <https://www.aiib.org/en/projects/details/2019/proposed/Belarus-Rehabilitation-and-Upgrading-of-National-Road-R46.html>

### LIST OF ABBREVIATIONS

AIIB	Asian Infrastructure Investment Bank
AIM	Anti-Icing Materials
AOI	Area of influence
ARP	Abbreviated Resettlement Plan
BOD	Biological oxygen demand
BSU	Belarussian State University
CEC	City Executive Committee
CESMP	Construction ESMP
CITIES	Convention on International Trade in Endangered Species
CMM	Center for maintenance management
COD	Chemical oxygen demand
CSC	Construction Supervision Consultant
CUE	Communal unitary enterprise
DEC	District Executive Committee
DLP	Defects Liability Period
EHS	Environment, health and safety
EIA	Environmental impact assessment
ES	Environmental and social
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESP	Environmental and Social Policy
ESS	Environment and Social Standards
GBV	Gender-based violence
GDS	Gas distribution station
GGM	Gamma-gamma-method
GRC	Grievance redress committee
GRM	Grievance redress mechanism
GOST	gosudarstvennyy standart (State standard)
HIV/AIDS	Human immunodeficiency virus / Acquired Immune Deficiency Syndrome
IPPF	Indigenous Peoples planning framework
IUCN	International Union for Conservation of Nature
km	Kilometer
kV	kilovolt
LC	Least concern
LLC	Limited liability company
LRD	Linear road distances
MPC	Maximum permissible concentration
MTC	Ministry of Transport and Communications
NEMS	National Environmental Monitoring System
NGO	Non-governmental organization
O&M	Operation and maintenance
OJSC (OAO)	Open Joint Stock Company
PAP	Project affected person
PD	Project Director
PIWG	Project Implementation Working Group
PPM	Project-affected People's Mechanism
RIUE	Republican Industrial Unitary Enterprise
RMD	Road Maintenance Department



ROD	Road and operational department
RPF	Resettlement Planning Framework
RUE	Republican unitary enterprise
SEA	Strategic environmental assessment
SEE	State ecological expertise
SEP	Stakeholder Engagement Plan
SFE (GLHU)	State forestry enterprise
STB	State standard of (Republic of) Belarus
TCP	Technical code of practice
UEPCP	Unified Environmental Pollution Calculation Program
WHO	World Health Organization
ПІК	Picket

## CONTENT

<b>Executive Summary .....</b>	<b>ii</b>
<b>LIST OF ABBREVIATIONS .....</b>	<b>xii</b>
<b>1. Introduction .....</b>	<b>1</b>
1.1. Project Background.....	1
1.2. Project Phases and Components .....	2
1.3. Category of the project.....	3
1.4. Objectives of the ESIA .....	3
1.5. Scope and Methodology of the ESIA .....	4
1.5.1. Reviewing Project Design.....	4
1.5.2. Scoping.....	5
1.5.3. Regulatory Review .....	5
1.5.4. Environmental and Social Baseline Survey .....	5
1.5.5. Assessment of Potential Impacts.....	5
1.5.6. ESMP Preparation .....	5
1.5.7. Resettlement Planning.....	6
1.5.8. Stakeholder Engagement.....	6
1.5.9. ESIA Report Compilation.....	6
1.6. EIA Study Team .....	6
<b>2. Project Description .....</b>	<b>7</b>
2.1. Description of the proposed activities.....	7
2.1.1. Reconstruction of the R-46 highway.....	7
2.1.2. Center for Maintenance Management.....	9
2.1.3. Construction of the Polotsk City bypass .....	10
2.1.4. Reconstruction of the Novopolotsk (Kalininsky) bridge .....	14
2.2. Ancillary project facilities.....	14
2.3. Description of construction work, stages.....	17
2.3.1. Reconstruction of the R-46 highway.....	17
2.3.2. Construction of the Polotsk City bypass .....	20
2.4. Movement of vehicles during the reconstruction period. Bypass roads .....	21
2.5. Supply of building materials and transportation range .....	24
<b>3. Analysis of Alternatives.....</b>	<b>32</b>
3.1. “No action” Alternative .....	32
3.2. Two lane vs. four lane alternative.....	33
3.3. Pavement alternatives .....	34
3.4. Alternatives for the Polotsk City bypass.....	36
3.5. Alternatives for the location of the bridge across the Western Dvina river.....	40

<b>4.</b>	<b>Legal and Policy Framework .....</b>	<b>42</b>
4.1.	Legal aspects in the field of environmental protection and rational nature management.....	42
4.2.	EIA procedure and public discussions of the EIA report .....	45
4.3.	International conventions and protocols in the field of environmental protection and nature management.....	49
4.4.	Aarhus Convention .....	50
4.5.	AIIB Policy .....	51
4.6.	Comparative characteristics of Belarusian legislation with the AIIB policy on environmental and social aspects .....	52
<b>5.</b>	<b>Environmental and Social Characteristics of the Project Area.....</b>	<b>59</b>
5.1.	Methodology for assessing the current state of the environment .....	59
5.2.	Natural conditions and resources .....	59
5.2.1.	Climate .....	59
5.2.2.	Radiation level.....	61
5.2.3.	Relief and geomorphological features of the study area, Engineering and geological conditions.....	62
5.2.4.	Hydrology of the study area.....	71
5.2.5.	Land and soil cover .....	82
5.2.6.	Landscapes.....	87
5.2.7.	General characteristics of the territory adjacent to the P-46 highway .....	89
5.2.8.	General characteristics of the territory of proposed Center for Maintenance Management .....	91
5.3.	Current state of the environment.....	92
5.3.1.	Air Quality .....	92
5.3.2.	Noise .....	95
5.3.3.	Soils .....	96
5.3.4.	Surface water .....	99
5.4.	Biological diversity.....	108
5.4.1.	Specially protected natural areas .....	108
5.4.2.	Vegetation.....	110
5.4.3.	Wildlife .....	150
5.5.	Social conditions.....	158
5.5.1.	Administrative-territorial units in the Project area .....	159
5.5.2.	Demographic situation.....	159
5.5.3.	Public health.....	165
5.5.4.	Social characteristics of the population affected by the project.....	167
5.5.5.	Social and cultural facilities.....	169

5.5.6. Objects of historical and cultural heritage.....	173
<b>6. ASSESSMENT OF IMPACTS AND MEASURES FOR MITIGATING CONSEQUENCES .....</b>	<b>176</b>
6.1. Impact assessment methodology.....	176
6.2. Impact on the physical environment.....	177
6.2.1. Noise .....	177
6.2.2. Air Quality .....	181
6.2.3. Impact on surface and groundwater. Assessment and forecast of changes in their condition.....	192
6.2.4. Impact on geology. Assessment and forecast of changes in geological conditions and topography .....	195
6.2.5. Impact on land and soil cover. Assessment and forecast of changes in the state of land resources and soil cover.....	196
6.3. Impact on the biological environment .....	200
6.3.1. Impact on vegetation .....	200
6.3.2. Impact on wildlife.....	203
6.4. Risks related to labor protection and industrial hygiene.....	207
6.5. Impact on the socio-economic environment .....	208
6.5.1. Impact on national and local economies .....	209
6.5.2. Traffic safety for pedestrians and cyclists.....	209
6.5.3. Land acquisition and involuntary resettlement.....	210
6.5.4. Changes in traffic, division of territories and restriction of access.....	214
6.5.5. Changing the availability of ecosystem services .....	215
6.5.6. Public health and safety during construction .....	215
6.5.7. Social Conflict and Influx of Workers.....	216
6.5.8. Impacts on Cultural Resources, Monuments, and Historical Sites .....	217
6.5.9. Site Clearance and Restoration.....	217
<b>7. Stakeholder Engagement and Information Disclosure.....</b>	<b>218</b>
7.1. Consultations along R-46.....	218
7.2. Consultation along Polotsk City bypass .....	219
7.3. Results of consultations and questionnaires conducted as part of the ESIA .....	220
7.4. Results of the survey .....	229
7.5. Results of processing online questionnaires (Google forms) .....	242
7.6. Plan for subsequent discussions on the implementation of the proposed activity.....	243
7.7. Disclosure .....	244
<b>8. Environmental and Social Management Plans .....</b>	<b>246</b>
8.1. Objective of ESMPs.....	246

8.2.	Overview of ESMPs .....	246
8.3.	Project-level Grievance Redress Mechanism .....	247
8.3.1.	GRM for PAPs .....	247
8.3.2.	Grievance Redress Mechanism for Project Workers .....	248
8.3.3.	Grievance Redress Mechanism Process overview .....	248
8.4.	AIIB’s Project-affected People’s Mechanism .....	254

## **List of Appendices**

Appendix A:	Overview map of the road R-46
Appendix B:	Copies of documents and letters provided by authorized state bodies and institutions
Appendix C:	Water Sample Analysis Protocols
Appendix D:	Results of public discussions (minutes, summary of reviews) held within the framework of the legislation of the Republic of Belarus
Appendix D.1:	Reconstruction of the highway R-46
Appendix D.2:	Construction of a Polotsk City bypass
Appendix E:	Minutes of meetings held May 27–28, 2020
Appendix F:	Completed Application Forms (in electronic form)
Appendix G:	Publication of information on planned activities for the period of the ESIA
Appendix H:	Environmental and Social Management Plan (Phase 1)

## LIST OF TABLES

Table 2.1:	Technical parameters of the project.....	7
Table 2.2–:	Technical parameters of the project for three options for the Polotsk bypass ....	13
Table 2.3:	Characteristics of the R-46 highway.....	18
Table 2.4:	Technical structures envisaged by the project for the reconstruction of the R-46 highway.....	18
Table 2.5:	<i>Possible suppliers of building materials for the first stage of the reconstruction of the P-46 highway and range of transportation.....</i>	<i>25</i>
Table 2.6:	<i>Sources of receipt and range of transportation of building materials and products for the second stage of reconstruction of the R- 46 highway .....</i>	<i>27</i>
Table 2.7:	<i>Possible suppliers of building materials for the construction of the Polotsk City bypass and the range of transportation.....</i>	<i>28</i>
Table 3.1:	<i>Comparison of the “Implement the project” and “No action” alternative options for reconstruction of the R-46 highway .....</i>	<i>32</i>
Table 3.2:	<i>Comparison of a two-lane and a four-lane alternative options for reconstruction of the R-46 highway .....</i>	<i>34</i>
Table 3.3:	<i>Comparison of the “Implement the project” and “No action” alternative options for reconstruction of the R-46 highway .....</i>	<i>37</i>
Table 3.4:	<i>Comparison of alternative options for bypassing the city of Polotsk .....</i>	<i>40</i>
Table 4.1:	<i>Comparison of Belarusian legislation with the AIIB policy on environmental and social aspects .....</i>	<i>53</i>
Table 5.1:	<i>Wind directions in Ushachskiy district .....</i>	<i>60</i>
Table 5.2:	<i>Wind directions in Polotskiy district .....</i>	<i>61</i>
Table 5.3:	<i>Types of land in the districts, on the territory of which the reconstructed highway R-46 passes .....</i>	<i>83</i>
Table 5.4:	<i>Cadastral valuation of land and soil fertility.....</i>	<i>84</i>
Table 5.5:	<i>General characteristics of the territory adjacent to the P-46 highway .....</i>	<i>89</i>
Table 5.6:	<i>Estimated background concentrations of pollutants in the air of rural settlements of Lepelsky, Ushachsky and Polotsk regions .....</i>	<i>93</i>
Table 5.7:	<i>Hygienic assessment of the degree of air pollution by a complex of pollutants at the maximum single concentrations.....</i>	<i>94</i>
Table 5.8:	<i>The calculation of the value of the complex indicator "P" in the area of the reconstruction of the object.....</i>	<i>95</i>
Table 5.9:	<i>Permissible equivalent and maximum sound levels in residential areas.....</i>	<i>95</i>
Table 5.10:	<i>The results of measurements on the maximum noise level .....</i>	<i>96</i>
Table 5.11:	<i>The average content of pollutants in soils on the background monitoring network of the Vitebsk region .....</i>	<i>96</i>
Table 5.12:	<i>Average pollutant content in roadside soils .....</i>	<i>98</i>
Table 5.13:	<i>Maximum permissible concentrations of some metals for water bodies of the Zapadnaya Dvina river basin .....</i>	<i>99</i>
Table 5.14:	<i>Average annual concentrations of chemicals in Zapadnaya Dvina river.....</i>	<i>101</i>
Table 5.15:	<i>Water quality indicators in samples from lakes.....</i>	<i>107</i>
Table 5.16:	<i>Water quality indicators in samples from rivers.....</i>	<i>107</i>
Table 5.17:	<i>Water quality and concentration of chemicals in surface water .....</i>	<i>107</i>

Table 5.18:	<i>Ratio of the concentration indicators of Mn and Cu to the standard indicators .....</i>	108
Table 5.19:	<i>Change in forest cover in the study area in 2013-2019.....</i>	111
Table 5.20:	<i>List of amphibians and reptiles found along the P-46 highway before reconstruction .....</i>	154
Table 5.21:	<i>Avifauna, occurring along the road R-46 to the reconstruction.....</i>	155
Table 5.22:	<i>List of mammals found along the P-46 highway before reconstruction .....</i>	157
Table 5.23:	<i>Population of the Vitebsk region.....</i>	160
Table 5.24:	<i>Population density by regions and the city of Minsk .....</i>	161
Table 5.25:	<i>Urban and Rural Population by Affected Areas .....</i>	162
Table 5.26:	<i>Vital population movement in affected areas.....</i>	162
Table 5.27:	<i>Population by age groups in affected areas .....</i>	163
Table 5.28:	<i>Average salaries by industry and type of activity in the Republic of Belarus .....</i>	164
Table 5.29:	<i>Average assigned monthly pensions in Belarus for 2019, BYN.....</i>	164
Table 5.30:	<i>Population structure in rural settlements of the Kamensky village council located near the R-46 highway .....</i>	167
Table 5.31:	<i>Population structure in rural settlements of the Zharsky village council located near the R-46 highway .....</i>	167
Table 5.32:	<i>Population structure in rural settlements of the Sorochinsky village council, located near the R-46 highway .....</i>	167
Table 5.33:	<i>Population structure in rural settlements of the Gomel village council located near the R-46 highway .....</i>	168
Table 5.34:	<i>Population structure in rural settlements of the Ekimansky village council, located near the R-46 highway and the planned Polotsk City bypass .....</i>	169
Table 6.1:	<i>Comprehensive assessment of the Project taking into account environmental and social impacts .....</i>	176
Table 6.2:	<i>Existing levels of maximum noise from vehicles on the streets within the project area .....</i>	180
Table 6.3:	<i>Location and length of noise barriers.....</i>	181
Table 6.4:	<i>Traffic flow and the weighted average traffic intensity on the reconstructed section of the R-46 highway 0.000 – 61.500 km for a 20-year perspective .....</i>	182
Table 6.5:	<i>Expected exhaust emissions from the reconstructed section of the R-46 highway 0.000 – 61.500 km for a twenty-year perspective .....</i>	183
Table 6.6:	<i>Expected exhaust emissions from the planned Polotsk City bypass .....</i>	185
Table 6.7:	<i>Pollutants excluded from the modelling .....</i>	187
Table 6.8:	<i>Estimated maximum surface concentration of the pollutant in fractions of the maximum one-time MPC at different distances from the edge of the roadway.....</i>	187
Table 6.9:	<i>Surface concentration of the pollutant in fractions of the maximum single MPC.....</i>	189
Table 6.10:	<i>Expected GHG emissions from the reconstructed section of the R-46 highway 0.000 – 61.500 km.....</i>	190
Table 6.11:	<i>Expected GHG emissions from the Polotsk City bypass .....</i>	190
Table 6.12:	<i>Soil pollution along the section of the M1 highway near Gorky .....</i>	198

Table 6.13:	<i>Soil pollution along the section of the M1 highway near Gorky with oil products and other substances</i> .....	199
Table 6.14:	<i>Assessment of road safety, pedestrians and cyclists</i> .....	210
Table 6.15:	<i>Impacts caused by land acquisition</i> .....	211
Table 6.16:	<i>Characteristics of sites with possible access restrictions</i> .....	214
Table 6.17:	<i>Impact on public health and safety during construction</i> .....	215
Table 7.1:	<i>Summary of public discussions held within the framework of the legislation of the Republic of Belarus (R-46 highway)</i> .....	218
Table 7.2:	<i>Summary of public discussions held within the framework of the legislation of the Republic of Belarus (the Polotsk City bypass)</i> .....	219
Table 7.3:	<i>Consultations held as part of the Project and the preparation of the ESIA</i> .....	222
Table 7.4:	<i>Evaluation of the Project by stakeholders based on the results of the survey</i> ..	230
Table 7.5:	<i>Evaluation of the possibility of implementing the proposals of the parties concerned and affected by the reconstruction project of the P-46 highway, received during the meetings, consultations and questionnaires</i> .....	235
Table 7.6:	Consultation and Participation Framework during Project Implementation ....	243
Table 8.1:	GRM Log outline .....	250
Table 8.2:	Timing of the response to grievances depending on the degree of urgency .....	251

## LIST OF FIGURES

Figure 1.1:	ESIA Methodology .....	4
Figure 2.1:	Project Location .....	8
Figure 2.2–	Three options for the Polotsk bypass .....	10
Figure 2.3:	Location of the Svyaditskoye sand deposits .....	15
Figure 2.4:	Location of the Atroshkovskoye sand deposit .....	15
Figure 2.5:	<i>Detour path during the reconstruction of the R-46 highway on the span between pickets ПК 427 + 70 ... ПК 496 + 50</i> .....	23
Figure 2.6:	<i>Transportation routes of building materials</i> .....	31
Figure 3.1:	<i>Detour of a reconstructed highway section (blue lines) for the option with cement concrete coating</i> .....	35
Figure 3.2:	<i>Redistribution of traffic due to the construction of the Polotsk City bypass</i> .....	36
Figure 5.1:	<i>Geomorphological areas near the R-46 highway</i> .....	63
Figure 5.2:	<i>Typical landforms in the area of the R-46 highway along the Chashnikskaya moraine and water-glacial plain</i> .....	64
Figure 5.3:	<i>Typical landforms in the area of the R-46 highway along the Ushachskaya glacial hill</i> .....	65
Figure 5.4:	<i>Typical landforms in the area of the R-46 highway along the Shumilino moraine plain</i> .....	66
Figure 5.5:	<i>Relief with forms of aeolian genesis along a highway section within the Polotsk Lowland</i> .....	67
Figure 5.6:	<i>Quaternary deposits of the area of the proposed activity is presented</i> .....	68



Figure 5.7:	<i>Vydritsa River near the R-46 highway</i> .....	72
Figure 5.8:	<i>Turzhanka River near the R-46 highway</i> .....	73
Figure 5.9:	<i>Turovlyanka river near the R-46 highway</i> .....	73
Figure 5.10:	<i>Dam and reservoir on the Belchanka river</i> .....	74
Figure 5.11:	<i>View of Lepel Lake from the R-46 highway</i> .....	75
Figure 5.12:	<i>Zmeinoe Lake</i> .....	76
Figure 5.13:	<i>A creek connecting Lake Lukshos with the Vydritsa River</i> .....	77
Figure 5.14:	<i>Yanovo Lake</i> .....	78
Figure 5.15:	<i>Gomel Lake</i> .....	79
Figure 5.16:	<i>Schaty Lake</i> .....	80
Figure 5.17:	<i>Map of landscapes in the rank of genus in the area passing the R-46 highway</i> .....	87
Figure 5.18:	<i>The location of the existing land plot and the newly allotted one</i> .....	92
Figure 5.19:	<i>Dependence of the degree of soil pollution on the intensity of traffic</i> .....	97
Figure 5.20:	<i>The content of heavy metals in soils at different distances from the roadbed</i> .....	98
Figure 5.21:	<i>The content of sulfates, nitrates and oil products in soils at different distances from the roadbed</i> .....	98
Figure 5.22:	<i>State of surface water bodies of the Zapadnaya Dvina river basin based on hydro-biological indicators</i> .....	100
Figure 5.23:	<i>State of surface water bodies of the Zapadnaya Dvina river basin based on hydro-chemical indicators</i> .....	100
Figure 5.24:	<i>The proportion of water samples from the Zapadnaya Dvina River with concentrations exceeding the MPC for the observed substances in 2014-2018</i> .....	101
Figure 5.25:	<i>Locations of water sampling points</i> .....	106
Figure 5.26:	<i>Natural monuments in the area of the planned activities</i> .....	108
Figure 5.27:	<i>The Sorochinsky boulder</i> .....	109
Figure 5.28:	<i>The Volotovka kamt</i> .....	110
Figure 5.29:	<i>Haircap-moss spruce forest on the study area</i> .....	112
Figure 5.30:	<i>Mossy spruce forest on the study area</i> .....	113
Figure 5.31:	<i>Broad-leaved spruce forests in the study area</i> .....	113
Figure 5.32:	<i>Mossy pine forests in the study area</i> .....	114
Figure 5.33:	<i>Lingonberry pine forests in the study area</i> .....	115
Figure 5.34:	<i>Roadside slopes along the highway within the Polotsk region are places where Pulsatilla patens grows</i> .....	115
Figure 5.35:	<i>Lichen pine forests in the study area</i> .....	116
Figure 5.36:	<i>Ledum pine forests in the study area</i> .....	117
Figure 5.37:	<i>Sedge-sphagnum pine forests in the study area</i> .....	117
Figure 5.38:	<i>Blueberry pine forests in the study area</i> .....	118
Figure 5.39:	<i>Blueberry birch forest in the study area</i> .....	119
Figure 5.40:	<i>Warty birch bracken-green-moss-sour forests on the study area</i> .....	120
Figure 5.41:	<i>Downy birch forests in the study area</i> .....	120
Figure 5.42:	<i>Black alder nettle forest in the study area</i> .....	121
Figure 5.43:	<i>Alder fern forest in the study area</i> .....	122

Figure 5.44:	<i>Gray alder forests in the study area</i> .....	123
Figure 5.45:	<i>Gray alder meadowsweet forests in the study area</i> .....	123
Figure 5.46:	<i>Monodominant forests consisting of spruce or pine forests in the study area</i> .....	124
Figure 5.47:	<i>Mixed forests consisting of spruce and birch forests in the study area</i> .....	124
Figure 5.48:	<i>Protective plantings along the highway</i> .....	125
Figure 5.49:	<i>Introduced decorative and fruit trees along the road</i> .....	126
Figure 5.50:	<i>Eastern pasqueflower and place of its growth</i> .....	127
Figure 5.51:	<i>Sedge rhizomatous and its place of grows</i> .....	128
Figure 5.52:	<i>Segetal vegetation along the highway</i> .....	129
Figure 5.53:	<i>Ruderal vegetation along the highway</i> .....	129
Figure 5.54:	<i>Sosnowski hogweed along the highway</i> .....	130
Figure 5.55:	<i>Residential vegetation along the highway</i> .....	131
Figure 5.56:	<i>Burnt dry grass along the road</i> .....	132
Figure 5.57:	<i>Overgrowing ditch extending along the road</i> .....	133
Figure 5.58:	<i>Overgrowing stream in the swamp near the road</i> .....	133
Figure 5.59:	<i>Overgrowing of a river section near a road</i> .....	134
Figure 5.60:	<i>Overgrowing of a pond located near a road</i> .....	134
Figure 5.61:	<i>Black alder forest in a swamp in the study area</i> .....	135
Figure 5.62:	<i>Open lowland swamp in the study area</i> .....	135
Figure 5.63:	<i>Sedge swamp in the study area</i> .....	136
Figure 5.64:	<i>Dead trees appeared because of stagnant waterlogging of the territory</i> .....	136
Figure 5.65:	<i>Transitional bog plot in the study area</i> .....	137
Figure 5.66:	<i>The intersection of the designed highway with the railway</i> .....	138
Figure 5.67:	<i>Trees and shrubs on soils with excessive moisture</i> .....	139
Figure 5.68:	<i>Blueberry pine forest along the Polotsk City bypass road</i> .....	139
Figure 5.69:	<i>Alder thickets along watercourses</i> .....	140
Figure 5.70:	<i>Shrubby willow thickets along the Polotsk City bypass route</i> .....	140
Figure 5.71:	<i>A section of a birch forest along the Polotsk City bypass road</i> .....	141
Figure 5.72:	<i>Spruce blueberry on the highway bypass Polotsk</i> .....	141
Figure 5.73:	<i>Black alder grass sedge forest along the Polotsk City bypass route</i> .....	143
Figure 5.74:	<i>Sedge-sphagnum pine forest along the Polotsk City bypass road</i> .....	143
Figure 5.75:	<i>Territory with shrubby vegetation within the city of Novopolotsk</i> .....	144
Figure 5.76:	<i>A loaded shallow body of water within the city of Novopolotsk</i> .....	145
Figure 5.77:	<i>Recreational load on the study area</i> .....	145
Figure 5.78:	<i>Ash-leaved maple off the coast of the Zapadnaya Dvina river</i> .....	146
Figure 5.79:	<i>Acidiferous spruce on the lands of the Polotsk educational and experimental leshoz</i> .....	146
Figure 5.80:	<i>Ripe and complex in acid composition spruce is a potentially typical biotope</i> .....	147
Figure 5.81:	<i>Ledum pine on the lands of the Polotsk training and experimental leshoz</i> .....	148
Figure 5.82:	<i>Swamp vegetation along the bypass route of the city of Polotsk</i> .....	149
Figure 5.83:	<i>The intersection of the highway R-46 of the Zapadnaya Dvina River</i> .....	150

Figure 5.84:	<i>Location of crested newt habitats along the P-46 road and in the area of its potential impact during construction.....</i>	153
Figure 5.85:	<i>Population of the Vitebsk region in comparison with other regions of the Republic of Belarus.....</i>	160
Figure 5.86:	<i>Age and gender pyramid of the population of Vitebsk region.....</i>	161
Figure 5.87:	<i>Primary incidence of the adult population of Vitebsk region.....</i>	165
Figure 5.88:	<i>Comparative characteristics of the primary incidence of the adult population.....</i>	166
Figure 5.89:	<i>The structure of the primary incidence of the adult population.....</i>	166
Figure 5.90:	<i>Shop in the village of Sorochino.....</i>	170
Figure 5.91:	<i>Post Office village of Sorochino.....</i>	170
Figure 5.92:	<i>Gas stations along the R-46 highway.....</i>	171
Figure 5.93:	<i>Cafe along the R-46 highway.....</i>	172
Figure 5.94:	<i>Cafe "Veterok".....</i>	172
Figure 5.95:	<i>Historical and Cultural Complex "Field of Military Glory".....</i>	174
Figure 5.96:	<i>Memorial complex in memory of 580 dead and fallen partisans and partisans of the brigade K.E. Voroshilov.....</i>	175
Figure 6.1:	<i>Map of sound attenuation at maximum points in the territory of the existing residential development in the daytime.....</i>	179
Figure 6.2:	<i>Map of sound attenuation at maximum points on the territory of the existing residential development at night.....</i>	179
Figure 6.3:	<i>Existing garages on the highway according to option 3 of the construction of the Polotsk City bypass.....</i>	213
Figure 7.1:	<i>Consulting with representatives of local authorities.....</i>	229
Figure 7.2:	<i>Project Evaluation Responses.....</i>	242
Figure 7.3:	<i>Project Evaluation Responses, all responses.....</i>	243
Figure 8.1:	<i>Complaints and Suggestions Form in Russian.....</i>	250
Figure 8.2:	<i>Management Structure of the GRM.....</i>	252

# 1. Introduction

The Belarussian Ministry of Transport and Communications (MTC) is planning a project of reconstruction of the R-46 Lepel-Polotsk – Russian Federation border (Yukhovichi) (hereinafter National Road R46 or R46), from kilometer (km) 1.700 to km 61.500. The project also includes the construction of the Center for Maintenance Management (CMM), the Polotsk City bypass and the reconstruction of the bridge over the Western River Dvina at 0.329 km of the highway R-20 Vitebsk - Polotsk - the border of the Republic of Latvia (Grigorovshchina). The Asian Infrastructure Investment Bank (AIIB, or the Bank) is considering financing the project. The implementing agency for the project is the Republican Unitary Enterprise for Motor Roads “Vitebskavtodor” (hereinafter referred to as RUE “Vitebskavtodor”).

The implementation of the planned activities is provided for by order of the President of the Republic of Belarus No. 09 / 222-34 P1052 dated 12.07.2017 and the state program for the development and maintenance of roads in the Republic of Belarus for 2017–2020, approved by the Decree of the Council of Ministers of the Republic of Belarus No. 699 of September 18, 2017.

The present Environmental and Social Assessment (ESIA) has been carried out to address the environmental and social impacts of the proposed project, in compliance with the national regulations as well as the AIIB’s Environmental and Social Policy (ESP).

## 1.1. Project Background

Government of Belarus plans to rehabilitate and upgrade the country’s road infrastructure and promoting the integration of the national road network into the wider region’s international transport corridors. The Government has developed the National Program for Development and Operation of Roads in the Republic of Belarus for the years 2017-2020, which was approved by the Council of Ministers in 2017. National Road R46 is included as one of the top priority investments in the program.

The National Road R46 is part of the improvement and upgrading of the North-South Corridor which was initiated by the Governments of Belarus and Russia and will provide the shortest route between Minsk and St Petersburg. The North-South Road Corridor includes the M3 and R46 in Belarus and national roads 58K-284 and E95 in Russia. Russia is Belarus’ largest trading partner, and accounts for around 50 percent of Belarus’ exports. St Petersburg is Russia’s second largest city, with a population of 4.8 million, and its main port on the Baltic sea. Improvement of the North-South Corridor will facilitate the flow of traffic from the Baltic region to Belarus and Russia and will promote the integration of the region’s economies. The upgrading of R46 is a priority for the Government and will allow the road to accommodate the expanding needs of the freight and passengers along the corridor, specifically international through traffic.

Currently, Polotsk is a regional transit center that connects several international roads. Besides the R46 that runs north to the border with Russia, National Roads R45 and R20 connect the city to the border with Lithuania (Kotlovka) and to the border with Latvia (Grigorovshchina) respectively. To prevent the rapidly growing mixed traffic from passing through and congesting the city of Polotsk, the project will finance construction of a new bypass, of around 10.5km in length, starting from km 61+500 of R46 and rejoining the R46 at km 67+470. The bypass will require the construction of a new bridge over the Western Dvina River with a span of around 300 meters and will also include strengthening of the existing Polotsk city bridge. The bypass will connect with R45 and R20 and facility the connection to other sea gate options of Belarus

in Baltic sea. The bypass will divert the international freight traffic and will reduce traffic in the city. This will reduce travel times and the cost of freight transport and will avoid further impacts on traffic in the city. It will also lower the risk of road accidents and reduce negative impacts on the environment.

## **1.2. Project Phases and Components**

The proposed project includes three phases. The Phase 1 will include rehabilitation of the prioritized section of National Road R46 with the length of around 59.8km, from Lepel city to Polotsk city, with the enhanced road safety measure and elimination of identified “black spots” in the road alignment, thus substantially reducing road accidents, and construction of the CMM. The Phase 2 will include construction of the bypass of City Polotsk and a new bridge over Western Devina River. The Phase 3 will comprise strengthening of the existing city bridge, called Novopolotsk Bridge with a span of 288 meters which currently is limited in use as it carries local traffic limited to loads of up to only 5 tons/axle (standard loading requires 11 tons/axle). Further details of these phases are presented below.

Phase 1- Component A. Rehabilitation of National Road R46 (USD100.5 million), comprising: (i) field investigations, detailed designs, including technical and environmental and social (ES) aspects for the road and associated small bridges, and preparation of tender documents for the rehabilitation of the national road R46, section from Lepel to Polotsk; (ii) Rehabilitation of R46 Road, including construction of two lots of the road sections, 2 years of Defect Liability Period (DLP) and establishment of “Center for Maintenance Management”; (iii) Maintenance of road R46, including maintenance during construction (for 2 years) and maintenance during the first 2 years of DLP after construction; and (iv) full time on-site supervision on construction of R46 road and during the first 2 years of DLP. (i) field investigations, detailed designs, including technical and environmental and social (ES) aspects for the road and associated bridges, and preparation of tender documents for the rehabilitation of the national road R46, section from Lepel to Polotsk and establishment of CMM; (ii) civil works for national R46 and CMM; and (iii) full time on site construction supervision of national road R46 and CMM.

Phase 1 - Component B. Technical Support and Project Management (USD 10.5 million). This includes: (i) project Implementation support and Audits including : Project Management Consultant/Support to overall project management, implementation, procurement, ES monitoring and evaluation; support in the preparation of the follow-up phases of the Entire Project; Technical Audit/Review; and Financial Audit of the Project; (ii) institutional capacity building, including trainings and provision of essential equipment and facilities; and (iii) incremental operation cost. (i) Project Implementation support, involving: Technical Audit/Review, support in procurement and overall project management (through hiring of 2-3 required specialists); implementation, monitoring and evaluation of ES aspects and institutional capacity building (for example: specialized courses in transport planning and management); and (ii) Preparation of Phase 2, comprising Detailed Designs (including ES) and , preparation of Tender Documents for the construction of the bypass of City Polotsk bypass , with and the new bridge over Western Devina River; (iii) planning, detailed designs and the preparation of Tender Documents for establishment of the Traffic Management and Maintenance Center in Vitebsk region; and (iv) Incremental operation cost.

Phase 2 and Phase 3 of Entire Project. Phase 2 of the Entire Project would include the following components: (i) field investigations, detailed designs, civil works and construction supervision of the bypass of Polotsk city, in length of about 10.5km. The bypass will include construction of a new bridge over the Western Dvina River with a span of about 300 meters; and (ii) project Implementation support, involving Technical Audit/Review, support in procurement and

overall project management, implementation, monitoring and evaluation of ES aspects and institutional capacity building. Phase 3 of Entire Project would involve filed investigations, detailed designs, civil work and construction supervision of strengthening of the existing Polotsk city bridge, called Novopolotsk Bridge with a span of 288 meters, which carries local traffic but is seriously limited to loads of up to only 5 ton/axle (standard is 11 ton/axle).

### **1.3. Category of the project**

AIIB's Environmental and Social Policy (ESP), including the Environment and Social Standards (ESSs) and the Environmental and Social Exclusion List will apply to this project. ESS 1 (Environmental and Social Assessment and Management) and ESS 2 (Involuntary Resettlement) are applicable. In accordance with AIIB's ESP, the project has been classified as **Category B**, since the environmental and social risks and impacts are relatively limited, reversible, localized, and will mainly occur during the construction phase.

### **1.4. Objectives of the ESIA**

In order to address the adverse environmental and social impacts of this project and in compliance with the national regulations as well as AIIB's ESP, Vitebskavtodor RUE has conducted the present ESIA for the entire project. This ESIA presents the assessment of the potential impacts on the environment and the social aspects and identifies the possible mitigation measures to address these impacts..

The present ESIA aims to address the potentially adverse impacts of the project and its activities on the physical and biological environment as well as on socio-economic aspect – to make the project environmentally sustainable and socially acceptable. The present study has been carried out in response to the requirements defined by the national regulations as well as AIIB ESP. The key objectives of this ESIA study include:

- Determining the current environmental and social baseline conditions of the area;
- Identifying important environmental and social components which may be impacted by the project;
- Assessing the potential environmental and social impacts, including any residual impact of the proposed project;
- Identifying measures to avoid, minimize or mitigate the adverse impact;
- Providing information for the preparation of the ESMP;
- Proposing Grievance Redress Mechanisms for project-affected people and workers.

In addition to this ESIA and to present detailed mitigation plans and their implementation mechanisms, three separate Environmental and Social Management Plans (ESMPs) are envisaged for the three phases of the project. For the Phase 1 of the project, the ESMP for R-46 has been prepared and presented as an **Appendix** of the ESIA. In addition, a supplementary ESIA will be carried out for the CMM prior to the implementation of Phase 1. The remaining two ESMPs will be developed for the Phase 2 and Phase 3 of the project when their respective designs are available.

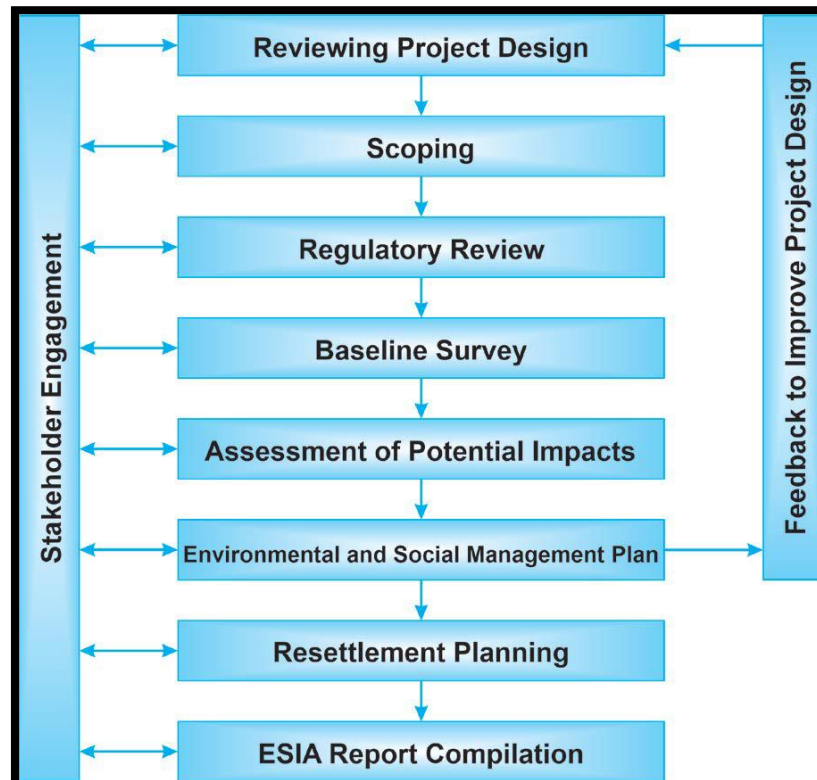
In addition to the above ESIA, a standalone Stakeholder Engagement Plan (SEP) has been prepared for all phases of this project. This ESIA and its ESMPs will be implemented together with the SEP.

A Resettlement Planning Framework (RPF) has also been prepared to cover the entire project and address any physical and/or economic displacement caused by the project, whether of a temporary or permanent nature.

## 1.5. Scope and Methodology of the ESIA

The study covers design, construction and operation and maintenance (O&M) phases of the proposed project. Most of the environment and socio-economic impacts of the project are expected to be localized. The direct area of influence (AOI) consists of the area of 200 m on each side of the road; 200m radius around proposed quarries, borrow areas, batching plant and construction camps. The study area also covers households along the R46 and Polotsk for socio-economic impact assessment, in addition to the direct AOI.

The methodology followed while conducting the present ESIA study of the proposed project is shown in **Figure 1.1** below.



**Figure 1.1: ESIA Methodology**

The activities at each stage of the present ESIA study are briefly described below.

### 1.5.1. Reviewing Project Design

Detailed information about the project and site conditions were used to evaluate the proposed interventions and their potential environmental and social impacts. The following aspects have been included in the brief description of the project:

- Location of the project and its accessibility;
- Use of natural resources i.e. soil, water and its sources;
- Use of raw materials, fuels and chemicals, their quantities, characteristics, arrangements for transport to site, and storage facilities;
- List of main equipment and machinery, built-in pollution control equipment, description of detailed manufacturing process;

- Information on solid, liquid and gaseous waste generated, and their points of generation;
- Noise level produced by equipment and machinery;
- Layout maps showing key project components.

### **1.5.2. Scoping**

The environmental and social components of the Project activities were identified during scoping process, which was implemented during two stages. At the first stage, environmental and social experts evaluated the impacts of the Project. This informed the preparation of the draft ESIA which will be disclosed for review and stakeholder consultations in accordance with AIIB ESP. Received feedback will be taken under consideration and relevant changes incorporated into the final ESIA. Based on Project activities the study team carried out the scoping and identified potential E&S impacts.

### **1.5.3. Regulatory Review**

As part of this task, national regulatory framework relevant to environmental and social assessment as well as involuntary resettlement was reviewed. In addition, the AIIB's ESP and ESS were reviewed and their relevance to the proposed project determined. Finally, a comparison of the two sets of the requirements (ie, national and AIIB requirements) was carried out and gaps between them identified.

### **1.5.4. Environmental and Social Baseline Survey**

The environmental and social baseline conditions of the proposed project area have been determined by collecting relevant data from primary and secondary sources. Under the ESIA study, available data on climate, geology, seismicity, water resources, land resources, soil properties, agriculture, ecology and socio-economic components have been collected from secondary sources. Reconnaissance field visit and instrument monitoring of environmental quality were also carried out in May-June 2020 to collect primary data in the key areas of terrestrial ecology, hydrology, industries and socioeconomics of the local community, physical and biological environment.

Majority of the socio-economic data has been collected from secondary sources as the ESIA was prepared in the conditions of limitations related to COVID-19 risks. Primary information was obtained through structured remote outreach, limited meetings in person and public gatherings.

### **1.5.5. Assessment of Potential Impacts**

Subsequent to the scoping, review of project details, and review of baseline environmental and social conditions, assessment of impacts on each of the environmental and social parameter was carried out. Once the potential impacts were identified, their significance was assessed. Subsequently, the mitigations and enhancement measures were suggested to avoid, minimize and /or compensate the potential impacts. For this purpose, mitigation strategies adopted during earlier projects of similar nature were reviewed in addition to relying upon experts' judgment. Subsequently, residual impacts – impacts that are likely to take place even after the implementation of mitigation measures – and their significance were assessed.

### **1.5.6. ESMP Preparation**

The ESMP was developed once the impact assessment was completed and mitigation measures identified. During the ESMP compilation, institutional arrangements for environmental and



social management of the project were recommended, mitigation and monitoring plans were formulated, documentation and reporting protocols were defined, training needs were assessed, and cost of ESMP implementation estimated.

### **1.5.7. Resettlement Planning**

As the Project activities may have negative impacts on PAPs' livelihoods, such as temporary/permanent land acquisition, economic displacement and restriction of access, a Resettlement Policy Framework was prepared to provide the process to be followed to address the involuntary resettlement impacts caused by the project in accordance with the national requirements as well as AIIB ESP and ESS.

### **1.5.8. Stakeholder Engagement**

Stakeholder engagement started from environmental and social baseline stage when data and information on baseline conditions is collected from the directly and indirectly project impacted people. Their perceptions were considered in the selection of important environmental and social components through the scoping process.

Limited consultations were carried out during ESIA study, due to COVID-19 restrictions. The ESIA team arranged consultation meetings with project affected people and local government authorities to elicit their feedback of project activities.

### **1.5.9. ESIA Report Compilation**

Towards to end of present assignment, the ESIA report was prepared compiling the process and outcome of the tasks described above.

## **1.6. EIA Study Team**

Assessment of the impact on the environment and social sphere was carried out by the staff of the Belarusian State University (BSU) under the supervision of a senior researcher at the Research Laboratory of Landscape Ecology, A. L. Demidova. Other members of the study team include:

- Head of the Research Laboratory of Landscape Ecology, PhD geo sciences S.I. Kuzmin
- Leading Researcher, PhD biol. Sciences M.A. Jus
- Senior Researcher A.V. Bobko
- Senior Researcher, PhD geo sciences A.A. Karpichenko
- Senior Researcher R.V. Novitsky
- Senior Researcher, PhD geo sciences D.A. Chizh
- Senior Researcher E.E. Davydik
- Senior Researcher I.A. Rudakovsky
- Researcher V.M. Khramau
- Researcher Yu.P. Chubis
- Researcher O.M. Oleshkevich
- Junior Researcher I.V. Pencrat.

## 2. Project Description

This section presents the characteristics of the planned activity, including a) reconstruction of the R-46 highway (Lepel - Polotsk - the border of the Russian Federation (Yukhovichi) from 1.700 km to 61.500 km), b) construction of the CMM; c) construction of the Polotsk City bypass, and d) reconstruction of Novopolotsk (Kalininsky) bridge across the Zapadnaya Dvina River (hereinafter - Project). A map of the location of proposed project is presented in **Figure 2.1** and **Appendix A**.

### 2.1. Description of the proposed activities

#### 2.1.1. Reconstruction of the R-46 highway

The Project is aimed at bringing the parameters of the existing road R-46 of category III to the standards of category II according to TCP 45-3.03-19-2008, equipping the road with fencing, signs, road marking, guiding devices, lighting networks, traffic lights, automated traffic control systems; ensuring road safety and the implementation of environmental measures. Reconstruction of the road will improve its transport and operational parameters (**Table 2.1**).

**Table 2.1 – Technical parameters of the project**

Indicator	Lot 1	Lot 2
Road category	II	II
The beginning of the designed road section	1.700 km	31.900 km
The end of the designed road section	31.900 km	61.500 km
Construction length, km	30.200	29.622
Number of lanes	2	2
Carriageway width, m	7.0	9.0
Roadbed width, m	13.0	13.0
Width of the stopping lane on shoulder, m	2.5	–
Width of shoulders, including, m	3.0	2.0
reinforced with asphalt concrete, m	2.5	1.5
reinforced with asphalt granulate, m	0.5	0.5
Type of pavement	capital	capital
Type of roadway cover	asphalt concrete	asphalt concrete
Single axle load specified in the project, t	11.5	11.5
Duration of the construction, months	24	24

When reconstructing the R-46 highway, two-lane traffic (the width of the carriageway is 7 m) will be preserved with a slight extension of the roadside to 3 m, of which 2.5 m will have asphalt concrete pavement.

See **Figure 2.1** for the project location.

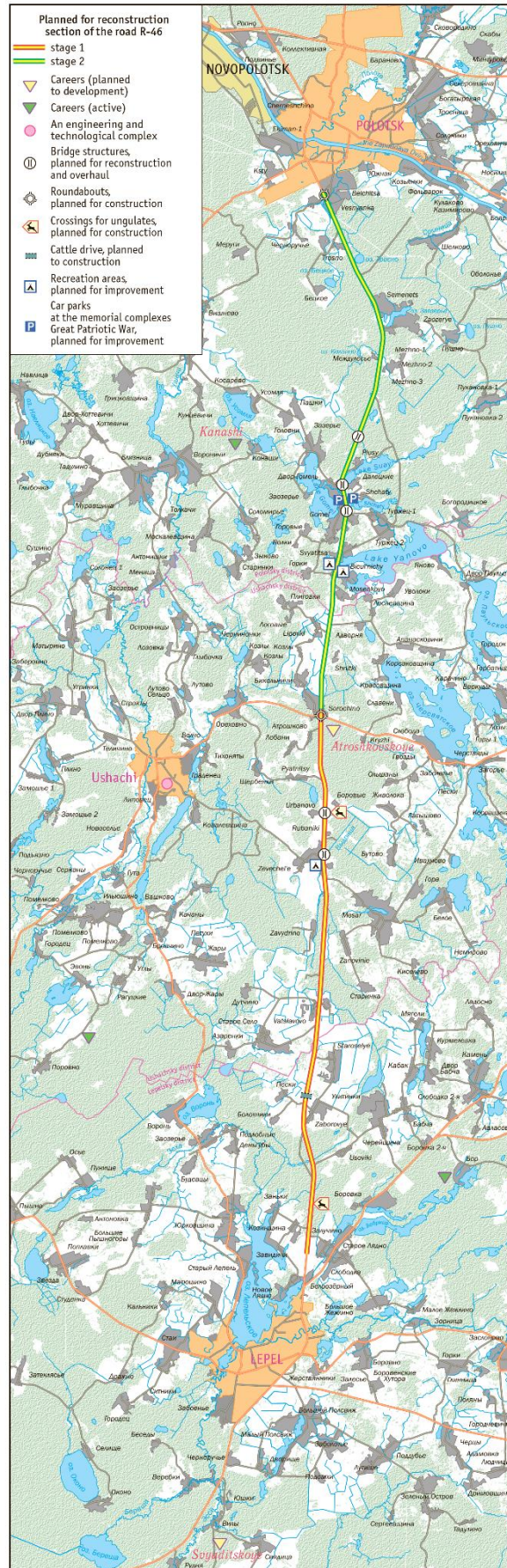


Figure 2.1– Project Location

Construction work is planned to be carried out in two stages.

It is planned to build about eight metal and 67 reinforced concrete culverts, five bridges, two roundabouts (in the towns of Sorochino and Belchitsa), two passages for ungulate animals and a protective fence from nets on the approaches to them, a cattle drive for Chereyshina OJSC, noise screens in the settlements of Vatslavovo, Sorochino, reconstruction of 54 bus stops (with the installation of new pavilions in the settlements of Kozinshchina, Usoviki, Zaborovye, Staroselye, Vatslavovo, Zanolvinie, Zevechel'e, Mosar, Rubaniki, Urbanovo, Pyatnitsy, Sorochino, Shnitki, Lipovka, Mosenkovo, Bicul'nichy, Svyatitsa, Gomel, Shchaty, Plusy, Zarechka, Mezno the 2nd, Zaozerye Semenets, Trosno, Belitsa); improvement of three sites for recreation and two existing parking lots for memorial complexes of the Second World War; outdoor lighting of settlements, bus stops and pedestrian crossings; metal barrier fencing on certain sections of roadsides and pedestrian walkways; road maintenance and road safety systems and other related works.

It is planned to reconstruct the existing elevated railway and access tracks at Lepel station and reconstruct the LDD-374 in the village of Ushachi with the installation of an engineering and technological complex for controlling the movement and maintenance of roads.

During the construction work, re-laying of communication cables, overhead power lines, and a gas pipeline to the Ushachi gas distribution station will be carried out. At the points of intersection with the existing gas pipeline branch to the Novopolotsk gas distribution station and oil pipelines, steel cases will be built up. In addition, disturbed elements of land reclamation systems will be restored, and the reconstruction of the existing household pressure sewer crossing the road reconstruction zone in the village of Vesnyanka will be carried out.

To provide the facility with a sand and gravel mixture, it will be mined from the new, directly connected with the Project, Atroshkovskoye and Svyaditskoye deposits, as well as from the existing deposits such as "Borovka" of OJSC DST-1, Vitebsk, "Borovka" CUE "Vitebskobldorstroy", "Kanashi", "Zvon'."

In addition, to ensure the supply of building materials, the organization of transit traffic, as well as road safety, pavement of the local road network will be strengthened.

### **2.1.2. Center for Maintenance Management**

CMM will be located in Ushachi, partly on the territory of the existing Linear Road Distances (LRD) -374 of Road Maintenance Department (RMD) No. 37 RUE "Vitebskavtodor" and on a newly allocated area adjacent to the LRD-374 territory (agreements on the allocation of land parcels have been received in full).

The project will provide for the construction of new buildings and structures on the newly allocated site, as well as the reconstruction of existing buildings on the territory of the current LRD-374, which will ensure the organization of preparation and storage of deicing materials in accordance with environmental and sanitary requirements.

The following buildings and facilities will be included in CMM:

- frame-tent storage for de-icing agents to store 2000 tonnes of sand and salt mixtures at the same time;
- shed for attachable equipment;
- storage for road furniture elements;
- area for containers with ash;



- storage tank;
- fire water tanks;
- evaporation pond;
- loading platform;
- brine collection system;
- area for storing sand;
- public utility area for containers with waste;
- chemical toilet;
- rest area;
- guest parking lot;
- staff parking lot;
- unit transformer substation.

Further details will be provided in the ESIA to be carried out for CMM, as mentioned in Section 1.4.

### 2.1.3. Construction of the Polotsk City bypass

The Polotsk City bypass is planned according to one of three options (Figure 2.2).

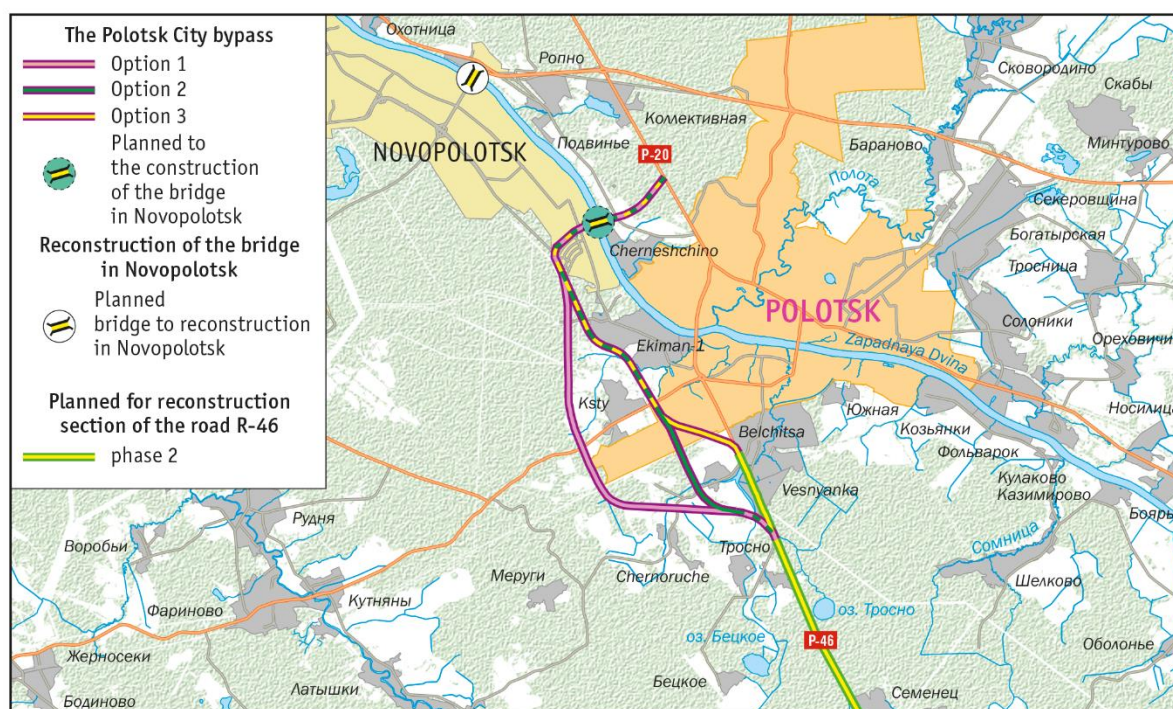


Figure 2.2– Three options for the Polotsk bypass

#### *Option 1*

The beginning of the route of Option 1 of the Polotsk City bypass approximately corresponds to the point 59.3 km of the R-46 Lepel-Polotsk highway - the border of the Russian Federation

(Yukhovichi) (0.76 km south of the border of the village of Vesnyanka).

After this, the route passes in a new direction from the western side, crosses the local highway N-3200 Polotsk - Ushachi in the region of the 8 km point and after 1.6 km turns north. Further, the route crosses the railway at different levels in the vicinity of Ksty station and then after 1 km it crosses the republican highway R-45 Polotsk - Glubokoe - the border of the Republic of Lithuania (Kotlovka), approximately at km 8. At the intersection of the bypass with the roads N-3200 and P -45 transport interchanges will be built.

Further, in the north, in a new direction along the forested area, the detour route crosses 110 kV and 330 kV overhead power lines, oil and gas pipelines, then adjoins Entrance 2 to Novopolotsk from the R-45 highway and then combined with Entrance 2 to Novopolotsk.

After 0.8 km, the bypass turns to the northeast. At the place of separation from Entrance No. 2 to Novopolotsk from the highway R-45 Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka), a transport interchange will be built.

Within the boundaries of Novopolotsk, the object is Designed St. No. 6 according to the "Detailed plan of microdistrict 8A and 10A (the area between microdistricts No. 8 and No. 10 and the continuation of Komsomolskaya St.)" with 4 lanes.

Crossing configuration Projected St. No. 6 from the Youth St., traffic intersection at the intersection with the continuation of Yakub Kolos St. in Novopolotsk and the location of the bridge over the river. Zapadnaya Dvina comply with the approved urban planning documentation.

After the bridge over the river. The Zapadnaya Dvina bypass route crosses the Entrance to the town of Polotsk from the R-20 highway Vitebsk - Polotsk - the border of the Republic of Latvia (Grigorovshchina) at the 4.1 km point with a transport interchange, then crosses the railway at different levels and adjoins the highway R-46 at 69 km with a ring crossing device. On the last 600 m, the road passes through marshy terrain.

The total length of the bypass in option 1 is 13.0 km.

When passing the route according to option 1, the construction of the following objects will be required:

- construction of 2 overpasses through the railway;
- construction of a bridge over the Zapadnaya Dvina River;
- construction of 7 transport interchanges: at the detour detachment from the R-46 highway, at the intersection with the N-3200 Polotsk-Ushachi highway, at the intersection with the R-45 highway, at the detachment from the highway Entrance No. 2 to Novopolotsk from the R-45 highway, at the intersection of Projected St. No. 6 with the continuation of Yakub Kolos St. in Novopolotsk, at the intersection with the Entrance to Polotsk from the R-20 highway Vitebsk-Polotsk-the border of the Republic of Latvia (Grigorovshchina), adjacent to the R-46 road at the end of the projected bypass;
- relocation of trunk oil and gas pipelines, 110 and 330 kV overhead lines.

### ***Option 2***

The start of the Polotsk City bypass route in option 2 coincides with the start of the route in option 1 and corresponds to 59.6 km of the R-46 highway (0.76 km south of the village of Vesnyanka).

The route then passes in a new direction from the north-west side, crosses the local highway N-3200 Polotsk - Ushachi at 7.1 km (0.5 km west of the village of Chernoruche-1) and then the bypass route is laid to the north crossing 110 kV overhead power lines, oil and gas pipelines.

After this, the bypass route crosses the railway at different levels east of Ksty station, after 1.2 km - the national highway R-45, approximately 6 km away. At the intersection of the bypass with the R-45 highway, a traffic intersection will be constructed. The section of the bypass route between the intersections with the railway and the R-45 road intersects or is located in close proximity to 110 kV high-voltage lines, oil pipelines, gas pipelines and a heating main.

After the traffic interchange with R-45, the bypass route for 4.2 km passes in the direction of the existing Entrance #2 to Novopolotsk from the R-45 highway. After detachment from Entrance #2 to the city of Novopolotsk, the direction of the route and design decisions coincide with option 1.

The total length of the route for option 2 is 12.5 km.

When passing the route according to option 2, the construction of the following objects will be required:

- two overpasses across the railway;
- bridge over the Zapadnaya Dvina river;
- seven interchanges: at the detachment of the bypass from the R-46 highway, at the intersection with the N-3200 Polotsk-Ushachi highway, at the intersection with the R-45 highway, at the detachment from the highway Entrance #2 to Novopolotsk from the highway P-45, at the intersection of Projected #6 St. with the continuation of Yakub Kolos St. in the city of Novopolotsk, at the intersection with the Entrance to the city of Polotsk from the R-20 highway Vitebsk-Polotsk-the border of the Republic of Latvia (Grigorovshchina), adjacent to the R-46 road at the end of the projected bypass;
- reconstruction of the main oil pipeline, gas pipeline, 110 kV high-voltage overhead lines, heating mains at the intersection with the highway.

### ***Option 3***

The beginning of the route corresponds to 61.6 km of the R-46 Lepel – Polotsk highway - the border of the Russian Federation (Yukhovichi) (0.6 km from the southern border of Polotsk near the village of Belchitsa). A roundabout will be organized at the intersection. Further, the bypass route crosses the railway at different levels and passes through the industrial zone of Polotsk at different levels.

The bypass route crosses the R-45 highway Polotsk-Glubokoe-the border of the Republic of Lithuania (Kotlovka) with a roundabout, then goes to Entrance #2 to Novopolotsk from the R-45 highway, passes through it to Novopolotsk and then passes in the city. The Zapadnaya Dvina river crosses 0.6 km north-west of the settlement Cherneshchino and connects with the R-46 highway at 69.0 km, 2.0 km northwest of the city of Polotsk. After crossing the R-45 highway, the route is similar to option 2.

The length of the projected route is 10.506 km.

When passing the route according to option 3, the construction of the following objects will be required:

- two overpasses across the railway, 1 – through the industrial zone of Polotsk;
- bridge over the Zapadnaya Dvina river;

- five circular intersections at one level: at the exit of the Polotsk City bypass from the R-46 highway at the beginning of the bypass, at the intersection with the R-45 highway, at the exit of the highway Entrance #2 to Novopolotsk from the R-45 highway, at the intersection with the highway; Access to Polotsk from the R-20 highway; at the entrance to the R-46 highway at the end of the planned bypass;
- transport tunnel at the traffic intersection in the city of Novopolotsk with the continuation of Yakub Kolas street;
- reconstruction of the gas pipeline, 110 kV high-voltage overhead lines, heating mains at the intersection with the highway.

**Table 2.2** shows the transport and operational parameters of the Polotsk City bypass.

**Table 2.2– Technical parameters of the project for three options for the Polotsk bypass**

Description	Bypass section		
	from the start of the detour to the intersection with the R-45 highway; from the intersection with the Entrance to the city of Polotsk from R-20 to the end of the detour.	Entrance number 2 to the city of Novopolotsk from the R-45 road to the exit in the city of Novopolotsk	within the boundaries of the city of Novopolotsk to the intersection with the Entrance to the city of Polotsk from the R-20 highway
Road category	II	I-B	A4
Number of lanes	2	4	4
The width of the subgrade, m	13,0	22,7	28,75
Roadway width, m	7,0 (2×3,5)	14,0 (2×7,0)	14,0 (2×7,0)
Width of edge safety strips, m	–	–	2,0 (2×0,5 + 2×0,5)
Curb width, including stop strip, m	6,0 (2×3,0)	6,0 (2×3,0)	6,5+4,25
Width of dividing strip, m	5,0 (2×2,5)	5,0 (2×2,5)	–
Type of roadway cover	cement concrete	asphalt concrete	cement concrete

The bypass section within the city of Novopolotsk (Projected #6 St., one of the main streets according to the draft detailed plan) will have 4 lanes and is designed taking into account the possibility of building a tram line in the future, which is provided for by the master plans for the development of the cities of Polotsk and Novopolotsk.

When the route passes through the city of Novopolotsk and in the area of the bridge over the Zapadnaya Dvina River, it is planned to build a rainwater drainage with water collection into the treatment plant. Treatment facilities include a sand-petrol-oil separator, consisting of a sand separator, where mechanical cleaning and collection of precipitated suspended substances (sand, silt, mud masses) from rainwater wastewater, and a coalescence module, in which the particles of oil products are enlarged, which accelerates their separation from waste water. Polyurethane foam of the coalescent module can be washed and with regular maintenance can last up to 5 years. After the end of its service life, it must be replaced. Sewage treatment facilities allow to reduce the concentration of suspended solids to 20 mg/l, oil products - to 0.3 mg/l.



It is planned to build a rain sewer and treatment facilities at the section of the route along the city of Novopolotsk and in the area of the bridge over the Zapadnaya Dvina river.

Landscaping of slopes and the territory of traffic intersections is planned.

Due to the presence of a large number of utilities crossing the projected street in Novopolotsk, as well as for the convenience and efficiency of repair and restoration work on underground utilities, the pavement in the indicated area will be of asphalt concrete, and in the remaining sections - of cement concrete.

The project also plans to:

- build pedestrian and bike paths;
- reconstruct the existing outdoor lighting in Novopolotsk and the construct a new one in the settlements, at the roundabouts and the designed bridge over the Zapadnaya Dvina river;
- build traffic lights at the intersection with Molodezhnaya St. in Novopolotsk and at the turn of the tram towards Polotsk (in the future);
- build a noise shield at the location of the road to a residential development (Polymirovsky district);
- organize of a road management system;
- create an engineering and technological complex for controlling the movement and maintenance of the road in the village Rossony, which intended for the preparation and storage of anti-icing materials, the placement of special machinery and equipment, the construction of buildings and structures of the road service;
- reconstruction of entrances to existing objects when they fall under the roadway of the designed bypass.

#### **2.1.4. Reconstruction of the Novopolotsk (Kalininsky) bridge**

Reconstruction of the existing bridge across the Zapadnaya Dvina river is planned to be carried out after the construction of the Polotsk City bypass, within the framework of which it is planned to build a new bridge with a length of about 300 m across the river 0.6 km north of the settlement Cherneshchino.

## **2.2. Ancillary project facilities**

Reconstruction of the existing bridge across the Zapadnaya Dvina river is planned to be carried out after the construction of the Polotsk City bypass, within the framework of which it is planned to build a new bridge with a length of about 300 m across the river 0.6 km north of the settlement Cherneshchino.

### ***Svyaditskoye sand deposit***

It is located on the territory of the Lepel region, 7 km south of the city of Lepel between the settlements of Sloboda and Vila, Sloboda village council (**Figure 2.3**). The GPS coordinates of the center of the land plot are 54 ° 47'16.50 "N 28 ° 39'39.52" E. For the extraction of sand for temporary use, a land plot is allocated with a total area of 9.0913 ha (9.0643 ha - forest land, 0.0270 - industrial, transport, communications, energy, defense and other lands). An access road is arranged for access to the extraction site, covered with crushed stone and sand mixture, 90 m long. Asphalt concrete paving will be laid at the junction of the existing road N – 2802 Chernoruche – Latygolichi – Krasnoluki.

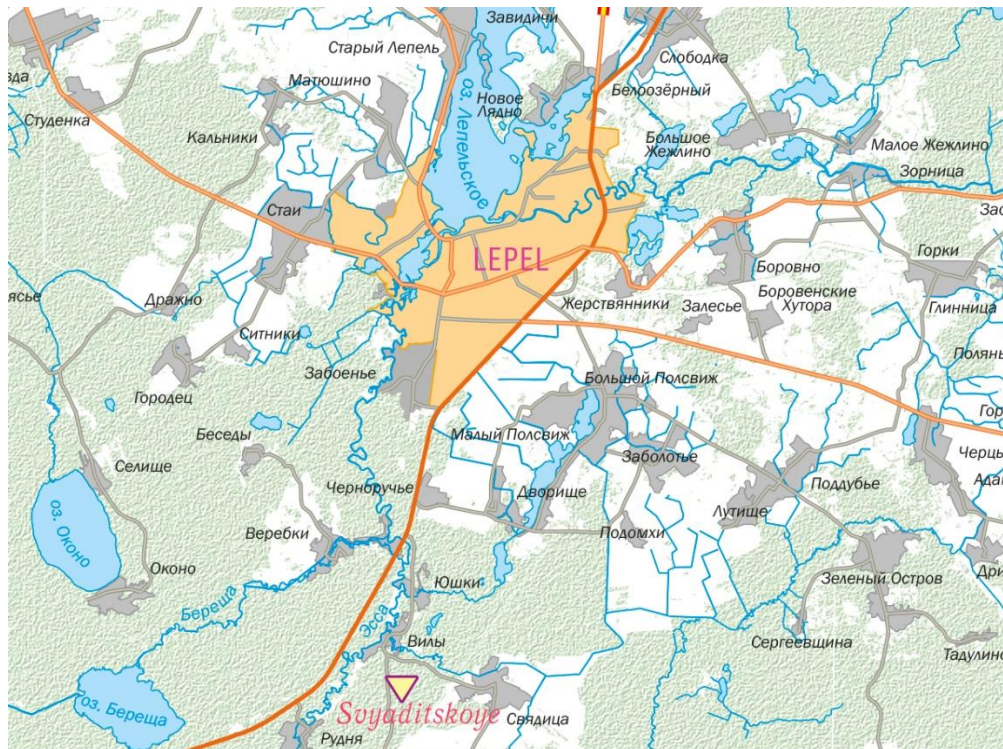


Figure 2.3: Location of the Svyaditskoye sand deposits

#### *Atroshkovskoye sand deposit*

It is located in the Ushachsky district near the village of Kryzh of the Sorochinsky village council. For the extraction of sand, a land plot is allocated for temporary use with a total area of 16.1789 ha (15.5212 ha - forest land, 0.3099 - land of settlements, horticultural associations, country cooperatives, 0.3478 ha - agricultural land). For access to the extraction site, an access road with crushed stone and sand cover is organized, a section of which will pass along the northern border of the village of Kryzhi. At the junction of the existing road R – 113 Senno - Beshenkovichi - Ushachi, asphalt concrete paving will be laid (Figure 2.4).

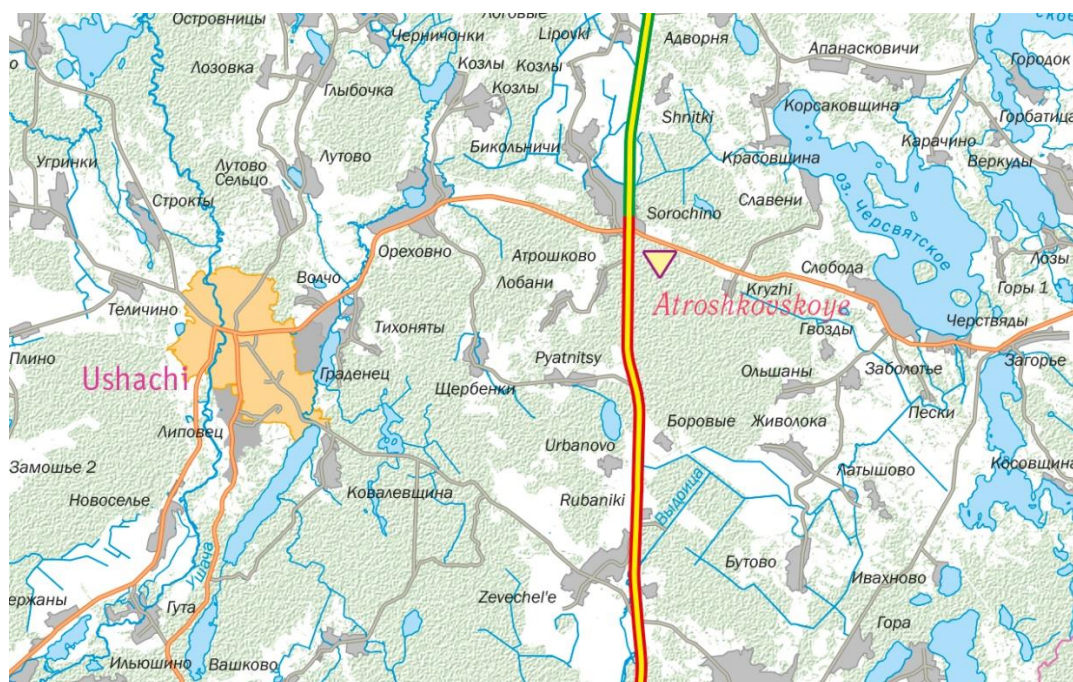


Figure 2.4: Location of the Atroshkovskoye sand deposit

*Engineering and technological complex in the urban-type settlement Ushachi (based on the Linear Road Distance (LRD) No. 374)*

In order to organize the maintenance of the road in the winter, ensure the proper operational condition of the road, comfortable and safe movement of vehicles on it, an engineering and technological complex (ITC) for managing the movement and maintenance of roads will be created. The facility will be located in the southern part of the urban-type settlement Ushachi on the territory of the LRD-374 ROD No. 37 of the RUE “Vitebskavtodor” and on the newly allotted area adjacent to the territory of the LRD-374.

To create an engineering and technological complex, the following should be done:

- dismantlement of an administrative building, a warehouse for storing materials with a canopy, loading ramp, substation on the territory of LRD-374;
- reconstruction of the workshop with the organization of administrative premises and the construction of a wood-burning boiler room;
- construction of a canopy for attachments, a warehouse for storage of road construction elements, a warehouse for anti-icing materials, a loading rack for anti-icing materials, fire tanks ( $2 \times 75 \text{ m}^3$ );
- reorganization of engineering networks that will be in the area of work on the project;
- connection to existing water supply networks.

Also, within the framework of the project, a section of Yubileinaya Street will be repaired in the urban-type settlement Ushachi from the intersection with Kalininskaya Street to the LRD territory.

*Reconstruction of the railway elevated track and railway access track at Lepel station*

In order to minimize the transportation distance of building materials and products, reconstruction of the existing railway elevated and railway access tracks at Lepel station is provided. Cargo turnover - 100 thousand tons / year. The facility will also be used to ensure the construction of facilities of Vitebskavtodor RUE.

It is planned to include the following in the reconstruction of the existing railway elevated and access track at Lepel station: elimination of subsidence of the subgrade by adding stone material, replacement of a worn rail-sleeper grid, installation of metal bridges on the elevated railway track for passage of service personnel, modernization of the unloading platform for providing the possibility of unloading heavy bulky cargo and maneuvering equipment, disassembling an existing railway crossing, lighting device for unloading sites, a fence device from reinforced concrete sections, a checkpoint and a gate to exclude the possibility of unauthorized access to the unloading site.

*Engineering and technological complex for traffic management and maintenance of roads in the urban settlement of Rossony*

The engineering and technological complex for traffic management and maintenance of roads is intended for the preparation and storage of anti-icing materials, the placement of special machinery and equipment. The facility will be located in the southeastern part of the Rossony urban type settlement.

The following facilities will be constructed to create an engineering and technological complex:

- household building;

- covered parking with storage facilities;
- anti-icing materials warehouse;
- mobile unit for the preparation of sand-salt mixtures;
- loading ramp;
- canopy for storage of removable equipment;
- sites for storage of sand;
- open parking for road cars and cars and other auxiliary facilities.

#### *Construction camps (sites)*

To carry out the reconstruction of the R-46 highway, the following is required:

- sites for construction camps at pickets ПИК 235+00 (left) and ПИК 459+00 (right), confined to existing technological sites;
- sites for storing vegetable soil - pickets ПИК 95 (right), ПИК 103 (right), ПИК 127 (left), ПИК 134 (left), and ПИК 224 (left);
- sites for storing asphalt granulate from milling of the existing pavement - pickets ПИК 70 (left), ПИК 178 (right), ПИК 235+00 (left), located on existing technological sites;
- sites for the construction of bridges across the rivers Vydritsa, Turzhanka, Turovlyanka;
- site for the construction of the crossing over the road for ungulate animals, picket ПИК 261 + 57 (right);
- construction site at the congress in the village of Zazerye, Polotsky district, picket ПИК 445 + 15 (left);
- placement of a wood waste or asphalt concrete crushing plant on an existing recreation site picket ПИК 483+00 (right).

For the construction of a bypass road for Polotsk (option 3), the following is required:

- construction sites with an area of 0.20 ha – picket ПИК 11 (left), pickets ПИК 15 ... ПИК 16 (left), picket PC 84 (right), picket ПИК 86 (right), pickets ПИК 89 ... ПИК 90 (right), picket ПИК 96 (right) and 0.4 ha near the pulp and paper mill - pickets ПИК 21 ... ПИК 22 (left);
- two sites for temporary placement of cement-concrete plants with an area of 1.3 hectares each - in the industrial zone of Polotsk, Stroitel'naya Street and south of the intersection of the Polotsk City bypass with the Entrance to Polotsk from the R-20 highway Vitebsk - Polotsk - the border of the Republic of Latvia (Grigorovshchina) at around 4.1 km.

After completion of work, construction camps, sites for construction and storage, cement and concrete plants will be dismantled, land plots will be restored.

## **2.3. Description of construction work, stages**

### **2.3.1. Reconstruction of the R-46 highway**

The characteristics of the P-46 highway are presented in **Table 2.3**.



**Table 2.3: Characteristics of the R-46 highway**

Road category	II
Total construction length, m	59822
Number of traffic lanes	2
Carriageway width, m	7.0
Road width, m	13.0
Stop lane width, m	2.5
The width of the shoulders, including	3.0
reinforced with asphalt concrete, m	2.5
reinforced with soil asphalt granulate, m	0.5
Road pavement type	capital
Type of roadway coverage	asphalt concrete
Single axle load, tons	11.5

**Table 2.4** provides information on the technical facilities provided by the Project.

**Table 2.4: Technical structures envisaged by the project for the reconstruction of the R-46 highway**

Description	Quantity / length	
	stage I	stage I
Culverts, pcs. :	75 (new)	
including metal	2	3 (on the main road) 3 (at the junctions)
reinforced concrete	13 (new) 1 (elongation) 1 (repair)	35 (on the main road); 2 (repair on the main road); 19 (at the junctions)
Bridge structures, pcs.	3	2
Crossings for hoofed animals, pcs.	2	–
Cattle drive	1	–
Intersection at one level, pcs.	10	12
Ring intersections, pcs.	1	1
Connections on one level, pcs.	33	37
Bus pavilions, pcs.	26	28
Noise screens, m	668	1380
Rest area, pcs.	1	2
One-way metal barrier fence (road), m	12112	19256
Retaining pedestrian fence, m	824	1560

Reconstruction of the R-46 road will be carried out in two stages:

1. pickets ПК17+00 ... ПК 319+00;
2. pickets ПК319+00 ... ПК 615+22.

Duration of construction works of the 1st stage:

- reinforced concrete bridge on ПК40 + 65 (combined structure for the passage of wild animals and the passage of a watercourse) - 5 months;

- cattle drive to ПК 103 + 01 (rectangular reinforced concrete pipe 4.0x2.5m) - 3 months;
- reinforced concrete bridge across the river Vydritsa on ПК238 + 44.5 - 7 months;
- construction of a reinforced concrete bridge at ПК261 + 55 (structure for the passage of wild animals and the passage of a watercourse) - 6 months;
- construction of a road maintenance and road safety management system - 7 months;
- reconstruction of the reclamation system that falls under the road expansion site - 1 month;
- re-laying of the gas pipeline branch to the Ushachi gas distribution station - 0.6 months.

Total duration of the 1st stage is 24 months, including preparatory period of 4 months. Duration of construction works of the stage II:

- a bridge over the Turanka river - 7 months;
- a bridge over the Turovlyanka river - 7 months;
- culvert at PK 472 + 25 - 2 months;
- reconstruction of LRD-374 in Ushachi with the construction of the ITC for traffic and road maintenance. Reconstruction of the entrance to LRD-374 (Yubileinaya street in Ushachi) - 6 months;
- construction of a road maintenance and road safety management system - 8 months.

The total duration of the construction of the stage II is taken according to the maximum permissible norm for the construction of a highway and is 24 months, including:

- 6 months' preparatory period;
- 1 month for acceptance of the object into operation.

Start of construction - January 2021.

Completion of construction - November 2022, road acceptance into operation - December 2022.

For reconstruction of the R – 46 road, additional land plots are allocated:

- Phase I – 97.4648 ha, including for permanent use – 46.332 ha (17.9318 in the Lepelsky district, 28.4002 ha – in the Ushachsky district), in the temporary – 51.1328 ha (24.2213 ha in Lepelsky district, 26.9115 ha in Ushachsky district);
- Stage II - 78.1996 ha, including 40.4691 ha for permanent use, 37.7305 ha for temporary use.

For the implementation of the planned activity requires the following preparatory work:

- breakdown of the axis of the road, entrances to deposits of sand, bypass roads, artificial structures, transition-speed lanes, junctions and intersections, sidewalks;
- if necessary, clearing the lane from trees and shrubs, rooting out stumps;
- if necessary, removal of the fertile soil layer, peeling of the wetlands to the mineral bottom;
- construction of temporary buildings for builders, including those with power supply;

- arrangement of entrances to soil deposits, exits to construction camps;
- removal of cable lines from the construction zone, laying of backup pipes at the intersection of cable lines with the road;
- reconstruction of overhead and cable power lines;
- reconstruction of gas pipelines (lengthening an existing case on a gas pipeline branch to Ushachi gas distribution station to the required distance from the bottom of the embankment with an existing exhaust candle attached to it and increasing its height to 5.0 m from the ground, building a steel case on an existing gas pipeline branch to gas distribution station Novopolotsk (117.9 km) at the intersection with R-46 highway picket ПК 380+17);
- Reconstruction of the existing household pressure sewer of the village of Vesnyanka, located in the area of the reconstructed highway at pickets ПК 605+69 ... ПК 608+00;
- building cases on existing oil pipelines to the required distance from the bottom of the embankment and arranging the underground passage of the R-46 highway with a polyethylene pipe for technological purposes.

In the course of work on the R-46 highway, some elements of reclamation systems will be disrupted. The project provides for their restoration.

Drainage from the coastal zone of the Vydritsa River and reclamation canals will be carried out by edge trays beyond the borders of the coastal strips, then by drainage trays of a closed type - to the bottom of the embankment into the damper. It is planned to construct a rain sewage system in the village of Sorochino with a release into the filtering ditch, through which rainwater is directed outside the settlement and discharged into the reclamation canal.

Rain runoff from the roadway and bridge pavements will be diverted to drainage pipes due to the longitudinal and transverse slopes of the roadway and also the slope of the sidewalks towards the roadway. To collect the runoff, a suspended drainage system will be constructed, which will direct water into the catchment well near the bridges.

In the coastal zone of Lake Yanovo, the Turzhanka River, the Turovlyanka River, Suya Lake and the Belchanka River, it is planned to construct a closed drainage system with the installation of storm water wells. Storm collectors that divert water outside the coastal zone are constructed from polyethylene pipes at the side of the road. During the construction of collectors in the coastal zones of the Turzhanka, Turovlyanka, Belchanka rivers, water-evaporation pools with a filter pad from crushed stone at the bottom are additionally built. It also provides for the construction of a closed drainage system and storm water wells in the village of Gomel, along a pedestrian walkway.

Reconstruction of the bridge over the river Turzhanka involves closing movement of vehicles for at least 6 months. At the time of construction, vehicles will be driven along the existing highway N-3241 Gomel - Bogorodetskoye - Rybaki.

### **2.3.2. Construction of the Polotsk City bypass**

An additional land allotment will be required for the construction of the Polotsk City bypass. When implementing a bypass according to option 1, about 5% of the length of the route will go along the existing road, according to option 2 - about 37%, according to option 3 - about 43%.

To implement the planned activity, it is necessary to carry out the following preparatory work:

- felling of trees and shrubs in the right of way;
- the construction of sites for the construction camp and for the needs of construction, including temporary power supply;
- removal of the fertile soil layer;
- relocation of communication cables, fiber optic cables, high-voltage and cable lines;
- relocation of water supply, sewerage, heat supply networks;
- relocation of gas pipelines and oil pipelines;
- reclamation network restoration;
- dismantle of a metal barrier and road signs;
- dismantling of existing reinforced concrete pipes;
- dismantling of private garages;
- reconstruction of the fence of the bus station in the city of Novopolotsk;
- construction of an entrance to a deposit of building materials;
- transfer of points of a geodetic network and a mobile communication tower;
- construction of sites and porches for temporary cement-concrete plant;
- construction of a fiber-optic communication line for an automated traffic control system;
- installation of temporary technical means of traffic management.

The construction period of the Polotsk City bypass, according to the investment justification, is determined to be 44 months. The following construction phases are distinguished:

- Phase I – picket ПК 0+00 – ПК 71+43; ПК 89+37 – ПК 105+06.
- Phase II – pickets ПК 71+43...ПК 89+37 (within the city of Novopolotsk on the site from the exit from Entrance No. 2 to the city of Novopolotsk from the R-45 highway to the intersection with the Entrance to Polotsk from the R-20 highway).

## **2.4. Movement of vehicles during the reconstruction period.**

### **Bypass roads**

The R-46 highway reconstruction project includes the construction of temporary bypass roads of various lengths from 0.15 to 3.3 km.

To ensure the safety of traffic on the site Phase 1 provides for the phased implementation of the construction works.

**Stage I.** Work on the construction of detours.

At the pavement reinforcement sections, detours will be constructed using the existing road pavement. This will provide the possibility of a single-lane driveway with a width of 3.5 m and traffic control with the installation of temporary traffic lights.

Detours in the area of pipe laying are being built with the extension of the existing carriageway to 3.5 m for the possibility of single-lane passage and traffic regulation with the installation of temporary traffic lights.



Detours on the new track are provided in the area of bridge construction, as well as in the laying areas of new pavement.

The following pavement is planned for detours in the area of crossing the road for ungulates, cattle passes and a bridge over the Vydritsa River:

- top layer of subgrade of dusty sandy soil;
- base of gravel-gravel-sand mixture;
- single-layer coating of gravel asphalt concrete.

On the remaining detours, the following pavement is planned:

- top layer of subgrade of dusty sandy soil;
- crescent-shaped coating of sand and gravel.

When constructing detours on a separate subgrade in wetlands, a single-layer reinforcement of the base of the embankment from the geotextile web is provided.

**Stage II.** Construction of the left lane in the areas of amplification, traffic on detours using the existing subgrade. Construction of the left and right lanes in the areas of new road pavement, traffic on detours outside the existing subgrade.

To connect the reconstructed sections with the existing asphalt concrete pavement, the construction of temporary crossings is envisaged.

**Stage III.** In the areas of reinforcement of pavement, one-lane passage will be provided on the constructed lane with traffic control through the installation of temporary traffic lights, construction of the right lane. Construction of the left and right lanes in the areas of new pavement.

**Stage IV.** Dismantling and reclamation of temporary detours.

Reconstruction of section II of the R-46 highway will be carried out in stages.

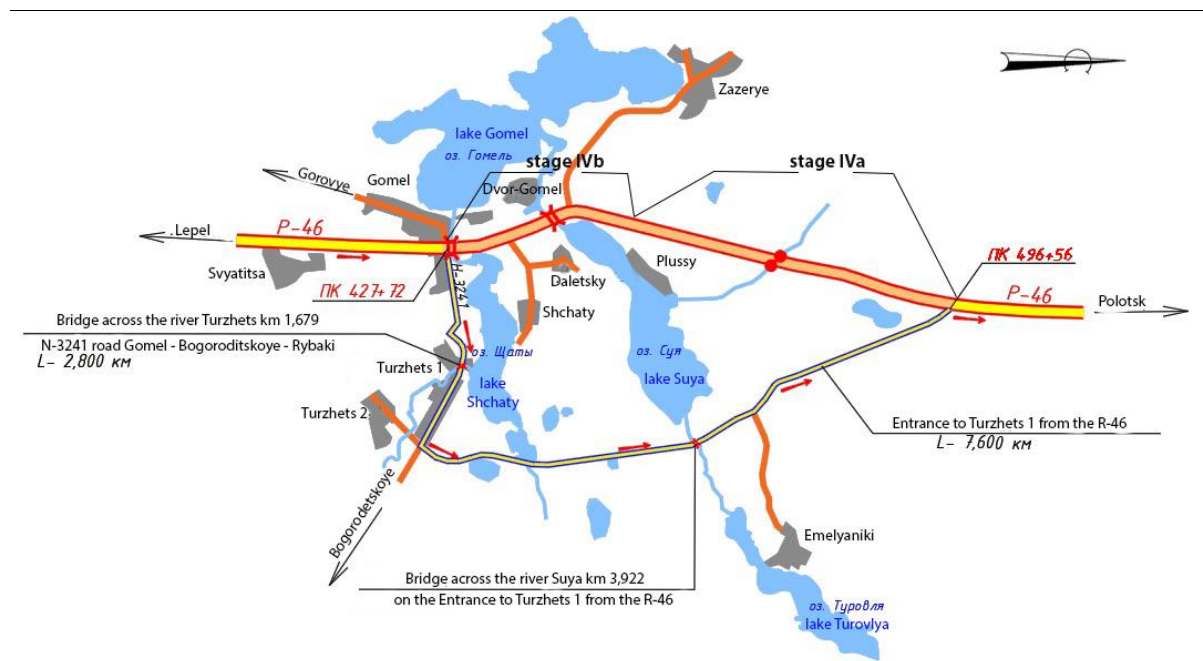
**At stage I,** from picket PK 319+00 to PK 427+50 and from picket ПК 496+50 to ПК 611+16, construction of detours at the places of construction of culverts is envisaged. For the construction of the roundabout at 61.4 km and drainage pipes, a detour is planned with a traffic pass in the direction of the settlements of Ushachi and Kozianka. Traffic at this stage is carried out along the existing road with a speed limit of up to 70 km / h.

**At stage II,** traffic is organized in detours. From picket ПК 427+50 to ПК 496+50, traffic is carried out unchanged along the existing road. From picket ПК 319+00 to ПК 427+50 and from picket ПК 496+50 to ПК 611+ 6, a complete reconstruction of the roadway will be made at the detour sections. On sections of the road between detours, traffic will be carried out without changes along the existing road. The vehicle speed will be limited to 70 km / h, and on small radius curves and in places where cars are changing lanes, to 50 km / h.

**At stage III,** reconstruction of road sections located between detours will be carried out. Reconstruction is planned with alternate passage of traffic in one lane. Traffic control will be made by traffic lights. In the constructed sections, traffic will be carried out in two lanes.

**At stage IV,** the reconstruction of the site from picket ПК 427+50 to ПК 496+50 will be carried out. During the reconstruction, traffic will be organized along the constructed sections from picket ПК 319+00 to ПК 427+50 and from picket ПК 496+50 to picket ПК 611+16. From picket ПК 427+50 to ПК 496+50, traffic is planned to detour along the existing N-3241 roads (Gomel - Bogoroditskoye - Rybaki) and along the Entrance to Turzhets-1 from the Lepel -

Polotsk - border of the Russian Federation (Yukhovichi) through the settlement Turzhets-1 (Figure 2.5).



**Figure 2.5: Detour path during the reconstruction of the R-46 highway on the span between pickets PK 427 + 70 ... PK 496 + 50**

The total length of the bypass road will be 10.4 km. For these purposes, the following measures will be taken on the bypass road: reinforcing the existing layers of pavement with asphalt concrete mix, installing new asphalt pavement, adjoining repair, reinforcing roadsides with gravel and sand, building 4 new reinforced concrete pipes, repair 2 reinforced concrete pipes and lengthening 4 reinforced concrete pipes.

Due to the multiplicity of defects affecting the carrying capacity, reliability and durability of structures, as well as an insufficient level of traffic safety, it is planned to reconstruct the bridge over the Turzhets creek, located on the 3.2th km of N-3241 highway, flowing from the Suya lake.

Due to the need to provide access to the village of Plusy, **stage IV is divided into stages IVa and IVb**. At the **stage IVa**, reconstruction of the road section from picket PK 450 + 50 to PK 496 + 50 with the construction of a pipe through a stream at picket PK 472 + 24 is provided. From the city of Lepel, access to the village of Plusa is possible by the existing road. From the side of the city of Polotsk, the access to the village of Plusy will be organized by detour along the existing roads to the agro-town Gomel and further along the existing road.

**At the stage IVb**, reconstruction of the road section from picket PK 427 + 50 to PK 450 + 50 including construction of bridges across the rivers Turzhanka on picket PK 428 + 81 and Turovlyanka on picket PK 442 + 60. From the side of the city of Polotsk, access to the village of Plusa is via a reconstructed road. From the direction of Lepel, access to the village of Plusa is from Gomel agro-town by detour along existing roads to the exit to the reconstructed road and further along the reconstructed road. Exit from the village of Shchaty and Daletsky is provided through the reconstructed road towards the village of Dvor-Gomel.

**At the stage V**, after the reconstruction of the main road, it is planned to organize detour traffic during the construction of pipes at the exits to the settlements of Advornya, Turgets-2 and Bikulnichi. Traffic will be carried out with a speed limit of up to 70 km / h, on small radius curves - up to 50 km / h.

During the construction of the pipe at the exit to the Gomel agro-town, traffic is organized to detour along the existing streets of the Gomel agro-town.

To provide the facility with building materials (sand and gravel) from the existing Kanashi field, it is envisaged to improve the coverage of the network of local roads:

- 3.6 km long road N – 3208 Bezdedovichi - Vetrino - Gomel;
- 1.85 km long road N – 3200 Polotsk - Ushachi;
- km road N – 3244 Voronichi – Konashi;
- access to the Kanashi field 1.9 km long.

On the roads N – 3208, N – 3200 and N – 3244, it is planned to construct the top layer of asphalt concrete pavement and strengthen the roadsides with a gravel and sand mixture.

At the entrance to the Kanashi field, it is planned to build a sickle-shaped coating from a gravel-sand mixture on the basis of cement granules from the processing of concrete and reinforced concrete products.

When constructing the Polotsk City bypass, detours will be arranged in places where it will be impossible to move along the existing Entrance No. 2 to the city of Novopolotsk. Such places are associated with the construction of new two lanes of the road in each direction due to the high embankment in relation to the existing one, laying of culverts, construction of roundabouts.

During the reconstruction of the existing bridge in the city of Novopolotsk across the Zapadnaya Dvina River along Kalinina Street, the movement of vehicles will be carried out on a new bridge built 0.6 km north of the settlement Cherneshchino, which will become part of the Polotsk City bypass.

## **2.5. Supply of building materials and transportation range**

For the reconstruction of the R-46 highway and the construction of the Polotsk City bypass, it is planned to organize the delivery of building materials and products using road and rail transport. An overview of possible suppliers of building materials is given in **Tables 2.5 to 2.7**, transportation routes is shown in **Figure 2.6**.

**Table 2.5: Possible suppliers of building materials for the first stage of the reconstruction of the P-46 highway and range of transportation**

Name of building materials	Possible supplier	Departure Station	to the highway			To the asphalt concrete plant of road construction administration No. 34		Mixing area at 7.0 km (km 17.8, km 23.6)	
			by rail	by road		by rail	by road	by rail	by road
			destination station	to point	km	destination station	km	destination station	km
Asphalt mix	Asphalt Concrete Plant of Road Construction Administration No. 34, Road Construction Trust No. 1 of Lepel			km 1,7	11				
Bitumen emulsion	Road maintenance section No. 32 of the city of Polotsk			km 31,9	34				
Granite crushed stone	RIUE "Granite"	Sitnitsa	Lepel	km 1,7	13	Lepel	1	Lepel	19 (29; 35)
Sand (crushed)	RIUE "Granite"	Sitnitsa	Lepel	km 1,7	13	Lepel	1	Lepel	19 (29; 35)
Bitumen	OJSC Naftan, Novopolotsk						89		
Mineral powder	OJSC Dolomite, Vitebsk	Pridvinskaya				Lepel	1		
Concrete, mortar, small concrete products	Branch "Novopolotsk-reinforced concrete" OJSC "Krichev-cement slate"			km 31,9	47				
Reinforced concrete pipe links	Spetszhelezbeton Plant	Mikashevichi	Lepel	km 1,7	13	Lepel			
Large concrete products	Plant of reinforced concrete bridge structures "Fanipol"	Fanipol	Lepel	km 1,7	13	Lepel			
Asphalt granulate	An object								13 (8; 11)
crushed stone mixture of optimal	Mixing area at 7.0 km (km 17.8, km 23.6)			An object	11				

Name of building materials	Possible supplier	Departure Station	to the highway			To the asphalt concrete plant of road construction administration No. 34		Mixing area at 7.0 km (km 17.8, km 23.6)	
			by rail	by road		by rail	by road	by rail	by road
			destination station	to point	km	destination station	km	destination station	km
particle size distribution No. 6, crushed stone-gravel-sand mixture, crushed stone-sand mixture									
Natural sand and gravel mix	Quarry "Borovka" (CUE "Vitebskobldorstroy")			km 6,7	11				12 (22; 27)
Soil	Svyaditskoe deposit			km 1,7	19				
Soil (subgrade)	Atroshkovskoye deposit			km 31,6	5				
Soil (subgrade)	Svyaditskoe deposit			km 1,7	19				
Soil (subgrade)	Quarry Borovka (OJSC Road Construction Trust No. 1, Vitebsk)			km 6,7	11				
Metal structures from disassembly (unusable)	An object			UE "Vitebskvtorchermet Polotsk workshop"	52				
Waste uprooting stumps, branches, branches, peaks	R-46 highway and the Polotsk bypass			Svyaditskoe deposit	34				
Fighting concrete and reinforced concrete products	R-46 highway and the Polotsk bypass								8 (on 17,8 km)

Name of building materials	Possible supplier	Departure Station	to the highway			To the asphalt concrete plant of road construction administration No. 34		Mixing area at 7.0 km (km 17.8, km 23.6)	
			by rail	by road		by rail	by road	by rail	by road
			destination station	to point	km	destination station	km	destination station	km
Asphalt from disassembly	R-46 highway and the Polotsk bypass			LLC "Dismantle-TradeStroy"	126				
Mixed waste	R-46 highway and the Polotsk bypass			LLC Avtodor-complex	146				

**Table 2.6: Sources of receipt and range of transportation of building materials and products for the second stage of reconstruction of the R– 46 highway**

Name of building materials	Possible supplier	Departure Station	To the highway			Technological site to the right of km 45.9
			by rail	by road		by road
			destination station	to point	km	rv
Asphalt mix	Asphalt concrete plant "Ksty"			km 61,5	5	
Crushed stone, sand from crushing screenings	RIUE "Granite"	Sitnitsa	Ksty	km 61,5	5	21
Cationic bitumen emulsion	Production and Technical Division "Ksty"			km 61,5	5	
Sand, natural sand and gravel mix, soil	Quarry "Natashino"			km 61,5	55	71
Dolomite crushed stone	OJSC Dolomite, Vitebsk	Zadvinie		km 61,5	5	21
Reinforced concrete pipe links	Spetszhelezobeton Plant	Sitnitsa	Ksty	km 61,5	5	
Large concrete products	Plant of reinforced concrete bridge structures "Fanipol"	Fanipol	Ksty	km 61,5	5	
Concrete, mortar, small concrete products, side stone	Branch "Novopolotsk-reinforced concrete" OJSC "Krichev-cement slate"			km 61,5	10	

Name of building materials	Possible supplier	Departure Station	To the highway			Technological site to the right of km 45.9
			by rail	by road		by road
			destination station	to point	km	rv
Crushed stone mixture of optimum particle size distribution No. 6, crushed stone-gravel-sand mixture	Site to the right of km 45.9			Average distance	15	
<p>Delivery of cars to Ksty station - 1 km.                      The distance from the motor transport enterprise No. 6 of Novopolotsk to the Ksti asphalt plant is 20 km, to the 61.5 km of the road is 17 km.                      The splinters of concrete and reinforced concrete products, substandard concrete structures and parts are processed at the facility with the receipt of secondary raw materials that are used at the facility.                      Excess asphalt granulate is transported to the production and technical unit "Ksty" - 5 km from km 61.5 of the road.                      Waste to be disposed of - solid waste landfill - 17 km from km 61.5 of the road (according to the permission of the Ministry of Natural Resources for storage and disposal of waste).                      Mixed waste, stump rooting waste, chopping residues - to the nearest waste management company registered in the register of the Ministry of Natural Resources and giving written consent to accept these wastes in the amount stipulated by the project.</p>						

**Table 2.7: Possible suppliers of building materials for the construction of the Polotsk City bypass and the range of transportation**

Name of building materials	Possible supplier	Departure Station	to the highway				To the concrete plant			On site for construction needs			
			by rail	left coast		right coast	by rail	left coast	right coast	By rail	left coast	right coast	
				by road				by road			By road		
			destination station	to point	km	to point	km	destination station	to km 2,5	to km 8,7	destination station	to km 2,5	to km 8,7
Asphalt concrete	Asphalt-concrete plant department of the road construction department No. 22 "Ksty"			km 2,5	1	km 10,2	9						

Name of building materials	Possible supplier	Departure Station	to the highway					To the concrete plant			On site for construction needs		
			by rail	left coast		right coast		by rail	left coast	right coast	By rail	left coast	right coast
				by road					by road			By road	
			destination station	to point	km	to point	km	destination station	to km 2,5	to km 8,7	destination station	to km 2,5	to km 8,7
Concrete, mortar, small concrete products	Branch "Novopolotsk-reinforced concrete" OJSC "Krichev-cement slate"			km 2,5	14	km 10,2	20						
Reinforced Concrete Culvert Links	Factory "Spetszhelezobeton", Mikashevichi	Sitnitsa	Ksty	km 2,5	1	km 10,2	9						
Bitumen emulsion	Production and Technical Division "Ksty"			km 2,5	1	km 10,2	9						
Granite crushed stone	RIUE "Granite", Mikashevichi	Sitnitsa	Ksty	km 2,5	1	km 10,2	9	Ksty	1	8	Ksty	1	8
Dolomite crushed stone	OJSC Dolomite, Vitebsk	The back		km 2,5	1	km 10,2	9				Ksty	1	8
Sand and gravel mix, sand, sand for the preparation of cement concrete	Quarry "Natashino" Polotsk district			km 2,5	52	km 10,2	64		52	63		52	63
Large concrete products	Plant of reinforced concrete bridge structures "Fanipol"	Fanipol	Ksty	km 2,5	1	km 10,2	9						
Sand for the preparation of cement concrete	Career "Cherkasy"	Fanipol						Ksty	1	8			
Concrete cement	OJSC Krasnoselskstroyaterialy	Ros						Ksty	1	8			



Name of building materials	Possible supplier	Departure Station	to the highway				To the concrete plant			On site for construction needs			
			by rail	left coast		right coast		by rail	left coast	right coast	By rail	left coast	right coast
				by road					by road			By road	
			destination station	to point	km	to point	km	destination station	to km 2,5	to km 8,7	destination station	to km 2,5	to km 8,7
Crushed-gravel-sand mixture	Platforms			average	3	average	1						
<p>Delivery of cars to Ksty station - 1 km.                      The distance from the motor transport enterprise No. 6 of Novopolotsk to the Ksti asphalt plant is 20 km, to the 61.5 km of the road is 17 km.                      The splinters of concrete and reinforced concrete products, substandard concrete structures and parts are processed at the facility with the receipt of secondary raw materials that are used at the facility.                      Excess asphalt granulate is transported to the production and technical unit "Ksty" - 5 km from km 61.5 of the road.                      Waste to be disposed of - solid waste landfill - 17 km from km 61.5 of the road (according to the permission of the Ministry of Natural Resources for storage and disposal of waste).                      Mixed waste, stump rooting waste, chopping residues - to the nearest waste management company registered in the register of the Ministry of Natural Resources and giving written consent to accept these wastes in the amount stipulated by the project</p>													

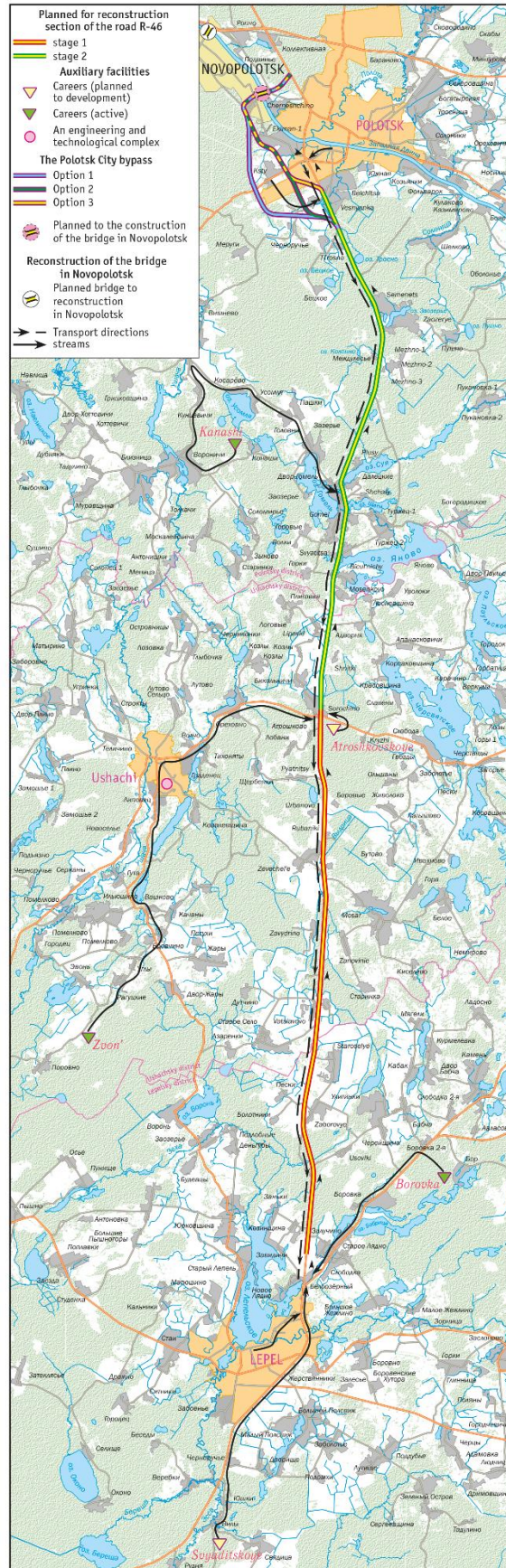


Figure 2.6: – Transportation routes of building materials

### 3. Analysis of Alternatives

#### 3.1. “No action” Alternative

As part of the environmental impact assessment, a comparative analysis of two alternatives was made: the “Implement the project” alternative “Implementation of the project for the reconstruction of the highway R-46 and “No action” alternative - “Rejection of the project for reconstruction of the highway R-46. Both positive and negative factors for the implementation of design decisions were identified. The rationale for choosing the best option is given in Table 3.1.

**Table 3.1: Comparison of the “Implement the project” and “No action” alternative options for reconstruction of the R-46 highway**

	“Implement the project” Alternative		“No action” Alternative	
	Positive factors	Negative factors	Positive factors	Negative factors
Natural environment: air	Improving road performance and traffic conditions will lead to a decrease in emissions of pollutants from cars into the air.	Temporary air pollution by exhaust gases of construction vehicles, other vehicles used in the transportation of building materials, machinery, workers, etc.  Temporary release of particulate matter into the air as a result of the movement of soil, sand, gravel, as well as during paving.	The absence of negative consequences of the implementation of the “Implement the project” Alternative	Higher number of vehicle braking-acceleration cycles and lower average traffic flow rate due to poor roadway coverage and low traffic capacity of the existing road. The operation of machine engines in this mode will cause a greater amount of pollutant emissions into the air.
Acoustic impact	Given the implementation of a set of noise protection measures, an acceptable noise level is expected in the territory of the existing residential development adjacent to the reconstructed highway.	Temporary increase in noise during construction.	The absence of negative consequences of the implementation of the “Implement the project” Alternative	Exceeding the permissible noise levels in the residential area adjacent to the object of the planned reconstruction.
Natural environment: soil, land resources	Using the latest construction technologies, reclamation and improvement of temporarily occupied lands will reduce the load on soils and land resources.	Land acquisition.  Temporary negative impact on soils during the construction period.	The absence of negative consequences of the implementation of the “Implement the project” Alternative	Further inflow of pollutants from vehicles into the soil in large volumes.

	“Implement the project” Alternative		“No action” Alternative	
	Positive factors	Negative factors	Positive factors	Negative factors
Natural environment: surface and groundwater	In accordance with the requirements of the legislation, the prevention of adverse effects on water resources will be achieved through the implementation of a range of measures to divert storm water.	Slight negative impact on water bodies during the construction period.	The absence of negative consequences of the implementation of the “Implement the project” Alternative	Further inflow of pollutants from vehicles into water bodies in large volumes.
Natural environment: objects of flora and fauna	The construction of crossings through the highway for wild animals with guiding mesh structures.	Removal of vegetation within the land allotment. During the reconstruction of the highway negative impact on wildlife is possible.	The absence of negative consequences of the implementation of the “Implement the project” Alternative	Further inflow of pollutants from vehicles in large volumes.
Socio-economic sphere	Decrease in the number of traffic accidents.  Development of roadside service, business opportunities.  The growth of the socio-economic potential of the region.	Not expected	Not expected	Lost profit in case of refusal of the project.
Transport conditions	The increase in freight traffic. Decrease in transport and maintenance costs (fuel, lubricants, spare parts and maintenance, depreciation, driver salaries, overhead costs, etc.).	Temporary worsening of traffic conditions during the construction works.	The absence of negative consequences of the implementation of the “Implement the project” Alternative	The cost of repair work on the existing highway.

### 3.2. Two lane vs. four lane alternative

During the assessment, a comparison was also made of the reconstruction of the road with the preservation of two-lane traffic and the extension of the road to four lanes. The main difference when performing reconstruction according to these two options is the different area of the allotted land for work. A comparison of the two options is shown in the **Table 3.2**.

**Table 3.2: Comparison of a two-lane and a four-lane alternative options for reconstruction of the R-46 highway**

	<b>Two-lane Alternative</b>	<b>Four-lane Alternative:</b>
Natural environment: objects of flora and fauna	Felling of trees and shrubs in a smaller area.	Work on the site between allotments 20 (left) and 41 (right) in the quarter 44 of the Gomel forestry GLHU "Polotsk Forestry" will be difficult due to the identified habitats for protected plant species. Felling of tree and shrub plantings over a larger area.
Socio-economic sphere	A smaller area of seized land, including land owned by citizens.	Increase in the number of affected parties.  A significant increase in the area of seized land, including land owned by citizens.
Transport conditions	Lower traffic safety is expected.	A longer period of deterioration of road conditions during construction work.  Increased traffic safety is expected.
Economic conditions	Lower Expected Costs	Higher Expected Costs

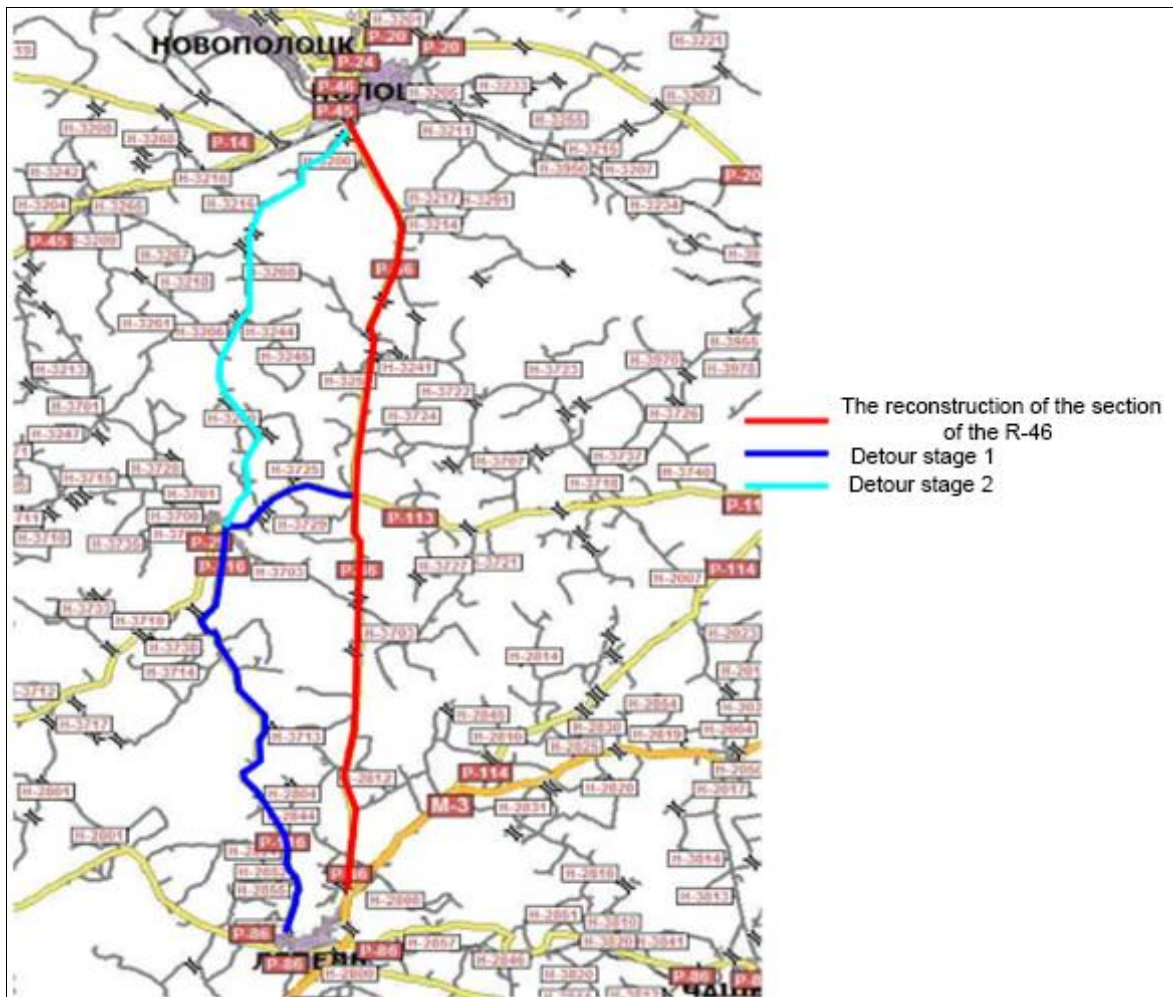
### 3.3. Pavement alternatives

During the development of the project for the reconstruction of the section of the R-46, *two variants of pavement* were considered for comparison: asphalt concrete and cement concrete pavement.

When building pavement with asphalt concrete pavement, in order to bring the longitudinal profile to the standard parameters, temporary detours with a total length of 14.2 km will be required.

When building pavement with cement concrete coating, it will be necessary to organize the movement of transit transport through the network of existing roads of national and local level (**Figure 3.1**).





**Figure 3.1: Detour of a reconstructed highway section (blue lines) for the option with cement concrete coating**

When creating a cement concrete coating, it is possible to perform work in 2 stages:

- Stage 1 - during the reconstruction of the road from the beginning of the section to the intersection with the R-113 Senno-Beshenkovichi-Ushachi highway, travel can be arranged from Lepel to Ushachi along the R-116 Ushachi-Lepel highway and from Ushachi to the R-46 along the R-113 highway Senno-Beshenkovichi-Ushachi. The total length of the detour is 46 km during the reconstructed section of 31.6 km.
- Stage 2 - during the reconstruction of the road from the intersection with the R-113 Senno-Beshenkovichi-Ushachi highway to 61.5 km, passage can be arranged along the R-113 Senno-Beshenkovichi-Ushachi highway from the R-46 highway to the city of Ushachi, and then along highway N-3200 Polotsk-Ushachi. The total length of the detour is 53.6 km, while the length of the reconstructed section is 31.9 km.

The possibility of carrying out work in one stage with the reconstruction and construction of cement concrete pavement throughout the projected area was also considered. This will require:

- arrangement of entrances to settlements with access only to R-46 - 40 km;
- reinforcement of sites for dumping transit transport - 89.1 km;
- strengthening local roads - 106 km.

Comparison of pavement options was made on the basis of a comparison of costs (construction and operating, user costs) for the period of analysis, taking into account the reduction of different costs to the first year of operation of the designed pavement using a discount rate.

To compare the economic indicators of the two options, the discounted costs are calculated. The above costs were understood as the sum of the total current production costs including depreciation and capital investments. The calculation showed that the option with asphalt coating is a more economically advantageous option for pavement.

### 3.4. Alternatives for the Polotsk City bypass

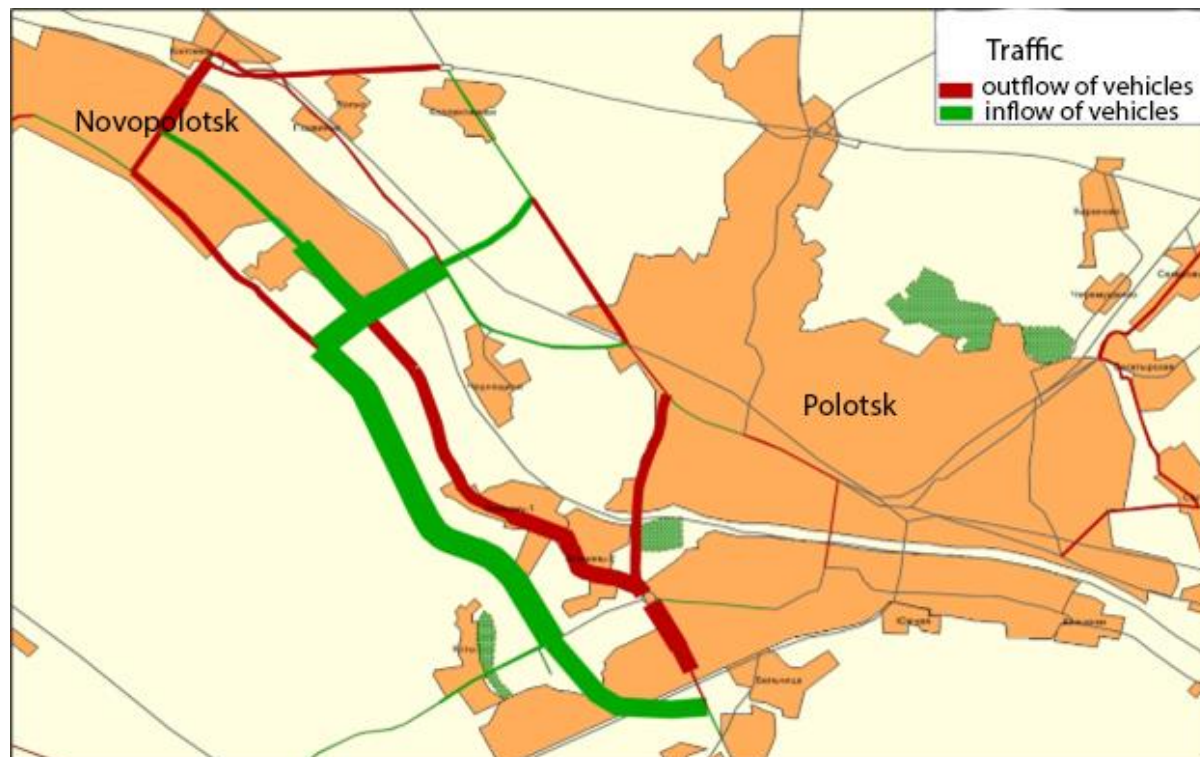
As part of the assessment, the following alternatives for the Polotsk City bypass were considered:

- The “No Action” alternative implies a rejection of the construction of the Polotsk City bypass;
- The “Implement the project” alternative implies the construction of a Polotsk City bypass.

According to the “No Action” alternative, traffic is carried out along roads and streets in the gravity zone of the designed bypass. The movement of transit transport in the north-south direction is carried out along the transit section of the R-46 highway through the city of Polotsk.

According to the “Implement the project” alternative, vehicles will be redistributed from roads and streets in the gravity zone to the planned Polotsk City Bypass.

The expected redistribution of traffic flows is shown in **Figure 3.2**.



**Figure 3.2:** *Redistribution of traffic due to the construction of the Polotsk City bypass*

A comparative analysis of the two alternatives is given in **Table 3.3**.

During the development of the project of bypassing the city of Polotsk on sections of roads of category I and II, two options for the construction of pavement were considered:

- asphalt concrete pavement (option 1);
- cement concrete coating (option 2).

When comparing the pavement design options, the annual change in the composition and intensity of traffic, the evenness of the coating and the speed of the traffic flow during the design service life of the pavement were taken into account.

According to the results of calculating the reduced costs, a more economically advantageous option for pavement is option 2 with a cement concrete coating with a lower amount of the reduced costs.

**Table 3.3: Comparison of the “Implement the project” and “No action” alternative options for reconstruction of the R-46 highway**

	«Implement the project» alternative: “Implementation of the project for the construction of the Polotsk City bypass”		«No Action» alternative: «Rejection of the project for reconstruction of the Polotsk City bypass»	
	Positive factors	Negative factors	Positive factors	Negative factors
Natural environment: air	Reducing the movement of transit vehicles in the city of Polotsk. Reduction of air pollution in Polotsk from vehicle emissions.	Temporary air pollution by exhaust gases of construction vehicles, other vehicles used in the transportation of building materials, machinery, workers, etc.  The increase in emissions from vehicles in the air in the southern part of Novopolotsk	There are no negative consequences of implementing the “Implement Project” alternative.	A significant amount of pollutant emissions into the air of the city of Polotsk due to transit freight traffic. The concentration of traffic in the city of Polotsk and emissions associated with them.
Acoustic impact	Decrease in noise created by vehicles in the city of Polotsk.	Noise reduction in the territory adjacent to the projected facility, including during the period of construction work. The increase in noise from traffic in the southern part of Novopolotsk	There are no negative consequences of implementing the “Implement Project” alternative.	Failure to comply with the proposals of the General Plan of Polotsk to redirect traffic from the city center, which should reduce emissions into the air and also reduce noise.  Inconsistency with the provisions of the detailed plans of the city of Polotsk (lower level of planning compared to the general plan of the city).



	«Implement the project» alternative: “Implementation of the project for the construction of the Polotsk City bypass”		«No Action» alternative: «Rejection of the project for reconstruction of the Polotsk City bypass»	
	Positive factors	Negative factors	Positive factors	Negative factors
Natural environment: objects of flora and fauna	Not expected	Removal of plant world objects and destruction of the natural habitat of animals within the allotment.	There are no negative consequences of implementing the “Implement Project” alternative.	Not expected
Natural environment: water resources	Not expected	Temporary negative impact on water resources, including the Zapadnaya Dvina River, during the construction of the road and the bridge.	There are no negative consequences of implementing the “Implement Project” alternative.	Not expected
Transport and socio-economic sphere	<p>Improving conditions for the development of the Polotsk agglomeration and its transport infrastructure.</p> <p>Reduced traffic and travel time for cars.</p> <p>Improving transport links for the cities of Polotsk and Novopolotsk.</p> <p>Redistribution of traffic flows in order to reduce the load on the street network of the centers of Novopolotsk and Polotsk.</p>	Significant costs for the implementation of the project.	Not expected	<p>Significant transport load will remain on the road section in the area of the bridge over the Zapadnaya Dvina River in the city of Polotsk and the associated time spent traveling through this section.</p> <p>Preservation of difficult traffic conditions in Polotsk due to heavy transit traffic.</p>

Due to the presence of a large number of underground utilities crossing the projected street in the city of Novopolotsk, as well as for the convenience of repair work on the underground utilities, pavement on an A4 category site is provided with asphalt concrete pavement. In the remaining sections of the bypass, the design of pavement with a cement concrete coating was selected according to the results of a comparison of options.

For further design accepted:

- asphalt concrete pavement on the section of the A4 category main street in the city of Novopolotsk - was chosen due to the presence of a large number of underground utilities, as well as for the convenience of carrying out repairs of underground utilities;
- cement concrete pavement on sections of roads of category I and II (from the beginning of the Polotsk City bypass to the intersection with access No. 2 to Novopolotsk from the R-45 highway and from the intersection with the entrance to Polotsk from the R-20 highway until the end of the bypass) selected by comparing pavement design options.

The transverse profile of the road is adopted according to the following parameters:

- category II on the sections from the start of the detour to the R-45 highway Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka) and from the intersection with the highway "Access to Polotsk from the R-20 highway Vitebsk-Polotsk-border of the Republic of Latvia (Grigorovshchina)" to end of the bypass;
- category I-B on the section from the intersection with the R-45 highway Polotsk-Glubokoe-the border of the Republic of Lithuania (Kotlovka) further in the direction of the road "Access No. 2 to Novopolotsk from the R-45 highway Polotsk-Glubokoe-the border of the Republic of Lithuania (Kotlovka) »Prior to unlocking in the city of Novopolotsk;
- category A4 (main city streets with 4 lanes according to TKP 45-3.03-227-2010) on the section from the exit from Access 2 to Novopolotsk from the R-45 Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka) to the intersection with access to the city of Polotsk from the highway R-20 Vitebsk-Polotsk-border of the Republic of Latvia (Grigorovschina) (in the city of Novopolotsk).

When choosing the optimal location of the route of the planned Polotsk City bypass, the existing transport network of roads in the suburban area, their condition, traffic intensity, existing residential and country buildings, urban planning documentation, engineering communications (gas pipelines, oil pipelines, lines) were developed and approved in accordance with the legislation power transmission), the boundaries of recreational areas, conservation areas, natural and other factors.

Comparative characteristics of the three options are presented in the **Table 3.4**.

Option 1 is recognized as the most expensive and unpromising, due to the greatest length (13 km) and significant passage in a new direction with virtually no existing roads (about 95%).

When choosing between Option 2 and Option 3, much attention was paid to the length of the route and the presence of intersections with utilities.

Given the shorter length of Option 3 (10.239 km versus 12.5 km), as well as a smaller number of intersections with utilities, **Option 3** was selected as the recommended option for the Polotsk City bypass route.

**Table 3.4: Comparison of alternative options for bypassing the city of Polotsk**

Criterion	Option 1	Option 2	Option 3
Natural environment: air	Air emissions in Belchitsa will be reduced	Air emissions in Belchitsa will be reduced	Air emissions in Belchitsa will remain at the same level.
Acoustic impact	Noise level in Belchitsa will be reduced	Noise level in Belchitsa will be reduced	Noise level in Belchitsa will remain as it used to be
Natural environment: objects of flora and fauna	Felling of trees and shrubs over a large area. Near the highway, there is an identified habitat for a protected plant species	Minimum area of felling of trees and shrubs Near the highway, there is a typical protected biotope	Minimum area of felling of trees and shrubs
Transport and socio-economic sphere	The most expensive option.  The traffic intensity on the road section in the area of the village of Belchitsa will decrease.  Seizure of plots in a garden partnership for the construction of a road.  No need to seize land from citizens.	The traffic flow on the road section in the area of the village of Belchitsa will decrease. The complexity of the pipeline crossing	The least expensive option.  Significant traffic intensity on the road section in the area of Belchitsa will continue.  Withholding of plots with private car garages for the construction of the road.

### 3.5. Alternatives for the location of the bridge across the Western Dvina river

When developing design documentation for the Polotsk City bypass, the following options for placing a bridge over the Zapadnaya Dvina River were also considered:

#### Option I (recommended)

Scheme: 84 + 126 + 84 m. The length of the bridge is 298.6 m.

Span - steel-reinforced concrete continuous composite system with 4 main beams with a height of 2.8 m box section, combined by longitudinal and transverse ties, resting on the supporting parts through metal cinch section 0.85 0,80.65 m.

The roadway slab is monolithic reinforced concrete, combined with the main beams of superstructures using flexible rod stops.

The length of the navigable span (126 m) is assigned on the basis of the conditions for reducing the number of intermediate supports and the placement of the navigable size (10.5-80 m).

Shore supports are supposed to build non-grillage double-row on bored pillars with monolithic nozzles and cupboard walls.

Intermediate supports - massive reinforced concrete three-columned individual design based on bored pillars with monolithic crossbars and foundations.

Sliding the main beams of the box section into the design position is carried out with two threads along the traffic lanes on temporary supports, metal girths are mounted in spans on high-strength bolts.

Coupling - reinforced concrete monolithic with a length of adapter plates of 8 m. Reinforcing slopes of cones - with monolithic concrete for crushed stone preparation.

The bridge canvas with asphalt concrete coating, the barrier fence is made of galvanized metal in accordance with STB 1300-2014.

## **Option II**

Scheme: 84 + 126 + 84 m. The length of the bridge is 298.6 m.

The span is continuous steel-reinforced concrete with 6 main beams with a box section cross-sectional height of 3.2 m, combined by longitudinal and transverse connections.

Combining the main beams of span metal structures with a monolithic reinforced concrete slab of the carriageway using flexible rod stops.

Shore supports - non-grillage double-row on bored pillars with monolithic nozzles and cupboard walls.

Intermediate supports are massive reinforced concrete, individual design with a base on bored pillars, monolithic support bodies, crossbars and foundations.

The span metal structures are slid into the design position by three strings along the permanent supports with the help of rotary devices located on the foundation of the intermediate support.

Coupling - reinforced concrete monolithic with a length of adapter plates of 8 m. Reinforcing slopes of cones - with monolithic concrete for crushed stone preparation.

The bridge canvas with asphalt concrete coating, the barrier fence is made of galvanized metal in accordance with STB 1300-2014.

### *Reconstruction of the bridge in the city of Novopolotsk*

Reconstruction of the bridge across the Zapadnaya Dvina River in the city of Novopolotsk is necessity because of its current state and considerable age. Therefore, an alternative option to refuse to implement the planned activity was not considered.

Two alternatives for reconstructing the bridge were considered. The first is to carry out only repairs while maintaining the existing characteristics of the bridge. The second is to carry out a significant modernization of the bridge - to increase the number of lanes, to build sidewalks, a bicycle path. The advantage of the first option is lower financial costs, of the second - improved comfort of the structure.

## 4. Legal and Policy Framework

This section discusses the key regulatory legal acts in the field of environmental protection and nature management of the Republic of Belarus (as of May 15, 2020) and the Environmental and Social Policy of AIIB.

### 4.1. Legal aspects in the field of environmental protection and rational nature management

The Basic Law of the Republic of Belarus, which has the highest legal force and enshrines the fundamental principles and norms of legal regulation of the most important public relations, is the Constitution of the Republic of Belarus of 1994 (as amended and supplemented by republican referenda on 11/24/1996, 10/17/2004 (Decision of 17.11. 2004 No. 1)).

The Republic of Belarus recognizes the priority of universally recognized principles of international law and ensures compliance with legislation (Article 8).

The state guarantees the rights and freedoms of citizens of Belarus, enshrined in the Constitution, laws and provided for by international obligations of the state (Article 21).

Everyone has the right to a favorable environment and to compensation for harm caused by a violation of this right (Article 46).

The state exercises control over the rational use of natural resources in order to protect and improve living conditions, as well as protect and restore the environment.

The legal framework for environmental protection, nature management, conservation and restoration of biological diversity, natural resources and objects is established by the *Law of the Republic of Belarus “On Environmental Protection”* (as amended on 06/18/2019, as amended on 12/18/2019) and aims to ensure constitutional rights citizens on a favorable environment for life and health.

This Law prescribes (Article 58) an EIA for facilities, the list of which is defined in the *Law of the Republic of Belarus “On State Ecological Expertise, Strategic Environmental Assessment and Environmental Impact Assessment”* dated July 18, 2016 No. 399-3 (as amended by July 15, 2019 No. 218-3). This Law regulates relations in the field of SEE, SEA and EIA and is aimed at ensuring environmental safety of the planned economic and other activities, as well as at preventing harmful effects on the environment. Articles 5–7 of the Law define the objects of SEE, SEA and EIA.

#### Other legal documents

The main regulatory legal documents establishing environmental requirements for conducting business in the Republic of Belarus in the development of the provisions of the Law “On Environmental Protection” are (as of May 15, 2020):

**The Code of the Republic of Belarus on Subsoil** dated July 14, 2008 No. 406-3 (as amended on December 18, 2019);

It regulates the relations arising in connection with the geological study of mineral resources, mining, the use and protection of other mineral resources, and is aimed at creating and expanding the mineral resource base, protecting the interests of the state, the rights and legitimate interests of subsoil users and other persons.

**The Land Code of the Republic of Belarus** dated July 23, 2008 No. 425-3 (as amended on October 24, 2016);

It regulates land relations and is aimed at the efficient use and protection of land, the protection of the rights of land users.

**Water Code of the Republic of Belarus** dated April 30, 2014 No. 149 (as amended on June 18, 2019 No. 201-3);

It regulates relations arising from the ownership, use and disposal of water and water bodies, and is aimed at protecting and rational (sustainable) use of water resources, as well as protecting the rights and legitimate interests of water users.

**Forest Code of the Republic of Belarus** dated December 24, 2015 No. 332-3 (as amended on December 18, 2018);

It establishes the legal basis for the use, conservation, protection and reproduction of forests and is aimed at the rational (sustainable) use of forest resources, the preservation and strengthening of environmentally-forming, water-protective, protective, sanitary-hygienic, recreational and other functions of forests.

**The Law of the Republic of Belarus “On the Protection of Atmospheric Air”** dated December 16, 2008 No. 2-3 (as amended on June 18, 2019);

It determines the legal and organizational basis for the protection of atmospheric air from pollutant emissions and is aimed at preserving, restoring atmospheric air quality, and ensuring environmental safety.

**The Law of the Republic of Belarus “On the Plant World”** dated 06.06.2003 No. 205-3 (as amended on 12/18/2018);

Establishes the legal basis for the protection, protection, reproduction, maintenance, seizure, removal, transplantation of plant world objects and their use, as well as landscaping, protection of the growth environment of plant world objects, increasing their environment-forming, water-protective, protective, sanitary, recreational and other functions in order to ensure a favorable environment for life and health of citizens, rational (sustainable) use of the resources of the plant world.

**The Law of the Republic of Belarus “On the Animal World”** dated July 10, 2007 No. 257-Z (as amended on June 18, 2019);

This Law establishes the legal basis for the protection and sustainable use of wildlife and their habitats in order to preserve biological diversity, prevent harm to life and health of wild animals from the harmful effects of anthropogenic factors, diseases, emergencies, adverse environmental conditions and ensure the ability of wildlife satisfy the economic, aesthetic and other needs of present and future generations.

**The Law of the Republic of Belarus “On Specially Protected Natural Territories”** dated November 15, 2018 No. 150-3;

It determines the legal basis for the announcement, functioning, transformation, termination of operation, protection and use of protected areas and is aimed at the conservation and restoration (reproduction) of valuable natural complexes and objects.

**The Law of the Republic of Belarus “On the Protection of the Ozone Layer”** dated November 12, 2001 No. 56-3 (as amended on June 18, 2019);

It defines the legal framework for the protection of the ozone layer and is aimed at preventing the destruction of the ozone layer and its restoration in order to protect human life and health, the environment from the adverse effects caused by the destruction of the ozone layer as a

result of exposure to ozone-depleting substances, as well as to fulfill obligations under international treaties of the Republic of Belarus in the field of ozone protection.

**The Law of the Republic of Belarus “On Waste Management”** dated July 20, 2007 No. 271-3 (as amended on May 10, 2019);

It defines the legal basis for waste management and is aimed at reducing waste generation and preventing their harmful effects on the environment, public health, state-owned property, property of legal entities and individuals, as well as the maximum use of waste, including waste management into civil circulation.

**The Law of the Republic of Belarus “On Land Reclamation”** dated July 23, 2008 No. 423-3 (as amended on July 17, 2018);

It determines the legal basis for land reclamation and aims to ensure the creation and maintenance of water, air, thermal, nutrient regimes of soils that are optimal for agricultural plants, forests and other plantings and the effective use of reclamation systems and separately located hydraulic structures.

**The Code of the Republic of Belarus “On Culture”** dated July 20, 2016 No. 413-3;

It is aimed at regulating public relations in the field of culture, as well as at determining the legal, organizational, economic and social foundations of cultural activities in order to preserve and use cultural values, develop cultural organizations and ensure universal access to cultural values.

**The Law of the Republic of Belarus “On the Sanitary and Epidemiological Well-Being of the Population”** dated January 7, 2012 No. 340-3 (as amended on July 15, 2019);

It is aimed at establishing the legal and organizational framework for preventing the adverse effects of environmental factors on the human body in order to ensure the sanitary and epidemiological well-being of the population.

The Republic of Belarus adopted regulatory legal, technical regulatory legal acts detailing the requirements of laws and codes, some of which are given below:

Decree of the Council of Ministers of the Republic of Belarus “On approval of the Regulation on the organization and conduct of public discussions of draft environmentally significant decisions, reports on environmental impact assessments, taking into account adopted environmentally significant decisions and amending and supplementing some decisions of the Council of Ministers of the Republic of Belarus” dated 14.06. 2016 No. 458 (as amended on 01/19/2017).

Decree of the Council of Ministers of the Republic of Belarus “On Approval of the Regulation on the Procedure for Conducting Public Ecological Expertise” dated October 29, 2010 No. 1592 (as amended on November 22, 2016).

Sanitary norms and rules “Requirements for the design, construction, overhaul, reconstruction, improvement of construction projects, commissioning and construction works”, approved by Decree of the Ministry of Health of the Republic of Belarus dated 04.04.2014 No. 24.

Environmental norms and rules 01/17/06-001-2017 "Environmental protection and nature management. Environmental Safety Requirements”, approved by the Decree of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus dated July 18, 2017 No. 5-T (as amended on December 18, 2019 No. 6-T).

Decree of the Council of Ministers of the Republic of Belarus of October 25, 2011 No. 1426

“On Certain Issues of the Treatment of Plant World Objects” (as amended on April 26, 2019); Decree of the President of the Republic of Belarus dated 02.28.2011 No. 81 “On the adoption of an amendment to the Convention on Environmental Impact Assessment in a Transboundary Context”;

Decree of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus dated 09.06.2014 No. 26 “On the establishment of lists of rare and endangered species of wild animals and wild plants included in the Red Book of the Republic of Belarus” and other regulatory and legal acts adopted in the country.

Decree of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus “On Approving the Instructions on the Procedure for Conducting Local Environmental Monitoring by Legal Entities Engaged in Economic and Other Activities that Harm the Environment, Including Ecologically Dangerous Activities” dated 01.02.2007 No. 9 (as amended on January 11, 2017).

Decree of the Ministry of Natural Resources and Environmental Protection “On the establishment of water quality standards for surface water bodies” No. 13 dated March 30, 2015 (as amended on May 26, 2017).

TKP 17.12-06-2014 (02120). Environmental protection and nature management. Vegetable world. Territory. Rules for the allocation and protection of typical and rare biotopes, typical and rare natural landscapes.

TKP 45-2-04-154-2009 (02250) Protection against noise. Building design standards.

Sanitary norms and rules “Requirements for the atmospheric air of settlements and places of mass recreation for the population” were approved by the Resolution of the Ministry of Health of the Republic of Belarus dated 30.12.2016 No. 141.

Specific sanitary and epidemiological requirements for the establishment of sanitary protection zones of objects that are affected by human health and the environment, approved by the Council of Ministers of the Republic of Belarus on December 11, 2019 No. 847 (as amended on 03.03.2020).

## **4.2. EIA procedure and public discussions of the EIA report**

The right to receive, store and disseminate complete, reliable and timely information about ... the state of the environment by citizens of the Republic of Belarus is guaranteed by the Constitution of the Republic of Belarus (Article 34).

Citizens of the Republic of Belarus have the right to participate in the decision of state affairs both directly and through freely elected representatives (Article 37).

For refusal to provide information to a citizen, administrative (Article 9.6 of the Code of the Republic of Belarus on Administrative Offenses) and criminal (Article 204 of the Criminal Code of the Republic of Belarus) liability is established.

Other regulations governing access to environmental information and public participation are:

- Law of the Republic of Belarus “On Environmental Protection”;
- The Law of the Republic of Belarus “On Information, Informatization and Information Protection”;
- Law of the Republic of Belarus “On Local Government and Self-Government in the Republic of Belarus”;



- The Law of the Republic of Belarus “On Public Associations”;
- Law “On Appeals of Citizens and Legal Entities”;
- Decree of the Council of Ministers of the Republic of Belarus “On Approving the Regulation on the Formation and Maintenance of a State Fund of Data on the State of the Environment and Impacts on It and the Composition of General Information for General Purpose, Required to be Distributed, of the Owners of Such Information Required to Distribute It, and the Frequency of Its Distribution”.

Conducting public discussions of the EIA report provides an opportunity to inform the public about the planned activity, to take into account public opinion on the environmental impact of the planned activity.

The EIA procedure and requirements for the composition of the EIA report are established in the *Regulation on the procedure for environmental impact assessment, the requirements for the composition of the environmental impact assessment report, the requirements for specialists performing environmental impact assessments, approved by the resolution of the Council of Ministers of the Republic Belarus dated 01/19/2017 No. 47* (as amended on 11/11/2019).

The objectives of the impact assessment are (Article 4 of the Regulation):

- to comprehensively consider the possible consequences in the field of environmental protection and the rational use of natural resources and related socio-economic consequences, other environmental consequences of the planned activity, including human health and safety, wildlife, flora, lands (including soils) , subsoil, atmospheric air, water, climate, landscape, as well as for objects of historical and cultural values and (if any) the relationships between these consequences before deciding on its implementation;
- to search for design decisions that are justified taking into account environmental and economic factors that help prevent or minimize the possible impact of the proposed activity on the environment and human health;
- to take effective measures to minimize the harmful effects of the proposed activity on the environment and human health;
- to determine the possibility (impossibility) of the implementation of the planned activity on a specific land plot.

One of the conditions of the EIA is the timeliness and effectiveness of informing the public, transparency and taking into account public opinion on the environmental impact of the proposed activity.

The objects for which the EIA is carried out are indicated in Article 7 of the *Law of the Republic of Belarus “On State Ecological Expertise, Strategic Environmental Assessment and Environmental Impact Assessment”*. EIA is conducted for the facility as a whole. It is not allowed to carry out an EIA for the individual work stages, construction phases, start-up complexes allocated in the project documentation for the facility.

The results of the EIA should include:

- conclusions on the nature and extent of possible environmental impacts, alternative placement options and (or) implementation of the proposed activity;

- a description of the possible consequences for the protection of the environment and the rational use of natural resources and related socio-economic consequences, other environmental consequences of the proposed activity, including human health and safety, wildlife, flora, lands (including soils), subsoil, atmospheric air, water resources, climate, landscape, natural territories subject to special and (or) special protection, as well as for objects of historical and cultural values and (if any) interconnections between these consequences and assessment of their significance;
- a description of measures to prevent, minimize or compensate for the possible harmful effects of the proposed activity on the environment and improve socio-economic conditions;
- substantiation of the choice of the priority location of the facility, the best available technical and other solutions of the planned activity, as well as the rejection of its implementation (zero alternative);
- conditions for the design of the facility in order to ensure environmental safety of the proposed activity.

According to the provisions of the Aarhus Convention and the requirements of the Belarusian legislation, it is compulsory to discuss the EIA report with the public, within the framework of the EIA, whose rights and legitimate interests may be affected when implementing project decisions.

Local Councils of Deputies, local executive and administrative bodies of administrative-territorial units in the territories of which the planned activity is expected to be implemented and whose territories are affected as a result of its implementation, together with the customer, with the participation of the project organization, conduct public discussions of the EIA report, including a meeting for discussion EIA report. The procedure for organizing and conducting public discussions was approved by a *resolution of the Council of Ministers of the Republic of Belarus "On approving the Regulation on the procedure for organizing and conducting public discussions of draft environmentally significant decisions, reports on environmental impact assessments, taking into account the adopted environmentally significant decisions and amending and supplementing some Council decisions Of Ministers of the Republic of Belarus" dated June 14, 2016 No. 458 (as amended on January 19, 2017)* (hereinafter the Regulation).

Public discussions of the EIA report are held in order to:

- inform the public on environmental issues;
- realize the rights of the public to participate in the discussion and adoption of environmentally significant decisions;
- take into account public comments and suggestions on environmental issues in the process of impact assessment and decision-making regarding the implementation of the proposed activity;
- search for mutually acceptable solutions for the customer and the public in matters of preventing or minimizing the harmful effects on the environment and public health during the implementation of the planned activity.

Prior to the public discussion of the EIA report, the customer informs the relevant local authorities about the need for public discussion of the EIA report.

Local authorities at least three working days before the publication of the notice of public discussions of the EIA report create a commission for the preparation and conduct of public

discussions, determine its composition and appoint the chairman of the commission from among the vice-chairmen of the relevant local authorities.

Local authorities notify the public of the start of public discussions by publishing a notice of public discussions of the EIA report in the print media, as well as posting a notice on its official website in the “Public Discussions” section.

The public may, within 10 working days from the date of the start of public discussions, apply to the relevant local authorities with a statement about the need to hold a meeting to discuss the EIA report. Local authorities within three working days from the day the public addresses the date and place of the meeting by publishing an announcement in the print media, as well as posting an announcement on its official website in the "Public Discussions" section.

The procedure for holding a meeting to discuss the EIA report is discussed in paragraphs 48–49 of the Regulation. If it is held within five working days, the minutes of the meeting are drawn up.

The local authorities together with the customer of the planned activity provide from the date of the start of public discussions public access to the EIA report and the possibility of sending questions, comments and suggestions on the report to the EIA throughout the entire period of public discussions.

The term for public discussions of the EIA reports may not be less than 30 calendar days (more is allowed).

Based on the results of public discussions of the EIA report, within 10 working days from the date of their completion, a protocol of public discussions is drawn up, which is signed by the members of the commission and approved by its chairman. The protocol should be posted on the official website of local authorities in the “Public Discussions” section. A summary of reviews is attached to the protocol and should also be posted on the official website of local authorities. This summary includes comments and suggestions on the EIA report received in the course of public discussions, as well as reasoned answers to them.

Local authorities send minutes and summaries of feedback to the customer of the activity to take into account when making decisions about the possibility of carrying out the planned activity.

Based on the results of public discussions of the EIA report, the customer of the planned activity and design organizations develop an agreed decision on the feasibility of implementing the planned activity on the proposed territory based on the environmental, socio-economic and other consequences of its implementation.

If necessary, the process of public discussion of the EIA report can be suspended to make changes and additions to the EIA report based on the results of public discussions, to analyze the comments and suggestions received, to obtain additional information, or to conduct additional studies. After the design decisions on the proposed activity are finalized, public discussions are resumed to consider other impacts and consequences not previously considered.

If necessary, the organizer of public discussions may consult with the public concerned.

Ecologically significant decisions, as well as decisions made as a result of the EIA, are subject to accounting by posting a list of decisions made on official websites in the section “Public Discussions”.

### **4.3. International conventions and protocols in the field of environmental protection and nature management**

The Republic of Belarus is a party to a number of international conventions and protocols governing relations in the field of environmental protection and nature management. [<http://www.minpriroda.gov.by/ru/konvencia-ru/#1>], the requirements of which must be taken into account when implementing the planned activity:

UN Framework Convention on Climate Change (New York, 1992; ratified by the Republic of Belarus on 10.04.2000);

Vienna Convention for the Protection of the Ozone Layer (Vienna, 1985; ratified by the Republic of Belarus on 05.23.1986);

Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, 1987; ratified by the Republic of Belarus on 10/25/1988);

Convention on Long-Range Transboundary Air Pollution (Geneva, 1979; ratified by the Republic of Belarus on 05/14/1980);

Geneva Protocol to the Convention on Long-range Transboundary Air Pollution concerning the financing of a joint program for the monitoring and assessment of the spread of long-range air pollutants in Europe (EMEP) (Geneva, 1984; ratified by the Republic of Belarus on 06.08.1985);

Protocol on the Reduction of Emissions of Nitrogen Oxides or their Transboundary Fluxes to the Convention on Long-Range Transboundary Air Pollution (Sofia, 1988; ratified by the Republic of Belarus on 05.24.1989);

Helsinki Protocol to the Convention on Long-range Transboundary Air Pollution on the reduction of at least 30% of sulfur emissions or their transboundary fluxes (Helsinki, 1985; ratified by the Republic of Belarus on 08/18/1986);

Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, EIA) (Espoo, 1991; ratified by the Republic of Belarus on 10.11.2005);

Convention on Biological Diversity (Rio de Janeiro, 1992; ratified by the Republic of Belarus on 10.06.1993);

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Washington, 1973; ratified by the Republic of Belarus on 12/20/1994);

The Ramsar Convention on Wetlands of International Importance mainly as a habitat for waterfowl (Rasmar, 1971; ratified by the Republic of Belarus on 05.25.1999);

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel, 1989; ratified by the Republic of Belarus on September 16, 1999);

Convention on World Cultural and Natural Heritage (Paris, 1992; ratified by the Republic of Belarus 12.10.1988);

Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus, 1998; ratified by the Republic of Belarus on 12/14/1999);

UN Convention to Combat Desertification in Those Countries Experiencing Serious Drought and / or Desertification, especially in Africa (Paris, 1994; signed by the Republic of Belarus on July 17, 2001);

Cartagena Protocol on Biosafety to the Convention on Biodiversity (Cartagena, 2000; ratified by the Republic of Belarus on 05.06.2002);

Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention (CMS) (Bonn, 1979; signed by the Republic of Belarus on March 12, 2003);

Convention on the Protection of Wild Fauna and Flora and Natural Habitats (Berne Convention) (Bern 1979; signed by the Republic of Belarus 02/07/2013);

Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992; ratified by the Republic of Belarus on April 21, 2003);

Stockholm Convention on Persistent Organic Pollutants (Stockholm, 2001; ratified by the Republic of Belarus on December 26, 2003);

World Meteorological Organization Convention (Washington, 1974).

#### **4.4. Aarhus Convention**

The Aarhus Convention was signed by the Republic of Belarus on 06.25.1998, approved by Decree of the President of the Republic of Belarus dated 12.12.1999 No. 726 "On approval of the Convention on access to information, public participation in decision-making and access to justice on environmental matters ". Entered into force for the Republic of Belarus 10.30.2001

The Aarhus Convention includes three fundamental components:

- access to the information. It is fixed in articles:
  - Access to environmental information.
  - Collection and dissemination of environmental information.
- public participation in decision making. Reflected in the articles:
  - Public participation in decision-making on specific activities.
  - Public participation in addressing issues related to plans, programs and policies related to the environment.
  - Public participation in the preparation of regulations with direct executive force and / or generally applicable legally binding regulations.
- access to justice. Disclosed in the article:
  - Access to justice.

Access to information is the first fundamental component of the Convention and creates the basis for two other components - public participation in decision-making and access to justice, implies the right of everyone to receive environmental information and the obligation of state bodies to disseminate and / or provide environmental information as requested.

The definition of environmental information is given in Article 2 of the Aarhus Convention.

Article 4 and article 5 of the Convention impose obligations on public authorities to ensure access to environmental information.

Articles 74, 74 (1) - 74 (7) of the Law of the Republic of Belarus "On Environmental Protection" define the composition, sources and types of environmental information, the forms of its provision and dissemination; access and restriction of access to environmental information; provision and dissemination of environmental information.

If the information is limited to access, but there is a public interest in receiving it, you should

provide such information, having previously excluded its confidential part. In practice, most often this situation arises when it is necessary to provide information that belongs to the category of information for official use. In this case, it is necessary to extract information to provide it to the public without compromising the confidentiality of the source of information.

Responsibility for concealment or willful misrepresentation of information on environmental pollution is enshrined in Art. 268 of the Criminal Code of the Republic of Belarus.

The Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, in accordance with paragraph 1 of Decision of the Council of Ministers of the Republic of Belarus dated December 29, 2001 No. 1900 “On measures to implement the provisions of the Convention on access to information, public participation in decision-making and access to justice on issues relating to the environment ”has been identified as responsible for implementing the provisions of the Convention.

#### **4.5. AIIB Policy**

Asian Infrastructure Investment Bank (AIIB) is an international organization that provides financial assistance to develop infrastructure and improve interconnections in the participating countries, including Belarus.

The Bank approved the Environmental and Social Policy (ESP), which includes the mandatory environmental and social requirements for each project, and the three associated mandatory Environmental and Social Standards (ESS) attached to it.:

- ESS 1: Environmental and Social Assessment and Management;
- ESS 2: Involuntary Resettlement;
- ESS 3: Indigenous Peoples.

AIIB, in accordance with the ESP, will not finance Projects on the Environmental and Social Exclusion List.

The Bank requires its customers to manage environmental and social risks and impacts associated with its Project (planned activity) in order to comply with the provisions of ESP and ESS.

The Bank recognizes the need for integrated consideration of three aspects of sustainable development - economic, social and environmental.

The environmental and social management approaches provided for in ESP and ESS include environmental and social screening, categorization of projects, analysis of potential environmental and social risks and impacts during the implementation of the planned activity, measures aimed at preventing, minimizing, compensating for the negative impact of Projects, mechanisms for conducting public consultations and providing (disclosing) the necessary information, monitoring and supervision of environmental and social management measures in the framework of Projects, and more.

The Bank carries out environmental and social due diligence of the Project with the aim of making a decision on its further financing and determining ways to eliminate environmental and social risks and impacts by the Client (Customer) during the planning and implementation of the Project.

When the Bank has determined, in consultation with the Client, that the Project has potentially adverse environmental or social risks and impacts, it requires the Client:

- To conduct an environmental and social assessment relating to these risks and impacts, and design appropriate measures to avoid, minimize, mitigate, offset or compensate for them, all as required under ESS 1.
- If the Project would result in Involuntary Resettlement, to address this in the social section of the assessment report, complemented by more in-depth coverage, as required under ESS 2. The Client covers Involuntary Resettlement in a resettlement plan (resettlement plan) or resettlement planning framework (RPF).
- If the Project would affect Indigenous Peoples, to address this in the social section of the assessment report, complemented by more in-depth coverage, as required under ESS 3. The Client covers impacts on Indigenous Peoples in an Indigenous Peoples plan (Indigenous Peoples plan) or Indigenous Peoples planning framework (IPPF), which is provided to the Bank as a freestanding document, an annex to the assessment report, or incorporated into the report as a recognizable element.

The planned activities for the reconstruction of the section of the R-46 highway, the construction of the Polotsk City bypass and the repair (strengthening) of the existing bridge in the city of Novopolotsk were rated as Category B Project.

#### **4.6. Comparative characteristics of Belarusian legislation with the AIIB policy on environmental and social aspects**

If the Bank determines that the relevant environmental and social requirements of the country in which the Project is located are more stringent than the requirements of ESP or ESS, then the national requirements of the country will be applied, provided that they do not violate the Bank's Charter. The following is a comparative description of the requirements of the Belarusian legislation regarding environmental and social impact assessment with the AIIB policy on environmental and social aspects (**Table 4.1**).

**Table 4.1: Comparison of Belarusian legislation with the AIIB policy on environmental and social aspects**

Aspect / component	National law	AIIB policy	Actions to address existing gaps in legislation
<b>Environmental Policy and Rules</b>	<p>In the Republic of Belarus, the following normative legal acts apply:</p> <ul style="list-style-type: none"> <li>• Constitution of the Republic of Belarus;</li> <li>• Law of the Republic of Belarus “On Environmental Protection”;</li> <li>• The Law of the Republic of Belarus “On State Ecological Expertise, Strategic Environmental Assessment and Environmental Impact Assessment” and other regulatory legal acts.</li> </ul>	<p>AIIB has an approved ESP and three ESS.</p>	<p>The EIA and SS report is developed in accordance with the requirements of national legislation and the requirements of AIIB.</p>
<b>Screening and categorization</b>	<p>The Law “On State Environmental Expertise, Strategic Environmental Assessment and Environmental Impact Assessment” regulates relations in the field of state environmental impact assessment, SEA and EIA, aimed at ensuring the environmental safety of planned economic and other activities, as well as at preventing harmful environmental impacts, including the social sphere. Articles 5 and 7 of the Law define the objects (planned activity) for which the state environmental review and EIA are carried out, including in terms of their direction of activity, capacity, location, etc.</p>	<p>AIIB selects and categorizes projects at an early stage of project preparation when there is enough information for this.</p> <p>Categorization into categories A, B, C, FI</p> <p>The project depends on the location, the component representing the greatest environmental or social risk, including direct, indirect, cumulative and induced impacts, depending on the situation, in the project area.</p>	<p>If the requirements of the AIIB and the national classification are different, a more stringent requirement applies.</p> <p>The EIA and SS report is developed in accordance with the requirements of national legislation and the requirements of AIIB.</p>
<b>Environmental and Social Impact Assessment (ESIA) - EIA / EIA Report and SS</b>	<p>In accordance with the Regulation on the procedure for environmental impact assessment ... dated 01/19/2017 No. 47, the EIA report includes:</p> <ul style="list-style-type: none"> <li>• non-technical resumes;</li> <li>• information about the customer;</li> <li>• information about the goals and the need to</li> </ul>	<p>In accordance with the Environmental and Social Policy, the EIA and MOP process report for category A projects includes the following chapters: (a) project description; (b) the political, legal and administrative framework,</p>	<p>The EIA and SS report is developed in accordance with the requirements of national legislation and the requirements of the AIIB, including regarding public disclosure of information.</p>



Aspect / component	National law	AIIB policy	Actions to address existing gaps in legislation
	<p>implement the planned activity;</p> <ul style="list-style-type: none"> <li>• description of alternative options (territorial and (or) technological) for the location and (or) implementation of the planned activity, including the refusal to implement it (zero alternative);</li> <li>• the results of a study of the existing state of the environment, socio-economic and other conditions on the territory of the Republic of Belarus and the affected parties in the event of a possible significant harmful transboundary impact of the proposed activity;</li> <li>• a description of the main sources and possible types of environmental impacts of each of the alternative location options and (or) the implementation of the planned activity;</li> <li>• forecast and assessment of changes in the state of the environment, socio-economic and other conditions as a result of the implementation of each of the alternative options for location and (or) the implementation of the planned activity;</li> <li>• a description of measures to improve socio-economic conditions and to prevent, minimize or compensate for significant harmful effects on the environment as a result of the implementation of alternative options for location and (or) implementation of the planned activity;</li> <li>• a forecast of emergencies and an assessment of their consequences, a description of measures to prevent such situations, respond to them, and eliminate their consequences;</li> </ul>	<p>including the international and national legal framework applicable to the Project; (c) a review, including stakeholder identification and a consultation plan; (d) analysis of alternatives, including the “no project” situation; (e) baseline environmental and social data; (f) assessment of environmental and social risks and impacts; (g) public consultation and disclosure; and (h) development of mitigation measures, monitoring and management in the form of ESMP or ESMPPF.</p> <p>For a Category B project, the scope of the EA and the report should be narrower than for Category A projects.</p>	

Aspect / component	National law	AIBB policy	Actions to address existing gaps in legislation
	<ul style="list-style-type: none"> <li>• substantiation of the choice of the priority option for location and (or) implementation of the planned activity from all the considered alternative options;</li> <li>• information in the form of separate sections on the assessment of the possible significant harmful transboundary impact of each of the alternative options for the location and (or) implementation of the planned activity on the environment of each of the affected parties and on proposed measures to prevent, minimize or compensate it;</li> <li>• description of programs for local environmental monitoring and, if necessary, subsequent analysis of the operation of the facility;</li> <li>• key findings of the EIA;</li> <li>• assessment of the reliability of the predicted consequences of the implementation of the planned activity, indicating the uncertainties identified during the EIA;</li> <li>• conditions for the design of the facility in order to ensure environmental safety, taking into account possible consequences for environmental protection and rational use of natural resources, socio-economic consequences, other environmental consequences of the planned activity, including human health and safety.</li> </ul> <p>The EIA report must be accompanied by the results of measurements in the field of environmental protection, the results of research, development, experimental and technological work,</p>		

Aspect / component	National law	AIIB policy	Actions to address existing gaps in legislation
	as well as documents confirming the preparation of the EIA for the relevant components of the natural environment, individuals who performed the EIA.		
<b>Environmental and Social Management Plan (ESMP / ESMP)</b>  <b>Stakeholder Engagement Plan (SEP)</b>	Within the framework of the EIA, the sources and types of impact of the planned activity are determined, measures are developed to improve the socio-economic conditions and to prevent, minimize or compensate for the harmful effects on the environment as a result of the project. If necessary, a program for local environmental monitoring and / or recommendations for a post-project analysis of the planned activity are developed. The SEIPP and SEP, as separate documents, are not compiled.	After the Client has identified the risks and impacts of the Project, the Bank requires him to develop an ESMP and SEP.	The comprehensive EIA and SS will include three Environmental and Social Management Plans - ESMP for the reconstruction of the R-46 highway, the construction of a new detour in Polotsk and the reconstruction of the Novopolotsk bridge.  A Stakeholder Engagement Plan (SEP) will be prepared.
<b>Public discussions (consultations) and information disclosure</b>	As part of the EIA, it is compulsory to discuss the EIA report with the public, whose rights and interests may be affected in the implementation of design decisions. The procedure for conducting public discussions and meetings (if necessary) should be clearly regulated and the dates indicated. Responsible persons (organizations) and the procedure for informing the public should also be identified.	The Bank requires the Client to carry out meaningful consultations with interested parties at the stages of preparation and implementation of the Project. Consultation is required for each category A project and for each category B project, in proportion to its risks and impacts.	Public discussions of the EIA reports on the R-46 highway and the Polotsk City bypass have already been held by the Customer in accordance with the requirements of the legislation of the Republic of Belarus. Additionally, consultations with interested parties are planned. The issues and concerns raised during the consultations will be reflected in ESMP documents. The resulting ones will be used for finalizing the ESIA report.
<b>Involuntary Resettlement (IR)</b>	Legislation of the Republic of Belarus governing relations in the field of land use includes: <ul style="list-style-type: none"> <li>• Land Code of the Republic of Belarus;</li> </ul>	AIIB approved the Environmental and Social Policy (ESP) and the	A brief resettlement plan is planned.

Aspect / component	National law	AIIB policy	Actions to address existing gaps in legislation
	<ul style="list-style-type: none"> <li>• Housing Code of the Republic of Belarus;</li> <li>• Civil Code of the Republic of Belarus;</li> <li>• Decree of the President of the Republic of Belarus “On the seizure and provision of land”;</li> <li>• Decree of the President of the Republic of Belarus “On some measures to improve relations in the field of withdrawal, provision and use of land”.</li> </ul>	Environmental and Social Standard (ESS 2 - Involuntary Resettlement).	
<b>Compensation for loss of property / assets</b>	<p>The legislation of the Republic of Belarus provides compensation to affected landowners:</p> <ul style="list-style-type: none"> <li>• agricultural, forestry organizations upon land acquisition compensate for the loss of production in material terms;</li> <li>• privately owned land plots can be redeemed at a cost not lower than the cadastral value taking into account inflation from the moment of valuation or exchanged for equivalent plots.</li> </ul>	In accordance with ESS 2, the Client is obliged to pay compensation and provide other resettlement rights before any physical or economic movement within the framework of the Project.	The project provides for reimbursement of losses of agricultural and forestry organizations, as well as losses of land users.
<b>Procedural mechanisms</b>	<p>Persons affected by the Project (PAPs) are notified in advance in writing of the seizure of land, for what needs, about the estimated amount of losses.</p> <p>Public consultations are held as part of public discussions of the EIA report.</p>	<p>Disclosure: resettlement documents must be timely submitted in an accessible place and in a clear language.</p> <p>Public consultations are held with affected individuals (PAPs). It is necessary to inform about their rights in the process of resettlement, resettlement options and the process of further participation. Particular attention is required to the needs of vulnerable groups (pensioners,</p>	<p>It differs in principle and application. Information will be provided during the implementation of the Project.</p> <p>Public discussions of the EIA reports on the R-46 highway and the Polotsk City bypass have already been held by the Customer in accordance with the requirements of the legislation of the Republic of Belarus.</p> <p>Additionally consulted with</p>

Aspect / component	National law	AIIB policy	Actions to address existing gaps in legislation
		women, children, etc.) and to ensure their participation in consultations.	PAPs.
	Complaints Procedure: The complaint is sent to the organization competent for its consideration.	Complaints Procedure: develop a grievance redress mechanism (GRM) to receive and facilitate the resolution of problems of persons displaced by the Project. Information about GRM should be communicated to affected individuals.	A grievance redress mechanism (GRM) will be proposed at two levels.
	Asset Acquisition Terms: Property can only be acquired after full compensation by PAPs.	Asset Acquisition Terms: Property can only be acquired after full compensation by PAPs.	
<b>Help Vulnerable and Severely Affected PAPs</b>	The Republic of Belarus has a system of state targeted social assistance aimed at supporting low-income and difficult-to-live citizens.	Special assistance is provided to PAPs who are recognized as vulnerable. In addition, at the pre-project level, their standard of living should be restored / improved.	AIIB ESS2 rules will be used during the implementation of the Project.

## **5. Environmental and Social Characteristics of the Project Area**

### **5.1. Methodology for assessing the current state of the environment**

Assessment of the current state of the environment in the region of the proposed activity was carried out on the basis of literature, archival materials, background documentation, specialized statistical information, EIA reports on the reconstruction of the R-46 highway and the construction of the Polotsk City bypass prepared by the Belgiprodor State Enterprise [4, 5], as well as on the basis of our own field and instrumental studies.

The main volume of the data presented in this chapter is given on the basis of various literary sources: special literature, reference books, cartographic materials, as a result of which sections on climate, topography, hydrography, soil cover of the territory, and landscape diversity have been prepared.

Information on the radiation situation, the presence of minerals, background pollution of the atmosphere, the state of the soil cover and a number of other data are given on the basis of specialized information provided by various government bodies and organizations - GU Polotsk District Center for Hygiene and Epidemiology, GU Lepel District Center for Hygiene and Epidemiology", Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, State Institution" Republican Center for Hydrometeorology, Radioactive Contamination Control and Environmental Monitoring", etc.

In characterizing the geological and geomorphological conditions, the results of exploration work by the organization developing the project are used.

Directly by the specialists of the Belarusian State University, instrumental measurements of the noise level of the road, sampling of surface waters with their further analysis, and field surveys of biological diversity were made.

The data on biological diversity obtained during field studies are supplemented by information on the presence of habitats of plants and habitats of animals belonging to species included in the Red Book of the Republic of Belarus and information on the frequency and localization of car accidents involving wild animals.

Socio-economic and demographic data were taken from open databases of the National Statistical Committee of the Republic of Belarus, population census data for Lepel, Ushachsky and Polotsk districts of the Vitebsk region. Information on individual settlements was provided upon requests to local authorities, the Internal Affairs Directorate of the Vitebsk Regional Executive Committee, as well as during consultations and surveys with stakeholders in May-June 2020.

### **5.2. Natural conditions and resources**

#### **5.2.1. Climate**

The reconstructed span of R-46 highway, the new Polotsk City bypass and the reconstructed bridge in the city of Novopolotsk are located on the territory of the Lepel, Ushach, Polotsk districts of the Vitebsk region and the cities of Polotsk and Novopolotsk.

The territory of the proposed activity belongs, like the entire Republic of Belarus, to a zone

with a temperate continental, unstable humid climate.

The reconstruction area of the R-46 highway is part of the first northern wet road-climatic region of the Republic of Belarus [TCP 45-3.03-19-2006 (02250)]. The region is characterized by moderately cool summers and relatively cold winters.

The coldest month is January with an average monthly air temperature of minus 6.4°C. The warmest month is July with an average monthly temperature plus 17.5-17.6 ° C (observation points are Lepel, Polotsk). The average annual temperature is + 5.7-5.8 ° C.

According to long-term observations, the transition of the average daily air temperature through 0 ° C in the spring occurs between March 25 and 30, the duration of the frost-free period (with an average daily temperature above 0 ° C) is 230-235 days. The transition of the average daily air temperature in spring through + 5°C occurs later than April 15, through + 10°C - between April 30 and May 5. The period with a temperature above + 5°C is 185-190 days, with a temperature above + 10°C - 140-145 days [1]. The average number of days with the transition of air temperature through 0°C is 70 days (Lepel town), 76 days (Polotsk town).

The first autumn frosts in the air can be observed on September 30, the last spring - on May 5. On the soil, the first autumn frosts are recorded on September 25-30, the last spring - on May 10-15.

The annual rainfall is 600-700 mm, the average rainfall for April-October is 461 mm (the city of Polotsk), 448 mm (the city of Lepel), for November-March it is 202 mm (the city of Polotsk), 212 (the city of Lepel) mm. The annual relative humidity is 79% (Lepel town), 80% (Polotsk town).

Winter usually comes in mid-November, and this season is characterized by a change of thaws and frosty periods. Stable snow cover in this area is formed on December 10-15.

The average of the largest decadal snow cover in winter is 25-27 cm, the maximum of the largest decadal is 48-50 cm, and the duration of stable snow cover is about 101-104 days [Change No. 1 SNB 2.04.02-2000].

The average of the maximum freezing depths per year for the soil is 60 cm (Polotsk), 53 cm (Lepel), the largest of the maximum freezing depths for open areas under natural snow cover is 122 cm (Polotsk), 99 cm (g Lepel).

In all winter months, cloudy weather is common. Spring arrives at the end of March, a periodic return of cold weather is typical, a stable snow cover falls on March 20-25. Moderately warm and humid summers begin at the end of May. In autumn, damp, windy and cloudy weather is characteristic, at the end there is frequent frost.

The prevailing wind directions in the area of the planned highway in the Ushachskiy and Polotskiy districts in the winter are southern and in the summer western (**Table 5.1**).

**Table 5.1: Wind directions in Ushachskiy district**

	N	NE	E	SE	S	SW	W	NW	Calm
January	5	4	10	12	23	17	19	10	2
July	13	9	10	7	14	14	22	11	10
year	9	7	12	11	19	15	18	9	6

The wind speed, the repeatability of exceeding which is 5%, is 6 m / s.

The coefficient depending on the stratification of the atmosphere, A = 160.

Terrain coefficient: 1.

The prevailing wind directions in the area of the R-46 highway in the Lepel district in the winter are southern, in the summer, northern and north-western (**Table 5.2**).

**Table 5.2: Wind directions in Polotskiy district**

	N	NE	E	SE	S	SW	W	NW	Calm
January	7	4	7	13	24	18	17	10	3
July	17	8	7	7	15	13	16	17	7
year	11	6	9	12	21	15	15	11	5

The wind speed, the repeatability of exceeding which is 5%, is 7 m / s.

Coefficient depending on the stratification of the atmosphere  $A = 160$ .

The topography coefficient is 1.

The geographical location of the road reconstruction region determines the amount of solar radiation and the nature of the atmospheric circulation. The amount of radiation balance for the year is less than 1500 MJ / m<sup>2</sup>. The annual total solar radiation is 3400-3600 MJ / m<sup>2</sup>.

In the territory under consideration, the following adverse weather conditions can be observed [1], which at high intensity can worsen the traffic situation and contribute to the rapid deterioration of the roadway:

- the average number of days with fogs per year is up to 40 (the average number of days with fogs per year in Polotsk is 44, the largest is 66);
- the average number of days with thunderstorms is up to 30 (the maximum number of days with thunderstorms per year in Lepel is 43);
- the average number of days with ice - 10-15 per year;
- the maximum number of cases per year with strong winds and squalls - 6 (Polotsk);
- the average number of days with thaws is 30-35 per year;
- the average annual number of days with snowstorms is 15-20;
- the maximum number of hail days per year is 4 (Polotsk), 7 (Lepel).

### 5.2.2. Radiation level

Radiation monitoring as a system of regular observations of the radiation situation and also a forecast of its future changes is part of the National Environmental Monitoring System of the Republic of Belarus

In recent years, the radiation situation in the Republic of Belarus has remained stable. Not a single case of excess of dose rate levels over steady multi-year values was revealed.

According to observations made on the radiation monitoring network of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, the radiation situation in the Vitebsk regions in 2019 was characterized as stable, the gamma radiation dose rate exceeded the level of natural gamma background (up to 0.20  $\mu\text{Sv} / \text{h}$ ). In regional cities, the average annual level of gamma radiation dose rate is in the range from 0.10 to 0.12  $\mu\text{Sv} / \text{h}$ . [3].

Monitoring the level of radioactive contamination of the forest fund lands in Lepelsky, Ushachsky and Polotsk forestries, through which the reconstructed section of the R-46 Lepel-



Polotsk border of the Russian Federation (Yukhovichi) 1.700–61.500 km passes, is carried out by the State Forest Protection and Monitoring Agency “Bellesozashchita.” According to this organization, forest land in the area where the proposed activity is planned is not contaminated with cesium-137 [4].

In the order of state sanitary supervision and radiation-hygienic monitoring in the Vitebsk region, radiochemical, spectrometric, radiometric studies of food products, food raw materials, drinking water, medicinal and technical raw materials for cesium-137 and strontium-90 are regularly conducted; environmental objects - on cesium-137 and natural radionuclides, drinking water on  $\alpha$ ,  $\beta$ -activity.

Food products manufactured by enterprises of the Vitebsk region, in terms of radionuclide content, comply with existing standards. No excess of the permissible level in the production of personal farms of the region was revealed. For 2014-2018, only four cases of exceeding the permissible level of cesium-137 content in samples of wild berries and mushrooms brought from outside the region were established [5].

### **5.2.3. Relief and geomorphological features of the study area, Engineering and geological conditions**

According to the geomorphological zoning of the Republic of Belarus, the R-46 highway Lepel-Polotsk-border of the Russian Federation (Yukhovichi) on the 1.700–61.500 km section, along with the Polotsk City bypass, are located within the Belarusian Lake District. [6].

Belarussian Lakeland is located in the north of the Republic of Belarus and borders on Lithuania, Latvia, the Pskov and Smolensk regions of Russia. In tectonic terms, this region is a complex joint of the Latvian saddle in the north, the slopes of the Belarusian Anteclise in the south, the Orsha Depression in the east. The far west within the Baltic ridge is occupied by the Baltic syncline and the Vileika buried ledge. A common feature of the geomorphology of the region is the youth of the relief, the formation of which in its modern form is associated with the last ice age, Late Glacial and Holocene. The main basins and elevations arose during the Sozh period.

The Belarusian Lake District is characterized by the distribution of frontal marginal elevations and angular elevations with a predominance of heavy moraine loams and boulder material not covered by younger sediments, with widespread forms of glacial accumulation and exazation. The distribution of fresh-water glacial basins, which occupied up to 50% of the territory and left behind flat-bogged swampy lowlands, should also be considered classic for the East European Plain. Differences in origin left its mark on the morphometric pattern of the region. Absolute heights vary from 120 m in the center to 239 m on the Ushach Upland.

Elongated in the sub-latitudinal direction bands of marginal glacial complexes are clearly pronounced in the relief of the Belarusian Lake District.

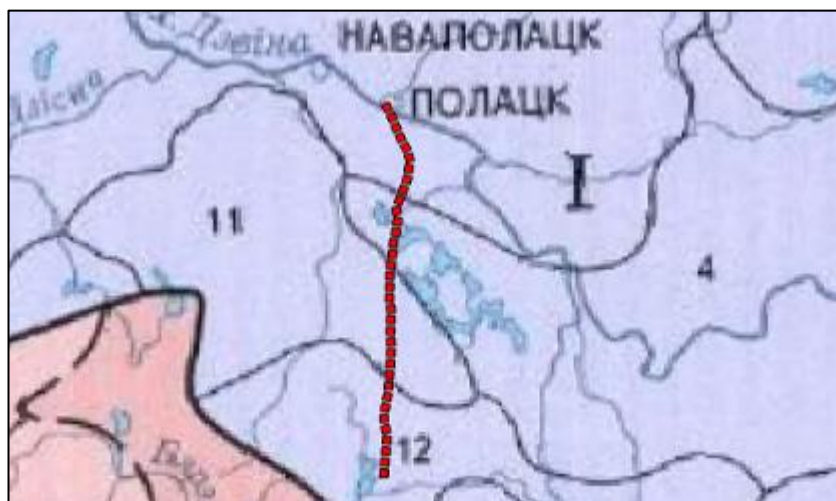
A distinctive feature of the geomorphological complexes of the Belarusian Lake District are the negative landforms - closed and semi-closed depressions, lake basins, and river valleys. Depression formed on the site of small reservoirs filled with glacial waters, and then during the deglaciation, deflated by streams and turned into swamps. The hollows of the “living” lakes in the Belarusian Lakeland are numerous and diverse. In combination with positive landforms, lake basins create a peculiar hilly moraine-lake landscape.

The formation of lake basins is associated with the activity of the glacier and its meltwater. Within the swampy lowlands, flat residual basins are widespread. Lakes most often form groups connected by shallow channels. The stability of their level is the result of greater depths

of the basins in comparison with streams and small rivers. The appearance and morphology of most lake basins are distinguished by numerous signs of youth, which is expressed in the preservation of glacial activity, a significant depth of cut into moraine deposits, a clear expression of the edge, slopes, underwater relief, the absence of erosion dissection, etc.

The most important feature of the geomorphology of the Belarusian Lake District are young river valleys. A modern hydrographic network was formed in the Late Glacial and Holocene, i.e. over the past 12-10 thousand years. The river valleys of the Belarusian Lake District have inherent features characteristic of undeveloped valleys - a canyon-like cross-sectional shape, the presence of rapids and rifts, a high degree of lake content, the distribution of through sections, poor development of floodplains and terraces, etc. Rivers belong to the Baltic Sea Basin [10].

The planned section of the R-46 highway intersects four geomorphological regions (**Figure 5.1**) - the Chashnikskaya moraine and water-glacial plain (12), the Ushachsky glacial upland (11), the Shumilinsky moraine plain (4) and the Polotsk lake-glacial lowland (6).



**Figure 5.1: Geomorphological areas near the R-46 highway**

*The Chashniki moraine and water-glacial plain* is located in the south of the Lake District and borders the Ushach Upland in the west, the Lukomskaya Upland and the Senno moraine plain in the south, and the Luchesinsky Lowland in the east.

The tectonics of the territory are reflected in the modern relief. Here is the junction of the Vileyka buried ledge of the Priorshan monocline. The depth of the crystalline basement increases from 450 m in the west to 1100 m in the east. In the submeridional direction, the territory is intersected by a fault line. Another fault was discovered east of the city of Chashniki. A steep turn of the Ulla River from the mouth of the Lukomka River is supposedly associated with it.

Sedimentary preanthropogenic rocks are represented by sands, clays, marls, dolomites of the Middle Devonian. Their surface is densely dissected with fluctuations in heights from 120-122 m. In this region, the Chashnikskaya hollow about 200 km long runs in the latitudinal direction, one of the deepest hollows of glacial plowing and erosion. It is confined to basement faults, is adjacent to local uplifts, and connects to the Dvina-Dnieper hollow. Anthropogenic deposits include sediments of all glacial and interglacial eras; their thickness varies from 80 to 250 m, with an average value of 100 m.

The main part of the Chashnikskaya plain is located at an altitude of 140-150 m above sea level. To the south, the surface rises and reaches 200 m at the border with the Lukom Upland. In general, the surface has the shape of an amphitheater with a decrease to the north, which corresponds to the position of the Kashniki glacial tongue. Its central part occupies the lowest elevations, being part of the Polotsk lowland, the waters of which spread during the maximum level with a wide strip. The main rocks are represented by lake-glacial sand deposits. The depth of the topography does not exceed 5-6 m / km<sup>2</sup>.

The southern and southeastern part of the region is represented by a moraine plain with a typical gently undulating and slightly hilly relief, with a predominance of boulder moraine loams and sandy loams. Significant diversity in the relief is made by water-glacial and glacial hollows (rhinn), most often occupied by lakes. The hollows of thawed glacial waters stretch from north to south; they differ in considerable width, up to 0.8-1.0 km, with a flat bottom and low slopes. The rhine troughs are deeply incised in moraine loams, elongated from the northwest to the southeast, differ in relatively small width, steep terraced slopes and other features of glacial troughs.

In addition to negative landforms, within the moraine plain there are positive landforms represented by kams and ozas associated with the relief formation of “dead” ice. There are narrow ridges 50-100 m wide, up to 2 km long, 10-15 m high, composed of sandy loam and loam. They formed in the cracks of a stationary glacier and, when it melted, were projected onto the surface of the bed. There are also squeezed out ozas ridges with a wavy profile, often superimposed on hills and lake basins. Kama complexes are also confined to the hollows, they are planted on moraine hills and reach a height of 15-20 m. In this part of the Chashnikskaya plain, the depth of dismemberment is 20-40 m / km<sup>2</sup>, and the density is about 0.5 km / km<sup>2</sup>.

The river network of the district is represented mainly by small rivers. River valleys connect lakes and have the character of a channel. The most significant is the Ulla River, flowing from Lake Lepelskoe and into the Zapadnaya Dvina River. Its tributaries are the Lukomka, Usveika, and Svechanka rivers. The width of the Ulla river valley is up to 2.5 km, and the channel reaches 50 m. The depth of the cut along with the floodplain and floodplain terrace is about 20 m. The tributary valleys are 300-400 m wide and have a well-defined floodplain. [10].

Typical landforms in the area of the R-46 highway along the Chashnikskaya moraine and water-glacial plain are shown on the **Figure 5.2**.



**Figure 5.2:** *Typical landforms in the area of the R-46 highway along the Chashnikskaya moraine and water-glacial plain*

*The Ushachskaya Glacier Upland* is one of the largest and most diverse in the Belarusian

Lakeland. In the tectonic structure, the main role is played by the Vileika buried ledge of the Belarusian anteklise. The surface of the foundation is located at heights of 400-550 m below sea level. Preanthropogenic rocks are represented by clays, dolomites, silts of the Middle Devonian. The surface of the bed of the anthropogenic cover is strongly dissected. In the direction Lepel – Novopolotsk, the meridional Ushachsky hollow of glacial plowing and erosion is located. Here, bedrock is located at a depth of 75 m. It is a large branch of the Dvina-Dnieper depression.

The thickness of anthropogenic deposits is 100-120 m and increases from west to east. The rocks are represented by moraine boulder loam and sandy loam, fluvio-glacial and lake sands. The location of the region, the main geomorphological indicators, and the location of the river network make it possible to distinguish a glacial lobe with two or three oscillatory stops and the large role of dead ice. Parallel to the line, stretched by the movement of the glacier from the northwest to the southeast, the area is divided into an elevated southwest and lowland northeast along the Ushacha river valley. In the western part, a large-hilly relief alternates with depressions and deep lake basins.

Shallow contour of moraine-hilly-lake relief is typical for the whole territory. A large role in the relief of this territory is played by lake basins and lakes, the number of which reaches 100 and the area is 10% of the total area. The Ushach glacial blade was a sedentary formation, broken by numerous longitudinal and transverse cracks. Intergovernmental areas of the territory form a wavy and flat surface of alignment, which is sharply disturbed near the lake basins. Absolute elevations are 150-160 m, the lowest level is the level of Lake Yanovo - 127 m. Noticeable increases in the depth of dissection and relative heights up to 20-30 m are observed in the southern part, where lake ozas ridges, Kama and complex hollows of lakes are widespread. [10]. Landforms in the area of passage of the highway R-46 are shown in **Figure 5.3**.



**Figure 5.3:** *Typical landforms in the area of the R-46 highway along the Ushachskaya glacial hill*

*Shumilino moraine plain* is located in the north-east of the republic. From southwest to northeast it is stretched for 70 km, the width exceeds 50 km.

The crystalline foundation in the southwest is confined to the Vileika buried ledge of the Belarusian Anteklise. The northeastern part is included in the Velizh saddle. The rocks of the foundation plunge from the southwest to the northeast from 500 to 1000 m below the surface of the earth. The rocks of the sedimentary cover are represented by sediments of the Devonian age: in the south-west by sand, clay, siltstone, and in the north-east by marls, limestones,



dolomites. The thickness of the anthropogenic stratum reaches 120-125 m.

Shumilino moraine plain is characterized by hollows of glacial plowing and erosion. In the south-west in the direction from Shumilino to Vitebsk, a stretch of the Dvinsko-Dneprovskaya hollow is extended with bottom marks up to  $-50$  m. Near the Losvido lake, a section of this hollow is located at a depth of 80-90 m. Shumilino moraine plain is a typical representative of this type of relief. The main part of the territory is represented by a flat and gently undulating surface, composed of red-brown boulder loams and sandy loams.

The flat character of the relief is expressed in small differences in elevations of up to about 5 m, with an average density of dissection of about  $0.27 \text{ km} / \text{km}^2$ . The flat and gently undulating surface is complicated by numerous thermokarst depressions. The prevailing absolute heights range from 150-170 m, with a minimum of 140 m in river valleys and a maximum of up to 180 m in areas of oz and kama complexes.

The relief of the plain changes near the lake basins, where the depth of dissection increases to  $10 \text{ m} / \text{km}^2$ . The surface is also formed by troughs of glacial meltwater runoff and glacial potholes created by the glacier and subglacial waters.

The river network of the Shumilino moraine plain consists of small rivers Usysa, Ovsyanka, Luzhesyanka. They are characterized by shallow and relatively narrow (0.5-0.6 km) valleys [10].

The relief during the passage of the highway R-46 in the area of the Shumilinsk moraine plain is shown in **Figure 5.4**.



**Figure 5.4:** *Typical landforms in the area of the R-46 highway along the Shumilino moraine plain*

*The Polotsk lake-glacial lowland* is the largest region of the Belarusian Lake District. It is extended in the sub-latitudinal direction by 190 km, with a maximum width of up to 85 km. Tectonically, in the west lies the Baltic monocline with a base depth of 500-600 m. In the center is the Vileika buried ledge, and in the east, on the slope of the Orsha Depression, crystalline rocks are located at a depth of up to 800 m. Numerous faults occur in the basement rocks. Preanthropogenic deposits are represented by clays, marls, sands, silts of the Devonian age. Their upper boundary is characterized by a change in depths from the surface from 100 to 40 m, as well as a wide distribution of hollows of glacial plowing and erosion.

The height of the surface of the Polotsk lowland in the central part is 130-140 m, and on the periphery, it increases to 150-160 m. The height fluctuations range from 102 m (water edge in the Zapadnaya Dvina) to 179 m (left bank of the Polota river). In general, the lowland

figuratively represents a bowl with uneven banks and a wavy bottom. The predominance of the flat and plane-wavy topography of the central part of the lowland corresponds to low elevation differences of 2-3 m and only near river valleys and on the periphery - up to 10 m. The average density of the partition is  $0.35 \text{ km} / \text{km}^2$ . The depth of dissection is  $3-5 \text{ m} / \text{km}^2$ , increasing in the lower part of river valleys to  $10-15 \text{ m} / \text{km}^2$ .

The main surface elements of the modern lowland are river valleys, residual lakes, moraine and kama uplifts - islands of the former lake, aeolian forms. The Zapadnaya Dvina River has numerous tributaries: on the left - Druya, Disna, Nacha, Ushach, Ulla, Luchesa; on the right is Drissa, Obol. In the valleys, a floodplain of 40–400 m wide and 2–5 m above the river level is distinguished. In the lower reaches of the valleys, the first and second erosion-accumulative floodplain terraces at heights of 5–9 m and 13–16 m are clearly expressed.

The surface of the lowland is complicated by dune hills up to 15-20 m high and 1-2 km long. The slopes of the dunes are asymmetric, with steep eastern slopes. Among aeolian forms there are blowing basins, sometimes occupied by shallow lakes. Ozovo-kamy forms are found mainly on the outskirts [10].

**Figure 5.5** shows the aeolian landforms (hills, dunes) found along the section of the road crossing the Polotsk lowland.



**Figure 5.5:** *Relief with forms of aeolian genesis along a highway section within the Polotsk Lowland*

The volume of transported soil as one of the indicators of the technogenic load on the relief of the studied territory varies from 10-20 thousand  $\text{m}^3 / \text{km}^2$  (in the territory of Lepel and Polotsk regions) to 20-40 thousand  $\text{m}^3 / \text{km}^2$  (in the territory of Ushachsky district). The relief resistance to technogenic loads is estimated as the highest for the segment in the Lepel region, less high for the end of the projected section in the Polotsk region, and is minimal among the three segments for the segment in the Ushach and partially Polotsk regions.

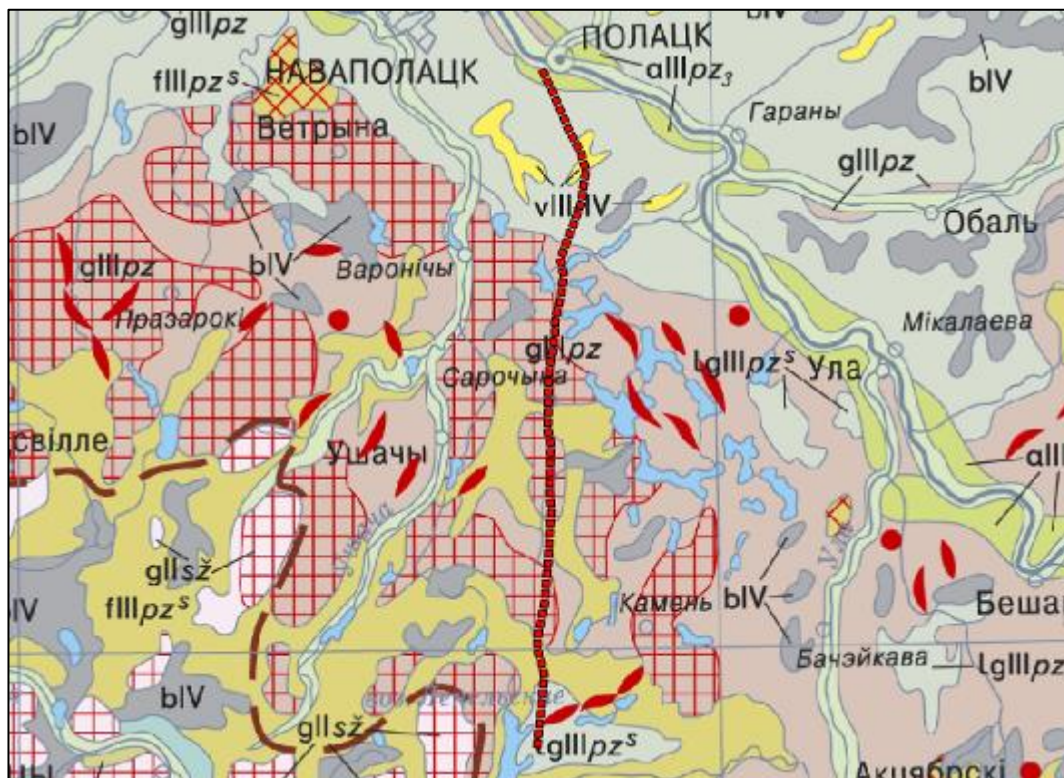
The degree of manifestation of landslides, screes is very low and medium when approaching the city of Polotsk [1]. Active geological processes in the projected section of the road are not observed.



Absolute elevations of the earth's surface in the studied area vary from 124.47 m (the intersection of the Turovlyanka river) to 187.33 m (near the village of Staroselye).

On sections with pickets ПК28 + 60 - ПК34 + 60, ПК39 + 80 - ПК41 + 60, ПК50 + 00 - ПК52 + 80, ПК68 + 40 - ПК70 + 40, ПК77 + 40 - ПК85 + 80, ПК102 + 00 - ПК106 + 80, ПК109 + 20 - ПК114 + 00, ПК116 + 60 - ПК117 + 60, ПК120 + 20 - ПК125 + 80, ПК129 + 80 - ПК139

+ 00, ПК163 + 20 - ПК185 + 00, ПК196 + 80 - ПК198 + 40, ПК203 + 00 - ПК206 + 00, ПК207 + 80 - ПК219 + 80, ПК222 + 40 - ПК223 + 80, ПК225 + 60 - ПК233 + 20, ПК234 + 40 - ПК235 + 40, ПК240 + 40 - ПК247 + 40, ПК283 + 60 - ПК285 + 60, ПК298 + 00 - ПК313 + 80, ПК321 + 60 - ПК326 + 80, ПК340 + 60 - ПК345 + 60, ПК382 + 00 - ПК384 + 00, ПК387 + 40 - ПК389 + 00, ПК395 + 20 - ПК423 + 60, ПК447 + 80 - ПК449 + 20, ПК470 + 40 - ПК475 + 00, ПК488 + 20 - ПК504 + 20, ПК496 + 00 - ПК504 + 20, ПК517 + 80 - ПК519 + 60, ПК534 + 40 - ПК553 + 20, ПК572 + 80 - ПК596 + 20 the existing highway runs through wetlands.

Quaternary deposits play a significant role in the formation of the ecological situation, since they are most susceptible to anthropogenic impact. Quaternary sediments are represented by the thickness of the Pleistocene and Holocene horizons, characterized by the great diversity of the geological section structure, lithological composition, and hydrogeological conditions (Figure 5.6). The most significant are deposits of the middle and upper parts of the Pleistocene, occurring from the surface, as well as Holocene (modern) deposits.



bIV	holocene swamp deposits
vIII-IV	aeolian deposits of the Pleistocene-Holocene
lgIIIpz <sup>s</sup>	lacustrine glacial sedimentary deposits of the Upper Pleistocene
fIIIpz <sup>s</sup>	fluvioglacial supernatural deposits of the upper Pleistocene
aIIIpz <sub>3</sub>	alluvially-terraced deposits of the Upper Lake District subhorizon
gIIIpz	Upper Pleistocene moraine deposits
	end moraine formations
	eskers

**Figure 5.6:** Quaternary deposits of the area of the proposed activity is presented

The following types of Quaternary sediments take part in the geological structure to a depth of 3.0-7.0 m:

***Holocene deposits:***

- Technogenic (thIV);
- Swamp (bIV);
- Alluvial (aIV);

***Upper Quaternary deposits of the Poozersky horizon:***

***Upper Lake District subhorizon***

- Over-moraine lake-glacial (lgIIIpz3S);
- Fluvioglacial (fIIIpz3);
- Moraine (gIIIpz3).

Technogenic formations are represented by layers of pavement of the existing road and bulk soils.

On the slopes and at the bottom of the embankment of the existing highway, a plant layer with a thickness of 0.07-0.10 and 0.20-0.35 m, respectively, is represented.

Swamp sediments are widespread in the territory of passage of the designed highway. Opened under the embankment of the existing road at the intersection of low areas (at kilometers 5.1, 17.0, 24.8, 26.65, 28.5, 31.8, 34.4, 49.6, 49.3, 58.0, 58.6, 59.5). They are represented by peat, black, dark brown, wet and water saturated, soils of varying degrees of peat. The thickness of the deposits varies from 0.3 to 2.0 m. Peat under the embankment of the road is in a compacted state.

Alluvial sediments were discovered under the embankment of the existing highway in the area of bridge crossings at the stream (47.279 km), the Turovlyanka river (44.307 km) and the Vydritsa river (23.875 km). They are represented by dusty, fine, medium-sized sands in a water-saturated state. The thickness of the deposits varies from 5.6 to 8.1 m.

Lacustrine-glacial sediments were discovered under the embankment of the existing highway and swamp sediments. They are represented by dusty and fine sands in a low-moisture, wet and water-saturated state. The thickness of the deposits varies from 0.3 to 3.3 m.

Fluvioglacial deposits are common in the central part of the study area, opened under the embankment of the existing highway and swamp deposits. They are represented by dusty, small and medium sands in a low-humid, moist and water-saturated state. The thickness of the deposits is 0.6-2.8 m.

Moraine deposits are widespread in the study area; they are represented by dusty sands, in rare cases, large sands that are in a slightly damp, moist and water saturated state, loams of a refractory texture and sandy loam of plastic consistency. The thickness of the deposits is 0.3-3.5 m.

***Hydrogeological conditions***

The hydrogeological zoning of the territory of Belarus is based on a combination of geological and hydrogeological features. The main units of zoning are: hydrogeological basin, hydrogeological massif, hydrogeological region.

On the territory of the Republic of Belarus, more than 60 aquifers are distinguished in the context of sedimentary rocks and in the fractured zone of the crystalline basement. These horizons are distinguished by the thickness of stratigraphic layers, lithological remains, spatial



structure, water saturation and permeability, and the chemical composition of groundwater.

The study area belongs to the Belarusian hydrogeological massif, which occupies the central and northwestern part of the country. It is a large reservoir of groundwater associated with the Belarusian anteklise and its slopes. The total thickness of the water-bearing rocks of the sedimentary cover within this massif varies from 80 to 500, sometimes up to 1000 m.

The Belarusian hydrogeological massif is a large positive hydrogeological structure within the Belarusian anteklise (central and western parts of Belarus). It is a large reservoir of fresh and mineralized groundwater contained in the rocks of the crystalline basement and in sedimentary sediment deposits. The total thickness of the sedimentary sequence varies from 100-200 m to 600-700 m.

In the hydrogeological section of the Belarusian hydrogeological massif, there are up to 20 or more aquifers and aquifers that are stratigraphically confined to sediments of the Quaternary, Cretaceous, Jurassic, Devonian, Silurian, Ordovician, Cambrian, and Upper Proterozoic. The absence of regional (continuous) catchment contributes to a good hydraulic connection between aquifers, which are fed by the infiltration of water from overlying horizons. River valleys are areas of groundwater discharge.

In the Belarusian hydrogeological massif, two hydrodynamic zones are distinguished: active and delayed water exchange.

Quaternary sediments cover almost the entire territory of the Republic of Belarus. Their thickness is on average about 80 m. The aquifers of the Quaternary sediments are characterized by a variety of lithological composition, fragmented distribution, frequent pinching out and erosion of water-bearing rocks. About 30% of all renewable fresh groundwater resources of the Republic of Belarus are formed in the aquifers of the Quaternary sediments. Individual water supply and many large centralized water supply systems are based on their use.

Non-pressure aquifers are confined to the cover sediments, having a close hydraulic relationship with each other, which allows us to consider them as a single complex of groundwater. The thickness of such an aquifer complex varies from a few centimeters to 20-30 m, averaging 10-15 m.

Groundwater along with waters of sporadic distribution are exploited by numerous wells, being the main source of water supply in rural settlements and in small towns.

The most important aquiferous subcomplexes of the Quaternary sediments containing pressure groundwater in the study area are the inter-moraine Sozhsko-Poozerskiy, Dnieper-Sozhskiy and Berezinsko-Dneprovskiy.

The Sozhsko-Poozerskiy aquifer is widespread in the northern part of the Republic of Belarus. Its southern border almost coincides with the border of the Poozerskoe glaciation. The depth of the roof of the subcomplex varies from several meters to 90 m, and the thickness is on average 10-20 m. Piezometric levels are set at depths of 1 to 55 m (sometimes in river valleys up to 1.5 m above the ground). The head pressure above the roof reaches 80 m. The filtration coefficients of the water-bearing rocks are on average 3-10 m / day, and the specific flow rates of the wells vary from 0.02 to 3.5 l / s.

The Dnieper-Sozh aquifer is developed in most of the Republic of Belarus, with the exception of Polesye. The southern boundary of the distribution of the subcomplex is close to the boundary of the Sozh glaciation. The depth of the roof varies from 2 to 40 m in river valleys up to 100 m or more on the watershed. The thickness of water-bearing deposits varies from 2 to 74 m, averaging 15-30 m. Piezometric levels are set at depths from 1-6 m (in river valleys)

to 30-35 m (on watersheds). The pressure values vary from 1 to 90 m, decreasing towards the river valleys. Water mobility and filtration properties of rocks are very diverse. The filtration coefficients of water-bearing rocks vary from 0.2 to 50, averaging 5-15 m / day. The specific production rates of the wells are from 0.01 to 9.5 l / s.

The Berezinsko-Dneprovskiy aquifer is also widespread. The depth of water-bearing rocks is up to 170 m, their thickness is from 2 to 170 m or more in ancient buried valleys. Piezometric levels are set at depths from 1 m to 78 m (in river valleys sometimes up to 2.5 m above the surface of the earth). The hydrostatic head varies from 1 to 134 m. The water mobility of the rocks is quite high, the specific flow rates of the wells are from 0.01 to 4.3 l / s, the filtration coefficients of the rocks vary from 0.2 to 26 m / s.

These aquifers are separated by moraine deposits. The thickness of moraines is on average 10-30 m, but in the glacial valleys and exaration depressions it increases to 100-120 m. Moraine deposits are mainly represented by loams and sandy loams (often with boulders), in the thickness of which water-saturated interlayers of sand and gravelly-pebble are found material. They do not form independent aquifers and are allocated as waters of sporadic distribution in relatively water-resistant moraine and end moraine formations of the Pozersky, Sozhsky, Dnieper and Berezinsky time [7].

During surveys, at depths from 0.0 to 1.0 m, in individual wells in elevated areas from 2.5 to 3.0 m, groundwater was discovered from the surface of the earth.

Non-pressure waters, confined to bulk sands, sands of alluvial, lake-alluvial, fluvioglacial and moraine deposits. Groundwater is an aquifer with a free surface. The source of groundwater recharge is precipitation.

The following water supply sources are available in the area of the R-46 highway section in the Lepelsky district [State Institution “Lepel District Center for Hygiene and Epidemiology” (outgoing No. 2410 of 11/20/2017, Appendix B):

- Beloozerny village, art well 500 m from the road,
- Kazinshchina village, a well 900 m from the road,
- Zaborovye village, a well 800 m from the road,
- a dairy farm in the village of Peski, a well 100 m from the road (second zone of the sanitary protection zone).

Along the highway R-46 in the Ushachsky district, there are water sources in the settlements: Wenceslas, Zavechelye, Sorochino, Lipovka [State Institution “Ushachsky District Center for Hygiene and Epidemiology” (outgoing No. 01-1165 of November 15, 2017, Appendix B)].

In rural areas of the Polotsk district of Gomel, Gorki, Zaozerye, Emelyaniki, Semenets, Mezno, Trosno and Chernoruchye there are wells that provide drinking water for these settlements [letter of the State institution “Polotsk District Center for Hygiene and Epidemiology” (out. No. 06- 02/5365 of 11/14/2017, Appendix B)].

#### **5.2.4. Hydrology of the study area**

According to the hydrological zoning of the Republic of Belarus, the reconstruction region of the R-46 Lepel-Polotsk-border of the Russian Federation (Yukhovichi) 1.700–61.500 km belongs to two hydrological regions: III - Vileika (subarea a) and I - Zapadnodvinsky (subareas a and b), the basin of the Zapadnaya Dvina River. The density of the river network in this region is 0.45 km / km<sup>2</sup> [1].

The designed highway crosses the watercourses: the Vydritsa and Belchitsa rivers, the channel between Lake Gomel and Shchaty, designated as the Turzhanka River, the channel between Lake Gomel and Suya, designated as the Turovlyanka River, streams, channels and reclamation channels. Planned Polotsk bypass will cross the Western Dvina River.

The Western Dvina is a river in the north of Eastern Europe, flowing through the territories of Russia, Belarus and Latvia. It is connected by the inactive Berezinskaya water system with the Dnieper River.

The length of the river is 1020 km, of which within Belarus - 328 km.

The Zaradnaya Dvina River flows out of Lake Koryakino (14 km south-west of the village of Peno, Tver region of Russia) called Dvinets at an altitude of 221.2 m above sea level, after which it flows through Lake Okhvat. Then it flows to the south-west, after Vitebsk turns to the north-west. It flows into the Gulf of Riga of the Baltic Sea within the city of Riga, forming an erosional delta near the former island of Mangalsala, which today is a peninsula, since the mouth of the second branch was filled up in 1567.

The basin area is 87.9 thousand km<sup>2</sup> (within Belarus - 33.2 thousand km<sup>2</sup>), the density of the river network is 0.45 km / km<sup>2</sup>, the average annual water discharge at the mouth is 666 m<sup>3</sup> / s, the total river drop in Belarus - 38 m, the average slope of the water surface is 0.12%.

**Vydritsa** is a river in the Ushachsky district of the Vitebsk region of Belarus (**Figure 5.7**). The length of the river is 20 km, the catchment area is 120 km<sup>2</sup>. The average slope of the water surface is 1.6 ‰.



**Figure 5.7: Vydritsa River near the R-46 highway**

The river originates 1.5 km northwest of the village of Vatslavovo and flows within the boundaries of the Ushachsko-Lepelskaya Upland. It flows into Lake Cherstvyatskoye from the south. The channel in the middle and lower reaches for 12.4 km is canalized [8, 9].

The Vydritsa River flows to the left of the R-46 highway for ~ 6 km at a distance of about 400 m from the road that crosses the river at 23.9 km.

At 42.9 km of the road, there is a bridge over the watercourse, designated as the ***Turzhanka River***, which is a channel between the Gomel and Shchaty lakes (**Figure 5.8**). It flows in the Polotsk district of the Vitebsk region, the length is about 1 km.



**Figure 5.8:** *Turzhanka River near the R-46 highway*

There is a bridge at 44.3 km of the road, the crossed watercourse is a channel between the lakes Gomel and Suya. On the information sign, the crossed watercourse is designated as the Turovlyanka river (**Figure 5.9**).



**Figure 5.9:** *Turovlyanka river near the R-46 highway*

***Turovlyanka*** is a river in the Polotsk district of the Vitebsk region, the left tributary of the Zapadnaya Dvina. The length of the river is 10 km from the lake. Touring to the Zapadnaya Dvina River. The river basin is located in the Polotsk Lowland. The catchment area is about 1000 km<sup>2</sup>. At the same time, 9% of the catchment area is occupied by the Ushach group of lakes. In addition, in the basin of the Turovlyanka River there is the Diva River.

The main direction of the current is east. The height of the source is 122.9 m. The height of the mouth is 110 m. The average annual water flow at the mouth is 6.9 m<sup>3</sup> / s, the average slope of the river is 1.3 m / km.

The river originates in Lake Turovlya, 1.5 km south-west of the village of Pukanovka 2nd, flows into the Zapadnaya Dvina near the village of Gorodishche.

***Belchitsa*** is a river in the Polotsk district of the Vitebsk region, the left tributary of the Zapadnaya Dvina river. The river is 10 km long, its catchment area is 47 km<sup>2</sup>. The average

slope of the water surface is 2.5 m / km. The city of Polotsk is located on the river.

The river originates in Lake Betskoye, flows through the Polotsk Lowland. The mouth is located within the boundaries of the city of Polotsk.

The channel in the upper and middle reaches for 5.1 km is canalized. Near the village of Chernoruche on the river there is a dam and a pond with an area of 8.8 hectares (**Figure 5.10**).



**Figure 5.10: Dam and reservoir on the Belchanka river**

In the area of the reconstruction of the 1.700–61.500 km section of the R-46 highway, there are following lakes:

- Lepelskoe at km 0.2 (to the left of the road at a distance of about 40 m),
- Zmeinoe 1 at km 6.9 (to the left of the road at a distance of about 120 m),
- Luksoosh at km 27.2 (to the left of the road at a distance of about 400 m),
- Yanovo at km 39.7 (to the right of the road at a distance of about 30 m),
- Lesnoye (nameless) at km 40.1 (to the left of the road at a distance of about 450 m),
- Gomel at km 43.0 (to the left of the road at a distance of about 450 m),
- Shchaty at km 43.1 (to the right of the road at a distance of about 45 m),
- Suya at km 44.6 (to the right of the road at a distance of about 30 m),
- Beloe at km 48.5 (to the right of the road at a distance of about 160 m),
- nameless lakes at km 49.6-49.7 (to the right of the road at a distance of about 70 m, to the left of the road at a distance of about 115 m),
- Zaozerye at km 53.4 (to the right of the road at a distance of about 260 m),
- Semenets at km 53.7 (to the right of the road at a distance of about 220 m),
- Trosno on km 57.3 (to the right of the road at a distance of about 130 m).

**Lepelskoye Lake** - is the largest body of water in the Lepel region of the Vitebsk region. Located in the Ulla river basin, which flows from the lake. On the southern shore of the lake there is the city of Lepel. The area of the lake is 10.18 km<sup>2</sup>, length - 7.57 km, the largest width - 2.03 km. The volume of water is 74.7 million m<sup>3</sup>. The catchment area is 1280 km<sup>2</sup>.



The basin of the lake has a complex structure and consists of three parts with their own names. North - Kustinsky lake - with prevailing depths of 10-18 m and a maximum depth of 23 m. The largest in area - City Lake - combines the central and southern parts of the reservoir, the prevailing depths are 13-15 m, at the city beach they reach 19.5 m. The structure of this part of the lake is complicated by numerous uplifts, shoals and islands. A narrow and shallow strait in the east connects City Lake with Bely - the deepest part of the reservoir. Here, near the village of Novo Lyadno, the maximum depth (33.7 m) was measured.

The slopes of the basin in the south, southeast and in some places in the west are up to 25 m high, with screes and landslides, soddy in places. The remaining slopes are about 10 m high, under crops, in the east - under the forest.

The shores of the lake are severely indented, the length of the coastline is 39.65 km - the third largest in Belarus after the lakes Neshcherdo and Naroch. Low and swampy shores prevail, often covered with bushes or forest. In the south and southeast, the banks merge with the slopes.

In the southern part, the Essa River flows into the lake, which was part of the Berezinsky water system built in 1797-1804. From the north, the Zekha River flows into the lake. In addition, water comes from several small streams. In the southeastern part of the lake, the Ulla River originates - the left tributary of the Zapadnaya Dvina River.

The lake has many bays, peninsulas, and 7 islands with a total area of 6.3 hectares.

The underwater part of the basin is characterized by the presence of numerous shallows on the site of the former islands and depressions. The bottom to a depth of 7-7.5 m is lined with sands, which are replaced by sapropels at a greater depth.

In 1958, after the construction of the Lepel hydroelectric station, the water level in the lake was raised by 3.5 m, which significantly changed the hydrological regime of the lake and its coastline. In the early 1970s, the hydroelectric power station was closed, but the water level remained at the same level. The hydropower plant was re-commissioned in 2003.

The nearby villages and especially the town of Lepel have an intense impact on the lake. Deforestation and plowing of coasts are underway [8,9,10].

A view of Lepel Lake from the R-46 highway is shown in **Figure 5.11**.



**Figure 5.11:** *View of Lepel Lake from the R-46 highway*

*Zmeinoe 1* is a small lake in the Lepel region (**Figure 5.12**), one of five lakes located one after

another in a chain and connected by streams. The lake is located near the Lepel-Polotsk highway, so it is considered to be the first, and the rest by distance from the road - 2, 3, 4 and 5. The shoreline of the lake has an oval shape, the banks are very boggy, overgrown with reeds, reeds and other aquatic plants.



**Figure 5.12: Zmeinoe Lake**

In the second half of summer, the shores and underwater part of the lake overgrow strongly. By the end of summer, algae become denser, sometimes floating on the surface of the water. In winter, the aquatic vegetation rots, which can lead to the death of fish.

The area of the lake is 0.013 km<sup>2</sup>, the length is 0.24 km, and the maximum width is 0.11 km. The coastline is about 0.54 km long. The greatest depth is 2.5 m.

**Lyuktosh** is a lake located 8 km east of the urban-type settlement Ushachi, near the village of Pyatnitsa, Ushachsky district, Vitebsk region, the Vydritsa river basin. The area of the lake is 0.31 km<sup>2</sup>, the length is 0.98 km, the maximum width is 0.44 km, the maximum depth is 1.8 m, the volume of water is 0.37 million m<sup>3</sup>, the length of the coastline is 2.35 km, area catchment area - 1.9 km<sup>2</sup>. The basin of the residual type, oval, is stretched from north to south. Slopes 3-7 m high (in the south-west 10-15 m), flat, forested.

The terrain around the lake is mostly flat, in the west hilly-ridged, mostly overgrown with forest and shrubs, sometimes marshy. The shores are low, in the southeast and southwest they are flooded, in the east in a small area they merge with the slopes. Floodplain from 50 to 250 m wide, swampy, overgrown with shrubs. The shallow water is wide, sandy-silty, the bottom is sapropelic. The greatest depths are in the central part of the lake. The bottom is flat, lined with sapropel. Along the east coast there is a narrow strip of sandy sediments. The lake is completely overgrown. In the southeast it is connected by a stream with an extensive system of drainage channels and through it with the Vydritsa River (**Figure 5.13**) [8–10].



**Figure 5.13:** *A creek connecting Lake Lukshos with the Vydritsa River*

**Yanovo (Yanovskoe)** is a lake in the Polotsk district of the Vitebsk region on the border with the Ushachsky district in the Diva River basin.

Included in the Ushachkaya group of lakes. This group of lakes is located in the Ushachsky district, partially in the Polotsk and Lepel districts of the Vitebsk region. Many lakes of the group belong to the basin of the Turovlyanka river.

It includes more than 60 lakes with a total area of more than 75 km<sup>2</sup> and a water volume of more than 350 million m<sup>3</sup>. The largest lakes of the group: Cherstvyatskoe, Paul, Otolovo, Polozerye, Yanovo, Berezovskoe, Krivoye, Gomel.

The catchment of lakes is more than 803 km<sup>2</sup>. The shores are represented by a complex of glacial and water-glacial landforms, mostly plowed.

The catchment area has a picturesque landscape, combining different types of hollows, the ozid ridges that surround them, and kame hills, often overgrown with forests.

The lakes are interconnected by numerous rivers and streams. The Diva River flows through a series of lakes.

The water level in the Ushach group of lakes is regulated by a dam in front of Lake Gomel.

The lakes of the Ushach group are a place of recreation and tourism.

Lake Yanovo is located 23 km south of the city of Polotsk and 3 km southeast of Lake Gomel. Near the lake are the villages of Bikulnichi, Svyatitsa, Masenkovo, Lesnevschina, Uvoloki, Yanovo, Prudok. At a distance of about 60 m, the R-46 motorway passes (**Figure 5.14**).





**Figure 5.14: Yanovo Lake**

The area of Yanovsky Lake is 7.7 km<sup>2</sup>. It is 6.5 km long, 2.2 km wide, and the coastline is over 25 km long. The catchment area is 721 km<sup>2</sup>. The volume of water is 0.041 km<sup>3</sup>.

The terrain is mostly hilly, overgrown with shrubs and light forests, sometimes marshy. In the north, east and west there are vast forests. The lake is surrounded by hills and intermittent ridges, overgrown with shrubs and light forests.

The hollow of Lake Yanovo is of a dammed type, stretched from the northwest to the southeast. The greatest depth is 13.2 m. The slopes of the basin up to 12 m high, under the forest, are partially plowed. In the north and south, a terrace is 2 m high.

The lake has one of the longest and most winding coastlines among the lakes of Belarus, forming many bays and capes. In the western part, the coastline forms two bays (the Northern Horn and the Southern Horn). Sandy shores up to 1 m high, in some places littered, merging in the east with a swampy lowland.

The littoral zone has a width of up to 100 m, is covered with sand, passes into a pronounced sublittoral slope. Depths up to 2 m occupy about 20% of the lake. The greatest depths are located off the southern shore of the lake. About 70% of the bottom area is covered with siliceous sapropel (Yanovsky sapropel deposit).

Lake Yanovo is eutrophic, with slow water exchange. Surface vegetation occupies a strip along the coast up to 70 m, underwater - up to 200 m.

The Diva River flows into Lake Yanovo, connecting it with Lake Paul, and two streams, including from Lake Advorenskoe. Lake Turzhets Yanovo is connected with the lake Shchaty. Eight streams flow into the Yanovo lake. There are several springs in the vicinity of the lake. In the west, the flowing lake, intersected by the R-46 highway, connects to a small forest nameless lake [8,9,10].

Also, at 38.8 km, the R-46 highway crosses the channel that connects Lake Yanovo with the vast swampy area to the left of the road.

**An unnamed forest lake** in the Polotsk district of the Vitebsk region, is located among the forest. Almost completely overgrown with wetland vegetation. The area of the lake is 0.05 km<sup>2</sup>. Length - 0.4 km, maximum width - 0.14 km. The coastline is about 1.7 km long.

**Gomel** is a lake in the Polotsk district of the Vitebsk region in the basin of the Turovlyanka

river (**Figure 5.15**). Located 18 km south of the city of Polotsk, near the agricultural town of Gomel, as part of the Ushach group of lakes. Lake Gomel is a eutrophic lake, dam-type.



**Figure 5.15: Gomel Lake**

The area around the lake is mostly hilly-ridged, with extensive forests, sometimes swampy.

The slopes of the basin are 4–8 m high, in the south-west up to 18 m, mostly plowed up, overgrown with shrubs in the lower part.

The coastline of Lake Gomel is winding, forming many bays and capes. The shores are mostly low, sandy, sometimes with boulders, overgrown with shrubs, light forests. The bottom of the northern reach is flat, the southern one is deeper, with steep slopes. The shallow water is narrow - the bays are completely or mostly shallow. Along the coast, the bottom is sandy and sandy-pebbled, deeper than sandy-silty and silty, in some places sapropelic. In the southern bay there is an island of 0.1 hectares. In the northwest, a stream flows from Lake Gomel from Lake Konashi, is connected by a channel to Lake Shchaty (in the southeast), and a stream flow into Lake Suya (in the east). The width of the strip of overgrowing by aquatic plants is up to 100 m.

The area of the lake is 3.46 km<sup>2</sup>. The greatest depth is 23 m. The length is 3.4 km, the greatest width is 1.2 km, the coastline is 11.7 km. The catchment area is 744 km<sup>2</sup>. The volume of water is 19.01 million m<sup>3</sup> [9.10].

**Shchaty (Zashchaty) (Figure 5.16)** - a lake in the Polotsk district of the Vitebsk region, refers to the basin of the Turovlyanka river. It is located 20 km south of the city of Polotsk, between the villages of Shchaty, Turzhets and the agricultural town of Gomel.



**Figure 5.16: Schaty Lake**

The area around the lake is mostly flat, in places hilly, overgrown with forest and shrubs, sometimes marshy.

The shores are sandy, mostly low, overgrown with forest and shrubs, sometimes swampy. The shallow water is narrow (and extensive in the bays), with a sandy bottom being replaced by a sapropel. The lake is prone to overgrowing. In the south, it is connected to Lake Yanovo by the Turgets River. In the west, the channel on which the dam is built is connected with Lake Gomel.

The area of the lake is 0.83 km<sup>2</sup>. The maximum depth is about 7 m. The length is 2.1 km, the greatest width is 0.6 km, the length of the coastline is 6.35 km. The catchment area is 660 km<sup>2</sup>. The volume of water is 2.74 million m<sup>3</sup> [8,9,10].

**Suya** - a lake in the Polotsk district of the Vitebsk region, belongs to the basin of the Turovlyanka river. Located 18 km south of the city of Polotsk, between the villages of Pluss and Daletsky.

The terrain is mostly flat, in places hilly-ridged, overgrown with forest and shrubs, and in some places swampy. The slopes of the basin are 5–8 m high, in places up to 10–14 m, overgrown with forests, and in the north they have been plowed. There are several bays and peninsulas.

The shores are sandy, mostly low, overgrown with forest and shrubs, marshy in the west. In the north, in some places along the coast, there are floating mats (plants that grows out from the shore across the surface of a lake) 5–10 m wide. A floodplain 10–20 m wide, swampy, under a shrub.

The shallow water is narrow (wide in the bays), sandy, the bottom is sapropelic. It grows moderately. It is connected with Turovlya lakes in the northeast and Gomel in the southwest. In the north, a flowing stream is connected to an extensive system of reclamation canals and through them with lakes Mokhovoe and Ponikloy. Along the coast, there is a strip of vegetation on the surface 8-50 m wide.

A stream flows from the north-west, which collects the drain of drainage channels from agricultural fields west of the village of Pashka.

The area of the lake is 1.54 km<sup>2</sup>. The maximum depth is 3.6 m. The length is 2.75 km, the greatest width is 0.82 km, the length of the coastline is 8.1 km. The catchment area is 787 km<sup>2</sup>. The volume of water is 3.28 million m<sup>3</sup> [8,9,10].

**White** is a lake in the Polotsk district of the Vitebsk region, refers to the basin of the

Turovlyanka river. It is located 10 km south of the city of Polotsk, about two kilometers south of the village of Mezchno-2 near an area called Zarechka.

The terrain is mostly hilly, in the east flat and marshy, covered with forest and shrubs. The lake in the north and east is surrounded by an extensive swampy floodplain with marsh vegetation and a rare shrub.

The slopes of the lake basin are up to 2 m high, in the south-west up to 5 m, under the forest, in the east and southeast are plowed.

The shores are low, overgrown with light forests and shrubs, boggy in the north and east. In the north, it is connected by a channel with an extensive system of reclamation canals.

The area of the lake is 0.13 km<sup>2</sup>. The maximum depth is 5 m. The length is 0.62 km, the greatest width is 0.24 km, the coastline is 1.5 km. The volume of water is 0.41 million m<sup>3</sup> [8.10].

On the 49.6-49.7 km section of the R-46 highway, there are *two small nameless lakes* on either side of the highway. The lake to the right of the road is located at a distance of about 70 m, its area is about 0.27 ha. Length - 72 m, the greatest width - 48 m, the length of the coastline is about 200 m.

The lake to the left of the road is located at a distance of about 115 m, its area is 0.93 hectares. Length - 126 m, greatest width - 94 m, coastline about 360 m.

**Zaozerye** is a lake in the Polotsk district of the Vitebsk region, belongs to the basin of the Somnitsa River (the left tributary of the Zapadnaya Dvina). The lake is located 10 km south of the city of Polotsk, between the villages of Zaozerye and Semenets.

The terrain around the lake is flat, sometimes hilly, covered with forest and shrubs, sometimes marshy.

The slopes of the basin are 3-5 m high, mainly under the bush, and in places in the north and south are plowed. 2 streams flow into the lake. In the northeast, a stream flows into the Somnitsa River. Lake Zaozerye is connected in the south-west by a stream with Lake Semenets.

The shores are sandy, sometimes clayey, mostly low, covered with shrubs and light forests.

The area of the lake is 0.43 km<sup>2</sup>. The maximum depth is 3.5 m. The length is 1.8 km, the greatest width is 0.36 km, the coastline is 4.25 km. The catchment area is 8 km<sup>2</sup>. The volume of water is 0.75 million m<sup>3</sup> [8–10].

**Semenets** is a lake in the Polotsk district of the Vitebsk region, belongs to the basin of the Somnitsa river (the left tributary of the Zapadnaya Dvina river). The lake is located 10 km south of the city of Polotsk, near the village of Semenets.

The terrain is mostly flat, in some areas hilly, covered with forest and shrubs, sometimes marshy. An extensive swampy floodplain (50-100 m wide) adjacent to the western shore, overgrown with meadow vegetation and a rare shrub.

The lake basin is oval in shape, stretched from north to south, the slopes of the basin are up to 2 m high. The shores are low, overgrown with shrubs and light forests, sometimes swampy. It grows moderately. A stream flows to the north, a stream flows to the lake Zaozerye in the south-west.

The area of the lake is 0.06 km<sup>2</sup>, the maximum depth is 5 m, the length is 0.45 km, the greatest width is about 0.2 km, the length of the coastline is 1.1 km. The catchment area is 7.2 km<sup>2</sup>. The volume of water is 0.11 million m<sup>3</sup> [8–10].

**Trosno** is a lake in the Polotsk district of the Vitebsk region, it belongs to the Belchitsa river basin (the left tributary of the Zapadnaya Dvina river). Located 5 km south of the city of Polotsk, 0.6 km southeast of the village of Trosno.

The area around the lake is mostly flat, sometimes hilly, marshy, overgrown with forest and shrubs.

The slopes of the hollow are up to 5 m high and are not expressed in the west and north. In the north, a stream flows into the Belchitsa River. The shores are low, overgrown with shrubs and forests, sometimes swampy. The lake is moderately overgrown with aquatic vegetation.

The area of the lake is 0.2 km<sup>2</sup>, the maximum depth is 3.9 m, the length is 0.52 km, the greatest width is 0.48 km, the coastline is 1.6 km. The catchment area is 2.62 km<sup>2</sup>, the volume of water is 0.42 million m<sup>3</sup> [8–10].

Near the R-46 highway there are artificial reservoirs - digging ponds and technological reservoirs.

In accordance with the Republican comprehensive scheme for the placement of fishing lands, approved by the Decree of the Ministry of Agriculture and Food of the Republic of Belarus dated 06/18/2014 No. 29, there are no fishing grounds on the rivers Vydritsa, Belchitsa, Turzhanka and Turovlyanka.

In accordance with the Republican integrated scheme for the placement of fishing lands, the lakes Lyuktosh, Gomel, Yanovo, Zaozerye, Suya, and Shchaty belong to the fishing lands:

- Lake Lyuktosh - to the bream-pike-roach class of ponds in the Ushachsky district;
- Gomel and Yanovo lakes - to the bream-bustling class of reservoirs in the Polotsk region;
- Lake Zaozerye - to the perch-carp class of reservoirs in the Polotsk region;
- Lakes Suya and Shchaty - to the bream-pike-carpenter class of reservoirs in the Polotsk region.

According to the State Institution “Lepelsky District Center for Hygiene and Epidemiology”, in the area of the reconstructed section of the R-46 highway in Lepelsky district, there are no surface water bodies used for recreational purposes, there are no recreation zones on them. Recreational zones are understood as areas of surface water bodies used for recreation in places determined by local executive and administrative bodies - in accordance with the Sanitary Rules and Rules “Requirements for the Content of Surface Water Bodies for Their Recreational Use”, approved. Resolution of the Ministry of Health of the Republic of Belarus dated 05.12.2016 No. 122.

According to the information of the State institution “Polotsk Zonal Hygiene and Epidemiology Center” in the Polotsk region there are reservoirs massively used by the population for recreational purposes: lakes Yanovo, Suya, Gomel, Shchaty, Beloe, Turovlyanka river, Belchitsa artificial reservoir.

### **5.2.5. Land and soil cover**

According to the State Land Cadastre of the Republic of Belarus, as of January 1, 2019, the total land area of the country is 20,760.0 thousand hectares, including 8,460.1 thousand hectares of agricultural land, of which 5,712.3 thousand ha arable.

**Table 5.3** presents data on the availability and distribution of land (thousand hectares), including in the Lepel, Ushach and Polotsk districts of the Vitebsk region, through the territory

of which the route of the reconstructed R-46 highway passes.

**Table 5.3: Types of land in the districts, on the territory of which the reconstructed highway R-46 passes**

Name of region, district	Total land area (thousand ha)	including (thousand ha)						
		arable	used for permanent crops	meadow, total	of which improved	agricultural, total	Forest land	covered with trees and shrubs
<b>Vitebsk region</b>	<b>4005,0</b>	<b>906,7</b>	<b>14,8</b>	<b>513,9</b>	<b>326,6</b>	<b>1435,4</b>	<b>1722,6</b>	<b>314,7</b>
Districts:								
Lepelskiy	182,22	29,78	0,59	15,03	8,44	45,40	102,96	9,72
Ushachskiy	148,94	26,24	0,53	19,03	8,16	45,81	66,47	14,02
Polotskiy	317,86	36,98	1,06	27,71	16,35	65,75	180,09	22,80

Table continuation

Name of region, district	including (thousand ha)							
	under the swamps	under water bodies	under transport communications	common land	building land	disturbed lands	unused land	other lands
<b>Vitebsk region</b>	<b>188,8</b>	<b>140,4</b>	<b>62,5</b>	<b>21,2</b>	<b>50,7</b>	<b>0,4</b>	<b>56,8</b>	<b>11,5</b>
Districts:								
Lepelskiy	8,10	7,13	3,07	0,93	1,78	0	2,70	0,44
Ushachskiy	9,20	8,36	2,16	0,50	1,01	0	1,18	0,22
Polotskiy	13,30	14,86	6,34	2,62	3,89	0,012	7,63	0,58

In the Vitebsk region, the area of drained lands is 630,293 ha, of irrigated land - 1,984 ha. In Lepel, Ushach and Polotsk regions, irrigated lands are absent, and the area of drained lands is [11]:

Lepel district - 18006 (including arable - 10877 hectares, meadow - 4211 hectares),

Ushachsky district - 16918 (including arable - 9060 hectares, meadow - 4086 hectares),

Polotsk district - 36437 (including arable - 15663 hectares, meadow - 9523 hectares).

The points of cadastral valuation of land and soil fertility by land types of the Vitebsk region (including Lepelsky, Ushachsky and Polotsk regions) are shown in **Table 5.4** [15].

As can be seen from the data in Table 4.4, the points of cadastral valuation of land and soil fertility in the areas through which the R-46 highway passes are below the regional average.

In accordance with the soil and geographic zoning of Belarus, the territory of the planned reconstruction of the R-46 Lepel-Polotsk-Russian border (Yukhovichi) 1.700–61.500 km, belongs to the Northern (Baltic) soil province. The stretch of the beginning of the reconstructed section up to 46 km belongs to the north-eastern soil-climatic region - the Senno-Rosson-Gorodok district of sod-podzolic loamy and loamy soils). The segment from 46 km to the end of the reconstructed site belongs to the northwestern soil-climatic region - the Polotsk region of sod-podzolic dusty sandy loamy soils u1, 12].



**Table 5.4: Cadastral valuation of land and soil fertility**

Name of region, district	The total score of cadastral valuation of land				Soil fertility score			
	land type				land type			
	arable, fallow, under permanent crops	improved meadow	natural meadow	total agricultural	arable, fallow, under permanent crops	improved meadow	natural meadow	total agricultural
Beshenkovichi district	26,7	24,5	14,0	24,3	29,0	27,9	13,5	26,4
Braslavsky district	21,4	20,3	13,7	20,5	25,2	24,9	12,7	24,2
Verkhnedvinsk district	23,1	20,8	12,4	21,1	26,1	24,7	12,3	23,8
Vitebsk region	24,7	23,6	11,5	23,1	27,8	27,1	11,5	26,0
Glubokoe District	23,1	24,1	12,8	22,2	26,3	27,4	12,5	25,1
Gorodok district	17,3	15,2	8,3	14,9	22,5	21,6	9,2	19,4
Dokshitsy district	23,7	23,8	11,5	23,0	25,9	26,0	10,9	24,9
Dubrovensky district	30,5	31,0	13,6	28,7	32,4	32,0	13,6	30,1
Lepel district	24,7	23,4	11,9	23,1	27,4	25,5	11,6	25,4
Liozno district	26,5	22,5	14,1	24,4	28,9	26,3	13,4	26,6
Miory district	24,6	26,2	13,3	23,8	27,0	27,6	12,5	25,5
Orsha district	30,3	27,6	13,6	28,9	33,5	30,9	13,3	31,9
Polotsk district	21,2	19,3	10,7	19,4	23,8	22,9	10,7	21,9
Postavy district	24,2	22,8	15,7	22,9	27,2	26,1	14,9	25,7
Rossonsky District	19,0	19,8	10,1	18,0	22,8	24,0	10,6	21,5
Senno district	24,6	23,2	12,6	22,9	27,3	26,6	12,0	25,3
Tolochinsky district	30,0	30,9	12,7	28,5	32,7	31,1	12,4	30,6
Ushachsky district	22,0	20,4	11,4	19,3	25,7	24,8	11,4	22,3
Chashniki district	25,1	23,7	11,9	22,5	28,1	27,5	12,5	25,3
Sharkovshchinsky district	27,3	28,3	16,5	26,9	29,2	29,1	15,8	28,4
Shumilinsky district	24,0	24,1	12,6	22,6	26,4	25,9	12,2	24,5
<b>Vitebsk region</b>	<b>25,0</b>	<b>23,7</b>	<b>12,4</b>	<b>23,3</b>	<b>27,9</b>	<b>26,7</b>	<b>12,2</b>	<b>25,8</b>

The northern (Baltic) province occupies the northern part of the republic, north of the Smorgon - Molodechno - Logoisk - Belynychy - Mogilev - Cherikov - Krichev line. Its area is 61.6 thousand km<sup>2</sup>, which is 29.7% of the territory of the Republic of Belarus. In terms of geological structure, relief, climate, vegetation, and soil cover features, this province differs markedly from the rest of the Republic of Belarus. Its geological structure is characterized by the fact

that under a small thickness of young moraine and water-glacial deposits of the Poozersky glaciation thick layers of clay, siltstone, and sand occur, and in the east and northeast - gypsum, dolomites, limestones, occasionally reaching the surface. The relief bears the features of finite moraine deposits on the hills, often alternating with large depressions and lowlands. The eastern part is located within the Orsha-Mogilev plain.

The soil cover is diverse. Sod-podzolic soils alternating with sod-podzolic boggy soils of varying degrees prevail.

The northern province is divided into two districts. The border dividing it into two parts runs approximately through Rossony - Shumilino - Ushachi - Lepel - Borisov - Berezino. To the west of this line is the North-West, and to the east of it the North-East district, differing in the nature of the relief and climate.

*The northeastern district* occupies the territory bounded by the Rossony-Berezino-Krichev line. The relief of the district is very diverse, within it are the Gorodok, Vitebsk and Orsha Uplands, the Chashnikskaya, Goretskaya and (partially) Orshano-Mogilev plains, the Sourozh and Luches lowlands. The complexity of the relief led to a significant dismemberment of the territory. Hills and lowlands alternate very often - at a distance of less than 800 m. The relative heights of the territory in some places exceed 20 m.

*The Senno-Rosson-Gorodok region of sod-podzolic loamy and loamy soils* covers the Gorodok Upland, the Sourozh, Shumilin and Chashnik Plains, and the Luches Lowland. The area is characterized by a large number of lakes in its territory, usually located in glacial basins, bordered by moraine ridges and hills. The territory is strongly divided by river valleys. A wide variety of landforms determines the variegation of the soil cover. Boulders are found everywhere in soils, which complicates the use of agricultural machinery.

On the Chashnikskaya Plain and the Lucheskaya Lowland, flat and broad-walled, and in some places, small-hilly reliefs prevail. The occurrence of boulders in the soil becomes smaller, but the area of boggy soils increases.

The area is dominated by sod-podzolic, sometimes weakly and moderately eroded soils, developing on light moraine and water-glacial loams and sandy loams, often underlain by sand. However, on separate hills sod-podzolic slightly podzolic soils develop on stony-gravel sands, moraine sandy loams and loams. Flat erosion is developed everywhere. On the tops of the hills, it is strongly pronounced, which leads to the complete destruction of the humus horizon and the exposure of red-brown moraine loam or washed sand. In depressions, sod-podzolic soils are washed up to a different degree and moistened.

Rough terrain leads to an uneven redistribution of precipitation. From elevated areas, water quickly flows into depressions. Therefore, the tops of the hills suffer from a lack, and lowering - from excess moisture. Waterlogged soils occupy one third of the territory. According to the particle size distribution, the soils of the region are distributed into loams, sandy loams, sands and peat.

*The northwestern district* occupies approximately 15.4% of the republic's territory and 52% of the province's territory. The relief of the district is very diverse. There are young moraine hills and vast lake-glacial lowlands. The district includes: Braslav, Sventyansk, Ushach, the northern part of the Minsk Uplands, as well as the western and central parts of the Polotsk and Verkhne-Berezinsky lowlands.

The division of the relief, both in density and in depth, is very uneven. At higher elevations, the density of dissection of the relief reaches its maximum value for the Republic of Belarus -



about 800 m / km. However, the decrease and increase are small and the difference in elevation does not exceed 5-10 m. A variety of natural conditions makes the soil cover difficult.

*The Polotsk region of sod-podzolic dusty sandy loamy soils* is located in the eastern part of the Polotsk Lowland within the Rosson and Polotsk administrative regions. The relief is shallow and flat, even.

Sod-podzolic soils are common on cohesive lake-glacial sandy loams, often underlain by lake clays, sometimes sand. The presence of an aquaculture contributes to waterlogging - more than 60% of the soils in the area are boggy. In depressions sod-podzolic boggy, peaty-gley and peaty soils are found.

The plowed area does not exceed 10%, but the proportion of meadow land as high as 25% [12].

The reconstructed section of the R-46 highway 1.700–61.500 km, passes through the territory with a strong degree of erosion and deflation of soils (10–20% of the agricultural land area) - on segments from 0.0–3.0 km and 31.5–45, 0 km; in the territory with a weak degree of soil erosion and deflation (1-5% of the agricultural land area) - in the interval of 9.0-16.0 km.

According to the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus (Ref. No. 03-09 / 3378 dated November 29, 2017, Appendix B) within the territory requested for the reconstruction of the object “Highway R-46 Lepel-Polotsk-border of the Russian Federation ( Yukhovichi) 1.700–61.500 km ”on the lands of Lepelsky, Ushachsky and Polotsky districts of the Vitebsk region, no solid mineral deposits have been identified. It is necessary to take into account that north of the village of Rubaniki in the Ushachsky region east of the R-46 highway there is a peat section “Rubaniki” of the peat deposit “In the floodplain of Vydritsa”, which is included in the state balance of mineral reserves of the Republic of Belarus and is registered by JSC “Ushachsky Rayagroservice”. In addition, 1.5 km south of the village of Zaborovye in the Lepelsky district (190 m west of the highway) there is a deposit of sand and gravel mix Usovka (categories C1, C2).

South of the city of Polotsk, the highway for 16.9 km passes through the third zone of the sanitary protection zone for the water intakes Okunevo and Zaozerye of the city of Polotsk.

According to the data of the Treatment and Prevention Institution “Lepel District Veterinary Station” (Ref. No. 939 of 11/14/2017, Appendix B) and the State Institution “Lepel District Center for Hygiene and Epidemiology” (Ref. No. 2410 of 11/20/2017, Appendix B) in the territory There are no cattle burial grounds, biothermal pits and other burial places for animals dead from anthrax in the reconstructed road and the adjacent zone of 1000 m in each direction.

According to the data of the Treatment and Prevention Institution “Ushachsky Veterinary Station” (Ref. No. 1003 of November 15, 2017, Appendix B) and the State Institution “Ushachsky District Center for Hygiene and Epidemiology” (Ref. No. 01-1165 of 11/15/2017, Appendix B), on the territory adjacent to the reconstruction object there are three anthrax burial sites of 1954. The location of the burial place is not known exactly, only the names of the settlements near which they were located are known:

- Vatslavovo village - at a distance of over 1100 m from the R-46 highway;
- Lobani village - at a distance of over 1100 m from the R-46 highway;
- Shnitki village - at a distance of over 500 m from the R-46 highway.
- Also, 1 km north of the village of Wenceslas, near the former MTF there is a cattle burial ground for the burial of corpses of wild pigs (ASF) - at a distance of over 1100 m from the project.

According to the information of the State institution “Polotsk Zonal Center for Hygiene and Epidemiology”, on the territory adjacent to the reconstruction object there are cattle burial grounds belonging to the Polymir-agro private enterprise: 0.3 km from the Gomel farm, and 3.0 km from the village of Gomel in the south east direction.

### 5.2.6. Landscapes

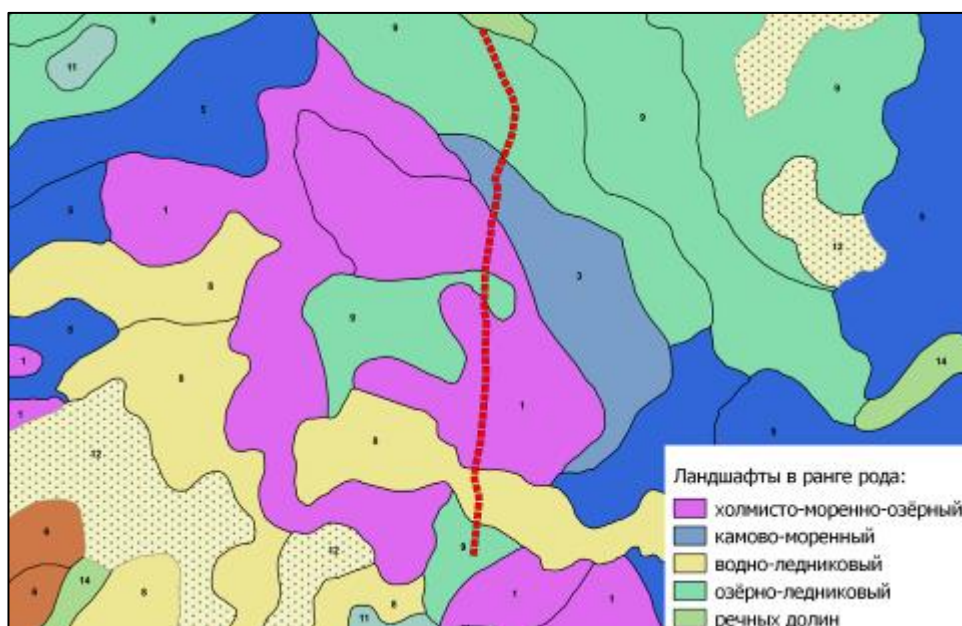
According to the landscape zoning of the Republic of Belarus, the R-46 highway Lepel-Polotsk border of the Russian Federation (Yukhovichi) 1.700–61.500 km, located within the subzone of boreal forests, the lake region of lake-glacial, moraine-lake and hilly moraine-lake landscapes with spruce, pine forests on sod-podzolic soils, often marshy soils, small-leaved forests in swamps. The highway runs within the following landscape areas [13]:

Polotsk flat-wavy lake-glacial with spruce, birch and swamps (6);

The Ushachsky small- and medium-hilly-ridge hilly-moraine-lacustrine with spruce and broad-leaved-spruce forests (12)

The road crosses the following landscapes in the rank of genus (**Figure 5.17**):

- lake-glacial;
- kame moraine;
- water-glacial;
- river valleys (at the intersection (approximation) of rivers, with a developed river valley and floodplain).



**Figure 5.17:** *Map of landscapes in the rank of genus in the area passing the R-46 highway*

Lacustrine-glacial poorly drained landscapes with secondary small-leaved, less often spruce forests on sod-podzolic boggy soils and pine forests on sod-podzolic soils. The formation of these landscapes is associated with the accumulative and abrasion activity of the glacial lakes of the Poozersky glacier. At the bottom they were deposited ribbon clay and silty chocolate, in the coastal zone - fine and fine-grained sands, gravel, pebbles. Flat abrasion pads dotted with

boulder-pebble material formed on the slopes. The development of the river network led to the descent of lake reservoirs and the formation of lowlands in their place.

The absolute heights of the surface are 130-160 m, sometimes 160–190 m, the height difference is 2-3 m. The surface is wavy, flat-wavy, weakly dissected by river valleys, hollows, and in places beams. Peaty basins with residual lakes are often found. In the areas composed of sandy deposits, dunes are widely represented, often in the form of ridges. In places of distribution of loamy-clay soils, thermokarst depressions are characteristic. Remains of moraine plain, kame and moraine hills are also found.

The flat, slightly drained relief led to the wide distribution of sod-podzolic waterlogged soils of different granulometric composition. The most valuable agriculturally are sod-podzolic temporarily excessively moistened and gleyed soils on lake-glacial loams and clays. After drainage reclamation, significant areas of such soils have been plowed and occupied by crops. Spruce and broad-leaved-spruce forests, as well as floodplain meadows, were preserved in small sections among them. Pine forests grow on less fertile sod-podzolic sandy-sandy loamy soils. Arable land is represented by small plots. In general, the share of agricultural land and forests is approximately equal and amounts to about 40% each. Poorly drained areas with peat-bog and soddy boggy soils are occupied by upland and transitional bogs, black alder, fluffy birch forests, and also floodplain meadows.

Kame-moraine-lacustrine of varying degrees of drainage landscapes with pine, broad-leaved-spruce, secondary small-leaved forests on sod-podzolic soils and upland marshes are located within the Belarusian Lakeland. Absolute elevations of the surface are 160-220 m, fluctuations in relative heights are 10-20, sometimes up to 40 m. Landscapes are characterized by a combination of individual kame and moraine hills, as well as ridges with lakes, hollows, thermokarst depressions, which emphasize and complicate the relief. The hills are oblong and rounded, the steepness of the slopes reaches 20-45 degrees.

Kame hills are composed of well-sorted sandy and sandy loamy material, often with traces of stratification, often with a cover of moraine sandy loam or loam with a thickness of 0.5-3 m. Moraine hills consist of boulder loam, rarely sandy loam. Within the described landscapes there are esker ridges composed of boulder and pebble material, sorted sand, sometimes with a moraine cover. Thermokarst depressions and drainage hollows have different configurations, sizes, often peaty or flooded with water.

Typical soils are sod-podzolic sandy loamy loamy soils. The proportion of agricultural land is about 48%. On the tops of the kame hills, sod-podzolic sandy soils are developed, usually occupied by areas of pine, less often birch forests. In general, the forest cover of landscapes is about 35%.

Soddy-podzolic boggy, soddy, and soddy-carbonate soils, to which meadows are confined (4.4%), were formed in deeply cut in hollows of the runoff. On the bottom of the basins are ауты and bogs with peat-bog soils. The described landscapes are distinguished by a relatively simple internal structure: one subgenus (with a surface occurrence of water-glacial sands and sandy-loamy moraine) and two species stand out.

Water-glacial moderately drained landscapes with pine, secondary small-leaved forests on sod-podzolic soils are the most common landscapes of the Republic of Belarus (17.5%). The formation of the geology of these territories is associated with the activity of melted glacial waters in the era of Pripyat and Poozersky glaciations. At the same time, the flows of subsequent glaciers were blocked by older deposits, as a result of which thick sandy layers of different ages were formed. In landscape lithology, sands are characteristic: from fine-grained

to coarse and different-grained with gravel, pebbles. Cover deposits are represented by sandy loam, less often loam. Landscapes are located in a rather wide range of absolute heights - from 150 to 190 m with fluctuations in relative heights of 2-3 m. Typical landforms are dunes, sometimes forming ridges 2-5 m high, closed basins, usually swampy and peaty, shallow river valleys. Less common are denudated moraine hills and slightly cut drain troughs. In the presence of loesslike loams, suffusion depressions appear.

The most common soils are sod-podzolic sandy-loamy sand, often marshy. Less common are soddy-pale-podzolic light loamy soils. The distribution of low-productive soils, unsuitable for agriculture, allowed to preserve quite large tracts of natural vegetation represented by forests (40%) and swamps. Among the forests, pine plantations prevail, which alternate with small areas of birch, rarely broad-leaved-spruce, black alder. Agricultural development of the territory is 50%. Arable land is confined to the most fertile sandy-loamy loamy, as well as drained peat-bog soils.

Landscapes of river valleys of varying degrees of drainage with pine forests on sod-podzolic soils, meadows on soddy swampy soils, swamps. They are confined to river valleys with a floodplain less than 1 km wide, along which there are intermittent narrow floodplain terraces. Within the Belarusian Lake District with weakly expressed river valleys, the described landscapes are characteristic even of the largest rivers, such as the Zapadnaya Dvina, Disna, etc. Absolute elevations of the surface are in the range from 130 to 170 m. The lowest level is occupied by floodplains, usually with flat relief, old depressions, and solitary rare meander scars. Using a clearly defined ledge 2-5 m high, the floodplain is articulated with the site of the first floodplain terrace, composed of sandy alluvium. The width of the first floodplain terrace varies, as a rule, from several hundred meters to 1-1.5 km. Dunes and dune ridges are usual on its surface. Soddy swampy soils with cereal hydro mesophytic meadows (9.5 %), as well as peat-bog soils with lowland marshes (12.3%) gravitate towards floodplains [17].

According to the landscape zoning adopted in the Republic of Belarus, the area of the planned location of the Polotsk bypass is located within the subzone of boreal landscapes, the Poozero province of lacustrine-glacial, moraine-lacustrine and hilly moraine-lacustrine landscapes with spruce, pine forests on sod-podzolic soils, often swampy soils, small-leaved forests in swamps. The road runs within single landscape area - the Polotsk flat-wavy lacustrine-glacial area with spruce forests, birch forests and swamps.

The road crosses the following landscapes in the rank of a genus: lacustrine-glacial and river valleys (when crossing (approaching) rivers, with a depleted river valley and floodplain).

### **5.2.7. General characteristics of the territory adjacent to the P-46 highway**

General characteristics of the area adjacent to the P-46 highway are presented in **Table 5.5**.

**Table 5.5: General characteristics of the territory adjacent to the P-46 highway**

Section	Road side (north direction), distance from road	Object, lands
km 1.7 – km 2.8	left and right, adjacent	agricultural lands
km 2.8 – km 8.8	left and right, adjacent	forest lands, State Forestry Institution “Lepel forestry”
km 8.8	right, adjacent	cemetery
km 8.8 – km 15.0	left and right, adjacent	agricultural lands

Section	Road side (north direction), distance from road	Object, lands
km 9.7	left, adjacent	cemetery
km 15.0 – km 15.7	left, adjacent	Vatslavovo village
km 15.0 – km 15.7	right, adjacent	agricultural lands
km 15.7 – km 16.0	left and right, adjacent	agricultural lands
km 16.0 – km 18.3	right, adjacent	forest lands, State Forestry Institution “Ushachsky forestry”
km 16.0 – km 18.4	left, adjacent	forest lands, State Forestry Institution “Ushachsky forestry”
km 18.3 – km 19.5	right, adjacent	agricultural lands
km 18.4 – km 19.5	left, adjacent	agricultural lands
km 19.5 – km 22.0	left and right, adjacent	forest lands, State Forestry Institution “Ushachsky forestry”
km 22.0 – km 24.0	left, adjacent	agricultural lands
km 23.8	left and right, crosses	Vydritsa river
km 22.0 – km 22.6	right, adjacent	agricultural lands
km 22.6 – km 23.1	right, adjacent	forest lands, State Forestry Institution “Ushachsky forestry”
km 23.1 – km 23.8	right, adjacent	agricultural lands
km 23.8 – km 24.8	right, adjacent	forest lands, State Forestry Institution “Ushachsky forestry”
km 24.0 – km 24.6	left, adjacent	Zavechele village
km 24.6 – km 27.0	left, adjacent	agricultural lands
km 24.8 – km 25.1	right, adjacent	agricultural lands
km 25.1 – km 25.2	right, adjacent	Rubaniki village
km 25.2 – km 27.4	right, adjacent	agricultural lands
km 27.0 – km 27.6	left, adjacent	forest lands, State Forestry Institution “Ushachsky forestry”
km 27.6 – km 27.9	left, adjacent	agricultural lands
km 27.4 – km 31.5	right, adjacent	forest lands, State Forestry Institution “Ushachsky forestry”
km 27.9 – km 31.5	left, adjacent	forest lands, State Forestry Institution “Ushachsky forestry”
km 31.5	right, adjacent	Gas station
km 31.6	right, adjacent	Cafe "Veterok"
km 31.5 – km 32.6	left, adjacent	Sorochino village
km 31.5 – km 32.3	right, adjacent	Sorochino village
km 32.3 – km 39.2	right, adjacent	agricultural lands
km 32.6 – km 38.2	left, adjacent	agricultural lands
km 38.2 – km 38.4	left, adjacent	forest lands, State Forestry Institution “Polotsk Forestry”
km 38.4 – km 42.4	left, adjacent	agricultural lands
km 39.2 – km 39.6	right, adjacent	Bikulnichi village
km 39.6 – km 40.4	right, adjacent	tree and shrub vegetation
km 40.4 – km 41.0	right, adjacent	Svyatitsa village
km 40.8 – km 41.0	right, adjacent	Natural monument
km 41.0 – km 42.4	right, adjacent	agricultural lands
km 42.4 – km 42.9	right, adjacent	ag. Gomel

Section	Road side (north direction), distance from road	Object, lands
km 42.4 – km 43.7	left, adjacent	ag. Gomel
km 42.9	left and right, crosses	Turzhanka river
km 42.9 – km 44.3	right, adjacent	agricultural lands
km 43.3	right, adjacent	Memorial
km 43.7 – km 44.5	left, adjacent	Dvor-Gomel village
km 44.3	left and right, crosses	Turovlyanka river
km 44.3 – km 53.3	right, adjacent	forest lands, State Forestry Institution “Polotsk Forestry”
km 44.5 – km 44.8	left, adjacent	agricultural lands
km 44.8 – km 58.8	left, adjacent	forest lands, State Forestry Institution “Polotsk Forestry”
km 53.3 – km 53.4	right, 50 m	cemetery
km 53.4 – km 53.6	right, adjacent	Garden community
km 53.6 – km 60.2	right, adjacent	forest lands, State Forestry Institution “Polotsk Forestry”
km 58.8 – km 58.9	left, adjacent	Gas station
km 58.9	left, adjacent	Cafe
km 58.9 – km 60.1	left, adjacent	forest lands, State Forestry Institution “Polotsk Forestry”
km 60.1 – km 61.5	left, adjacent	Belchitsa village
km 60.2 – km 60.8	right, adjacent	Vesnyanka village
km 60.8 – km 61.5	right, adjacent	Belchitsa village

### 5.2.8. General characteristics of the territory of proposed Center for Maintenance Management

Center for maintenance management (CMM) will be located in Ushachi, partly on the territory of the existing Linear Road Distances (LRD) -374 of Road Maintenance Department (RMD) No. 37 RUE “Vitebskavtodor” and on a newly allocated area adjacent to the LRD-374 territory (agreements on the allocation of land parcels have been received in full).

The location of the existing land plot and the newly allotted one is indicated in the scheme (Figure 5.18).





- territorial gaps from highways;
- noise screens and special planting systems in the form of stripes along main roads;
- introduction of new technologies for cleaning emissions from vehicles, technical equipment and types of fuel used in transport, etc.

**Table 5.6: Estimated background concentrations of pollutants in the air of rural settlements of Lepelsky, Ushachsky and Polotsk regions**

Pollutant code	Name of pollutant	Air quality standards, mcg / m3			WHO requirements, µg / m3	Background concentrations, mcg / m3
		Maximum single-time concentration	Daily average concentration	Annual average concentration		
2902	Particulate matter *	300,0	150,0	100,0	10 (annual average), 25 (daily average)	56
0008	PM10 **	150,0	50,0	40,0	20 (annual average), 50 (daily average)	29
0330	Sulfur dioxide	500,0	200,0	50,0	20 (daily average), 500 (10 min average)	48
0337	Carbon oxide	<b>5000,0</b>	<b>3000,0</b>	<b>500,0</b>	-	<b>570</b>
0301	Nitrogen dioxide	250,0	100,0	40,0	40 (annual average), 200 (average for 1 hour)	32
0303	Ammonia	200,0	-	-	-	48
1325	Formaldehyde	<b>30,0</b>	<b>12,0</b>	<b>3,0</b>	-	<b>21</b>
1071	Phenol	<b>10,0</b>	<b>7,0</b>	<b>3,0</b>	-	<b>3,4</b>
0703	Benz (a) pyrene ***	-	<b>5,0 нг/м<sup>3</sup></b>	<b>1,0 нг/м<sup>3</sup></b>	-	<b>0,50 нг/м<sup>3</sup></b>

\* solid particles (dust / aerosol undifferentiated in composition)

\*\* solid particles, fractions up to 10 microns in size

\*\*\* for the heating period

The existing level of atmospheric air pollution in the area of the 1.700–61.500 km section of the R-46 Lepel-Polotsk-border of the Russian Federation (Yukhovichi) can be estimated based on the values of background concentrations of pollutants.

Estimated values of background concentrations of pollutants in the atmospheric air of rural settlements of Lepelsky, Ushachsky and Polotsky districts of Vitebsk region provided by the State Institution “Republican Center for Hydrometeorology, Radioactive Contamination Control and Environmental Monitoring” (letters No. 9-2-3 / 216 of 13.02 .2019, No. 9-2-3 / 267 and No. 9-2-3 / 268 of 02.15.2019, Appendix B) are given in table 4.5. Indicators are valid



until 01.01.2022.

Background concentrations of pollutants in the air of the reconstruction area of the R-46 highway do not exceed the maximum allowable concentrations of pollutants in the air of settlements and places of public recreation approved by the Resolution of the Ministry of Health of the Republic of Belarus dated 08.11.2016 No. 113. Based on this, it can be concluded that the existing level of air pollution does not pose a threat to public health.

**Calculation of the total indicator of air pollution "R"**

Hygienic assessment of the degree of danger of atmospheric air pollution with the simultaneous presence of several harmful substances was carried out by the value of the total pollution indicator "P", taking into account the frequency of exceeding the maximum permissible concentration, the hazard class of the substance, the number of pollutants present in the atmosphere. The indicator "P" takes into account the nature of the combined action of harmful substances as an incomplete summation.

The calculation of the complex indicator "P" is carried out according to the formula:

$$Pi = \sqrt{\sum_{i=1}^n Ki^2}$$

where Pi is the total indicator of pollution;

Ki - concentrations of substances of hazard classes 1, 2, 4, expressed in fractions of their MPC and then "reduced" to that of the biologically equivalent 3rd hazard class using the coefficients: 1st class - 2.0; Grade 2 - 1.5; Grade 4 - 0.8.

The air pollution of populated areas is estimated depending on the value of the indicator "P" in five degrees:

- I - permissible
- II - weak
- III - moderate
- IV - strong
- V - dangerous.

By the value of the total indicator "P" in accordance with the evaluation **Table 5.7**, the degree of danger of air pollution is established depending on the amount of harmful substances and the value of the indicator "P".

**Table 5.7: Hygienic assessment of the degree of air pollution by a complex of pollutants at the maximum single concentrations**

Air pollution	The value of the complex indicator "P" with the number of air pollutants			
	2-3	4-9	10-20	21 and more
I - permissible	до 1,6	до 3,0	до 5,0	до 7,1
II - weak	1,7 – 3,2	3,1 – 4,8	5,1 – 6,4	7,2 – 8,0
III - moderate	3,3 – 6,4	4,9 – 9,6	6,5 – 12,8	8,1 – 16,0
IV - strong	6,5-12,8	9,7-19,2	12,9 – 25,6	16,1 – 32,0
V - dangerous	12,9 and more	19,3 and more	25,7 and more	32,1 and more

The calculation of the value of the complex indicator "P" in the area of the reconstruction of the facility is shown in **Table 5.8**.

**Table 5.8: The calculation of the value of the complex indicator "P" in the area of the reconstruction of the object**

Name of pollutant	Hazard Class	Maximum single-time maximum permissible concentration, $\mu\text{g} / \text{m}^3$	Maximum single concentration, $\text{mcg} / \text{m}^3$	Multiplicity of exceeding the maximum one-time maximum permissible concentration	
				Actual	Reduced to hazard class 3
Solid particles	3	300,0	56	0,187	0,187
Particulate matter fractions up to 10 microns in size	3	150,0	29	0,193	0,193
Sulfur dioxide	3	500,0	48	0,096	0,096
Carbon oxide	4	5000,0	570	0,114	0,091
Nitrogen dioxide	2	250,0	32	0,128	0,192
Ammonia	4	200,0	48	0,240	0,192
Formaldehyde	2	30,0	21	0,700	1,050
Phenol	2	10,0	3,4	0,340	0,510
Benz (a) pyrene	1	5,0 $\text{HГ}/\text{M}^3$ (MPCc.c.)	0,50 $\text{HГ}/\text{M}^3$	0,040	0,080
The total indicator "P"				1,24	
Pollution degree				I - permissible	

The total atmospheric air pollution index "R", determined by the background maximum single concentrations of pollutants in the atmospheric air of the facility location area, is 1.24, which corresponds to the permissible degree of atmospheric pollution.

### 5.3.2. Noise

Cars moving along the R-46 highway are a significant source of noise impact on residents of adjacent settlements.

In the framework of this work, on 27.05.2020 instrumental studies of the noise level created by automobiles using the Octave Ecophysics-110A sound level meter were carried out in the daytime. The measurements were carried out in accordance with GOST 20444-85 Noise. Traffic flows. Methods for measuring noise characteristics; GOST 23337-78 Noise. Methods for measuring noise in residential areas and in residential and public buildings.

Moving vehicles are a linear source of noise. Acceptable equivalent and maximum sound levels in residential areas in accordance with clause 9 of Appendix 2 to the Sanitary Standards, Rules and Hygienic Standards "Noise at workplaces, in vehicles, in residential, public buildings and residential buildings", approved by a regulation of the Ministry Health of the Republic of Belarus dated 11.16.2011 No. 115 (hereinafter referred to as the Sanitary Norms) are shown in **Table 5.9**.

**Table 5.9: Permissible equivalent and maximum sound levels in residential areas**

Destination of territories	Times of Day	Permissible sound levels, dBA	
		equivalent	maximum
Territories adjacent to residential buildings, educational institutions	с 7 <sup>00</sup> до 23 <sup>00</sup> (day)	55	70
...	с 23 <sup>00</sup> до 7 <sup>00</sup> (night)	45	60

\* According to WHO standards, night time is 10 hours

The permissible noise level is such a noise level that does not cause a person anxiety and significant changes in the functional state indicators of systems and analyzers that are sensitive to noise.

Assessment of variable noise, to which vehicle noise relates, is carried out both by equivalent (energy) and maximum sound levels. Exceeding the permissible values of at least one of these indicators is interpreted as non-compliance with sanitary standards.

Noise level measurements were made on the R-46 highway at a distance of 20 m from its axis in the Gomel village and at a distance of 40 m from its axis in the Svyatitsa village. The results of measurements of the maximum noise level are presented in the **Table 5.10**.

**Table 5.10: The results of measurements on the maximum noise level**

Type of transport	Number of measurements	Equivalent level, Leq dBA	Maximum level, Lmax dBA
Gomel village, 20 m from the axis of the highway			
Freight: trucks, trailers, vans	10	68,8	90,2
Passenger	10	63,4	79,2
Svyatitsa village, 40 m from the axis of the highway			
Freight: trucks, trailers, vans	11	68,6	93,8
Passenger	8	62,3	78,4

As follows from the table, in both measurement points for each of the measurements, the excess of the permissible noise level at the border of the residential area adjacent to the highway is recorded.

At a distance of 40 m from the axis of the highway and closer is residential development in the settlements: Wenceslas (left), Rubaniki (right), Sorochino (left), Svyatitsa (right), Gomel (left and right), Belchitsa (left and right).

### 5.3.3. Soils

To assess the degree of existing soil pollution and determine the degree of anthropogenic loads on soils during the implementation of the planned economic activity, the measured values were compared with the background content, maximum permissible concentrations or tentatively permissible concentrations of substances in the soil, and their clark for the Republic of Belarus.

In the framework of monitoring the background pollution of soils in the Republic of Belarus, soils were studied at a network of observation points in the background territories that are little exposed to anthropogenic stress and represent stationary sites uniformly distributed throughout the republic.

The average content of determined ingredients in soils on the background monitoring network of the Vitebsk region [23], MPC [24] and clarks [25] for the Republic of Belarus are shown in **Table 5.11**.

**Table 5.11: The average content of pollutants in soils on the background monitoring network of the Vitebsk region**

Indicator	SO <sub>4</sub> <sup>-</sup>	NO <sub>3</sub> <sup>-</sup>	Oil products	Cd	Zn	Pb	Cu	Ni	Cr	As	Hg
Background values (max.), Mg / kg	66,8		51,9	0,11	9,6	4,4	5,7	3,0	1,4	0,9	0,03
MPC, mg / kg	160	130	100/500*			32			100	2,0	2,1
- sandy and sandy loamy soils				0,5	55		33	20			

Indicator	SO <sub>4</sub> <sup>-</sup>	NO <sub>3</sub> <sup>-</sup>	Oil products	Cd	Zn	Pb	Cu	Ni	Cr	As	Hg
- loamy and clay soils				1	110		66	40			
(pH <5.5)				2	220		13 2	80			
- loamy and clay soils				0,1	35	12	13	20			

\* Maximum allowable concentrations of petroleum products in soils for various land categories [26]

The data obtained indicate that the content of pollutants in soils at the background monitoring points is below the MPC.

According to the observations of the National Environmental Monitoring System (NEMS) of the Republic of Belarus, in 2018 the content of benz (a) pyrene in the soils of the Vitebsk region was below the detection limit (0.001 mg / kg) [23].

In addition, the content of other observables in soils at points of the background monitoring network has changed insignificantly compared to previous years. Thus, the concentrations at these points can be used as the basis for assessing soil pollution levels in the rest of the territory.

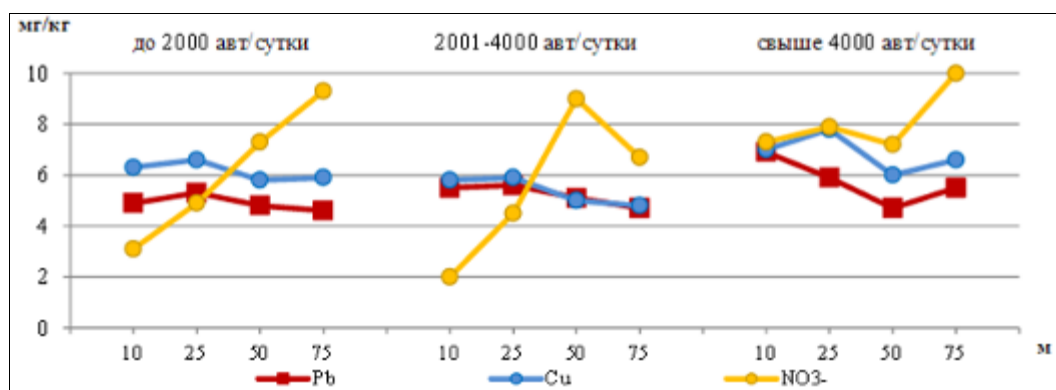
Within the framework of the National system of environmental monitoring of the Republic of Belarus, roadside lanes are monitored on 22 soil profiles. These profiles are located on open landscapes of meadow biogeocenoses with a flat terrain near roads with a lifespan of at least 20 years, differing in traffic intensity from 696 to 16926 cars per day. In soil samples along the above profiles, the content of heavy metals, oil products, sulfates, nitrates and benzo (a) pyrene was determined.

For statistical analysis, the profiles were grouped into three intervals according to traffic intensity: up to 2000 cars / day; 2001-4000 cars / day; over 4000 cars / day.

The interval with a traffic intensity of up to 2000 vehicles / day includes the soil profile near the 16<sup>th</sup> km of the R-46 highway Lepel-Polotsk-border of the Russian Federation (Yukhovichi).

Traffic intensity in 20 years on the R-46 highway is estimated at about 8000 cars / day. This is consistent with the existing traffic intensity near the R-53 highway Sloboda-Novosady - 8499 cars / day.

The dependence of the degree of soil pollution on the traffic intensity is traced for lead - a pollutant of the 1st hazard class (**Figure 5.19**). Its content in the soil increases by an average of 6-40% with an increase in traffic from 1 to 16 thousand cars per day. A similar dependence is also observed for cadmium, copper and nitrates.



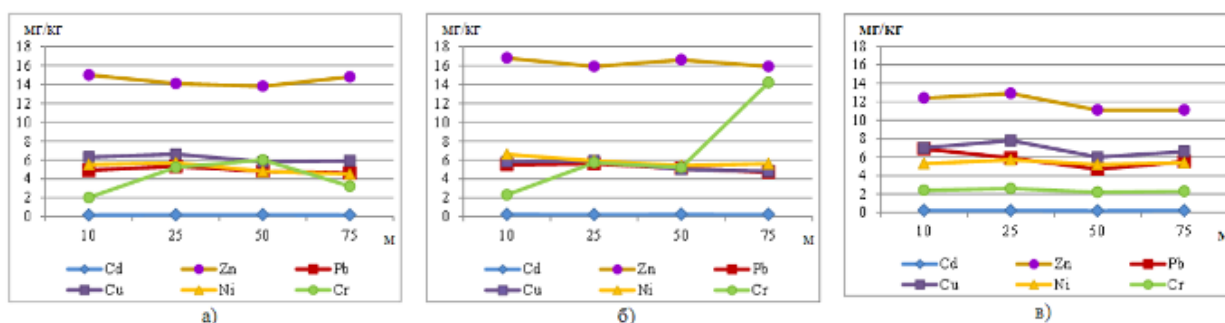
**Figure 5.19:** Dependence of the degree of soil pollution on the intensity of traffic: a) - less than 2000, b) - from 2000 to 4000, c) - more than 4000 bus / day

The average content of pollutants in the soils of roadside lanes in 2016 (mg / kg) is shown in Table 5.12.

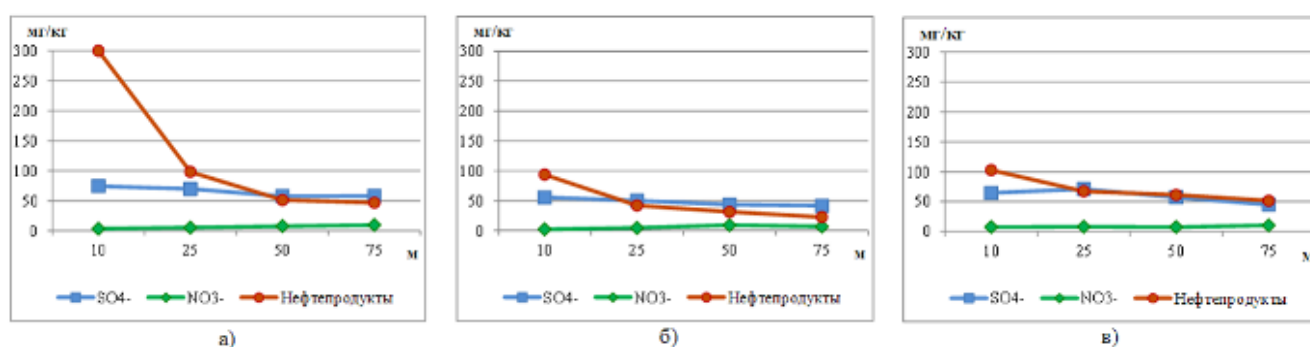
**Table 5.12: Average pollutant content in roadside soils**

Traffic intensity, cars / day	Distance from the road, m	Heavy metals						SO <sub>4</sub> <sup>-</sup>	NO <sub>3</sub> <sup>-</sup>	Heavy metals	Benz (a) pyrene
		Cd	Zn	Pb	Cu	Ni	Cr				
up to 2000 (9 profiles)	10	0,14	15,0	4,9	6,3	5,5	2,0	74,1	3,1	303,7	
	25	0,17	14,1	5,3	6,6	5,7	5,2	69,6	4,9	98,0	0,0087
	50	0,18	13,8	4,8	5,8	4,8	6,0	57,4	7,3	51,0	
	75	0,15	14,8	4,6	5,9	4,5	3,2	57,8	9,3	46,5	0,0027
2001-4000 (7 profiles)	10	0,22	16,8	5,5	5,8	6,6	2,3	55,5	2,0	93,6	
	25	0,20	15,9	5,6	5,9	5,9	5,7	50,1	4,5	41,8	0,0077
	50	0,23	16,6	5,1	5,0	5,4	5,2	43,4	9,0	31,3	
	75	0,21	15,9	4,7	4,8	5,6	14,2	41,7	6,7	22,5	0,0020
over 4000 (6 profiles)	10	0,21	12,4	6,9	7,0	5,3	2,4	64,4	7,3	102,6	
	25	0,20	12,9	5,9	7,8	5,7	2,6	70,9	7,9	67,2	0,054
	50	0,17	11,1	4,7	6,0	5,2	2,2	57,2	7,2	61,0	
	75	0,20	11,1	5,5	6,6	5,4	2,3	44,9	10,0	51,4	0,0080

There is a clear correlation between the decrease in the content of contaminants in roadside soils with the removal of the road from the roadbed (nitrates show an inverse relationship) (Figures 5.20 and 5.21).



**Figure 5.20: The content of heavy metals in soils at different distances from the roadbed with a traffic intensity: a) - less than 2000, b) - from 2000 to 4000, c) - more than 4000 cars / day**



**Figure 5.21: The content of sulfates, nitrates and oil products in soils at different distances from the roadbed with a traffic intensity of: a) - less than 2000, b) - from 2000 to 4000, c) - more than 4000 cars / day**

The main pollutants of roadside soils are petroleum products and benz (a) pyrene. The highest concentrations are characteristic for a 10-meter zone.

There are no excess MPCs for heavy metals, as well as nitrates and sulfates in soil samples of roadside lanes of highways.

In 2018, in the Vitebsk region, an assessment of the degree of soil pollution was carried out on the basis of a study of samples taken in various zones: in the residential zone (including in the territory of child care facilities), in the territory of industrial enterprises and their influence, in places of crop production, highways, in places of toxic waste storage.

The proportion of samples that do not meet hygienic standards for chemical indicators (2017 - 0.5%; 2018 - 0.0%); by bacteriological indicators (2017 –0.0%; 2018 –0.0%); for the presence of helminths (2017 - 0.8%; 2018 - 1.0%) [5].

### 5.3.4. Surface water

To assess the degree of anthropogenic transformation of water bodies as part of the implementation of the State Program for the Development of the National Environmental Monitoring System of the Republic of Belarus, a network of background monitoring of surface waters was organized.

The existing state of surface waters of the Zapadnaya Dvina river basin is determined according to the National Environmental Monitoring System in the Republic of Belarus [23].

The priority pollutants discharged into the wastewater are ammonium ion, phosphate ion, nitrite ion, organic substances (according to BOD5), iron compounds [18].

Assessment of the state of water bodies in Belarus is based on hydrochemical and hydrobiological indicators obtained by the National Environmental Monitoring System of the Republic of Belarus.

The planned highway crosses the rivers Vydritsa, Turzhanka, Turovlyanka, Belchitsa, runs near the lakes Lepelskoe, Yanovo, Shchaty, Gomel, Suya, the last four of which are connected by channels. The Polotsk City bypass crosses the Zapadnaya Dvina River.

Firstly, the ecological state of water bodies and watercourses in the Zapadnaya Dvina basin is determined on the one hand by the natural geochemical features of the territory and the ability of rivers to self-purify, and on the other hand, by anthropogenic impact associated with the discharge of wastewater from cities, industrial enterprises, and agricultural land.

The quality of surface waters by the metal content can be estimated by comparing the actual concentrations detected in water with their maximum permissible concentrations established in the Republic of Belarus on the basis of their natural content. The maximum permissible concentrations of metals in water bodies of the Zapadnaya Dvina river basin are presented in **Table 5.13** [27].

Observation of *hydrobiological indicators* makes it possible to give a comprehensive assessment of water quality, which is formed under the influence of natural and anthropogenic factors.

**Table 5.13: Maximum permissible concentrations of some metals for water bodies of the Zapadnaya Dvina river basin**

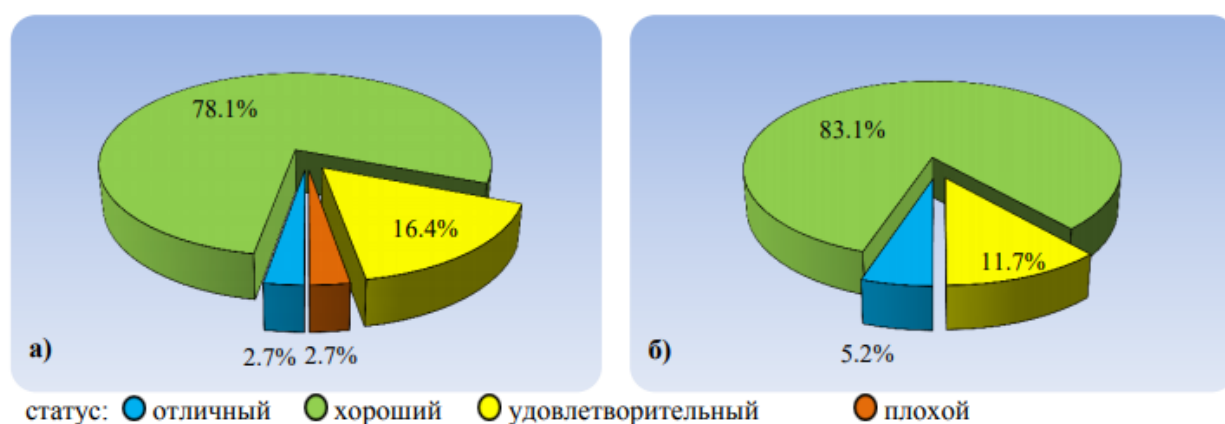
Surface water body	Estimated natural metal content, mg / dm <sup>3</sup>			
	Iron (total)	Manganese	Copper	Zink
For the rivers Zapadnaya Dvina, Disna, Kaspla, Obol, Ulla, Usvyacha, Ushacha	0.280	0.033	0.0042	0.014



Surface water body	Estimated natural metal content, mg / dm <sup>3</sup>			
	Iron (total)	Manganese	Copper	Zink
For other rivers, streams and canals	0.260	0.030	0.0038	0.012
For lakes, ponds and reservoirs	0.135	0.023	0.0035	0.010

In the Republic of Belarus, regular observations are made of the main communities of freshwater ecosystems: phytoplankton and zooplankton in lakes, phytoperiphyton and macrozoobenthos in rivers.

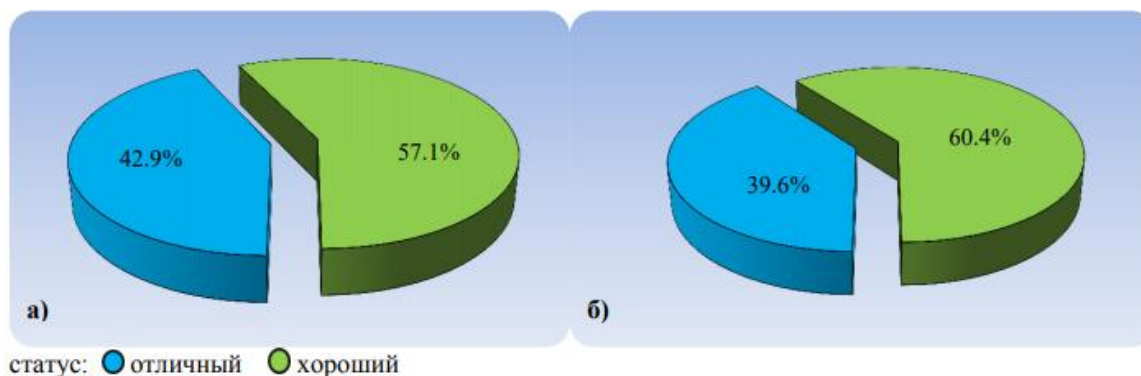
According to hydrobiological indicators, the state of surface water bodies of the Zapadnaya Dvina basin is generally assessed as good (83.1 % of surface water bodies) or satisfactory (11.7 %) (**Figure 5.22**).



**Figure 5.22:** *State of surface water bodies of the Zapadnaya Dvina river basin based on hydro-biological indicators*

The state of surface water bodies of the basin was assessed as excellent and good by hydrochemical indicators (**Figure 5.23**).

A comparative analysis of the average annual concentrations of basic substances in surface water bodies of the Zapadnaya Dvina river basin indicates a decrease in the concentration of phosphorus compounds, as well as an increase in the concentration of oil products. The concentrations of the remaining substances did not change significantly (**Table 5.14**).



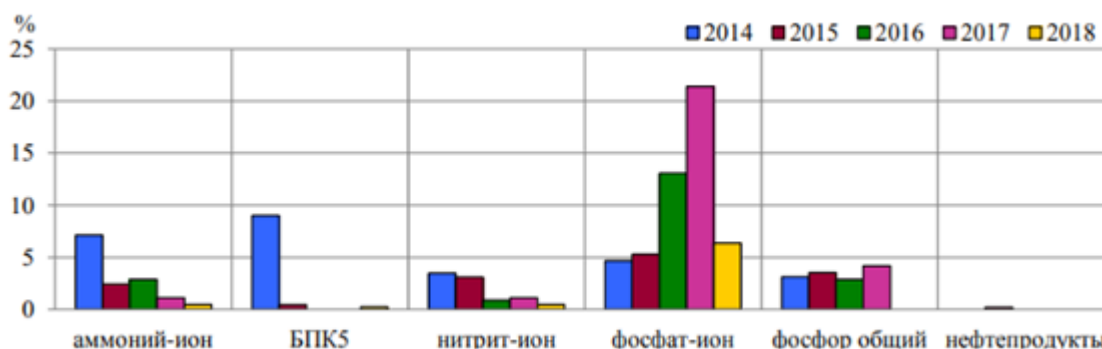
**Figure 5.23:** *State of surface water bodies of the Zapadnaya Dvina river basin based on hydro-chemical indicators*



**Table 5.14: Average annual concentrations of chemicals in Zapadnaya Dvina river**

Observation period	Average annual concentrations of chemicals						
	Organic substances (according to BOD5), mgO <sub>2</sub> / dm <sup>3</sup>	Ammonium ion, mgN / dm <sup>3</sup>	Nitrite ion, mgN / dm <sup>3</sup>	Phosphate ion, mgP / dm <sup>3</sup>	Total phosphorus, mgP / dm <sup>3</sup>	Oil products, mg / dm <sup>3</sup>	SAS, mg / dm <sup>3</sup>
2017	2.24	0.14	0.0066	0.052	0.073	0.0072	0.013
2018	2.10	0.13	0.0060	0.034	0.049	0.0087	0.014

In 2018, there were no cases of exceeding the MPC for petroleum products, total phosphorus. The number of water samples with increased concentrations of phosphate ion compared to 2017 decreased by 15% (**Figure 5.24**).



**Figure 5.24: The proportion of water samples from the Zapadnaya Dvina River with concentrations exceeding the MPC for the observed substances in 2014-2018**

**Zapadnaya Dvina River.** In accordance with the landscape-geochemical conditions of the region, the surface waters of the basin are of the hydrocarbon-calcium type. In the water of the Zapadnaya Dvina River, the anionic composition was dominated by bicarbonate ion, the content of which during the year varied from 65.2 to 140.3 mg / dm<sup>3</sup>, averaging 105.6 mg / dm<sup>3</sup>. The content of sulfate ion ranged from 2.2-19.1 mg / dm<sup>3</sup>, the average - 9.7 mg / dm<sup>3</sup>. The content of chloride ion ranged from 1.7-11.5 mg / dm<sup>3</sup>, an average of 6.8 mg / dm<sup>3</sup>.

Calcium ion dominated in the composition of cations: 24.8-56.1 mg / dm<sup>3</sup>, average annual content - 41.8 mg / dm<sup>3</sup>. The content of magnesium ion varied in the range of 4.9-14.7 mg / dm<sup>3</sup>, the average annual content was 9.8 mg / dm<sup>3</sup>. Mineralization of the waters of the Zapadnaya Dvina River averaged 215.4 mg / dm<sup>3</sup> and ranged from 126-254 mg / dm<sup>3</sup>.

The values of the hydrogen index (pH) varied from 7.3 to 8.2, which corresponds to a neutral and slightly alkaline reaction of water. The content of suspended solids ranged from 3.2-6.2 mg / dm<sup>3</sup> and averaged 5.1 mg / dm<sup>3</sup> per year. The content of dissolved oxygen varied in the range of 7.8-10.6 mgO<sub>2</sub> / dm<sup>3</sup>. The oxygen regime of the river corresponded to established quality standards.

The content of organic substances (in accordance with BOD5) in all the samples did not exceed the quality standard (6.0 mgO<sub>2</sub> / dm<sup>3</sup>), varying in the range from 1.5 to 2.6 mgO<sub>2</sub> / dm<sup>3</sup>, the average annual value was 2.1 mgO<sub>2</sub> / dm<sup>3</sup>. During the year, the concentrations of CODsCr varied from 47.6 to 71.4 mgO<sub>2</sub> / dm<sup>3</sup>, making up a total of 56.8 mgO<sub>2</sub> / dm<sup>3</sup>.

The level of “ammonia” pollution of surface water bodies in the area of large industrial centers - the cities of Polotsk, Novopolotsk and Verkhnedvinsk in 2018 slightly increased, but does not exceed the MPC level.

During 2018, the concentration of ammonium ion ranged from 0.01 to 0.27 mgN / dm<sup>3</sup> and did not exceed the normative allowable content. The concentration of nitrite ion in Zapadnaya Dvina water varied throughout the year from trace amounts (<0.005) to 0.015 mgN / dm<sup>3</sup>. Despite the increase in the average annual nitrite ion content in 2018 compared with the previous one, in fact, no excesses were revealed for this indicator. The content of nitrate ion in the water of the Zapadnaya Dvina during the year did not exceed the normalized value.

During 2018, the content of phosphate ion in the river water varied from 0.031 to 0.077 mgR / dm<sup>3</sup>, the maximum content was recorded in April below the city of Vitebsk. Average annual concentrations decreased throughout the river, and did not exceed the permissible level.

During 2018, no excess of the maximum permissible concentration of total phosphorus in the river water was recorded, and its maximum concentration (0.11 mg / dm<sup>3</sup>) was recorded in April 2.0 km below Vitebsk. The average annual content of total phosphorus in individual sections varied from 0.043 to 0.11 mg / dm<sup>3</sup>.

The iron content (total) ranged from 0.296 to 0.916 mg / dm<sup>3</sup>, which is slightly higher than the level of the previous year, with minimum concentrations exceeding the MPC level (0.280 mg / dm<sup>3</sup>), and average annual concentrations ranged from 0.531 to 0.576 mg / dm<sup>3</sup>.

The average annual copper concentrations in the Zapadnaya Dvina water ranged from 0.0028 to 0.0045 mg / dm<sup>3</sup>, and the maximum concentration was recorded 2.0 km below Vitebsk and exceeded the MPC by 1.9 times.

The average annual concentration of manganese (0.050-0.059 mg / dm<sup>3</sup>) in the water of the Zapadnaya Dvina River exceeded the MPC level by 1.5-1.8 times.

The average annual zinc content ranged from 0.011 to 0.015 mg / dm<sup>3</sup>. At the same time, the maximum one-time concentrations of metals were fixed above the established standard throughout the river (Figure 65).

During 2018, the oil content in the water of the Zapadnaya Dvina River did not exceed the MPC level. Exceeds the permissible content of synthetic surfactants in water Zapadnaya Dvina was not observed during the year.

Phytoperiphiton. The values of the saprobity index in the water of the Zapadnaya Dvina River throughout its length varied from 1.71 to 2.12. Minimum values (1.71) were recorded in areas above the city of Polotsk. The maximum index value (2.12) is recorded below the city of Verkhnedvinsk.

Macrozoobenthos. The values of the modified biotic index in the section of the Zapadnaya Dvina River were 6–8. A satisfactory hydrobiological status has been determined for the site below the city of Verkhnedvinsk.

***Tributaries of the Zapadnaya Dvina River.*** According to the national monitoring data, the tributaries of the Zapadnaya Dvina River are characterized by significant fluctuations in the content of components of the salt composition. The content of anions in the water of the tributaries was: bicarbonate ion from 55.9 to 229.0 mg / dm<sup>3</sup>, sulfate ion from 1.3 to 34 mg / dm<sup>3</sup> and chloride ion from 1.1 to 27.5 mg / dm<sup>3</sup>. The cationic composition was dominated by calcium ion. Its concentration ranged from 20.6 to 68.1 mg / dm<sup>3</sup>. The content of magnesium ion in the water of the tributaries varied from 4.5 to 20.3 mg / dm<sup>3</sup>.

The water of the tributaries of the Zapadnaya Dvina River was characterized by a neutral and slightly alkaline reaction (pH = 7.0-8.4). Mineralization of water ranged from 91 to 363 mg / dm<sup>3</sup>. The content of suspended solids ranged from 1.5 mg / dm<sup>3</sup> to 6.0 mg / dm<sup>3</sup>.

Throughout the year, the water of the Zapadnaya Dvina River tributaries was sufficiently supplied with dissolved oxygen, its content ranged from 6.0 to 10.8 mg O<sub>2</sub> / dm<sup>3</sup>, which ensured the stable functioning of river ecosystems. Cases of deficiency of dissolved oxygen were not observed.

The content of easily oxidized organic substances (BOD<sub>5</sub>) in the water of the tributaries of the Zapadnaya Dvina did not exceed the permissible level of their content (MPC = 6 mgO<sub>2</sub> / dm<sup>3</sup>). The content of organic substances (BOD<sub>5</sub>) in river water varied from up to 3.8 mgO<sub>2</sub> / dm<sup>3</sup>.

Number difficult-organic substances identified by the COD Cr ranged from 33.1 to 77.2 mgO<sub>2</sub> / dm<sup>3</sup>. The average COD Cr values varied from 39.5 to 68.8 mgO<sub>2</sub> / dm<sup>3</sup>.

C The average annual concentration of ammonium ion in the water of the tributaries did not exceed the MPC value.

The maximum content of ammonium ion in the tributaries was within acceptable limits.

During the year, there was no excess nitrite ion in the water of the tributaries of the Zapadnaya Dvina River. The average annual values for this indicator varied in the range of 0.003-0.011 mgN / dm<sup>3</sup>.

The average annual values of the phosphate ion ranged from 0.023 to 0.068 mgR / dm<sup>3</sup>.

The average annual phosphorus content was (0.030-0.093 mgP / dm<sup>3</sup>), and the range of its values during the year ranged from (0.009-0.18 mgP / dm<sup>3</sup>), which indicates the absence of water pollution of the tributaries according to this indicator.

The iron content (total) ranged from 0.051 to 1.38 mg / dm<sup>3</sup>. Excesses of its permissible content were observed in the water of all tributaries of the Zapadnaya Dvina River. The average annual iron content was 0.506 mg / dm<sup>3</sup>.

The average annual manganese content was 0.050 mg / dm<sup>3</sup>, which is higher than the established background value [30].

The zinc content in the water of the tributaries of the river. The Zapadnaya Dvina ranged from 0.002 to 0.022 mg / dm<sup>3</sup> (1.6 MAC). The average annual zinc content was 0.011 mg / dm<sup>3</sup>.

In the water of the tributaries of the Zapadnaya Dvina, the average annual copper content was 0.0026 mg / dm<sup>3</sup>, with concentrations ranging from 0.0005 to 0.007 mg / dm<sup>3</sup>.

The concentration of petroleum products did not exceed permissible values. The content of surfactants in the water of the tributaries was also recorded within acceptable limits.

Phytoplankton. In 2018, in the tributaries of the Zapadnaya Dvina river basin, the saprobity index varied from 1.57 to 1.97.

Macrozoobenthos. The value of the modified saprobity index was 6-9. [2, 24].

***Lakes and reservoirs of the Zapadnaya Dvina river basin.*** Water bodies in the Zapadnaya Dvina river basin are characterized by a reaction of water in the range from neutral to alkaline (pH = 7.0-8.5). The content of suspended solids is in the range of 1.5-6.9 mg / dm<sup>3</sup>.

The content of dissolved oxygen in water was above the minimum acceptable value both in winter (4.0 mgO<sub>2</sub> / dm<sup>3</sup>) and in summer (6.0 mgO<sub>2</sub> / dm<sup>3</sup>) periods. The amount of dissolved oxygen ranged from 6.9 to 13.2 mgO<sub>2</sub> / dm<sup>3</sup>. There were no cases of oxygen deficiency in the

water of the reservoirs of the basin.

The content of easily oxidizable organic substances (BOD<sub>5</sub>) in the water of most lakes corresponded to the values characteristic of aquatic ecosystems not subject to anthropogenic impact. Annual average concentrations ranged from 1.3 to 5.1 mgO<sub>2</sub> / dm<sup>3</sup>.

The content of dissolved oxygen in the water bodies of the Zapadnaya Dvina river basin varied in the range of 6.9-13.2 mgO<sub>2</sub> / dm<sup>3</sup> with a norm of 6 mgO<sub>2</sub> / dm<sup>3</sup>.

The amount of organic substances determined by Cr COD was in the range from 12.1 to 75.6 mgO<sub>2</sub> / dm<sup>3</sup>.

The ammonium ion content in the reservoirs of the Zapadnaya Dvina River basin was in the range from 0.01 to 0.32 mgN / dm<sup>3</sup>.

The content of nitrite ion, total nitrogen does not exceed the permissible values.

The phosphate ion content in the lakes of the Zapadnaya Dvina basin exceeded the MPC only in lake Lepel'skoe, in which it reached 1.3 MPC (0.088 mgR / dm<sup>3</sup>). The amount of phosphate ion in other lakes ranged from 0.003 to 0.066 mgR / dm<sup>3</sup>.

The total phosphorus content ranged from 0.003 to 0.11 mgR / dm<sup>3</sup>, not exceeding the permissible concentration of 0.2 mgR / dm<sup>3</sup>.

The total iron concentration varied in the range from 0.013 to 0.667 mg / dm<sup>3</sup> (Lake Lepelskoe in February). The average annual iron content in the water of the Zapadnaya Dvina river basin was 0.189 mg / dm<sup>3</sup> (1.4 MPC).

The manganese content in lake water ranged from 0.002 to 0.094 mg / dm<sup>3</sup>. The average annual content was 0.0236 mg / dm<sup>3</sup>.

The copper content in the water of reservoirs varied from 0.0005 mg / dm<sup>3</sup> in the water of most lakes of the Zapadnaya Dvina river basin to 0.0090 mg / dm<sup>3</sup>. The average annual copper content was 0.0024 mg / dm<sup>3</sup>, this value did not exceed the quality standard of 0.0035 mg / dm<sup>3</sup>.

Zinc concentrations ranged from 0.001 to 0.028 mg / dm<sup>3</sup> (Lake Lepelskoe in February). The average annual value did not exceed the quality standard and amounted to 0.0078 mg / dm<sup>3</sup>.

The content of oil products and surfactants in the water of the reservoirs of the Zapadnaya Dvina river basin was in accordance with the established water quality standards.

Phytoplankton. In 2018, from 7 to 53 phytoplankton species were found in lakes and reservoirs of the Zapadnaya Dvina River basin. The values of the saprobnosity index ranged from 1.5 to 2.12.

Zooplankton. The values of the saprobity index of water bodies ranged from 1.35 (Lake Gomel) to 1.81 (Lake Lyadno). A satisfactory hydrobiological status has been determined for Lake Lepelskoe [2].

On the territory of the Lepelsk district there are no surface water bodies used for recreational purposes and located near the reconstructed section of the R-46 highway (data of the State Institution "Lepel District Center for Hygiene and Epidemiology"). On the territory of the Polotsk region lakes Yanovo, Suya, Gomel, Shchaty, Belaye, the Turovlyanka river, artificial reservoir Belchitsa are used for recreational purposes (data from the State institution "Polotsk Zonal Center for Hygiene and Epidemiology").

*Secondly, the state of surface water in the zone of influence of the object was also evaluated on*

the basis of analyzes of water samples taken by the staff of the Research Laboratory of Landscape Ecology of the Belarusian State University in May 2020. The sampling locations are shown in Figure 3.4: v-1 - Lake Lepelskoe, v-2 - the Vydritsa River, v-3 - the Yanovo Lake, v-4 - the Turzhanka River, v-5 - the Shchaty Lake, v-6 - the Turovlyanka River, v-7 - Suya Lake, v-8 - Belchitsa River (**Figure 5.25**) (Appendix C).

Analytical work was carried out at the Central Laboratory branch of the RPC Scientific and Practical Center for Geology, accredited for compliance with the requirements of STB ISO / IEC 17025-2007 (Appendix C).

The results of the analysis of water samples are given in **Tables 5.15** and **5.16** and Appendix C.

Most of the indicators studied (mineralization, pH, ammonium nitrogen, petroleum products, chlorides, zinc and lead) do not exceed permissible concentrations.

Exceeding the standards for manganese content for the rivers Vydritsa (1.6 MPC), Turovlyanka (2.27 MPC), Belchitsa (2.23 MPC), Lakes Yanovo (1.22 MPC), Shchaty (3.30 MPC), Suya (3.13 MAC). All these water bodies are connected (except for the Belchitsa River). Elevated manganese concentrations may be associated with the effects of water discharge from a number of reclamation sites.

The excess of permissible values for the copper content in Lake Shchaty (2.29 MPC) and Suya (1.43 MPC), as well as the Turovlyanka ducts (2.74 MPC) were recorded.

Since the excess of permissible concentrations could be of a random nature, the research laboratory of the ecology of landscape ecology of BSU re-took samples in Lake. Suya (test V-11/66301) and Shchaty (test V-13/66301) and in the duct (river) Turovlyanka (test V-12/66301). Analysis of samples for the content of manganese and copper was also carried out in the “Central Laboratory” of the Republican Research Center for Geology. Absolute concentrations are shown in **Table 5.17**, concentrations in fractions of MPC - in **Table 5.18**.



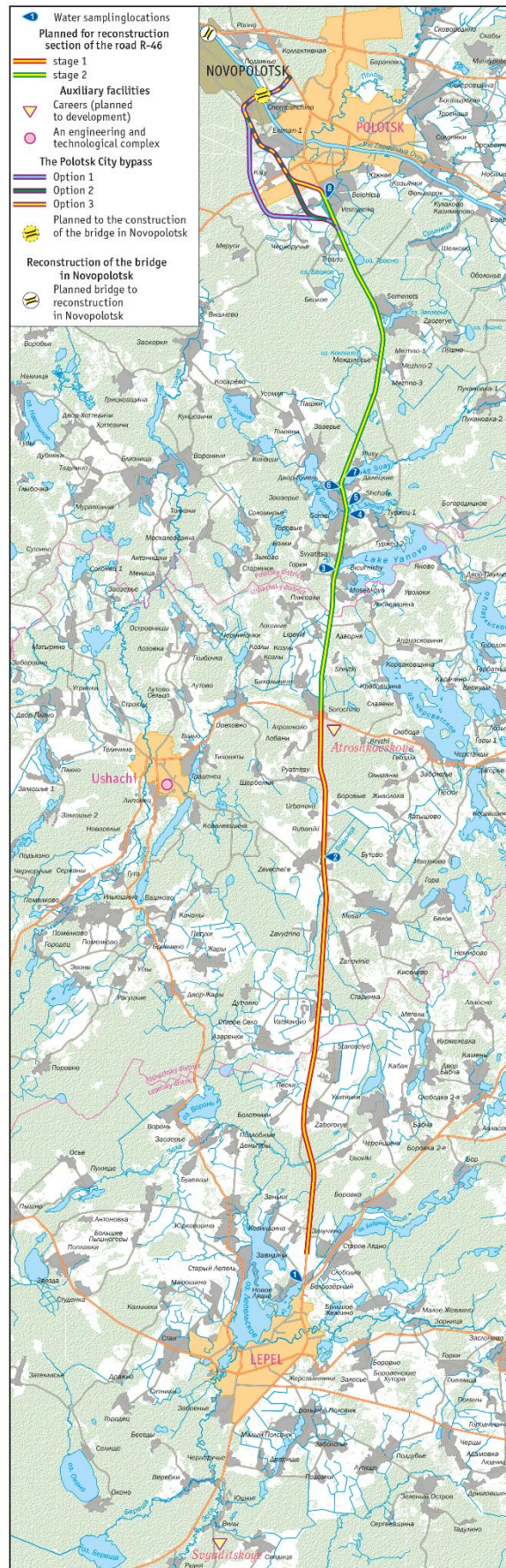


Figure 5.25: Locations of water sampling points

**Table 5.15: Water quality indicators in samples from lakes**

Name of ingredient, indicator	Unit of measurement	Normalized value [30]	v-1 - Lake Lepelskoe	v-3 - Yanovo Lake	v-5 - Shchaty Lake	v-7 - Suya Lake
Solids (water mineralization)	mg / dm <sup>3</sup>	no more than 1000	270	310	266	370
Ammonium Nitrogen (NH <sub>4</sub> <sup>+</sup> )	mgN / dm <sup>3</sup>	0.39	0.1556	0.0778	0.1556	0.0778
PH value	units pH	6.5-8.5	7.9	7.8	7.6	7.6
Oil products	mg / dm <sup>3</sup>	0.05	0.006	0.006	0.006	0.008
Chlorides (Cl <sup>-</sup> )	mg / dm <sup>3</sup>	300.0	11.7	38.3	16.0	64.4
Manganese (Mn)	mg / dm <sup>3</sup>	0.023	0.008	<b>0.028</b>	<b>0.076</b>	<b>0.072</b>
Copper (Cu)	mg / dm <sup>3</sup>	0.0035	0.0025	0.0010	<b>0.0080</b>	<b>0.0050</b>
Zinc (Zn)	mg / dm <sup>3</sup>	0.010	<0.0005	<0.0005	<0.0005	<0.0005
Lead (Pb)	mg / dm <sup>3</sup>	0.014	0.0052	<0.005	<0.005	<0.005

**Table 5.16: Water quality indicators in samples from rivers**

Name of ingredient, indicator	Unit of measurement	Normalized value [30]	v-2 - Vydritsa River	v-4 - Turzhanka River	v-6 - Turovlyanka River	v-8 - Belchitsa River
Solids (water mineralization)	mg / dm <sup>3</sup>	no more than 1000	398	259	261	273
Ammonium Nitrogen (NH <sub>4</sub> <sup>+</sup> )	mgN / dm <sup>3</sup>	0.39	0.1556	0.0778	0.0778	0.3111
PH value	units pH	6.5-8.5	7.8	8.1	8.0	7.6
Oil products	mg / dm <sup>3</sup>	0.05	0.005	0.008	0.008	0.007
Chlorides (Cl <sup>-</sup> )	mg / dm <sup>3</sup>	300.0	20.7	15.4	16.0	22.3
Manganese (Mn)	mg / dm <sup>3</sup>	0.023	<b>0.048</b>	0.027	<b>0.068</b>	<b>0.067</b>
Copper (Cu)	mg / dm <sup>3</sup>	0.0035	0.0010	<0.001	<b>0.0104</b>	0.0018
Zinc (Zn)	mg / dm <sup>3</sup>	0.010	<0.0005	<0.0005	<0.0005	<0.0005
Lead (Pb)	mg / dm <sup>3</sup>	0.014	<0.005	<0.005	<0.005	<0.005

The study showed that the excess of permissible values for manganese in Lake Suya increased from 3.13 MPC to 4.82, while for those located upstream of the Turovlyanka and Lake Shchaty it decreased below acceptable values (0.82 and 0.95 MPC, respectively). This indicates the possible seasonality of the manganese content in these water bodies.

The excess of permissible values of copper content was again established; moreover, a significant increase was noted for Lake Suya and the Turovlyanka River to 4.77 and 3.95 MPC, respectively, while a slight decrease was noted above Lake Schaty (from 2.29 to 1.94 MPC).

**Table 5.17: Water quality and concentration of chemicals in surface water**

Name of substance / indicator	Unit of measurement	Normative value [30]	Lake Suya (sample B-11/66301)	Lake Schaty (sample B-13/66301)	Turovlyanka river (sample B-12/66301).
PH value	units pH	6,5-8,5	7,33	7,68	7,92
Manganese (Mn)	mg / dm <sup>3</sup>	0,030 (rivers)/ 0,023 (lakes)	<b>0,1108</b>	0,0218	0,0246
Copper (Cu)	mg / dm <sup>3</sup>	0,0038 (rivers)/ 0,0035 (lakes)	<b>0,0167</b>	<b>0,0068</b>	<b>0,0150</b>



**Table 5.18: Ratio of the concentration indicators of Mn and Cu to the standard indicators**

Name of substance / indicator	Lake Suya (sample B-11/66301)	Lake Schaty (sample B-13/66301)	Turovlyanka river (sample B-12/66301).
Manganese (Mn)	4,82	0,95	0,82
Copper (Cu)	4,77	1,94	3,95

## 5.4. Biological diversity

### 5.4.1. Specially protected natural areas

There are several natural monuments in the area of the planned activities for the reconstruction of the section of the P-46 highway (Figure 5.26). At a considerable distance from the P-46 highway there are a nature reserve, national parks and wildlife reserves.



- 1 – Geological natural monument of national significance "Boulder Sorochinsky"
- 2 – Geological natural monument of national importance "Boulder Svyatitsky"
- 3 – Geological natural monument of national importance "Kamovy hill "Volotvka"

**Figure 5.26: Natural monuments in the area of the planned activities**

In the zone of influence (up to 200 m) of "Highway R-46 Highway Lepel-Polotsk-border of the Russian Federation (Yukhovichi) 1,700 - 61,500 km" the following objects are located.

Ushachsky district:

- a geological natural monument of national significance "Boulder Sorochinsky" - 1.5 km north of the village of Sorochino, 15 m west of the P-46 highway (km 34);

Polotsk region:

- geological natural monument of national importance "Boulder Svyatitsky" - 0.5 km south-west of the main street of Svyatitsa village, 50 m west of the P-46 road (km 40);
- a geological natural monument of national importance "Kamovy hill "Volotovka" – 0.5 km north of the main street of the village of Svyatitsa, adjacent to the P-46 road (km 40);

The Sorochinsky boulder is located 15 m from the P-46 highway on the berm of the reclamation canal (**Figure 5.27**).



**Figure 5.27:** *The Sorochinsky boulder*

When developing design solutions for the reconstruction of a section of the P-46 highway, attention should be paid to the close location of this natural monument and the Volotovka kamt hill adjacent to the road (**Figure 5.28**).

камовый холм  
«Волотовка»



**Figure 5.28:** *The Volotovka kamt*

Geological natural monument of national importance "Boulder" Svyatitsky "is located 50 m west of the P-46 highway - outside the boundaries of the reconstruction of the road section and the planned activity will not have a negative impact on this object.

All other natural monuments of national and local importance in the area of the P-46 highway are located at a considerable distance (more than 350 m) from the planned work area and, as expected, there will be no negative impact on these monuments.

#### **5.4.2. Vegetation**

##### **Vegetation on the reconstructed section of the R-46 highway**

Study area belongs to the Polotsk region of the West Dvina geobotanical district of the subzone of oak-dark coniferous forests [6, 28–30].

The section of the P-46 road to be reconstructed passes both through open areas, which is mainly occupied by agricultural land, and through the territory of forestry enterprises: GLHU "Lepel forestry enterprise", GLHU "Ushachsky forestry enterprise" and GLHU "Polotsk forestry enterprise".

The vegetation of the study area along the P-46 road is represented by forest, segetal, residential, ruderal, meadow, coastal water and bog types.

Vegetation of the study area along the R-46 highway, represented by forest, segetal (weeds), residential, ruderal, meadow, coastal and marsh types.

Forest vegetation along the reconstructed section of the R-46 highway, 1.700–61.500 km, is represented by both large forest tracts and small-contour plots of agricultural land.

According to the State Property Committee of the Republic of Belarus [15], the districts of the Vitebsk region, through which the reconstructed section of the R-46 highway passes, have a rather high forest cover. Long-term dynamics of forest cover in the study area are given in **Table 5.19**.

**Table 5.19: Change in forest cover in the study area in 2013-2019**

Territory	Forest cover as a percentage of the total area						
	2013	2014	2015	2016	2017	2018	2019
Vitebsk region	<b>39,7</b>	<b>39,8</b>	<b>40,3</b>	<b>40,8</b>	<b>40,8</b>	<b>41,0</b>	<b>41,1</b>
Areas:							
Lepel district	53,6	53,7	53,8	53,9	53,9	53,8	53,9
Ushachsky district	41,4	41,7	41,9	42,5	42,5	42,7	43,4
Polotsk district	54,3	54,4	54,8	55,1	55,2	55,2	55,9

Forest vegetation. Necessary explanation. In the Republic of Belarus, a biogeocenotic classification of forest types is used. Names are given by prevailing land cover. The diversity of forests in Belarus is characterized by more than 130 types of native forests. These are 13 types of pine forests, 12 types of spruce forests. Broad-leaved forests are mainly represented by floodplain oak forests and various species of ash trees.

The forests of the Zapadnaya Dvina geobotanical region are characterized by the appearance of taiga forests in Eastern Europe - here the plants of the boreal flora are most fully represented and the West European species are least involved.

Among the forests along the R-46 highway, mainly pine forests grow on the elevated areas of the relief, while spruce forests grow on the lower sections. At the transitions from the hills to the lowlands, predominantly mixed and small-leaved forests are occupied, which include birch, aspen, and black alder. Broad-leaved species of pure stands do not form, entering as an impurity in the composition of other formations (mainly spruce and black alder).

*Spruce forests* along the R-46 highway occupy areas of different sizes, often determine the general background of forests. The composition of spruce forests is quite uniform, sometimes one type of spruce tree dominates a rather large territory [30].

In the surveyed area, spruce forests are mainly represented by blueberry, mossy and acidic.

The typological group of spruce southern taiga green-bilberry forests combined with shrub-moss forests is represented in the study area by blueberry and haircap-moss spruce forests (**Figure 5.29**).





**Figure 5.29:** *Haircap-moss spruce forest on the study area*

These forests are confined to low relief elements with moist podzolic and sod-podzolic sandy loam and loamy clay soils. The stands are monodominant, but, in addition to ordinary spruce (*Picea abies*), there are senile birch (*Betula pendula*), ordinary pine (*Pinus sylvestris*), and occasionally aspen (*Populus tremula*). The undergrowth is rare and consists of the common honeysuckle (*Lonicera xylosteum*), mountain ash (*Sorbus aucuparia*), and buckthorn (*Frangula alnus*).

The main identifier and dominant of the layer of the living ground cover is blueberries (*Vaccinium myrtillus*), lingonberries (*Vaccinium vitis-idaea*), hairy swine (*Luzula pilosa*), common sour acidum (*Oxalis acetosella*), and horsetail (*Equisetum sylvumium aquaticum*) ) In the moss layer, *Hylocomium splendens*, *Dicranum undulatum*, *Pleurozium schreberi*, *Ptilium crista-castrensis* and others are abundant. Sphagnum mosses (*Sphagnum girgensohnii*, *S. squarrosum*) are found in small areas in the lowest areas.

The forest stands of mossy spruce forests (**Figure 5.30**) are often monodominant, sometimes besides birch spruce, birch and pine ordinary take part in the forest stand. The undergrowth layer is very poorly developed, closer to the edges there are mountain ash, less commonly hazel (*Corylus avellana*). Juniperus (*Juniperus communis*) is noted in spruce forests located along the highway on the lands of the Polotsk forestry.



**Figure 5.30:** *Mossy spruce forest on the study area*

The species composition of the ground cover is relatively poor, lingonberries are common, sometimes blueberries are found in hollows, scattered groups are marked by common sour acid, double-leafed stalk (*Maianthemum bifolium*), and boron (*Milium effusum*). In a well-developed moss layer - *Pleurozium schreberi*, *Dicranum undulatum*, *D. scoparium*, *Hylocomium proliferum*, etc.

The typological group of broad-leaved-spruce, broad-leaved-pine-spruce and spruce green-sorrel acidic in combination with fern and nettle-raspberry forests (**Figure 5.31**) is the most floristically rich and structurally complex in the composition of the forests of the spruce formation of the region.



**Figure 5.31:** *Broad-leaved spruce forests in the study area*

This group of spruce trees grows on highly fertile loamy soils, where optimal conditions are



created for the growth and development of broad-leaved species (oak (*Quercus robur*), small-leaved linden (*Tilia cordata*), acutifolia (*Acer platanoides*)), birch, aspen, rarely elm (*Ulmus glabra*).

This typological group is represented by the following types of spruce forests: acidic spruce, found most often and in a large area, as well as small in area, confined to various edaphic conditions, bracken, nettle, fern and chrysanthemum.

The following plant species predominate in the undergrowth of all these types: common hazel, common honeysuckle, brittle buckthorn, common mountain ash, warty spindle tree (*Euonymus verrucosus*).

In the ground cover of these forests, the common background is formed by wood sorrel. Representatives of the boreal flora act as fragmented dominants of the cover: common bracken, female nomad (*Athyrium filix-femina*), male thyroid (*Dryopteris filix-mas*), species of non-moral grasses (depending on the type of forest): dwarf (*Aegopodium podagraria*), nettle (*Urtica dioica*), as well as the noble liverwort (*Hepatica nobilis*), European ungulate (*Asarum europaeum*), European civet (*Lamium galeobdolon*), fragrant bedstraw (*Galium odoratum*), etc.

The moss layer consists of green mosses: *Dicranum undulatum*, *D. scoparium*, *Hylocomium splendens*, *Rhytidiadelphus triquetrus*, *Climacium dendroides*, etc.

*Pine forests* along the studied section of the R-46 highway occupy a significant territory and are especially common in the Ushachskiy and Polotskiy regions.

The typological group of pine shrub-green-moss forests is represented by mossy (**Figure 5.32**) and lingonberry pine forests (**Figure 5.33**). The latter are found in the study area on small islands confined to elevated and slightly wavy relief elements. In the composition of these phytocenoses, spruce (often in the undergrowth) acts as a constant co-identifier, and occasionally, drooping birch.



**Figure 5.32:** *Mossy pine forests in the study area*





**Figure 5.33:** *Lingonberry pine forests in the study area*

In the undergrowth there is juniper, occasionally mountain ash. Lingonberry and green mosses dominate in the ground cover of lingonberry pine forest, blueberries and heather grows in curtains. Blueberries may occur in depressions. Of the herbaceous species, sheep fescue (*Festuca ovina*), meadow grasshopper (*Melampyrum pratense*), round-leaved pear (*Pyrola rotundifolia*), lily of the valley (*Convallaria majalis*), squat goatroot (*Scorzonera humilis*), and Umbrellas (*Chimila*) are found. The rare representatives of the flora of old-aged pine trees of mossy and lingonberry, especially on the tops and slopes of the hills are Zeiler diphphiastrum (*Diphasiastrum x zeileri*), rocky (*Gypsophila fastigiata*), green-flowered pear (*Pyrola chlorantha*), and *Pulsatilla patens* marked along the roadside slopes along the highway within the Polotsk region (**Figure 5.34**).



**Figure 5.34:** *Roadside slopes along the highway within the Polotsk region are places where *Pulsatilla patens* grows*

On the tops of dry sandy hills and along the slopes of quarries, heather and lichen pine forests are found (**Figure 5.35**). They are characteristic in the study area mainly for the Polotsk region, and belong to the typological group of lichen-shrubby pine forests, confined mainly to dry podzolic and sod-podzolic sandy soils.



**Figure 5.35:** *Lichen pine forests in the study area*

Sites of lichen-shrubby pine forests are relatively small and interspersed with pine forests of other categories. The stand is mainly monodominant, formed by the common pine, occasionally there is participation in the stand of spruce and birch, in the undergrowth - common juniper.

Typical oligotrophic-xerophytic species are represented in the ground cover. These are lichens from the genus *Cladonia* (*Cladonia silvatica*, *C. rangiferina*, *C. cornuta*), Icelandic *Cetraria* (*Cetraria islandica*), heather abundantly develops in heather pine, common thyme (*Thymus serpyllum*), hairy hawk (*Hieracium pilosella bursa, curta*), in places abundantly green mosses.

Ledum and sedge-sphagnum pine forests belonging to the typological group of pine shrub-sedge grass-grass-sphagnum forests combined with shrub-longhorn forests in transitional and upper bogs occupy small sections of transitional bogs, sometimes on the outskirts of high bogs, and also occur on the shores of lakes. Soils range from humus-peaty-gley to thin peat-gley, humidification is plentiful, often stagnant.

The main edifier of phytocenoses is pine. Fluffy birch (*Betula pubescens*), as well as Norway spruce is a co-edifier (**Figure 5.36**).





**Figure 5.36:** *Ledum pine forests in the study area*

In rosemary pine forest, a continuous tier above sphagnum mosses (*Sphagnum palustre*, *S. girgensohnii*, *S. magellanicum*, etc.) creates wild rosemary (*Ledum palustre*). Here you can also find bog-rosemary (*Andromeda polifolia*), marsh myrtle (*Chamaedaphne calyculata*), and blueberries. In sedge-sphagnum associations, in addition to various types of sedges (*Carex lasiocarpa*, *C. rostrata*, *C. elongata*), marsh grasses (marsh cinquefoil (*Comarum palustre*), common reed (*Phragmites australis*) are also involved.

In areas with excessive moisture and peat-bog soils, sedge-sphagnum pine forests were noted (**Figure 5.37**), which belong to the typological group of pine shrub-cannon-sphagnum forests in high bogs. In the forest stand, except for pine, in some areas a small amount of birch is present.



**Figure 5.37:** *Sedge-sphagnum pine forests in the study area*

These forests are characterized by the typical representatives of the swamp boreal flora - bog-rosemary, ordinary chamaedaphne and wild rosemary marsh, are also found blueberries (*Vaccinium uliginosum*), common cranberry (*Vaccinium oxycoccos*), vaginal cotton grass (*Eriophorum vaginatum*), sedges (*Carex lasiocarpa*, *C. rostrata*), well-developed moss cover

from sphagnum (*Sphagnum palustre*, *S. magellanicum*, *S. cuspidatum*, etc.).

The typological group of pine moss-blueberry forests in the study area is represented by blueberry pine forests (**Figure 5.38**), which grow mainly on flat low places with well-moistened soils. In the stands, along with the common pine, common spruce, less often birch. Some sites are characterized by abundant presence of spruce in the undergrowth.



**Figure 5.38:** *Blueberry pine forests in the study area*

The undergrowth layer is formed by juniper, buckthorn, mountain ash, euonymus. The background of the ground cover is blueberries, under which green mosses (*Pleurozium schreberi*, *Dicranum undulatum*, *D. scoparium*, *Hylocomium splendens*) grow as a continuous cover. In the upper tier of the cover, in associations edaphically conjugated with a mossy pine, lingonberries and meadow grass are often found, and in associations with increasing moisture to long-moss and rosemary pine forests, blue mollusk, gray reed, ash sedge (*Carex canescens*), rosemary, marsh.

In the ground cover there are also the Chartres thyroid (*Dryopteris carthusiana*), the round-leaved wintergreen (*Pyrola rotundifolia*), the annual plunion (*Lycopodium annotinum*), etc.

On quite rich soddy-podzolic sandy loam and light loamy soils of optimal moisture, bracken pine forests (a typological group of broad-leaved-pine bracken-green-moss-sorrel forests) grow from oak groves and spruce forests. The stands are highly productive, complex in composition, mostly pure pine, but with an admixture of broad-leaved species (oak, less often linden and maple) in the lower tiers. In the stand, an admixture of spruce and birch is often observed.

Hazel grows abundantly in the undergrowth. The common bracken dominates in the ground cover, shrubs (blueberries, lingonberries), as well as sorrel, greenfinch, European ungulate, European starlet (*Stellaria nemorum*), creeper survivor (*Ajuga reptans*), double-leaved mainland, etc. are dominant. mesophilic *Hylocomium splendens*, *Pleurozium schreberi*, species of the genus *Dicranum*, *Hylocomium splendens*, etc.

Small-leaved forests in the study area are represented by derivatives of warty birch and gray alder forests, as well as indigenous black alder and fluffy birch stands.

*Birch forests* along the R-46 highway are found in separate often quite significant areas.

The warty birch forests in the vast majority are derived from pine-spruce and spruce forests



and are mainly represented by birch forests, bilberry, dolomosa, sorrel, sorrel, cereal, bracken and chrysanthemum.

In the stands of bilberry and longhorn birch forests (**Figure 5.39**), which belong to the typological group of warty-birch moss-bilberry forests in combination with shrub-polytric, birch breeze dominates, there is pine, sometimes spruce, aspen, oak, in areas with increased moisture - fluffy birch. The undergrowth is thick, formed by the same species that are characteristic of indigenous phytocenoses. The main components of the undergrowth are buckthorn, hazel, mountain ash, and sometimes juniper. The main background of the ground cover is created by blueberries and green mosses, on overwatered areas there is common cuckoo flax, annual plow, blue moth, and in microdepressions - species of sphagnum mosses (*Sphagnum girgensohnii*, *S. centrale*, etc.).



**Figure 5.39:** *Blueberry birch forest in the study area*

On overgrown felling, a grassy type of birch forest is sometimes found. The ground cover here is enriched with grass and vegetation, which appears due to the lesser density and openwork of the canopy. The following species are common here: sheep fescue (*Festuca ovina*), giant fescue (*Festuca gigantea*), terrestrial reed (*Calamagrostis epigeios*), meadow bluegrass (*Poa pratensis*), pine forest bluegrass (*Poa nemoralis*), etc.

The species-rich communities of birch forests of sorrel, bracken birch forests belong to the typological category of warty birch barks, bracken-moss-sorrel forests in combination with Characidae (**Figure 5.40**).



**Figure 5.40:** *Warty birch bracken-green-moss-sour forests on the study area*

Forest stands with the participation of aspen, pine, less often - spruce, oak, with abundant undergrowth of the same species. Hazel, buckthorn, and mountain ash are plentiful in the undergrowth. The structure of the lower tiers is similar to the indigenous types of forests.

The downy birch forests (**Figure 5.41**) of the studied region mainly grow on the outskirts of the marshes and, due to the presence of many wetlands in the region, are quite common. On transitional swamps, pine is mixed with fluffy birch, on lowland – with spruce and black alder.



**Figure 5.41:** *Downy birch forests in the study area*

Fur-birch sedge forests in lowland marshes are characterized by significant water cut and relatively low flow and are represented by sedge, bog ferns and sedge-grass types. Forest stands mixed with black alder, sometimes pine and spruce. In the undergrowth tier there are brittle buckthorn and willows (*Salix cinerea*, *S. triandra*, *S. myrsinifolia*, etc.).

Sedges (*Carex vesicaria*, *C. nigra*, *C. canescens*), ferns (*Thelypteris palustris*, *Athyrium filix-femina*, *Dryopteris carthusiana*) are widely represented in the ground cover - especially in fern



birch, common moth (*Calla palustris*), common cane, bog (*Caltha palustris*), European breeder (*Lycopus europaeus*), meadowsweet meadowsweet (*Filipendula ulmaria*), creeping buttercup (*Ranunculus repens*), other species of bog forbs, and various species of mosses.

Fluffy-birch and pine-fluffy-birch sedge-grass-sphagnum forests in combination with *Ledum* on transitional bogs are highly flooded and low-flowing, confined to transitional and margins of upland bogs, with peat-gley and peat-gley or peat-gley. Forest stands with an admixture of pine, warty birch, less often - spruce and black alder. The undergrowth is quite rare, formed by willows and buckthorn brittle. Here sedges and bog forbs are plentiful, as well as a developed moss cover formed by *Sphagnum squarrosum*, *S. teres*, *Sph. centrale* et al.

*Black alder forests* in the region of reconstruction of the R-46 highway occupy relatively small areas in local depressions. They are common in places of peaty small lakes, along watercourses and near large water bodies.

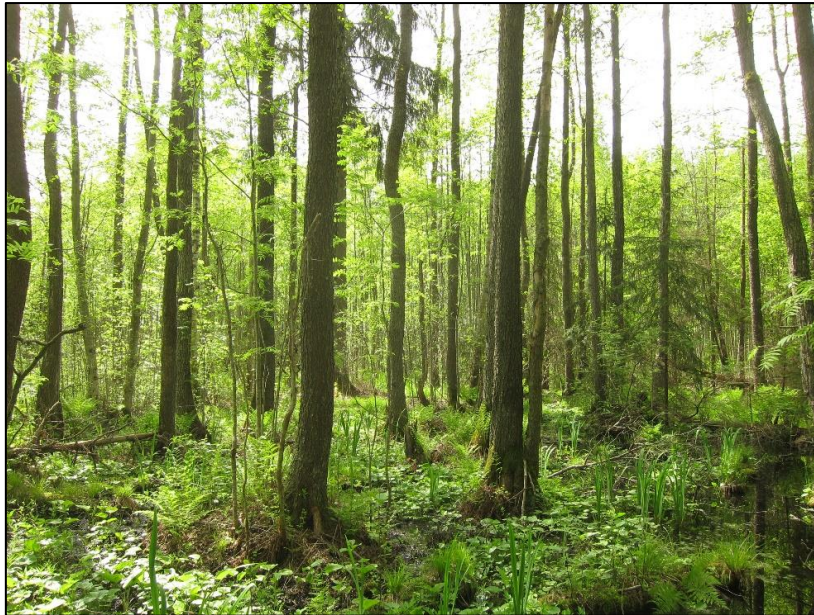
Derived types of forests - sorrel, chickpea and nettle black alder forests, belonging to the group of black alder nettle forests - in combination with sorrel and chanterelle forests, grow on rich soils with excess moisture where water is relatively mobile. The first tier of forest stands is monodominant; spruce, sometimes ash (*Fraxinus excelsior*), aspen and birch grow in the second tier (**Figure 5.42**).



**Figure 5.42:** *Black alder nettle forest in the study area*

On the reconstruction section of the R-46 highway, indigenous black alder forests (**Figure 5.43**) are represented by alder ferns, meadowsweet, sedge, bog ferns.





**Figure 5.43:** *Alder fern forest in the study area*

Fern alders are located mainly in peaty hollows with slight deviations without pronounced channels of watercourses. Significant water cut and weak water flow are characteristic of the alder of the meadowsweet, found on flat depressions near watercourses.

In the stands, in addition to black alder, there is fluffy birch, in some areas in the second tier there is spruce. The undergrowth layer is well developed; buckthorn, bird cherry, viburnum, cumanica, raspberry (*Rubus idaeus*), blackcurrant, and various species of willows (*Salix cinerea*, *S. myrsinifolia*, etc.) are found, and hazel is rarely found in black alder.

In the black alder of the meadowsweet, the meadowsweet meadowsweet dominates, the nettle is common here, the common nettle (*Galium palustre*), the common loosestrife, the common moorwort, the different types of sedge and bog grass.

The ferns *Athirium filix-femina*, *Dryopteris carthusiana*, *Thelypteris palustris*, dioica nettle, *Impatiens ordinary* (*Impatiens noli-tangere*), meadowsweet, *Solanum dulara*) are widely represented in the ground cover of alder fern.

Areas of lowland waterlogging with strong water cut and low flow rate are occupied by sedge alder forests. Marsh alpine ferns occupy closed depressions of the relief, which have strong flooding and temporary stagnation of waters.

In the stands, in addition to alder, there is fluffy birch, less often spruce. The undergrowth layer is well developed here. In the living ground cover of alder sedge sediment abundance of sedges (*Carex riparia*, *C. acutiformis*, *C. canescens*, *C. elongata*, *C. vesicaria*, etc.), marsh grass is also widely represented. *Thelypteris palustris*, *Solanum dulcamara*, *Galium palustre*, *Lysimachia vulgaris*, *Lythrum salicaria*, as well as various species of sedges and other species of marsh plants, are constantly found in the alder marsh-fern.

*The gray alder forests* of the R-46 highway reconstruction area are represented by two typological groups:

- gray alder sour forests in combination with fern and chrysanthemum forests arose on the site of spruce, broad-leaved-spruce, broad-leaved-pine and broad-leaved forests.

They grow in low, level places with sod-podzolic sandy loam and loamy fresh, sometimes



moist soils. In the stands of these gray alder forests, in addition to the gray alder (*Alnus incana*), spruce, aspen, oak, and ash can be present. In the understory - buckthorn, mountain ash, raspberries. In the ground cover there is common dapple, common touchy, dioica nettle, greenfinch, creeping tenacious, European unguilate, sour, ferns (**Figure 5.44**).



**Figure 5.44:** *Gray alder forests in the study area*

- gray alder meadowsweet forests in combination with nettle and sedge-blueberry are derived from deciduous-spruce and broad-leaved-spruce-black alder forests (**Figure 5.45**).



**Figure 5.45:** *Gray alder meadowsweet forests in the study area*

These forests are confined to low places adjacent to the water, with sod-podzolic-gley sandy loamy or loamy moist soils. In the wood layer there is an admixture of black alder, less often oak, elm, ash. Buckthorn, mountain ash, raspberries, cumonica, and currants are found in the understory. In the grass cover there are meadowsweet, chickweed, loosestrife, bog scrub (*Crepis paludosa*), river gravel (*Geum rivale*), nettle and other species.



Gray alder also grows in separate small curtains near some watercourses, on the edges of agricultural fields and unused lands, where cereals are found in the ground cover: narrow-leaved bluegrass, red fescue (*Festuca rubra*), dog barn (*Agrostis canina*), as well as representatives of forbs - wild strawberries, creeping clover (*Trifolium repens*), common blackhead (*Prunella vulgaris*), bracken, etc.

Along the R-46 highway, there are areas of artificial tree planting. Plantings are of different ages; forest stands of the following species are found:

- - monodominant, consisting of spruce or pine (**Figure 5.46**);
- - mixed, consisting of spruce and birch or pine and birch (**Figure 5.47**).



**Figure 5.46:** *Monodominant forests consisting of spruce or pine forests in the study area*



**Figure 5.47:** *Mixed forests consisting of spruce and birch forests in the study area*

Along the R-46 highway, 1.700–61.500 km, there are tree stands that serve as protective stands along highways, as well as a decorative function (**Figure 5.48**).



**Figure 5.48:** *Protective plantings along the highway*

The age and species composition of the stands differs significantly in different sections of the road and is represented by the following tree species: common spruce, common ash, saggy birch, aspen, Canadian poplar. Trees are planted either in clean single or double rows, or in mixed rows. The vast majority of trees in the plantings are middle-aged, in relatively good condition and fulfill their target functions. Some plantings require additional care in the form of removal of dead and drying trees, pruning and removal of dry branches of 2-3 orders in the crown. In place of trees cut down or lost, it is advisable to plant new, pollution-resistant species (linden, maple, poplar, etc.).

In some sections, the highway is bordered by young spruce seedlings that form snow-retaining stripes. Decorative and fruit tree introductions are occasionally found near roadside settlements in roadside plantations — common lilac, home apple, plum home, cherry plum, vesicular leaves, etc., (**Figure 5.49**).





**Figure 5.49:** *Introduced decorative and fruit trees along the road*

The significance of the majority of forest communities along the proposed highway in maintaining biodiversity is assessed as moderate and relatively low. During the preparatory and construction works, these forest stands will be partially cut down, however, the biotopes that fall into the permanent allotment zone are quite representative of the stands along the erected section of the road.

In order to reduce the negative impact on the plant communities of the region, the removal of vegetation objects is planned to be the minimum possible.

According to a letter from the Lepel District Inspectorate of Natural Resources and Environmental Protection (Ref. No. 334 of 10/17/2017, Appendix B), there are no registered plant growth sites listed in the Red Book of the Republic of Belarus in the area of the reconstructed section of the R-46 highway.

GLHU “Lepel Forestry” informs (out. No. 2849 dated 10.24.2017, Appendix B) that there are no plant growth sites listed in the Red Book of the Republic of Belarus in the zone of influence of the designed project.

According to the information of the Ushachsky District Inspectorate of Natural Resources and Environmental Protection (Ref. No. 01-31 / 319 of 10/18/2017) and the State Forestry Institution "Ushachsky Forestry" (Ref. No. 1254 of 10/20/2017) (Appendix B) in the zone of influence of the object " Highway R-46 Lepel-Polotsk-border of the Russian Federation (Yukhnovichi) 1.700–61.500 km ”in the territory of the Ushachsky district, there are no places of plant growth listed in the Red Book of the Republic of Belarus.

According to the letters of the Novopolotsk City and District Inspectorate of Natural Resources and Environmental Protection (Ref. No. 01-42 / 745 of 12/18/2017, Appendix B) and GLHU “Polotsk Forestry” (Ref. No. 667 of 10/24/2017, Appendix B) to the zone of influence of the object of reconstruction in the Polotsk region there are no places of growth of plants listed in the Red Book.

During field surveys, in the vicinity of Plusy village and Mezjno-2 of Polotsk region, in the zone of potential impact of the reconstructed section of the road, previously unknown growing places of a protected plant species were found - the open lumbago (*Pulsatilla patens* (L.) Mill.) (**Figure 5.50**)



**Figure 5.50:** *Eastern pasqueflower and place of its growth*

The identified localities of the plant growth places impose restrictions on doing business in quarters 43 (allotment 23), 44 (allotments 20, 41), 50 (allotments 1, 11) of the Gomel forestry of the GLHU Polotsk Forestry.

The following growth sites were identified:

- 50.8 km to the left, Polotsk Leskhoz GLHU, Gomel Forestry, quarter 44, allotment 20, 55 ° 22'4.56 "N 28 ° 48'30.88"E- about 10 groups of shrubs measuring 20x100 m;
- 51.0 km to the right, GLHU Polotsk Forestry, Gomel Forestry. quarter 44, allotment 41, 55 ° 21'55.43 "N 28 ° 48'30.92"E - more than 10 groups of shrubs with an area of 25x10 m.

During field studies in the area of the planned activity, one place of plant growth was identified that belongs to the species included in the Red Book of the Republic of Belarus - Sedge rhizomatous (*Carex rhizina* Blytt ex Lindbl.), protection category IV (**Figure 5.51**).

The place of plant growth in the 14th quarter of the 6th Polotsk Forestry State Forestry Center "Polotsk Forestry" within option 1 Polotsk City bypass.





**Figure 5.51:** *Sedge rhizomatous and its place of grows*

Vitebsk region is a territory of active and diverse economic development, long-term and fairly intensive settlement. It belongs to the category of long-developed agro-industrial regions of Belarus, therefore, along the reconstructed section of the R-46 highway, a significant part of the area is constituted by areas subject to intense anthropogenic impact - these are the territories of settlements, as well as land occupied in agricultural circulation.

The dominant type of vegetation in the area of reconstruction of the R-46, 1.700–61.500 km highway, in the areas occupied in agriculture, is segetal vegetation formed on agricultural lands (**Figure 5.52**).

The most widespread representatives of segetal flora in farmland are the following plant species: creeping wheatgrass (*Elytrigia repens*), odorless tripe (*Tripleurospermum inodorum*), annual diva (*Scleranthus annuus*), four-pointed galinsoga (*Galinsoga quadriradiata*), summer foliage *Viola arvensis*), blue cornflower (*Centaurea cyanus*), white gauze (*Chenopodium album*), field bindweed (*Convolvulus arvensis*), field creeper (*Cirsium arvense*), field sow thistle (*Sonchus arvensis*), etc.



**Figure 5.52:** *Segetal vegetation along the highway*

In the study area, grassy ruderal vegetation of wastelands, wastelands, and other disturbed habitats, formed as a result of human activity, is widespread. Along the existing route of the R-46 highway, a considerable area along the roadway is occupied by ruderal roadside communities, actively cropped during the growing season (**Figure 5.53**).



**Figure 5.53:** *Ruderal vegetation along the highway*

The following plants were most widely distributed: common dandelion (*Taraxacum officinale*), large plantain (*Plantago major*), common chicory (*Cichorium intybus*), wormwood (*Artemisia absinthium*) and common (*Artemisia vulgaris*), short-haired sedge (*Carex hirta*) curly (*Rumex crispus*), annual bluegrass (*Poa annua*), tansy (*Tanacetum vulgare*), yarrow (*Achillea millefolium*), goose cinquefoil (*Potentilla anserina*), mountaineer bird (*Polygonum aviculare*), etc.

Along the reconstructed section of the R-46 highway, along almost the entire length (especially near water bodies and humid shady edges of deciduous forests), in the Ushachsky and Polotsk districts, the habitats of Sosnovsky (*Heracleum sosnowskii*), one of the most dangerous aggressive species, were found (**Figure 5.54**). Other massive invasive plants along the road are



perennial lupins (*Lupinus polyphyllus*) and reed fescue (*Festuca arundinacea*).



**Figure 5.54:** *Sosnowski hogweed along the highway*

The segetal and ruderal types of vegetation are not important for the preservation of floristic diversity along the reconstructed highway. However, ongoing construction work may lead to a further, wider distribution of the diaspores of these alien species. In this regard, the soil used for construction should be free from the seeds of Sosnovsky hogweed, and the roadsides should be regularly trimmed (2 times a year) before the flowering of these plant species begins.

Since the highway runs through settlements, residential vegetation is common in residential areas. This type of vegetation is represented by lawn, flower, shrub plantings, tree plantings. The vegetation of the village cemeteries along the highway has a similar nature (**Figure 5.55**).



**Figure 5.55:** *Residential vegetation along the highway*

To preserve natural diversity, residential vegetation is not valuable, however, in some cases, it is a potential source of the distribution of aggressive alien species from these places — the Commonweed (*Phococarpus opulifolius*), the mountain ash (*Sorbaria sorbifolia*), the white snowdrop (*Symphoricarpos albus*), and the ash maple *Acer negundo*) and others.

Meadow vegetation in the study area is quite widespread, and is found mainly in open areas of river valleys, near water bodies and in the right of way of the road.

Floodplain and lowland meadows are characterized by permanent or temporary excess moisture. The meadows of these groups are often combined with the formations of lowland grass marshes, forming meadow-bog complexes. They are represented by cereal, sedge, and wet-grass communities, where the presence of hygromesophytic species indicates a significant water cut of ecotopes. Their base, along with bushes, is most often formed by the double-reed spring (*Phalaroides arundinacea*) and common reed (figure). Significant abundance and occurrence are also characterized by large manna (*Glyceria maxima*), chytomycetes (*Juncus effusus*), crowded chythorn (*J. conglomeratus*), bluegrass (*Poa palustris*), bluegrass (*Poa palustris*), and horsetail (*Equisetum fluviatile*) common-leaved, common loosestrife, large species of sedges (*Carex acutiformis*, *C. riparia*, *C. vesicaria*), bulrush (*Scirpus sylvatica*), broadleaf cattail (*Typha latifolia*), etc.

Fragments of meadow vegetation near many watercourses and water bodies are subject to strong anthropogenic impact. Here, in addition to the recreational impact, there are littering, dry grass stalls (**Figure 5.56**). The grass cover in such places is severely disturbed, along with meadow-bog plants includes numerous ruderal species - nettles, forest bugs, Sosnovsky hogweed, etc.



**Figure 5.56: *Burnt dry grass along the road***

In forest glades and clearings, at the edges of forests and swamps, in the right of way of the road, quite common grassy-grassy meadows are quite common. They are based on red and meadow fescue, beechless rump (*Bromopsis inermis*), a team hedgehog (*Dactylis glomerata*), meadow timothy (*Phleum pratense*), fragrant spikelet (*Anthoxanthum odoratum*), medium-sized shake (*Briza media*), and thin wood pole (*Agrostis tenuis*) wheat grass creeping, etc.

Regionally rare meadow communities include phytocenoses with a high participation in the herbage of fluffy sheep (*Avenula pubescens*) and spring primrose, noted, for example, in the vicinity of the village of Gomel. In the absence of hayfields, upland plots of meadows are often shrubby and overgrown with young forest.

The R-46 highway Lepel-Polotsk border of the Russian Federation (Yukhovichi) 1.700–61.500 km crosses numerous watercourses (rivers, reclamation ditches, canals), passes near permanent and temporary water bodies (figure), therefore, in the study area as part of the coastal-water vegetation plants of the following phytocenotic groups are present [31]:

## 1. HYDROFITES

### 1.1. EUHYDROPHYTES

- 1.1.1. Eugidrophytes completely submerged
- 1.1.2. Eugidrophytes completely submerged, not rooted
- 1.1.3. Eugidrophytes completely submerged, rooting
- 1.1.4. Eugidrophytes with aerial generative organs
- 1.1.5. Eugidrophytes with aerial generative organs, rooted

### 1.2. PLASTIC HYDROPHYTES

- 1.2.1. Pleistohydrophytes non-rooting
- 1.2.2. Root Pleistohydrophytes

### 1.3. AEROHYDROPHYTES

- 1.3.1. Aerohydrophytes tall
- 1.3.2. Midhydrohydrophytes
- 1.3.3. Aerohydrophytes undersized

## 2. HYGROFITES



## 2.1. EUHYGROPHYTES

- 2.1.1. Tall eugrophytes
- 2.1.2. Medium growth eugrophytes
- 2.1.3. Eugidrophytes undersized

Arious types of overgrowing of water bodies intersected or located in the immediate vicinity of the highway are shown in **Figures 5.57** to **5.60**.



**Figure 5.57:** *Overgrowing ditch extending along the road*



**Figure 5.58:** *Overgrowing stream in the swamp near the road*





**Figure 5.59:** *Overgrowing of a river section near a road*



**Figure 5.60:** *Overgrowing of a pond located near a road*

Marsh vegetation in the study area is common and is represented by all the main types of bogs: upland, transitional and lowland. Lowland (eutrophic) marsh phytocenoses predominate. There are no large swamp massifs near the reconstructed section of the R-46 highway, but the number of shallow wetland sections is significant.

Lowland marshes are confined to the floodplains of lakes, rivers and other watercourses, and flowing hollows. In place of overgrown lakes, upland and transitional bogs form.

In the area of the planned activity, both forest lowland (eutrophic) and lowland grass (open) swamp complexes were noted.

Forest swamps are represented by small-leaved (fluffy birch and black alder) indigenous forests in the swamps (**Figure 5.61**), their description is given in the characteristics of forest

vegetation.



**Figure 5.61:** *Black alder forest in a swamp in the study area*

Open lowland swamps occupy the most flooded areas and are represented by grass, sedge and grass-shrub swamps (**Figure 5.62**).



**Figure 5.62:** *Open lowland swamp in the study area*

In conditions of high water cut and flow rate, reed marshes develop. Here, in addition to the dominant species of common reed, there are birch spruce (*Phalaroides arundinacea*), gray reed (*Calamagrostis canescens*), broadleaf cattail (*Typha latifolia*), as well as a large number of species of bog grass, shrubs and sedges.



On sedge bogs, the ground cover is formed by various types of sedges (*Carex acuta*, *C. acutiformis*, *C. echinata*, *C. rostrata*, *C. riparia*, *C. elongata*, *C. vesicaria*, etc.) and species of bog grasses (river gravel, marsh cinquefoil, bogweed, bluegrass, broomfly, marsh european breeder, aquatic sorrel (*Rumex aquaticus*), forget-me-not marsh (*Myosotis scorpioides*), officinalis officinalis (*Valeriana officinalis*), three-leaved watch (*Menyanthes trifoliata*), different species of tavola. species of willows (*Salix cinerea*, *S. triandra*, *S. pentandra*, *S. myrsinifolia*, etc.) (**Figure 5.63**).



**Figure 5.63:** *Sedge swamp in the study area*

Often, stagnant waterlogging of the territory near the highway leads to oppression and death of the tree layer, including trees forming protective plantings along the highway, for example, at km 12.5 (**Figure 5.64**).



**Figure 5.64:** *Dead trees appeared because of stagnant waterlogging of the territory*

Upland bogs are characterized by the oligotrophic type of vegetation. Bogs are distinguished by a relatively pronounced convexity of the surface, being treeless or rarely overgrown with pine. Due to the lack of mineral nutrition and low oxygen content in the soil, the pine tree does not form a continuous cover and is represented by undersized bog forms. Fluffy birch is found near the highway. The section of the upland swamp near the R-46 highway (17.3–17.7 km) belongs to the protected typical biotopes in accordance with the TCH 17.12-06-2014 (02120) - “5.1 Upper Swamps” (**Figure 5.65**).

The grass-shrub layer is formed by vaginal canyon, marsh myrtle, marsh rosemary, common white, blueberry, heather, along with sphagnum mosses (*Sphagnum cuspidatum*, *S. capillifolium*, *S. angustifolium*, etc.), which often forms the background of ground cover, ground cover, white archer (*Rhynchospora alba*), etc.

Transitional bogs are characterized by prolonged excess moisture with very weak water flow. In the study area are rare, narrow areas along the edges of the upland and lowland bogs. In the stand there are black alder, pine and fluffy birch, in the undergrowth - dense thickets of willow. In the ground cover there is a lot of reed, sedge (black, rough-fruited (*Carex lasiocarpa*), bloated (*Carex rostrata*), bubbly, grayish), common cotton grass, marsh cinquefoil, common loosestrife, there are marsh shrubs (bogged down and rosemary).



**Figure 5.65:** *Transitional bog plot in the study area*

### **Vegetation on the Polotsk City bypass**

The vegetation of the study area along the route of the planned Polotsk City bypass is represented by forest, segetal, residential, ruderal, meadow, coastal-water and marsh types.

Forest vegetation along the planned highway is represented by sections along the existing highway. Entrance No. 2 to Novopolotsk from the Polotsk – Glubokoe – border of the Republic of Lithuania (Kotlovka) and at the end of the designed road in the area adjacent to the R-46 highway. Certain areas with woody-shrubby vegetation are found along agricultural fields, railways and highways in the area where the facility is located, in the industrial zone of Polotsk and on the territory of Novopolotsk.



The route of the projected road runs through the territory of the Farinovsky forestry of the State Forestry Institution “Polotsk Leskhoz” and the Polotsk training and experimental forestry of the Polotsk State Forest College. The Polotsk forestry is located in the north-eastern part of the Vitebsk region on the territory of the Polotsk and Ushachsky districts. Part of the forests of the leshoz is located within the borders of the city of Polotsk and the city of Novopolotsk.

In the area of intersection of the designed highway and the industrial zone of Polotsk, they grow as separate trees of common pine (*Pinus sylvestris*), aspen (*Populus tremula*), hanging birch (*Betula pendula*), goat willow (*Salix caprea*) and brittle (*S. fragilis*), as well as small massifs, formed mainly by alder sulfur (*Alnus incana*) and fluffy birch (*Betula pubescens*), various species of willows, with a rare participation of hanging birch and aspen (**Figure 5.66**).

Often areas with woody-shrubby vegetation are located on soils with excessive moisture (**Figure 5.67**).

In small elevated areas on the stretch to the intersection with the P-45 highway, blueberry pine forests are found (**Figure 5.68**). As part of the stands, along with the ordinary pine, there is saggy birch.

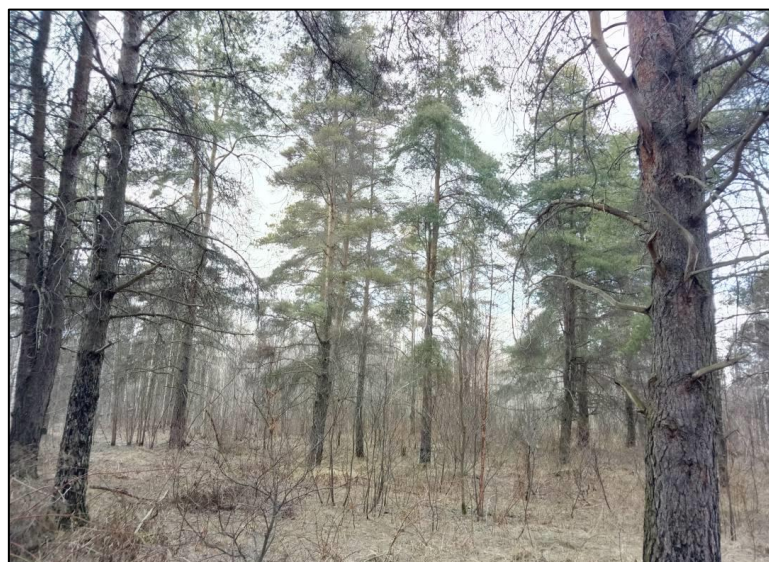


**Figure 5.66:** *The intersection of the designed highway with the railway*





**Figure 5.67:** *Trees and shrubs on soils with excessive moisture*



**Figure 5.68:** *Blueberry pine forest along the Polotsk City bypass road*

The undergrowth layer in these forests is dense, formed mainly by buckthorn brittle (*Frangula alnus*) and common mountain ash (*Sorbus aucuparia*), raspberries (*Rubus idaeus*) and cumanica (*Rubus nessensis*) are found. Bilberry (*Vaccinum myrtillus*), powdery boron (*Milium effusum*), reed reed (*Calamagrostis arundinaceus*), hairy swine (*Luzula pilosa*), oak grove (*Melampyrum nemorosum*), and lily of the valley (*Mayalis alv.*) grow in the ground cover. Also, green mosses (*Pleurozium schreberi*, *Dicranum undulatum*, *D. scoparium*, *Hylocomium splendens*).

After junction with the R-45 highway, the road runs for 4.2 km in the direction of the existing road. Entrance No. 2 to Novopolotsk from the Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka). Tree-shrubbery vegetation along the existing highway is noted along the banks of watercourses among agricultural fields, and by separate tape sections along the road.

Black alder (*Alnus glutinosa*), gray alder, drooping birch and various species of willow trees and shrubs (brittle (*Salix fragilis*), five-stamen (*S. pentandra*), three-stamen (*S. triandra*), blackening (*S. myrsinifolia*), ashy (*Salix cinerea*) grow along watercourses (**Figure 5.69**).



**Figure 5.69:** *Alder thickets along watercourses*

On waterlogged sections along the existing road, Access 2 to the city of Novopolotsk from the Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka) highway, shrub willow thickets are mainly found (**Figure 5.70**).



**Figure 5.70:** *Shrubby willow thickets along the Polotsk City bypass route*

In the forest from Ekiman-1 to unlocking the projected route from the road Porch No. 2 to Novopolotsk from the Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka), there are birch forests near the road - derivatives of phytocenoses from spruce forests, mainly bilberry type (**Figure 5.71**).

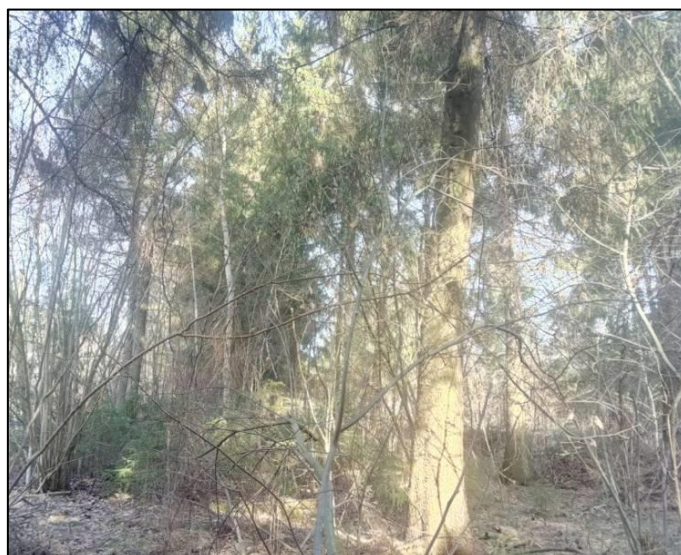




**Figure 5.71:** *A section of a birch forest along the Polotsk City bypass road*

In these stands, drooping birch dominates. In areas with increased moisture - mixed with fluffy birch. Norway spruce (*Picea abies*) is present mainly in the undergrowth, aspen is found in close proximity to the road. The undergrowth is thick, formed by the same species that are characteristic of indigenous phytocenoses. The main components of the undergrowth are brittle buckthorn, common mountain ash, and common hazel (*Corylus avellana*). The main background of the ground cover is created by blueberries and green mosses, lingonberries (*Vaccinium vitis-idaea*), hairy ozhik, common sour (*Oxalis acetosella*), oak star (*Stellaria nemorum*), creeper survivor (*Ajuga reptans*), two-leaved broom (*Mai mantum*) are found. unclear moths (*Pulmonaria obscura*) and others. In the lowest areas, sphagnum mosses are found in small areas.

In the indicated forest area, blueberry spruce forests are found in small contour areas (**Figure 5.72**).



**Figure 5.72:** *Spruce blueberry on the highway bypass Polotsk*

These sites are confined to even lower relief elements with moist podzolic and sod-podzolic sandy loam and loamy gleyed soils. In the stands, in addition to ordinary spruce, there are saggy

birch, fluffy birch, occasionally aspen, and black alder is noted near the waterways. Rowan, buckthorn, and hazel are abundant in the undergrowth.

The main edicator and dominant of the upper tier of the living ground cover is blueberries, lingonberries, hairy swallows, common sour acid, forest horsetail (*Equisetum sylvaticum*), common bracken (*Pteridium aquilinum*), unclear lungwort, creeping tartaris larvae, and mullet dwarf. *Hylocomium splendens*, *Dicranum undulatum*, *Pleurozium schreberi*, *Ptilium crista castrensis* and others. Sphagnum mosses are found in low waterlogged areas.

Also, spruce and mossy spruce forests are found in small contour areas in this territory.

The forest stands of mossy spruce forests are mostly monodominant, only occasionally the birch and aspen take part in the forest stand. The undergrowth layer is very poorly developed, closer to the edges there are mountain ash, less commonly hazel.

The species composition of the living ground cover is relatively poor, lingonberries and heather are common, sometimes blueberries occur in hollows, common sour oxides, double-leafed stalks, and boron are spread out in dispersed groups. *Pleurozium schreberi*, *Dicranum undulatum*, *D. scoparium*, *Hylocomium proliferum*, etc. are present in the moss layer.

The composition of the stands is rather complex, it is characterized by the presence of small-leaved (drooping birch, aspen) and broad-leaved species (English oak (*Quercus robur*), heart-shaped linden (*Tilia cordata*)). In the undergrowth common hazel, buckthorn brittle, common mountain ash, forest honeysuckle (*Lonicera xylosteum*) prevail.

In the ground cover of these forests, common oxalis forms the common background, representatives of the boreal flora are common: common bracken, female coomber (*Athyrium filix-femina*), male thyroid (*Dryopteris filix-mas*), and species of nemoral forbs.

On the left side of the road Entrance No. 2 to the city of Novopolotsk from the Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka) highway, along the cutting line under the power transmission line and gas pipeline, sections of pine forests are marked at a distance of more than 100 m from the road

Small sections of gray alder forests are noted near the road at the site of deforestation, in particular, in the area of the power line and gas pipeline at km 2.65 of the existing road; Entrance No. 2 to the city of Novopolotsk

In plantations, birch, aspen, and less often spruce (in the undergrowth) are mixed with gray alder. In the understory, mainly buckthorn, hazel and raspberry (*Rubus idaeus*). In the ground cover, common dwarf dominates (*Aegopodium podagraria*), nettles (*Urtica dioica*), common toucans (*Impatiens noli-tangere*), European hoofed moth (*Asarum europaeum*), noble liverwort (*Hepatica nobilis*), galliformes Ornate (*Chrysosplenium alternifolium*), etc.

As you approach the wetland (km 3.15 – km 3.88 of the existing road) Access No. 2 to Novopolotsk from the Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka) highway) black alder appears in the stands.

In the study area, black alder forests of sedge, bog ferns and willow forests are recorded, which belong to the typological group of black alder and fluffy birch-black alder grass-sedge forests in combination with bog ferns in lowland marshes (**Figure 5.73**). The stands of black alder mixed with fluffy birch and spruce. The undergrowth layer of willows (*Salix myrsinifolia*, *S. triandra*, *S. cinerea*) is well developed; in the willow alder, they form continuous thickets. The ground cover is formed by sedges (*Carex canescens*, *C. vesicaria*, *C. elongata*, *C. nigra*, etc.), representatives of the bog forbs: bog teliperis (*Thelypteris palustris*), bog marsh (*Comarum palustre*), marsh bentwort (*Caltha palustris*, *Ranunculus repens*), marsh bedstraw (*Galium*

palustre), common loosestrife (*Lysimachia vulgaris*), female cochlein, Chartres moth, etc.



**Figure 5.73:** *Black alder grass sedge forest along the Polotsk City bypass route*

Along the route of the bypass Option 2 there is a site that is a protected biotope – “6.6 Black alder and fluffy birch forests on excessively moistened soils and lowland marshes” (allotment 50 of quarter 23 of Polotsk forestry GLHU Polotsk Forestry).

On the left side of the existing road in the wetland, a sedge-sphagnum pine forest is marked, which is a bidominant pine-birch community (**Figure 5.74**). Shrubs are noted in the grass-shrub layer: blueberries (*Vaccinium uliginosum*), marsh rosemary (*Ledum palustre*), common whitebird (*Andromeda polifolia*), marsh myrtle (*Chamaedaphne calyculata*), blueberry hummocks (different species of *Vaccinium*) dominate in the bilberry (*Vaccinium uliginum*) (*Carex lasiocarpa*, *C. limosa*, *C. cinerea*), representatives of bog grass.



**Figure 5.74:** *Sedge-sphagnum pine forest along the Polotsk City bypass road*

At the junction of the transport interchange at the detachment of the constructed road from Entrance No. 2 to the city of Novopolotsk, the vegetation is represented by a small area of a young mixed planting of spruce-type fir mixed with warty birch, gray alder and aspe.

Further, on the territory of the proposed construction of Projected Street No. 6, Novopolotsk (according to the draft detailed plan) between the multi-storey buildings of Pervostroiteley Street (left) and the cottage buildings of Troitskaya Street (right) to the intersection with ul.



Youth vegetation is represented by young small forests of deciduous species - gray alder, warty birch, goat willow, hazel, single young spruce and pine trees.

In open unforested areas and clearings near the cottages (the distance to farm buildings in some cases does not exceed 15–20 m), grass-shrubbery vegetation is formed, which is dominated by ruderal nitrophilic meadow and edge-forest tall grass from the team hedgehog, forest bill, nettle, a double source of reed, buten of aromatic. There are areas with thickets of invasive American species - Canadian goldenrod (*Solidago canadense*). Shrub vegetation is represented mainly by various species of willow (goat, ashy, three-stamen, brittle), ash-leaved maple, bird cherry, young shoots of gray alder and warty birch (**Figure 5.75**).



**Figure 5.75:** *Territory with shrubby vegetation within the city of Novopolotsk*

Here, the territory is subject to strong anthropogenic pressure (recreation), the sanitary condition of the territory is unsatisfactory (littered with household waste).

When approaching st. Project No. 6 (according to the draft detailed plan) to the intersection with ul. Youth in the runoff hollow has a spring-loaded shallow body of water, formed as a result of the construction of ul. Youth, the slopes of which are overgrown with willow brittle and ashy, there are young trees of warty birch, alder black and gray, maple ash. The banks of the reservoir are overgrown with hygrophilic tall grass with a predominance of the double-reed source, cattails broadleaf, mannus flowing and large. The territory is undeveloped, littered (**Figure 5.76**).



**Figure 5.76:** *A loaded shallow body of water within the city of Novopolotsk*

On the site from the transport interchange with Molodezhnaya Street to the Zapadnaya Dvina River, small-leaved tree plantations are located. The terrain, formed in the runoff hollow, is replete with ravines and ravines. Young alder stands are dominated by gray nettles, with a slight participation of warty birch and spruce in the stand.

Along the edge of the floodplain terrace, there are small plots of barking warty birch forests, some of which are rarely found plant species, such as multi-flowered, wild strawberry, common ostrich, starlet oak, etc.

The picturesque relief and the proximity of the river determine the active use of this territory by the population for recreation and recreation (**Figure 5.77**).



**Figure 5.77:** *Recreational load on the study area*

In the place of the proposed construction of the bridge over the Zapadnaya Dvina River, on the banks of the river, shrubby vegetation develops with the participation of basket willow, brittle, purple, three-stamen, blackening. In some areas, willow shrubs form continuous thickets. In



their composition, an invasive American species is quite common - ash maple (*Acer negundo*) (**Figure 5.78**).



**Figure 5.78:** *Ash-leaved maple off the coast of the Zapadnaya Dvina river*

Along the highway where traffic interchange with the highway of the designed road is planned, there are plantings that serve as protective stands as well as a decorative one (Figure 41). Plantations are formed mainly by pine, trees are planted in double rows, but self-sowing of birch and aspen is sometimes found. The vast majority of trees in plantings are in relatively good condition and fulfill their target functions.

Further, the route of the proposed highway passes through a field with harvested crops overgrown with weedy-segetal plant species during the survey (field Veronica, spring, five-stalked spruce, annual diva, sandcracker, etc.) with a seasonal yellow aspect of common colza.

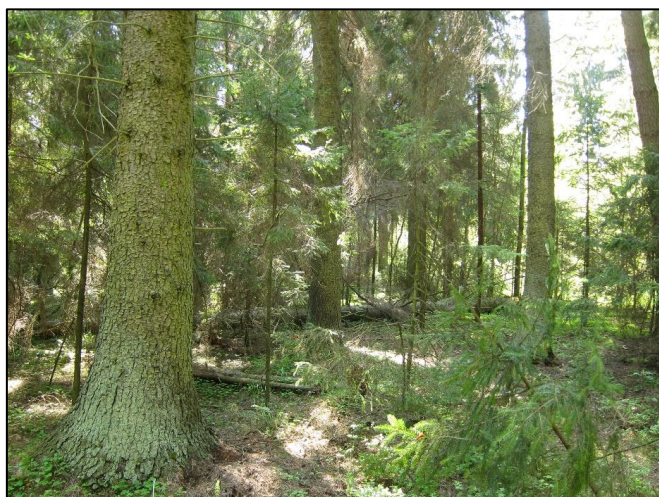
Further, the highway passes through the forest lands of the Polotsk training and experimental leshoz. These are ripening and ripe stands of mixed breed composition with a predominance of gray alder and warty birch. In the forest stand, spruce, pine and aspen are found as impurities, and occasionally, oak oak. Near the railway, a small area (0.7 ha) of saplar-type spruce grows (**Figure 5 79**).



**Figure 5.79:** *Acidiferous spruce on the lands of the Polotsk educational and experimental leshoz*

On the section of the Vitebsk – Bigosovo railway intersected by the proposed highway, mesophilic meadow vegetation develops with a predominance of herb-cereal phytocenoses. The dominants of the grass stand are fluffy sheep (*Avenula pubescens*), meadow fescue (*Festuca pratensis*) and red (*F. rubra*), meadow timothy (*Phleum pratense*), bluegrass (*Poa angustifolia*) and meadow (*Poa pratensis*). (drawing). In the forbs of roadside meadows, a regionally rare (possibly invasive) species, the cruciate nude (*Cruciata glabra*), was noted.

After crossing the railway, in a small section of the projected road, a ripe and complex sorrel spruce forest grows (**Figure 5.80**). As accompanying species, warty birch, aspen and pine grow in the upper forest layer. In the undergrowth - buckthorn, mountain ash, hazel, forest honeysuckle. Typical species in the ground cover are sorrel, blueberry, lanceolate, yellow Zelenchuk, branched boron, palm sedge, double-leafed stalk, medicinal, wild strawberry, Chartre and male thyroid, wall mycelis, veronica oak, and others. Insufficiently large. the stand does not allow us to consider this community as particularly valuable, unique or rare. However, its good preservation, favorable hydrological regime, and rich species composition of all structural elements of the forest community, in the future, will probably allow us to classify this biotope as typical (6.1. “Western taiga”). In this regard, economic activities at this site should be carried out while maintaining the integrity of the old spruce and pine trees (over 80 years old). Other components of this forest community (including live ground cover, large dead wood, old standing dead trees) should be preserved to the maximum extent.



**Figure 5.80:** *Ripe and complex in acid composition spruce is a potentially typical biotope*

Further, until the end of the course, the planned Polotsk City bypass passes through the reclaimed swampy pine forest.

Ledum pine forests grow on excessively moistened soils, and bilberry and longhorn pine forests are common on the periphery of the forest in places with pronounced clumpy nanorelief and drier soils, where blueberries and common flax dominate in the ground cover

In the rosemary pine forests, the main edificator of phytocenoses is pine. Fluffy birch acts as a co-identifier; common spruce is quite rare in young growth (**Figure 5.81**).



**Figure 5.81:** *Leduc pine on the lands of the Polotsk training and experimental leshoz*

Above sphagnum mosses (*Sphagnum russowii*, *S. girgensohnii*, *S. centrale*, etc.), almost continuous tier creates marsh rosemary and blueberries; occasionally, common whitewash, common hamedaphne and blueberry. Sparse cover forms vagina. These forest lands are actively used by the population to collect blueberries.

The route of the proposed highway partially passes through the land occupied in agriculture - at the beginning of the section to the intersection with the railway, then when passing along the existing highway Access 2 to the city of Novopolotsk from the Polotsk-Glubokoe border of the Republic of Lithuania (Kotlovka) and on the section intersections with the road. Access to the city of Polotsk from the highway Vitebsk-Polotsk-border of the Republic of Latvia (Grigorovschina).

The dominant type of vegetation in the area of the construction of the Polotsk City bypass in the areas occupied in agriculture is segetal vegetation on agricultural lands. Representatives of segetal communities are the following plant species: creeping wheatgrass, field violet, common taupe, white maar, large plantain, odorless tripe, grass calf, gray hooter, field bindweed, cyclic stork and many others.

In the study area, grassy ruderal vegetation is very common, since many areas of disturbed habitats formed as a result of human activity, underutilized and unused lands are noted along the projected route. Also, along the existing highway, Entrance No. 2 to Novopolotsk from the Polotsk-Glubokoe-border of the Republic of Lithuania (Kotlovka) highway, along which the designed road passes, and along the R-46 highway there are ruderal roadside communities.

The following weed-ruderal species of plants are most widely used: plantain big, bluegrass annual, common dandelion, common wormwood, common tansy, yarrow, goose cinquefoil, stonecrop, highlander, and many others.

During field studies, the habitats of Sosnovsky hogweed (*Heracleum sosnowskii*), one of the most dangerous invasive plants, were identified.

he segetal and ruderal types of vegetation are not important for the preservation of floristic diversity along the route of the constructed road.

Along the planned Polotsk City bypass, waterlogged areas with stagnation are very often observed, but on the 3.15–3.88 km section of the existing road, access 2 to the city of Novopolotsk from the Polotsk-Glubokoe border of the Republic of Lithuania (Kotlovka) on both sides Roads are relatively large swamp massifs, where swamp vegetation is widely



represented (**Figure 5.82**).



**Figure 5.82:** *Swamp vegetation along the bypass route of the city of Polotsk*

In the area of the planned activity, both forest lowland swamps and grassy (open) lowland swamps were noted.

Forest swamps are represented by small-leaved (black alder) indigenous forests in the swamps, their description is given in the characteristics of forest vegetation.

Open lowland swamps occupy the most flooded areas and are represented by grass, sedge and grass-shrub swamps.

Depending on the conditions of water cut and flow, swamps develop with the dominance of common reed (*Phragmites australis*) or various types of sedges (*Carex acuta*, *C. echinata*, *C. rostrata*, *C. canescens*, *C. elongata*, *C. vesicaria*, etc.).

In addition to the dominant species, reed canaries (*Phalaris arundinacea*), graying reed (*Calamagrostis canescens*), marsh grass and sedge are found on reed marshes; in areas of sedge bogs - bogwort, bluegrass (*Poa palustris*), river gravel (*Geum rivale*), broadleaf cattail (*Typha latifolia*), forget-me-not forget-me-nots (*Myosotis scorpioides*), medicinal valerian (*Valeriana officinalis*), ulavia elm (elm etc.), near the road there is overgrowing with various species of willows (*Salix cinerea*, *S. rosmarinifolia*, *S. pentandra*, *S. myrsinifolia*, etc.).

Due to the high degree of economic development of the region, the natural meadow vegetation of the area of the planned activity of small-scale and has limited distribution. Meadows are often combined with formations of low-lying grass bogs, forming meadow-bog complexes, which are represented by cereal, sedge, and wet-grass groups, where the abundance of hygromesophytic species indicates a significant water cut of ecotopes. The basis of the vegetation cover under these conditions is formed by the reed canary, large mannifer (*Glyceria maxima*), chythorn biloba (*Juncus effusus*), crowded biloba (*J. conglomeratus*), various species of sedges (*Carex* sp.), Bluegrass marsh, meadow fescue (*Festuca pratensis*), horsetail (*Equisetum fluviatile*), meadowsweet, common loosestrife

The floodplain vegetation of the Zapadnaya Dvina River is mainly represented by grass-grass associations. In areas of high-level meadows, the predominant types of cereals are meadow fescue, soddy meadow (*Deschampsia cespitosa*), meadow bluegrass (*Poa pratensis*), white polewort (*Agrostis alba*), meadow timothy grass (*Phleum pratense*), fragrant common spikelet (*Anthoxanthrys thr. (Sieglingia decumbens)*), sedge early (*Carex praecox*), calyx segmented (*Juncus articulatus*). The following types of herbs are represented: grass starlet (*Stellaria*

graminea), sorrel sorrel (*Rumex acetosa*), upright cinquefoil (*Potentilla erecta*), creeping buttercups (*Ranunculus repens*) and burning (*R. flammula*), meadow clover (*Trifolium pratense*) and medium (*T. medium*) and others.

Low level meadows are represented by hydromesophytic cereal and sedge associations.

Fragments of meadow vegetation on the left bank of the river are subject to strong anthropogenic impact due to their location within the city. The grass cover is sparse, severely disturbed and, along with meadow plants, includes ruderal species.

On the fringes of forests, along power lines, gas pipelines, roads, dry grass-grass meadows are fragmented, which in some cases do not have a continuous coating and are small-grass or fine-grass-grass associations. Their basis is often formed by red and meadow fescue, the hedgehog team (*Dactylis glomerata*), timothy grass meadow, thin polewort, creeping wheatgrass, soddy meadow, etc.

Polotsk City bypass crosses the Zapadnaya Dvina river (**Figure 5.83**), streams, reclamation canals; therefore, the studied territory contains coastal-aquatic vegetation represented by communities of eugidrophytes, pleistohydrophytes, air-water plants (aerohydrophytes), hygrophytes and hygrophelophytes [31]. The most widespread species of aquatic and semi-aquatic plants are reed birch sprouts, broadleaf cattail, manniferous large and swollen, reed, stonetiformes, common calamus, acute sedge, marsh calyx, plantain rhyme, arrowworm, small and three-lobed duckweed, common gooseberry, yellow.



**Figure 5.83:** *The intersection of the highway R-46 of the Zapadnaya Dvina River*

### **5.4.3. Wildlife**

According to zoogeographic zoning, the section of the reconstructed highway belongs to the Northern Lake District [6].

The section of the reconstructed highway R-46 Lepel-Polotsk-border of the Russian Federation (Yukhovichi) 1.700–61.500 km, passes through the lands occupied by forest vegetation, as well as through agricultural lands where the territory is characterized by low-value communities with low biodiversity.

The characteristic of the wildlife is given both on the basis of field observations made by the employees of the Belgiprodor State Enterprise and the Belarusian State University, as well as on the basis of literature data [32–37], as well as according to information from hunting farms.

## **Entomofauna (Insects)**

On the territory of the project, entomocomplexes are mainly represented by widespread species that live throughout Belarus.

The species composition of beetles in agrocenoses is characterized by widespread species of open spaces. On agricultural lands, insect pests of agricultural crops are found (bugs of the family bug turtle; butterflies and caterpillars of cabbage white; larvae of nutcracker beetles, etc.). In the soil layer in the wetlands, mosquito larvae, as well as larvae of flies of geese, are widespread.

On sections of the highway along forested lands in forest biocenoses, pests of forest species (bark beetles, grinder beetles, sawflies, leaf beetles, weevils, etc.) are common.

The mesofauna is represented by widespread species, characteristic not only for this region, but also for the entire country.

According to field studies and literature data, including published data from scientific research organizations, the entomofauna of the territory in question is represented by the classes: cryptogastric (entognatha) and insects (insecta).

Representatives of the following orders are included in the class of cryptomandibular: Protura, Collembola and Diplura.

Insects are represented by the following orders: Zygentoma, Odonata, Orthoptera, Dermaptera, Psocoptera, Phthiraptera, Thysanoptera, Hemiptera, Hymenoptera, Coleoptera, Neuroptera, Lepidoptera, Diptera, etc.

## **Ichthyofauna (Fish)**

The reconstructed section 1.700–61.500 km of the R-46 highway crosses the watercourses: the channel between Lake Gomel and Shchaty, designated as the Turzhanka River, the channel between the lake Gomel and Suya, designated as the Turovlyanka River, the rivers Vydritsa and Belchitsa.

The indicated watercourses belong to the third category of fishing lands; the composition of the ichthyofauna of these watercourses in the areas of construction works is depleted and quantitatively small to varying degrees.

In the ichthyofauna common freshwater fish species prevail (common roach, gudgeon, common ruff, river perch, etc.).

In accordance with the Comprehensive scheme of fishing land allocation approved by the Decree of the Ministry of Agriculture and Food of the Republic of Belarus dated 06/18/2014 No. 29, there are no fishing lands on the floodplains of Vydritsa, Belchitsa, Turzhanka and Turovlyanka.

In the area of the reconstructed section of the R-46 highway, there are lakes: Lepelskoe, Zmeinoe 1, Lyuktosh, Yanovo, Lesnoye, Gomel, Shchaty, Suya, Beloye, Zaozerye, Semenets, Trosno.

The ichthyofauna of Lepel Lake belongs to the bream-pike-perch type. The main types of fish: bream, zander, perch, roach, rudd, gley, tench, burbot. The lake is periodically stocked.

There are pike, roach, bream, perch and other fish species in Lake Yanovo, and zander and catfish are found. In different years, the lake was stocked with carp, carp and eel.

The ichthyofauna of Shchaty and Suya lakes is represented by the following fish species:

bream, perch, tench, roach, pike, crucian carp, etc.

In the lakes White, Zaozerye, Trosno live perch, roach, bream, pike, tench and other species. On Lake White organized paid recreational fishing.

The ichthyofauna of the remaining lakes is also represented by freshwater fish species.

In accordance with the Republican integrated scheme for the placement of fishing lands, the Lepelskoe, Lyuktosh, Gomel, Yanovo, Zaozerye, Suya and Shchaty lakes belong to the fishing lands:

- Lepelskoye Lake - to the bream-pike-roach class of ponds in Lepelsky district;
- Lake Lyuktosh - to the bream-pike-roach class of ponds in the Ushachsky district;
- Gomel and Yanovo lakes - to the bream-bustling class of reservoirs in the Polotsk region;
- Lake Zaozerye - to the perch-carp class of reservoirs in the Polotsk region;
- Lakes Suya and Shchaty - to the bream-pike-carpenter class of reservoirs in the Polotsk region.
- The designed bypass route of the city of Polotsk crosses the Zapadnaya Dvina River.

In accordance with the Republican comprehensive scheme for the placement of fishing lands, the Zapadnaya Dvina with adjacent floodplain water bodies within the Polotsk region is the first category of fishing grounds.

In the ichthyofauna common freshwater fish species predominate. On the riverbed section of the river live: chub, pike, bream, ide, asp, burbot, tench, pike perch; Among low-value fish species, perch, roach, ruff, grouse, rudd, gudgeon, etc. are found. Crucian carp and tench are confined to areas with a slowed flow.

## **Amphibians and Reptiles**

The studied territory is inhabited by species of amphibians and reptiles, widely found throughout the entire Vitebsk region.

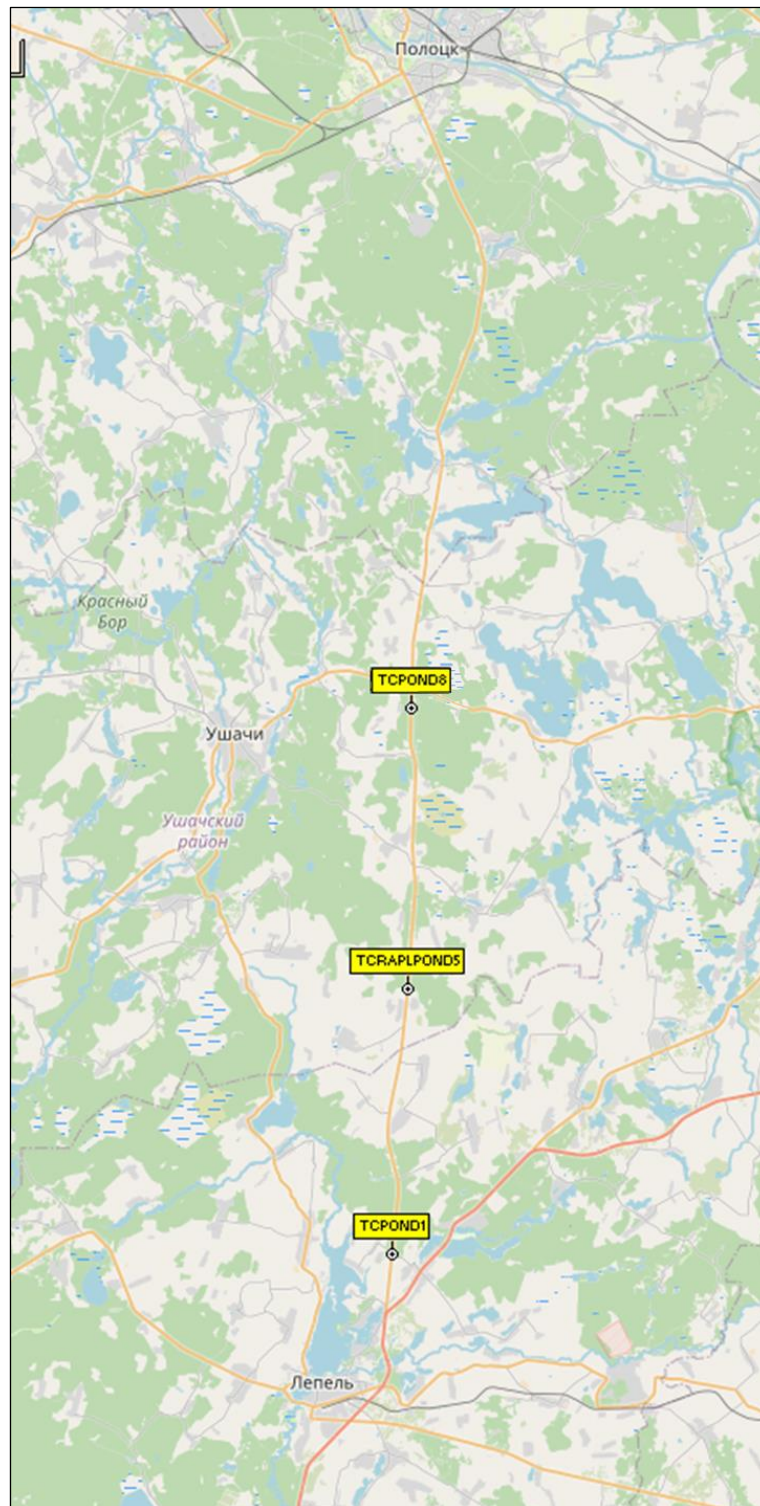
The following amphibian species are found in various types of biotopes (forest, near-water, etc.): grass frog (*Rana temporaria*), sharp-faced frog (*Rana arvalis*), lake frog (*Rana ridibunda*), pond frog (*Pelophylax lessonae*), edible frog (*Pelophylax esculentus*), red-bellied toad (*Bombina orientalis*), green (*Bufo viridis*), common garlic (*Pelobates fuscus*), common newt (*Lissotriton vulgaris*), comb newt (*Triturus cristatus*).

In addition, as a result of field studies, 3 habitats of the crested newt (*Triturus cristatus*), an animal belonging to species included in the Red Book of the Republic of Belarus, were found. Its IUCN status – LC [32] (**Figure 5.84**):

- 30.6 km on the right, GLHU “Ushachsky Leskhoz”, Sorochinskoye forestry, quarter 29, allotment 20 - habitat is located by the road embankment;
- 16.4 km on the right, GLHU “Ushachsky Leskhoz”, Sorochinskoye forestry, quarter 75, allotment five - habitat is located by the road embankment;
- 3.0 km on the right, GLHU “Lepel Forestry”, Zaozersky forestry, quarter 112, allotment 12 - habitat is located by the road embankment.

During the survey of amphibians, 76 reservoirs were surveyed potentially suitable for reproduction of amphibians. Of this number, 22 water bodies (28.9%) turned out to be

inhabited, which is a fairly high indicator for Belarus and relatively high for the Vitebsk region in particular. The main reasons for such a number of reservoirs inhabited by amphibians are a large number of natural depressions and irregularities in the landscape where water stagnates, located along the road. At the same time, a significant part of the surveyed water bodies is in a state of significant eutrophication or overgrowth, which reduces their attractiveness as breeding grounds for amphibians.



**Figure 5.84:** *Location of crested newt habitats along the P-46 road and in the area of its potential impact during construction*



The location of amphibian populations is mainly associated with flooding areas along the road, reservoirs and river floodplains, old shallow artificial reservoirs, as well as reservoirs created by beavers.

The fauna of amphibians and reptiles in the territories occupied in agriculture is characterized by a high degree of triviality and low density, since water bodies and streams in this territory are subject to constant eutrophication due to the flow of organic fertilizers, as well as the introduction of toxic chemicals (**Table 5.20**). Also, a low diversity and abundance of amphibians and reptiles is observed in territories subjected to heavy anthropogenic stress (buildings, industrial zone, etc.).

Within the framework of the State scientific and technical program “Natural Resources and the Environment” (the subprogram “Natural Resources and Their Complex Use”), specialists from the National Scientific and Practical Center for Biological Resources of the National Academy of Sciences of Belarus developed a scheme of problem sections of the republic’s roads with high intensity of amphibian migrants. In accordance with the studies carried out until 2012, areas with the death of amphibians were recorded on the reconstructed R-46 highway, presumably there are migration corridors of amphibians.

In the framework of this study, the study of the migration activity of amphibians was carried out. As a result, areas were identified on which migration occurs through the existing road and, in some cases, the massive death of amphibians.

In total, 3 plots with confirmed amphibian migration through the highway were allocated: pickets ПК 12 + 480...ПК 12 + 600; ПК 10 + 465...ПК 10 + 645 and ПК 6 + 780...ПК 7 + 100. Breeding sites are located at a distance of 20 to 50 m from the road embankment.

Among the reptiles in the study area there are: the lizard (*Lacerta agilis*), the live-bearing lizard (*Zootoca vivipara*), the common (*Natrix natrix*), the fragile spindle (*Anguis fragilis*), and the common viper (*Vipera berus*).

**Table 5.20: List of amphibians and reptiles found along the P-46 highway before reconstruction**

№	Family	Latin name	English name	IUCN Status [32]	Red Book of Belarus
<b>Amphibians</b>					
1	<i>Bufo</i>	<i>Bufo bufo</i>	Common toad	LC	
2	<i>Rana</i>	<i>Rana arvalis</i>	Moor frog	LC	
3	<i>Rana</i>	<i>Rana temporaria</i>	Common frog	LC	
4	<i>Pelophylax</i>	<i>Pelophylax lessonae</i>	Pool frog	LC	
5	<i>Pelophylax</i>	<i>Pelophylax ridibundus</i>	Marsh frog	LC	
6	<i>Pelophylax</i>	<i>Pelophylax esculentus</i>	Edible frog	LC	
7	<i>Triturus</i>	<i>Triturus cristatus</i>	Northern crested newt	LR	4(I)
8	<i>Lissotriton</i>	<i>Lissotriton vulgaris</i>	Smooth newt	LC	
<b>Reptiles</b>					
1	<i>Anguis</i>	<i>Anguis fragilis</i>	Slow worm	LC	
2	<i>Lacerta</i>	<i>Lacerta agilis</i>	Sand lizard	LC	
3	<i>Zootoca</i>	<i>Zootoca vivipara</i>	Viviparous lizard	LC	
4	<i>Natrix</i>	<i>Natrix natrix</i>	Grass snake	LC	
5	<i>Vipera</i>	<i>Vipera berus</i>	Common European viper	LC	

## Avifauna (Birds)

The avifauna of the vicinity of the study area is characterized by a fairly rich species diversity of birds. Both nesting and migratory species are widely represented.

In the region of reconstruction of the R-46 section of the road and the construction of the Polotsk City bypass, bird species belonging to the orders Vorobinovy, Anseriformes, Falconiformes, Ciconiiformes, Crane-like, Charadriiformes, Owl-like, Chicken-like, Cuckoo-shaped, live. The most numerous is the order Vorobyinobraznyh.

A significant part of the study area passes through the territory covered by forest vegetation; therefore, there are bird species in the study area related to forest and tree-shrub ecological complexes: rattle (*Phylloscopus sibilatrix*), finch (*Fringilla coelebs*), great tit (*Parus major*), forest horse (*Anthus trivialis*), wren (*Troglodytes troglodytes*), forest curler (*Prunella modularis*), oriole (*Oriolus oriolus*), common cuckoo (*Cuculus canorus*), spotted woodpecker (*Dendrocopos major*), jay (*Garrulus* and many *glandarius*) (**Table 5.21**).

A section of the road crosses watercourses, and also passes near lakes and waterlogged places; in this regard, there are species of coastal-water and near-water-bog ecological complexes. Here, bird species such as mallard (*Anas platyrhynchos*), mute swan (*Cygnus olor*), white stork (*Ciconia ciconia*), gray heron (*Ardea cinerea*), teal crackling (*Anas querquedula*), and lake gull (*Larus ridibundus*) are found here.

**Table 5.21: Avifauna, occurring along the road R-46 to the reconstruction**

№	Family	Latin name	English name	IUCN Status [32]	Red Book of Belarus
1.	<i>Sylviidae</i>	<i>Phylloscopus sibilatrix</i>	Wood warbler	LC	-
2.	<i>Fringillidae</i>	<i>Fringilla coelebs</i>	Common chaffinch	LC	-
3.	<i>Paridae</i>	<i>Parus major</i>	Great tit	LC	-
4.	<i>Motacillidae</i>	<i>Anthus trivialis</i>	Tree pipit	LC	-
5.	<i>Troglodytidae</i>	<i>Troglodytes</i>	Eurasian wren	LC	-
6.	<i>Prunellidae</i>	<i>Prunella modularis</i>	Dunnock	LC	-
7.	<i>Oriolidae</i>	<i>Oriolus</i>	Eurasian golden oriole	LC	-
8.	<i>Cuculidae</i>	<i>Cuculus canorus</i>	Common cuckoo	LC	-
9.	<i>Picidae</i>	<i>Dendrocopos major</i>	Great spotted woodpecker	LC	-
10.	<i>Corvidae</i>	<i>Garrulus glandarius</i>	Eurasian jay	LC	-
11.	<i>Anatidae</i>	<i>Anas platyrhynchos</i>	Mallard	LC	-
12.	<i>Anatidae</i>	<i>Cygnus olor</i>	Mute swan	LC	-
13.	<i>Ciconiidae</i>	<i>Ciconia</i>	White stork	LC	-
14.	<i>Ardeidae</i>	<i>Ardea cinerea</i>	Grey heron	LC	-
15.	<i>Anatidae</i>	<i>Anas querquedula</i>	Garganey	LC	-
16.	<i>Laridae</i>	<i>Larus ridibundus</i>	Black-headed gull	LC	-
17.	<i>Muscicapidae</i>	<i>Saxicola rubetra</i>	Whinchat	LC	-
18.	<i>Motacillidae</i>	<i>Anthus campestris</i>	Tawny pipit	LC	-
19.	<i>Charadriidae</i>	<i>Vanellus</i>	Northern lapwing	LC	-
20.	<i>Alaudidae</i>	<i>Alauda arvensis</i>	Eurasian skylark	LC	-
21.	<i>Sylviidae</i>	<i>Sylvia communis</i>	Common whitethroat	LC	-
22.	<i>Emberizidae</i>	<i>Emberiza citrinella</i>	Yellowhammer	LC	-
23.	<i>Accipetridae</i>	<i>Buteo buteo</i>	Common buzzard	LC	-
24.	<i>Accipetridae</i>	<i>Circus aeruginosus</i>	Western marsh harrier	LC	-
25.	<i>Accipetridae</i>	<i>Circus pygargus</i>	Montagu's harrier	LC	-
26.	<i>Corvidae</i>	<i>Pica pica</i>	Eurasian magpie	LC	-

№	Family	Latin name	English name	IUCN Status [32]	Red Book of Belarus
27.	<i>Corvidae</i>	<i>Corvus monedula</i>	Western jackdaw	LC	-
28.	<i>Corvidae</i>	<i>Corvus cornix</i>	Hooded crow	LC	-
29.	<i>Corvidae</i>	<i>Corvus frugilegus</i>	Rook	LC	-
30.	<i>Passeridae</i>	<i>Passer domesticus</i>	House sparrow	LC	-
31.	<i>Anatidae</i>	<i>Aythya ferina</i>	Common pochard	LC	-
32.	<i>Anatidae</i>	<i>Anas querquedula</i>	Garganey	LC	-

The following bird species are the common species on agricultural lands: meadow mint (*Saxicola rubetra*), field horse (*Anthus campestris*), lapwing (*Vanellus vanellus*), field lark (*Alauda arvensis*), gray grave (*Sylvia communis*), and oatmeal (*Emberiza citrinella*) etc. Agricultural lands are the nuclei of attraction for many birds and rodents, therefore there are birds of prey here: common buzzard (*Buteo buteo*), marsh harrow (*Circus aeruginosus*), meadow harrier (*Circus pygargus*), etc.

Near the settlements, bird species belonging to the synanthropic ecological complex were noted: magpie (*Pica pica*), jackdaw (*Corvus monedula*), gray crow (*Corvus cornix*), rook (*Corvus frugilegus*), house sparrow (*Passer domesticus*), etc.

In the floodplain of the Zapadnaya Dvina River, most birds belonging to the orders Anseriformes and Charadriiformes use this territory during seasonal migrations and migrations. In the area of the planned placement of the bridge over the Zapadnaya Dvina River, mallard, red-headed dive, and teal-cracker are noted.

For the studied territory, the habitat of bird species included in the Red Book of the Republic of Belarus is not characteristic.

## Mammals

Theriofauna of the study area is quite diverse. The basis of the mammalian world is formed by widespread species characteristic of natural forest and open landscapes. Representatives of all groups registered in the fauna of the republic meet in the area where the facility is located (**Table 5.22**).

The most abundant rodents on the agricultural lands are the common vole (*Microtus arvalis*), the red vole (*Myodes glareolys*), the house vole (*Microtus oeconomus*), the field mouse (*Apodemus agrarius*), as well as representatives of the Squid (*Soricomorpha*) order: common mole (*Talpa europaea*), shrews (*Sorex sp.*), etc. Agricultural fields can serve as a food base for the brown hare (*Lepus europaeus*), white hare (*Lepus timidus*). Of the predators on agricultural lands, there can be found a fox (*Vulpes vulpes*), a weasel (*Mustela nivalis*), and a forest polecat (*Mustela putorius*).

The near-water biotopes inhabit: muskrat (*Ondatra zibethicus*), river beaver (*Castor fiber*), river otter (*Lutra lutra*), American mink (*Mustela vison*).

Near the reconstructed section of the R-46 highway, beaver dams and traces of beaver activity were found on some watercourses and wetlands.

Representatives of the Rodent order such as the red-backed vole (*Myodes glareolus*), yellow-necked mouse (*Apodemus flavicollis*), and forest mouse (*A. sylvaticus*) are found in forest biotopes. Of the predators in the forests of the region of the planned economic activity, the forest polecat, the common fox, the wolf (*Canis lupus*), the raccoon dog (*Nyctereutes procyonoides*), the marten (*Martes martes*) and the stone (*M. foina*), weasel, live. A ubiquitous

species is the common hedgehog (*Erinaceus europaeus*).

According to information from hunting farms, the following species of artiodactyls, which represent the main danger to traffic, live in the forested areas of the site where the object is located: European roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*), red deer (*Cervus elaphus*), elk (*Alces alces*). During environmental surveys, traces of ungulates on forest roads, trails, and a fire strip were noted.

Due to the proximity of the Berezinsky Biosphere Reserve, bears are regularly encountered in the road construction zone, which use the territory as a transit and feeding area (searching for and consuming food).

According to letters from the Lepel District Inspectorate of Natural Resources and Environmental Protection and the Lepel Forestry State Forestry Institution, there are no registered habitats of animals listed in the Red Book of the Republic of Belarus in the area of the reconstructed section of the R-46 highway.

**Table 5.22: List of mammals found along the P-46 highway before reconstruction**

№	Family	Latin name	English name	IUCN Status	Red book of Belarus
1.	<i>Castoridae</i>	<i>Castor fiber</i>	Eurasian beaver	LC	-
2.	<i>Erinaceidae</i>	<i>Erinaceus europaeus</i>	European hedgehog	LC	-
3.	<i>Leporidae</i>	<i>Lepus europaeus</i>	European hare	LC	-
4.	<i>Leporidae</i>	<i>Lepus timidus</i>	Mountain hare	LC	-
5.	<i>Talpidae</i>	<i>Talpa europaea</i>	European mole	LC	-
6.	<i>Mustelidae</i>	<i>Mustela nivalis</i>	Least weasel	LC	-
7.	<i>Mustelidae</i>	<i>Mustela putorius</i>	European polecat	LC	-
8.	<i>Mustelidae</i>	<i>Lutra lutra</i>	Eurasian otter	NT	-
9.	<i>Mustelidae</i>	<i>Mustela vison</i>	American mink	LC	-
10.	<i>Mustelidae</i>	<i>Martes martes</i>	European pine marten	LC	-
11.	<i>Mustelidae</i>	<i>Martes foina</i>	Beech marten	LC	-
12.	<i>Muridae</i>	<i>Apodemus agrarius</i>	Striped field mouse	LC	-
13.	<i>Muridae</i>	<i>Apodemus flavicollis</i>	Yellow-necked mouse	LC	-
14.	<i>Muridae</i>	<i>Apodemus sylvaticus</i>	Wood mouse	LC	-
15.	<i>Cervidae</i>	<i>Capreolus capreolus</i>	Roe deer	LC	-
16.	<i>Cervidae</i>	<i>Cervus elaphus</i>	Red deer	LC	-
17.	<i>Canidae</i>	<i>Vulpes vulpes</i>	Red fox	LC	-
18.	<i>Canidae</i>	<i>Canis lupus</i>	Wolf	LC	-
19.	<i>Canidae</i>	<i>Nyctereutes procyonoides</i>	Raccoon dog	LC	-
20.	<i>Suidae</i>	<i>Sus scrofa</i>	Wild boar	LC	-
21.	<i>Cricetidae</i>	<i>Myodes glareolys</i>	Bank vole	LC	-
22.	<i>Cricetidae</i>	<i>Microtus arvalis</i>	Common vole	LC	-
23.	<i>Cricetidae</i>	<i>Microtus oeconomus</i>	Tundra vole	LC	-
24.	<i>Cricetidae</i>	<i>Ondatra zibethicus</i>	Muskrat	LC	-
25.	<i>Cervidae</i>	<i>Alces alces</i>	Elk	LC	-
26.	<i>Ursidae</i>	<i>Ursus arctos</i>	Brown bear	LC	II

According to the Ushachsky District Inspectorate of Natural Resources and Environmental Protection and the Ushachsky Leskhoz GLHU in the zone of influence of the R-46 Lepel-Polotsk-Russian border (Yukhnovichi) 1.700–61.500 km object in the territory of the habitat of animals brought in in the Red Book of the Republic of Belarus, are absent.

According to letters from the Novopolotsk City and District Inspectorate for Natural Resources

and Environmental Protection and the Polotsk Forestry State Forestry Institution there are no habitats for animals listed in the Red Book of the Republic of Belarus in the zone of influence of the reconstruction object in the Polotsk region.

According to the map-scheme of the main migratory corridors of ungulates in Belarus (Figure 82), developed by the National Scientific and Practical Center “Biological Resources of the National Academy of Sciences of Belarus” under the project “Development of the scheme of the main migration corridors of model species of wild animals in the Republic of Belarus 2013-2015” with funding from the Ministry natural resources and environmental protection of the Republic of Belarus, and recommended for use in the work of organizations involved in the development of project documentation (letter of the Ministry of Natural Resources of the Republic of Belarus dated 02.11.2016 No. 10-9 / 2931-vn), the reconstructed section of the R-46 highway crosses the ungulate corridors in the areas of km 3–9.5 km, 26–41 km, 53–57.8 km.

The reconstructed section of the R-46 road passes through the territory of the following hunting farms: GLPU “Lepelsky Forestry”, Institution “Ushachsky District Organizational Structure” RSOO “BOOR”, Hunting Farm UChP “Swan”, Institution “Polotsk District Organizational Structure” RSOO “BOOR”.

According to the State Forestry Institution “Lepel Forestry” (Ref. No. 2849 dated 10.24.2017, Appendix B), on the R-46 highway, over the past 3 years, animal deaths were recorded at 3, 4, 8, 9, 12 kilometers.

According to the Institution "Ushachsky District Organizational Structure" of the Republican State and Public Association "Belarusian Society of Hunters and Fishers" (outgoing No. 158 of November 9, 2017, Appendix B), cases of traffic accidents were recorded on the R-46 highway in recent years with wild animals at 12, 18, 22, 25, 35 kilometers of the road, also in the areas of km 16 - km 22.5 and km 34 - km 36.5, migration activity of animals was noted.

According to the data available at the State Automobile Inspectorate of the Internal Affairs Directorate of the Vitebsk Regional Executive Committee (outgoing No. 7/20659 of 11/22/2017, Appendix B) for the period 2013-2017. on the R-46 highway, road accidents involving wild animals occurred on the following kilometers of the road: 2, 3, 4, 8, 9, 11, 12, 17, 19, 27, 29, 30, 31, 33, 34, 37, 42, 43, 44, 50, and 53.

## **5.5. Social conditions**

R-46 highway is a road of national importance and provides transport links to the administrative centers of the districts and nearby settlements of the Vitebsk region. The road carries out regular transit traffic of trucks carrying out international transportation in the direction from the Republic of Belarus to the Russian Federation.

R-46 highway passes through the territory of the Vitebsk region. Two other large European highways pass through the territory of the region - E30 (M-1) and E95 (M-8), intersecting in the Orsha region [39].

The considered section of the R-46 highway 1,700 - 61,500 km is located in the Lepel, Ushach and Polotsk districts of the Vitebsk region.

The assessment of the socio-economic situation in the area of the planned activity was carried out on the basis of literature sources, reference and specialized statistical information, reports on EIA of projects for the reconstruction of the R-46 highway and the construction of a bypass in Polotsk prepared by the State Enterprise Belgiprodor. Additionally, demographic and statistical information was obtained from representatives of local authorities, as well as through



consultations and surveys.

To identify vulnerable groups of the population (disabled people, pensioners, children, women), consultations were held with representatives of regional and rural executive committees (in particular, with representatives of the departments for labor, employment and social protection of regional executive committees), socio-economic, demographic, information that provided in village executive committees. The analysis of the information received showed that the most effective form of interaction with vulnerable groups is to organize contacts with them with the help of representatives of local authorities and to use the developed complaints mechanism in the future.

### **5.5.1. Administrative-territorial units in the Project area**

*Lepelsky district* is located in the south-west of the Vitebsk region. It borders with the Chashniki, Dokshitsky, Beshenkovichi, Ushachi regions. Area 1800 km<sup>2</sup>.

The largest population center of the region is its administrative center - the city of Lepel, located on the shore of Lake Lepel, located 110 km from Vitebsk and 150 km from Minsk.

A total of 225 rural settlements and two military towns are combined into 9 rural Councils: Bobrovsky, Borovsky, Volosovichsky, Gorsky, Domzheritsky, Kamensky, Lepelsky, Slobodsky, Staysky.

The M-3 Minsk-Vitebsk international highway passes through the district, republican roads: R-46 Lepel-Polotsk-border of the Russian Federation (Yukhovichi), R-15 Krichev-Orsha-Lepel, R-86 Bogushevsk (from M-8) -Senno -Lerel-Myadel, R-116 Ushachi-Lepel. Lepel is the final destination of the Orsha-Lepel railway line, which is 130 km long [40].

*Ushachsky district* is located in the central part of the Vitebsk region, it borders on the Shumilinsky, Beshenkovichsky, Lepelsky, Dokshitsky, Gluboksky and Polotsky districts. Area - 1500 km<sup>2</sup>. The length from west to east is 65 km, from north to south - 30 km.

The center of the district is the town of Ushachi. In Ushachsky region there are more than 250 settlements. The district in administrative-territorial terms is divided into 7 village councils (Velikodoletsky, Verkudsky, Glybochensky, Zharsky, Kublichsky, Sorochinsky, Ushachsky).

Highways R-46 Lepel-Polotsk-border of the Russian Federation (Yukhovichi), R-113 Senno-Beshenkovichi-Ushachi, R-116 Ushachi-Lepel, R-29 Ushachi-Vileyka [34] pass along the territory of the district [41].

*Polotsky district* is located in the north-east of the Vitebsk region and occupies 3,140 km<sup>2</sup> (the largest in area in the Vitebsk region and the 4th in the Republic of Belarus). In the south, the district borders on Ushachsky and Gluboksky districts, in the southwest - on Verkhnedvinsky, in the northwest - on Rossonsky, in the north - on Gorodoksky, in the north-east - on Shumilinsky.

Polotsk district includes 403 settlements, of which 1 is a city - a regional center - the city of Polotsk; 1 urban village (Vetrino), 14 agro-towns. Administratively, the district is divided into 14 village Councils of Deputies: Azinsky, Babynichsky, Borovukhsky, Vetrinsky, Voronichsky, Gomelsky, Goryansky, Zelenkovsky, Malositnyansky, Ostrovshchinsky, Polotovskiy, Soloniksky, Farinovsky, Ekimansky [42].

### **5.5.2. Demographic situation**

Medical and demographic indicators, such as fertility, mortality, average life expectancy, are an important criterion for assessing the health status of a population, and the socio-economic well-being of a society. Demographic processes influence the course of all other social

processes.

One of the unfavorable demographic trends in the Belarusian regions is the loss of economically active population. According to the report of the Ministry of Economy on the development of the economic and demographic situation in the country, the population of rural regions of Belarus will decrease by 500 thousand people by 2032. According to the forecast, this can lead to the fact that the number of districts with a critical level of population that ensure sustainable socio-economic development of the territory can increase from 51 districts in the current situation to 77 by 2032 - this is more than 60% of the country's territory.

The demographic situation in the Vitebsk region reflects the situation characteristic of the whole country. Demographic trends are becoming negative and are caused by a variety of factors of a social and economic nature. The population is gradually decreasing, mainly due to a decrease in the rural population, and according to the data of the Main Statistical Office of the Vitebsk region at the beginning of 2019 it amounted to 1,171.6 thousand people, **Table 5.23** [43].

**Table 5.23: Population of the Vitebsk region**

Indicators	2016	2017	2018	2019
All population (thousand people)	<b>1 193,5</b>	<b>1 188,0</b>	<b>1 180,2</b>	<b>1 171,6</b>
urban	916,6	916,3	914,0	911,7
rural	276,9	271,7	266,2	259,9
men	551,3	549,3	546,3	542,3
women	642,2	638,7	633,9	629,3

The urban population of Vitebsk region makes up 77.8% of the total population.

In terms of regions of the republic, Vitebsk region is in fourth place in terms of population (**Figure 5.85**) [44, 45].



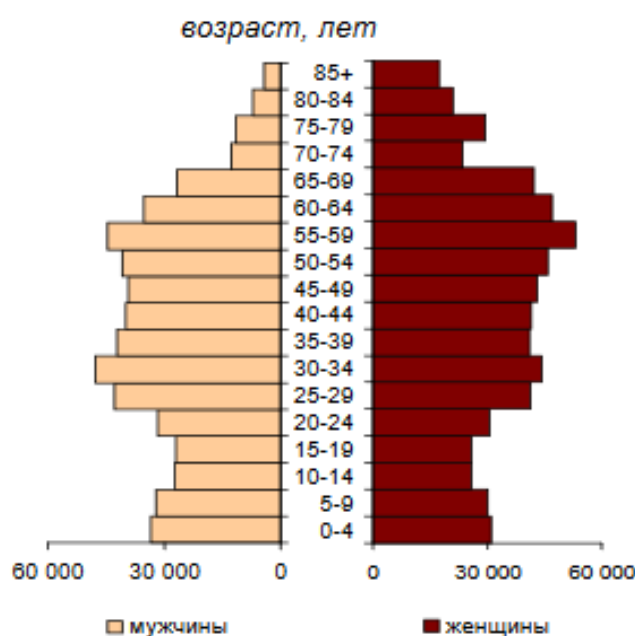
**Figure 5.85: Population of the Vitebsk region in comparison with other regions of the Republic of Belarus**

However, the population density indicator of the Vitebsk region is the lowest in Belarus, see **Table 5.24**.

**Table 5.24: Population density by regions and the city of Minsk**

Region	Territory, thousand km <sup>2</sup>	Population density, people per 1 km <sup>2</sup>
Republic of Belarus	207,6	46
region and Minsk:		
Brest	32,8	42,1
Vitebsk	40,1	29,2
Gomel	40,4	34,9
Grodno	25,1	41,4
Minsk	39,8	35,9
Minsk	0,35	5693,4
Mogilev	29,1	36,2

In the general structure of the population of the Vitebsk region, the proportion of the female population was 53.7%, the male - 46.3%. The ratio between the sexes is at the level of 1: 1.16. The age-sex pyramid of the population of the Vitebsk region is shown in **Figure 5.86** [43].



**Figure 5.86: Age and gender pyramid of the population of Vitebsk region**

One of the unfavorable demographic trends is the loss of economically active population. The main feature of the demographic situation in rural areas is the continuing decline in the population.

The main demographic indicators of the administrative units of the Vitebsk region: Lepelsky, Ushachsky and Polotsky districts of the Vitebsk region, through the territory of which the reconstructed section of the R-46 highway passes, are presented in **Tables 5.25** and **5.26** [43, 46].

**Table 5.25: Urban and Rural Population by Affected Areas**

Population (at the beginning of the year), people	2011	2014	2015	2016	2017	2018	2019
Lepel district	34 680	33 625	33 419	33 151	32 939	32 764	32 519
urban population (Lepel town)	17 427	17 608	17 630	17 690	17 822	17 828	17 846
rural population	17 253	16 017	15 789	15 461	15 117	14 936	14 673
Ushachsky district	15 371	14 251	13 969	13 805	13 463	13 236	12 942
urban population (Ushachi town)	5 518	6 071	6 036	6 030	5 948	5 974	5 930
rural population	9 853	8 180	7 933	7 775	7 515	7 262	7 012
Polotsk district	109 532	108 792	108 643	108 389	108 207	107 480	106 939
urban population	86 218	87 250	87 382	87 298	87 146	86 674	86 361
Polotsk	83 632	84 968	85 126	85 078	85 012	84 597	84 332
g.Vetrino	2 586	2 282	2 256	2 220	2 134	2 077	2 029
rural population	23 314	21 542	21 261	21 091	21 061	20 806	20 578

**Table 5.26: Vital population movement in affected areas**

Index (Lepel district)	2010	2013	2014	2015	2016	2017	2018
Number of births	336	425	441	395	361	313	305
Number of dead	578	528	523	503	511	458	513
Natural increase, decrease (-)	-242	-103	-82	-108	-150	-145	-208
Number of arrivals	1 046	1 105	1 230	1 406	1 208	1 266	1 134
Number of dropouts	1 359	1 313	1 354	1 566	1 270	1 296	1 171
Migration growth, decrease (-)	-313	-208	-124	-160	-62	-30	-37
Index (Ushachsky district)	2010	2013	2014	2015	2016	2017	2018
Number of births	137	155	130	154	143	128	99
Number of dead	399	353	338	301	340	295	316
Natural increase, decrease (-)	-262	-198	-208	-147	-197	-167	-217
Number of arrivals	530	473	496	539	435	496	351
Number of dropouts	741	604	570	556	580	556	428
Migration growth, decrease (-)	-211	-131	-74	-17	-145	-60	-77
Index (Polotsk district)	2010	2013	2014	2015	2016	2017	2018
Number of births	1 116	1 237	1 278	1 283	1 248	1 051	979
Number of dead	1 791	1 638	1 595	1 553	1 543	1 518	1 461
Natural increase, decrease (-)	-675	-401	-317	-270	-295	-467	-482
Number of arrivals	3 526	3 342	3 577	3 394	3 353	3 053	3 140
Number of dropouts	3 121	3 389	3 409	3 378	3 240	3 313	3 199
Migration growth, decrease (-)	405	-47	168	16	113	-260	-59

As can be seen from the data presented, the demographic situation in these areas remains tense:

the population is steadily decreasing, mainly due to the rural population.

The rural population is decreasing mainly due to the fact that the number of deaths annually exceeds the number of births. The second important statistical characteristic of the rural population is the degree of aging, which is at least 2 times higher than in the city. The third important feature of the demographic situation of rural settlements is the decline in the birth rate.

Also the most dangerous demographic threats are: intense depopulation; relatively low life expectancy, which should be regarded as a decrease in the viability of the population of the region; reduction in the population of rural areas and deformation of the gender and age structure of the rural population of the region; high coefficient of population aging, which means deformation of the age structure of the region's population.

Departure of the population outside the districts is another acute problem. In the Lepel and Ushach districts, the balance of migration was during 2013–2018. remains negative. In Polotsk district, migration growth was recorded in 2014–2016, but in 2017–2018. there is a migration decline in the population.

In these areas, as well as in the Vitebsk region as a whole, a regressive type of structure of the rural population is observed. The main age groups in the total population of the Lepelsky, Polotsky and Ushachsky districts and the city of Novopolotsk (in percent) are shown in **Table 5.27** [43, 46].

**Table 5.27: Population by age groups in affected areas**

Administrative unit of Vitebsk region	Age					
	younger than able-bodied		able-bodied		older than able-bodied	
	2011	2019	2011	2019	2011	2019
Lepel district	15,1	16,9	60,3	55,2	24,6	27,9
urban population	15,8	19,0	62,2	55,6	22,0	25,4
rural population	14,5	14,5	58,3	54,7	27,2	30,8
Ushachsky district	14,6	15,7	53,9	49,3	31,5	35,0
urban population	18,5	19,0	62,8	53,9	18,7	27,1
rural population	12,4	12,9	48,9	45,3	38,7	41,8
Polotsk district	14,4	16,6	61,2	57,9	24,4	25,5
urban population	14,7	17,1	62,8	59,4	22,5	23,5
rural population	13,5	14,6	55,1	51,3	31,4	34,1
Novopolotsk	13,7	15,6	65,1	61,1	21,2	23,3

The data indicate a decrease in the share of the able-bodied population and an increase in the share of the population over working age, which also indicates an unfavorable demographic situation in the Vitebsk region.

According to the National Statistical Committee of the Republic of Belarus, the average accrued wages in the country as of May 2020 amounted to BYN 1,227.9, which corresponded to USD 505.9. For comparison, in April the average salary was 1193.8 BYN (or 476.2 USD).

For the first half of 2019, the nominal average monthly wage in the Lepel district of the Vitebsk region was 770.2 BYN, Ushachsky - 675.5 BYN, Polotsk - 880.7 BYN.

Most of the citizens, whose interests may be affected, are employed in agriculture, or are retired. As can be seen from **Tables 5.28** and **5.29**, these are one of the poorest categories of the population.



**Table 5.28: Average salaries by industry and type of activity in the Republic of Belarus**

Industry	Nominal accrued average monthly wage, Belarusian rubles		Real wages, as a percentage of the corresponding period of the previous year	
	May 2020	January - May 2020	May 2020	January - May 2020
Total	1 227.90	1 177.20	108.7	107.9
Agriculture, forestry and fisheries	898	851.4	109.2	112
Industry	1 224.30	1 198.60	101.5	103
Building	1 343.40	1 284.90	106.7	109.6
Wholesale and retail trade; repair of cars and motorcycles	1 079.10	1 070.00	102.6	106.1
Transport activities, warehousing, postal and courier activities	1 170.50	1 141.30	96.2	98.6
Temporary accommodation and catering services	734.9	779.1	90.6	101
Information and communication	4 262.30	3 999.40	129.6	114.3
Financial and insurance activities	2 022.10	1 976.00	96.2	101.5
Real estate operations	963.8	945	103.8	106.3
Professional, scientific and technical activities	1 491.70	1 534.70	98	105.1
Activities in the field of administrative and support services	799.2	776.9	103.1	104.2
Education	879.5	837.4	110.2	110
Healthcare and social services	1 158.70	981.7	134.6	120
Creativity, sports, entertainment and recreation	800.5	851.4	100.8	109.2
Provision of other types of services	825.6	827.6	101.8	106.2

**Table 5.29: Average assigned monthly pensions in Belarus for 2019, BYN**

2019 year	Average assigned monthly pensions	Average old-age pensions granted
January	381.17	393.27
February	381.8	393.51
March	381.8	393.51
April	381.8	393.51
May	405.05	418.41
June	405.05	418.41
July	405.05	418.41
August	432.27	446.84
September	432.27	446.84
October	432.27	446.84

2019 year	Average assigned monthly pensions	Average old-age pensions granted
November	431.67	446.34
December	431.29	445.90

### 5.5.3. Public health

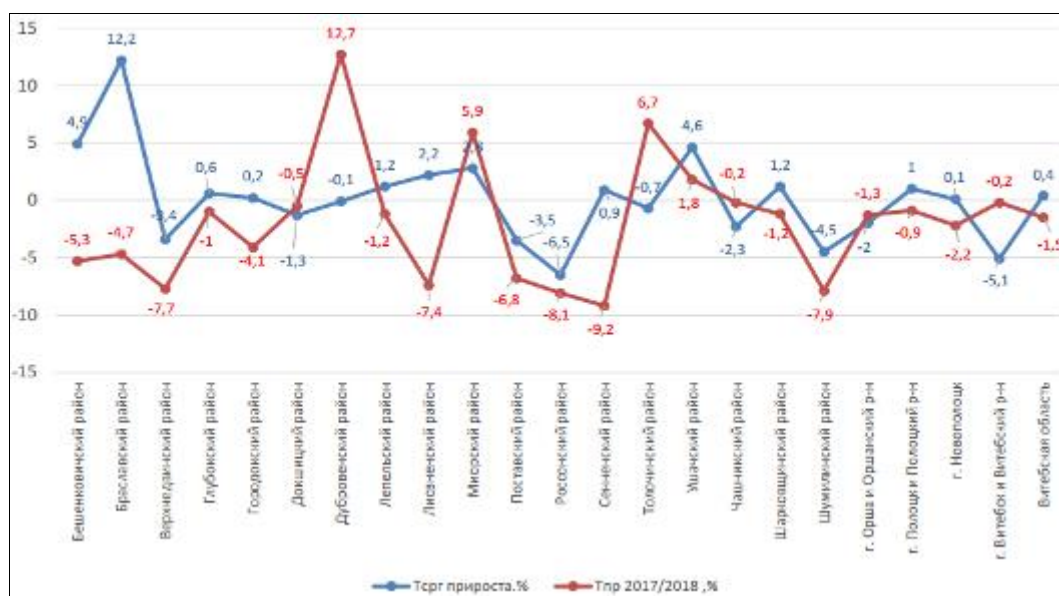
Incidence is one of the most important parameters characterizing the state of public health. An analysis of the state of public health is carried out by the public health authorities in order to identify the most common patterns and trends that allow making informed management decisions to improve the organization of medical care. Morbidity indicators, which are commonly referred to the group of negative health indicators, are important for characterizing the health of the population, since disability of the population and mortality rate mainly depend on them.

State institution “Vitebsk Regional Center of Hygiene, Epidemiology and Public Health” based on an assessment of the average value of the dynamic series of health indexes \* in all administrative territories of the Vitebsk region for the period from 2007 to 2017, 4 groups of districts were determined experimentally by gradation of the level of the health index: minimal (up to 22.0%); moderate (up to 24.6%); increased (up to 34.8%) and high (up to 43.0%).

\* *The health index is the proportion of non-sick people living in the territory (who did not seek medical help in connection with an illness or an exacerbation of a chronic disease).*

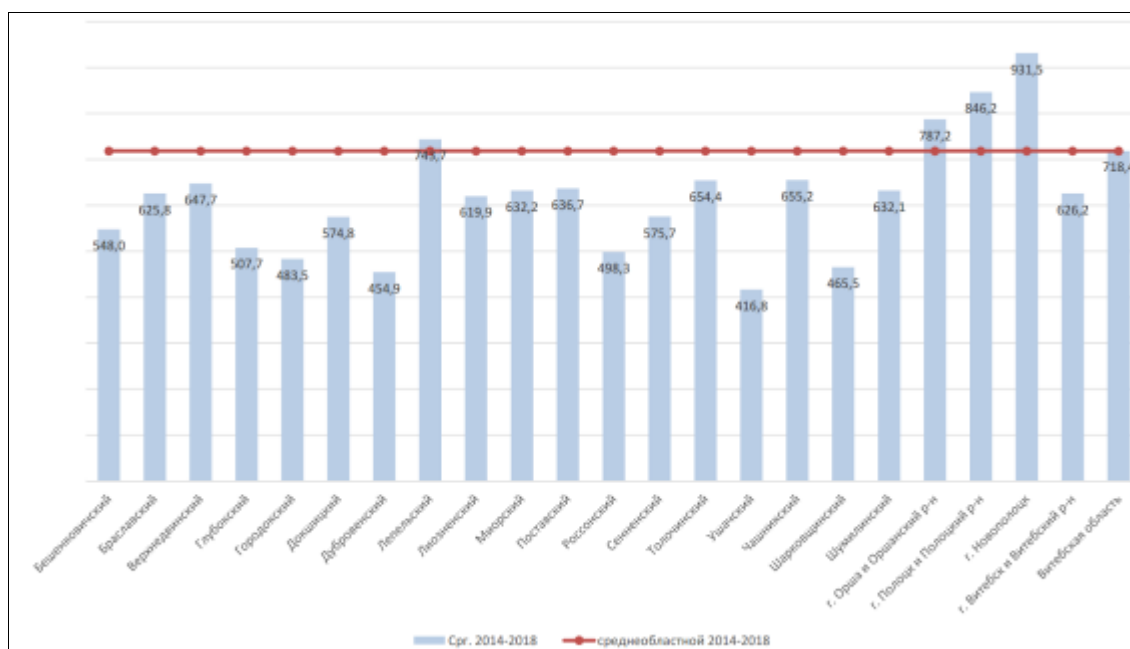
The Lepel and Ushach districts belong to the group with a moderate level of health index, the cities of Polotsk and Polotsky district belong to the group with a minimum level of health index.

The primary incidence of the adult population of Vitebsk region in 2018 decreased by 1.5% compared to 2017. For Lepel district, this indicator decreased by 1.2% compared to 2017, for the city of Polotsk and Polotsk region it decreased by 0.9%, and for Ushachsky region it increased by 1.8% (**Figure 5.87**) [9].



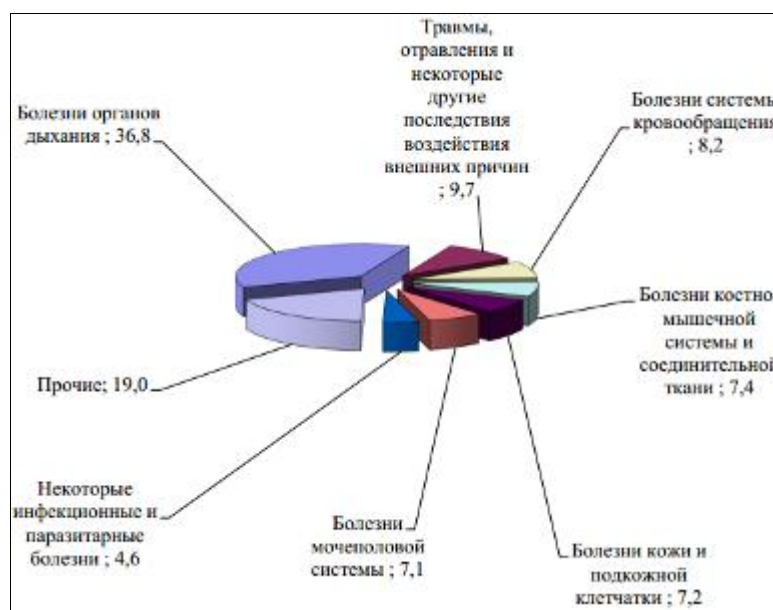
**Figure 5.87: Primary incidence of the adult population of Vitebsk region**

In the territory of the city of Polotsk and the Polotsky district, as well as the Lepelsky district, the background indicators of the primary incidence of the population, calculated for the period 2014-2018, are higher than the average regional indicator, and for the Ushachsky district - much lower (**Figure 5.88**).



**Figure 5.88: Comparative characteristics of the primary incidence of the adult population**

In the structure of the primary morbidity of the adult population of the region, respiratory diseases (36.8%), injuries, poisoning and other consequences of external causes (9.7%), diseases of the circulatory system (8.2%) prevailed (**Figure 5.89**).



**Figure 5.89: The structure of the primary incidence of the adult population**

The total incidence of the child population of the city of Polotsk and the Polotsky district decreased in 2018 compared with 2017 by 9.9% and amounted to 1,444.3 ‰ (2017 - 1602.9 ‰). The incidence of the child population of the Lepelsky and Ushachsky districts also decreased from 1309.4 ‰ in 2017 to 1265.9 ‰ in 2018 in the Lepelsky district and from 949.8 ‰ to 891.2 ‰ in the Ushachsky district.

In the structure of the general incidence in 2018, respiratory diseases are leading - 78.9%, eye diseases - 4.0%, some infectious and parasitic diseases - 3.3%, injuries and poisoning and some other consequences, external causes - 2, 2%

#### 5.5.4. Social characteristics of the population affected by the project

The design decisions being worked out on the reconstruction of the road, the construction of a bypass and reconstruction of the bridge across the Zapadnaya Dvina river affect the territory of 11 rural settlements and two cities - Polotsk and Novopolotsk. In the immediate vicinity of the territory of the planned activity, more than 30 rural settlements are located.

About 200 thousand inhabitants live in directly affected urban settlements, more than 1500 live in rural areas. The number of inhabitants in the nearest rural settlements and their age structure are presented in **Tables 5.30 to 5.34**.

**Table 5.30: Population structure in rural settlements of the Kamensky village council located near the R-46 highway**

№	Name of rural settlement	Number of households	Number of permanent residents	By age:		
				younger than able-bodied	able-bodied	older than able-bodied
affected						
1.	Zaborov'e	62	146	10	88	48
closest						
2.	Bolotniki	3	3	0	1	2
3.	Peski	8	13	0	5	8
4.	Pligovki	4	6	1	2	3
5.	Starosel'e	26	48	2	25	21

**Table 5.31: Population structure in rural settlements of the Zharsky village council located near the R-46 highway**

№	Name of rural settlement	Number of households	Number of permanent residents	By age:		
				younger than able-bodied	трудоспособного	старше трудоспособного
affected						
1.	Vatslavovo	19	31	2	15	14
interested						
2.	Zavydrino	4	5	0	0	5

**Table 5.32: Population structure in rural settlements of the Sorochinsky village council, located near the R-46 highway**

№	Name of rural settlement	Number of households	Number of permanent residents	By age:		
				younger than able-bodied	able-bodied	older than able-bodied
affected						

№	Name of rural settlement	Number of households	Number of permanent residents	By age:		
				younger than able-bodied	able-bodied	older than able-bodied
1.	Zavechele	53	98	6	68	24
2.	Kryzhi	4	6	0	4	2
3.	Sorochino	94	209	29	124	56
closest						
4.	Advorna	10	13	0	3	10
5.	Atroshkovo	7	8	0	6	2
6.	Biculnici	7	9	0	6	3
7.	Borovye	8	8	0	3	5
8.	Gosberg	3	5	0	2	3
9.	Kozly	4	4	0	1	3
10.	Lipovki	14	28	2	10	16
11.	Lobani	6	7	0	1	6
12.	Logovye	1	2	0	0	2
13.	Pligovki	6	6	0	1	5
14.	Urbanovo	1	1	0	0	1
15.	Shnitki	3	7	0	3	4

**Table 5.33: Population structure in rural settlements of the Gomel village council located near the R-46 highway**

№	Name of rural settlement	Number of households	Number of permanent residents	By age:		
				younger than able-bodied	able-bodied	older than able-bodied
affected						
1.	Gomel	115	287	50	170	67
2.	Svyatitsa	8	11	2	4	5
3.	Turzhets-1	17	27	4	10	13
closest						
4.	Biculnici	11	13	0	7	6
5.	Gorovaya	8	9	0	6	3
6.	Dalets	6	8	1	4	3
7.	Yard Gomel	21	38	5	15	18
8.	Zaozerye	140	341	56	213	72
9.	Masenkovo	0	0	0	0	0
10.	Interno-1	3	3	0	1	2
11.	Mezhno-2	10	14	2	6	6
12.	Mezhno-3	4	5	0	1	4
13.	Plusses	7	14	1	8	5
14.	Seedling	62	130	14	71	45
15.	Shchaty	1	2	0	1	1



**Table 5.34: Population structure in rural settlements of the Ekimansky village council, located near the R-46 highway and the planned Polotsk City bypass**

№	Name of rural settlement	Number of households	Number of permanent residents	By age:		
				younger than able-bodied	able-bodied	older than able-bodied
affected						
1.	Belchitsa	281	597	96	341	160
2.	Vesnyanka	65	165	25	102	38
3.	Trosno	21	44	7	29	8
not affected						
4.	Glinishche	13	16	1	6	9
5.	Ksty	34	63	11	35	17
6.	Blackhand 1	12	23	6	11	6
7.	Ekiman-1	163	346	65	196	85

The age and sex structure of the population as of January 1, 2019 in the context of villages, that the proportion of the age group "older than the able-bodied" (men aged 61 and older and women aged 56 years and older) of the rural population of the Ushachi, Lepel and Polotsk regions is from 30 to 100 %. The population under the working age is most significant in the Sorochino agricultural town of the Ushachsky village council (29 out of 209 permanent residents), the Gomel and Zaozerye agricultural towns of the Gomel village council (50 out of 287 and 56 out of 341, respectively), in the village of Chernoruchye-1 and Ekiman-1 of the Ekiman village council ( 6 out of 23 and 65 out of 346 respectively).

Most of the people affected by the displacement are older than the working age and therefore are classified as vulnerable.

Some land users do not reside permanently in the settlements on the territory of which their plots are located, but use them as places for summer recreation and maintenance of subsidiary farming.

Citizens with disabilities live in the villages of Belchitsa, Vesnyanka, Trosno and Ekiman-1 of the Ekiman village council of the Polotsk district. They do not belong to the category affected by the implementation of the project.

One veteran of the Second World War lives in each of the village of Zavydrino, Zharsky village council, Lepel district, another one - in the village of Semenets, Gomel village council, Polotsk district. They are not affected by the Project.

The proportion of the female population is 53.7%, male - 46.3%. The gender ratio is at 1: 1.16.

At the design stage of the Polotsk bypass and the bridge over the river. Zapadnaya Dvina has not been allocated land plots, so there is no information on the nature of the movement (permanent or temporary).

### 5.5.5. Social and cultural facilities

In these settlements there are a number of objects of socio-cultural purpose, which serve as a place of gravity for the local population, which, accordingly, is associated with the movement of residents through the reconstruction of the road: in the village of Zaborovye - a shop, a village club library; in ag. Gomel - State institution "Gomel kindergarten - primary school", children's art school, feldsher - midwife point, pharmacy kiosk, rural house of culture; in the village of Sorochino there is a shop, a paramedic and obstetric center, a club, and a post office. The shop (**Figure 5.90**) and the post office (**Figure 5.91**) in the village of Sorochino are located

in close proximity to the reconstructed section of the R-46 highway.

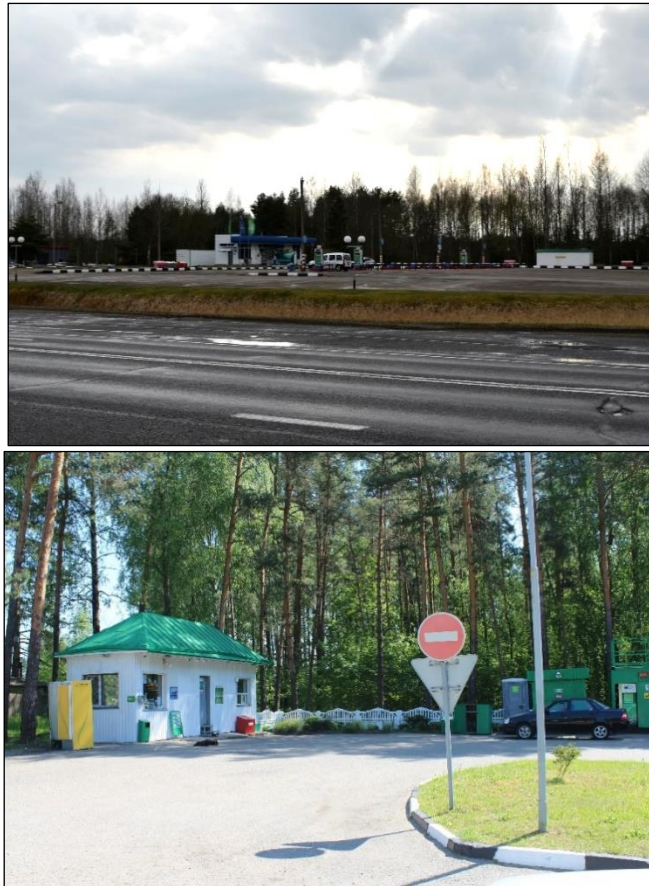


**Figure 5.90:** *Shop in the village of Sorochino*



**Figure 5.91:** *Post Office village of Sorochino*

Two refueling stations (**Figure 5.92**), two cafes (**Figure 5.93**) and a non-working cafe “Veterok” in the village of Sorochino are located along the reconstructed section of the R-46 highway (**Figure 5.94**).



**Figure 5.92:** *Gas stations along the R-46 highway*





**Figure 5.93:** *Cafe along the R-46 highway*



**Figure 5.94:** *Cafe "Veterok"*

### 5.5.6. Objects of historical and cultural heritage

Within a radius of up to 2 km from the area of implementation of the proposed economic activity, there are immovable objects of historical and cultural values, which were given the status of historical and cultural values by the resolution of the Council of Ministers of the Republic of Belarus dated May 14, 2007 No. 578:

- a settlement of the culture of hatched ceramics (V-III centuries BC) - 2 km from the western outskirts of the village of Staroselye, Lepel district; at a distance of about 1 km to the west of the projected section of the P-46 highway;
- burial mound (X-XI centuries) - 1 km to the south from the village of Belchitsa, Lepel district; at a distance of about 600 m to the west of the projected section of the P-46 highway;
- burial mound (X-XII centuries) - near the village of Glinishche, Polotsk region, on the bank of the Belchanka river; at a distance of about 1.5 km to the west of the projected section of the P-46 highway;
- burial mound (XII-XIII centuries) - 2 km south-west of the village of Gomel, Polotsk region; at a distance of more than 1 km to the west of the projected section of the P-46 highway;
- mass grave (1941-1944) - the village of Gomel, Polotsk region; at a distance of about 320 m to the west of the projected section of the P-46 highway;
- a settlement (XI-XIII centuries) - on the northwestern outskirts of the village of Plussy, Polotsk region; at a distance of about 600 m to the east of the projected section of the P-46 highway;
- mass grave (1941-1944) - the village of Ekiman, Polotsk region; at a distance of about 1 km from the end of the projected section of the P-46 highway.

All of the abovementioned historical and cultural values are located outside the boundaries of works on the reconstruction of the section of the P-46 highway, and the planned activities will not affect them.

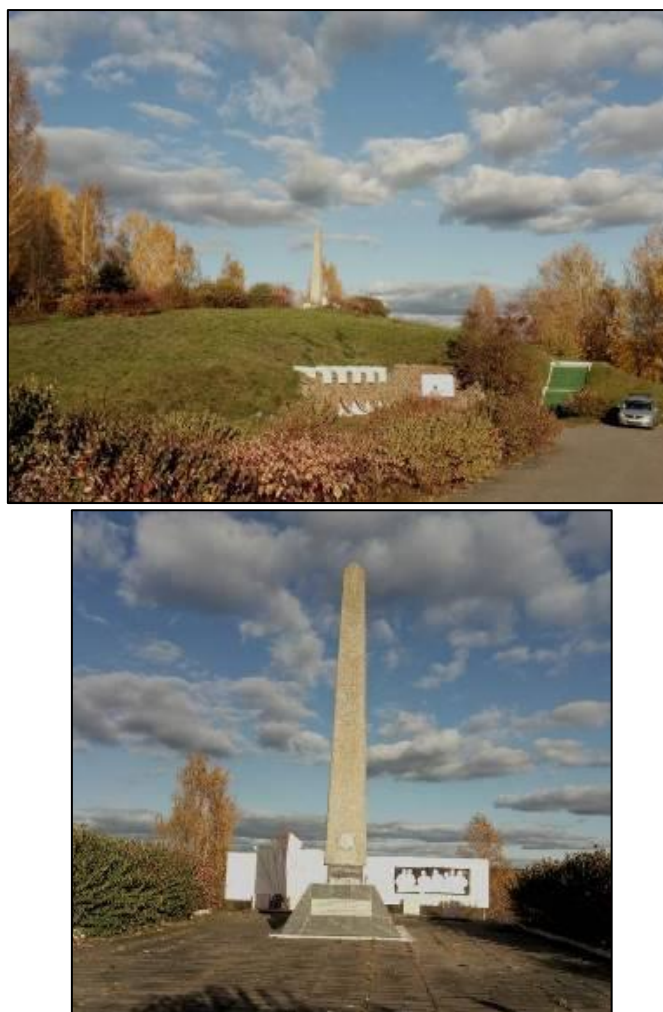
Near section of the R-46 highway Lepel-Polotsk-Russian border (Yukhovichi) 1.700–61.500 km there are historical-cultural and memorial complexes located near the Gomel agro-town:

- historical and cultural complex “Field of Military Glory” - 43.1 km of the road (left); at a distance of about 90 m from the highway (**Figure 5.95**);
- a memorial complex in memory of 580 dead and fallen partisans and partisans of the brigade of KE Voroshilov - km 43.2 of the highway (right); at a distance of about 55 m from the highway (**Figure 5.96**).





**Figure 5.95: Historical and Cultural Complex "Field of Military Glory"**



**Figure 5.96:** *Memorial complex in memory of 580 dead and fallen partisans and partisans of the brigade K.E. Voroshilov*

In accordance with the Code of the Republic of Belarus of July 20, 2016 No. 413-3, in order to prevent the destruction of possibly existing archaeological sites, specialists of the Institute of History, National Academy of Sciences of Belarus conducted archaeological research in the reconstruction area of the object. According to the results of the work presented a scientific report.

Studies have shown the absence of archaeological finds along the R-46 highway, with the exception of the Glinishche village, where the remains of burial mounds have been discovered. All identified mounds are located at a distance of more than 200 m from the R-46 highway - outside the boundaries of the work and will not be affected during the reconstruction of the road section.

If any archaeological sites and objects of material culture are detected during earthworks, work at the site should be suspended and notified by archaeologists from the Institute of History of the National Academy of Sciences of Belarus.

In the area of the reconstruction of the R-46 highway and the construction of the Polotsk City bypass, there are no nature reserves and reserves. In the zone of influence of the object (0.5 km north of the main street of the village of Svyatitsa), there is a geological nature monument of republican significance “Kame hill “Volotovka”, which is adjacent to the R-46 road on the right (40 km).

## 6. ASSESSMENT OF IMPACTS AND MEASURES FOR MITIGATING CONSEQUENCES

### 6.1. Impact assessment methodology

Assessment of the impact of the planned reconstruction of the R-46 road section, the construction of Polotsk City bypass and the reconstruction of the bridge over the Zapadnaya Dvina river in the city of Novopolotsk on the environment and the social sphere was carried out on the basis of the project developed by the State Enterprise Belgiprodor, legal acts, and field and instrumental studies conducted by BSU, specialized information from various organizations, calculations and modeling, data from surveys.

The main method used was the expert assessment method. In addition, the forecast of changes in air quality and noise level was made on the basis of modeling by the State Enterprise Belgiprodor of dispersion of pollutants and noise level using specialized software, taking into account the standards adopted in the republic and taking into account the data of instrumental measurements.

As an assessment of the possible impact on the soil cover, an analogy method was used using data from the National Environmental Monitoring System in the Republic of Belarus.

Assessment of the likely impact on the plant and animal world is based on our own field studies and archival materials.

When assessing the impact on the socio-economic environment, the practitioner widely uses methods of conducting surveys, questionnaires, and collecting public opinion.

Based on the component-by-component environmental impact assessment of the Project, a comprehensive assessment was made taking into account all environmental and social impacts.

A comprehensive assessment is presented in **Table 6.1**.

**Table 6.1: Comprehensive assessment of the Project taking into account environmental and social impacts**

Impact type	The nature of the impact	Impact degree
<i>preparatory stage</i>		
Noise impact	Temporary impact of construction equipment during preparatory work	moderate
Impact on atmospheric air	Temporary exposure to emissions from construction equipment during preparatory work	moderate
Impact on surface and groundwater	Possible impact in storage areas	moderate
Impact on the geological environment	Minor terrain changes	Minor
Impact on land and soil cover	Removal of the fertile soil layer	Minor
Impact on flora	Rduction of vegetation	strong
Impact on wildlife	Removal of habitats, direct impact on selected species	strong
Impact on the socio-economic environment	Land acquisition	Strong
<b>Overall Impact assessment for the stage</b>		<b>moderate</b>

Impact type	The nature of the impact	Impact degree
<i>construction phase</i>		
Noise impact	Temporary impact of construction equipment during construction work	moderate
Impact on atmospheric air	Temporary exposure to emissions from construction machinery during construction work	moderate
Impact on surface and groundwater	Impact on water bodies during reconstruction and construction of bridges	moderate
Impact on the geological environment	Construction of artificial landforms	moderate
Impact on land and soil cover	Removal of the fertile soil layer	weak
Impact on flora	Reduction of vegetation	strong
Impact on wildlife	Removal of habitats, direct impact on selected species	strong
Impact on the socio-economic environment	Change and obstruction of traffic, division of territories, restriction of access	moderate
<b>Impact assessment construction stage</b>		<b>moderate</b>
<i>operation stage</i>		
Noise impact	The impact of road transport when driving	strong
Impact on atmospheric air	The impact of road transport when driving	moderate
Impact on surface and groundwater	Impact of road waste water	Minor
Impact on the geological environment	Change in dynamic loads on soil	Minor
Impact on land and soil cover	Change in the structure of land use; soil pollution from mobile sources of pollution	Minor
Impact on flora	Indirect impact associated with transport emissions into the air	Minor
Impact on wildlife	Direct impact when animals cross the road	moderate
Impact on the socio-economic environment	Improving the quality of the road	moderate
<b>Overall Impact assessment of O&amp;M stage</b>		<b>moderate</b>
<b>Final assessment</b>		<b>moderate</b>

## 6.2. Impact on the physical environment

### 6.2.1. Noise

According to the General sanitary and epidemiological requirements for the maintenance and operation of capital structures (buildings, structures), isolated premises and other objects belonging to business entities, approved by Decree of the President of the Republic of Belarus on November 23, 2017 No. 7, the functioning of facilities should not worsen the living conditions of a person in terms of having hygienic standards [47].

The noise load from the traffic flow is determined by the following factors:

- traffic intensity;
- the composition of the traffic flow;
- speed of movement;

- transport-operational condition of the road, which has the greatest impact on noise levels.

The noise generated by vehicles in residential areas is fluctuating, the sound level of which continuously changes over time. The parameters of unstable noise in the premises of residential buildings and in residential areas for which acceptable values are set are the equivalent (LA<sub>equiv</sub>) and maximum sound levels (LA<sub>max</sub>), measured in dBA (decibels in frequency response “A”).

### **Construction phase**

During construction work, road construction machines will have a significant noise impact on the environment. As a rule, such impact will be carried out only during the daytime and in limited areas associated with works on a specific section of the road. To reduce noise levels on construction sites, noise-insulating enclosures should be used on equipment that emit intense noise and, if necessary, use portable temporary noise-enclosures. Such intense noise impact will be temporary and will not damage adjacent ecosystems.

### **Operation phase**

In accordance with the Scheme of the complex territorial organization of the Vitebsk region approved by Decree of the President of the Republic of Belarus on January 18, 2016 No. 13 (Appendix B), the object of the planned reconstruction is located within the urban axis, as a result of which are equivalent in energy and maximum sound levels for noise generated at the adjacent to a residential area by road may exceed established hygiene standards.

The noise reduction from the road is ensured by such factors as the presence of a buffer zone between residential buildings and the road, laying of the road taking into account the terrain, rational design of the plan and the longitudinal profile of the road, creating conditions for the optimal mode of movement of vehicles.

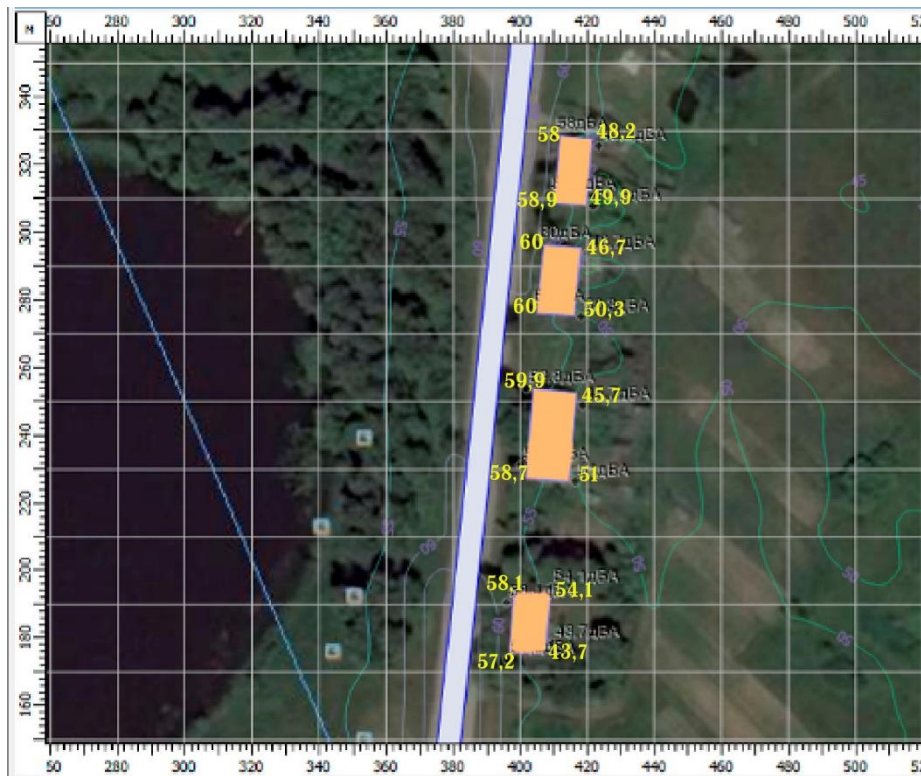
Reducing the acoustic load in the adjacent territories can be achieved through the construction of capital road pavement, rationally organized transverse profile of the road, optimal mode of car traffic; construction of noise protection structures, green spaces, creation of buffer zones, etc. At the location of the proposed road to the residential development, the construction of a noise screen with a total length of 2048 m is proposed.

To assess the noise level in the residential area, modeling was performed by Belgiprodor using the Ecolog-noise software of Integral (Russia).

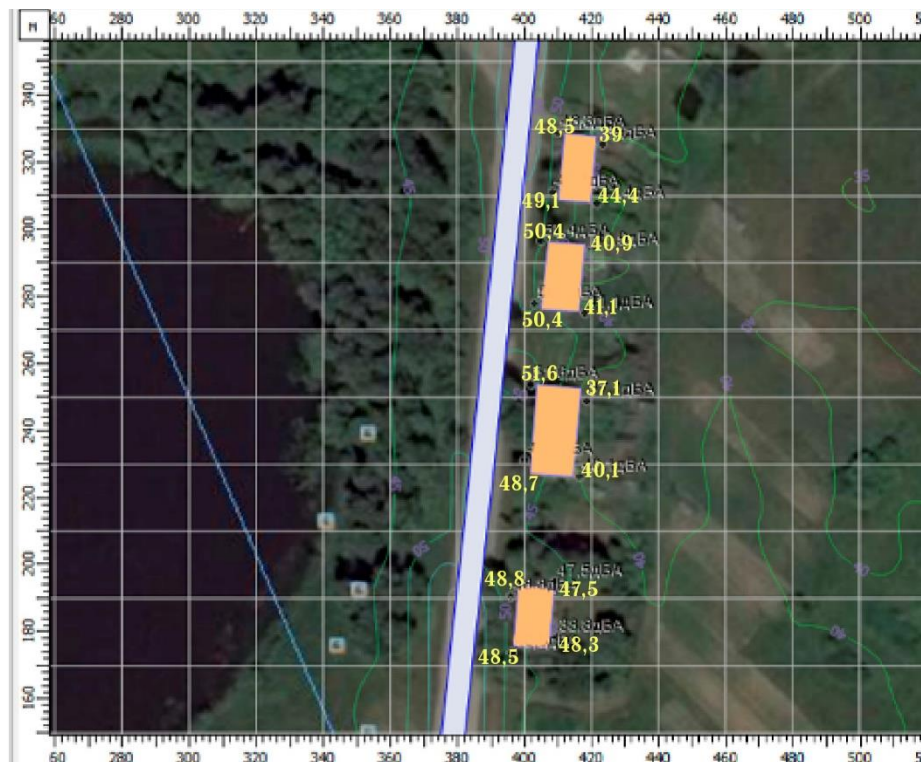
According to the results of acoustic calculations, the existing noise levels in a number of design points on the territory of the existing residential development adjacent to the R-46 highway exceed the permissible levels regulated by the Sanitary norms, rules and hygienic standards “Noise at workplaces, in vehicles, in residential premises, public buildings and on the territory of residential development”, approved by the resolution of the Ministry of Health of the Republic of Belarus of 16.11.2011 No. 115.

Selected sound attenuation maps at maximum points of current noise level on the territory of the existing residential development the daytime (from 7:00 to 23:00) and night time (from 23:00 to 7:00) are presented in **Figures 6.1** and **6.2**, respectively.





**Figure 6.1:** *Map of sound attenuation at maximum points in the territory of the existing residential development in the daytime*



**Figure 6.2:** *Map of sound attenuation at maximum points on the territory of the existing residential development at night*

The results of the calculation of traffic noise in the territory of the nearest residential development of Novopolotsk are presented in a detailed plan of microdistrict 8A and 10A (par.

5.2.4, **Table 6.2**), developed in 2016 by the Novopolotsk branch of UE Institute Vitebskgrazhdanproekt, Appendix B.

**Table 6.2: Existing levels of maximum noise from vehicles on the streets within the project area**

№	Street	Average speed, km / h	Traffic intensity in both directions, cars / hour	The maximum noise level of 7.5 m from the axis of one lane dBA
1	Designed No. 1	40	510	69,9
2	Projected No. 6	40	260	67,0
3	Vasilevtsy	40	340	68,1
4	First builders	40	320	67,9
5	Denisova	40	320	67,9
6	Oil industry workers	40	320	67,9

When calculating the noise level on Projected Street №6, the traffic intensity in two directions of 260 cars / hour was used (Appendix B).<sup>3</sup>

## Mitigation Measures

### *Construction Phase*

For the period of construction of the facility, a set of measures should be provided to minimize the levels of physical impacts on the adjacent territory:

- equipment idling should be minimized;
- the maximum possible reduction in the number of transport routes through residential territory;
- use of equipment with a lower level of sound power;
- taking into account the possibilities of using the natural terrain for noise reduction;
- the arrangement of working machines, taking into account mutual fencing and natural barriers.
- Avoiding nighttime works particularly near the settlements;
- Maintaining liaison and coordination with communities near the work sites;
- Installation of temporary noise barriers where required particularly near the settlements’
- Operationalization of GRM to capture noise related complaints from the communities.

Thus, taking into account the implementation of these measures, the impact of noise from the operation of construction equipment during the period of work on the reconstruction of the facility is insignificant and will be of a local and temporary nature.

### *O&M Phase*

The instrumental measurements of the noise level in two sections near the R-46 road carried out in this work showed that the allowable noise level was exceeded at a distance of at least 40 m from the axis of the road.

Thus, the project should include noise protection measures that must ensure compliance with

---

<sup>3</sup> The noise level across R-46 is not likely to be significantly different after the reconstruction works under the proposed project.

sanitary standards.

Soundproofing measures can be implemented:

- on the path from the noise source to the facility (acoustic screens and shielding structures, green spaces);
- at the facility (structural and construction methods, providing increased sound insulation of the external structures of buildings).

At a distance of 40 m from the axis of the road and closer is residential development in the settlements: Wenceslas (left), Rubaniki (right), Sorochino (left), Svyatitsa (right), Gomel (left and right), Belchitsa (left and right).

To reduce the noise load on the adjacent residential area, the Project provides for the installation of noise protection screens. The places of their installation are presented in **Table 6.3**.

**Table 6.3: Location and length of noise barriers**

Localization		Soundproof screen length, m	Screen height, m
from picket ПК +	up to picket ПК +		
152 + 55 (left)	154+64	208	4,2
154 + 69 (left)	156+54	196	4,2
316 + 49 (left)	317+43	100	4,2
317 + 37 (left)	322+14	472	4,2
323 + 11 (left)	324+79	168	4,2
404 + 71 (right)	405+62	92	4,2
406 + 00 (right)	406+56	56	4,2
426 + 73 (right)	427+71	108	4,2
427 + 00 (left)	427+56	64	4,2
427 + 89 (left)	428+86	140	4,2
603 + 60 (right)	606+32	276	4,2
609 + 63 (right)	610+35	76	4,2
610 + 71 (right)	611+62	92	4,2
<b>Total</b>		<b>2048</b>	

Installation of noise barriers allows reducing the noise level on the territory of residential buildings to standard values.

### 6.2.2. Air Quality

In accordance with the Sanitary norms and rules “Requirements for the atmospheric air of settlements and places of mass recreation for the population” approved by the Decree of the Ministry of Health of the Republic of Belarus dated December 30, 2016 No. 141 [47], the placement, design, construction and operation of facilities is allowed only if pollutant emissions into the air do not exceed the standards of maximum permissible concentrations of pollutants in the air (hereinafter referred to as the MPC) and tentatively safe levels of exposure to pollutants in the air of settlements and places of public recreation (SHOE).

The main sources of air pollution during the construction works will be: the operation of road-building equipment and vehicles during earthworks, installation of bridge structures and pavement, transportation of soil, building materials, workers performing construction and installation works; mechanical processing of building materials; paint work, etc.

The impact of technological processes on air during the reconstruction of the facility is temporary. The extent and duration of this impact depends on the duration of the work and the technology used.

Air pollution with inorganic dust (classified in two categories - inorganic dust containing silicon dioxide less than 70% and more than 70%) occurs as a result of the movement of soil, sand, gravel, during excavation and construction of pavement. Emissions of pollutants by road-building equipment and vehicles occur during heating and operation of internal combustion engines in motion and at idle. In this case, nitrogen dioxide, nitric oxide, soot, sulfur dioxide, carbon monoxide, and hydrocarbons are released into the air.

The main source of air pollution during the operation of roads and bridge crossings is vehicles moving along them. The impact of road transport on the atmosphere is mainly associated with exhaust emissions.

The amount and composition of exhaust gases is determined by the design features of mechanical vehicles, depending on the type of fuel, the type and power of the engine, the mode of operation of the engines, the technical condition of the vehicle.

The degree of air pollution from vehicles is determined by the amount of emissions which depends on the specific emissions of pollutants, the quality of the road surface, the intensity and mode of movement on the road.

According to the data on the traffic intensity performed by the specialists of the State Enterprise Belgiprodor in October 2017, on the reconstructed section of the R-46 Lepel-Polotsk border of the Russian Federation, 1.700–61.500 km, the actual daily traffic intensity averaged over the year is in the range from 2076 to 5912 cars per day. Cars dominate in the traffic flow, which make up 47 to 63% of the total number of vehicles, while heavy-weight road trains make up 7 to 17%.

The average annual daily and maximum hourly traffic intensities were calculated according to GOST 32965-2014 “General-purpose automobile roads. Methods of accounting for traffic flow”.

When calculating the prospective traffic intensity, the annual growth rate of vehicle traffic was taken into account at 2.1% for trucks, buses, minibuses and 2.5% for cars.

To calculate the emissions of pollutants into the air from vehicles, the weighted average traffic intensity in the reconstructed section of the road was taken into account (**Table 6.4**).

The list of pollutants and the expected emissions from vehicles in the air are determined in accordance with TKP 17.08-03-2006 (02120) "Environmental protection and nature management. Atmosphere. Emissions of pollutants and greenhouse gases into the air. Rules for calculating emissions by motor vehicles in settlements "subject to changes #1 and #2.

**Table 6.4: Traffic flow and the weighted average traffic intensity on the reconstructed section of the R-46 highway 0.000 – 61.500 km for a 20-year perspective**

Type of vehicles, (calculation model *)	Vehicle traffic		
	Per day	Per hour	Maximum per hour
Cars on gasoline, gas (ЛБ)	2318	203	275
Cars on diesel fuel (ЛД)	580	51	69
Minibuses on gasoline, gas (ГБ)	181	16	22
Minibuses on diesel fuel (ГД)	272	24	32
Trucks up to 3.5 tons on gasoline, gas (ГБ)	321	28	38
Trucks up to 3.5 tons on diesel fuel (ГД)	482	42	57



Type of vehicles, (calculation model *)	Vehicle traffic		
	Per day	Per hour	Maximum per hour
Trucks over 3.5 tons of diesel fuel (ГД)	1061	93	126
Intercity diesel buses (AM)	157	14	19
<b>Total</b>	<b>5372</b>	<b>471</b>	<b>638</b>

\* Classification of motor vehicles in accordance with TKP 17.08-03-2006 (02120) "Environmental protection and nature management. Atmosphere. Emissions of pollutants and greenhouse gases into the air. Rules for calculating emissions by motor vehicles in settlements" (paragraph 5, table 5).

The list of pollutants and the expected emissions from vehicles in the air are determined in accordance with TCP 17.08-03-2006 (02120) "Environmental protection and nature management. Atmosphere. Emissions of pollutants and greenhouse gases into the air. Rules for calculating emissions by motor vehicles in settlements "subject to changes #1 and #2.

The following traffic parameters were used to calculate emissions of pollutants and greenhouse gases:

- types of vehicles and their number per unit of time;
- speed of traffic flow;
- length of the designed road section;
- the number of stops (braking, acceleration) during movement.

Expected emissions, g/s (calculated from the maximum intensity values) and tons / year (calculated from the average values of traffic intensity) are presented in **Table 6.5**.

The total volume of gross emissions from traffic on the reconstructed section of the R-46 highway Lepel-Polotsk border of the Russian Federation (Yukhovichi) in the 1.700–61.500 km section may be 24,432.642 tons per year. The highest emissions are expected for carbon dioxide and oxide, nitrogen dioxide. Sources of pollutants in the air can also be the engines of cars in recreational areas.

A retrospective assessment shows that the expected release of pollutants into the air for the recreation site, as a rule, does not exceed 0.7 t / year.

**Table 6.5: Expected exhaust emissions from the reconstructed section of the R-46 highway 0.000 – 61.500 km for a twenty-year perspective**

Name of substance	Emission of substance		
	g/day	g/s	ton/year
Carbon oxide (CO)	1 032 971	1.419904	377.034
Nitrogen oxides (NOx)	640 938	0.881023	233.943
Volatile Organic Compounds (VOC)	165 055	0.226882	60.24522
Methane (CH <sub>4</sub> )	17 855	0.024543	6.517112
Particulate Matter (PM)	31 457	0.043241	11.481951
Non-methane Volatile Organic Compounds (NMVOC)	147 200	0.202339	53.7281
Carbon dioxide (CO <sub>2</sub> )	64 701 837	88.93804	23616.171
Sulfur dioxide (SO <sub>2</sub> )	16 723	0.022988	6.104041
Cadmium (Cd)	0.205	2.824·10 <sup>-7</sup>	7.500·10 <sup>-5</sup>
Chrome (Cr)	1.029	1.415·10 <sup>-6</sup>	3.757·10 <sup>-4</sup>
Copper (Cu)	34.973	4.807·10 <sup>-5</sup>	0.012765
Nickel (Ni)	1.440	1.980·10 <sup>-6</sup>	5.257·10 <sup>-4</sup>



Name of substance	Emission of substance		
	g/day	g/s	ton/year
Selenium (Se)	0.205	$2.824 \cdot 10^{-7}$	$7.500 \cdot 10^{-5}$
Zinc (Zn)	20.572	$2.828 \cdot 10^{-5}$	0.007509
Ammonia (NH <sub>3</sub> )	12 447	0.017109	4.543105
Nitrous Oxide (N <sub>2</sub> O)	13 190	0.018131	4.814495
Indeno (1,2,3-cd) pyrene	0.341	$4.686 \cdot 10^{-7}$	$1.244 \cdot 10^{-4}$
Benzo (k) Fluorantent	0.524	$7.200 \cdot 10^{-7}$	$1.912 \cdot 10^{-4}$
Benzo (b) Fluorantent	0.610	$8.386 \cdot 10^{-7}$	$2.227 \cdot 10^{-4}$
Benzo (ghi) perylene	0.639	$8.778 \cdot 10^{-7}$	$2.331 \cdot 10^{-4}$
Fluorantent	6.239	$8.576 \cdot 10^{-6}$	0.002277
Benzo (a) pyrene	0.202	$2.781 \cdot 10^{-7}$	$7.386 \cdot 10^{-5}$
Dioxins	0.002052	$2.821 \cdot 10^{-9}$	$7.490 \cdot 10^{-7}$
Furans	0.004351	$5.980 \cdot 10^{-9}$	$1.588 \cdot 10^{-6}$
Alkanes	35 863	0.049297	13.090103
Alkenes	32 478	0.044643	11.854370
Alkins	9 288	0.012768	3.390244
Aldehydes	6 359	0.008741	2.321054
Ketones	471	$6.475 \cdot 10^{-4}$	0.171930
Cycloalkanes	1295	0.001781	0.472807
Aromatic hydrocarbons	73 248	0.100686	26.735620
<b>Total, including carbon dioxide:</b>			<b>24 432.642</b>
<b>Total excluding carbon dioxide:</b>			<b>816.472</b>

To carry out maintenance of the road in the winter, ensure its proper operational condition, comfortable and safe movement of vehicles, at the stage of justifying investments, it is planned to create an engineering and technological complex for controlling the movement and maintenance of roads on the basis of LDD-374 in Ushachi.

During the preparation, storage and loading of deicing materials, as a rule, inorganic dust with a silica content of less than 70% and particulate matter are released into the atmosphere. Also, the source of air pollution is the movement of road equipment and vehicles on the territory of production sites. In this case, emissions of such substances as nitrogen dioxide, soot, sulfur dioxide, carbon monoxide, saturated hydrocarbons C11-C19 will occur.

To calculate the traffic intensity on the planned Polotsk City bypass, data were used on the intensity of traffic on sections of roads included in the zone of influence of the bypass. The data used included the results of measurements of traffic intensity on the R-46 highway Lepel-Polotsk-border of the Russian Federation (Yukhovichi) sections of 61.400-71.600 km (measurements were carried out in October-November 2017) and 67.470-131.534 km (measurements were carried out in October 2017) the R-45 highway Polotsk-Glubokoe-the border of the Republic of Lithuania (Kotlovka) on section 4.730-10.500 km (measurements were taken in July-August 2015), the R-20 highway Vitebsk-Polotsk-the border of the Republic of Latvia (Grigorovshchina) on section 111.6-112.0 km (measurements were carried out in August-September 2015).

In the year the facility is commissioned, the expected traffic intensity will be from 3238 to 15078 cars per day. In the transport stream, the share of passenger transport will be from 67 to 74% of the total flow, while the share of freight transport will be from 16 to 23% of the total flow.

To determine the prospective traffic intensity, the annual growth in traffic intensity was assumed to be 2.5% for cars and 2.1% for trucks and buses.

The expected traffic intensity bypassing Polotsk for a 20-year perspective will be from 5336 to 24954 cars per day.

Impact assessment is carried out for a variant of the prospective development of transport infrastructure for a period of 20 years from the moment of design documentation development, taking into account the annual increase in the number of motor vehicles relative to the current state and taking into account the reduction of specific emissions by 1.5% annually (**Table 6.6**).

**Table 6.6: Expected exhaust emissions from the planned Polotsk City bypass**

Name of substance	Emission of substance	
	g/s	ton/year
Carbon oxide (CO)	621 582	226.877
Nitrogen oxides (NOx)	303 442	110.756
Volatile Organic Compounds (VOC)	94 715	34.571
Methane (CH4)	4 746	1.732
Particulate Matter (PM)	11 311	4.128
Non-methane Volatile Organic Compounds (NMVOC)	89 969	32.839
Carbon dioxide (CO2)	29 298 188	10 693.838
Sulfur dioxide (SO2)	8 009	2.923
Cadmium (Cd)	0.092	$3.373 \cdot 10^{-5}$
Chrome (Cr)	0.464	$1.694 \cdot 10^{-4}$
Copper (Cu)	15.803	$5.768 \cdot 10^{-3}$
Nickel (Ni)	0.652	$2.380 \cdot 10^{-4}$
Selenium (Se)	0.092	$3.373 \cdot 10^{-5}$
Zinc (Zn)	9.297	$3.393 \cdot 10^{-3}$
Ammonia (NH3)	8 262	3.016
Nitrous Oxide (N2O)	7 792	2.844
Indeno (1,2,3-cd) pyrene	0.179	$6.538 \cdot 10^{-5}$
Benzo (k) Fluorantent	0.167	$6.110 \cdot 10^{-5}$
Benzo (b) Fluorantent	0.240	$8.754 \cdot 10^{-5}$
Benzo (ghi) perylene	0.395	$1.442 \cdot 10^{-4}$
Fluorantent	3.345	$1.221 \cdot 10^{-3}$
Benzo (a) pyrene	0.102	$3.715 \cdot 10^{-5}$
Dioxins	0.001283	$4.684 \cdot 10^{-7}$
Furans	0.002675	$9.764 \cdot 10^{-7}$
Alkanes	23 218	8.475
Alkenes	19 991	7.297
Alkins	5 677	2.072
Aldehydes	3 887	1.419
Ketones	288	0.105
Cycloalkanes	792	0.289
Aromatic hydrocarbons	44 806	16.354
<b>Total, including carbon dioxide:</b>		<b>11 149.547</b>
<b>Total, excluding carbon dioxide:</b>		<b>455.709</b>

According to our estimates, the total volume of gross emissions from motor vehicle traffic on the Polotsk City bypass (excluding carbon dioxide) can reach 455.71 tons per year.

The main hygienic criterion for assessing the environmental hazard of pollutants is MPC - the

maximum amount of a substance that guarantees the absence of negative direct or indirect effects on the health of the present and subsequent generations of man and the ecosystem.

According to the Environmental Standards and Rules 17.01.06-001-2017 "Environmental protection and nature management. Environmental Safety Requirements", approved by Decree No. 5-T of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus dated July 18, 2017, the standards for environmentally safe concentrations of pollutants must be observed in the air of nature-protected territories.

To assess the potential air impact of the reconstructed section of the R-46 highway Lepel-Polotsk-Russian border (Yukhovichi) 1.700–61.500 km, the dispersion of pollutants in the surface layer of the atmosphere was modeled on the basis of the calculated data on the emissions of pollutants. Concentrations were evaluated at a distance of 10 to 150 m from the edge of the carriageway of the R-46 highway, including within the nature monument of republican significance "Kama Hill "Volotovka".

Dispersion modeling was performed using the Unified Environmental Pollution Calculation Program "Ekolog" (UEPCP "Ekolog") (Version 4, Integral Ltd., St. Petersburg, Russia).

The dispersion calculation, taking into account the background concentrations of pollutants and climatic characteristics in the area of the planned activity, was carried out for 18 major pollutants, as well as for the summation groups 6005 (ammonia, formaldehyde), 6009 (nitrogen (IV) oxide, sulfur dioxide).

In addition, modeling of dispersion of emissions of three types of pollutants in atmospheric air (nitrogen dioxide, sulfur dioxide and ammonia) was carried out, for which the standards for ecologically safe concentrations of a short-term averaging period were approved.

To calculate the dispersion, a road plan was used, the route of which was divided into straight sections to approximate the simulated emission sources to the shape of the road. Each section was considered as a source of pollution type #8 - "highway" in the UEPCP Ekolog", the longitudinal axis of symmetry of the sections coincided with the axis of the road.

Background concentrations of pollutants in the area of the proposed activity, meteorological characteristics and coefficients that determine the conditions for the dispersion of pollutants in the air are provided by the State Institution "Republican Center for Hydrometeorology, Radioactive Contamination Control and Environmental Monitoring" (Appendix B).

Modeling of dispersion of pollutants in the surface layer of the atmosphere, parameters of emission sources, dispersion maps with isolines of calculated concentrations are presented in Appendix B.

The calculation results are considered satisfactory if the following conditions are met:  $Q+Q_{\phi} \leq 1$  (MPC share)

$Q \leq 1$  (when  $Q_{\phi}=0$ ), MPC share, where:

$Q$  – pollutant concentration at the point for which the calculation was made, MPC share;  
 $Q_{\phi}$  – background concentration of the pollutant at the point for which the calculation was made, MPC share.

The list of pollutants for which dispersion modeling is impractical by the expediency criterion  $E3 = 0.01$  is presented in **Table 6.7**.

**Table 6.7: Pollutants excluded from the modelling**

Pollutant code	Name of pollutant
0124	Cadmium and its compounds (in terms of cadmium)
0140	Copper and its compounds (in terms of copper)
0163	Nickel (Nickel Metal)
0203	Chrome (VI)
0229	Zinc and its compounds (in terms of zinc)
0368	Amorphous selenium
0401	Aliphatic saturated hydrocarbons C1-C10
0410	Methane
0550	Unsaturated aliphatic hydrocarbons

The results of modelling of the maximum surface concentrations of pollutants in the air during the most unfavorable period are given in **Table 6.8**.

**Table 6.8: Estimated maximum surface concentration of the pollutant in fractions of the maximum one-time MPC at different distances from the edge of the roadway**

Code of pollutant or summation group	Name of pollutant or summation group	Estimated maximum surface concentration							
		taking into account background concentrations				excluding background concentrations			
		10 m	25 m	50 m	75 m	10 m	25 m	50 m	75 m
0301	Nitrogen oxide (IV)	0.15	0.14	0.13	0.13	0.03	0.02	0.01	0.01
0303	Ammonia	0.25	0.25	0.25	0.25	0.01	0.01	0.01	0.01
0330	Sulfur dioxide	0.07	0.07	0.07	0.07	0.00	0.00	0.00	0.00
0337	Carbon oxide	0.13	0.12	0.12	0.12	0.01	0.00	0.00	0.00
0655	Aromatic hydrocarbons	0.02	0.01	$6.8 \cdot 10^{-3}$	$4.9 \cdot 10^{-3}$	0.02	0.01	$6.8 \cdot 10^{-3}$	$4.9 \cdot 10^{-3}$
0703	Benz (a) pyrene	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00
1325	Formaldehyde	0.60	0.60	0.60	0.60	0.00	0.00	0.00	0.00
2754	Aliphatic hydrocarbons C11-C19	$2.9 \cdot 10^{-3}$	$2.0 \cdot 10^{-3}$	$1.3 \cdot 10^{-3}$	$9.5 \cdot 10^{-4}$	$2.9 \cdot 10^{-3}$	$2.0 \cdot 10^{-3}$	$1.3 \cdot 10^{-3}$	$9.5 \cdot 10^{-4}$
2902	Solid particles	0.23	0.23	0.23	0.23	0.00	0.00	0.00	0.00
6005	Ammonia formaldehyde	0.85	0.85	0.85	0.85	0.00	0.00	0.00	0.00
6009	Nitrogen oxide, sulfur dioxide (IV)	0.23	0.22	0.21	0.20	0.04	0.03	0.02	0.01

Modeling showed that in the surface layer of the atmosphere at the points for which the concentrations were calculated, no excesses of the maximum one-time MPC and environmentally safe concentrations are expected for any of the considered pollutants and summation groups.

The maximum values of the expected surface concentrations of pollutants according to the

simulation results will be (in fractions of the maximum one-time MPC): 0.15 for nitrogen dioxide; 0.25 for ammonia; 0.07 for sulfur dioxide; 0.13 for carbon monoxide; 0.02 for benz (a) pyrene; 0.6 for formaldehyde; 0.23 for particulate matter; 0.85 for the summation group 6005 (ammonia, formaldehyde); 0.23 for the summation group 6009 (nitrogen dioxide, sulfur dioxide).

The expected maximum surface concentrations of aromatic hydrocarbons will not exceed 0.02 of the maximum one-time MPC, hydrocarbons of the limiting aliphatic series C<sub>11</sub>-C<sub>19</sub> -  $2.9 \cdot 10^{-3}$  of the maximum one-time MPC.

The calculated maximum values of the expected concentrations of pollutants in the atmospheric air of the environmental areas, taking into account the background level of atmospheric air pollution, will be (in fractions of environmentally safe concentration): 0.19 for nitrogen dioxide; 0.25 for ammonia; 0.18 for sulfur dioxide.

The simulation results indicate that the main contribution to the formation of surface concentrations of formaldehyde, nitrogen dioxide, ammonia, sulfur dioxide, carbon oxide, particulate matter, benz (a) pyrene is the background level of air pollution.

The expected pollutant emissions from the projected road do not exceed the standards for maximum permissible concentrations of pollutants in the air, regulated on the territories of residential, public-business, recreational zones of settlements, places of public recreation and environmentally safe concentrations established in the atmospheric air of nature-protected territories.

Thus, it is expected that the reconstructed section of the R-46 Lepel-Polotsk-border of the Russian Federation (Yukhovichi) 1.700–61.500 km, will not have a significant impact on the air condition. The air condition will not change significantly and will remain within acceptable limits.

To assess the potential impact on the atmospheric air of the constructed Polotsk City bypass, based on the calculation of the expected emissions of pollutants, a simulation of the dispersion of pollutants in the surface layer of the atmosphere was carried out. The model determined the concentrations at the border of the residential zone of Novopolotsk (the nearest apartment buildings No. 186 (buildings 2 and 3), No. 190 (buildings 2 and 3) on Pervostroiteley St.) and at the border of the low-rise building quarter.

The planned Polotsk City bypass was considered as a source of pollution type No. 8 - "highway". The calculations were performed in conventional coordinate systems for a site measuring 410x440 m with a grid spacing of 10 m.

The results of modeling the dispersion of pollutants in the surface layer of the atmosphere, the parameters of the sources of emissions, the graphic results of modeling with isolines of the calculated concentrations are presented in Appendix B.

The expected maximum surface concentrations of pollutants in the air during the most unfavorable period are given in **Table 6.9**.



**Table 6.9: Surface concentration of the pollutant in fractions of the maximum single MPC**

Code of pollutant	Name of pollutant	Estimated surface concentration			
		taking into account background concentrations		excluding background concentrations	
		on the border of a low-rise residential area	on the border of a low-rise residential area	on the border of a low-rise residential area	on the border of a low-rise residential area
0301	Nitrogen (IV) oxide (nitrogen dioxide)	0.33	0.26	0.142	0.072
0303	Ammonia	0.17	0.17	0.005	0.005
0330	Sulfur dioxide	0.36	0.36	0	0
0337	Carbon oxide	0.14	0.13	0.02	0.01
0550	Unsaturated aliphatic hydrocarbons	$1.2 \cdot 10^{-3}$	$5.7 \cdot 10^{-4}$	$1.2 \cdot 10^{-3}$	$5.7 \cdot 10^{-4}$
0655	Aromatic hydrocarbons	0.08	0.04	0.08	0.04
0703	Benz / a / pyrene	0.03	0.03	0.003	0.003
1325	Formaldehyde	0.39	0.38	0.023	0.013
2754	Aliphatic hydrocarbons C11-C19	0.02	$7.4 \cdot 10^{-3}$	0.02	$7.4 \cdot 10^{-3}$
2902	Solid particles	0.18	0.18	0.007	0.007
6005	Ammonia formaldehyde	0.56	0.55	0.028	0.018
6009	Nitrogen dioxide, sulfur dioxide	0.69	0.62	0.142	0.072

Modeling showed that no excesses of the maximum one-time MPC are expected for any of the considered pollutants and summation groups in the surface layer of the atmosphere at the border of the nearest residential development in Novopolotsk.

Taking into account the background level of air pollution and the prospective increase in the intensity of traffic, the maximum values of the expected surface concentrations of pollutants according to the simulation results will be (in fractions of the maximum one-time MPC): 0.33 for nitrogen dioxide; 0.17 for ammonia; 0.36 for sulfur dioxide; 0.14 for carbon oxide; 0.03 for benz (a) pyrene; 0.39 for formaldehyde; 0.18 for particulate matter; 0.56 for the summation group 6005 (ammonia, formaldehyde); 0.69 for the summation group 6009 (nitrogen dioxide, sulfur dioxide).

The expected maximum surface concentrations will not exceed (in fractions of the maximum one-time MPC): for hydrocarbons of unsaturated aliphatic series – 0.0012, aromatic hydrocarbons – 0.08, hydrocarbons of the limiting aliphatic series C<sub>11</sub>-C<sub>19</sub> – 0.02.

The calculated maximum values of the expected concentrations of pollutants in the atmospheric air of the environmental areas, taking into account the background level of atmospheric air pollution, will be (in fractions of environmentally safe concentration): 0.19 for nitrogen dioxide; 0.25 for ammonia; 0.18 for sulfur dioxide.

Modeling and calculations allow us to expect that the contribution of emissions from the planned facility to the surface concentration of pollutants is negligible. The main contribution

to the formation of surface concentrations of formaldehyde, nitrogen dioxide, ammonia, sulfur dioxide, carbon oxide, particulate matter, benz (a) pyrene is made by the background level of air pollution.

Emissions of pollutants from the planned facility do not exceed the standards for maximum permissible concentrations of pollutants in the air, regulated in the territories of residential, public-business, recreational zones of settlements, places of public recreation.

Thus, the construction of the road will not have a significant impact on air pollution. The air condition will not change significantly and will remain within acceptable limits.

The calculation of greenhouse gas emissions was carried out in accordance with Changes No. 1-3 to TCH 17.08-03-2006 (02120).

Estimated greenhouse gas emissions from road traffic within the planned section are presented in **Table 6.10**.

**Table 6.10: Expected GHG emissions from the reconstructed section of the R-46 highway 0.000 – 61.500 km**

Greenhouse gases	Expected emission	
	g/s	ton/year
Carbon dioxide (CO <sub>2</sub> )	64 701 837	23 616.171
Methane (CH <sub>4</sub> )	17 855	6.517
Nitrous Oxide (N <sub>2</sub> O)	13 190	4.814
<b>TOTAL</b>	<b>64 732 882</b>	<b>23 627.502</b>

The total expected greenhouse gas emissions from road traffic will be 23,627.502 tons / year and are within acceptable levels.

The implementation of the planned reconstruction of the facility will not entail climate change. The requirements of the UN Framework Convention (New York, 1992) on climate change are being respected.

Estimated values of greenhouse gas emissions during road traffic on the constructed bypass of the city are presented in **Table 6.11**.

**Table 6.11: Expected GHG emissions from the Polotsk City bypass**

Greenhouse gases	Estimated emissions from traffic	
	g/s	ton/year
Carbon dioxide (CO <sub>2</sub> )	29 298 188	10 693.838
Methane (CH <sub>4</sub> )	4 746	1.732
Nitrous Oxide (N <sub>2</sub> O)	7 792	2.844
<b>TOTAL</b>	<b>29 310 726</b>	<b>10 698.415</b>

The total expected greenhouse gas emissions from road traffic bypassing Polotsk will be within acceptable levels.

The amount of greenhouse gas emissions during the construction period will increase directly within the construction sites. However, in the whole country, the amount of emissions will not increase, since all the equipment involved in the work is constantly functioning and involved and is currently at construction sites.

The total emission, based on the number of equipment involved in the construction work and the period of construction work on the R-46 highway, the construction of the Polotsk City bypass and the reconstruction of the bridge in the city of Novopolotsk, will be about 80,020 tons / year, while carbon dioxide is about 80 000 tons / year, methane - about 12 tons / year, nitrous oxide - about 8 tons / year. Greenhouse gas emissions during the construction period will be within acceptable levels.

## **Mitigation Measures**

### ***Construction Phase***

In order to minimize the adverse impact of the planned activity on the air during the construction period, a number of environmental measures are proposed:

- when using machines in the conditions established by the operational documentation, the levels of dust, gas contamination at the driver's workplace, as well as in the area of operation of mechanisms and equipment should not exceed hygienic standards that establish requirements for dust and gas contamination in workplaces;
- used building materials, products and structures must have documents confirming their safety and harmlessness to humans;
- transportation of dusty goods must be carried out in specially equipped trucks to prevent dusting, spilling or leakage of contents;
- organization of work on the construction of the facility should include the use of specialized enterprises and permanent production bases equipped with a system for controlling emissions of pollutants entering the atmospheric air.
- preventing the operation of equipment at idle;
- the maximum possible reduction in the number of transport routes through residential territory;
- Liaison with local communities will be maintained near the construction sites;
- GRM will be operationalized and will capture complaints related to air quality particularly dust emissions.

### ***O&M phase***

Additional measures to prevent or reduce potential adverse effects on the air during the operation of the facility are not required. This is due to the fact that the expected level of air pollution by vehicle emissions in the territory adjacent to the facility, taking into account the background level of atmospheric pollution, growth in traffic, the sum of the biological effects of simultaneously present pollutants, will not exceed the established environmental and hygienic standards.

The implementation of the project for the reconstruction of the bridge in Novopolotsk will not lead to an increase in air pollution.

In general, the implementation of the projects under consideration will not lead to a change in the emissions of pollutants and greenhouse gases into the air, since the planned work does not directly affect the traffic intensity.

### **6.2.3. Impact on surface and groundwater. Assessment and forecast of changes in their condition.**

Impact on surface water can occur both at the construction stage and during the further operation of the facility.

The designed road crosses the Vydritsa and Belchitsa rivers, the channel between Lake Gomel and Shchaty, designated as the Turzhanka River, the channel between Lake Gomel and Suya, designated as the Turovlyanka River, and the reconstructed section runs near the lakes. Polotsk City bypass crosses the network of reclamation canals and the Zapadnaya Dvina River.

**During the construction phase**, impacts on natural waters will mainly be temporary and local. Construction work will produce only minor, localized and short-term negative impacts. Surface and groundwater can be contaminated with sewage, waste water, solid and liquid waste, as well as fuel and oil leakage from auxiliary construction sites. Such impacts are common in road construction, are temporary and reversible, and can be controlled by monitoring the environmental impact and using appropriate building codes.

Reconstruction of the bridge in Novopolotsk should be carried out by methods with minimal impact on the water surface of the Western Dvina River, which will minimize the possible impact on surface waters.

According to Article 25 of the Water Code of the Republic of Belarus dated 30.04.2014 No. 149-3, when designing objects that affect water bodies, it should provide:

- measures ensuring the protection of waters from pollution and clogging, as well as the prevention of harmful effects on water bodies;
- application of the best available technical methods;
- emergency prevention;
- prevention of flooding, waterlogging, salinization of soil, soil erosion.

In accordance with Art. 46 of the Water Code of the Republic of Belarus dated April 30, 2014 No. 149-3, waters discharged from the road lane into the environment are not considered wastewater.

However, potential pollutants of water bodies may be emissions from vehicles, wear products of coatings, tires and brake pads, materials, anti-icing mixtures, construction materials, which, when washed away by rain and meltwater, can lead to saturation of surface runoff water with various pollutants.

To minimize the adverse effects of the designed facility on surface and groundwater, it is planned to drain rainwater outside the coastal strip or to clean it.

According to the requirements of Article 52 of the Water Code of the Republic of Belarus, water protection zones are not established for drainage system channels, therefore, additional measures for their protection are not required. At the intersection of the road and the drainage network, its reconstruction will be done if necessary.

The project provides for the construction of a new bridge across the Western Dvina River.

According to the provisions of the Water Code of the Republic of Belarus, it is allowed to erect bridge crossings and hydraulic structures and devices, other objects of engineering infrastructure within the boundaries of coastal stripes of water bodies.

The project provides for the construction of a new bridge across the Western Dvina River.

According to the provisions of the Water Code of the Republic of Belarus, within the boundaries of the coastal strips of water bodies, it is allowed to erect bridges and hydraulic structures and devices, other engineering infrastructure facilities.

Within the boundaries of the city of Novopolotsk and in the area of the bridge over the Zapadnaya Dvina river, it is planned to construct a rain sewage system and collect water into treatment facilities.

On the construction site and in the adjacent area there are no:

- water supply sources;
- surface water bodies used for recreational purposes;
- other zones of planning restrictions in accordance with the requirements of the legislation in the field of sanitation and epidemiology [letter of the State institution “Novopolotsk City Center for Hygiene and Epidemiology” dated 04.04.2019 No. 950 (Appendix B)].

The designed bridge is located outside the boundaries of the sanitary protection zones of water intakes.

Taking into account the proposed measures, no negative impact on surface and groundwater as a result of the implementation of the planned activity is expected.

Reconstruction of the highway will not have a significant impact on *groundwater*.

A section of the R-46 highway south of the city of Polotsk for 16.9 km runs through the third zone of the sanitary protection zone for the water intakes Okunevo and Zaozerye of the city of Polotsk.

According to Art. 26 of the Law of the Republic of Belarus dated 24.06.1999 No. 271-Z “On Drinking Water Supply” within the boundaries of the third sanitary protection zone of underground drinking water sources that use insufficiently protected groundwater, it is prohibited:

- construction of waste storage and disposal facilities, warehouses of fuel and lubricants, burial places, cattle burial grounds, manure storages, silo trenches, livestock facilities, sewage irrigation fields, biological wastewater treatment facilities in natural conditions (filtration fields, underground filtering fields, filtering trenches, sand and gravel filters), earth accumulators;
- storage of snow containing sand and salt mixtures, anti-ice reagents;
- wastewater injection into the bowels, mining operations, with the exception of mining operations carried out with a view to extracting groundwater.

In the Lepel district, the reconstructed section of the road passes at a distance of about 100 m from the farm arthole in the village of Peski, in the second sanitary protection zone of the underground source.

In accordance with Art. 26 of the Law of the Republic of Belarus "On Drinking Water Supply" within the boundaries of the second zone of sanitary protection of underground sources of drinking water supply, the prohibitions and restrictions specified for the third zone apply. In addition, the use of chemical plant protection products and fertilizers is prohibited.

During the reconstruction of the 1.700–61.500 km section of the R-46 highway, the above activities will not be carried out, and the construction and reconstruction of the highway does



not contradict the established restrictions.

In the settlements of the Ushachsky district - Vatslavovo, Zawechel'e, Sorochino and Lipovka, located near the reconstructed section of the R-46 highway, there are water sources.

In the rural settlements of the Polotsk region - Gomel, Gorki, Zaozerye, Emelyaniki, Semenets, Mezjno, Trosno and Chernoruchye, located in the area of the R-46 highway, there are artesian wells that provide drinking water for these settlements.

In accordance with the Scheme of the integrated territorial organization of the Vitebsk region, approved by Decree of the President of the Republic of Belarus on January 18, 2016 No. 13, in order to supply the population of the region with clean drinking water in rural settlements, it is necessary to improve the second and third sanitary protection zones of local water intakes and artesian wells, develop draft zones sanitary protection and establish a regime of approved sanitary protection zones.

Implementation of the proposed measures in compliance with environmental standards, both by construction organizations and individuals operating this road, should maintain the anthropogenic load on surface and groundwater at a level at which their ability to self-clean is maintained.

According to the information of the State institution "Polotsk Zonal Center for Hygiene and Epidemiology" in the Polotsk region there are reservoirs used by the population for recreational purposes: lakes Yanovo, Suya, Gomel, Shchaty, Beloye, Turovlyanka river, Belchitsa artificial reservoir.

In accordance with the Sanitary norms and rules "Requirements for the maintenance of surface water bodies during their recreational use" approved by the Decree of the Ministry of Health of the Republic of Belarus dated 05.12.2016 No. 122, recreational use of surface water bodies is carried out in places determined by local executive and administrative bodies subject to the presence of positive opinion state sanitary and hygienic examination.

Recreation area should be located outside the sanitary protection zones of industrial enterprises.

In accordance with the Scheme of the integrated territorial organization of the Vitebsk region, approved by Decree of the President of the Republic of Belarus on January 18, 2016 No. 13 (Appendix B), the object of the planned reconstruction is located within the national transport and communication corridor. Thus, the location of the planned reconstruction object does not contradict the functional zoning of the Vitebsk region.

## **Mitigation Measures**

To mitigate the negative effects on surface and groundwater during construction, the following requirements must be met:

- mandatory compliance with the boundaries of the territory allotted for construction;
- compliance with restrictions on the performance of work in coastal water bodies;
- compliance with the regime of activities within the water protection zones;
- prohibition of unauthorized parking of vehicles;
- on the territory of the construction site, places for storing building materials, products and structures should be specially equipped;
- near construction sites it is necessary to arrange dry closets for the needs of workers, as well as pits for domestic wastewater with their subsequent disposal;

- to exclude the filtration of wastewater into groundwater, the bottom and walls of the pits should be concreted;
- the duration of the wastewater in the pit should not exceed 3-4 days;
- wastewater must be transported by special vehicles to treatment plants;
- territories where water is used regularly to reduce dust generation, including warehouses, concrete, gravel and asphalt plants, should be equipped with drainage systems to drain water into special containers for sedimentation of solid particles;
- after settling, water can be reused for dust removal and washing;
- it is forbidden to dump and merge any materials and substances obtained during the performance of work into water sources and low places of relief;
- all contaminated water and wastewater from construction sites must be collected and moved to special containers;
- it is prohibited to base or operate road construction equipment in close proximity to water sources;
- construction sites should be located outside the protection zone of water bodies and contoured by drainage grooves with concrete sedimentation tanks.

To reduce the removal of pollutants from wastewater from the construction site, it is necessary:

- regularly clean the area with the maximum mechanization of harvesting;
- to protect the territory with the ordering of surface water diversion according to the temporary system to the settling tanks;
- localize the territory and refueling sites of construction vehicles and mechanisms, as well as areas where spills and spills of harmful substances and oil products are inevitable;
- streamline the storage and transportation of building materials.

Prevention of the erosion of building materials by storm water and their ingress into water bodies is ensured by the storage of these materials on specially prepared sites isolated by a surface drainage system.

Materials actively interacting with water should be stored in special warehouses under the roof, organic substances - in closed storage.

In order to protect surface and groundwater from dust pollution, a device must be provided for coatings to prevent dust formation.

#### **6.2.4. Impact on geology. Assessment and forecast of changes in geological conditions and topography**

The main sources of impact on geology during the reconstruction of the R-46 Lepel-Polotsk border of the Russian Federation (Yukhovichi) 1.700–61.500 km, the construction of Polotsk City bypass are the following types of work:

- preparation of the road lane (relocation of communications, construction of sites for the needs of construction and detours around them);
- career development;
- backfilling of a subgrade;

- reconstruction of bridges.

No significant impact on the geological environment at the stage of preparatory work is predicted.

The impact of the planned road on geology is associated, first of all, with the construction of the subgrade - an artificial landform. In this case, significant masses of soils will be moving, creating excavations and dumps. The subgrade, playing the role of a dam, often leads to drainage of the territory on one side of the road and waterlogging on the other, up to the formation of an open water mirror with insufficient provision of drainage and culverts.

Possible impacts of road reconstruction on geology are:

- landslides, screes, floats, other types of shifts of earth masses due to their impact during construction work;
- land erosion due to the concentration of water flows by artificial structures, ditches and ditches;
- changing the coastline of water bodies, cross-sections of watercourses, the activation of channel processes in the construction of bridges;
- an increase in sediment volume and siltation of river beds with erosion products of construction sites, unreinforced subgrade, as well as during the construction of bridge piers when laying a road route in floodplains.

Possible consequences of exploiting the reconstructed road and bypassing the city of Polotsk for geology are: changes in dynamic loads on soils, stress state of rocks, erosion-accumulation processes.

As a result of the reconstruction of the existing bridge, the appearance of new technogenic landforms is not predicted.

### **Mitigation Measures**

The project should provide measures to minimize the impact of the construction and operation of the road on geology and terrain.

To protect the roadsides and slopes of the subgrade from erosion at an embankment height of more than three meters, drainage trays are planned on approaches to bridges over waterways and sections of bends.

Anti-erosion measures should be provided, such as: strengthening the slopes of the subgrade, strengthening the bottom, slopes of the ditches and the bottom of the embankment by sowing grasses, strengthening roadsides, etc.

To prevent flooding of the surrounding areas, it is planned to construct culverts in low places of relief.

When implementing the project for the reconstruction of the bridge in Novopolotsk, the impact on the geological environment is not predicted.

### **6.2.5. Impact on land and soil cover. Assessment and forecast of changes in the state of land resources and soil cover**

Possible impacts on land and soil cover from the reconstruction of the R-46 Lepel-Polotsk border of the Russian Federation (Yukhovichi) 1.700–61.500 km, the construction of the Polotsk City bypass and the reconstruction of the bridge across the Zapadnaya Dvina river in Novopolotsk are as follows:

- changes in land use as a result of land allotment;
- drainage and waterlogging of soils when changing groundwater flow conditions as a result of excavations in conditions of close occurrence of groundwater or when designing deep excavations;
- soil pollution from mobile sources (vehicles);
- pollution of soils with fuel and lubricants of automobiles, road-building machines and mechanisms on designed sites for construction needs, in places of unloading soil, as well as in parking lots of road-building machines and mechanisms.

The track of the reconstructed road passes through the lands occupied in agricultural production, as well as along the lands of the State Forest Fund.

One of the types of impacts of the planned activities on land is a change in land use as a result of permanent and temporary land allotment during the construction of the roadbed, road interchanges, bypasses, sites for construction needs, for storing fertile soil, the reconstruction of utilities, land reclamation systems and etc.

In order to reduce the impact on the land resources of the region, the allocation of land for the subgrade and road structures should be adopted in minimum sizes.

When passing the route of the projected object through wetlands, peat removal to the mineral bottom is envisaged.

All temporarily allotted lands upon completion of construction work are subject to improvement, reclamation and transfer to former land users.

The impact on the soil cover during the **construction phase** of the facility may be associated with the removal of natural vegetation and the removal of the fertile soil layer.

At logging sites, with a shallow groundwater level, in favorable geomorphological conditions, waterlogging processes can be activated due to a decrease in biological transpiration.

When arranging the subgrade, transport interchanges, artificial structures, detours, sites for the needs of construction, during the reorganization of communications, and other works related to land disturbance, it is necessary to provide for the removal of the fertile soil layer.

Project documentation should include measures to preserve the fertile soil layer during earthwork and its further use.

The processes of planar and linear soil erosion can be caused by disturbance of the vegetation cover, removal of the fertile soil layer, a change in the relief during construction (cutting of slopes, development of excavations, etc.), as well as redistribution of snow cover, transformation of runoff. During the construction process, water and wind erosion of the slopes of the subgrade should be prevented.

With the proper strengthening of the slopes and roadsides of the subgrade, as well as the bottom of the ditches of the grass sowing, the risk of activation of erosion and slope processes can be minimized.

When planning the work, it is necessary to take into account to the north of the village of Rubaniki, the Ushachsky region east of the R-46 highway, the peat section "Rubaniki" of the peat deposit "In the floodplain Vydritsa" registered by Ushachsky Rayagroservice OJSC.

When preparing the land cadastral documentation for the requested land plot, if it is not possible to comply with the requirements of the legislation, the land management organization stops

preparing the documentation and within three working days informs the local executive committee that sent the order (Decree of the President of the Republic of Belarus dated December 27, 2007 No. 667 “On the seizure and provision of land”).

The project envisages reimbursement to land users of losses and losses of agricultural and forestry production.

*Soil contamination* in the zone of influence of highway reconstruction is mainly associated with emissions of pollutants from motor vehicles. In this regard, the assessment of possible soil contamination was carried out by extrapolating the monitoring results carried out by the BeldorNII in the framework of the research work “Organize monitoring of the complex impact of roads on the environment” (topic 21.370.5.2006, state registration number 20065286). This work was carried out in accordance with Decree of the President of the Republic of Belarus dated April 18, 2006 No. 251 “On approval of the State Program for the Development of the National Environmental Monitoring System in the Republic of Belarus for 2006-2010” in accordance with task No. 48.

To forecast soil contamination in the zone of influence of reconstructed and new facilities within the framework of this EIA, a section of the M-1 / E30 Brest (Kozlovichi) -Minsk-border of the Russian Federation (Radish) region, located in the city of Gorky, was selected as an analogue object. Dzerzhinsk, which is an object of observation of the integrated environmental impact of roads.

In accordance with the regulation for monitoring the impact of roads on the environment, approved by the Belavtodor Department, it is necessary to measure the total content of lead, cadmium, zinc and copper, petroleum products, sodium, potassium, chlorides, pH, and cationic capacity to assess soil pollution sharing. Additionally, the content of sulfates, nitrates, metabolic calcium, magnesium, nickel and manganese was measured.

Assessment of the degree of soil pollution was carried out by comparing the actual concentrations in the samples with the MPC adopted in the Republic of Belarus [49, 50].

The results of determining the level of soil pollution in the zone of influence of a similar object are presented in **Tables 6.12** and **6.13**.

**Table 6.12: Soil pollution along the section of the M1 highway near Gorky**

Distance from the edge of the roadway	Total content, mg / kg					
	Pb	Cd	Zn	Cu	Ni	Mn
10 m	7,73	<0,50	36,03	8,18	8,33	268,15
50 m	10,98	0,74	111,68	10,26	10,34	511,62
100 m	8,86	0,68	14,72	4,48	5,83	130,28
<b>MPC, mg / kg *</b>	<b>32</b>	<b>1,0</b>	<b>55</b>	<b>33</b>	<b>20</b>	<b>1500</b>
Background content, mg/kg **	4,4	0,11	9,6	5,7	3,0	133

\* - ГН 2.1.7.12-1-2004 The list of maximum permissible concentrations and tentatively permissible concentrations of chemicals in the soil [27].

\*\* - according to the observations of the national environmental monitoring system at observation points located in areas unchanged by human activities



**Table 6.13: Soil pollution along the section of the M1 highway near Gorky with oil products and other substances**

Distance from the edge of the roadway	Water extract, mg / 100 g				Oil products, mg / kg	NO <sub>3</sub> - mobile, mg / 100g (salt extract)
	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	K <sup>+</sup>	Na <sup>+</sup>		
10 m	92,61	0,41	3,0	64,25	62,84	0,40
50 m	62,58	0,78	0,5	31,00	32,52	1,93
100 m	8,76	0,53	1,0	2,80	9,14	<0,10
<b>MPC, mg / kg *</b>		<b>160,0</b>			<b>100/500*</b>	<b>130,0</b>
Background content, mg/kg **		66,8			51,9	8,0

\* Maximum allowable concentrations of petroleum products in soils for various land categories [29].

The total content of heavy metals in the soil of the zone of influence of the designed object is expected to be slightly higher than the background indicators, but will not exceed their permissible concentrations.

It is expected that the concentrations of petroleum products, sulfates and nitrates will also not exceed acceptable values.

The use of leaded gasoline, as well as the use of metal-containing additives containing lead, manganese and iron, is prohibited by law in the Republic of Belarus. Therefore, pollution by lead and other heavy metals from vehicle exhaust is not predicted.

The scheme of the integrated territorial organization of the Vitebsk region, approved by Decree of the President of the Republic of Belarus on January 18, 2016 No. 13, provides for reducing the level of chemical exposure to soils of roadside territories from mobile sources by introducing new technologies for cleaning motor vehicle emissions, using modern environmentally friendly engines and fuels.

### Mitigation Measures

In order to reduce the impact of the planned activity on land resources, the area of land allocated for construction should be as small as possible. All temporarily allotted lands at the end of construction work are subject to reclamation, land improvement and transfer to former land users.

Land provided for temporary use must be brought into a condition suitable for intended use and returned to their former land users.

Land temporarily withdrawn from agricultural circulation must be restored to agricultural land.

Work on restoration of the fertility of the reclaimed land is carried out by land users, to whom the land is transferred after technical restoration at the expense of the enterprises that carried out work on these lands that caused damage to the soil cover, within the time period stipulated by the project.

When developing project documentation, measures should be taken to preserve and further use the fertile soil layer to restore the fertility of the reclaimed land in the course of work related to land disturbance and land improvement, as well as determine the location of the storage of the fertile soil layer and the procedure for applying it to the reclaimed plots.

When removing the fertile soil layer, the project must provide for measures to prevent its quality deterioration, such as mixing with the underlying layers, with fuel, oils, etc. The fertile soil layer that is not used immediately during the work should be stored and transferred for storage to the responsible official according to the act, which indicates the volume, conditions

of its storage and use.

The removed fertile soil and peat are preserved for further use to strengthen the slopes of the subgrade, slopes of ditches, roadsides, slopes of powder berm road signs, during the restoration of disturbed lands. Peat that is not used locally can be used in the reclamation of quarries or transferred by agricultural enterprises to restore the fertility of arable land.

In order to prevent wind and water erosion, the project should provide anti-erosion measures, such as: strengthening the slopes of the subgrade, the bottom of the ditches and the bottom of the embankment by sowing grass along a layer of fertile soil, strengthening the curbs, strengthening the log at culverts, etc.

In order to avoid waterlogging of the territory adjacent to the road, in all low places it is necessary to provide for the removal of surface water through culverts.

### **6.3. Impact on the biological environment**

#### **6.3.1. Impact on vegetation**

During the construction and reconstruction of roads, natural plant communities are directly affected. The most significant impact on vegetation during construction is expected due to the removal of natural tree and shrub vegetation and, as a result, changes in environmental conditions within the land allotment and on adjacent areas.

Also, earthworks have a negative impact on ecosystems, after which there are areas of exposed soil that are vulnerable to new species entering the local plant community, as well as a violation of the hydrological regime, often leading to decay or severe weakening of forest stands. It is necessary to take into account the littering of roadsides with household garbage, the distribution of weed species along the route, and the concentration of synanthropic and marginal plant species along the new edge of the forest.

There may be cases of flooding of the territories adjacent to the roads due to deficiencies in the construction of culverts.

During the reconstruction of the highway, it is planned to cut down trees and shrubs with uprooting stumps.

During the implementation of the Project, measures should be taken to preserve the habitats of protected plant species included in the Red Book of the Republic of Belarus.

In the habitats of the protected species *Pulsatilla patens* (L.) Mill., (See section 5.4.2, **Figure 5.50**) as well as in the vicinity of the village of Plusy and Mezhno-2 of the Polotsk region, in the zone of potential impact of the Project according to the TCP 17.05-01-2014 it is prohibited to:

- conduct continuous and gradual cutting of main use;
- carry out thinning updates and reorganization;
- allow an increase in the canopy density of the stand over 0.5;
- allow an increase in the total projective cover of undergrowth and undergrowth of more than 20%;
- burn wood residues;
- use machines on a caterpillar track, arrange timber warehouses, fueling stations and equipment parking lots;

- to violate the integrity of the litter and living soil cover, to process and violate the integrity of the soil, with the exception of work carried out with the aim of protecting the forest and fighting fires, as well as scientifically based work on the conservation and resettlement of species;
- carry out the construction of buildings and structures;

According to the Novopolotsk City and District Inspectorate of Natural Resources and Environmental Protection (Ref. No. 01-34 / 395 of 04/11/2019, Appendix B), registered plant growth sites in the territory of the facility and in the zone of its influence (within a radius of 2 km), listed in the Red Book of the Republic of Belarus are absent.

### **Mitigation Measures**

During field studies in the area of the planned activity, one place of plant growth was identified that belongs to the species included in the Red Book of the Republic of Belarus - Sedge rhizomatous (*Carex rhizina* Blytt ex Lindbl.) (see **Section 4.4.2, Figure 5.50**). The plant was found within the 14th quarter of the 6th Polotsk Forestry State Forestry Center "Polotsk Forestry" within option 1 of the Polotsk bypass. It is prohibited there to:

- carry out clear-cut, gradual cutting and group-selective cutting of main use;
- carry out thinning updates and reorganization;
- allow an increase in the total projective cover of undergrowth and undergrowth of more than 30%;
- burn wood residues;
- use machines on a caterpillar track, arrange timber warehouses, fueling stations and equipment parking lots;
- to violate the integrity of the litter and living soil cover, to process and violate the integrity of the soil, with the exception of work carried out with the aim of protecting the forest and fighting fires, as well as scientifically based work on the conservation and resettlement of species;
- carry out hydro technical land reclamation and other work to regulate the water regime of lands (soils), surface and ground waters, except for restoration of the violated regime;
- carry out the construction of buildings and structures.

*The presence of this plant's habitat is a limiting factor in the construction of the Polotsk bypass according to option 1.*

Typical biotopes identified along the P-46 highway and the Polotsk bypass are also a limiting factor for construction work on these sites (see **Section 5.4.2, Figures 5.51**):

- typical biotope "Raised bog", 17.4-17.8 km on the right. GLHU "Ushachsky forestry", Sorochinsky forestry, quarter 72, allotments 33, 34;
- typical biotope "Black alder and fluffy birch forests on excessively moistened soils and lowland marshes", the initial section of the Polotsk City bypass according to option 2, allotment 50 of quarter 23 of the Polotsk forestry of the Polotsk Forestry GLHU.

Other measures aimed at minimizing the effects of exposure to vegetation during the reconstruction and operation of the road section include: organizational, organizational,

technical, forestry and agricultural.

*Organizational and organizational and technical measures include the following restrictions:*

- it is forbidden to cut trees and shrubs outside the area reserved for construction work;
- damage to all elements of plant communities (trees, shrubs, ground cover) is prohibited outside the area reserved for construction work;
- hot work is strictly prohibited;
- littering with construction and other rubbish is not allowed;
- It is strictly forbidden to arrange places for storage of building material, equipment parking lots, etc. outside the sites established for this purpose.

When planning road construction works, the identified detached oak trees should be considered:

- on km 15 to the right in a decorative planting along the road, at a distance of about 10 m from the axis of the road;
- on km 27 on the right at a distance of about 23 m from the axis of the road;
- on km 44.1 on the right at a distance of about 35 m from the axis of the road.

During the reconstruction of the highway, these objects of the plant world are recommended to be preserved if possible. To avoid causing mechanical damage, detached oak trees near the road should be fenced with wooden shields 1.5–2.0 m high, protecting the trunks from damage. Shields are recommended to be placed in a triangle at a distance of 0.5–1.0 m from tree trunks and reinforced with stakes. To save from damage to the root system around the enclosing triangle, do not work closer than 1.5 m.

Forestry activities include:

- preventing the placement of logging residues at the edges of the forest in order to avoid forest fires;
- prevention of powdering of the root necks of trees with soil, which during the month can lead to weakening and drying of the trees;
- prevention of mechanical damage to trees by working construction equipment;
- removal of wood felling residues and wood located in the right of way.
- *Agro technical measures include:*
- in order to prevent the spread of aggressive plant species and prevent secondary soil contamination, roadside mowing and mowing are necessary;
- the use of planting trees and shrubs in a favorable period.

Recommended measures to prevent biological pollution of adjacent territories by invasive species:

- removal of identified plant species during the construction work, the distribution of which are subject to regulation: Sosnovsky hogweed, Mantegazzi hogweed, Canadian goldenrod, giant goldenrod, ash-leaved maple, false acacia robust, echinocystis lobed;
- in areas where Sosnovsky hogweed is growing, create a lawn from coarse-grained crops (hedgehogs, common fescue) along the slopes and in the alienation zone of the

highway, which are serious competitors to the hogweed and, in the presence of dense grass sod, can displace this species;

- it is necessary to carry out mowing of sites with Sosnowski hogweed along the highway until the flowering period of plants (end of June-July) and preferably a second time during mass flowering until the fruit is formed (August);
- in areas where the invasive species is most common and where mowing is difficult, treatment with herbicides should be carried out;
- in order to prevent secondary pollution of soils and to prevent biological pollution in the strip between the edge of the forest and the road, mowing should be carried out and immediately after mowing, the mowed grass should be removed.

The implementation of the design solution for the reconstruction of the bridge in Novopolotsk will not affect the flora.

### **6.3.2. Impact on wildlife**

The impact on the fauna during the implementation of the project will be provided at the stages of preparatory and construction work - destruction of habitats, direct impact on certain species, at the stage of operation - death of animals when crossing a road. The existing road is a significant disturbance for animals.

The fauna of the area of planned activity includes mainly widespread species.

According to the information provided by the district inspectorates of natural resources and environmental protection and leshozes, there are no habitats of animals listed in the Red Book of the Republic of Belarus in the reconstruction area of the 1.700–61.500 km section of the R-46 highway and the construction of the Polotsk City bypass.

During the field study, 4 habitats of the comb newt, a protected animal species, were identified. According to the TCP 17.07-01-2014 (02120), within the limits of the terrestrial habitat of the comb newt, it is prohibited:

- carry out hydro technical land reclamation and other work on regulating the water regime of soils, except for restoration of the violated regime (this prohibition does not apply to the lands of existing irrigation and drainage systems);
- carry out clear-cuts for main use;
- to cut down trees of broad-leaved species and alder during felling;
- use tracked vehicles, arrange warehouses, refueling and parking places for equipment;
- burn logging residues of harvested wood;
- burn dry vegetation and its remains on the vine, with the exception of scientifically based work on burning dry vegetation and its residues on the vine, reed, reeds and other thickets of wild plants;
- run and graze farm animals, organize summer camps for them;
- use pesticides
- apply all types of fertilizers;
- dispose of solid household waste.

Thus, the habitats of the crested newt are the limiting factor for the reconstruction of the R-46



highway and must be preserved.

Entomofauna. On the territory of the project, entomocomplexes are mainly represented by widespread species that live throughout Belarus.

The reconstruction of the R-46 highway and the construction of the Polotsk City bypass will not cause significant harm to the entomofauna of the region.

Ichthyofauna. The reconstructed section of the road crosses the channel between Lake Gomel and Shchaty (designated as the Turzhanka river) the channel between Lake Gomel and Suya (designated as the Turovlyanka river), the Vydritsa and Belchitsa rivers.

In accordance with the Comprehensive Layout Scheme for the Fishing Land of the Republic of Belarus, there are no fishing lands on the floodplains of Vydritsa, Belchitsa, Turzhanka and Turovlyanka.

The composition of the ichthyofauna of these watercourses in the areas of construction works is depleted and quantitatively small to varying degrees.

Adverse effects during construction work on rivers will be manifested in the form of a zone with increased turbidity of the water, destruction of sections of natural coasts and coastal shallow waters.

The designed Polotsk City bypass crosses the Western Dvina River. In accordance with the Comprehensive Layout Scheme for the Fishing Land of the Republic of Belarus, Zapadnaya Dvina River with adjacent floodplain water bodies is the first category of fishing land.

Adverse effects during the construction of the bridge will also be manifested in the form of a zone with increased turbidity of water, the destruction of sections of natural coasts and coastal shallow waters.

The avifauna along the reconstructed section of the R-46 highway and the Polotsk City bypass is characterized by a fairly rich species diversity of birds. Both nesting and migratory species are widely represented. The avifauna is represented by species related to forest, tree-shrub, near-wetland, coastal-aquatic and synanthropic ecological complexes, as well as types of open spaces.

As a result of construction work, a local disturbance of ecosystems will occur, which will entail a change in the spatial distribution of birds, especially in the first years of operation of new sections of the road. A decrease in the density of a number of forest bird species or their local concentrations beyond the influence of the road may occur. But later, due to high mobility, the number of background and common bird species will reach average values.

Reconstruction of the highway and the construction of a new section will not cause significant damage to the places of nesting and feeding of birds.

The species composition of mammals in the study area is quite diverse. The species composition is based on the species widespread in the Republic of Belarus that are characteristic of natural forest and open landscapes. The most widely represented rodents.

In the vicinity of the research site, traces of the activity of beavers and beaver dams were found on some watercourses and wetlands. Construction work should not have a significant impact on the life of beavers. The common beaver is characterized by a high degree of adaptation to changing environmental conditions. A prerequisite for the existence of this type of rodent is only the presence of a water body, as well as the presence on the coast of grassy vegetation and soft species of deciduous trees, bark, young shoots and wood of which are used by beavers for food.

The construction of culverts should not lead to a change in the hydrological regime of watercourses crossed by the road, and will not create obstacles to the movement of near-water animals.

Given the above, the implementation of the project will not affect the livelihoods and populations of beavers and other near-water animals in this region.

During the operation of the road, both direct and indirect impacts on the fauna of this area may occur.

Direct impact may result in the death and injury of animals as a result of traffic accidents. The main reason for the appearance of ungulates on the road is the dissection of the forest tracts and agricultural land used by ungulates for feeding, as well as permanent migration corridors and places of concentration of ungulates.

According to the map of the main migratory corridors of ungulate animals in Belarus, developed by the National Research and Production Association of the National Academy of Sciences of Belarus for Bioresources, the reconstructed section of the R-46 highway crosses the migration corridors of ungulates in the spans 3–9.5 km, 26–41 km, and 53–57.8 km.

According to the information of hunting farms, on the territory of which the R-46 highway passes, and the State Automobile Inspectorate of the Department of the Interior of the Vitebsk Oblast Executive Committee, on the reconstructed site, the facts of the death of wild animals were noted at kilometers: 2, 3, 4, 8, 9, 11, 12, 17, 18, 19, 22, 25, 27, 29, 30, 31, 33, 34, 35, 37, 42, 43, 44, 50, 53. The migratory activity of animals is maximal at the spans 16–22.5 km and 34–36.5 km).

In general, a significant part of road accidents involving ungulates is associated with the peculiarities of agriculture and the spatial location of obstacles limiting the migration activity of animals (lakes, settlements). In addition, it should be noted the importance of maintaining the sufficiency of biotechnological measures on the part of hunting farms. The high degree of fragmentation of hunting grounds requires a revision of the spatial location of biotechnical measures, as well as the placement of hunting areas to prevent the intentional corral of animals towards the road. Thus, taking into account the changes in the management of the hunting economy, it is possible to enclose only certain areas along the road. If biotechnical measures are not taken at the proper level, it is possible to significantly expand the length of the installation of guide structures to prevent ungulates from entering the road.

### **Mitigation Measures**

A possible impact of highway reconstruction will be a slight decrease in the number of amphibians due to the death of the reproductive part of local populations.

The conducted studies revealed the areas of migration activity of amphibians in the projected section of the highway. In this regard, the necessary condition is the construction of the following structures:

- a transition for amphibians at pickets ПК 12+480...ПК 12+600;
- a fender at pickets ПК 10+465...ПК 10+645 (without pipes for access);
- guide structures for amphibians at pickets ПК 6+780...ПК 7+100, including under the exit to the parking lot at the picket ПК 7+025.
- The project provides for the following compensatory measures:

- construction of a concrete bumper for amphibious animals at PK 12 + 480 ... PK12 + 600;
- reconstruction of the existing pipe with the installation of a new metal pipe with a diameter of 1.2 m at PK 12 + 482;
- reconstruction of the existing pipe at PK 6 + 889 with the installation of a new metal pipe with a diameter of 1.2 m. At the exit of PK 7 + 025 (to the parking lot), a pipe with a diameter of 0.6 m is provided.

Measures to mitigate the consequences of economic activity in relation to beaver settlements can be as follows:

- At PK 3 + 000, during the survey, a beaver burrow was found in the road embankment, which shows that the road embankment was not constructed with sufficient quality.
- Before starting construction work, it is necessary to notify the Lepel forestry hunting farm about the need to relocate the beaver family to other lands.
- One of the alternative options provides for the regulation of the beaver population before the start of construction works to prevent flooding during the construction period.
- If no measures are taken to resettle or regulate the number of beavers, it is recommended to inform the builders about the need to observe precautions when handling beavers, as well as inform about the places of their settlement in the immediate vicinity of the work.
- As the experience of the construction work of previous years shows, during the construction period, beavers move to other lands outside the zone of active work, and at the end of those they return to their original habitats.
- 

The following set of measures is proposed to prevent ungulates entering the roadway and minimize the likelihood of accidents with their participation:

- It is necessary to arrange a passage (height not less than 4.0 m) for ungulates as well as construction of mesh guide structures on both sides on the road section 3–9 km;
- Measures are required to ensure road safety on the road section 55–58 km. In particular, it is necessary to inform hunting farms about the need to conduct biotechnical attracting activities near the projected passages for ungulates, such as laying out salt, placing feeding grounds, arranging a watering hole, if necessary, etc. Such activities must be carried out for at least 3 years after the reconstruction of the road;
- Installation of mesh structures and information signs "Wild Animals" is required on the road section 18-20 km.
- Design solutions provide for compensating measures:
- installation of safety nets with a height of 2.4 meters at 56 sites and a total length of 71.3 km;
- installation of 54 warning road signs 1.25 "Wild animals";
- construction of two crossings for ungulates:

- at 4,065 km, a combined structure is envisaged to replace the existing pipe, which is in an unsatisfactory condition, which will act as a bridge over a stream and a passage for wild animals. The size of the combined structure: width 8 meters, height 4.5 meters. PK 26 + 155 provides for an underground passage for animals 8 meters wide, 4.5 meters high and 9.7 meters long.

The implementation of the planned work as a whole will not significantly affect the biological diversity of the region. The land plots that may be affected during the implementation of the project are:

- not a habitat that is significant for species that are on the verge of extinction and / or endangered species;
- not a habitat that is significant for endemic species and species with a limited habitat / growth area;
- not a habitat supporting globally significant accumulations of migratory species and / or pack species;
- not a territory associated with the most important evolutionary processes;
- ecosystems which are not at serious risk of degradation and are not unique to the area of planned economic activity.

#### **6.4. Risks related to labor protection and industrial hygiene**

The construction activities of the project pose significant OHS risks for the construction workers and nearby communities. These risks are associated with working near construction machinery and heavy vehicles, working at heights, excavation, vehicular traffic, electric shock, fall and trip risks, excessive noise, excessive air pollution, working in/over water, working near running traffic, and other similar risks and hazards.

##### **Mitigation Measures**

The contractor will be required to prepare and implement OHS management plan, which will define procedures and measures to address all kinds of OHS risks, methodology to prepare job hazard analysis for all field activities, OHS organizational setup as well as roles and responsibilities, OHS training mechanism, emergency procedures, and reporting requirements.

All types of construction and installation, loading and unloading, transportation of people, transportation of materials and structures will be carried out in compliance with safety regulations and industrial sanitation.

The project provides measures to reduce the risks of emergencies and emergencies during construction, loading and unloading, transporting people, transporting materials and structures.

It is forbidden for workers to be without signal vests in the work area where traffic is taking place.

Necessary accesses to the construction site, on-site driveways and fencing of the construction area must be completed before construction begins.

When constructing a construction site, work sites, driveways for construction vehicles, walkways for people, zones should be defined within which hazardous production factors constantly operate or may act. Hazardous areas in order to prevent access by unauthorized persons should be fenced and marked with signs and inscriptions of the established form.

Driveways, walkways, loading and unloading sites and workplaces must be regularly cleaned

of construction waste and not cluttered. In winter, clear of snow and ice, sprinkle roads with sand and slag.

At all construction sites where work conditions are required (for machines and mechanisms, on highways) and other dangerous places, clearly visible signs should be hung out, and at night, illuminated warning and warning signs or safety signs, posters and instructions for safety precautions. If necessary, fences should be put up or duty officers should be appointed.

Passages with a slope of more than 20 degrees, as well as approaches to workplaces and passages through ditches and trenches (more than 1 m deep) should be equipped with gangways or stairs with a passage width of at least 1 m and a railing of 1.1 m high.

The construction site should be provided with working, emergency, evacuation, and, if necessary, security lighting.

The labor protection of workers should be ensured by the issuance of the necessary personal protective equipment (overalls, shoes, etc.), the implementation of measures for the collective protection of workers (fencing, lighting, ventilation, protective and safety devices and appliances, etc.), sanitary facilities and devices in accordance with applicable standards and the nature of the work performed.

The necessary working conditions, food and rest should be created for workers.

At the construction site, dispatch communication and operational dispatch control of construction should be created.

## **6.5. Impact on the socio-economic environment**

The impact on the socio-economic environment will occur at all stages of the Project implementation: preparatory work, construction, and operation.

The main negative socio-economic impact factors at the stage of construction work are the deterioration of traffic conditions and possible difficulties with the provision of public services.

### **Mitigation Measures**

The mitigation measures are:

- arrangement of construction work in turns,
- carrying out construction work as soon as possible,
- construction of temporary driveways, ensuring that local routes and accesses are not blocked, and if required, preparing alternate routes
- re-laying of engineering communications (water supply, power lines, cable communication lines) serving the population before the start of construction work.
- Relocation and restoration of all public utilities damaged/affected by the project activities;
- Maintaining close liaison with the local communities near the construction worksites;
- Operationalizing the GRM to capture community grievances.

Planned compensatory measures will allow to reduce the possible negative impact on the social environment during the construction work. Taking into account these measures, the significance of the impact is assessed as low.



### **6.5.1. Impact on national and local economies**

The reconstruction of the road section R-46 will positively affect the social environment and improve road safety, namely:

- an increase in the speed of movement along the reconstructed section of the road by ensuring a rational transverse profile of the subgrade;
- the improvement of transport and operational parameters of the road will affect such aspects of socio-economic development as the productivity of the road sector, the effectiveness of entrepreneurship, and the investment attractiveness of the region.

With the improvement of the operational characteristics of the road, the volume of freight traffic will increase, roadside services will develop, which will lead to an increase in the socio-economic indicators of the region. Additional local jobs may be created for the local population.

The implementation of the planned activities for the socio-economic development of the region as a whole will have a positive effect.

The construction of Polotsk City bypass with the construction of a new bridge over the Zapadnaya Dvina river will allow to ensure:

- additional transport links of the cities of Polotsk and Novopolotsk;
- redistribution of transit traffic flows (international and domestic long-distance routes) in order to reduce the traffic load on the existing streets of Polotsk (Maxim Bogdanovich St., Petrus Brovka St., Zygin St.) and Novopolotsk (Molodezhnaya St.);
- the prospect of the development of the Polotsk agglomeration and its transport infrastructure;
- providing transport links for transit traffic following the direction of the Russian Federation (Yukhovichi), and increasing the attractiveness of the transport transit corridor;
- increasing speed, ensuring safe conditions for the movement of vehicles;
- reduction of transport and non-transport costs.

The implementation of the planned activity on the construction of a detour in Polotsk as a whole will have a positive effect on the socio-economic development of the region.

### **6.5.2. Traffic safety for pedestrians and cyclists**

The project provides the following solutions aimed at traffic safety:

- bringing the parameters of the plan and the longitudinal profile to the standards of category II, providing for the construction of a stop strip 2.5 m wide with a coating of asphalt concrete;
- ensuring snow tolerance of the reconstructed site;
- the device of asphalt concrete coating with the coefficient of adhesion of the tire of the car with a coating of not less than 0.50;
- the device of ring crossings at intersections with high traffic;
- lighting of settlements, bus stops and pedestrian crossings;
- arrangement of sidewalks in the area of bus stops;

- installation of a metal barrier on the side of the road;
- installation of safety signal posts with elements of retroreflective film;
- device edge band with a sound effect;
- the device of a protective fence from the nets, excluding the exit of animals on the roadway.

Changes in road safety, pedestrians and cyclists in accordance with the adopted design decisions are presented in the **Table 6.14**.

**Table 6.14: Assessment of road safety, pedestrians and cyclists**

Category	Factor	Change Assessment	Possible improvement
motorists	movement within a settlement	moderate positive	exclusion of pedestrian's access to the carriageway
	movement outside a settlement	moderate positive	construction of a four-lane road
	crossroads	moderate positive	construction of multi-level interchanges
pedestrians	illumination	significant positive	-
	transition security	moderate positive	construction of crossings at different levels with the highway
	movement within a settlement	moderate positive	construction of sidewalks along the highway throughout the entire settlement
	movement outside a settlement	moderate positive	arrangement of special footpaths
cyclists	movement within a settlement	moderate positive	special bike lanes

### 6.5.3. Land acquisition and involuntary resettlement

For the implementation of the Project for the reconstruction of the P-46 Lepel-Polotsk-Russian Federation border (Yukhovichi) 1,700 - 61,500 km, additional land with a total area of 204.1205 hectares will be allocated, of which 90.1913 hectares will be acquired, and 113.9292 hectares will be transferred for temporary use.

It may be necessary to allocate common land for the reconstruction of the bridge over the Western Dvina River in Novopolotsk.

None of the design decisions implies a forced relocation.

For the implementation of the project, the lands of legal entities, individual entrepreneurs, individuals and lands not provided to the land user, which are under the jurisdiction of district and rural executive committees, are seized.

A brief description of the impact caused by land acquisition for the entire project is presented in the **Table 6.15**.

**Table 6.15: Impacts caused by land acquisition**

Land user	Nature of the impact	Withdrawal period	Significance of Impact
Open Joint Stock Company "Lepelagroservice"	Land allotment along the edge of agricultural land	permanent and temporary use	low
Open Joint-Stock Company "Chereyshchina"	Land allotment along the edge of agricultural land	permanent and temporary use	low
Open Joint-Stock Company Ilyushinsky	Land allotment along the edge of agricultural land	permanent and temporary use	low
Municipal agricultural unitary enterprise "Orekhovno"	Land allotment along the edge of agricultural land	permanent and temporary use	low
Agricultural unitary enterprise "Polymir-agro"	Land allotment along the edge of agricultural land	permanent and temporary use	low
Open Joint Stock Company "Polotsk Combine of Bread Products"	Land allotment along the edge of agricultural land	permanent and temporary use	low
State Forestry Institution "Lepel Forestry"	Withdrawal of a strip of forest land	permanent and temporary use	low
State Forestry Institution "Ushach Forestry"	Withdrawal of a strip of forest land	permanent and temporary use	low
State Forestry Institution "Polotsk Forestry"	Withdrawal of a strip of forest land	permanent and temporary use	low
Municipal design and repair construction unitary enterprise "Vitebskobldorstroy"	Withdrawal of a strip of forest land	permanent and temporary use	low
Republican Unitary Enterprise of Roads "Vitebskavtodor"	Withdrawal of a strip of forest land	permanent and temporary use	low
Vitebsk republican unitary enterprise of electric power industry "Vitebskenergo"	Land acquisition with the reconstruction of utilities	permanent and temporary use	average
Republican Unitary Telecommunication Enterprise Beltelecom	Land acquisition with the reconstruction of utilities	permanent and temporary use	average
Open Joint Stock Company Gazprom Transgaz Belarus	Land acquisition with the reconstruction of utilities	permanent and temporary use	average
Ushachsky municipal unitary enterprise of reclamation systems "Ushachskoye PMS"	Withdrawal of a small plot	permanent and temporary use	low
Republican Unitary Enterprise of Postal Service "Belposhta"	temporary use of land	temporary use	low
Municipal Unitary Production Enterprise Borovka	Withdrawal of a small plot	permanent use	low
Republican subsidiary unitary enterprise for the provision of petroleum products	Withdrawal of a small plot	permanent and temporary use	low
Open Joint Stock Company Polotsktransneft Druzhba	Land acquisition with the reconstruction of utilities	permanent and temporary use	average
Production Republican Unitary Enterprise "Vitebskoblgaz"	Land acquisition with the reconstruction of utilities	temporary use	average

Land user	Nature of the impact	Withdrawal period	Significance of Impact
Unitary Production Enterprise Zapad-Transnefteproduct	Land acquisition with the reconstruction of utilities	permanent and temporary use	average
Joint Mobile TeleSystems Limited Liability Company	temporary use of land	temporary use	low
Private service unitary enterprise "ARSmoto"	temporary use of land	temporary use	low
Ushachsky regional consumer society	Withdrawal of a small plot	permanent and temporary use	low
Individual entrepreneur Startsev Viktor Mikhailovich (village Bikulnichi)	Withdrawal of a small plot	permanent and temporary use	average
Pashuta Vasily Evgenievich (village Sorochino)	Seizure of an insignificant land area without buildings and structures	permanent use	low
Suboch Nikolay Nikolaevich (village Sorochino)	Complete withdrawal of the site with the cafe building located on it	permanent use	high
Malashchenko Gennady Viktorovich (village Rubaniki)	Seizure of an insignificant land area without buildings and structures	permanent use	low
Telepen Zinaida Timofeevna (village of Wenceslas)	temporary use of land	temporary use	low
Teplovodsky Yuri Valerievich (village of Wenceslasovo)	temporary use of land	temporary use	low
Volkov Vitaliy Leonidovich (agro-town Gomel)	Seizure of an insignificant land area without buildings and structures	permanent and temporary use	low
Golub Ivan Ivanovich (agro-town Gomel)	Seizure of an insignificant land area without buildings and structures	permanent and temporary use	low
Demeshko Tatyana Mikhailovna (agro-town Gomel)	Seizure of an insignificant land area without buildings and structures	permanent and temporary use	low
Kazeko Oleg Vladimirovich (agro-town Gomel)	Seizure of an insignificant land area without buildings and structures	permanent and temporary use	low
Ivanova Valentina Grigorievna (agro-town Gomel)	Seizure of an insignificant land area without buildings and structures	permanent and temporary use	low
Ivanova Vera Nikolaevna (agro-town Gomel)	temporary use of land	temporary use	low
Shmatkova Olga Ivanovna and Sabanzheeva Lyudmila Mikhailovna (agro-town Gomel)	temporary use of land	temporary use	low
Begunov Alexander Filippovich (village Belchitsa)	Seizure of an insignificant land area without buildings and structures	permanent and temporary use	low

Land user	Nature of the impact	Withdrawal period	Significance of Impact
Zakrevsky Anatoly Alexandrovich (village Belchitsa)	temporary use of land	temporary use	low
Astashova Elena Pavlovna (village Trosno)	temporary use of land	temporary use	low
LLC Ligmot	Withdrawal of a small plot	permanent use	low
OJSC Vitebskoblavtotrans	Withdrawal of a small plot	permanent use	low
Garden Association "Strawberry"	Withdrawal of a small plot	permanent use	low
Unitary enterprise for the provision of services "A1"	The tower is likely to be transferred	permanent use	high
UO "Belarusian State Technological University"	Withdrawal of a small plot	permanent use	low
Branch of the Vitebsk republican unitary enterprise of electric power industry "Vitebskenergo" "Vesna-energo"	Land allotment along the edge of agricultural land	permanent use	low
UTEK-Bel LLC	Withdrawal of a small plot	permanent use	low
OJSC "Meter"	Withdrawal of a small plot	permanent use	low
LLC "Energoavtomatika"	Withdrawal of a small plot	permanent use	low

As part of the project for the construction of the roundabout with the R-113 road Senno - Beshenkovichi - Ushachi, it is planned to completely remove the land and one non-residential building. The structure - the catering pavilion, is a frame building, sheathed with sheets of tin, with a large area of glazing of the front part and a brick extension in the end part of the building. The removal of this site is assessed as an impact of high significance.

In the territory of the city of Novopolotsk, land within the site for the construction and maintenance of the IP center facility, mobile radiotelephone communication of the GSM standard, base station will be withdrawn. high impact exposure.

If option 3 of the construction of the Polotsk City bypass is chosen, three sites for maintenance and maintenance of existing garages are subject to withdrawal (**Figure 6.3**). The right to these sites has not been established. The impact of land acquisition is assessed as the impact of high significance.



**Figure 6.3:** Existing garages on the highway according to option 3 of the construction of the Polotsk City bypass



## Mitigation Measures

To mitigate the impacts associated with temporary and permanent land acquisition and other resettlement impacts, three ARPs will be prepared for the three phases of the project.

### 6.5.4. Changes in traffic, division of territories and restriction of access

The reconstruction of the bridge over the Turzhanka River involves the closure of traffic for at least 6 months. At the time of construction, transport will be redirected along the existing highway N-3241 Gomel - Bogorodetskoye - Rybaki and along the Podzdezd to the village of Turzhets-1 from the highway Lepel - Polotsk - the border of the Russian Federation (Yukhovichi) through the settlement of Turzhets-1. Impact from traffic: noise and the impact of emissions of pollutants into the air will affect residents of the village Turzhets-1. In connection with the reconstruction of the R-46 highway, construction equipment will also move along this detour. Directly along the bypass road there are more than 30 land plots of citizens. Impact is assessed as strong in level and average in duration.

Along the reconstructed highway R-46 there are sections to which you can drive only from its side. During the reconstruction of the R-46 highway, difficulties may arise when approaching them. The list of sites is presented in the **Table 6.16**.

**Table 6.16: Characteristics of sites with possible access restrictions**

Location	Location relative to the highway	Characteristic
Sorochino village, Krinichnaya St. d.1. (Ilyushevich Sergey Mikhailovich)	from the right side	Land for construction and (or) maintenance of a residential building
Sorochino village, St. Central, 38 (as well as 4 neighboring plots)	from the left side	Land for maintenance of a single-family residential building. The type of right not to one of the sites is undefined
ag. Gomel, St. Tyabuta D.V., 1. Demeshko Tatyana Mikhailovna	from the right side	Land for maintenance of a multifunctional building with an isolated living room
Belchitsa village, St. School, 2, 2A, 2B. (Pugachev Yuri Arkadevich)	from the left side	Land for construction and maintenance of a residential building, etc. plots
Sorochino village	from the right side	Land for maintenance and servicing of container gas station No. 37
Shop ushachsky district consumer society	from the right side, during the construction of the roundabout	Land with store building

## Mitigation Measures

Alternative routes/accesses will be provided for the sites listed in Table 5.16 above, in consultation with the affected people and concerned government authorities.

### 6.5.5. Changing the availability of ecosystem services

The change in the availability of ecosystem services during the reconstruction of the R-46 road section is associated with a temporary closure of traffic on the section from the river. Turovlyanka to the river Turzhanka.

At present, aquatic ecosystems are actively used in this area for amateur fishing. Due to the sufficient supply of water to the region, changes in the availability of this ecosystem service will not be a significant impact.

### 6.5.6. Public health and safety during construction

Impact of the Project on the health and safety of the population during the construction phase will be associated with increased traffic in connection with the transportation of goods and construction materials on local roads and also with the construction activities. An increase in traffic can lead, first of all, to an increase in the risk of road traffic accidents, as well as to noise exposure and the formation of dust during the movement of utility vehicles.

The main characteristics of the impact on public health and safety during the construction period are presented in the **Table 6.17**.

**Table 6.17: Impact on public health and safety during construction**

Impact area	Impact factor	Exposure frequency	Exposure intensity
Lepel city, Chuikova, highway R-86 Bogushevsk-Senno-Lepel-Myadel	transportation of crushed stone, sand, reinforced concrete pipes from Lepel station	regular, moderate frequency	Moderate
village Belozerny	transportation of crushed stone, sand, reinforced concrete pipes, soil, sand and gravel from Lepel station, Svyaditskoye and Borovka quarries	regularly often	High
villages Vily, Yushki	soil transportation from Svyaditskoye open pit	irregular, moderate frequency	Moderate
villages Borovka, Old Lyadno	soil transportation from Borovka quarry	irregular, moderate frequency	Moderate
village Kryzhi	soil transportation from the Atroshkovskoye quarry	irregular, moderate frequency	Moderate
Villages Vatslavovo, Sorochino, Priest, Gomel, Turets-1, Belchitsa	transportation of any goods, materials	regularly often	High
villages Voronichi, Kuntsevichi, Zarotki, Kosarevo, Uslya, Golovny, Pashka, Zazerye, Dvor-Gomel	soil transportation from Kanashi quarry	irregular, moderate frequency	Moderate
Chernoruche-1 village, Belchitsa	transportation of crushed stone, asphalt concrete, sand, reinforced concrete products	irregular, moderate frequency	Moderate

Impact area	Impact factor	Exposure frequency	Exposure intensity
	from Ksta station, asphalt concrete plant Ksta		
All construction sites near communities	Construction activities, movement /operation of construction machinery, excavation, works at heights, hazardous materials	regularly often	High

## Mitigation Measures

The contractor will be required to prepare and implement a Traffic Management Plan in consultation and coordination with local communities and relevant authorities. The Plan will define transportation routes, timings, speed limits, and other precautions.

The contractor will be required to prepare and implement a Community Health and Safety Plan to address the public risk and hazards posed by the construction activities. The Plan will provide precautionary measures, training /awareness raising plan for communities, information dissemination protocol, and reporting and documentation requirements.

The GRM will be operationalized to capture community complaints related to health and safety issues.

### 6.5.7. Social Conflict and Influx of Workers

The influx of a large number of workers from other parts of the Country can potentially cause conflict between the project personnel and the local community. This could be because of differences in culture, religion, social norms, acceptable social behavior, and even dress code. In addition, the construction activities can potentially affect the women economic activities. Any such impact can be detrimental to the project since it can potentially cause tension between the project and local communities and even disruption of construction works.

## Mitigation Measures

The mitigation measures to address impacts associated with the social conflict are listed below.

- The World Bank Guidance Note<sup>4</sup> will be used to address potential impacts caused by temporary project induced labor influx;
- The World Bank Guidance Note on gender-based violence (GBV) will be used to address potential impacts caused by temporary project induced labor influx;
- The contractor will prepare and implement a Code of Conduct for all site personnel, in consultation and coordination with the local community;
- All site personnel will be provided orientation and training on Code of Conduct. Awareness raising materials such as posters and signage will be used as appropriate;
- All site personnel will be provided awareness and training to prevent communicable diseases, sexually transmitted infections, Human immunodeficiency virus (HIV) infections / Acquired Immune Deficiency Syndrome (AIDS);

<sup>4</sup> The Note is available at: <http://pubdocs.worldbank.org/en/497851495202591233/Managing-Risk-of-Adverse-impact-from-project-labor-influx.pdf>.

- Privacy of women will be respected; routes and places used by them will be avoided as far as possible;
- As described earlier, construction camps will be located at least 500 m away from the communities. Entry of the site personnel in the local communities will be minimized to the extent possible/appropriate.
- No child labor or forced labor will be engaged by the project or its contractors.
- Liaison with the community will be maintained.
- The GRM described earlier will also address community grievances related to social conflict.

#### **6.5.8. Impacts on Cultural Resources, Monuments, and Historical Sites**

As described in **Section 5.5.6**, no cultural resources, monuments or historical sites are likely to be impacted by the construction activities. Nonetheless, precautionary measures will be taken to avoid any unintended impacts on these objects. These measures would include clearly marking such sites on construction maps, providing temporary fencing around such sites if necessary to avoid any unauthorized entry, educating the construction workers regarding the importance of these sites and the precautionary measures, and maintaining photographic record to capture the condition of these sites/objects during the construction phase.

In addition, chance find procedures will be implemented in case of any discovery of any cultural resources/objects particularly during the construction of Phases 2 and 3 of the project.

#### **6.5.9. Site Clearance and Restoration**

After the completion of the construction activities, the left-over construction material, debris, spoils, scraps and other wastes from workshops, and camp sites can potentially create hindrance and encumbrance for the local communities in addition to blocking natural drainage and or irrigation channels.

#### **Mitigation**

The contractors will be required to remove all left-over construction material, debris, spoils, and other wastes from the construction sites in a timely manner. The camps sites will be completely cleaned and restored in original condition to the extent possible. No waste disposal will be carried out in the streams and canals. Photographic record will be maintained for pre-construction and post-construction condition of the sites.

## 7. Stakeholder Engagement and Information Disclosure

### 7.1. Consultations along R-46

In accordance with the requirements of the legislation of the Republic of Belarus, public discussions of the EIA report were held in each administrative district on the territory of which the reconstruction of the R-46 highway is planned. Information on the public discussion procedure, dates and results obtained are presented in **Table 7.1**.

**Table 7.1: Summary of public discussions held within the framework of the legislation of the Republic of Belarus (R-46 highway)**

Procedure	Administrative territorial unit (district)		
	Lepelskiy (DEC)	Ushachskiy (DEC)	Polotskiy (DEC)
Commission for the preparation and conduct of the PD EIA report	Order of February 25, 2020 No. 45r	Order of February 26, 2020 No. 48r	Order No. 58r of 02.26.2020 (as amended on April 16, 2020, No. 131r)
PD Notification Start Date: newspaper;	"Lepelskiy Krai" No. 18 (11783) dated 03/03/2020	"Patryet" No. 18 (9950) dated 04/03/2020	"Polotskiy Vestnik" No. 20 (14684) dated 10/03/2020
District Executive Committee (DEC) website;	<a href="http://lepel.vitebsk-region.gov.by/ru/obsuzhdeniya">http://lepel.vitebsk-region.gov.by/ru/obsuzhdeniya</a> /	<a href="http://ushachi.vitebsk-region.gov.by/ru/obsuzhdeniya">http://ushachi.vitebsk-region.gov.by/ru/obsuzhdeniya</a> /	<a href="http://polotsk.vitebsk-region.gov.by/">http://polotsk.vitebsk-region.gov.by/</a>
The place where it was possible to read the EIA report	Lepel District Executive Committee (room 107)  <a href="http://lepel.vitebsk-region.gov.by/ru/obsuzhdeniya">http://lepel.vitebsk-region.gov.by/ru/obsuzhdeniya</a> /	Ushachsky District Executive Committee (rooms 30, 37)  <a href="http://ushachi.vitebsk-region.gov.by/ru/obsuzhdeniya">http://ushachi.vitebsk-region.gov.by/ru/obsuzhdeniya</a> /	Polotsk District Executive Committee (rooms 139, 140)  <a href="http://polotsk.vitebsk-region.gov.by/">http://polotsk.vitebsk-region.gov.by/</a>
PD duration	05/03/2020 – 03/04/2020	04/03/2020 – 02/04/2020	10/03/2020 – 08/04/2020
Date of notice of the meeting: Newspaper  DEC website	The DEC did not receive requests for a meeting;  the meeting was not held	The DEC did not receive requests for a meeting;  the meeting was not held	The DEC did not receive requests for a meeting;  the meeting was not held
PD protocol	dated 08/04/2020	dated 09/04/2020	dated 17/04/2020
Feedback (questions, comments, suggestions) on the EIA report	No feedback received	No feedback received	No feedback received



## 7.2. Consultation along Polotsk City bypass

Information on the public discussion procedure for the EIA report on the Polotsk City bypass, the dates and results obtained are presented in **Table 7.2**.

**Table 7.2: Summary of public discussions held within the framework of the legislation of the Republic of Belarus (the Polotsk City bypass)**

Procedure	Administrative territorial unit (district)	
	Polotskiy (DEC)	Novopolotskiy (CEC)
Commission for the preparation and conduct of the PD EIA report	Order of February 2, 2020 No. 42p	Order of February 7, 2020 No. 57p
PD Notification Start Date: newspaper	"Polotskiy Vestnik" No. 13 (14677) dated 14/02/2020	"Novopolotsk Segodnya" No. 12 dated 11/02/2020
District Executive Committee (DEC) or City Executive Committee (CEC) website;	<a href="http://polotsk.vitebsk-region.gov.by/">http://polotsk.vitebsk-region.gov.by/</a>	<a href="http://www.novopolotsk.gov.by/">http://www.novopolotsk.gov.by/</a>
The place where it was possible to read the EIA report	Polotsk District Executive Committee (rooms 139, 140)  <a href="http://polotsk.vitebsk-region.gov.by/">http://polotsk.vitebsk-region.gov.by/</a>	Novopolotsk City Executive Committee (room 311)  <a href="http://www.novopolotsk.gov.by/">http://www.novopolotsk.gov.by/</a>
PD duration	14/02/2020 – 16/03/2020	11/02/2020 – 12/03/2020
Date of notice of the meeting: newspaper DEC/ CEC website	The DEC did not receive requests for a meeting;	"Novopolotsk Segodnya" No. 16 dated 25/02/2020  <a href="http://www.novopolotsk.gov.by/">http://www.novopolotsk.gov.by/</a>
EIA Report Discussion Meeting	The meeting was not held	The meeting took place on 03/11/2020 at 18.00 at the address: Novopolotsk, 74 Youth St., office 213.  Twelve people were registered.  During the meeting, written and oral appeals were made from citizens G. Popkova, A. N. Shcherbakova, O. Silchenko. Minutes of the meeting are dated 17/03/2020
PD protocol	dated 19/03/2020	dated 23/03/2020
Feedback (questions, comments, suggestions) on the EIA report	No feedback received	During the meeting, three written appeals were received with questions, comments and suggestions, to which written replies were given (to Popkova G.V., Scherbakov A.N., Silchenko O.G.)  Citizens were interested in the following questions:

Procedure	Administrative territorial unit (district)	
	Polotskiy (DEC)	Novopolotskiy (CEC)
		<ul style="list-style-type: none"> <li>• increasing acoustic load and emissions of pollutants along Projected Street No. 6 due to transit traffic through Novopolotsk;</li> <li>• the location of the main water supply networks of Novopolotsk in the area of the planned bypass section of category A4;</li> <li>• distance from the axis of the projected road to residential buildings in Novopolotsk.</li> </ul> <p>Citizens expressed the wish that the Polotsk City bypass should not pass through the "young" neighborhoods of Novopolotsk.</p>

The results of public discussions - minutes, summary reports - are presented in Appendix D.

### 7.3. Results of consultations and questionnaires conducted as part of the ESIA

Trips with the purpose of holding meetings on the ground with affected and interested parties took place on May 27 and 28, 2020. Information about the Project was previously sent out and an agreement was reached with representatives of local authorities on informing and questioning interested and affected parties to the Project.

For district, city and rural executive committees, land users (organizations and individuals) of land plots planned for temporary or permanent allotment for reconstruction of the road and construction of an allotment in Polotsk, as well as land users whose plots are located in the area of the planned activity, questionnaires were developed. These questionnaires, as well as the minutes of the meetings, contain an assessment of the provisions of the Project, collected information on vulnerable categories of people, expressed during personal meetings with interested persons, concerns, wishes and suggestions.

Citizens interested in the implementation of the Project, supervisory bodies living in the vicinity of highways, public organizations, including environmental profile, enterprises and organizations that may be potentially affected by the acquisition of land under the Project, organizations involved in the implementation of the Project expressed their attitude to the Project, concerns, comments, suggestions, etc. by e-mail, in Google form and by phone. Key comments, concerns and suggestions made by stakeholders in the questionnaires are given in **Table 7.3**. The original questionnaires can be found in the Appendix F.

During meetings with representatives of local authorities, the main design solutions were presented for the reconstruction of the R-46 highway, Lepel-Polotsk - the border of the Russian Federation (Yukhovichi) from Lepel to Polotsk, the construction of a Polotsk City bypass, the reconstruction of the existing bridge over the river Zapadnaya Dvina in the city of Novopolotsk, as well as land and cadastral plans of the lands of interested and affected land users of the Lepel, Ushach and Polotsk regions (**Figure 7.1**). BSU specialists collected information on the socio-economic and demographic conditions in the areas in which the project will be implemented. The main fears and expectations of representatives of the administration and local residents related to the implementation of the Project were also systematized.

The result of consultations and surveys were:

- Profiles received during personal meetings - 12;
- Questionnaires received by e-mail - 34;
- Written appeal of the affected and interested parties received by e-mail - 1 (village Kryzhi).


Information obtained as a result of consultations and surveys was discussed with representatives of ABBI, RUE "Vitebskavtodor", SE "Belgiprodor", Ushachskiy, Lepelskiy, Polotsk RIK, Novopolotsk State Electoral Commission during zoom conferences.



**Table 7.3: Consultations held as part of the Project and the preparation of the ESIA**

<i>Interested and affected parties</i>	<i>Place and time of the consultation</i>	<i>Solutions. Conclusions. Suggestions</i>
Lepel District Executive Committee	Questionnaire 02 dated 05.29.2020.	The project was evaluated positively. It is impractical to develop additional measures for vulnerable categories of citizens.
Zharsky Village Council	The meeting was conducted in Vatslavovo 11.00 11.30 Protocol dated 05.28.2020.	The project was evaluated positively. It is necessary to familiarize citizens living in the village council with the reconstruction scheme of the R-46 highway It is also necessary to convey to the designers the wish to equip the bicycle path along the village of vatslavovo before turning to the village of Staroe Selo
Ushachsky district executive committee	Questionnaire 02 dated 05.25.2020.	The project was evaluated positively.
	Meeting in the urban village of Ushachi from 12.00 to 13.00 in the building of the Ushachi district executive committee. Protocol dated 05.28.2020.	The project was evaluated positively. The meeting participants expressed satisfaction with the improvement of road infrastructure. It was decided to post information about the project on the website of the Ushachsky district executive committee
Novopolotsk City Executive Committee	Meeting in Novopolotsk from 17.15 to 18.00 in the building of the Novopolotsk city executive committee	The project was evaluated positively, great interest was expressed in its implementation.
	Questionnaire 02 dated 05.26.2020.	The project was evaluated positively
<i>Village Councils</i>		
Lepel village council	Meeting in Lepel from 9.00 to 9.30 in the building of the Lepel village executive committee. Protocol dated 05.28.2020.	A decision was made to additionally inform citizens living in the village council about the Project
Kamensky Village Council	Meeting in the agro-town Kamen in the building of the Kamensky Village Council from 12.00 to 12.30. Questionnaire 03 dated 05.27.2020.	The project is evaluated positively. Concern is caused by the allocation of land from the cemeteries of the village of Zaborodye.
	Protocol of 05.27.2020.	Decisions taken: <ul style="list-style-type: none"> <li>• familiarize residents with design decisions;</li> <li>• inform the initiator of the concern of citizens about the removal of cemetery land under the road.</li> </ul>


<i>Interested and affected parties</i>	<i>Place and time of the consultation</i>	<i>Solutions. Conclusions. Suggestions</i>
		<ul style="list-style-type: none"> <li>• Kamensky Village Council should facilitate the collection of comments and suggestions on the project at BSU.</li> </ul>
Sorochinsky Village Council	Questionnaire 03 dated 05.27.2020	The project was evaluated positively. A desire was expressed to equip pedestrian crossings with road signs.
	Meeting in the village of Sorochino in the building of the Sorochinsky village executive committee from 10.45 to 11.40. Protocol dated 05.28.2020.	Concern was expressed about the condition and possibility of refueling agricultural machinery. The desire was expressed to equip the pedestrian crossing with a traffic light. Residents have concerns about the accessibility of the exit from the R-46 highway to the cemetery of the village of Pyatnitsa during the construction period.
Gomel Village Council	Questionnaire 03 dated 05.26.2020	<p>The project was evaluated positively.</p> <p>The residents are concerned about the dismantling, transfer and installation of concrete fencing on the street. D.V. Chuckle.</p> <p>The desire was expressed to regularly update the road markings, repair pedestrian crossings, ramps at stopping points, build pedestrian walkways near memorials.</p>
	Meeting in the agricultural town of Gomel in the building of the Gomel Village Council from 14.20 to 15.20. Protocol dated 05.28.2020.	It was pointed out that it was necessary to inform the initiator of the Project about the concerns of citizens expressed in the questionnaires and also to give explanations to interested parties about the timing of the project.
Ekiman Village Council	Meeting in Ekiman', in the building of the Ekiman' village council from 16.50 to 17.30. Protocol dated 05.28.2020.	<p>The project was evaluated positively.</p> <p>A proposal was made for the construction of a pedestrian path between the villages of Vesnyanka and Belchitsy, pedestrian crossings, stopping points, a bicycle path to the roundabout.</p>
<i>Inspection of Natural Resources and Environmental Protection</i>		
Lepel District Inspectorate of Natural Resources and Environmental Protection <i>Head Bazhenova O.V.</i>	Meeting in the city of Lepel at the premises of the Lepel District Inspectorate for Environmental and Environmental Protection from 9.45 to 10.00. Questionnaire 08 dated 05.27.2020.	<p>The project was evaluated positively.</p> <p>It was pointed out that it is necessary to take into account the presence of foci of the growth of the hogweed of Sosnovsky on the border of the Lepelsky and Ushachsky districts at the place of passage of the R-46 highway in order to avoid its spread to the adjacent territories.</p>
<i>Affected Individuals</i>		



<i>Interested and affected parties</i>	<i>Place and time of the consultation</i>	<i>Solutions. Conclusions. Suggestions</i>
Resident A of the village of Svyatitsa	Meeting in the village of Svyatitsa, Gomel village council at Svyatitsa, 2 from 13.20 to 13.45. Questionnaire 05 from 28.05.2020.	<p>The project was evaluated positively.</p> <p>Desires were expressed to revise the Project and to move the road westward without affecting the site of the Kiselev family, to establish a noise barrier, and also provide for the possibility of access to the house during construction.</p>
		
Resident B of the village of Svyatitsa	Meeting in the village of Svyatitsa, Gomel village council at Svyatitsa, 4 from 13.50 to 14.10. Questionnaire 05 from 28.05.2020.	<p>The project was evaluated positively.</p> <p>It was suggested to arrange the construction site on the other side of the road without affecting the land, to preserve the existing structure on the site (the barn and well), provide for the entrance to</p>

<i>Interested and affected parties</i>	<i>Place and time of the consultation</i>	<i>Solutions. Conclusions. Suggestions</i>
		<p>the house during the construction and during further operation of the road.</p>
<p>Resident C of the village of Belchitsa</p>	<p>Meeting in the village of Ekiman, in the building of the Ekiman village council from 16.50 to 17.30. Plot of land at Belchitsa village, St. School, 3. Questionnaire 05 from 05.06.2020</p>	<p>The project was evaluated positively.</p> <p>Dissatisfaction was expressed with the fact that the Project was not coordinated with the land user at the design stage, as well as concern about the possible increase in environmental pollution, including noise when choosing options number 2, 3 bypass Polotsk. An objection has been expressed against the expansion of the R-46 highway at the expense of lands used for garden in a private household. Landowners do not have information about the alleged compensation for the seized land; they are concerned about the upcoming costs of re-registering the land in the Bureau of Technical Inventory. A wish was expressed to build a detour around the city of Polotsk according to option No. 1.</p>
		

<i>Interested and affected parties</i>	<i>Place and time of the consultation</i>	<i>Solutions. Conclusions. Suggestions</i>
Resident D. of the village Rubaniki	Telephone consultations were held by A. Demidov 05/29/2020 and 05/06/2020. A project description, a plan of the affected site, and a questionnaire were sent through Viber messenger.	
Owner of the cafe «Veterok»	A telephone consultation was conducted by A. Demidov 05/29/2020, sent through viber the characteristic of the planned activity, the plan of the affected area. The questionnaire dated 08.06.2020.	The project was evaluated positively. The respondent expressed dissatisfaction with the amount of compensation calculated.
JSC Ligmod	Consultation by telephone was conducted by Chubis Yu.P. Questionnaire dated 04.06.2020.	The project was evaluated positively. It was suggested: <ul style="list-style-type: none"> <li>• change the boundaries of development so that the existing building of the shopping center is not affected.</li> <li>• provide a congress to the shopping center at 194 Molodezhnaya, and in the immediate vicinity of the intersection with Molodezhnaya street;</li> <li>• to arrange a public transport stop;</li> <li>• provide a recreation facility in the area of the final bus station.</li> </ul>
Unitary enterprise for the provision of services "A1"	Consultation by telephone was conducted by Chubis Yu.P. Questionnaire dated 05.06.2020.	It was proposed to amend the project to exclude the dismantling of the tower due to the high financial costs of land acquisition and the construction of a new tower.
<i>Stakeholders identified during the consultations</i>		
Resident of the village of Sorochino	Meeting in Sorochino in the building of the Sorochinsky Village Council from 11.20 to 11.40. Questionnaire 05 dated 02.06.2020.	The project was evaluated positively. Suggestions were made: <ul style="list-style-type: none"> <li>• during the period of construction work to build an additional access road to the house at the village of Sorochino. St. Krinichnaya, building 1, as existing is non-alternative.</li> <li>• build rainwater drainage that erodes the existing access road due to the slope.</li> </ul>

<i>Interested and affected parties</i>	<i>Place and time of the consultation</i>	<i>Solutions. Conclusions. Suggestions</i>
Resident of the village of Kryzh of the Sorochinsky Village Council	The meeting took place at Vitebsk region, Ushachsky district, Kryzhi village, 2 from 21.30 to 23.00. Questionnaire 06 dated 28.05.2020.	<p>The respondent was not familiar with the decision to build an access road to the Atroshkovskoye career. The route of this road is objectionable, as according to the project, it passes too close to its site, the noise load will increase significantly. The access road to the village will be broken by large construction equipment, which will make it difficult for locals to travel to the village. There is a high risk of the spread of Sosnovsky hogweed growing on the site between the village of Kryzhi and the 31st quarter of the Ushachsky Leskhov GLHU.</p> <p>A proposal was made to change the route of the bypass road so that it immediately went from the 30th quarter to the R-46 highway, or along the border of the 31st quarter and agricultural fields of the Orekhovno KUSP. It is necessary to reconstruct the gas station in the village of Sorochany and not to close it.</p>
		
Resident of Novopolotsk	Consultation by phone was conducted by I. Penkrat, a questionnaire was transmitted to the address Novopolotsk, ul. Troetskaya, 10-1	Extreme dissatisfaction was expressed with the Project regarding the construction of Polotsk City bypass within the boundaries of the city of Novopolotsk due to a possible increase in environmental pollution, including increased noise from the road.
Lepel local broadcasting and TV programs, editorial staff of the broadcasting program	Meeting in Lepel from 9.30 to 9.45 at the address Lepel, St. Partizanskaya, 12	An agreement was reached on posting on Lepel TV information on the reconstruction project of the R-46 highway, the construction of a detour in the city of Polotsk and a bridge in the city of Novopolotsk.

<i>Interested and affected parties</i>	<i>Place and time of the consultation</i>	<i>Solutions. Conclusions. Suggestions</i>
LLC "Energoavtomatika"	Consultation by telephone was conducted by Chubis Yu.P. Questionnaire dated 02.06.2020	<p>The project of bypassing the city of Polotsk was rated positively.</p> <p>It was proposed to make a congress from the highway in the industrial zone in Stroitel'naya Street, an objection to changing the boundaries of land use of the enterprise.</p>
Training and experimental leshoz UO BSTU Polotsk State Forest College	Consultation by telephone was conducted by Chubis Yu.P. Questionnaire dated 03.06.2020	<p>The project was evaluated positively.</p> <p>It was proposed to preserve the fortifications located on the territory of the training and experimental leshoz (quarter 29, 30, 37).</p>
Representatives of RUE "Vitebskavtodor", SE "Belgiprodor", Ushachskiy, Lepelskiy, Polotskiy District Executive Committees, Novopolotsk City Executive Committee	Videoconference via Skype from 11.06.2020 from 11.00 to 11.45 was held by A. Demidov with the participation of Chizha D.A., Chubis Yu.P., Davydik E.E., Oleshkevich O.M.	<p>It is noted that during the implementation of the Project, the following elements and factors identified during the research period should be addressed:</p> <ul style="list-style-type: none"> <li>• places of growth and habitat of species included in the Red Book of the Republic of Belarus,</li> <li>• natural monument of local significance north of the village of Svyatitsa,</li> <li>• transitions for ungulates and amphibians;</li> <li>• road to the Atroshkovskoye career,</li> <li>• designed sidewalks, bike paths;</li> <li>• congresses in the villages of Sorochino and Ekiman, the agricultural town of Gomel.</li> </ul> <p>Priority options for bypassing the city of Polotsk were discussed. Informing should be in accordance with the AIIB Policy.</p> <p>A complaint handling scheme is presented.</p>
Representatives of RUE "Vitebskavtodor", SE "Belgiprodor"	Videoconference on Skype 11.06.2020 from 12.00 to 12.50 spent Demidov AL with the participation of Chizha D.A., Chubis Yu.P., Davydik E.E., Oleshkevich O.M.	





**Figure 7.1:** *Consulting with representatives of local authorities*

Interested parties were informed about the assessment of the impact on the environment and the social sphere and the features of the procedure in accordance with national legislation and the requirements of the AIIB in preparation for the construction phase. In particular, contact details were indicated for sending appeals, comments, comments and suggestions.

To further inform the public about the planned activity in the media, four publications were published (Appendix G).

#### **7.4. Results of the survey**

In order to fully and comprehensively take into account the opinions, concerns and suggestions of interested parties, to minimize potential negative impacts during the construction and operation of the R-46 highway, questionnaires were distributed, mainly by e-mail (**Table 7.4**).

During the publication of information at the design stage, 97 questionnaires were sent to affected and interested parties, more than 60 telephone conversations were conducted (remote communication).

The possibilities for implementing the proposals made are presented in **Table 7.5**.

**Table 7.4: Evaluation of the Project by stakeholders based on the results of the survey**

<i>Parties concerned</i>	<i>Questionnaire</i>	<i>Remarks, Concerns, Suggestions</i>
Branch "Bus fleet number 2 of Polotsk	Questionnaire 01 dated 01.06.2020	The construction project of the Polotsk City bypass is evaluated positively, because it will reduce the intensity of traffic flow through the city.
UE "Vitebsk branch of BelCCI"	Questionnaire 01 dated 01.06.2020	The project is evaluated positively, as it contributes to the development of transport infrastructure and the transit potential of the region
Branch "Motor transport company No. 14 of Lepel" OJSC "Vitebskoblavtotrans"	Questionnaire 01 dated 29.05.2020	The project is evaluated positively
Vitebskavtodor	Questionnaire 01 dated 05.06.2020	The project is evaluated positively, as a result of reconstruction of the R-46 highway, accident rate will decrease, traffic safety will increase, and road infrastructure will improve.
OJSC Gazprom Transgaz Belarus	Questionnaire 01 dated 25.05.2020	The project is evaluated positively. The respondent is objectionable to the construction of the Polotsk City bypass with the reconstruction of the entrance No. 2 to the city of Novopolotsk, because to the intersection of the R-45 Polotsk-Glubokoe-Border of the Republic of Lithuania (Kotlovka) and Entrance No. 2 to Novopolotsk adjoins the land plot leased by Gazprom transgaz Belarus intended for the implementation of the investment project "Construction of the Polotsk automobile gas-filling compressor station". Currently, design and survey work are underway, an agreement has been signed on the development of submittals. A proposal was made to link the project of bypassing the city of Polotsk with the project of access roads to the designed gas-filling compressor station.
Branch of Krupskoye UMG OAO Gazprom Transgaz Belarus	Questionnaire 01 dated 25.05.2020	It was proposed to build parking for large vehicles, as well as places for recreation and food
JSC "Cheryishchina"	Questionnaire 01 dated 04.06.2020	The project is evaluated positively.
"Polotsk electric networks" RUE "Vitebskenergo"	Questionnaire 01 dated 04.06.2020	The construction project of the Polotsk City bypass is evaluated positively, as the load on city streets will decrease.

<i>Parties concerned</i>	<i>Questionnaire</i>	<i>Remarks, Concerns, Suggestions</i>
		The respondent's fears are associated with a possible negative impact on workers in the Ksti industrial zone during the construction period.
RUE Belorusneft-Vitebskobnefteprodukt	Questionnaire 01 dated 26.05.2020	The project is evaluated positively, as the traffic will be safer, the throughput will increase, the transport load in the city of Polotsk will decrease, including for delivering fuel from a petroleum product storage depot to gas stations
GLHU "Ushach Forestry"	Questionnaire 01 dated 09.06.2020	The project is evaluated positively, as the traffic will be safer, the throughput will increase, the traffic load in the village of Sorochino will decrease after the organization of circular traffic at the intersection of the R-46 and R-113
Lepel District Executive Committee	Questionnaire 02 dated 29.05.2020	The project is evaluated positively. Carrying out additional activities for vulnerable categories of citizens is impractical
Novopolotsk City Executive Committee	Questionnaire 02 dated 26.05.2020	The project is evaluated positively.
Zharsky village council	Questionnaire 03 dated 26.05.2020	The project is evaluated positively, because road infrastructure in the village of Vatslavovo will improve. A proposal was made to build a bike path along the reconstructed highway within the boundaries of Vatslavovo up to the turn to the village of Starye Selo
Resident A the agricultural town of Gomel	Questionnaire 05 dated 27.05.2020	The project is evaluated positively It was proposed to build a footpath to the memorials
Resident B the agricultural town of Gomel	Questionnaire 05 dated 26.05.2020	The project is evaluated positively because the highway will improve and a footpath will appear. Respondents are concerned about the upcoming costs of re-registering the land after removing part of it in the bureau of technical inventory.
Resident C the agricultural town of Gomel	Questionnaire 05 dated 27.05.2020	The project is evaluated positively
Resident D the agricultural town of Gomel	Questionnaire 05 dated 26.05.2020	The project is evaluated positively

<i>Parties concerned</i>	<i>Questionnaire</i>	<i>Remarks, Concerns, Suggestions</i>
Resident E the agricultural town of Gomel	Questionnaire 05 dated 26.05.2020	The project is evaluated positively, because the quality of the roadway will improve. The concern of the respondents is related to the desire to preserve the existing boundaries of the site after the reconstruction of the highway.
Resident Of the agricultural town of Gomel	Questionnaire 05 dated 27.05.2020	The project is evaluated positively
Resident of the village of Belchitsa	Questionnaire 05 dated 10.06.2020	The project is evaluated positively, A suggestion was made to establish a noise barrier, as well as to place a bus stop 30 m further towards Polotsk.
Resident A of the village Vaclavovo	Questionnaire 05 dated 27.05.2020	The project is evaluated positively, because the condition of the R-46 highway will improve
Resident B of the village Vaclavovo	Questionnaire 05 dated 27.05.2020	The project is evaluated positively
Resident A of the village of Sorochino	Questionnaire 05 dated 27.05.2020	The project is evaluated positively. The respondent expressed concern that due to the passage of the route close to home, the environment will deteriorate.
Residents of Novopolotsk		
21 persons	Questionnaire 05 dated 04–10.06.2020	The project is evaluated positively
8 persons	Questionnaire 05 dated 04–10.06.2020	The project is evaluated positively. The respondent expressed the need for reconstruction of the bridge.
Resident A of Novopolotsk	Questionnaire 05 dated 09.06.2020	The project is evaluated positively, but the location of the highway near residential buildings and the Polymirovsky residential area is cause for concern.
Resident B of Novopolotsk	Questionnaire 05 dated 09.06.2020	The project is evaluated positively. Suggestions were made: <ul style="list-style-type: none"> <li>• at the intersection of the highway with Molodezhnaya Street, build a multi-level interchange,</li> <li>• to build a gas station in the village of Chereyshchina,</li> <li>• on the R-46 highway, additionally build a cafe and a gas station.</li> </ul>
Resident C of Novopolotsk	Questionnaire 05 dated 09.06.2020	The project is evaluated positively. A proposal was made to improve roadside service along the P–46 highway.

<i>Parties concerned</i>	<i>Questionnaire</i>	<i>Remarks, Concerns, Suggestions</i>
Resident D of Novopolotsk	Questionnaire 05 dated 09.06.2020	The project is evaluated positively. The wish was expressed to strictly comply with environmental standards.
Resident E of Novopolotsk	Questionnaire 05 dated 09.06.2020	The project is evaluated positively, but concerns were expressed about possible inconveniences during the construction period.
Resident F of Novopolotsk	Questionnaire 05 dated 08.06.2020	The project was evaluated positively. The need for a new bridge was announced. The respondent's concerns are related to the deterioration of the environmental situation in Novopolotsk.
Resident G of Novopolotsk	Questionnaire 05 dated 04.06.2020	The project was evaluated positively. A proposal was made to introduce a ban on parking heavy vehicles in the city. The respondent's concerns are related to the deterioration of the environmental situation in Novopolotsk.
Resident H of Novopolotsk	Questionnaire 05 dated 09.06.2020	The project was evaluated positively. A proposal was made to create a roadside service (cafe) on the Polotsk City bypass
Resident J of Novopolotsk	Questionnaire 05 dated 09.06.2020	The reconstruction project of the R-46 highway was evaluated positively. It was noted that the option of organizing a two-level interchange with ul. Youth Concerns were expressed that the intersection of the Polotsk City bypass with a city street at the same level would lead to delays in transit and urban transport, as well as to an increase in air pollution from vehicle emissions at this intersection. A suggestion was made to use the land slope towards the Zapadnaya Dvina River in the area from Molodezhnaya Street to Y. Kolas Street to deepen the route of the planned bypass, with Molodezhnaya Street going down the overpass. This constructive solution will provide: <ul style="list-style-type: none"> <li>• separation of transit flow from city and public transport;</li> <li>• reduction in traffic jams and accident rate;</li> <li>• creating conditions to reduce noise levels for nearby residential buildings;</li> <li>• reduction in emissions due to the lack of need for stops at the intersection;</li> </ul>



<i>Parties concerned</i>	<i>Questionnaire</i>	<i>Remarks, Concerns, Suggestions</i>
		<ul style="list-style-type: none"> <li>the possibility of organizing a standard butterfly interchange.</li> </ul>
Belarusian Society of Disabled	Questionnaire 04 dated 05.06.2020	The project is evaluated positively, because this can improve infrastructure in relation to the needs of persons with disabilities. A desire was expressed to familiarize the Belarusian Society of Disabled with measures to ensure accessibility and safety during the implementation of the Project.
NGO "Bagn"	Questionnaire 04 dated 01.06.2020	The project is evaluated positively. Suggestions were made: <ul style="list-style-type: none"> <li>to build underground passages without stairs through the R-46 highway for the period of reconstruction;</li> <li>reasonably approach the choice of places for transitions and barriers for ungulates and amphibians;</li> <li>to examine the areas allocated for quarrying for the presence of species included in the Red Book of the Republic of Belarus.</li> </ul>
NGO "Ecohouse"	Questionnaire 04 dated 06.06.2020	Suggestions were made: <ul style="list-style-type: none"> <li>build passages for amphibians and small mammals;</li> <li>build bike lanes or wide hard-paved roadsides;</li> <li>conduct public discussion of the ESIA.</li> </ul>
Novopolotsk City and District Inspection of Natural Resources and Environmental Protection	Questionnaire 04 dated 08.06.2020	The project is evaluated positively because positively affect the environment and make travel easier for residents
Ushachsky District Inspectorate of Natural Resources and Environmental Protection	Questionnaire 04 dated 08.06.2020	The project was evaluated positively because transport infrastructure will improve
State institution "Lepel district center of hygiene and epidemiology"	Questionnaire 04 dated 04.06.2020	The project was evaluated positively. because the transport infrastructure will improve, the level of transport security, the quality of services, as well as the improvement of the territory of the Lepel region will increase.
Ushachsky regional organization of the public association "Belarusian Union of Women"	Questionnaire 04 dated 10.06.2020	The project is evaluated positively because it will ensure road safety, improve road performance, road infrastructure

**Table 7.5: Evaluation of the possibility of implementing the proposals of the parties concerned and affected by the reconstruction project of the P-46 highway, received during the meetings, consultations and questionnaires**

<i>Interested and affected parties</i>	<i>Place, date and time of consultations, questionnaires</i>	<i>Comments, concerns, suggestions</i>	<i>Assessment of the possibility of implementing proposals, conditions of implementation</i>
<i>Village councils</i>			
Zharsky village council	Meeting in the village of Vatslavovo from 11.00 to 11.30 Minutes dated 28.05.2020.	A wish was expressed about the need to build a cycle path in the village of Vatslavovo up to the turn of the road to the village of Staraya Selo	Possible, but not advisable due to the low intensity of cycling. In the case of the construction of a separate PK145 + 47 - PK155 + 34 cycle track with a length of about 990 m, the following will be required: <ul style="list-style-type: none"> <li>• additional land allotment,</li> <li>• changes in the Project concerning the reclamation system, noise protection,</li> <li>• reconstruction of the water supply system.</li> </ul>
Kamensk village council	Meeting in the agro-town Kamen in the building of the Kamensk rural executive committee from 12.00 to 12.30. Questionnaire 03 dated 05/27/2020.	The allotment of land for cemeteries in the village of Zaborodye causes concern.	Construction work will be carried out outside the cemetery and will not affect it
Sorochinsky village council	Questionnaire 03 from 27.05.2020 Meeting in the village of Sorochino in the building of the Sorochinsky village executive committee from 10.45 to 11.40. Minutes dated 28.05.2020.	Wishes were expressed: equip pedestrian crossings with road signs, equip a pedestrian crossing with traffic lights. Concern was expressed about the state and the possibility of refueling agricultural machinery. Concern was expressed about the accessibility of the exit from the P-46 motorway to the right to the cemetery near the village of Pyatnitsa during the period of construction work.	Pedestrian crossings in the area of the projected roundabout in Sorochino are equipped with LED road signs "Pedestrian Crossing", yellow traffic lights, additional lighting will be arranged. The existing gas station in Sorochino is not affected by the construction. It will be possible to drive into it and refuel. During construction, access will be provided to the existing ramps, including the cemetery in the village of Pyatnitsa.

<i>Interested and affected parties</i>	<i>Place, date and time of consultations, questionnaires</i>	<i>Comments, concerns, suggestions</i>	<i>Assessment of the possibility of implementing proposals, conditions of implementation</i>
Gomel village council	Questionnaire 03 from 26.05.2020 Meeting in the agricultural town Gomel in the building of the Gomel Rural Executive Committee from 14.20 to 15.20. Minutes dated 28.05.2020.	Concern was expressed about the dismantling, relocation and installation of a concrete fence on ul. D.V. Tyabuta. A wish was expressed to ensure regular maintenance and repair of road markings, pedestrian crossings, ramps at stopping points. And also to build walking paths near the memorials.	Dismantling of fences is due to the need for the construction of footpaths, bus stops, pedestrian crossings, lighting, installation of noise screens, construction of a culvert and its strengthening. The wishes were taken into account. Near the memorial at 43.3 km of the road, in accordance with the Project, it is planned to build pedestrian paths, staircases equipped with ramps, a pedestrian crossing, a recreation area on the left, lighting. Pedestrian communication with the agricultural town of Gomel will be carried out from the side of the street. Zarechnaya along the planned pedestrian path from the bridge to the substation with access to the existing path to the recreation area
Ekiman village council	Meeting in the village of Ekiman, in the building of the Ekiman rural executive committee from 16.50 to 17.30. Minutes dated 28.05.2020.	A proposal was made to build a pedestrian path between the villages of Vesnyanka and Belchitsy, as well as pedestrian crossings, stopping points, a bicycle path to the roundabout.	Pedestrian traffic between the villages of Vesnyanka and Belchitsa is organized from the junction at PK 606 + 60 (settlement Vesnyanka) to the stopping point at N of the item. Belchitsa on the right along the road and further beyond it on the left. The construction of a bike path is impractical due to the low intensity of cycling. Cyclists may move along the footpath.
<i>Inspectorate of Natural Resources and Environmental Protection</i>			
Lepel District Inspectorate of Natural Resources and Environmental Protection, Chief	Meeting in Lepel in the premises of the Lepel District Inspectorate of Natural Resources and Environmental Protection from 9.45 to 10.00. Questionnaire 08 dated 05/27/2020.	There was a proposal to take into account the contamination of the Sosnovsky territory with hogweed on the border of the Lepel and Ushach districts at the place where the P-46 highway passes in order to avoid its spread to the adjacent territories.	Proposals will be taken into account in the Project
<i>Affected individuals</i>			
A resident of the village of Svyatitsa	Meeting in the village of Svyatitsa, Gomel'skogoselsovet at the address	A wish was expressed to revise the Project and to shift the road westward	The projected road section is laid in such a way as to maximize the use of the existing subgrade and road

<i>Interested and affected parties</i>	<i>Place, date and time of consultations, questionnaires</i>	<i>Comments, concerns, suggestions</i>	<i>Assessment of the possibility of implementing proposals, conditions of implementation</i>
	of the village Svyatitsa, 2 from 13.20 to 13.45. Questionnaire 05 dated 28.05.2020.	without affecting the land plot of the Kiselev family, to install a noise barrier, to provide for the possibility of access to the house during construction work.	surface. A change in the Project will entail an increase in the volume of work, an increase in the allotment of agricultural land, an increase in the cost of the project. The installation of a noise barrier will be considered based on the ESIA results. Construction work does not affect the entrance to the house.
Resident of the village of Svyatitsa	Meeting in the village of Svyatitsa, the Gomel village council at the address of the village of Svyatitsa, 4 from 13.50 to 14.10. Questionnaire 05 dated 28.05.2020.	A desire was expressed to build a technical site for builders on the other side of the road, without affecting a private land plot, to preserve the buildings on the site (a shed and a well), and also to provide for the possibility of an entrance to the house during construction work and during further road operation.	At house 4 in the village of Svyatitsa, the project provides for the connection of the projected exit with the existing one without affecting the territory of the household. The ability to drive to the house will be preserved.
OJSC "Ligmod"	The telephone consultation was conducted by Yu.P. Chubis. Questionnaire dated 04/06/2020.	It was suggested to: <ul style="list-style-type: none"> <li>• change the building boundaries so that the existing shopping center building is not affected;</li> <li>• provide an exit to the shopping center at St. Molodezhnaya 194, and in the immediate vicinity of the intersection with St. Youth;</li> <li>• build a public transport stop;</li> <li>• build a recreation facility in the area of the terminal bus station.</li> </ul>	The shopping center building is not affected by the project. It is supposed to occupy the minimum area adjacent to the shopping center. Taking into account the decisions "General plan of Novopolotsk", as well as the project "South-eastern continuation of St. Molodezhnaya in Novopolotsk" project of bypassing Polotsk does not plan to build additional ramps, bus stops and recreation areas along Molodezhnaya Street in Novopolotsk. The entrance to the territory of the shopping center at the address Molodezhnaya St., 194 will be carried out from Molodezhnaya St.
Unitary enterprise for the provision of services "A1"	The telephone consultation was conducted by Yu.P. Chubis. Application form 05.06.2020.	It was suggested to change the Project in order to avoid dismantling the tower due to the high costs of land acquisition and construction of new towers.	The project will not affect the communication tower of Unitary Enterprise "A1"
Stakeholders identified during the consultations			

<i>Interested and affected parties</i>	<i>Place, date and time of consultations, questionnaires</i>	<i>Comments, concerns, suggestions</i>	<i>Assessment of the possibility of implementing proposals, conditions of implementation</i>
Resident of the village of Sorochino	Meeting in the village of Sorochino in the building of the Sorochinsky rural executive committee from 11.20 to 11.40. Questionnaire 05 dated 02.06.2020.	A proposal was made to build an additional entrance to the house at the address of Sorochino village during the construction period. St. Krinichnaya, building 1, t. the existing one is the only one. Construct drainage and rainwater drainage that would erode the existing access road due to the slope of the area.	During construction, an entrance to the house at the address of Sorochino village. St. Krinichnaya, building 1 will be provided. The project provides for rainwater drainage in the area of the projected circular intersection in Sorochino with discharge into an evaporation and drainage trench.
Resident of the village of Kryzhi, Sorochinsky village council	The meeting took place at the Vitebsk region, Ushachsky district, Kryzhi village, 2 from 21.30 to 23.00. Questionnaire 06 dated 28.05.2020.	A proposal was made to change the routing of the bypass road, bypassing the planned one from the 30th block on the R-46, or along the border of the 31st block and the agricultural field of the KUSP "Orekhovno". To reconstruct the petrol station in Sorochany village and not close it.	The proposal cannot be implemented, since the proposed options pass through agricultural lands. It is impossible to resolve the issue with the land user. Compensatory measures that can be additionally taken into account in the design and estimate documentation: construction of a transitional type cover (additionally to the end of the village of Kryzhi - 1793 m <sup>2</sup> ), for dust control, provide for additional irrigation during the operation of the entrance; construction of a metal profile fence 72 in length (protection of a nearby house at Kryzhi village, building 2)
LLC "Energoavtomatika"	Telephone consultation was conducted by Yu.P. Chubis. Application dated 02.06.2020	It was proposed to build an exit from the road in the area of the industrial zone on the street. Construction, an objection was expressed against changing the boundaries of the land use of the enterprise.	The project provides for the construction of an additional exit on the street. Construction site of Polotsk from the bypass route. The minimum possible occupation of land for construction work is envisaged.
Educational and experimental forestry belonging to BSTU "Polotsk State Forestry College"	The telephone consultation was conducted by Yu.P. Chubis. Application form 03.06.	A proposal was made to preserve the fortifications located on the territory of the training and experimental forestry enterprise (forest quarters 29, 30, 37).	Fortifications will be preserved if possible



<i>Interested and affected parties</i>	<i>Place, date and time of consultations, questionnaires</i>	<i>Comments, concerns, suggestions</i>	<i>Assessment of the possibility of implementing proposals, conditions of implementation</i>
OJSC "Gazprom transgaz Belarus"	Questionnaire 01 dated 05/25/2020	<p>The construction of the Polotsk bypass with the reconstruction of entrance No. 2 to Novopolotsk raised objections, since a land plot leased by OJSC Gazprom transgaz Belarus, intended for the implementation of the investment project "Construction of CNG filling station Polotsk", adjoins the intersection of highway P-45 and Entrance No. 2 to Novopolotsk. Currently, design and survey work is being carried out at the site, an agreement has been concluded for the development of design and estimate documentation.</p> <p>A proposal was made to link the design solutions for the bypass of the city of Polotsk with design solutions for access roads to the projected CNG filling station.</p>	The Polotsk bypass project will be linked to the investment project "Construction of CNG filling station Polotsk" (gas filling station).
Branch "Krupskoye UMG" OJSC "Gazprom transgaz Belarus"	Questionnaire 01 dated 05/25/2020	There was a proposal to build parking lots for large-sized equipment, places for rest and food.	On the 31.9 - 61.5 km section, it is planned to build 2 recreation areas with parking and equipped recreation areas. At the filling station at 58.9 km there is a roadside service object - a cafe. Taking into account the "General plan of Novopolotsk" and "General plan of Polotsk", the Project does not provide for the construction of parking lots and parking lots for heavy vehicles. Additional roadside service facilities can be built after the construction of the facility in agreement with the local authorities and the road owner.
Zharsky village council	Questionnaire 03 dated 05/26/2020	There was a proposal to build a bicycle path in the village of Vatslavovo before	The implementation of the proposal is impractical due to the low intensity of cycling.

<i>Interested and affected parties</i>	<i>Place, date and time of consultations, questionnaires</i>	<i>Comments, concerns, suggestions</i>	<i>Assessment of the possibility of implementing proposals, conditions of implementation</i>
		turning to the village of Staroye Selo along the highway	In the case of the construction of the PK145 + 47 - PK155 + 34 separate cycle path with a length of about 990 m, it is required: <ul style="list-style-type: none"> <li>• additional land allotment,</li> <li>• changes in the Project for the reconstruction of reclamation networks, noise protection,</li> <li>• re-laying the water supply.</li> </ul>
Resident of the agro-town Gomel	Questionnaire 05 dated 27.05.2020	There was a proposal to build a pedestrian path to the memorials	At the 43.3 km memorial, the project provides for the construction of footpaths, staircases with ramps, a pedestrian crossing, lighting, repair of the recreation area to the left of the road. Pedestrian communication is carried out from the street. Zarechnaya.
Resident of the agro-town Gomel	Questionnaire 05 dated 26.05.2020	There was a proposal to preserve the existing boundaries of the site after reconstruction	The project provides for the installation of a noise shield along the border of the visibility zone and partial dismantling of the existing fence.
Resident of the village of Belchitsa	Questionnaire 05 dated 10.06.2020	There was a proposal to install a noise barrier and move the bus stop 30 m towards Polotsk.	Installation of a noise shield is provided by the Project. Shifting the bus stop towards Polotsk is not advisable, because this will entail the occupation of a larger area for the construction of a higher embankment and the demolition of non-residential buildings (sheds, arbor). The adopted design solution provides for the dismantling and re-installation of the fence during the construction of a bypass for the period of repair of the road section, construction of a pipe at PK612 + 36 and a circular intersection.
Resident of Novopolotsk	Questionnaire 05 dated 09.06.2020	There was a proposal to make an intersection with Molodezhnaya Street at different levels, to build a gas station in the village of	Taking into account the "General plan of Novopolotsk", the project does not provide for the construction of a traffic intersection at different levels at the intersection with Molodezhnaya street.

<i>Interested and affected parties</i>	<i>Place, date and time of consultations, questionnaires</i>	<i>Comments, concerns, suggestions</i>	<i>Assessment of the possibility of implementing proposals, conditions of implementation</i>
		Chereyshina, as well as a cafe and a gas station along the P-46 highway.	Also, the presence of buildings along the street. Youth and possible future development of electric transport for communication between Novopolotsk and Polotsk does not allow the construction of a traffic intersection.
Resident of Novopolotsk	Questionnaire 05 dated 04.06.2020	There was a proposal to introduce a ban on the parking of heavy vehicles within the city.	Taking into account the "General plan of Novopolotsk", the project does not provide for the arrangement of parking lots for heavy vehicles.
Resident of Novopolotsk	Questionnaire 05 dated 09.06.2020	There was a proposal to provide a roadside service (cafe) on the bypass	The project does not provide for the device of a roadside service bypassing the city of Polotsk. The development of roadside services can be provided after the construction of the facility in agreement with the local authorities and the road owner.
Resident of Novopolotsk	Questionnaire dated 05 09.06.2020	It was noted that the option of organizing a two-level interchange with St. Youth.	Taking into account the "General plan of Novopolotsk", the project does not provide for the construction of a traffic intersection at different levels at the intersection with Molodezhnaya street. Also, the presence of buildings along the street. Youth and possible future development of electric transport for communication between Novopolotsk and Polotsk does not allow the construction of a traffic intersection.
PA "Bagna"	Questionnaire 04 dated 01.06.2020	There was a proposal to build underground passages without stairs through the P-46 during the reconstruction;	The implementation of this proposal is impractical since the intensity of pedestrian traffic is low. Pedestrian crossings will be built at the same level. When passing the route within the boundaries of the city of Polotsk or the city of Novopolotsk, construction of traffic lights for pedestrian crossings is provided.

## 7.5. Results of processing online questionnaires (Google forms)

To diversify the ways of informing about the Project and taking into account the opinions, concerns and proposals of interested parties, an online questionnaire was developed. It was proposed for placement on the sites of district and city executive committees. Link to the online questionnaire:

<https://docs.google.com/forms/d/1kd2tTTdY8mAHfhRI-ruifnwUXrqGwslTvKADRHX2H4E>

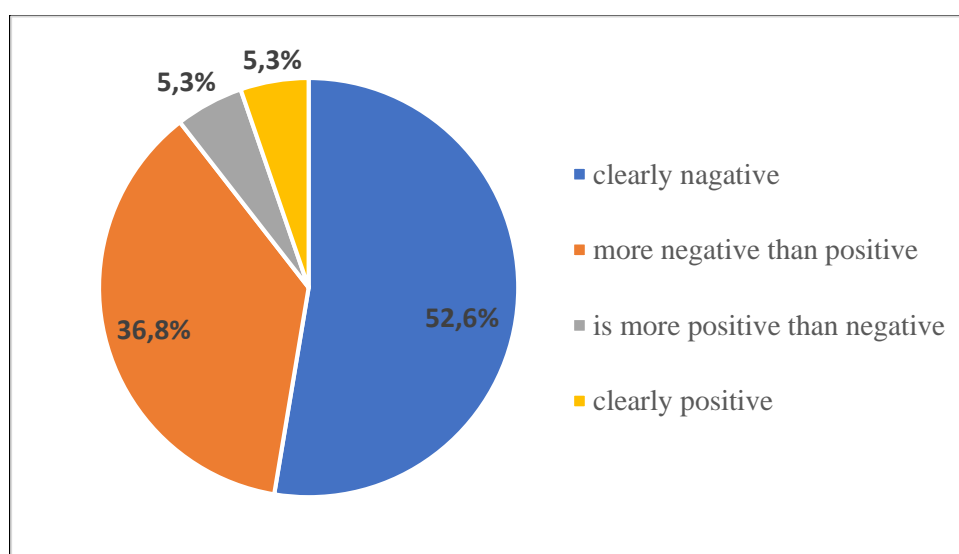
In addition, from Gudenko (Baran) Nina Alexandrovna ([ninsapr@yandex.ru](mailto:ninsapr@yandex.ru)) 06/01/2020 to the e-mail address of BSU ([ecoland.bsu@gmail.com](mailto:ecoland.bsu@gmail.com)) received an application for a link to an online questionnaire.

The survey involved 19 people. All citizens live in the city of Novopolotsk.

The respondents have the greatest objections or fears associated with the Project caused by the passage of the road section to be reconstructed close to the residential development. Most respondents suggested moving this road to a less populated area.

The following answers were received to the question “*How do you generally evaluate the Project, including the reconstruction of the R-46 Lepel-Polotsk road section — the border of the Russian Federation (Yukhovichi); reconstruction of the bridge across the Zapadnaya Dvina River at 0.329 km of the highway; access to the city of Novopolotsk from the highway R-20 Vitebsk - Polotsk - the border of the Republic of Latvia (Grigorovschina); and construction of the Polotsk City bypass*”:

- 52.6% clearly negative;
- 36.8% more negative than positive; and
- 5.3% (one answer) clearly positive
- 5.3% (one answer) is more positive than negative (**Figure 7.2**)

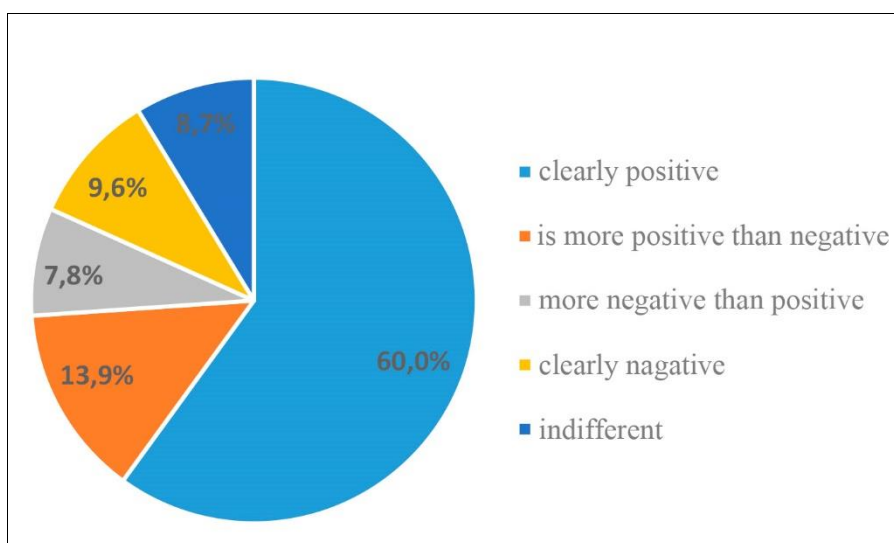


**Figure 7.2: Project Evaluation Responses**

During the design phase, the following was done:

- sent out paper questionnaires - 97 copies;
- telephone conversations were held with 61 interested parties;
- publications in the media - 4;
- an online survey was organized (in which 19 respondents took part);
- held personal meetings with questionnaires - 13.

After processing a total of 115 responses from questionnaires, minutes of meetings, written requests and online questionnaires received from interested and affected parties, it turned out that 69 respondents assessed the design solutions unequivocally positively, more positively than negatively – 16; more negatively than positively – 9 people, unequivocally negative – 11, completed the questionnaires, but 10 people did not express their attitude to the project. The percentage distribution of respondents’ answers is shown in **Figure 7.3**.



**Figure 7.3:** *Project Evaluation Responses, all responses*

## 7.6. Plan for subsequent discussions on the implementation of the proposed activity

Informing the public and local population about the status of the Project and the progress of its implementation will be carried out by posting information in local media, on the websites of RUE “Vitebskavtodor”, district and city executive committees.

A complaint mechanism has been proposed, which, after agreement with RUE Vitebskavtodor, will be presented to the public.

**Table 7.6** presents the tentative plan for future consultations during the project implementation. This plan will be reviewed and revised if necessary once the PIWG is formed.

**Table 7.6: Consultation and Participation Framework during Project Implementation**

Description	Target Stakeholders	Timing	Responsibility
Public awareness campaigns/scoping sessions to share ESIA,	Communities within project area, general	Before commencement	PIWG/ Supervision Consultants



Description	Target Stakeholders	Timing	Responsibility
ESMP and RPF with the PAPs, communities and other stakeholders.	public; and line departments/ agencies.	of project activities	
Establishment of GRM and GRCs	Communities at/around project area	Before commencement of project activities.	PIWG
Consultations with the communities during ARP implementation	Communities at/around subproject area	Before commencement of project activities.	PIWG / Supervision Consultants
GRM implementation	Relevant line departments; and communities (as needed).	Project implementation Stage	PIWG/ Supervision Consultants
Informal consultations and discussions.	Communities at/around project area	Project implementation Stage	PIWG / Supervision Consultants; contractor
Consultations with the communities during internal monitoring	Communities at/around project area	Construction Stage	PIWG / Supervision Consultants
Consultation workshops to review ESIA/ESMP and ARP implementation, any outstanding issues and grievances, views and concerns of communities; and actions needed to address them.	Rural and Urban Communities at the project area; relevant line department; relevant NGOs	Six-monthly during implementation phase	PIWG / Supervision Consultants
Consultations with the communities during the site visits by the AIIB Review Missions.	PIWG; Communities at/around subproject area	Construction/ Operation Stage	PIWG, Supervision Consultants

## 7.7. Disclosure

This draft ESIA document and RPF (in English and Russian) were disclosed at the websites of MTC<sup>5</sup> and AIIB<sup>6</sup> and the same will be done for the final versions. Their Executive Summaries

<sup>5</sup> <http://www.vitavtodor.by/regulatory/proekt-rekonstruktsiya-respublikanskoy-avtomobilnoy-dorogi-r-46/>

<sup>6</sup> <https://www.aiib.org/en/projects/details/2019/proposed/Belarus-Rehabilitation-and-Upgrading-of-National-Road-R46.html>

will also be disclosed in Belarussian. This is done to ensure that Project-affected people and other stakeholders can provide feedback. The hard copies of the draft and final ESIA and RPF will also be available in the relevant government offices and other appropriate locations.

## 8. Environmental and Social Management Plans

Three separate Environmental and Social Management Plans (ESMPs) are envisaged for the three phases of the project. For the Phase 1 of the project, the ESMP for R46 has been prepared and presented in **Appendix H** of the ESIA. A complementary ESIA including an ESMP for the CMM will be prepared prior to the implementation of Phase 1 of the project. The remaining two ESMPs will be developed for the Phase 2 and Phase 3 of the project when their respective designs are available. This Chapter provides objectives and an overview of these ESMPs as well as details of the GRMs.

### 8.1. Objective of ESMPs

The basic objective of the ESMPs is to manage adverse impacts of proposed project on the environment and people in the project area. The specific objectives of the ESMP are to:

- Facilitate the implementation of the mitigation measures discussed earlier in **Chapter 6** of the ESIA.
- Maximize potential project benefits and control negative impacts;
- Describe the institutional setup for the implementation of the ESMP and outline responsibilities for Project Implementation working Group (PIWG), contractors, supervision consultants, and other entities for the environmental and social management of the project;
- Define a monitoring and reporting mechanism and identify monitoring parameters in order to:
  - Ensure the complete implementation of all mitigation measures,
  - Ensure the effectiveness of the mitigation measures;
- Assess environmental training requirements for different stakeholders at various levels.
- Establishes the grievance redress mechanisms (GRM) for project-affected people and workers.

### 8.2. Overview of ESMPs

The key elements of the ESMP include institutional setup, mitigation plan, monitoring plan, reporting and documentation mechanism, grievance redress mechanism, and capacity building.

The overall responsibility of environmental and social performance of the project and effective ESMP implementation will rest with RUE “Vitebskavtodor”, which will establish the PIWG to lead the Project implementation. The PIWG will be headed by the Project Director (PD). An Environmental and Social (E&S) Specialist will be hired in PIWG under PD’s supervision. The E&S Specialist will be responsible for overall environmental and social management for the project, supervising the environmental and social performance of the project, and oversee the Construction Supervision Consultant (CSC) and contractors. CSC and contractors will also engage dedicated on-site staff for E&S management.

The ESMP lists all the potential impacts, the mitigation measures to address these impacts, and implementing and monitoring responsibilities for these measures – associated with each key activity of the project. The contractor will be required to implement the ESMP, in addition to preparing the Construction ESMP (CESMP) based upon the ESMP and then implementing it.

Two types of monitoring, i.e. environmental quality monitoring (or effects monitoring) and compliance monitoring will be carried out during project construction phase. For the environmental quality monitoring, parameters like water contamination, dust and noise will be monitored by CSC through certificated laboratory. Separate monitoring will be carried out for the implementation of the ARP.

Compliance monitoring will focus on the monitoring the compliance of various labor and environment, health and safety (EHS) requirements and implementation of mitigation measures identified in the ESMP and CESMP. Semi-annual Environmental and Social Monitoring Reports will be prepared by PIWG and submitted to AIIB every half a year. The Environmental and Social Monitoring Report will focus on the implementation of the ESMP, CESMP and ARP. It will (i) verify the compliance to regulations, contract agreements, ESMP, and CESMP; (ii) summarize the monitoring results of environmental quality, capacity building and accidents; (iii) review the implementation of grievance redress mechanism (GRM) (described below); and (iv) recommend corrective actions or amendments in ESMP and CESMP.

### **8.3. Project-level Grievance Redress Mechanism**

The project will establish two separate GRMs, one for the PAPs and the other for the project employees and workers. These GRMs will be in line with the requirements of the AIIB to provide an opportunity for an independent and impartial review of the submitted complaints.

All parties involved in GRM should adhere to a joint approach at all stages of project planning and implementation to assure those affected by the fact that there are almost no reasons for complaints. However, some people may still have legitimate grievances related to project activities. Many complaints arise from an inadequate understanding of project policies and procedures and can be quickly resolved by properly explaining the situation to the person who has the complaint.

Complaints not related to the activities or impacts of the project may not be resolved by the GRM and grieved party will be informed of this. There may be no charges or fees for the grieved party at any stage of the process. All grievances shall be recorded in a consolidated GRM journal which will be maintained by RUE "Vitebskavtodor".

#### **8.3.1. GRM for PAPs**

The Project Implementation Working Group (PIWG) will establish and lead a three-tier system for the people affected by the project. The first tier is created at the local level and is managed by the local Complaints Committee, the second tier is at the level of the Project Coordination Group (PIWG) and is managed by it. The third tier is at the Project Implementation Working Group Level.

*Level 1 (field).* At this level, a Grievance Redress Committee (GRC) will be established. The GRC will consist of the staff of the village council (chairman + manager) and representative of the PIWG/CSC. Persons affected by the project may contact any of them and they will be responsible for receiving and registering complaints. The Field Grievance Redress Committee (GRC) will be established and will record, consider, and resolve complaints within their competencies. If there are insufficient competencies and depending on the degree of criticality of the complaint, determine the level of delegation of authority to review and resolve it and immediately transmit the documented information regarding the complaint either to the Grievance Redress Committee sublevel, which will then report to the PIWG or immediately to the second level of GRM.

**Level 2 (regional).** At this level, the GRC will consist of representatives of the departments / divisions of the district executive committee who are directly interested in the implementation of the project (at least 1 representative), the head of the district inspection of natural resources and environmental protection, and a representative each of PIWG and CSC. The regional GRC will be headed by a coordinator (elected from among the GRC members - employees of the district executive committee). At this sublevel, complaints are reviewed and resolved within the competence of GRC members. In case of insufficient competencies, it is permissible to involve one or several PIWG members for conducting an expert assessment. If it is not possible to examine and resolve the complaint, the documented information will be transferred to the next level of the GRM.

**Level 3.** At this level, the GRC will consist of PIWG representative(s), CSC representative, and representatives delegated from among the members of the Technical Council or, if necessary, is additionally invited from among the employees of organizations forming the Technical Council. The PIWG is headed by a leader (elected from among the PIWG members who participate in the Technical Council. At this sub-level, complaints are processed and resolved within the competence of PIWG members. If there are insufficient competencies, it is permissible to involve one or more employees from organizations participating in the project or other Competent Organizations.

If the applicant does not agree or is not satisfied with the decision made, s/he has the right to apply to a higher authority (MHCS) in the order of subordination or directly to the Court of Law for a decisionsolution.

### **8.3.2. Grievance Redress Mechanism for Project Workers**

In accordance with best practices, it is necessary to create a separate mechanism for dealing exclusively with complaints related to workers hired by contractors for construction work. Such complaints may include wage rates and unpaid overtime work, irregular and partial payments, lack / inadequacy of living quarters, lack of clean drinking water and the necessary sanitary and epidemiological conditions, as well as lack of medical care, etc.

GRC complaints committee(s) will be created to deal with labor complaints, including members who are directly or indirectly related to construction work. In particular, GRC will include a road foreman / head of the contractor's work department, who is responsible at the workplace for the functions of the organizer of the work process, in addition to a representative of PIWG. The PIWG Manager will appoint an officer for each GRC to receive complaints and ensure that the complainant does not lose his job and is not afraid to withdraw the complaint before the formal hearing. To ensure an impartial and transparent hearing of complaints, they will be held in a non-threatening environment and will be open to all other workers on the site.

### **8.3.3. Grievance Redress Mechanism Process overview**

#### **Complaint Registration**

Grievances, regardless of how they are filed, must receive confirmation of their registration. In the case of an oral submission, a confirmation is issued from the GRC member registering the complaint in the form of a receipt indicating the name of the applicant, the date of registration and the registration number of the complaint, by simultaneously entering these data into the complaint register. The complainant should be able to leave his/her signature in the appropriate column of the complaints register. Receipt of complaints filed by the applicant by phone will be confirmed no later than one business day by letter, e-mail, SMS-message or phone call indicating the date of registration and registration number of the complaint. The receipt of a complaint in writing or by e-mail must also be confirmed by letter or e-mail. A confirmation

must be issued on the day the complaint is received by GRC and sent to the applicant no later than one business day.

Each party involved in the GRC at the field and regional sublevels must maintain a record book for registering complaints. GRC members should regularly report the details of complaints to the coordinator (a PIWG member): complaints and the status of their resolution. The GRC coordinator should coordinate with each GRC member at the regional and field sublevels on a weekly basis, collect relevant documents, maintain a consolidated register of complaints received at the GRC level, monitor the status of resolution of each complaint received, maintain an updated database of complaints and report accordingly to the PIWG on a weekly basis.

Whatever method is used to receive the complaint (e-mail, mail, fax, call, etc.) and no matter what status it had at the time of entering the GRC first level consolidated register, the complaint should be registered by the GRC coordinator at the regional level in consolidated registry. The complaint registration number assigned by a GRC member remains unchanged in all registry books (including the consolidated PIWG registry). Priority investigation and consideration of complaints at the GRC level, which requires clear coordination of all parties involved in GRM, speed and maximum transparency of information related to the project. All complaints will be recorded and include, but are not limited to, the following details:

- Contact information of the affected party;
- Date, time and place where the complaint was received;
- The name of the person who received the complaint;
- Description of appeal.

In the event that the complainant refuses to provide contact information or contact information is not indicated in the complaint received by email / mail / fax, GRC will consider the anonymous complaint. In such cases, when an oral statement, receipt of a complaint by simple postal management or fax, the answer or decision will be posted on the information board near the village council or district executive committee (depending on which member of GRC received and registered the complaint). In this way, the complainant will be informed of the response or decision. For anonymous cases of receiving a complaint from project employees, a written response must be provided at the headquarters / slave building.

The regional coordinator of the GRC at the regional level (administrative district) will collect data on complaints and maintain a generalized (consolidated) register of complaints, where the complaint of each affected person, group or community has an individual number in all registers and registration logs. If the issue has not been resolved at the GRC level, it is referred for consideration and possible resolution to the PIWG level. A generalized register of complaints will be maintained and updated weekly by the PIWG manager.

A GRM Log all complaints will be developed in a simple format to facilitate data entry, to obtain information about the complaint and its status of resolution, the terms of resolution and the levels at which this issue was considered and resolved, tracking individual complaints, etc. The register of complaints will contain brief information on resolving complaints and include information on the satisfaction of the party that filed the complaint with the decision (with the exception of complaints submitted anonymously). The register of complaints will also include relevant information on cases of appeal where it was not possible to arrive at a decision satisfying both parties. Forms for registering complaints, complaints register, register of registered complaints are shown below.



**Table 8.1: GRM Log outline**

Complaint Registration Number	Registration date	Name of applicant	Brief Summary of Complaints	Reply Date	Solution Status	Decision Time	Decision Maker	Decision Date

**Figure 8.1: Complaints and Suggestions Form in Russian**

1-й экземпляр остается у регистратора, копия передается заявителю (если заявитель указал возможность связаться)

**ФОРМА ДЛЯ ЖАЛОБ И ПРЕДЛОЖЕНИЙ**

Регистрационный номер жалобы: \_\_\_\_\_  
 Дата регистрации: \_\_\_\_\_  
 Место регистрации: \_\_\_\_\_

**Информация о заявителе жалобы:**  
 Ф.И.О. полностью \_\_\_\_\_  
 Я прошу оставить мою жалобу анонимной  
 Я прошу не раскрывать мои идентификационные данные без моего согласия

Пожалуйста, укажите, как с вами можно связаться:  
 По почте: Пожалуйста, укажите ваш адрес: \_\_\_\_\_  
 По телефону: \_\_\_\_\_  
 По электронной почте: \_\_\_\_\_

**Описание инцидента и суть жалобы:**  
 Общее краткое описание проблемы в отношении жалобы (Что случилось? Где это случилось? С кем это произошло? Каков результат проблемы?)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Единичный инцидент/жалоба (дата \_\_\_\_\_)  
 Случалось больше одного раза (Сколько раз? \_\_\_\_\_)  
 Продолжается (в настоящее время испытываю проблему)

Как бы вы хотели решить эту проблему?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Срок ответа (указывается в зависимости от степени критичности): \_\_\_\_\_ дней.  
**Дальнейшие процедуры обращения и жалоб, если вы недовольны жалобой**  
 1. Подать жалобу в соответствии с законодательством Республики Беларусь;  
 2. Подать жалобу через официальный сайт Азиатского банка инфраструктурных инвестиций.

**Полученный ответ:**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Срок исполнения по ответу, выданному заявителю жалобы, соответствует заявленному? (зачеркнуть ненужное)  
 Да Нет  
 Ответ получен. Удовлетворено ли обратившееся лицо? (зачеркнуть ненужное)  
 Да Нет

Подпись: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_      Дата: \_\_\_\_\_  
 Ф.И.О.

## Grievances operation overview

Depending on the urgency of the grievances, the following deadlines are set for answering it (or resolving the issue, if possible)

**Table 8.2: Timing of the response to grievances depending on the degree of urgency**

Urgency	Response time (problem resolution)
<p><i>1 degree:</i> the complained action or inaction of the project participants completely blocks the complainant (group of complainants) from the opportunity to exercise their property and fundamental constitutional rights or the rights of the employee. Example 1. <i>As a result of construction work, the only possible access to the house of a local resident was completely closed.</i></p> <p>Example 2. <i>Healthy workers and workers with a confirmed diagnosis or obvious signs of COVID-19 are placed in one living room of a construction camp.</i></p> <p>Example 3. <i>All cases of grievances related to cases of Gender-based violence, sexual assault and harassment (GBV/SEAH).</i></p>	<p>No more than one business day from the date of registration of the complaint</p>
<p><i>2 degree:</i> the complained action or inaction of the project participants partially blocks the complainant (group of complainants) from the opportunity to exercise their property and fundamental constitutional rights or the rights of the employee. Example 1. <i>As a result of construction work, the only access road to the house of a local resident was temporarily unsuitable for unhindered travel on personal vehicles.</i> Example 2. <i>In a construction camp, insufficient provision of workers with sanitary hygiene points (washbasins and toilets).</i></p>	<p>No more than 3 business days from the date of registration of the complaint</p>
<p><i>3 degree:</i> the complained action or inaction of the project participants does not violate the property and fundamental constitutional rights or the rights of the employee of the complainant (group of complainants). Example 1. <i>As a result of construction work, the condition of the dirt access road to the local resident's house has significantly deteriorated, but unhindered travel on it with personal vehicles has been ensured.</i> Example 2. <i>In a construction camp, household garbage is removed from special containers in a timely manner, as a result of which they are overfilled, you have to compose packages of household garbage next to the container site.</i></p>	<p>No more than 7 business days from the date of registration of the complaint</p>

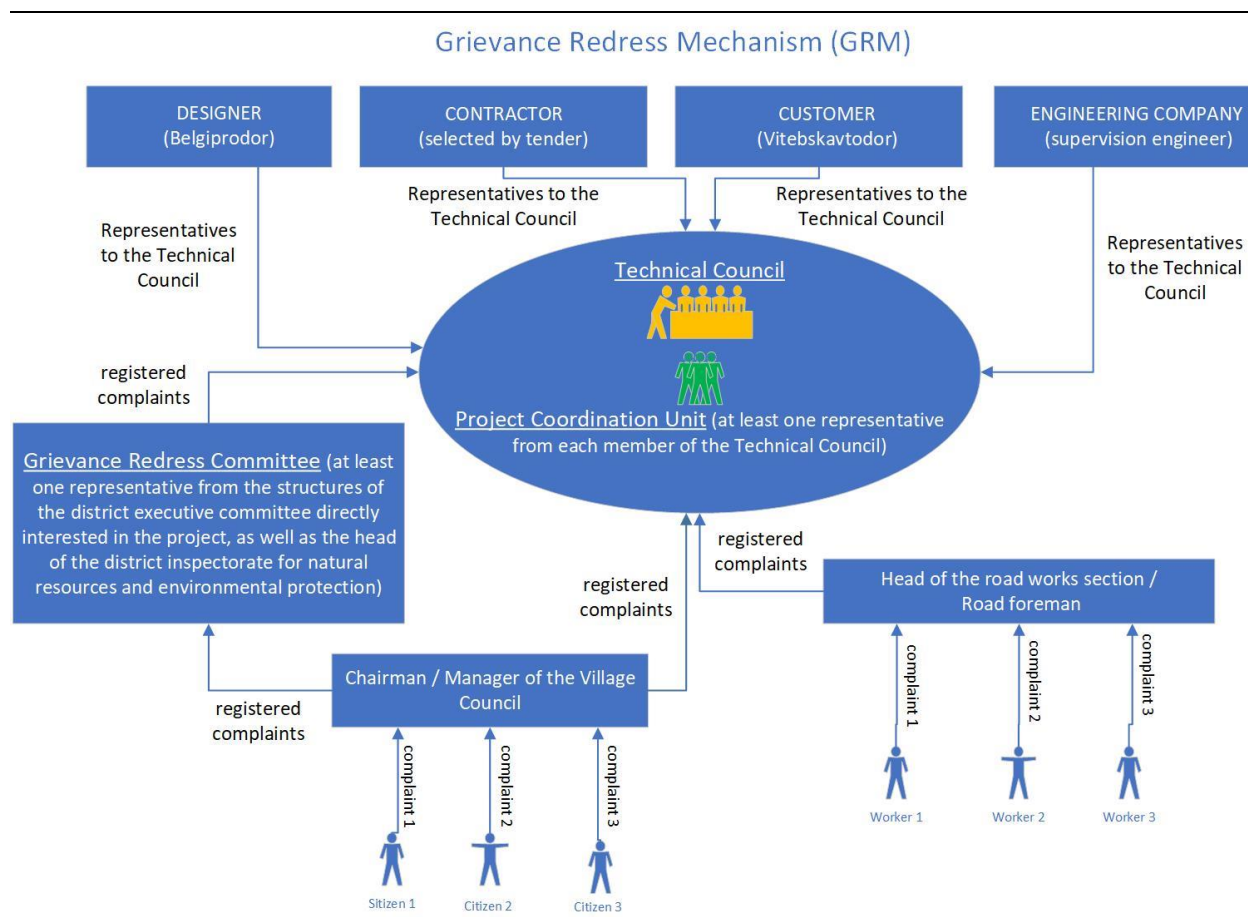
Any material claims that may indicate a risk to the safety, security and dignity of PAP or worker should be resolved immediately and/or communicated to relevant state authorities.

GRCs will continue to function for the benefit of affected individuals throughout the construction phase, including the period of responsibility for resolving any defects found (defects liability period).

Depending on the nature of the complaint, response measures may include verification, investigation, negotiations, mediation, coordination with relevant authorities and decision-making.

**GRM audit.** The audit includes the collection of documents, evidence, and facts, as well as clarification of the initial information, in order to get a clear idea of the circumstances of the appeal case. The audit will be carried out by GRC members, and overall coordination of activities will be ensured by the GRC coordinator at the regional level. The results of the audit or fact-finding activities will be presented at the GRC meeting at the regional level, where this issue will be considered, and an attempt will be made to resolve the issue. Regular GRC meetings at the regional level will be held twice a month, however, special extraordinary meetings can be arranged between regular meetings as needed. The GRC coordinator at the regional level will ensure that actions and decisions are properly designed to demonstrate that GRC at the regional level pays attention to complaints and is actively seeking ways to resolve the issue to the satisfaction of the parties.

**Figure 8.2: Management Structure of the GRM**



If the complaint cannot be resolved by GRC at the field or regional level it is referred to the PIWG at the third level. Relevant documents collected during the investigation and fact-finding will be provided to the PIWG leader. The PIWG Manager will distribute these documents to the PIWG members to make sure they are informed of all relevant details before the PIWG meeting.

The PIWG review of the appeal case may require additional verification of the issue, including

the collection of additional documents, obtaining information from various government stakeholders and project participants, in order to get a clear idea of the circumstances of the appeal case. Additional verification (as necessary) will be carried out by PIWG members, and overall coordination of activities will be ensured by the PIWG leader. The results of the verification will be presented at a meeting of the PIWG, where this issue will be considered, and an attempt will be made to resolve the issue.

Regular PIWG meetings at the central level will be held monthly, however special extraordinary meetings can be arranged between regular meetings, as necessary.

If after consideration of the PIWG complaint at the third GRM level, the complaint will not be resolved to the satisfaction of the complaining parties, it will be recommended to seek its resolution through the court. Regardless of the outcome of the complaint, the documentation regarding the discussion of the complaint at all levels will be collected and stored by the PIWG manager (with the participation of GRC coordinators at the regional level). The head of the PIWG will separately track cases that have not been settled by GRM and have been referred to the legal system of the Republic of Belarus.

### **Feedback to complainant**

The response to the complaint, recommendations or decisions will be provided to the party who filed the complaint by the preferred means of communication mentioned in the complaint registration form.

If the complaint is not resolved at the first and second GRM levels and will be transferred to the PIWG for consideration and resolution. Relevant information will be provided to the party who filed the complaint, including the date when the case was submitted to the PIWG and the date when the result of the complaint at the second level is expected.

If the complaint has been resolved at the second level, the complaining party will be informed of the outcome of the complaint. If the complaint has not been resolved by the PIWG, the relevant information will be provided to the party who filed the complaint, including details of why the case was not resolved, as well as recommendations for seeking its resolution through the legal system of the Republic of Belarus.

If the complaint was anonymous or the applicant refused to provide contact information, information on the status of the consideration of complaints and the results of the resolution process will be posted on information boards at the place of registration. The outcome of the grievance resolution process will also be documented in the consolidated grievance registers.

Complaints should be traceable for monitoring and reporting using the complaint registration form and registration logs. The complaint registration form must be completed for each appeal case (related to the project) by the GRM parties at the first level where the complaint was filed, as well as at the second level (if the complaint was submitted directly to the PIWG, bypassing GRC).

GRC focal points at the regional sublevel will coordinate activities with GRC members at the field sublevel on a weekly basis to update the consolidated GRC complaint registry for each administrative district. Each GRC member at the regional level will have access to a consolidated register of complaints.

The GRC coordinator at the regional level will monitor the grievance resolution process and prepare a summary report on GRM, which will be included in the quarterly progress report to the PIWG. The GRC coordinator at the regional level will provide complaint monitoring forms, as well as a database of a consolidated registry for his administrative district, to the PIWG

manager on a monthly basis.

The PIWG leader at the third level will collect data from the GRC coordinators at the first and second levels, monitor the entire GRM process, monitor the timelines for resolving complaints, recommend corrective actions to the GRC coordinators at the regional level (if necessary), and prepare a summary report on GRM, which will be sent as needed to AIIB. In addition, the PIWG manager will maintain a consolidated register of complaints and will update it monthly.

Information about GRM for the project will be disseminated through announcements and presented during meetings with stakeholders and public consultations (if necessary). During such meetings, it will be necessary to emphasize that the unofficial GRM aims at a quick and friendly resolution of complaints and does not replace the legal process established in accordance with national legislation.

### **GRM Monitoring**

The monitoring of GRM will be carried out through a set of indicators ensuring effective and timely resolution of grievance. The indicators will be measured within the reporting periods. The indicators are listed below.

- Number of Grievances received;
- Number (%) of Grievances acknowledged within the timeframe;
- Number (%) of Grievances unilaterally decided;
- Number (%) of Grievances closed within the specified timeframe;
- Number (%) of grievance related to a same or repeated event and /or location to identify areas most affected by potentially negative impacts of the project.
- Number (%) of grievance received comparing to the previous reporting period.
- Number (%) of complainant satisfied with the process (timely, fair)
- Number (%) of complainant satisfied with the outcome.

### **8.4. AIIB's Project-affected People's Mechanism**

The Bank's Policy on the Project-affected People's Mechanism (PPM) applies to this Project. The PPM has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from Project- affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through the Project-level GRM or AIIB Management's processes. For information on how to make submissions to the PPM, please visit: <https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>.

### List of materials and information sources used

1. TCP 45-3.03-19-2008 Highways of the lower categories. Design rules. Minsk: Ministry of Architecture and Construction of the Republic of Belarus, 2008.
2. TCP 45-3.03-19-2006 Roads. Design Standards. Minsk: Ministry of Architecture and Construction of the Republic of Belarus, 2006.
3. TCP 45-3.03-227-2010 Streets of settlements. Building design standards. Minsk: Ministry of Architecture and Construction of the Republic of Belarus, 2011.
4. Highway R-46 Lepel-Polotsk border of the Russian Federation (Yukhovichi) 1.700–61.500 km: EIA report / State Enterprise Belgiprodor; I.D. Franskevich. - Minsk, 2020 .-- 230 s.
5. Construction of the Polotsk City bypass 112-18-20-I-OI-EIA: EIA report / State Enterprise Belgiprodor; I.D. Franskevich. - Minsk, 2020 .-- 335 s.
6. Natsyyanalny atlas of Belarus / Republic on land resources, geadezii i map, pr Savece Ministra Respubliki Belarus - Minsk, 2002. - 292 p.
7. <http://www.rad.org.by>
8. <http://www.bellesozashita.by>
9. <http://www.cgevtb.by>
10. Yakushko O.F., Maryina L.V., Emelyanov Yu.N. Geomorphology of Belarus. - A textbook for students of geographic and geological specialties - Minsk: BSU, 1999. - 173 p.
11. Makhnach A.S., Garetsky R.G., Matveev A.V. et al. Geology of Belarus - Minsk: Institute of Geological Sciences of the NAS of Belarus, 2001. - 815 p.
12. <http://www.cricuwr.by>
13. Блакітны скарб Беларусі: Рэкі, азёры, вадасховішчы / Маст.: Ю.А. Тарэеў, У.І. Цярэнцьеў - Мн.: БелЭН, 2007. – 480 с.
14. Ivanov-Smolensky V.G. All Lakes of Belarus: a Handbook - Minsk: Riftur Print, 2013. - 751 p.
15. <http://www.gki.gov.by>
16. Soils of the Republic of Belarus. V.V. Lapa [et al.]; under the editorship of V.V. Paws. - Minsk: Information Center of the Ministry of Finance, 2019 .-- 632 p.
17. Martsinkevich G.I. Landscaping. - Minsk: BSU, 2007 .-- 207 p.
18. <http://www.minpriroda.gov.by>
19. Environmental protection in the Republic of Belarus. Statistical Digest / Ed. Coll .: I.V. Medvedeva, I.S. Kangro et al. - Minsk: National Statistical Committee of the Republic of Belarus, 2019 - 200 p.
20. Statistical Yearbook of the Vitebsk Region, 2019 / Ed. Coll .: Yu.I. Moskalev, I.V. Khodikova et al. - Vitebsk: Main Statistical Office of the Vitebsk Region, 2019 - 482 p.
21. GOST 20444-85 Noise. Traffic flows. Methods for measuring noise characteristics;
22. GOST 23337-78 Noise. Methods for measuring noise in residential areas and in residential and public buildings.
23. <http://www.nsmos.by>
24. GN 2.1.7.12-1-2004 List of maximum permissible concentrations (MPC) and tentatively permissible concentrations (MPC) of chemicals in the soil / Approved. Decree of the Chief State Sanitary Doctor of the Republic of Belarus of February 25, 2004 - 29 p.



25. Petukhova N.N., Kuznetsov V.A. To clarks of trace elements in the soil cover of Belarus // Reports of the Academy of Sciences of Belarus, 1992. - Volume 26. No. 5. - S.461-465.
26. Decree of the Ministry of Health of the Republic of Belarus dated 12.03.2012 No. 17/1 "On approval of the maximum permissible concentrations of oil products in lands (including soils) for various land categories"
27. Decree of the Ministry of Natural Resources and Environmental Protection dated March 30, 2015 No. 13 "On the establishment of water quality standards for surface water bodies"
28. Yurkevich I.D., Hunger D.S., Aderikho V.S. Vegetation of Belarus, its mapping, protection and use. - Minsk: "Science and technology", 1979. - 247 p.
29. Yurkevich I.D., Geltman V.S. Geography, typology and zoning of forest vegetation. - Minsk: Science and technology, 1965. - 286 p.
30. Geltman V.S. Geographical and typological analysis of forest vegetation of Belarus - Minsk: "Science and Technology", 1982. - 328 p.
31. Sadchikov A.P., Kudryashov M.A. Ecology of coastal aquatic vegetation. - Moscow.: publishing house NIA-Priroda, REFIA, 2004. - 220 p.
32. IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>. Downloaded on 09 July 2020.
33. Shalapenok E.S., Buga S.V. Workshop on Invertebrate Zoology - Minsk: New Knowledge, 2002 - 272 p.
34. <http://www.insecta-g2n.weebly.com>
35. Pikulik M.M. Amphibians of Belarus - Minsk: "Science and technology", 1985. - 191 p.
36. Nikiforov M.E., Yaminsky B.V., Shklyarov L.P. Birds of Belarus: A guide to identifying nests and eggs. Minsk: Higher School, 1989. -- 479 p.
37. Savitsky B.P., Kuchmel S.V., Burko L.D. Mammals of Belarus - Minsk: Publishing Center of BSU, 2005. -- 319 p.
38. Grichik V.V., Burko L.D. The animal world of Belarus. Vertebrates: textbook. allowance - Minsk: Publishing house of BSU, 2013.-- 399 p.
39. <http://www.vitebsk-region.gov.by>
40. <http://www.lepel.vitebsk-region.gov.by>
41. <http://www.ushachi.vitebsk-region.gov.by>
42. <http://www.polotsk.vitebsk-region.gov.by>
43. Statistical Yearbook of the Vitebsk Region, 2019 / Ed. Coll .: Yu.I. Moskalev, I.V. Khodikova et al. - Vitebsk: Main Statistical Office of the Vitebsk Region, 2019 - 482 p.
44. Vitebsk region in numbers. Statistical Handbook, 2019 / Ed. Coll .: Yu.I. Moskalev, I.V. Khodikova et al. - Vitebsk: Main Statistical Office of the Vitebsk Region, 2019 - 88 p.
45. Belarus in numbers. Statistical Handbook, 2019 / Ed. Coll .: I.V. Medvedeva, I.S. Kangro et al. - Minsk: National Statistical Committee of the Republic of Belarus, 2019 - 71 p.
46. <http://www.vitebsk.belstat.gov.by>
47. General requirements in the field of environmental protection for the maintenance and operation of capital structures (buildings, structures), isolated premises and other objects belonging to business entities, approved. By Decree of the President of the Republic of Belarus 11.23.2017 No. 7.

48. Sanitary norms and rules “Requirements for the atmospheric air of settlements and places of mass recreation for the population”, approved by the resolution of the Ministry of Health of the Republic of Belarus dated December 30, 2016 No. 141
49. TCP 17.08-03-2006 (02120) “Environmental protection and nature management. Atmosphere. Emissions of pollutants and greenhouse gases into the air. Rules for calculating emissions by motor vehicles in settlements ”
50. GN 2.1.7.12-1-2004 List of maximum permissible concentrations (MPC) and tentatively permissible concentrations (MPC) of chemicals in the soil / Approved. Decree of the Chief State Sanitary Doctor of the Republic of Belarus of February 25, 2004 - 29 p.
51. Decree of the Ministry of Health of the Republic of Belarus dated 12.03.2012 No. 17/1 “On approval of the maximum permissible concentrations of oil products in lands (including soils) for various land categories”.