M60 EXPRESSWAY BETWEEN PÉCS AND BARCS

ENVIRONMENTAL IMPACT ASSESSMENT - FOR THE MODIFICATION OF THE ENVIRONMENTAL PERMIT

MILE POST BETWEEN 91+00 AND THE BORDER

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Ministry of Construction and Transport
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Designer:
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Vibrocomp space number - 159/2021
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THOSE INVOLVED IN THE PREPARATION OF THE DOCUMENTATION

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MAIN FINDINGS

1. The subject of this Environmental Impact Assessment (EIA) for *the* modification of the environmental permit is the ***"Section of the M60 expressway between mile post 91+000 and the border"***.

2. The construction of the M60 expressway between Szigetvár and Barcs as an expressway is subject to an environmental impact assessment ***pursuant to Annex 1, point 37 a) of Government Decree No. 314/2005 (XII.25) (construction of expressway, highway, motorway, including interchange elements)***.

3. On 30 November 2017, the M60 expressway from mile post 31+10 (area of Pécs) to mile post 95+613 km (No. 6623 municipal road and junction with main road 6) was granted an environmental permit under file number PE/KTF/4213-114/2017. The ***present EIA has been prepared for the modification of*** this ***section from mile post 91+000 to the national border.*** The need to amend the permit is justified by the modification or extension of the route.

4. The planned investment is **part of a transport infrastructure investment of high national economic importance** pursuant to **Annex 1, point 1.1.56. of Government Decree No.345/2012 (XII. 6.)** on the declaration of administrative authority cases related to certain transport development projects as matters of high national economic importance and the designation of the competent authorities (Implementation of the M60 expressway between Szigetvár and Barcs, national border).

5. ***The purpose of*** the documentation is to assess the environmental impacts of the proposed investment and to make proposals to minimise the adverse impacts as far as possible. This will ensure ***compliance with the environmental legislation in force and obtain the consent of the environmental authorities for*** the construction permit and the construction works.

6. The content of this documentation ***has been compiled in*** accordance with the environmental legislation in force, ***taking into account Act LIII of 1995 on the General Rules of Environmental protection, Act LIII of 1996 on Nature Conservation in Hungary, and Government Decree No. 314/2005 (XII. 25.)*** regarding the procedures of environmental impact assessment and the single procedure of authorization of utilization of the environment.

7. According to section 10 of the Government Decree No. 275/2004 (X.8.) on nature conservation areas of European Community importance, if the project may affect a Natura 2000 site, either alone or in combination with other plans or projects, the impact of the project on the Natura 2000 site must be assessed. The proposed development will affect the ***Western Drava Priority Bird Protection Area HUDD10002 and the Central Drava Priority Conservation Area HUDD20056***, therefore a ***Natura 2000 impact assessment has*** been prepared for these sites.

8. Based on the studies and assessments carried out, it has been concluded that the ***implementation and operation of*** the proposed project is likely to result in adverse impacts, primarily ***from a wildlife conservation perspective***, but the development is not expected to cause significant conflicts if the proposed measures are adhered to. In order to prevent and mitigate the impacts estimated for the period of implementation of the proposed investment and also during its operation and maintenance, ***proposals/measures have been formulated for*** each environmental compartment in the section addressing the

environmental compartment concerned. ***After implementation and commissioning, the expected impact on each environmental compartment is acceptable and not significant.***

9. ***The nature and extent of the anticipated environmental effects*** previously identified during the implementation and operation of the proposed project, subject to the proposed ***measures, are considered acceptable under existing environmental legislation and regulations. The implementation of the installation will comply with the relevant environmental legislation.***

1. INTRODUCTION

The section of the M60 expressway between Pécs and Barcs including the return junction of the main road No 6 was granted an environmental permit in 2018. The further preparation of the 65 km long section is divided into two phases.

1. The 37 km long section between Pécs and West Szigetvár, for which the permit plans are already being prepared.
2. The 28 km long section between West Szigetvár and Barcs contains 2 further subsections:
   - One from the West Szigetvár junction to the East Barcs east junction of the main road No 6. This sub-section has an environmental permit.
   - The other subsection is the approximately 3 km subsection between the Barcs East 6 junction and the border, which does not have an environmental permit.

On 30 November 2017, the M60 expressway from mile post 31+160 (area of Pécs) to mile section 95+613 (No. 6623 municipal road and junction with main road 6) was granted an environmental permit under file number PE/KTF/4213-114/2017. This environmental impact assessment has been prepared for the modification of the section of this permit from mile post 91+000 to the national border. The need for the modification of the environmental permit is justified by the modification of the authorised route from mile post 91+000 and its No. 6623 municipal road 6623000 south of the junction with the main road 6.

On 02 February 2021, the National Infrastructure Developer Private Company Limited by Shares (NIF Ltd.) received the order for the preparation of the M60 Szigetvár - Barcs section between the national border under the number KIFEF/ 13508/2021-ITM.

Pursuant to Government Decree No. 362/2022 (IX. 19.), the Ministry of Construction and Transport took over the functions of the defunct NIF Ltd. from 1 January 2023.

On behalf of Pannonway Construction Ltd., Vibrocomp Ltd. is preparing the environmental impact assessment of the project in question and the Natura 2000 impact assessment documentation required by the relevant legislation.

We hereby declare that:

In the case of tangible investments, no related activity shall be taken into account as defined in subsection (e) section 2 of Government Decree No. 314/2005 (XII. 25.)**.**

The environmental impact assessment does not contain **classified information** within the meaning of Section 3 of Act CLV of 2009 on the Protection of Classified Information, nor **trade secrets** within the meaning of subsection (1) section 2:47 of Act V of 2013 on the Civil Code.

1.1. SUBJECT AND PURPOSE OF THE APPLICATION

Subject of the environmental impact assessment

The planned investment concerns the M60 expressway mile post 91+000 and the national border, part of which has an environmental permit.

The construction of the M60 expressway between Szigetvár and Barcs as a motorway is subject to an environmental impact assessment **pursuant to Annex 1, point 37 a) of Government Decree 314/2005 (XII. 25.) (construction of expressway (motorway, highway) including interchange elements).**

On 30 November 2017, the M60 expressway from mile post 31+160 (area of Pécs) to mile post 95+613 (No. 6623 municipal road and junction with main road 6) was granted an environmental permit under file number PE/KTF/4213-114/2017. The **present EIA has been prepared for the**

modification of this **section from mile post 91+000 to the national border.** The need to amend the permit is justified by the modification or extension of the route.

The construction of the bridge on the river Drava, which is linked to the section under consideration, will be carried out in a separate phase, in a project, and is therefore not the subject of this document.

The subject of the present impact assessment is the ***environmental impact assessment for the modification of the environmental permit for the M60 expressway from mile post 31+160 (area of Pécs) to mile post 95+613 (junction of No.6623 municipal road. and main road 6) between mile post 91+000 and the border.***

Pursuant to Article 10 of Government Decree 275/2004 (X.8.) on sites of European Community importance for nature conservation, if the project may affect a Natura 2000 site, either alone or in combination with other plans or projects, the impact of the project on the Natura 2000 site must be assessed. The proposed development will affect the **Western Drava Priority Bird Protection Area HUDD10002 and the Central Drava Priority Conservation Area HUDD20056**, therefore a Natura 2000 impact assessment has been prepared for these sites.

The environmental impact assessment took the environmental impacts caused by the utilities concerned into account.

Purpose of the environmental impact assessment

The purpose of the environmental impact assessment is to estimate and assess the environmental impacts expected from the proposed activity, to make recommendations to minimise adverse impacts as far as possible, and to identify any environmental barriers to its implementation.

The impact assessment has assessed the current environmental status, conditions and processes of the study area, and has evaluated the environmental impacts, the extent and consequences of the proposed activity on the basis of available plans and documents.

The current and long-term (post-project) status of each environmental element and environmental system, the delimitation of the study area, and the possible methods of protection that may be required are examined separately for each field, and then the results of the study are summarised in a summary assessment.

1.2. HISTORY

In 2021, the M60 expressway mile post 91+000 and the border section, in which 13 track alternatives were examined, some of which were combinations of each other. In the area north to the M60 railway line, the variants were received in four track corridors and continued in five directions in the area south to the railway line.

As a result of the planning and consultation processes following the Pre-Decision Study, two variants were selected for further planning at the level of study design, Variant 3 and Variant 7.

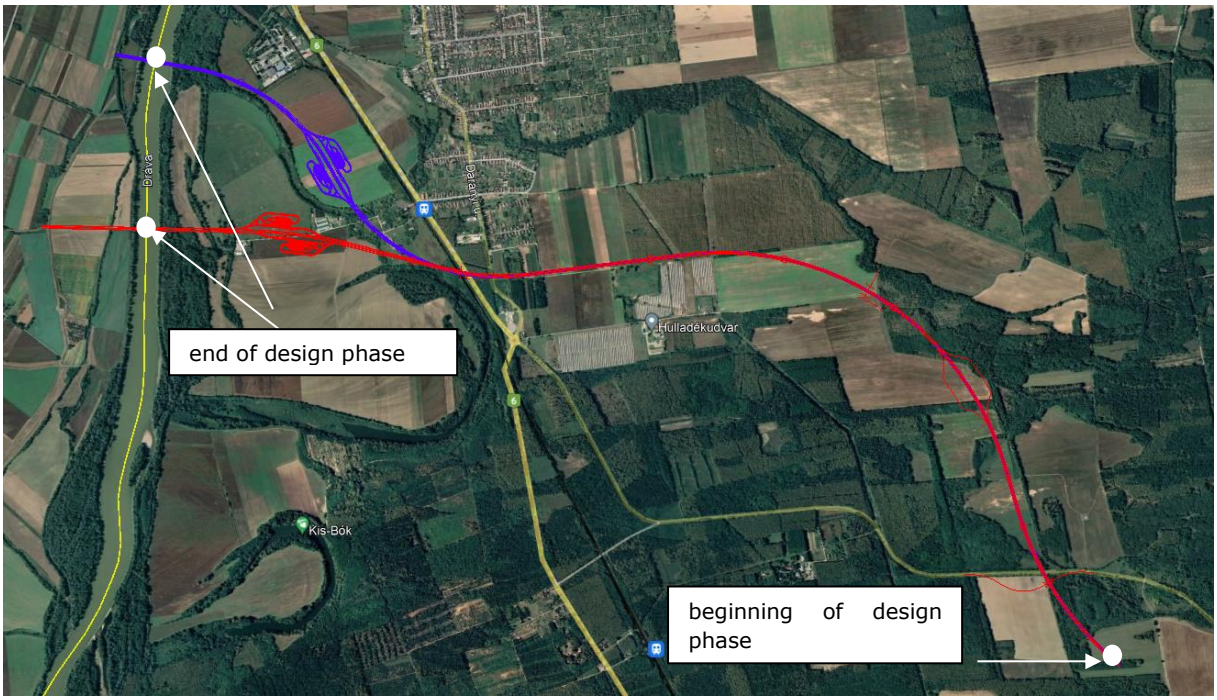


Figure 1.2.2. Design study track variants (3 - red, 7 - purple)

The results of the study design studies are summarised in the table below.

Table 1.2.1. Results of study design studies

Environmental medium/component	***Evaluation criteria***	***Most favourable variant***
Soil	Reservation by length	track No. 3
Groundwater	Groundwater quality protection area affected	no difference can be made
	Affected watershed protection zones	no difference can be made
Surface water	Number of watercourse crossings	track No. 3
	Affected area of an area regularly infected by inland flooding	no difference can be made
	Exposure to flooding	no difference can be made
Air	Distance to nearest residential/protected building	no difference can be made
Wildlife	Protected natural values and sites affected	Track No. 7 - with proposed modification

Environmental medium/component	*Evaluation criteria*	*Most favourable variant*
Landscape	Landscape protection area affected, use of forest land, use of new land, National Ecological Network affected	track No. 7
Built environment	Archaeological sites, monuments affected	track No. 3
Noise	Distance to nearest dwelling, need for noise protection measure	no difference can be made
Waste	Quantity of waste generated during construction	track No. 3

For many of the environmental aspects assessed, no difference can be made between the two track variants - including noise and air protection.

The length of the newly built track is an important indicator of land occupation, as the longer the planned section, the higher the proportion of paved surfaces and the higher the amount of waste generated as the length of the road increases, so the alignment of Track No. 3 is considered to be more favourable from a soil protection and waste management point of view.

Also in favour of option No. 3 is the fact that the complex rest area of option No. 7 crosses an archaeological site and that option No. 3 crosses fewer watercourses.

However, from a habitat and landscape conservation point of view, option No. 7 is preferable. It is important to note that both track variants affect thousands of protected plants, as well as the habitat of a highly protected mammal species (wildcat) and the feeding area of a highly protected bird species (little egret). In favour of option No. 7 is the reduced impact on the area of priority landscape conservation, the impact on planned forest areas, the impact on Natura 2000 sites and the impact on the National Ecological Network.

As a result of consultations after the study plan was prepared, this EIA includes both the Track No. 3 and Track No. 7 variants and also examines the design of Junctions A and C as well.

Consultation with the Croatian partner

The following exchanges of correspondence have taken place with the Croatian partner for the purpose of conciliation:

- 3 December 2021: first request, sending a variant of the track in pdf (Pannonway Ltd.)
- 5 January 2022: no reply since 3 December 2021, so they were contacted again (Pannonway Ltd.)
- 7 January 2022: we received a reply to our request, project preparation will start in the second quarter of 2022 (Sven Jesenkovic (Hrvatske Ceste))
- 31 August 2022: new request, variant 7 of the track sent (by NIF Ltd.),
- 15 October 2022: no reply to the letter of 31 August 2022, new request (by NIF Ltd.),
- 17 October 2022: we have received a reply to our request, Environment Impact Assessment (EIA) contract is being signed, planning should start this year - (Sven Jesenkovic (Hrvatske Ceste))
- 9 November 2022: letter from the Croats, the preparation of the KHT has started, they ask for the traces in .dwg variant (Sven Jesenkovic (Hrvatske Ceste))
- 9 November 2022: traces and length sections sent to the Croatian partner (Pannonway Ltd.)

2. BASIC DATA OF THE PLANNED ACTIVITY

The design task is the construction of a ~3 km long expressway between the junction with main road 6 of East Barcs and the border, including a complex control station, a complex rest area, border crossing and the

M60 expressway on main road 6, creation of a separate intersection with No. 6623 municipal road. .

As the previously permitted route up to the junction of main road 6 was hampered by the current use of the properties concerned, the planning was extended to the north of Highway 6.

2.1. BASIC DATA OF THE APPLICANT

Ministry of Construction and Transport

Address: H-1054 Bp. 5, Alkotmány Street
Tax number: 15847397-2-41
CSO: 15847397-8411-311-01
KÜJ (Environmental Customer ID): 100365768

2.2. TECHNICAL SPECIFICATIONS OF THE ACTIVITY

2.2.1. Volume of activity, technical data

2.2. 1.1 Existing conditions

The planning area is located in Somogy County, east of the town of Barcs.

The main infrastructure network in the area is the main road 6 and the main road 68. On the mile post 258+726 of the main road No 6 there is a roundabout junction with the No. 6623 municipal road (section 25+916 km) and Darányi Street. The roundabout is located outside the centre of Barcs, to the east of it, on the north side of the railway line No 60. *

North to the roundabout section of Highway 6, No. 6623 municipal road there is an industrial development area, solar parks, a reclaimed landfill and a waste treatment plant.

To Croatia, there is currently a two-lane bridge over the river Drava. The existing border crossing station is located in Hungary.

2.2.1.1. Presentation of the planned status

Line management

Variant 3

The planned route connects to the mile post 91+000 from the previous section with an environmental permit. The total length of the planned variant is 8605 m.

At the beginning of the section, the track starts with a slope of 0.50% and runs close to the ground level, with an embankment height of around 1 m. Between mileposts ~96+650-94+400 , the track continues on a high embankment section, approaching 10 m in height in places. Thereafter, up to the mile post ~97+300, the track follows a notch, with the notch depth varying, typically between 5-6 m. After the notch section, the planned longitudinal section continues in embankment and ends at the end of the planning section, crossing the Drava riverbed.

Intersecting facilities:

- mile post 91+700 No. 6623 municipal road - underpass
- mile post 94+007 No. F940K crossing dirt road - overpass
- mile post 96+465 main road No. 6- underpass
- mile post 96+770 No. 60 railway line - underpass
- mile post 97+571 No. F975K crossing dirt road - underpass
- mile post 99+344 River Drava - overpass

Variant 7

The planned route connects to mile post 91+000 of the previous section with an environmental permit. The total length of the planned variant is 8671 m.

At the beginning of the section, the track starts with a slope of 0.50% and runs close to the ground level, with an embankment height of around 1 m. Between sections mile posts ~96+650-94+400, the track continues on a high embankment section, approaching 10 m in height in places. Thereafter, up to the mile post ~97+600, the track follows a notch, with the notch depth varying, typically between 5-6 m. After crossing the Zimóna stream at mile post 97+610, the planned longitudinal section continues in an embankment and ends at the end of the planning section crossing the Drava riverbed.

Intersecting facilities:

- mile post 91+700 No. 6623 municipal road - underpass
- mile post 94+007 No. F940K crossing dirt road - overpass
- mile post 96+646 No. 6 main road - underpass
- mile post 96+765 No. 60 railway line - underpass
- mile post 97+610 Zimóna stream crossing - overpass
- mile post 97+534 No. F975K crossing dirt road - underpass
- mile post 99+571 River Drava - overpass

Basic design data

M60 expressway

Nature of the road:	Suburban
Environmental conditions:	A.
Department of Public Roads:	express roads (motorway)
Planning Department:	K.II.A.
Design speed:	110 km/h
Crown width:	20,00 m

Related intervention elements

Drava Bridge

In both of the proposed alternatives, the construction of the Drava bridge will also mean an intervention. In the present case, the most economical solution for the given span is the arch bridge, also because the connecting floodplain sections are of approximately equal length, so a symmetrical structure is aesthetically justified.

During the construction of the bridge, there will certainly be a need for a temporary excavation road alongside the bridge in the floodplain, connecting to the road network. The floodplain openings will be reinforced concrete girder structures, and the largest machinery used for construction will be a piling machine, a truck crane and 40-tonne trucks.

In case of the Drava Bridges, the floodplain openings can be built with prefabricated beams by crane, and an access road must be built next to the bridge. For the construction of the embankment openings, a floating crane is likely to be needed, which will require a working area of the same size as the bridge footprint, close to the bridge, with a road connection. In the case

of paving, the roadway will have to be constructed on one side of the road, served by the same road parallel to the bridge as the roadway for the floodway openings. Given the width of the bridge, it would be advantageous to have an access road on both sides. In addition, there will be a need for additional staging areas in the vicinity of the bridge, with a footprint of approximately the same size as the bridge.

In all cases, construction of the bridge must start before road construction, so the road location in front of the floodplain can be used as a staging area.

The exact area affected is therefore also a function of organisation, contractor and construction technology, and will be addressed in detail in later design phases.

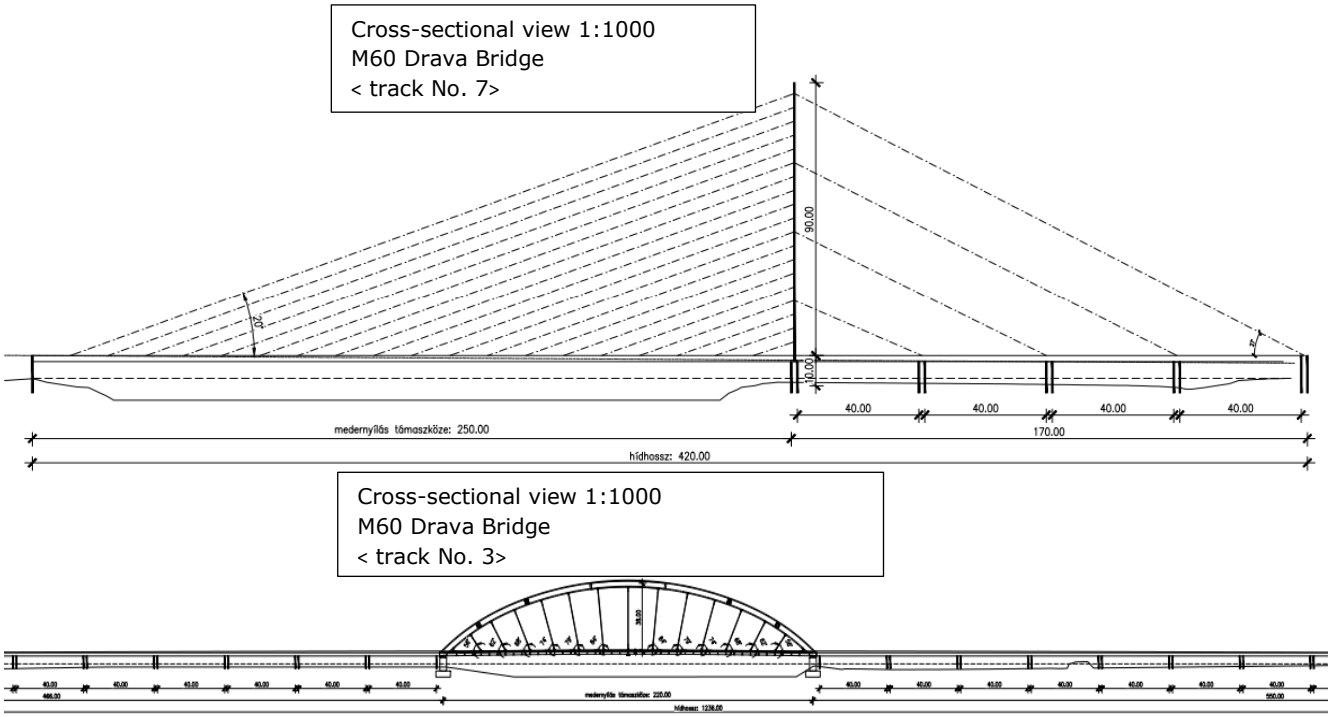


Figure 1.2 Two possible configurations of the planned Drava bridges

Related facilities

Complex rest area

The rest area is located around mile post 93+100 of the M60 expressway, in the administrative area of Barcs.

The number of parking spaces is defined as follows (per site):

- 46 cars for passenger cars,
- 4 handicapped parking spaces for disabled people with reduced mobility,
- 5 parking spaces for cars for the future E-charging station (securing of space, technical conditions to be part of a future design),
- parking for 25 lorries,
- 3 parking spaces for buses.

2.2.2. Date of implementation and start of operations, phases

The investment is previously scheduled to start in 2027 and to be completed by the end of 2030, but the feasibility of meeting these dates depends on the availability of domestic financial resources.

2.2.3. Location and area requirements

The areas concerned are located in the outskirts and in the centre of Barcs.

2.2.4. Residues and wastes from installation, operation and abandonment

Wastes currently generated and those expected to be generated during installation, operation or abandonment are described in Chapter 5.10 Waste management.

2.2.5. Description of the implementation of the activity, technologies to be used

The main stages of construction:

- real estate land reservation,
- setting up sites, temporary mixers, depots,
- possible archaeological works, providing specialist archaeological supervision,
- utility replacements,
- demolition works: section of Darányi Street to be demolished, stable buildings south of this 6 main road,
- earthworks, landscaping, road foundations,
- construction of a new road and related works,
- construction and operation of drainage and drainage systems,
- construction of transport hubs,
- planting plants,
- construction of environmental facilities.

The implementation process is currently unknown, the organisational plan will be prepared by the Contractor. Proposals for the definition of the organisational area will be made in the sector-specific chapters.

The main work processes of the operation:

- maintenance of functionality (e.g. road maintenance, winter salting),
- the operation of related facilities.

2.2.6. Deliveries necessary for the activity

It is advisable to use raw materials from the mines nearest to the road construction and to transport them along the existing route or by main roads, avoiding settlements if possible, taking into account the principles of proximity and economy.

The selection of construction fill material (mine sands) may be made at the time of the Contractor's selection.

2.2.7. Environmental facilities, measures already planned

The environmental measures for the construction of the link road are described in detail in the sector-specific chapters.

2.2.8. Technology new in Hungary, already used abroad

No new technology is being introduced in Hungary for road construction, but those already being used abroad.

2.3. CIRCULATION MODEL

2.3.1. Traffic conditions

The traffic data was provided by Trenecon Ltd. on behalf of Pannonway Construction Ltd. A summary table of the traffic data is provided in the Traffic Annex II.

2.3.2. Uncertainty (availability) of data

For the baseline data, the uncertainty is mainly in the traffic forecast, the long-term emissions data and the environmental protection during construction.

Traffic forecast: in general,± traffic volume forecasts may contain an uncertainty of 5-7%. Even on some network elements in the current state, there may be a discrepancy between the available official traffic count data and the modelled load values on the network. This uncertainty is acceptable for the 15 to 20 year horizon traffic projections, justified by the uncertainties in the baseline data (vehicle supply, actual implementation of planned network elements, etc.) that can be estimated for the time horizon under consideration, and by the fact that changes in socio-economic conditions cannot be accurately predicted.

When projecting vehicle emissions of air pollutants, international vehicle regulations and the trend of vehicle replacement, depending on economic development, are taken into account.

Construction data: at the current planning stage - environmental impact assessment - the contractor and related data are not yet known. It is therefore not possible to know what kind of machinery the contractor will have, what the timetable for the planned development will be, and where the individual construction lines, mixing plants and machine storage areas will be located. We also do not know precisely where the material extraction sites and the areas for the disposal of humus may be located. It is up to the contractor to designate and authorise these.

Specific data on construction are available during the preparation of the construction plans, so only general specifications can be made for the previous planning stages that, specifications that do not depend on the contractor, his machinery and the construction schedule.

Uncertainty in the database on which noise is calculated arises from the uncertainty in the modelling of the social and economic processes on which the forecast is based. In addition to determining the volume of the processes, there are factors that depend on the size (small and large), pursuit and activity of the economic agents (enterprises). The latter data are the basis for the creation of a database on the distribution of vehicle type, where the uncertainty is mainly in the forecast of the type distribution of lorry traffic.

The expected date of construction and opening to traffic of the planned road depends on the resources available to cover the investment (feasibility cost). There may therefore be uncertainty as to when the road will be built and when it will be opened to traffic.

New forest plans may be developed in several areas before the actual start and completion dates of the construction that can be estimated or planned in the present period, which may result in the likelihood of forest land use change and the possibility of changes in the value of the forest use calculations estimated in the present period. It should be noted that this uncertainty, taking into account forest management practices (e.g. avoidance of fresh afforestation), may indirectly affect the natural processes currently experienced and the habits of the wildlife (e.g. game migration) that are hidden in the area.

A further factor of uncertainty in the planning process is the outcome of the ongoing negotiations with the Croatian partner and the fact that the planning is still at an early stage at the side of the Croatian partner.

3. TRANSBOUNDARY ENVIRONMENTAL IMPACTS

The border of the planning area is the Hungarian-Croatian state border; therefore the possibility of transboundary impacts is assumed. The Espoo Annex to this EIA is a separately documented file prepared in accordance with the Espoo Convention, which describes the transboundary environmental impacts of the proposed motorway and its facilities on specific environmental elements.

4. IMPACT FACTORS, IMPACT PROCESSES, AGENTS, SPHERES OF INFLUENCE

The following provides an overview of the impact processes, impacts, changes in the status of the impactors, and general principles for defining the boundaries of the impact areas, and in the individual sections we discuss in detail their magnitude, significance, and the specific boundaries of the impact areas, where these can be given on the basis of our current knowledge.

The impact of the investment can be broken down by stage of activity as follows:

- **Execution** - an activity lasting for a specified period of time, the effects of which may occur within the work area (the area to be occupied), in its immediate surroundings, or on the road network in the area and in the surrounding settlements as a result of transport.
- **The impact of the facility** - mainly in terms of land occupation due to redevelopment. The impacts will exist independently of traffic once the facility is in place.
- **Impacts from the operation of the installation** - impacts from traffic, mainly related to noise and air pollutant emissions from motor vehicles.
- **Impacts of facility operation** - impacts created by maintenance and servicing processes.
- **Abandonment** - not specific to the activity in the case of public roads, but an assessment of the impact of abandonment is presented for all environmental media where appropriate. The effects of abandonment are the same as those expected during construction.

The area of influence is the area where the effects are felt to the extent specified in the legislation. The area of influence is defined according to the provisions of Annex 7 to Government Decree No 314/2005 (XII.25.).

The area of influence includes areas potentially affected by pollution (air, water, soil) from the disaster, but which cannot be defined in advance (the area of influence depends on a number of factors, such as the nature of the disaster, the type and amount of pollutants released into the environment, weather conditions).

Areas at risk include, for example, residential areas close to the route, surface waters and natural habitats directly adjacent to the road.

4.1.1. Direct area of influence

The direct area of influence is defined in Annex 7 of Government Decree No 314/2005 (XII. 25.) as "the areas attributable to each of the impact factors, which may be

- the dispersion areas of certain emissions of substances or energy to land, water, air in the environmental compartment concerned,
- areas of direct use of land, water, wildlife, built environment."

Each environmental element has a specific relationship to the impacts of the investment, and therefore the area of impact needs to be given per environmental element.

4.1.2. Indirect area of influence

According to the above-mentioned Regulation, "Areas of indirect effects are the area of propagation of the effects of an impact process that is affected by an impact process because of changes in the environmental status of the direct effect areas."

4.2. EXPECTED CHANGES IN ENVIRONMENTAL STATUS EXPECTED WITHOUT THE ACTIVITY (FACILITY)

The impacts expected without the facility are described separately for each environmental element (in the subsections on the current situation).

5. ESTIMATION AND ASSESSMENT OF EXPECTED ENVIRONMENTAL IMPACTS

The findings of the environmental impact assessment for the procedure for the environmental permit PE/KTF/4213-114/2017 are maintained for all relevant sections of the M60 expressway between mile posts 31+160 - 91+000. The present document only considers the sections that will be modified or that represent an extension of the previously planned road.

5.1. PROTECTING SOIL AND GROUNDWATER

5.1.1. Area of influence

Direct coverage

The immediate area of influence, **in relation to the ground,** is the entire construction area of the track, including stormwater drainage ditches, staging and depot areas and any material storage areas. It is within this area that the soil may be directly impacted during the construction phase and within this area that direct contamination may occur in the event of a disaster.

For groundwater, the direct area of influence is difficult to define and can only be defined by modelling (influencing effect of soil as a mediating medium). If the project is carefully designed and implemented, groundwater contamination is not expected and therefore no delimitation of the area of influence is necessary.

Indirect coverage

Geological medium, surface water and groundwater

The indirect impact area for *soil and groundwater* is interlinked. In case of pollution of any of the two environmental elements, the indirect impact area is determined by emissions from the installation and associated road traffic, and by disasters. Its extent is difficult to estimate and depends on the quality of the geological medium, the pollutant, its features and the amount released, as well as the time elapsed since the pollution.

5.1.2. Geological and soil conditions

The planning area is located in Somogy County.

Topography of the wider area

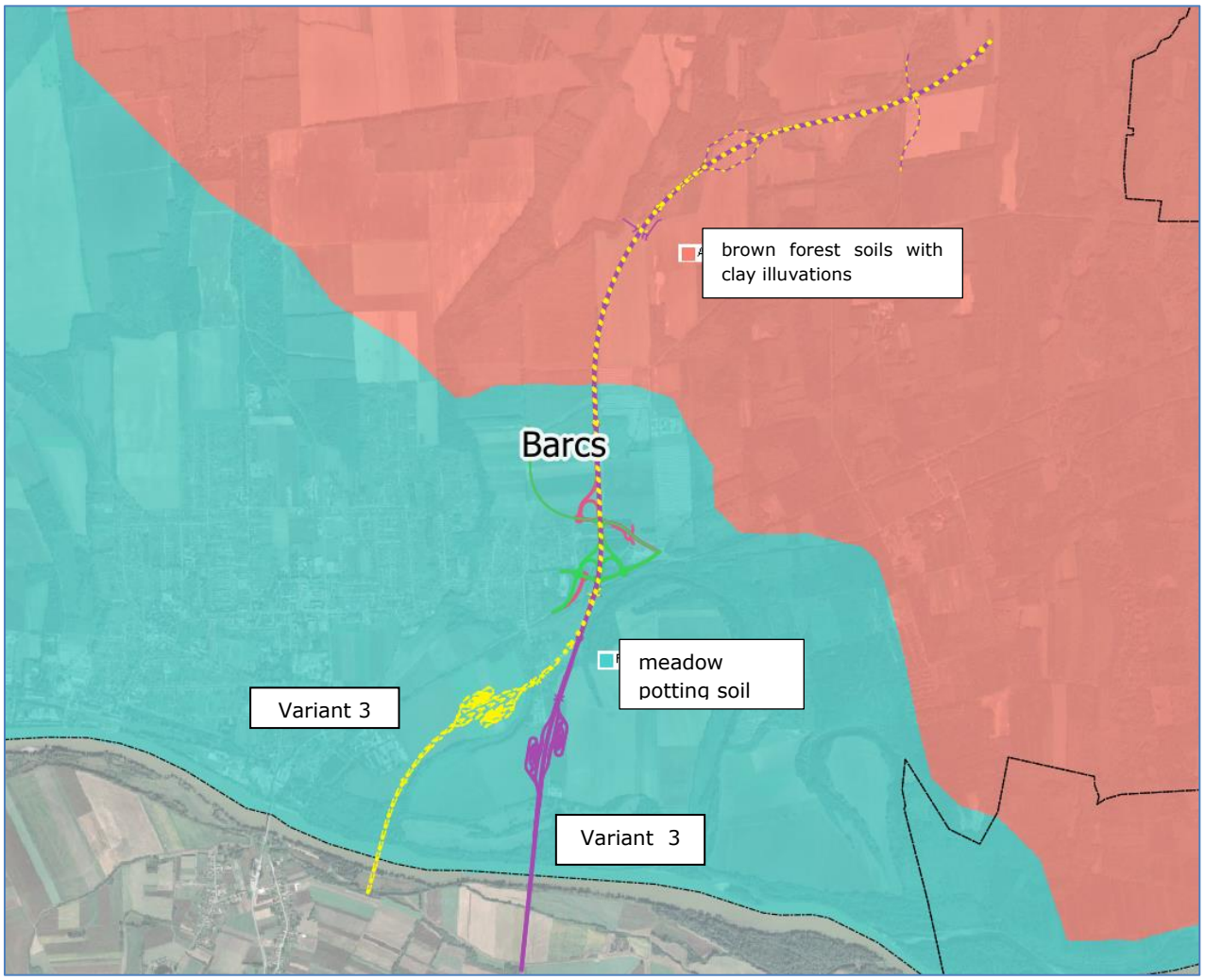
The wider alluvial conglomerate is about 80 km long and 16-20 km wide. The average height at 150-170 m above sea level. Quicksand forms are typical.

Geological characteristics of the planning area

The subsoil of the tracks is characterised by quicksand, sand and aleurolite up to the junction with the main road 6.
A more volatile soil environment is expected after the separation of the two tracks after main road 6. Geological mapping shows that the subsoil of the area is composed of river sediments (sand, gravel) and riverine marsh sediments.
At the intersection of watercourses, clay and possibly organic, organic-rich soil layers may also occur.

Soil conditions in the planning area

Based on the Agrotopographic Database of the Research Institute of Soil Science and Agrochemistry of the Hungarian Academy of Sciences, the planned variations concern brown forest soils with clay-loam decomposition and meadow cast soils.



5.1.1: Genetic soil types along the proposed track

5.1.1Table 1: Characteristics of soil types affected in the planning area

Soil type	***brown forest soils with clay illuviations***
thermal layer thickness	>100 cm

water management properties	Soils with high water absorption and conductivity, medium water storage capacity, poor water holding capacity
Soil type	***meadow potting soils***
thermal layer thickness	>100 cm
water management properties	Soils with good water absorption and water conductivity, good water storage capacity and good water holding capacity

The meadow potting soils affected by the studied variations belong to the medium fertility soil class, while the brown forest soils with clay illuviations belong to the low fertility class.

Based on the **Soil Investigation Report and Geotechnical Design Report** prepared by Terraexpert Ltd. in June 2022, the following conclusions can be drawn:

On the surface, the common track is mainly covered by granular soils, silty sand, fine sand, medium sand. Below a depth of 3 m fine-grained layers, silt, sandy silt soils are also common. Due to the high frequency of silty sands, the surface assemblage is susceptible to frost or frost-sensitive.
Approaching the Drava after the separation, the predominantly fine-grained layers, silt, sandy silt, and possibly thin to medium clay soils are typical near the surface.

Mining sites

The mining areas within 5 km of the planned tracks, as recorded by the Hungarian Mining and Geological Survey, are summarised in the table below.

5.1Table .2: Solid mineral and hydrocarbon deposits in the vicinity of the planning area

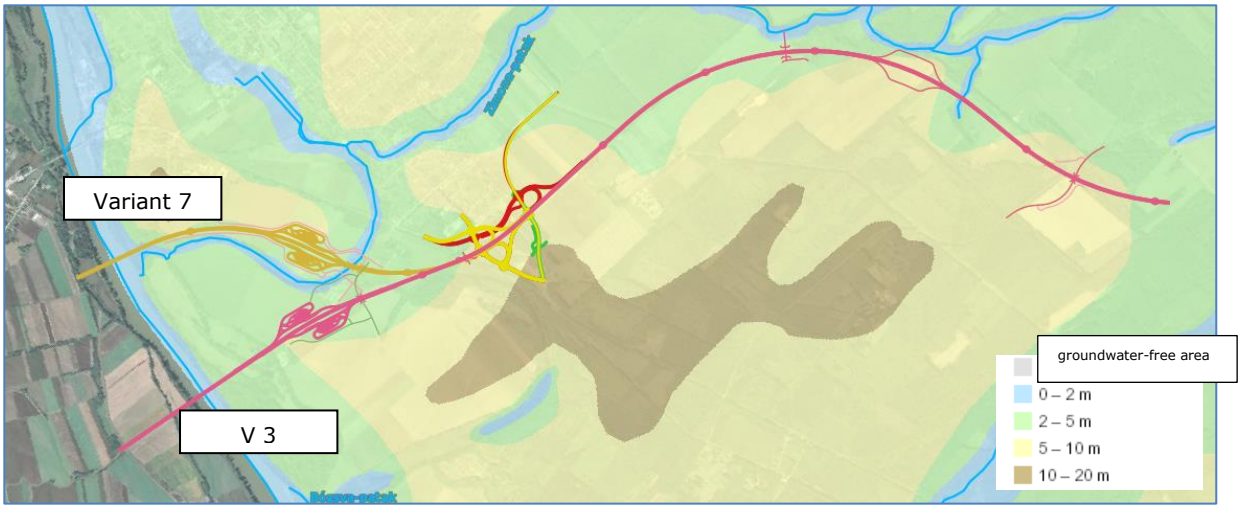
Protected name of mining site	***Mined material***	***Name of the mining contractor (beneficiary)***	***Status***	***Contact***
Darány I - hydrocarbons	petroleum	Darány Energy Ltd.	mining site	yes
Babócsa IV - hydrocarbon	petroleum hydrocarbons natural gas	MOL Hungarian Oil and Gas Plc.	mining site	no
Barcs I. - hydrocarbon	petroleum hydrocarbons natural gas	MOL Hungarian Oil and Gas Plc.	mining site	no
Istvándi II - hydrocarbons	petroleum hydrocarbon natural gas coal natural gas (II)	Hungarian Horizont Energia Trade and Service Ltd.	mining site	no

The planned track variations affect the area of the Darány I hydrocarbon deposit. As the extraction of the raw material takes place at great depth, it will not be affected by the planned investment.

5.1.3. Groundwater conditions

Typical groundwater level

According to the mapping database of the Hungarian Mining and Geological Service, the water table is typically at a depth of 2-5 m or 5-10 m.



5.1.2: Depth of groundwater table below the surface along the track variations *(source: https://map.mbfsz.gov.hu/tvz/)*

Based on the **Soil Investigation Report and Geotechnical Design Report** prepared by Terraexpert Ltd. in June 2022, the following conclusions can be made regarding groundwater:

In the planning sections, the water table was observed at depths of 2-5 m up to the vicinity of the mile post 94+000. Thereafter, the water table dropped to a depth of less than 5 m everywhere, and in some places to less than 10 m in the section up to the mile post 97+550.
The groundwater will again be near-surface (5 m or within 5 m) after mile post ~97+600 for both track variants.

Sensitivity assessment of the site

According to the Annex of the Decree No. 27/2004 (XII. 25.) of the Ministry of Environmental Protection and Water Management on the classification of settlements in areas with sensitive groundwater status, Barcs, where the planning area is located, is classified as a sensitive groundwater quality zone.

Of the groundwater body types, shallow porous water bodies are the most likely to be affected by the proposed project. The quantitative and chemical status of these water bodies is also good.

Water resources

According to Annex 2.1 of the revised 2021 Watershed Management Plan of Hungary, the studied variants do not affect drinking water abstraction protection areas.

Nitrate sensitive areas

The entire area affected by the project is classified as nitrate sensitive. The areas classified as nitrate sensitive are defined in Government Decree No. 27/2006 (7.II.).

5.1.4. Impact of construction

The project will inevitably lead to a reduction in the quality and surface area of the soil, and the area occupied by the road and its associated facilities will be part of the infrastructure.

The impact of the installation will be on the roadway and its associated facilities (e.g. structures, intersections, rest areas, etc.), the areas used for staging and depot areas, and the areas used for material collection points, where the original function of the land will be changed and its natural state will be lost.

The total length of track variant 3 is 8605 m, and the total length of variant 7 is 8671 m. The planned road is a 2x2 lane design with a planned crown width of 20 m.

A complex rest area will be created around mile post 93+100 of the M60 expressway. The number of parking spaces is defined as follows (per site):

- 46 parking spaces for cars,
- 4 accessible places,
- 5 spaces for the remote e-charging station,
- 25 spaces for lorries,
- 3 seats for buses.

In both of the proposed alternatives, the construction of the Drava bridge will also be an intervention. This will certainly require a temporary excavation road alongside the bridge in the floodplain, connecting to the road network.

The staging and landfill areas will increase the extent of land occupation, but these areas will be temporarily occupied and can be restored by recultivation after construction is completed.

Although agricultural land is affected, the negative impact of the land occupation is mitigated by the fact that arable land with excellent soil quality is not affected. Forest areas are also affected to a small extent.

The permanent or temporary withdrawal from cultivation of the land used by the project, staging areas and landfill sites must be authorised by the competent territorial land office.

The top humus layer at these sites should be extracted according to the humus management plan and then stored in temporary landfills for use during construction.

During the construction, the heavy machinery will compact the soil. Once construction is complete, the soil will be recultivated (by soil loosening) and then planted with native plants (including grass) to create the final condition.

From the point of view of soil protection, the replacement of overhead lines, underground cables and gas pipelines involves additional land occupation and excavation. As a result of the transmission line relocation, transport and pipeline pulling activities will be carried out along the sections of the affected route, and heavy machinery will be expected to pass alongside the pylon sites to be constructed.

In the event of a disaster on the planned route and transport routes, the adverse effects of pollution may extend beyond the immediate impact area. An appropriate emergency plan should be available to the contractor and, during operation, to the operator.

5.1.5. Impacts of the operation and management of the facility

The negative impacts of operation may be due to the possible release of pollutants from vehicles into the environment, e.g. oil derivatives, air pollutants settling out to the ground, leaching into groundwater, salt solutions leaching during winter de-icing of the pavement, or extra loads from

accidents. The magnitude of the pollution during operation may be significant mainly in relation to possible accidents involving accidents of fuel trucks, lorries.

The status of groundwater and surface water during both the construction and operation periods is primarily determined by the way and efficiency of the drainage of the new road section.

Surface water and groundwater pollution may be more significant if an accident occurs. However, a good road design should reduce these events.

The expected contaminants CH derivatives and heavy metals are leaching to the soil to a small extent, but literature and research suggest that contaminants are bound in the top 30 cm of soil , and that contaminants washed into the trench by precipitation are deposited as a thin layer of silt bound to soil particles. Infiltrating pollutants are broken down by a biofilm in the root zone of the vegetation.

A study on expressways in 2008 found that chloride accumulation was not even present in samples along expressways. Appropriate dewatering solutions should ensure that as little salt as possible can accumulate in stagnant water conditions and that run-off water is safely discharged.

The magnitude of pollution during operation can be significant mainly in relation to accidents involving trucks.

In the event of an incident on the planned road section and transport routes, the adverse effects of pollution may extend beyond the immediate impact area. Indirect contamination of soils may occur via water (e.g. groundwater contaminated by accidental groundwater or contaminated surface water), the impact area is difficult to estimate.

5.1.6. Effects of abandoning a facility

The planned investment is not likely to be abandoned. If abandonment were to occur, the impacts would be the same as those expected during construction, and the entire site would have to be recultivated once demolition is complete.

5.1.7. Extraordinary events

The prevention of emergencies is ensured by the observance of technological discipline and the use of machinery in good working order. Regular technical inspection of machinery is compulsory.

In the event of pollution, the foreman must be informed immediately. The spilled pollutants must be collected together with the saturated medium (soil) in a closed container and treated in accordance with the provisions of Government Decree No. 225/2015 (VII. 7.). The foreman shall supervise the collection of the pollutant, contaminated soil as completely as possible and the cleaning of the contaminated surfaces. The foreman shall document any incident involving a spill of half a litre or more of hazardous material.

In the event of an unexpected breakdown of machinery and material handling vehicles, oily leachate (e.g. sand, soil) resulting from the collection of spilled oil must be treated as hazardous waste and handed over to an undertaking authorised to receive such waste.

During construction, the contractor shall provide oil absorbent, an oil waste collection device and a storage container at the work site.

In the event of a potential accident, the competent local authority for the environment and nature conservation must be informed.

During operation, a road accident involving vehicles carrying dangerous goods may result in dangerous goods being placed on the road surface or in the road environment. The transport of dangerous goods is governed by international conventions, which also lay down the steps to be taken in such cases (European Agreement concerning the International Carriage of Dangerous

Goods by Road, ADR (Accord for Dangerous Goods by Roads, hereinafter referred to as ADR). Its application for inland transport is declared in Decree No. 61/2013 (X.17.) of the Ministry of National Development.

5.1.8. Proposed protection measures

The temporary and permanent use of soil for other purposes is subject to authorisation. For the permanent and temporary set-aside of agricultural land occupied by the road, as well as for the permanent and temporary set-aside of access roads, storage and storage areas, the use of agricultural land for other purposes is subject to authorisation by the real estate authority. Such authorisation must be obtained in advance, before the use of the soil (other use) is commenced.

The humus depots should be kept free of weeds until they are used. Weed growth on the surface of temporary depots should be prevented until they are replanted in the short term. Weed infestation shall be controlled by mowing in the pre-sowing stage.

After completion of the works, the recultivation of the land temporarily used by the temporary staging areas, containers, mobile mixing plant, etc., must be carried out.

During construction, only machinery and transport equipment in perfect condition may be used to avoid pollution and regular technical inspections are mandatory. During the construction work, the release of pollutants into the environment can be prevented by observing technological discipline.
Only mineral raw materials (stone, gravel, sand, clay, or any mixture of these in any proportion) extracted under a valid and legally binding official permit may be used in the construction. The choice of material extraction sites has been made closer to the construction sites in order to reduce transport distances.

Road construction causes soil compaction, the extent of which can be minimised by reducing the extent of the work area, avoiding wider tamping than necessary, and minimising the time spent by machinery and work organisation. Once construction is completed, the soil should be recultivated by soil loosening, followed by planting of appropriate native plants typical of the landscape and grassing with appropriate species.

In order to protect groundwater resources, the contractor and, during operation, the operator must have an appropriate contingency plan in place. The plan shall include how the spreading or leakage of pollutants from the pavement or contaminated area, or from the contaminated area, to the ground will be prevented or minimised in the event of an accident.

In the event of a possible accident, immediate action must be taken to prevent the spread of contamination. Spilled contaminants must be collected in a closed container together with the contaminated medium (soil) and treated in accordance with the provisions of Government Decree No. 225/2015 (VII. 7.). During construction, the contractor must provide oil absorbent, a means for collecting oily waste and a storage container at the work site.

In the event of a possible accident, the South Transdanubian Water Directorate (DDVIZIG) must be informed immediately so that it can take the appropriate measures.

5.2. SURFACE WATER PROTECTION

5.2.1. Area of influence

The delimitation of the scope is presented in chapter 5.1.

5.2.2. Hydrographic features

Hydrographic characteristics of the planning area

The planned track variations cross the following watercourses:

Table 5.2.1 Watercourses crossed by tracks

Tested track variation	*Crossed watercourse*
track No. 3	Drava
	Zimóna Eastern branch
track No. 7	Dráva
	Zimóna Stream
	Zimóna Eastern branch

According to Annex 2 of Decree No. 28/2004 (XII. 25.) of the Ministry of Water Management, the watercourses in the area belong to category 4 (general), i.e. the limit value for the discharge of precipitation water is 10 mg/l for fat and oil content.

Track No. 3 crosses the Dráva at 151.448 river km, where:
- MÁSZ (gauge flood level): 103.89 m above Baltic Sea.
- minimum level of the lower edge of the bridge structure 108,24 m above Baltic Sea.

Track No. 7 crosses the Drava at 150.478 river km, where:
- MÁSZ (gauge flood level): 103.74 m above Baltic Sea.
- minimum level of the lower edge of the bridge structure 108,09 m above Baltic Sea.

Track No. 7 crosses the Zimóna stream with the planned ribbon road at mile post 97+610 at mile post 1+808.

According to the South Transdanubian Water Management Directorate (hereinafter: DDVIZIG), the 3rd track variant will affect irrigated areas in the vicinity of the existing wastewater treatment plant and pig farm. The provision of irrigation for the affected areas will have to be planned in further design phases.

Flood and inland water protection

According to the Somogy County Spatial Plan, all track variants affect the zone of the large water body.

According to the Annex of the Joint Decree No. 18/2003 (XII. 9.) of the Ministry of Transport, Building and Urban Affairs on the classification of municipalities according to flood and inland water hazard, the municipality of Barcs belongs to the "A" highly vulnerable category. "A municipality is classified in category A if it has residential property on the flood plain or if it is subject to free flooding from the floodwaters of rivers and other watercourses without protection.

The studied track variations are not at risk of flooding based on the 30-year (3.3%), 100-year (1%) and 1,000-year (0.1%) probability potential flooding maps (source: www.vizugy.hu/Árvízi risk-management).

Description of the planned drainage

Stormwater run-off from the road surface either flows in sheets along the embankment and gullies or, in the case of greater lengths and embankment heights, collects along drainage verges and flows through gullies into the drainage system alongside the road. Receivers are the eastern branch of the Zimóna stream, the main branch of the Zimóna stream and the Dráva river.

In the design section, the track variations will be both in embankments and notches. Stormwater runoff will be diverted by ditches and, where necessary, incision channels will be created. Depending on the length, the trapezoidal ditches will be paved.

To protect receptors, it is proposed to build a sediment trap at the point of discharge. The end of the sediment trap, before the discharge, should be equipped with a reed barrier to provide a barrier in case of an emergency.

5.2.3. Impact of construction

The impacts on surface water status during both construction and operation will be determined primarily by the way and efficiency of drainage of the new link road.

The deposition and wash-off of air pollutants on pavements depends on weather conditions, rainfall intensity and traffic volume. The concentration of air pollutants precipitated diffusely by traffic is diluted in roadside areas and therefore does not have a significant effect.

Track No. 7 variant crosses the Zimóna stream160 at mile post 97+, over which a bridge will be built.

Track No. 3 crosses the Drava at 151.448 river km and track 7 at 150.478 river km. In both cases a bridge structure is required.

In order to protect the surface water in the vicinity of the project, increased attention must be paid to pollution prevention standards. During construction, adverse impacts may result from the maintenance and repair of machinery in the vicinity of watercourses, and such activities should not be carried out in the vicinity of watercourse crossings.

Before the concentrated discharge of the collected rainwater into the sewer, a sand/sediment separation structure is proposed.

Tracks on embankments or in cut-offs can alter or fragment river basins. No significant change in river bank condition or water movement is expected if the pipe culvert is of appropriate size.

The utility replacements resulting from the project are activities of limited duration, which may have impacts within the work area, in its immediate vicinity, and on the road network in the area and in the surrounding settlements due to transport. Activities related to the replacement of air and gas pipelines (construction) do not require the use of water. The laid gas pipeline shall be pressure tested prior to commissioning, for which water shall be taken from the mains drinking water supply or from the fire water supply. After the pressure test the used water shall be discharged to the public sewer. The water used shall be treated before discharge.

5.2.4. Impacts of the operation and management of the facility

On 30 November 2017, the M60 expressway from mile post 31+160 (area of Pécs) to mile post 95+613 (No.6623 municipal road and junction with main road 6) was granted an environmental permit under file number PE/KTF/4213-114/2017. The operational requirements for this section remain in force.

The impacts on surface water status during the operational period will be determined primarily by the way and efficiency of the new road section drainage.

The paved surfaces increase the area evaporation, but reduce the surface infiltration, so the balance remains in equilibrium. The installations will have no noticeable impact on the water balance.

The operation and traffic of the bypass will not have a significant impact on surface water quantity and quality parameters. During operation, pollution of surface watercourses may occur mainly indirectly. This may be mediated to watercourses by groundwater, metal from wear and

tear of vehicle parts, rubber and drip fuels, other oils and coolants, dust from road surface dusting and de-icing material splashed on the road surface. The adverse effects of salting are short-lived and minor.

Direct pollution can affect watercourses in accidental incidents, which can be localised and eliminated primarily through damage control.

The drainage ditches are directly received by the intersecting watercourses. The provisions of Decree No 28/2004 (XII. 25.) of the Ministry of Environmental Protection and Water Management on the limit values for discharges of water pollutants and certain rules for their application must be complied with regarding the quality of water that may be discharged into watercourses.

Stormwater drainage

TPH contamination study, study

Based on the 2008 publication "TPH pollution of stormwater runoff from motorways and busy roads" by the Department of Water Utilities and Environmental Engineering of the Budapest University of Technology and Economics and the 2009 PhD thesis of Dr. Kálmán Buzás, we present the characteristics and the course of TPH pollution.

In water run-off from the pavement, a significant proportion of TPH is formed by the spillage of 28-carbon number motor oil and adheres to micron-sized particles of solid contaminants on the surface and to the road surface. The high flow rate and pressure drop sucks up and separates the oily contaminants adhering to the surface and lifts them into the air as a water spray. The extent of TPH contamination is determined by the rainfall depth and the current traffic volume at the time of the rainfall event. Wash-off oil does not emulsify with stormwater and can therefore only be removed with low efficiency by oil traps and oleophilic adsorbents. Studies have shown that a ditch system leading to the receptor has a TPH retention effect, i.e. it reduces the level of pollution. A properly sized and grassed ditch system has a retention effect of 60% and a paved ditch system 20%. If concentrations of the pollutant are still above the limit value after the reduction, clean-up is required.

The characteristic value expressing the TPH contamination of runoff should be considered to be the average concentration of the event, which is the product of the current runoff yield multiplied by the assigned pollutant concentration over the total rainfall runoff duration and the total runoff volume. On the basis of Decree No. 28/2004 (XII. 25.) on limit values for discharges of water pollutants and certain rules for their application, the specific limit values for direct discharge into the receiving water body are the following minimum and maximum values according to the TPH: 3 mg/l and 20 mg/l.

5.2.2Table 1: Expected evolution of mean event concentrations as a function of current traffic intensity on motorways and precipitation depth for paved drainage

J, 10^3 jármű	Csapadékmagasság H mm															
	1.5	2	3	4	5	6	7	8	9	10	15	20	25	30	40	50
	C_E, esemény átlagkoncentráció, mgTPH/l															
0.2	**0.79**	**0.76**														
0.3	**1.22**	**1.20**	**1.15**	**1.10**	**1.05**											
0.4	**1.66**	**1.63**	**1.58**	**1.53**	**1.48**	**1.43**	**1.38**	**1.33**	**1.28**							
0.5	**2.09**	**2.06**	**2.01**	**1.96**	**1.91**	**1.86**	**1.81**	**1.76**	**1.71**	**1.66**						
0.6	**2.52**	**2.50**	**2.45**	**2.40**	**2.34**	**2.29**	**2.24**	**2.19**	**2.14**	**2.09**	**1.84**					
0.7	**2.95**	**2.93**	**2.88**	**2.83**	**2.78**	**2.73**	**2.68**	**2.63**	**2.57**	**2.52**	**2.27**	**2.02**				
0.75	3.17	3.15	3.10	3.04	**2.99**	**2.94**	**2.89**	**2.84**	**2.79**	**2.74**	**2.49**	**2.23**	**1.98**			
0.8	3.39	3.36	3.31	3.26	3.21	3.16	3.11	3.06	**3.01**	**2.96**	**2.70**	**2.45**	**2.20**	**1.94**		
0.9	3.82	3.80	3.74	3.69	3.64	3.59	3.54	3.49	3.44	3.39	3.14	**2.88**	**2.63**	**2.38**		
1.0	4.25	4.23	4.18	4.13	4.08	4.03	3.98	3.92	3.87	3.82	3.57	3.32	3.06	**2.81**	**2.30**	
1.2	5.12	5.09	5.04	4.99	4.94	4.89	4.84	4.79	4.74	4.69	4.44	4.18	3.93	3.68	3.17	**2.66**
1.4	5.99	5.96	5.91	5.86	5.81	5.76	5.71	5.66	5.61	5.56	5.30	5.05	4.79	4.54	4.03	3.53
1.6	6.85	6.83	6.78	6.73	6.67	6.62	6.57	6.52	6.47	6.42	6.17	5.91	5.66	5.41	4.90	4.39
1.8	7.72	7.69	7.64	7.59	7.54	7.49	7.44	7.39	7.34	7.29	7.03	6.78	6.53	6.27	5.77	5.26
2.0	8.58	8.56	8.51	8.46	8.41	8.36	8.31	8.25	8.20	8.15	7.90	7.65	7.39	7.14	6.63	6.13
2.2	9.45	9.42	9.37	9.32	9.27	9.22	9.17	9.12	9.07	9.02	8.77	8.51	8.26	8.01	7.50	6.99
2.4	**10.32**	**10.29**	**10.24**	**10.19**	**10.14**	**10.09**	**10.04**	9.99	9.94	9.89	9.63	9.38	9.12	8.87	8.36	7.86
2.6	**11.18**	**11.16**	**11.11**	**11.06**	**11.00**	**10.95**	**10.90**	**10.85**	**10.80**	**10.75**	**10.50**	**10.24**	9.99	9.74	9.23	8.72
2.8	**12.05**	**12.02**	**11.97**	**11.92**	**11.87**	**11.82**	**11.77**	**11.72**	**11.67**	**11.62**	**11.36**	**11.11**	**10.86**	**10.60**	**10.10**	9.59
3.0	**12.91**	**12.89**	**12.84**	**12.79**	**12.74**	**12.69**	**12.64**	**12.58**	**12.53**	**12.48**	**12.23**	**11.98**	**11.72**	**11.47**	**10.96**	**10.46**

The above table shows that up to a traffic intensity of 700 vehicles per hour, no action is justified as the pollutant concentration remains below the limit value.

In the study "TPH pollution of stormwater run-off from motorways and busy roads", in addition to the study of the test results, a calculation procedure was developed to determine the expected total aliphatic hydrocarbon pollution (average concentration) as a function of road traffic.

Correlation applied on the basis of the study, in the case of a covered trench:

CE = (4.33 * J - 0.0507 * H), (mgTPH/l), where

CE - average concentration of the TPH event,

J - the number of unit vehicles per hour of rainfall in thousands of unit vehicles (1000 unit vehicles per hour), and

H - height of the precipitation (mm).

The study suggests that the resulting value should be reduced by 60% for grassed ditches.

The reference precipitation height was taken to be 10 mm based on the recommended range of the study (1 ≤ H ≤ 50 mm). The resulting concentration value should be compared with the allowable limits and the intervention method determined.

The average traffic volume of the planned M60 expressway between the 6623 and the 91+000 sections is estimated at 455 vehicles per hour in 2036 based on traffic data. This is based on 228 vehicles per hour per direction.

For curved overpasses, the standard is 455 vehicles per hour:

CE = (4.33 * 0.455 - 0.0507 * 10) = **1.46 mg TPH/l**, which applies to the case of a covered trench. In the case of earthen ditches, this gives 0.88 mg TPH/l.

For a roof section track, the standard is 228 vehicles/hour:

CE = (4.33 * 0.228 - 0.0507 * 10) = **0.48 mg TPH/l**, which applies to the case of a covered trench. In the case of earthen trenches, this gives **0.289 mg TPH/l.**

The limit values for the pollution of direct discharges to the receiving water are specified in Annex 2 of Decree No 28/2004 (XII. 25.) of the Ministry of Environmental Protection and Water Management concerning emission standards of water pollutant substances and laying down rules of application. In the planning area there are mainly watercourses of the generally protected receptor category 4, where the permitted level of organic solvent extract is 10 mg/l.

The calculated values indicate that the estimated oil pollution does not exceed the permitted limit. On this basis, the construction of a sediment trap is sufficient for the discharge of stormwater to the interceptor. The end of the sediment trap, before the discharge, will require the construction of a sediment barrier rail. The sediment trap will protect the crossed watercourses from physical pollution and the rail will provide a barrier in case of an emergency.

It may be necessary to use a cleaning, oil-catching device as specified by the watercourse operator.

The implementation of the two-sided grassed ditches will not have a significant negative impact on groundwater or surface water, either directly or indirectly.

5.2.5. Effects of abandoning the facility

The planned investment is not likely to be abandoned. If abandonment were to occur, the impacts would be the same as those expected during construction.

5.2.6. Extraordinary events

Depending on the nature of the pollutant, it is primarily necessary to prepare for the quickest possible containment, collection and removal of solid and liquid pollutants from the road area. In the case of solid pollutants, this is a relatively easy task, because the spread of the pollutant can be well defined, while liquid pollutants can more easily reach the receiving area. The measures must simultaneously eliminate the source of the contamination, the spreading of the contaminant, its approach to the receptor and its leakage. In the event of a potential accident, the competent local environmental and nature protection authority must be informed.

5.2.7. Proposed protection measures

In order to avoid extraordinary, unexpected pollution and contamination, the compliance with the technological standards and the technical condition of the equipment must be monitored closely and continuously.

During the construction period, urban waste water generated at the construction sites shall be collected in closed tanks and disposed of in a sewage treatment plant with pre-treatment.

The limit values for the pollution of direct discharges into the receiving waters are laid down in Annex 2 of Decree No 28/2004 (XII.25.) of the Ministry of Environment Protection and Water Management. In the planning area there is a watercourse of the category of generally protected receptor 4, where the permitted level of organic solvent extract is 10 mg/l.

The water from the planned road trenches must be discharged into a living watercourse - River Drava, Zimóna stream - through a prefabricated sludge-oil interceptor, if required by the competent authority, in order to protect natural waters from pollution. Their size will depend on the water flow.

For the implementation of stormwater drainage, an application for a water right establishment permit must be submitted to the Department of Disaster Management Authority of the Baranya County Directorate of the Deputy Director General of the Disaster Management Authority, together with the permit documentation pursuant to the amendment of Decree No. 18/1996 (VI.

13.) of the Ministry of Environmental Protection and Water Management, on the application and annexes required for the water right permit procedure.

5.3. AIR-PURITY-PROTECTION

5.3.1. Area of influence

Direct area of influence - methodology

Direct area of construction

During construction, the air pollution impact area was calculated from the magnitude of the surface dust load from rough earthworks and the emissions of pollutants from construction machinery, based on the laws of propagation.

In the present circumstances, the boundary delimitation according to Article 2.12c. a), b) and c) of Government Decree No. 306/2010 (XII. 23.) during the construction:

(a) greater than 10% of the one-hour (24-hour for PM_{10}) air pollution limit value,
b) greater than 20% of the load capacity, or
c) greater than 80% of the one-hour (24-hour in the case of PM_{10}) maximum value

For the purposes of this document, the immediate scope of the construction period has been defined as condition (a).

Direct area of operation

During operation, the air pollution impact area was calculated on the basis of the traffic emissions and dispersion laws of the proposed road and rest area (see Overview Site Plan at the end of this document).

In the present circumstances, the boundary delimitation according to Article 2.14. a), b) and c) of Government Decree No. 306/2010 (XII.23.) is the boundary delimitation for the planned bypass:

a) is greater than 10% of the one-hour (24-hour for PM_{10}) air pollution limit value,
b) greater than 20% of the load capacity, or
c) greater than 80% of the one-hour (24-hour in the case of PM_{10}) maximum value

Exposure: the difference between the air pollution limit value and the background air pollution.

Direct area of influence - calculation

Direct area of construction

The direct impact area for particulate matter (PM_{10}) under average meteorological conditions is as follows:

- Road construction: 115 m
- Surface parking, rest area: 13 m

The areas directly affected:

- inland: residential, commercial and service buildings, roads and other vegetated areas are located within the immediate area of influence.
- in the countryside: residential buildings, farms, agricultural land, roads and woodland within the immediate area of influence.

Direct area of operation

The direct impact area during operation was calculated for the sections of the planned road.

a): greater than 10% of the hourly air pollution limit value (NO_2 : 10 g/m). μ^3

b): the hourly air pollution limit value for nitrogen dioxide is 100 g/mμ^3 according to Decree No. 4/2011 (14.I.VM); the load factor is based on the baseline air pollution of the planning area (17.7 g/m)μ^3 , thus 82.3 g/mμ^3 . 20% of this is 16.46 g/mμ^3 .

c): the calculated maximum value for NO_2 is 68.2 g/mμ^3 , of which 80% is 54.5 g/mμ^3 .

The scope of the road construction was defined according to condition (a), as this gives the largest scope. The area of influence is illustrated in the Site Plan. The immediate area of influence is met within 106 m.

- inland: residential, commercial and service buildings, roads and other vegetated areas are located within the immediate area of influence.
- in the countryside: residential buildings, farms, agricultural land, roads and woodland within the immediate area of influence.

Indirect coverage - methodology

Indirect area of influence of construction

During construction, the indirect impact area may include paved sections of transport routes where traffic changes of more than 20% are expected, unpaved roads, and the vicinity of depots, material receiving areas and factory areas.

Indirect area of operation

In the absence of a legal requirement, roads and intersections where the planned installation will cause a traffic change of more than 20% are considered to be indirectly affected from an air quality protection point of view. In the case of a physical investment, a change of around 20% may result in a detectable change in air pollution, and therefore, in the absence of legal provisions, this delimitation characteristic can be used to objectively define the so-called indirect air protection impact area for the associated road networks.

Indirect coverage - calculation

Indirect area of influence of construction

At this stage of the planning process, the locations of the material extraction sites are not yet known. In the vast majority of cases, transport will be on the route of the roadway under construction No. 6623 municipal road, main road No. 6.

The roads listed above are paved and their current traffic volume does not change by more than 20% due to transport and are therefore not part of the indirect impact area. The unpaved section of the new roadway that can be used by trucks as a transport route is considered to be an indirect impact area.

Indirect area of operation

Taking into account the criteria described above, the following road sections can be considered as indirect impact areas for this project:

a drop in turnover of more than 20%:

- Main road No. 6 (up to the intersection of axis 7)
- Main road No. 6 from the roundabout to the outer sections

Increase in turnover of more than 20%:

- (Bajcsy) Darányi Street (Roundabout-roundabout) section

It is important to note that in the long term, the hourly (CO and NO_2) and 24-hourly (PM_{10}) health limit values for all the components under consideration are expected to be met at a reference distance of 10 m, so that concentrations below the limit values are also expected at the

average distance (10-20 m) from the buildings to be protected.

5.3.2. Test method

Two time horizons were considered, the current one (2022) and the long term reference horizon (2037).

The air immission calculations were based on road traffic data provided by the Client.

The determination of emissions for line sources was carried out according to the standard MSZ 21459.

Emissions were determined for each road section and condition using traffic data and specific emission values for each condition (HBEFA[1]) for the following pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2) and particulate matter (PM_{10}).

To perform the model calculations, air immission calculations were performed using the AERMOD View 10.0.1 software developed by Lakes Environmental, using current 2022 and future (2037) emission results.

The current air quality status in 2022 and the future (2037) air quality status under average meteorological conditions and considering a standard hourly flow (MOF) were considered.

5.3.3. Air quality protection assessment of the current situation

Baseline air pollution level - based on OLM monitoring station data

The basic tasks and powers related to air quality protection are regulated by Government Decree No. 306/2010 (XII.23.). According to this, air pollution in the country must be regularly monitored and assessed by the National Air Pollution Monitoring Network (OLM).

The air quality values of the area were determined on the basis of the data of the nearest measuring station - the automatic measuring station located at Apáczai Csere János körtér in Pécs - as part of the National Air Pollution Monitoring Network. The station in Pécs is located ~55 km from the planning area and measures air pollution from an urban background.

The station has not exceeded the annual limit values for any of the components tested over the last 5 years, so the air quality in the study area is considered good.

Current road network

For the road sections in the vicinity of the planning area, at the average distance of the nearest buildings to be protected (10-20 m), the calculations show that the hourly (CO and NO_2) and 24-hourly (PM_{10}) health limit values are already met at this distance.

5.3.4. Air pollution during construction

In all cases, air pollution from construction is temporary and the impact on a section is relatively short-lived. This additional burden is mainly due to the rough excavation work and the exhaust fumes from construction machinery. The air pollution levels of particulate matter (PM_{10}) expected during the construction phase of the coarse excavation works were carried out using AERMOD View 10.0.1 software for average meteorological conditions. Based on the model calculations, the average distance for meeting the 24-hour health limit value for particulate matter (PM_{10}) (50 $\mu g/m^3$) is 172 m for road construction and 170-230 m for surface parking/rest area construction.

[1] Handbook Emission Factors for Road Transport: Emission Factors from the Model PHEM for the HBEFA Version 4.1, Graz University of Technology - Institute for Internal Combustion Engines and Thermodynamics. 1 November 2019

As regards the construction phase, it can be concluded that under average meteorological conditions, during the construction of the road, the construction of the interchange and the construction of the surface parking/rest area, the 24-hour health limit value for particulate matter (PM_{10}) at the nearest residential buildings is not expected to be exceeded during the period of the rough earthworks. The 24-hour health limit value is met with a high degree of certainty even with background exposure.

The excavation activities of the proposed utility replacement project have a lower dust load than the excavation activities considered in the documentation and therefore do not require a separate assessment from an air quality perspective. If the work organisation processes allow, the utility replacement will be carried out simultaneously with the excavation processes, so that no additional dust loads will be generated.

5.3.5. Air pollution during operation (management)

We evaluated the expected long-range loads within 50 m of the section of Planned track No. 3 and No. 7 (No. 6623 municipal road - end of planned section). The long-range exposure was calculated by adding the OLM automatic measuring station values and the expected long-range air exposure from traffic at a distance of 50 m. Distance exposure was compared with hourly (CO and NO_2) and 24-hourly (particulate matter PM_{10}) health limit values. The calculations show that the hourly and 24-hourly health limit values are expected to be met with a high degree of certainty for all three components under consideration: 42.4% of the limit value for NO_2 , 4.76% for CO and 36.8% for PM . $_{10}$

It is important to note, however, that at the distance of the nearest residential building (172 m), more favourable concentration values are expected than those calculated.

Related road network

The following conclusion can be drawn for the linked road section compared to the reference condition in the long term:

- no forecasted traffic and immission changes at the Bajcsy-Zs.-68 intersection (roundabout) and at No. 6623 municipal road,
- Traffic and immissions are expected to increase by 42% on the (Bajcsy) Darányi Street (Roundabout-roundabout) section,
- A 37-50% reduction in traffic and immissions is expected on the sections of Highway 6 (up to the Axis 7 intersection) and Highway 6 from the roundabout to the outer sections

Even with the increase in traffic, the health limit values are still met for all three components. The nearest buildings are located 10-20 m from the road axis, at which distance the hourly (CO and NO_2) and 24-hourly (PM_{10}) health limit values are expected to be met.

Overall, it can be concluded that the proposed development does not pose a conflict in terms of air protection.

5.3.6. Proposed protection measures

- Transport activity is not recommended on low-traffic streets.
- During construction works, the rate of spraying can be significantly reduced by increasing the moisture content, i.e. by continuous sprinkler irrigation.
- The materials used in the execution of the works shall be transported in closed containers or in temporary covered containers preventing pollinage and spillage, or by means of a

special-purpose vehicle or transport vehicle providing such conditions, in such a way as to avoid air pollution.
- Outdoor storage should be designed to minimise the release of air pollutants into the environment.
- Regular road maintenance is needed to minimise fugitive dust emissions from roads.
- In dry weather, dusting and cleaning of transport routes by watering is necessary.
- The technical condition of the transport fleet must be satisfactory, both in terms of engines and bodywork (dust-free). Regular checks are required.
- Material collection points should be chosen as close as possible to the track and transport routes should be chosen to avoid populated areas.
- Locate construction machinery and equipment as close as possible to the track, away from residential areas and avoid unnecessary movements on surrounding roads.
- In the constructed sections, grass the gullies as soon as possible and plant to reduce pollinage.

5.4. WILDLIFE: MAN AND SOCIETY

5.4.1. Social, economic impacts

In general, as with new roads, experience shows that optimal use is achieved within a few months of construction. Once built, the residential and commercial/economic areas surrounding the roadway also benefit from the new transport system and economic and commercial development is initiated.

The stakeholders are the residents living in the vicinity of the road to be built, the economic operators and the future users of the road to be built.

Impact of construction

The construction of road improvements is a temporary, transitory activity where the effects of construction:

- are in the delimitable immediate work area and its surroundings, or
- are caused by transport on the road network approaching the study area.

These impacts are mostly temporary in social and economic terms (given the temporary presence of contractors in certain areas) and are minor compared to the impacts caused by the operation of the road.

Impact of operation

In general, the greatest advantage of the planned road network development is that it will divert traffic from the current residential area to a road that is mostly away from residential areas.

Direct effects

The direct socio-economic impacts on the areas surrounding road development can be seen in the following factors:

- the construction of the new road will open up new areas, which will help to achieve spatial development objectives and promote the development of the areas concerned,
- a reduction in traffic in the town centre, thus reducing noise and pollution for the population concerned.

Indirect effects

In the field of indirect social impacts, the experts consider the following impacts to be important, based on foreign and domestic experience. These impacts are secondary in the sense that they

are partly inherent in the direct impacts listed above and the social responses to them, and partly interrelated:

- the infrastructural situation of municipalities is improving,
- the health of the population will be positively affected by the new road, through reduced traffic
    - reduce air pollutant emissions on inland roads, so that the number and severity of chronic and acute respiratory disease is expected to decrease,
    - reduce the noise exposure of the population, which has a positive impact on the quality of rest and reduces the daily stress on the nervous system,
- less inland traffic will make traffic safer and is expected to reduce the number of accidents,
- improve access to the surrounding agricultural and industrial areas, so the planned development could stimulate these sectors, which could lead to an improvement in employment and the financial situation of the population.

5.4.2. Health effects

The two most significant environmental impacts on humans - noise and air pollution - are related to changes in the health situation of the population living in the area, if the road development project is implemented. The construction of the M60 road will relieve several neighbourhoods of Barcs of significant through traffic, so that noise and pollution levels in these areas will be lower than at present, and therefore positive impacts can be expected in these areas.

We do not expect any negative impact on the health of the population living in the vicinity of the intervention, provided that the recommendations and measures are followed.

Expected changes if the road development is built

The air protection chapter gives a detailed and quantified description of the air pollution during the construction and operation phases.

In all cases, air pollution from construction is temporary and the impact on a section is relatively short-lived. This additional load is mainly due to transport traffic, exhaust fumes from construction equipment and rough earthworks.

Dust loads from construction equipment and transport vehicles are negligible compared to earthworks, accounting for less than 10% of the total additional dust load during construction. The temporary exceedance may be due to dust deposited along the transport routes, which can be significantly reduced by compliance with the proposed protection measures.

The protection measures proposed during construction and operation must be complied with and the best available techniques (BAT) must be used. Construction machinery and transport vehicles must comply with the air protection requirements laid down in the legislation in force.

From a noise protection point of view, it can be concluded that the noise exposure of the buildings to be protected in the direct and indirect zones of the project does not exceed the relevant limit values during operation, either during the day or at night. No noise protection measures are required during operation or construction and the noise impact of the activity is acceptable.

5.5. WILDLIFE CONSERVATION

5.5.1. Area of influence

The immediate wildlife protection zone of the newly constructed M60 expressway is defined as 100-100 m from the axis. It is within this distance that traffic noise is the most significant environmental emission directly disturbing wildlife.

The indirect impact area is the distance from the track line within which the impact of the visual appearance of vehicles or structures is perceived by wildlife. This distance depends on the topography, the vegetation condition (smaller in the case of a section bordered by forest strips or tree-lines, larger in open areas) and whether the track is at 'ground level' or elevated on an embankment. Averaging the aforementioned circumstances, the indirect habitat protection reach can be defined as 250 m from the track.

5.5.2. Baseline, survey results

Landscape: Transdanubian hills

Middle: Inner-Somogy

Microregion: 4.3.14. Central Drava Valley

The small area in which the study track is located is presented in the light of the information available at www.novenyzetiterkep.hu, where the vegetation of the geographical small areas is described in a concise but clear manner.

Central Drava Valley, 4.3.14.

"Most of the small area is suitable for forests. Unique in Hungary, it is home to Illyrian beech and Illyrian-oak hornbeam forests. Unique species in the vicinity of Zákány and Őrtilos are the Balm-leaved Red Deadnette (*Lamium orvala*), the dentaria trifolia (*Dentaria trifolia*) and the Three-Leaved *anemone* (*Anemone trifolia*), but other mountain rarities such as the Austrian Leopard's bane (*Doronicum austriacum*) and the great masterwort (*Astrantia major*) are also found. More common and typical species are the May lily (*Maianthemum bifolium*), the herb Paris (*Paris quadrifolia*), the Martagon lily (*Lilium martagon*). In a beech wood near Bélavár, the oriental Leopard's bane (*Doronicum orientale*) grows. Scilla vindobonensis and scilla drunensis (*Scilla vindobonensis*, *S. drunensis*), wood *anemone* (*Anemone nemorosa*), spring snowflake (*Leucojum vernum*), twayblade orchid (*Listera ovata*), thin-spiked wood sedge (*Carex strigosa*) are mainly found in hardwood forests. Rough horsetail (*Equisetum hyemale*) is sometimes abundant in summer meadows, and Loddon lilies (*Leucojum aestivum*) in grasslands. In woodland margins, milk- parsley (*Peucedanum verticillare*) is characteristic. In marshy and blue-pear meadows and stubble sedges, which have been created by the clearing of hardwood forests, fibrous tussock-sedge (*Carex appropinquata*), checkered lily (*Fritillaria meleagris*), Siberian iris (*Iris sibirica*), adder's-tongue (*Ophioglossum vulgatum*) and false herreborine (*Veratrum album*) also grow. In some places, there is a mass of tubular water-dropwort (*Oenanthe fistulosa*). *Cardaminetum amarae* grows in several places at the bottom of the springs on the high banks, and watercress (*Nasturtium officinale*) stands in the ditches draining their waters. The backwaters are rich in seaweed. There is a high prevalence of tall sedges, dominated in places by bottlesedge (*Carex rostrata*) and greater tussock (*Carex paniculata*), and stands of cyperus sedge (*Carex pseudocyperus) are* associated with great speerworth (*Ranunculus lingua*). Marsh fern (*Thelypteris palustris*) is abundant in some marsh sedges. Narrow buckler fern (*Dryopteris carthusiana*), water violety (*Hottonia palustris*) and greater tussock-sedge (*Carex paniculata*) also grow in bogs. The dwarf cattail vegetation includes *cyperus michelianus* (*Cyperus michelianus*), *isolepis setacea (Isolepis setacea*), and schoenoplectus supinus (*Schoenoplectus supinus*). On the reefs of the Dráva, a shrubby-scrubby stand of *purple willow* (*Salix purpurea)* develops, accompanied by coastal willow (*Salix elaeagnos*) and myricaria germanica (*Myricaria germanica*).

Number of species: 900-1000; number of protected species: 80-100; common species: acacia (*Robinia pseudoacacia*), goldenrod (*Solidago spp.*)."

Protected natural values and sites affected

The figure below shows the impact on Natura 2000, ecological network and ex lege protected natural values. None of these are affected by the northern common section of the two track alternatives under consideration, so below the overview map we present a map highlighting the southern parts, where the individual impacts can be seen better. The extent of the Danube-Drava National Park is the same as the extent and boundaries of the Natura 2000 SCI.

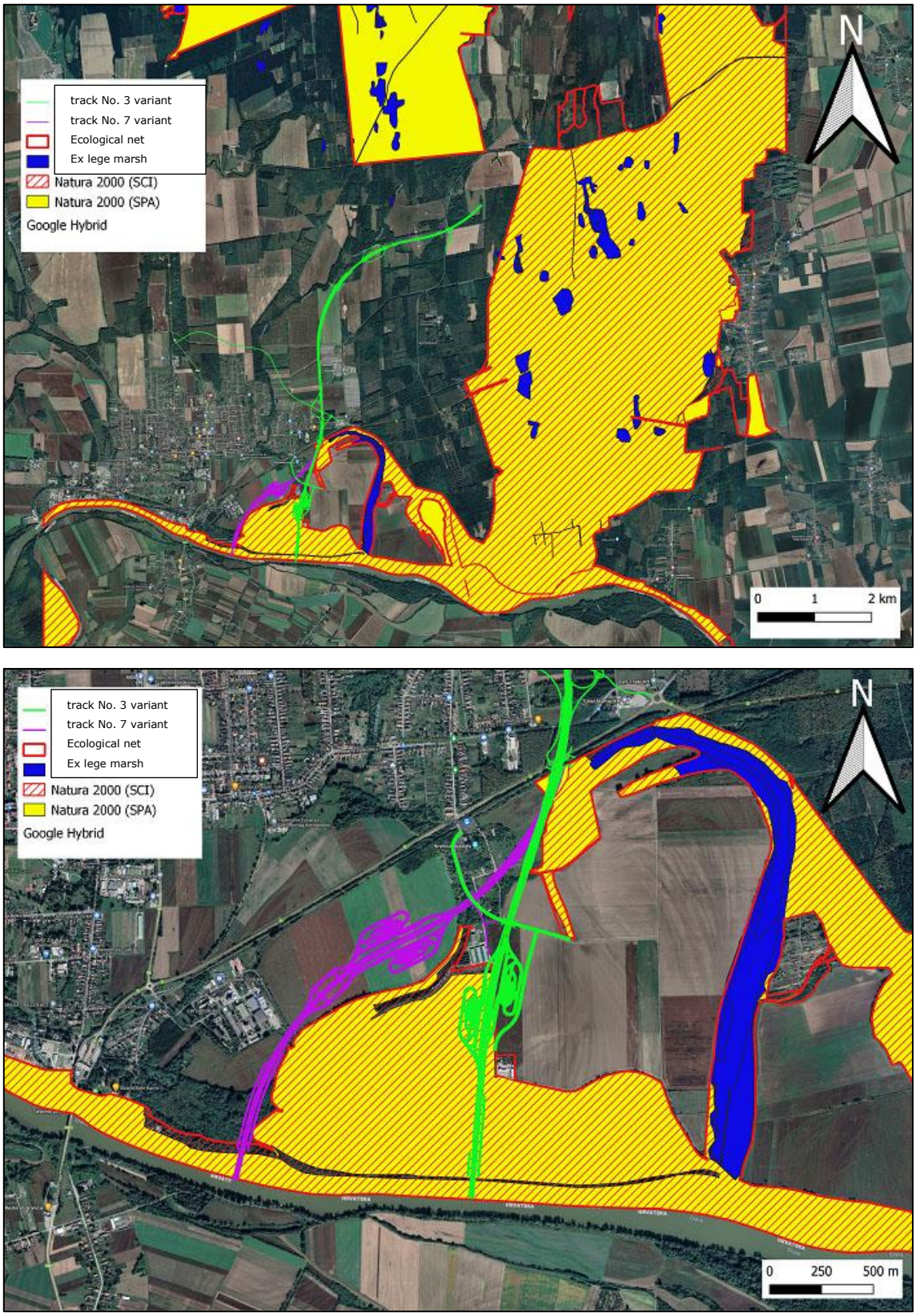


Figure 5.5.1: Affected Natura 2000, ecological network and ex lege protected areas

The track variants affect the core area of the Danube-Drava National Park, the HUDD10002 West-Drava KMT (Special area of Conservation), the HUDD20056 Central-Drava KJTT (Priority Conservation Area), the core area of the National Ecological Network, the buffer area and the transition zone of the Mura-Drava-Danube UNESCO Biosphere Reserve (MAB). The 13,650 m^2 (30 m x 455 m) of temporary land reservation (i.e. significant use and conversion of land) required for the construction of the bridge has been planned for the eastern section of the Track No. 3, entirely within the territory of the Danube-Drava National Park and Natura 2000 area.

A protected natural area of national importance is directly affected by the section of the development. The common track will cross the national park trunk area for about 160 m between mile posts 96+800-97+000 at the southern boundary of the road bypassing Barcs from the south. The western track variant 7 runs for 175 m within the national territory of the Danube-Drava NP, while the eastern track variant 3 runs for 1,060 m within the habitats of the core area of the Danube-Drava NP (see Figure 5.5.1), and the 13,650 m^2 (30 m x 455 m) of temporary land reservation required for the construction of the bridge is also planned within the core area of the national park.

Ex lege protected natural values are located in the vicinity of the development site. There is no direct impact, the nearest marsh, Nagybók, is approached by the common track at a distance of 130 m at mile post 96+800.

Protected natural areas of local importance within 100 m of the proposed route:

- Belcsapuszta: protected since 2003, it covers 2 hectares and includes the ruined Kremsier Castle and the surrounding park. The proposed track 7 variant passes within 100 m between mile posts 97+400-97+500, with no direct impact.

The location of the habitats forming part of the **Ecological Network** in the vicinity of the surveyed track is shown in Figure 5.5.1. Most of the Natura 2000 sites are classified as core areas, but there are also several sites classified as ecological corridors and protection zones.

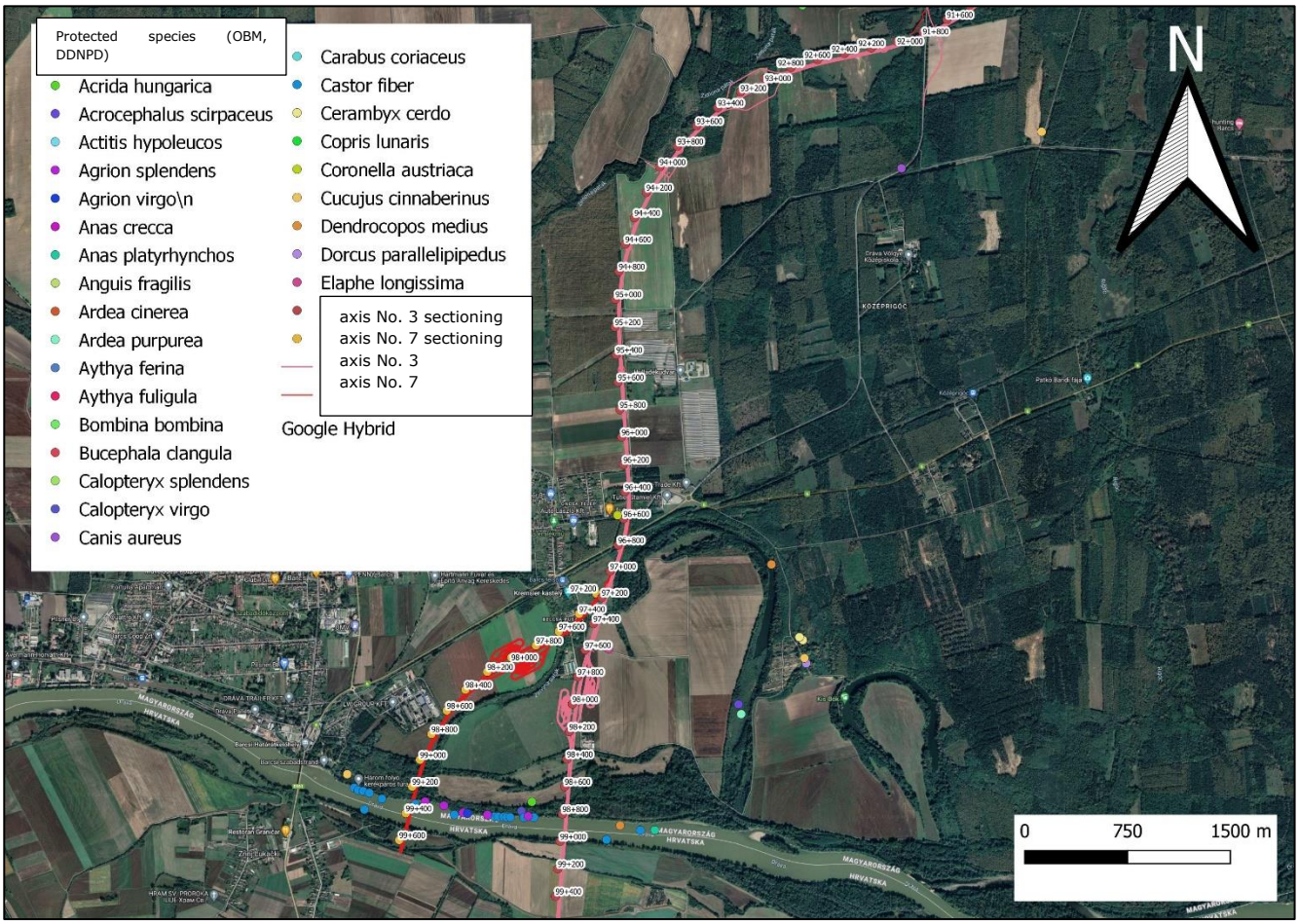
SSSIs, HNVs: the entire administrative territory of Barcs affected by the project is part of the zone of highly sensitive natural areas and is not part of the High Nature Value Areas (HNVs).

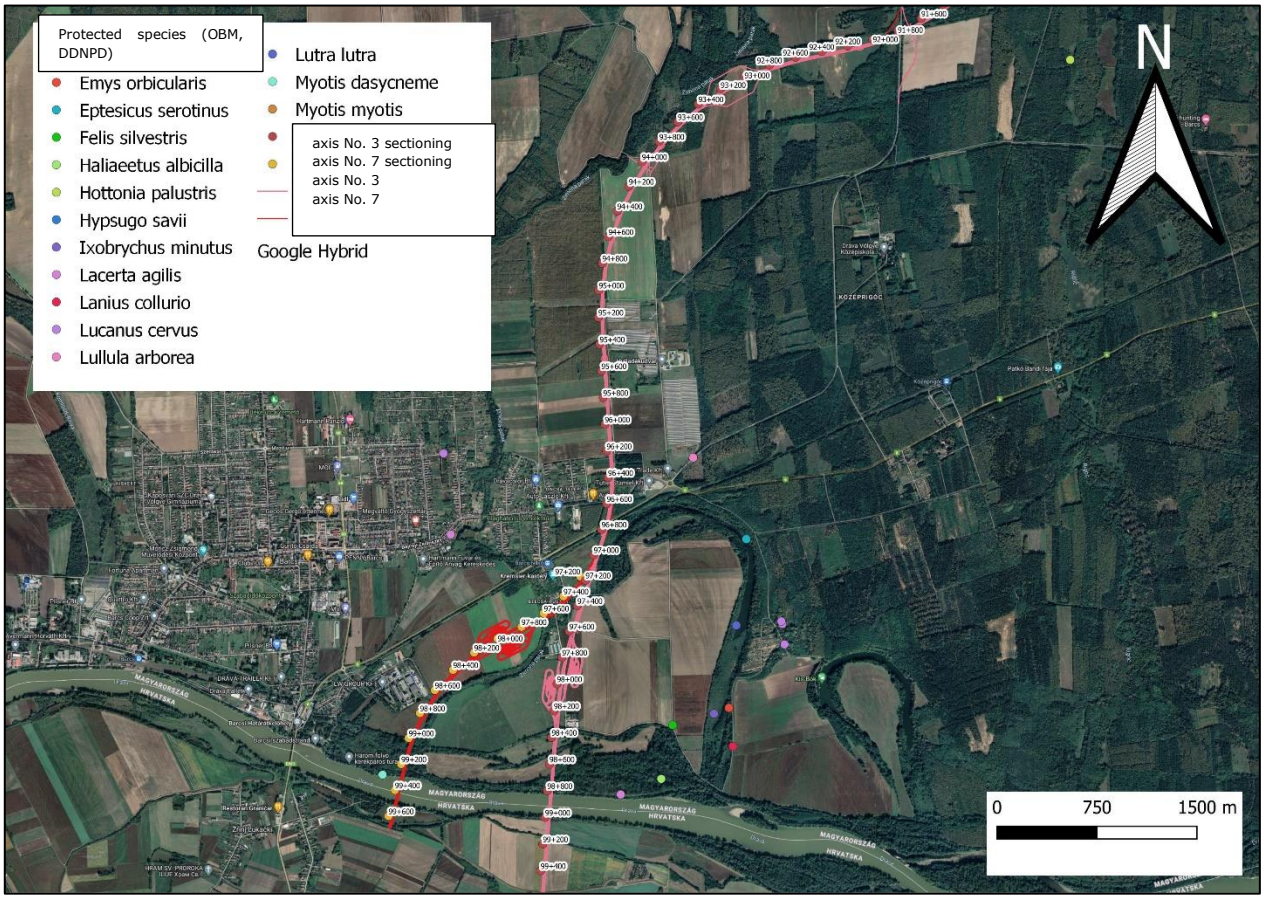
Nature park: the administrative territory of Barcs is not included in any nature park.

Description of the natural condition in the area affected by the plan or investment

The species lists below are a summary of the results of the full botanical surveys carried out in autumn 2021, spring 2022 and summer 2022, and the zoological data from a total of 10 field visits between October 2021 and October 2022. In addition, targeted surveys for bats, fish, dragonflies and butterflies were carried out during the optimum period for each species group in each year.

In 2022, the Danube-Drava National Park Directorate provided us with biotic data on the planned track alternatives and their surroundings, which are summarised in the figure below.


Protected species (OBM, DDNPD)
Acrida hungarica
Acrocephalus scirpaceus
Actitis hypoleucos
Agrion splendens
Agrion virgo\n
Anas crecca
Anas platyrhynchos
Anguis fragilis
Ardea cinerea
Ardea purpurea
Aythya ferina
Aythya fuligula
Bombina bombina
Bucephala clangula
Calopteryx splendens
Calopteryx virgo
Canis aureus
Carabus coriaceus
Castor fiber
Cerambyx cerdo
Copris lunaris
Coronella austriaca
Cucujus cinnaberinus
Dendrocopos medius
Dorcus parallelipipedus
Elaphe longissima
axis No. 3 sectioning
axis No. 7 sectioning
axis No. 3
axis No. 7
Google Hybrid
N
0
750
1500 m


Protected species (OBM, DDNPD)
Emys orbicularis
Eptesicus serotinus
Felis silvestris
Haliaeetus albicilla
Hottonia palustris
Hypsugo savii
Ixobrychus minutus
Lacerta agilis
Lanius collurio
Lucanus cervus
Lullula arborea
Lutra lutra
Myotis dasycneme
Myotis myotis
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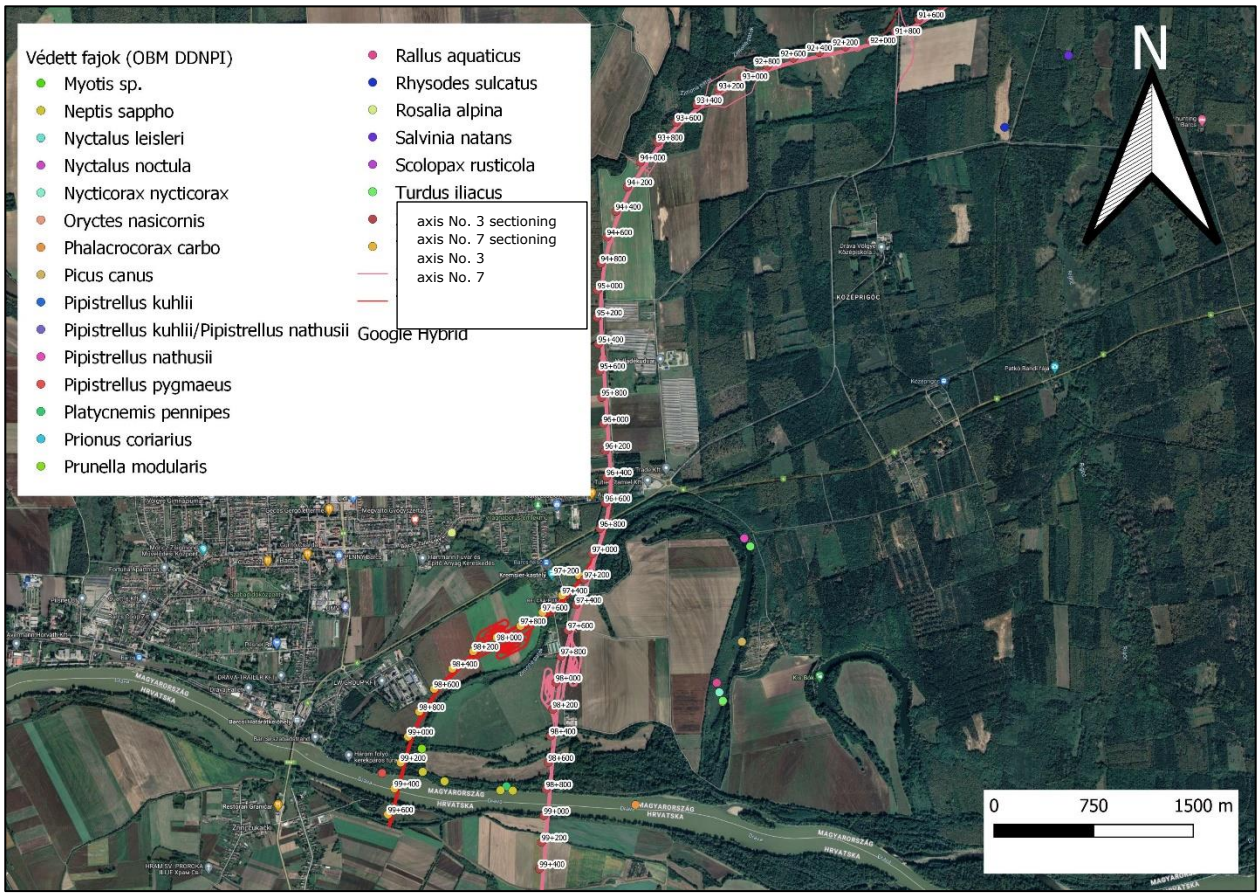


5.5.1: Biotic data from the Danube-Drava NPD

Botanical survey results (by Tamás Zsólyomi)

Protected species

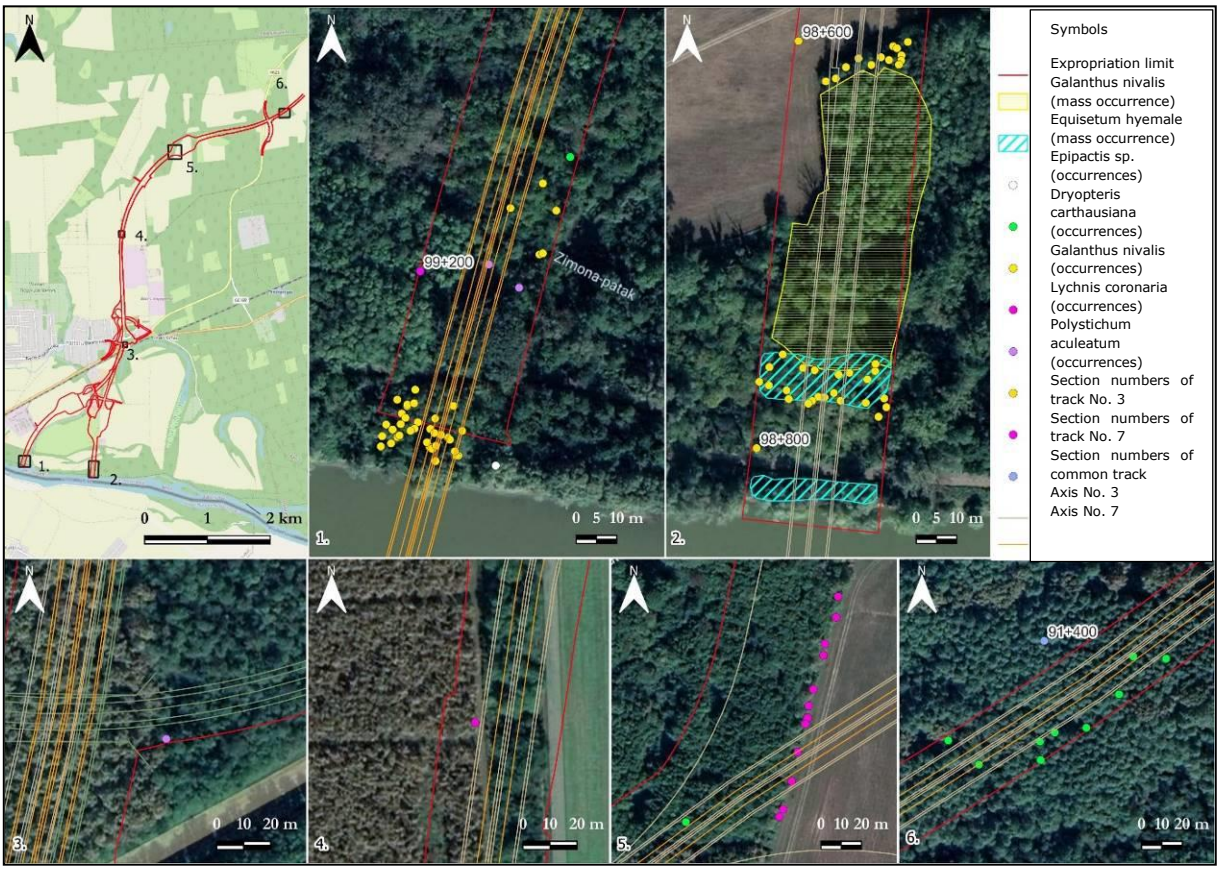


Figure 5.5.2Protected plant species occurring within the expropriation boundary of the proposed route

During the field inspections, a total of 81,699 protected species were found in the following distribution (conservation values are given on the basis of Decree No. 13/2001 (V. 9.) of the Ministry of the Environment Protection):

- rough horsetail (*Equisetum hyemale)* 2300 plants - conservation value: HUF 5,000 /each
- narrow buckler fern (*Dryopteris carthusiana)* 273 plants - conservation value: HUF 5,000t/each
- snowdrops (*Galanthus nivalis)* 70-80 thousand plants - conservation value: HUF 10,000 /each
- hard shield fern (*Polystichum aculeatum)* 5 teres - conservation value: HUF 5,000 /each
- rose campion (*Lychnis coronaria)* 210 dozen - conservation value: HUF 10,000 /each

A total of 28 habitat types and 303 species of vascular plants were identified in the area, five of which are protected species. The locations of the protected species are shown in Figure 5.5.3. Natural habitats (D34 × OC, J2, J4, K1a) occur in small quantities in the study area. The vast majority of the surveyed areas are either agricultural habitats or uncharacteristic grassland, dry shrubland or woodland dominated by alien tree species. The protected species found were located in the few natural habitats affected by the track. Thus, from the willow-aspen floodplain forests (J4), which are ribbon-like along the banks of the Drava, and from the marsh and swamp forests (J2) and hornbeam pedunculate oak (K1a) habitat types in the northern segment. Rough horsetail (*Equisetum hyemale*) and snowdrop (*Galanthus nivalis*) typically occur in high abundance in the willow aspen-floodplain forest habitat type (J4). The rose campion (*Lychnis coronaria*) is represented in the scrubby forest edge of the hornbeam-pedunculate oak (K1a) habitat with a high number of plants (210). Narrow buckler fern (*Dryopteris carthusiana*) is

associated with alder swamp woodland, while hard shield fern (*Polystichum aculeatum*) is typically found in uncharacteristic hardwood dominated woodland.

The total length of the investigated tracks (eastern and western tracks) is ~ 8000 meters. About 18.75% of this track crosses **Natura 2000** protected areas (which also covers the core area of the Danube-Drava National Park). Specifically, as follows:

- Sites of Special Conservation Interest

Western (Track 7): Habitats affected: J4, RDb, OB, total 0.773 ha.

Eastern (Track 3): Habitats affected: D34 × OC, RB, U11, P45, S1, OB, J4, U10, totalling 9,957 hectares. In addition, 13,650 m^2 (30 m x 455 m) is the site of temporary land reservation required for bridge construction.

- Special Protection Areas for Birds

Western (Track 7): Habitats affected: J4, RDb, T1b, OC, total 0.117 ha.

Eastern (Track 3): Habitats affected: D34 × OC, RB, P45, S1, OB, J4, totalling 9,525 hectares.

Joint section: S1, total 0.805 hectares

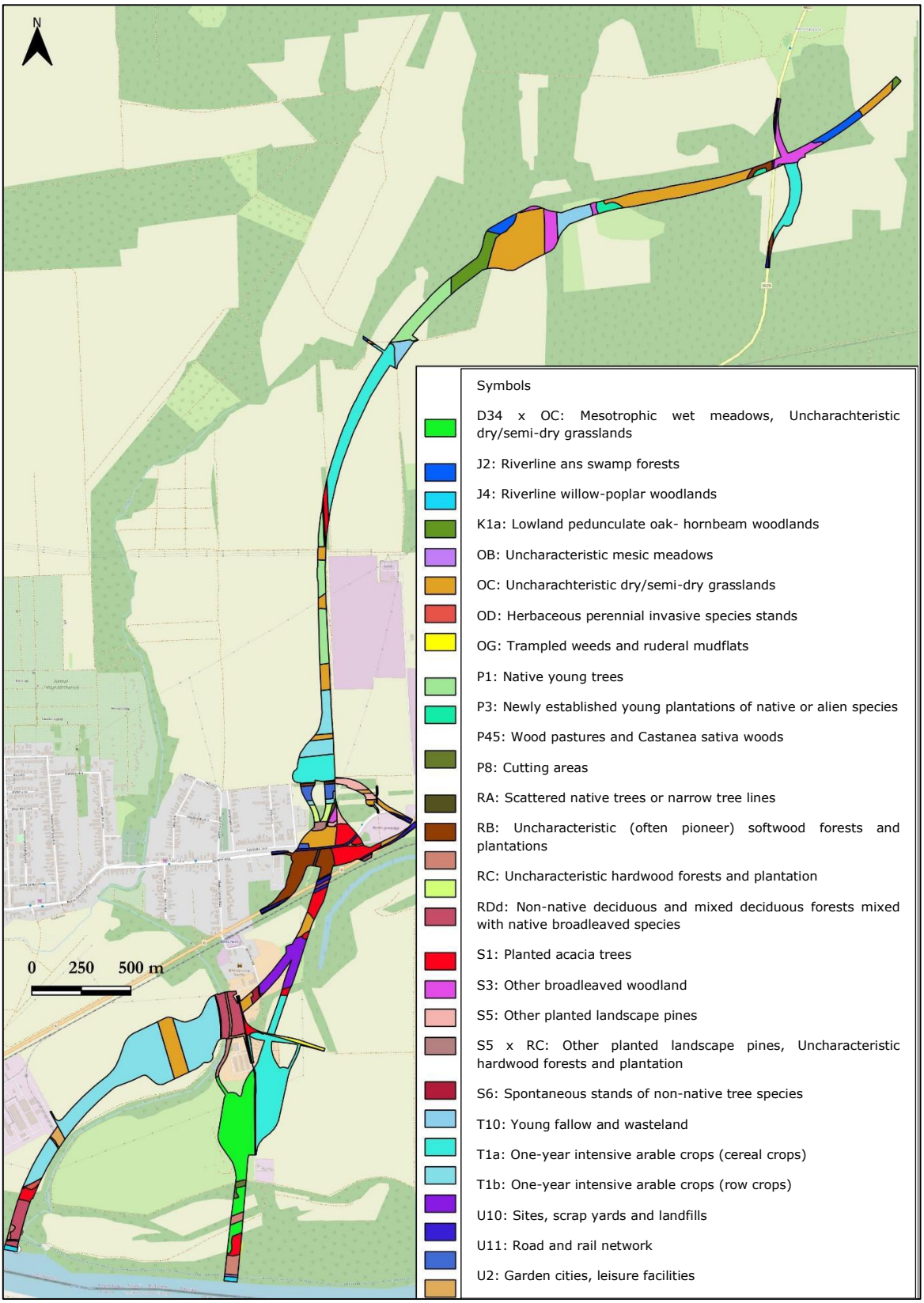


Figure 5.5.4: Overview habitat map

The 28 habitat types observed during the full botanical surveys carried out in autumn 2021, spring 2022 and summer 2022 are described in detail below.

A section of the track through a Natura 2000 site (Special Protection Areas for Birds, Special Areas of Conservation)[2]

J4 – Riverine willow-poplar woodlands

Habitat type narrowly bordering the Drava. The forest floor is composed of loosely closed white willow (*Salix alba*). The shrub layer is dense in some places, with *dogwood* (*Cornus sanguinea*) forming the main mass. The grassland is poor, with many nitrogen-favouring species, extensive colonies of rough horsetail (*Equisetum hyemale*) and high numbers of snowdrops (*Galanthus nivalis*). The habitat is also heavily stressed by the invasive plant species tall white aster (*Aster lanceolatus)* and wild cucumber (*Echinocystis lobata), and the* occasional intensive presence of the necklaceweed (Veronica *peregrina) on* the banks of the Dráva. Extensive patches of bamboo are also found here as a result of anglers' planting.

Protected species: Equisetum hyemale, Galanthus nivalis.

D34 × OC – Mesotrophic wet meadows. Uncharacteristic dry/semi-dry grasslands and tall herb communities

Dry meadows, some of which are actively grazed and some of which are mown. The grazed parts are dominated by drought- and disturbance-tolerant species, while mown areas are dominated by elements of potential natural vegetation. In some places, depressions of a few 10 m^2 are interspersed with stands dominated by moisture tolerant species. No protected plant species were found in their stands during the surveys. With the provision of some additional water and avoidance of overgrazing, their stocking could be significantly improved.

P45 - Wood pastures and Castanea sativa woods

Areas grazed by cattle, about 20% covered with wood. The dominant tree species are *Robinia pseudoacacia* and *Prunus cerasifera.* Its shrubs are heavily chewed. The grassland is poor, with few species that are tolerant of disturbance.

OB - Uncharacteristic mesic meadows and tall herb communities

A narrow grassy strip along the edge of the cycle path that runs alongside the Drava. It is mown several times a year. Its species composition is mixed. No protected species are found in the habitat.

OC - Uncharacteristic dry to semi-dry grasslands and tall herb communities

Uncharacteristic dry grasslands along the margins of dirt roads. The dominant grass species are common wheatgrass (*Elymus repens*) and cocksfoot grass (*Dactylis glomerata*). Several other generalist dicotyledons occur in their species assemblage.

RB – Uncharacteristic (often pioneer) softwood forests and plantations

Narrow, ribbon-like stands accompanying a former river branch. The canopy is dominated by white willow (*Salix alba*), white poplar (*Populus alba*) and field elm (*Ulmus minor*). The shrub layer is composed of moisture-demanding species such as grey willow (*Salix cinerea*), guelder rose (*Viburnum opulus*), and dogwood (*Cornus sanguinea*). At the grassland level, the open parts are dominated by tall-flowering species such as large-flowered hemp -nettle (*Galeopsis speciosa*), common nettle (*Urtica dioica)*, while the more closed patches are dominated by common lomberdean species: broad-leaved enchanter's nightshade (*Circaea lutetiana*), wood avens t (*Geum urbanum*). In the early spring, we found stands of **snowdrops (*Galanthus***

[2] In the parts of the HUDD10002 (Western Drava) bird sanctuary and HUDD20056 (Central Drava) nature conservation area affected by trail planning, the spatial deviations (boundaries) are minimal. There is no difference in vegetation between them, so there is no reason to separate their vegetation in this case.

***nivalis*) in the** tens of thousands in this type. In the east-west depression in the woodland, we found thousands of **rough horsetail (*Equisetum hyemale*).** Typical softwood forest species are absent.

RDb - Non-native deciduous and mixed deciduous forests mixed with native broadleaved species

They are present in Natura 2000 areas with a very small area coverage. The area concerned is a narrow strip of forest along the Zimóna stream. It is dominated by pedunculate oak and white willow, with green maple being the dominant invasive species. The shrub layer is dominated by black elder. The grassland is featureless.

S1 - Planted acacia trees

The row planting is clearly visible in the stands. The canopy layer is dominated by acacia, with a few native species. The shrub and grassland layer is composed of uncharacteristic nitrophilous weeds. Near the Drava, adjacent to the RB habitat, there is a significant presence of **snowdrops (*Galanthus nivalis*).**

U10 - Sites, scrap yards and landfills

Grassland on an agricultural site. The vegetation is composed of uncharacteristic species that are resistant to disturbance, with occasional groups of trees (usually fruit trees) wedged into the grassland.

Section of track crossing a non Natura 2000 area

J2 - Riverine and swamp forests

Forests dominated by common alder. In places there is also a slight degree of shrub encroachment. Common protected species is the narrow buckler fern. It typically occurs in depressions and near the rootstocks of alders.

Protected species: Dryopteris carthusiana.

K1a – Lowland pedunculate oak-hornbeam woodlands

Young stands, 40-50 years old. Intensive forestry interventions are well reflected. Single-level, single-aged stands. Dominantly hornbeam, with interspersed oaks and mountain elm. The grass and shrub layer is almost nude. On the edges of the woodland there is more dense vegetation, with high numbers of **rose campion (*Lychnis coronaria*)**. In the forest interior, a patch of ***narrow buckler fern* (*Dryopteris carthusiana*)** was found.

OC - Uncharacteristic dry to semi-dry grasslands

It includes semi-arid vegetation of fallows, wastelands, boundaries, mown grasslands and degraded lime avoider sandy grasslands . The species assemblage is dominated by generalists with a wide range of tolerances. In several places, on the margins bordering the P1 and K1a habitats, stands of **rose campion (*Lychnis coronaria*)** were found.

OD - Herbaceous perennial invasive species stands

Patches dominated by tall goldenrod (*Solidago gigantea*). The original vegetation type can no longer be determined, and they appear wedged between fields and wooded areas. Their intensive spread is likely.

OG - Trampled weeds and ruderal mudflats

Typical vegetation of country roads. They develop in the lane between the tracks, but they also colonise the tracks as traffic decreases. They are composed of species that are resistant to trampling.

P1 - Native young trees

Afforestation of turkey oak and pedunculate oak target stands. One pioneer tree species per stand will be uprooted in their stands, with a good chance of being driven out of the stands by forest management practices during clearings. Their grassland is poor, currently due to a lack of light.

RA – Scattered native trees or narrow tree lines

They appear in narrow bands and small, well-defined blocks. They are dominated by oak species, with bird cherry, field maple and walnut usually occurring in their stands. In places, various species of pine also appear in the shrub layer. The grassland is heterogeneous, with a species assemblage from the surrounding areas.

Protected species: Polystichum aculeatum.

RB – Uncharacteristic (often pioneer) softwood forest and plantation

The narrow strip of white willow (*Salix alba*) dominates the Zimóna stream. Its shrub cover is dominated by black elder (*Sambucus nigra*). The grassland is dominated by reed canary (*Phalaris arundinacea*) and common reed (*Phragmites australis*).

RC – Uncharacteristic hardwood forests and plantations

Young forests dominated by pedunculate oak (*Quercus robur*), with early maple (*Acer platanoides*), mountain maple (*Acer pseudoplatanus*) and silver maple (*Acer saccharinum*) as accompanying species. The grassland is poor, with a high cover of bracken fern (*Pteridium aquilinum*).

RDb - Non-native deciduous forests mixed with native deciduous tree species and mixed forests

It is a fairly common type on the surveyed track. In addition to the native species, acacia and late cherry are always dominant. The shrub and grassland layer is generally featureless. narrow buckler fern **(*Dryopteris carthusiana*)** and **hard shield fern (*Polystichum aculeatum*)** occur in patches in stands.

P3 - Newly established young plantations of native or alien species

Typically afforestations established from oak species. Due to the cultivation, they have a nude grassland character with an average height of 1-1.5 m.

P8 - Cutting areas

Habitat established around high-voltage transmission lines, the study area is flanked by RA habitat, and these cuts may have previously been forested areas.

S1 - Planted acacia trees

The row planting is clearly visible in the stands. Acacia dominates in the woodland, with a few native species. The shrub and grassland layer is made up of uncharacteristic nitrophilous weeds.

S3 - Other broadleaved woodland

Forest strips and patches dominated by late cherry (*Padus serotina*) and white acacia (*Robinia pseudoacacia).* The shrubs are dominated by single-seed hawthorn (*Crataegus monogyna*). The grassland is dominated by nitrophilous and annual weeds.

S5 - Other planted landscape pines

Planted stands of silver fir (*Abies alba*), *European* spruce (*Picea abies*), *blue* spruce (*Picea pungens).* The shrub layer is not typical. Nudum grassland, more diverse on forest edges.

S5 × RC - Other planted non-coniferous pine forests × Native hardwood forests with no character

Young forests dominated by pedunculate oak (*Quercus robur*), with early maple (*Acer platanoides*), mountain maple (*Acer pseudoplatanus*) and silver maple (*Acer saccharinum*) as accompanying species. *Picea abies* is planted in bands in the stands. Their grass cover is poor, with a high cover of bracken fern *Pteridium aquilinum*.

S6 - Spontaneous stands of non-native tree species

Spontaneously afforested parts of copper pits, scrapyards. The canopy is dominated by white acacia (*Robinia pseudoacacia*), the shrub layer by black elder (*Sambucus nigra*) and cherry plum (*Prunus cerasifera*). The grassland is uncharacteristic and the vegetation is dominated by nitrophilous species which are tolerant to disturbance. Their stands are small and patchy.

T1ab - One-year intensive arable crops (cereals-crops)

Cornfields, sunflowers, wheat and barley fields. Their margins are dominated by vegetative weeds. Inside the fields there is minimal weed cover.

T10 - Young fallow and wasteland

Habitats created by the reforestation of arable land abandoned a few years ago, with many lime-avoiding species.

U10 - Farms, family farms

Grassland on an agricultural site. The vegetation is composed of uncharacteristic species that are resistant to disturbance, with occasional groups of trees (usually fruit trees) wedged into the grassland.

U11 - Road and rail network

No roads or railways, no vegetation along the line of the linear facility. Pioneer, possibly salt-tolerant vegetation is established on embankments and verges.

U2 - Garden cities, leisure facilities

Gardens, car parks, anthropogenic habitats in the interior of Barcs.

U4 - Sites, scrap yards and landfills

Former railway "director" of sites. Currently disused. A heavily scrubby and wooded area.

Botanical evaluation

Based on the botanical observations and the biotic data obtained from DDNPD, the 2 track alternatives studied are evaluated below.

Track No. 3: The track passes through alder plantations east of the Kaposvár road, which contain a significant number of protected plants. It also bypasses the northern unprotected forest block to the north and west. To the west of the solar panels, it passes through young oak plantations and ploughland. It passes through a small section of protected area (forest) south of road 6, then reaches the Drava south of the pig farm, through protected grassland (pasture and mowed fields) and forest. About 250 m north of the Drava, it crosses the filled remnant of an old backwater, which functions as a waterway habitat with willow bushes and locusts. Thousands of protected species of 2 species (rough horsetail and snowdrop) are found along the proposed track, close to the Drava. The temporary land reservation required for the construction of the bridge is planned

in a 100% nationally protected national park core area and Natura 2000 area, which is expected to provide habitat for a number of additional protected plants, to be specified before construction.

Track No. 7: The track passes through alder plantations east of the Kaposvár road, which contain a significant number of protected plants. It also bypasses the northern unprotected forest block to the north and west. To the west of the solar panels, it passes through young oak plantations and ploughland. It crosses a small stretch of protected area (forest) south of road 6. It runs north of the pig farm near but not in the protected area, which is a watercourse (Zimóna stream) bordered by reeds and old willows. After crossing the stream, the track runs west of the edge of the protected area in agricultural land. It reaches the Drava at the unprotected mixed acacia forest. It crosses protected area only at the crossing of the Drava. On the bank of the Drava and on the border of the protected area, the track crosses mature willows and a group of mature poplars. A significant population of protected plant species (snowdrops, *Epipactis* sp., *Polystichum* sp.) is found along the proposed route close to the Drava.

Northern starting point of the common track: 2 mature oak trees with trunk diameters of 130-150 cm fall within the proposed track in the forest strip located here.

From a conservation point of view, the final route should be chosen to minimise the impact of the construction of the route and the expropriation of the construction area on protected and Natura 2000 sites, as the concentration of protected plants is the highest in the area. Accordingly, of the two variants, the western variant, no. 7, will cause less damage to nature conservation.

Zoological survey results

Based on the field visit, NPD biotic data and literature data, the following is a summary of the list of typical vertebrates found in the study area and its immediate surroundings.

Field surveys covering the entire track were carried out 10 times between October 2021 and October 2022, and based on this and literature sources (e.g. DDNPD biotic database), the list of protected species in the study area is summarised below.

Mammals (protected species)

In July 2022, we conducted a targeted bat survey, which is the optimal time to study the bat population and species composition of a given area. In addition to monthly field surveys, the results of this are also included in the table.

Table 5.5.1: Mammals (protected species)

English name	*Latin name*	*Conservation value (HUF)*	*Variant 3*	*Variant 7*
European mole	*Talpa europaea*	25,000	X	X
Eastern Hedgehog	*Erinaceus concolor*	25,000	X	X
wildcat - FV	*Felis silvestris*	250,000	X	X
Eurasian beaver	*Castor fibre*	50,000	X	X
otter - FV	*Lutra lutra*	250,000		X
squirrel	*Sciurus vulgaris*	25,000	X	
soprano pipistrelle	*Pipistrellus pygmaeus*	25,000	X	X
Nathusius' pipistrelle	(*Pipistrellus nathusii*)	25,000	X	X
white-edged pygmy pipistrelle	(*Pipistrellus kuhlii*)	50,000	X	X

English name	Latin name	Conservation value (HUF)	Variant 3	Variant 7
common pipistrelle	(*Pipistrellus pipistrellus*)	25,000	X	X
common noctule	*Nyctalus noctula*	25,000	X	X
serotine	(*Eptesicus serotinus*)	25,000	X	X
water bat	*(Myotis daubentonii)*	50,000	X	X
pond bat - FV	*(Myotis dasycneme)*	100,000	X	X
alpine bat	*(Hypsugo savii)*	50,000	X	X
Barbastelle - FV	*(Barbastella barbastellus)*	100,000	X	X

FV: highly protected

A presentation of the protected bats found during the detector surveys:

Pond bat (*Myotis dasycneme*)

It is a rare, highly protected species of Natura 2000 Community importance, both in Europe and in Hungary. It occurs in small numbers in the area of the Dráva, including the Barcs area. It is associated with large rivers and their tributaries. It can be found both in the wooded areas of riverside forests and in riverside buildings. It is important for the riparian tall woody vegetation, which provides wind shade. It is present in small numbers in the immediate vicinity of the study area. Construction is not expected to have a significant impact on local or national populations.

Barbastelle (*Barbastella barbastellus*)

A rare, highly protected species of Natura 2000 Community importance. Occurs in small numbers in old oak forests alongside the Drava. Also known from old oak stands in the Barcs area. Habitat specialist. Its roosts are found exclusively under the bark of deciduous trees (mainly oaks). It hunts in closed forests and along forest roads. Its presence indicates old forests and areas with good habitat conditions. There are no forest stands along the proposed track suitable for its establishment, but it may occur in forest patches with more mature native species during hunting. Its habitat is not threatened by the new highway, but it may fragment its habitat, potentially negatively affecting local population conditions in the future.

Birds (protected species)

Surveys were carried out in all seasons, in all periods of the day. All species of birds (whether sight or sound) observed during field visits were recorded, so the list below is 100% detailed.

Table 5.5.2: Birds (protected species)

English name	Latin name	Conservation value (HUF)	Variant 3	Variant 7
night heron - FV	*Nycticorax nycticorax*	100,000		X
blackcap	*Sylvia atricapilla*	25,000	X	X
marsh tit	*Parus palustris*	25,000	X	X
wagtail	*Motacilla alba*	25,000	X	X
western-marsh harrier	*Circus aeruginosus*	50,000	X	
common sandpiper	*Actitis hypoleucos*	50,000	X	

English name	Latin name	Conservation value (HUF)	Variant 3	Variant 7
Eurasian hoopoe	*Upupa epops*	50,000	X	X
crested lark	*Galerida cristata*	50,000	X	X
stonechat	*Saxicola torquatus*	25,000	X	X
lemon balm	*Emberiza citrinella*	25,000	X	X
chicory	*Serinus serinus*	25,000	X	
chiffchaff	*Phylloscopus collybita*	25,000	X	X
siskin	*Carduelis spinus*	25,000	X	X
jackdaw	*Corvus monedula*	50,000	X	X
nuthatch	*Sitta europaea*	25,000	X	X
honey buzzard - FV	*Pernis apivorus*	100,000	X	X
common buzzard	*Buteo buteo*	25,000	X	X
wood finch	*Fringilla coelebs*	25,000	X	X
wood lark	*Lullula arborea*	50,000	X	X
tree pipit	*Anthus trivialis*	25,000	X	X
Dunnock	*Prunella modularis*	25,000	X	
marsh warbler	*Acrocephalus palustris*	25,000	X	X
song thrush	*Turdus philomelos*	25,000	X	X
white stork - FV	*Ciconia ciconia*	100,000	X	
black woodpecker	*Dryocopus martius*	50,000	X	X
Blackbird	*Turdus merula*	25,000	X	X
pine finch	*Fringilla montifringilla*	25,000	X	X
Fieldfare	*Turdus pilaris*	25,000	X	
nightingale	*Luscinia megarhynchos*	25,000	X	X
barn swallow	*Hirundo rustica*	50,000	X	X
rail	*Rallus aquaticus*	50,000		X
bee-eater - FV	*Merops apiaster*	100,000	X	X
grey-headed woodpecker	*Picus canus*	50,000	X	X
rock pipit	*Anthus spinoletta*	25,000	X	
common treecreeper	*Certhia familiaris*	25,000	X	X
black redstart	*Phoenicurus ochruros*	25,000	X	X
raven	*Corvus corax*	50,000	X	X
kingfisher	*Alcedo atthis*	50,000		X

English name	Latin name	Conservation value (HUF)	Variant 3	Variant 7
Eurasian hobby	*Falco subbuteo*	50,000	X	X
cuckoo	*Cuculus canorus*	25,000	X	
linnet	*Carduelis cannabina*	25,000	X	X
blue tit	*Parus caeruleus*	25,000	X	X
red-footed falcon - FV	*Falco vespertinus*	500,000	X	
Blue Pigeon	*Columba oenas*	50,000	X	X
Northern Harrier	*Circus cyaneus*	50,000	X	X
merlin	*Falco columbarius*	50,000	X	X
lesser spotted woodpecker	*Dryobates minor*	50,000	X	X
Little Egret - FV	*Egretta garzetta*	250,000		X
blackpoll warbler	*Sylvia curruca*	25,000	X	X
middle spotted woodpecker	*Dendrocoptes medius*	50,000		X
pied flycatcher	*Ficedula hypoleuca*	25,000		X
mistle thrush	*Turdus viscivorus*	50,000	X	X
hawfinch	*Coccothraustes coccothraustes*	25,000	X	X
Eurasian skylark	*Alauda arvensis*	25,000	X	X
common whitethroat	*Sylvia communis*	25,000	X	X
tree sparrow	*Passer montanus*	25,000	X	X
house martin	*Delichon urbicum*	50,000	X	X
great spotted woodpecker	*Dendrocopos major*	25,000	X	X
great grey shrike	*Lanius excubitor*	50,000	X	X
wryneck	*Jynx torquilla*	50,000	X	X
wren	*Troglodytes troglodytes*	25,000	X	X
collared flycatcher	*Ficedula alba*	25,000	X	
long-tailed tit	*Aegithalos caudatus*	25,000	X	X
meadow pipit	*Anthus pratensis*	25,000	X	X
short-toed treecreeper	*Certhia brachydactila*	25,000	X	X
goldcrest	*Regulus regulus*	25,000	X	X
Eurasian golden oriole	*Oriolus oriolus*	25,000	X	X
bullfinch	*Pyyrhula pyrrhula*	25,000	X	X
wood warbler	*Phylloscopus sibilatrix*	25,000	X	X

English name	Latin name	Conservation value (HUF)	Variant 3	Variant 7
great tit	*Parus major*	25,000	X	X
redwing	*Turdus iliacus*	25,000	X	X
grey heron	*Ardea cinerea*	50,000	X	X
spotted flycatcher	*Muscicapa striata*	25,000	X	
goldfinch	*Carduelis carduelis*	25,000	X	X
red-backed shrike	*Lanius collurio*	25,000	X	X
turtle dove	*Streptopelia turtur*	50,000	X	X
rook	*Corvus frugilegus*	50,000	X	
common moorhen	*Gallinula chloropus*	25,000		X
robin	*Erithacus rubecula*	25,000	X	X
kestrel	*Falco tinnunculus*	50,000	X	
European Greenfinch	*Carduelis chloris*	25,000	X	X
green woodpecker	*Picus viridis*	50,000	X	X

FV: highly protected

Amphibians (protected species)

Table 5.5.3: Amphibians (protected species)

English name	Latin name	Conservation value (HUF)	Variant 3	Variant 7
European tree frog	*Hyla arborea*	10,000	X	X

Reptiles (protected species)

Table 5.5.4: Reptiles (protected species)

English name	Latin name	Conservation value (HUF)	Variant 3	Variant 7
sand lizard	*Lacerta agilis*	25,000	X	X
green lizard	*Lacerta viridis*	25,000	X	X
smooth snake	*Coronella austriaca*	50,000	X	X

Fish (protected species)

In August 2022, a targeted fish stock survey was carried out (surveyors: Dr. László Antal and Krisztián Nyeste) in the vicinity of the planned bridge sites.

During the sampling, a total of 20 species of fish were detected in 1134 specimens using electric fishing machines in the sampling sections (see tables). Seven of the 20 species (Danube sturgeon, spirlin, bitterling, whitefin gudgeon , Danube roach, European pond terrapin, Hungarian zingel) are protected in Hungary, and another 1 species (vimba) is also listed in Appendix III of

the Bern Convention. In addition to the protected species, three species of adventive origin (round goby , tuberose goby , monkey goby) occur.

Table 5.5.5: Species and numbers of fish detected in the first sampling transect (track 3 - bridge West)

English name	Latin name	Total	Adult	Offspring
Danube sturgeon #	***Eudontomyzon mariae***	**4**	**4**	**0**
Chub	*Squalius cephalus*	233	209	24
white bream	*Blicca bjoerkna*	25	23	2
vimba bream	*Vimba vimba*	40	35	5
roach	*Rutilus rutilus*	8	8	0
Danube roach #	***Rutilus virgo***	**1**	**1**	**0**
spirlin	***Alburnoides bipunctatus***	**35**	**29**	**6**
Common bleak	*Alburnus alburnus*	56	36	20
Bitterling #	***Rhodeus amarus***	**38**	**32**	**6**
common nase	*nasal chondrostoma*	10	10	0
barbel #	*Barbus barbus*	6	4	2
European pond terrapin #	***Cobitis elongatoides***	**23**	**23**	**0**
whitefin gudgeon#	***Romanogobio vladykovi***	**2**	**2**	**0**
Perch	*Perca fluviatilis*	8	8	0
Redfin perch	*Sander lucioperca*	3	0	3
Asp #	*Leuciscus aspius*	3	0	3
burbot	*Lota lota*	1	1	0
round goby *	*Neogobius melanostomus*	8	7	1
tuberose goby *	*Proterorhinus semilunaris*	25	17	8
monkey goby *	*Neogobius fluviatilis*	86	67	19

*Bold: protected species; #: Natura2000 candidate species; *: faunal elements of adventive origin*

5.5Table .6: Species and numbers detected on the second sampling transect (track 3 - bridge Eastern)

Hungarian name	Latin name	Total	Adult	Offspring
Chub	*Squalius cephalus*	113	101	12
Silver bream	*Blicca bjoerkna*	6	6	0
vimba bream	*Vimba vimba*	28	28	0
roach	*Rutilus rutilus*	6	6	0
Danube roach #	***Rutilus virgo***	**3**	**3**	**0**
spirlin	***Alburnoides bipunctatus***	**5**	**2**	**3**
Common bleak	*Alburnus alburnus*	152	114	38
Bitterling #	***Rhodeus amarus***	**19**	**19**	**0**
Common nase	*nasal chondrostoma*	2	2	0
European pond terrapin #	***Cobitis elongatoides***	**22**	**22**	**0**
whitefin gudgeon #	***Romanogobio vladykovi***	**2**	**1**	**1**
Perch	*Perca fluviatilis*	2	2	0
Redfin perch	*Sander lucioperca*	1	0	1

Hungarian name	Latin name	Total	Adult	Offspring
zingel #	***Zingel zingel***	**1**	**1**	**0**
Asp #	*Leuciscus aspius*	3	1	2
round goby *	*Neogobius melanostomus*	13	11	2
tuberose goby *	*Proterorhinus semilunaris*	6	6	0
monkey goby *	*Neogobius fluviatilis*	105	47	58

*Bold: protected species; #: Natura2000 candidate species; *: faunal elements of adventive origin*

The conservation values of the protected species detected during the survey are given in the table below, based on Decree No. 13/2001 (9 May 2001) of the Ministry of Transport and Water.

Table 5.5.7: Conservation value of protected species detected during the survey

Species	Scientific name	Conservation value (HUF/quarter)
Danube sturgeon - FV	*Eudontomyzon mariae*	100,000
Danube roach	*Rutilus virgo*	10,000
Spirlin	*Alburnoides bipunctatus*	10,000
Bitterling	*Rhodeus amarus*	5,000
European pond terrapin	*Cobitis elongatoides*	10,000
whitefin gudgeon	*Romanogobio vladykovi*	10,000
zingel- FV	*Zingel zingel*	100,000

FV: highly protected

Introduction to the protected species:

- ***Eudontomyzon mariae* (Berg, 1931) - Danube sturgeon:** Occurs in the domestic Danube section, in the Rába and the Drava and their smaller tributaries. It can also occur in the lower river levels, in the common nase , Barbel and Common Bream zones. Mud-dwelling larvae feed mainly on organic debris. By the age of four years, they have developed reproductive organs and a characteristic funnel-shaped mouthparts, which they sometimes use to attach themselves to fish, but do not usually injure them or become parasites. It is likely that adults no longer feed at all, living only on their accumulated reserves, and die after spawning. It is not large, with a maximum length of 18-21 cm. A representative of an ancient group of animals that is disappearing, the fact that it is **highly protected in our country is a factor in the** survival of this rare species, which is sensitive to water pollution. **Natura2000 candidate species, natural value: HUF 100,000 .**
- ***Zingel zingel* (Linnaeus, 1758) - Hungarian zingel**: Native fish of the Danube and Dniester basins. Although it is a stream-loving species and lives mainly in the more drifty stretches of our medium and larger rivers, it thrives in the slower stretches, unlike its close relative the German zingel . It feeds mainly on small benthic organisms and organic debris, with larger individuals also feeding on fish. It deposits its eggs in pre-made burrows on the sandy-gravel riverbed. Its populations are mainly threatened by the swelling of our waters. **It is a highly protected species in Hungary, a Natura2000 candidate species, with a natural value of HUF 100 000 .**

Invertebrates (protected species)

In August 2022, in parallel with the fish survey, we also carried out a survey of aquatic macroinvertebrate fauna focusing on mussels and snails (surveyor: Júlia Szeles) in the vicinity of

the planned 2 bridge sites. The main objective was to detect the presence or absence of the Natura 2000 candidate species thick shelled river mussel (*Unio crassus)* and to detect possible occurrence of protected species.

A total of 8 mollusc species were detected in the 2 sampling sites (4 Gastropoda and 4 Bivalvia), of which the species with conservation status are

- *Amphimelania holandrii* protected snail and
- *Unio crassus* is a protected species of Community importance (Natura 2000).

Both protected species have an intrinsic value of 10,000 Ft/each, and both were found only in the vicinity of the bridge site on Track 3 (east), while no protected species were found in the vicinity of the bridge site on Track 7 (west).

We also conducted targeted daytime warbler surveys between May and October 2022 (they had not flown in earlier months). The table below shows all protected species detected in and near the tracks between October 2021 and October 2022.

Table 5.5.8: Protected invertebrates

English name	***Latin name***	***Conservation. value (HUF)***	***Variant 3***	***Variant 7***
beautiful demoiselle	*Calopteryx virgo*	5,000	X	X
hawker dragonfly (green-eyed hawker)	*Aeshna isoceles (Anaciaeschna isosceles)*	5,000	X	X
Yellow-legged dragonfly (river clubtail)	*Gomphus flavipes (Stylurus flavipes)*	50,000	X	X
common clubtail	*Gomphus vulgatissimus*	5,000	X	
green eyed hook-tailed dragonfly (damselfly)	*Onychogomphus forcipatus*	5,000	X	
green clubtailed dragonfly (forest dragonfly)	*Ophiogomphus cecilia*	50,000	X	
scarce chaser (swamp dragonfly)	*Libellula fulva*	5,000	X	X
European stag beetle	*Lucanus cervus*	10,000	X	X
Lesser stag beetle	*Dorcus parallelipipedus*	5,000	X	X
cone-headed grasshopper	*Acrida hungarica*	50,000	X	X
horned dung beetle	*Copris lunaris*	5,000	X	
cupid alcetas	*Cupid alcetas*	5,000	X	
gatekeeper	*Pyronia tithonus*	10,000	X	X
common glider	*Neptis sappho*	10,000	X	X
red admiral	*Vanessa atalanta*	5,000	X	X
Chinese scarce swallow-tail	*Iphiclides podalirius*	10,000		X
marbled fritillary	*Brenthis daphne*	5,000	X	X
silver-washed fritillary	*Argynnis paphia*	5,000	X	X
European peacock	*Nymphalis io*	5,000	X	X
polygonia c-album	*Nymphalis c-album*	5,000	X	X

Cone-headed grasshoppers were found in several locations in July in the order of 100:

- Route 3 around mile post 98+600 min. 100 individuals,
- common northern track in the vicinity of mile post 91+200 in order of magnitude 10,
- common northern track around mile post 91+800 min. 10 individuals,
- common northern track around mile post 95+400 min. 10 individuals.

Among the protected butterflies, the gatekeeper has the smallest home range and is a locally occurring species. However, it is sometimes described as common in its native habitats (Dr. Péter Gergely et al (2017): Our butterflies of the day), and we observed 1-1 specimen at 2 sites during our own survey. The other protected butterfly species found occur in large areas of our country and are considered common.

Targeted surveys for butterflies along the proposed tracks have identified 28 non-protected species in addition to the protected species described above.

In addition to the protected dragonflies described above, 13 non-protected species were also found.

During field surveys, we specifically searched for protected Natura 2000 candidate species, such as the great Capricorn beetle (*Cerambyx cerdo*) and the cucujius cinnaberitus (*Cucujus cinnaberinus*) under the bark of old trees, but we did not encounter these species.

Zoological summary

From a nature conservation point of view, the final route should be chosen in such a way that the construction of the route and the expropriation of the area for construction purposes will have the least possible impact on protected and Natura 2000 sites in the area, as the above shows that this is where the greatest concentration of protected plants and animals are found. Accordingly, of the two alternatives, the western alternative, Track No. 7, will cause less damage to nature conservation. In the case of protected and Natura 2000 habitats alongside the Drava, the design of tracks with bird and bat diversion walls high on the bridge structure should be considered.

Both track alternatives affect the habitat of protected mammal species (wildcat, pond bat, Barbastelle) and the feeding area of protected bird species (little egret, night heron , white stork, honey buzzard , bee-eater). In addition, the Zimóna stream, a habitat of the highly protected otter, is affected by track 7 at mile post 99+200, while the Hungarian zingels are identified as highly protected fish species near the bridge of track 3 and the Danube sturgeon near the bridge of track No. 7. We also detected the presence of the Natura 2000 candidate thick shelled river mussel in the vicinity of the bridge of track 3. Along the tracks, 20 protected arthropods were detected, mainly from protected and Natura 2000 designated habitats along the Drava. Neither of the two variants is much better than the other. The only advantage of variant 7 is that it crosses a significantly smaller area of protected Natura 2000 habitats than variant 3. From a conservation point of view, the former makes Variant No. 7 slightly preferable.

The study area is home to a number of protected species or species worthy of protection, which use the area as a regular habitat, breeding and feeding ground.

Wildlife management

According to the data provided by the Department of Wildlife Management of the Ministry of Agriculture, the planning area covers the 405th Inner-Somogyi wild game management landscape unit.

The Inner-Somogy game management landscape is a landscape with a character of a high-level large wild game, and the hunting areas affected by the planned track also have a relatively high density of big game. The density of large game species in the hunting areas of the affected

hunting rights holders was as follows (individuals/100 ha), based on the stock assessment data for February 2022, broken down by game species.

Right to hunt	*Red deer*	*Fallow deer*	*Wild boar*	*Deer*
SEFAG Forestry and Timber Ltd (Barcs)	4,6	0,9	1,5	1,3
Rigóci Friends Hunting Club	2,5	0,4	0,9	2,3

The most common large wild game species, according to the game population assessment data, is the red deer, but wild boar and deer are also important, with smaller numbers of fallow deer.

According to the data received, neither now nor after the construction of the new road section, specific key game migration routes cannot be identified, as large wild game is expected to be present along the entire planned section. Currently, the movement of large wild game is limited only by fixed fenced objects, while its temporal and spatial distribution is regulated by the state of the respective agricultural crops and the current human disturbance (e.g. agricultural and forestry works, tourism, mushroom picking).

Almost anywhere along the studied tracks (except for the currently fenced areas), wildlife-prone road sections could be created after implementation, so wildlife conflicts are expected along almost the entire section.

On the roads and railroad tracks in the parts of the two hunting areas near the proposed track, considering the average of several years, there are nearly 20 deer collisions per year, of which about 50% are red deer. Thus, once completed, potential wildlife-vehicle collisions on the planned M60 expressway could result in greater damage to property and serious personal injury due to the high weight of the deer (up to 200 kg) and the maximum speed of vehicles travelling on the road. **It is therefore proposed to build a fence of a quality and height (240 cm) on both sides of the road to prevent the entry of ungulates, in particular roe deer, and to install objects to allow them to escape.**

No wildlife crossing is required on the planned section. A fence to prevent game from entering the driveway will create a new forced migration route that will not impede game movement, but will change the direction of game movement, but this is not significant from a wildlife management perspective.

Of the two tracks studied, track variant No. 7 is the more favourable from a wildlife management and hunting point of view.

5.5.3. Impact of establishment

Natura 2000 habitats will be removed for each variant to the following extent.

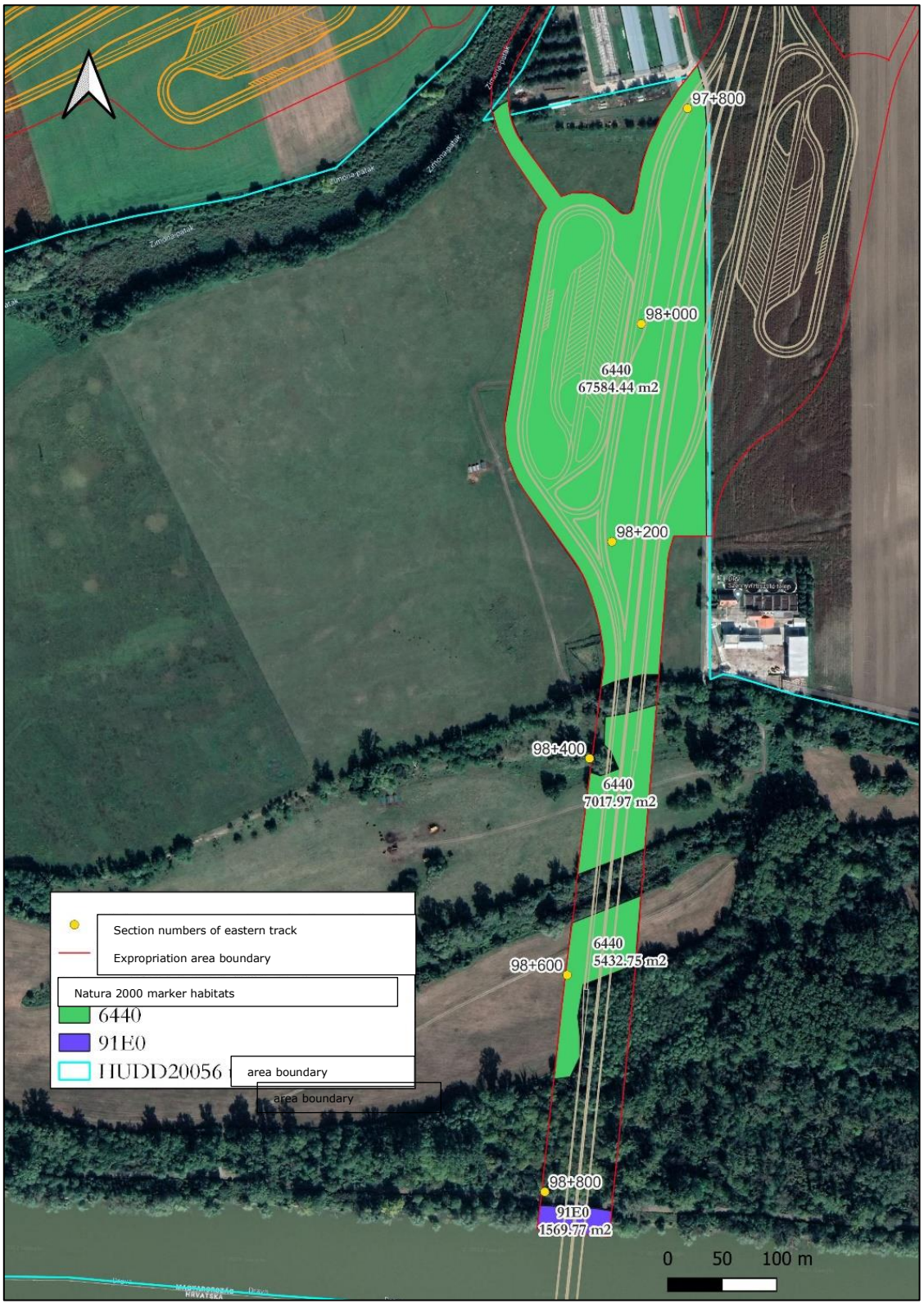


Figure 5.5.5: Marker habitats that will be lost with the implementation of the eastern track No. 3

The loss of marker habitats is expected for the eastern Track No. 3 to the following extent:

- 6440 Floodplain marsh meadows : 80035.16 m^2 , i.e. 8 ha in extent, and the temporary reservation of land for bridge construction will add ~7,500 m^2 ;
- 91E0 Softwood groves, alder and ash groves and swamp forests : 1569.77 m^2 in extent.

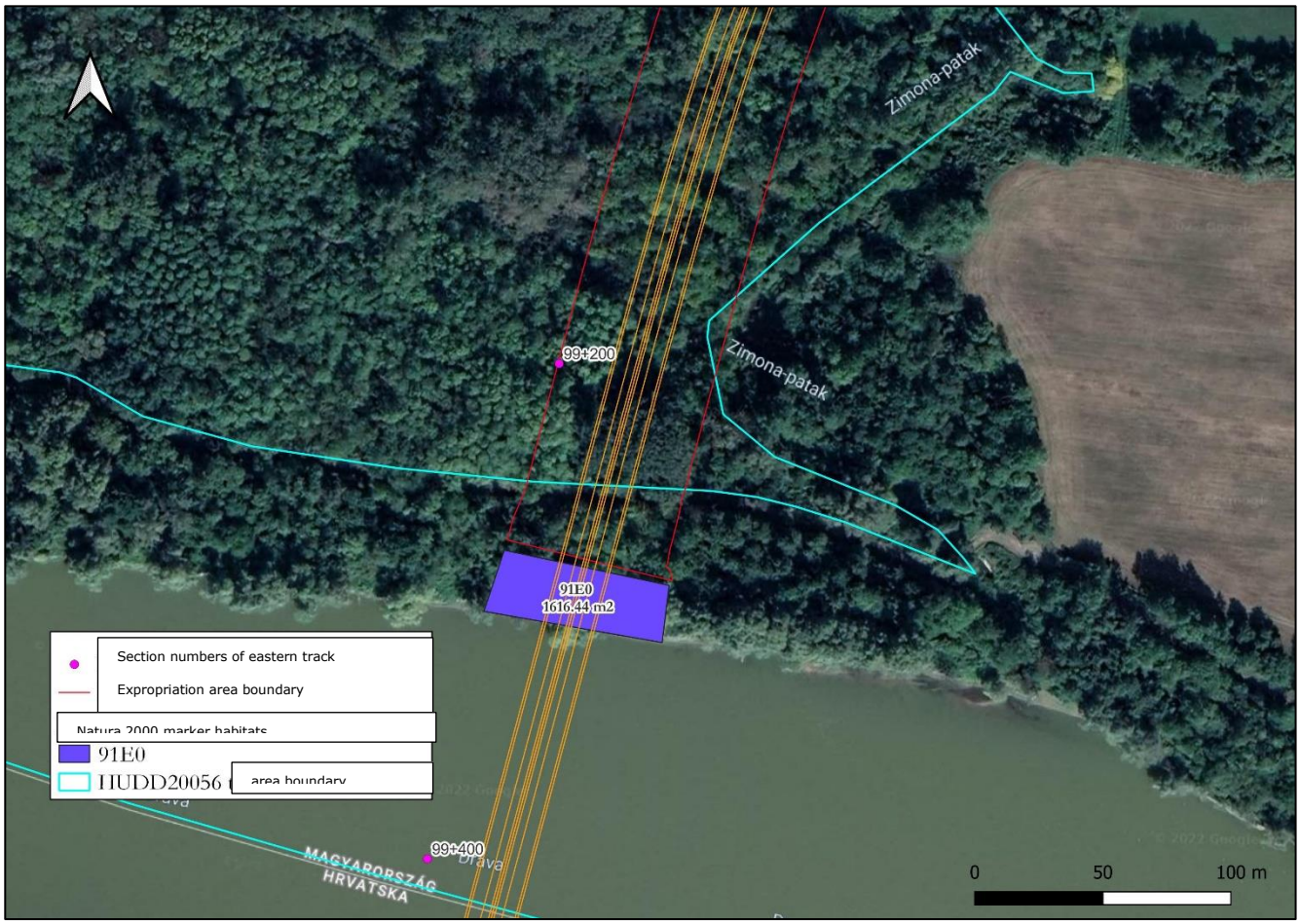


Figure 5.5.6: Marker habitat that will be lost with the implementation of the western track No. 7

The following loss of marker habitats is expected for the western Track No. 7:

- 91E0 Softwood groves, alder and ash groves and swamp forests: 1616.44 m^2 in extent.

In case of the Drava bridges, the floodplain openings can be built with cranes, prefabricated beams and an access road must be built next to the bridge. For the construction of the bed openings, a floating crane is likely to be needed, which will require a working area of the same size as the surface area of the bridge , close to the bridge, on the bank, with a road connection. The extent of the workspace required for this floating crane is not known at this stage, but the creation of this working area on the bank of the Drava will result in the removal of additional marker habitat (91E0), whichever alternative track variant is chosen. In the case of push-in, the track holder will have to be constructed on one side of the road, served by the same road parallel to the bridge as the floodplain openings. Given the width of the bridge, it would be advantageous to construct an access road on both sides within the proposed expropriation boundary. In addition, additional staging areas will be required in the vicinity of the bridge, with a footprint of approximately the same size as the bridge area. The spatial extent of these staging areas is currently unknown, but it can already be stated that the creation of these staging areas in the core area of the National Park and Natura 2000 area will result in the removal of additional marker habitats for Track No. 3, further increasing the significant impact of Track No. 3 on wildlife.

In connection with the construction of the bridge over the Drava, the temporary reservation of land, the assembly area, could in principle also be built on the Croatian side, in which case the

impact of the temporary reservation of land on the Hungarian side would be much smaller and more favourable from a nature conservation point of view.

As the planned investment will take place entirely in habitats that have not been used for this purpose so far, it will be necessary to create separate organisational roads in protected Natura 2000 habitats and in northern non-protected forest areas. The de-vegetation of the expropriation area and the groundworks will entail the removal of the original vegetation, resulting in the loss of the protected plant habitats detailed below. A further temporary impact will be the temporary disposal of the excavated soil, which will be carried out within the expropriation boundary. In addition to the loss of habitat, the construction of the organisation roads and bridge construction area will also result in all negative impacts (noise and air pollution) from the motor traffic required during construction and bridge construction on the adjacent nationally protected and Natura 2000 habitats for months on end, as a result of the construction of the Track variant no. 3. For Track No. 7, this will affect nationally protected (national park) and Natura 2000 habitats to a much lesser extent. These indirect impacts will also negatively affect the activities of protected plants and protected and highly protected animals.

Protected plant species are affected, and their habitat will be lost if the project goes ahead. The occurrence of the affected species is detailed in the table in the botanical work with precise coordinates. The implementation of the western track variant 7 will affect about 4,000 individuals of snowdrop (*Galanthus nivalis*), 4 hectares of hard shield- fern (*Polystichum aculeatum)* and 1 hectare of Dryopteris carthusiana (*Dryopteris carthusiana).* Alternative 3, Eastern Track, will eliminate habitat for about 75,000 stems of snowdrop (*Galanthus nivalis*) and 2,300 stems of rough horsetail (*Equisetum hyemale*). In addition to the above, the protected plant species affected by the northern common track are: 272 stems of drioptery carthusiana (*Dryopteris carthusiana)*, 1 stem of hard shield-fren (*Polystichum aculeatum)* and 210 stems of rose campion (*Lychnis coronaria).* In the area near the Drava, where a temporary reservation is planned to be established for the construction of a bridge, it is estimated that several hundred additional protected plants may be affected, which will be clarified before construction.

The eastern variant of the track No. 3 will cross nationally protected and Natura 2000 areas between mile post 97+800-98+850 (up to the Drava), and if implemented, will eliminate habitats that provide habitat for several hundred protected insects (e.g. cone-headed grasshopper, protected butterfly species) and regular feeding areas for protected and highly protected bat species, protected and highly protected bird species. In the area close to the Drava, where a temporary reservation (13.650 m^2) is planned to be established for bridge construction, it is assumed that several 100 additional protected insects (e.g. cone-headed grasshopper) may be affected, this will be clarified before construction.

Within 100-250 m of the central axis, the effect is indirect. For some species sensitive to disturbance (e.g. honey buzzard, wild cat), the latter effects can be considered indirect even at this distance, as individuals of these species are unlikely to return to their original habitat and will seek new habitat in areas further away from the proposed highway track. For direct effects, habitat disturbance can be considered as habitat loss, a definite negative effect on wildlife.

As previously described, the investments will be in a diverse habitat environment, making the protected and specially protected species detailed in the botanical and zoological work section potential affected partners of development. Habitat for the protected plants affected will be lost, so provision will need to be made for the relocation of these plants prior to the commencement of works.

In addition to the loss of habitat, the disturbance associated with the works (e.g. noise and dust) is also considered to be an adverse effect. This disturbance is considered to be adverse because the works will always take place along habitats that have not been regularly used (except for the

agricultural areas concerned), in the vicinity of protected and specially protected habitats. The presence of wintering and feeding species may also be temporarily reduced in the immediate vicinity of the working areas.

Construction-related accidents can potentially release contaminants into soil and watercourses. This can be avoided by working with foresight.

During construction, it should be taken into account that during the breeding season (to protect protected species such as ground nesting birds, invertebrates), construction works involving excavation should be avoided, and the proposed construction period should be outside this period (see the Recommendations section).

The planned interchanges A and C and the associated road sections will be located in t degraded habitat from the point of view of wildlife protection areas with low natural vegetation cover and will therefore not have a significant impact on habitat conservation.

The long-term conservation of Natura 2000 marker habitats in the immediate vicinity of the development site, but outside the immediate area of influence of the Natura 2000 marker habitats to be removed, is a priority, both under the Natura 2000 SDF and the conservation plan, and should be promoted by all possible means. Negative impacts can be avoided by the working method and implementation toolbox set out in the proposals.

Between mile posts 96+800-96+900, the proposed common track will affect the western buffer zone of the Nagybók backwater, a natural acacia forest of natureness 1, which is part of the Danube-Drava National Park and a Natura 2000 Special Bird Protection Area . In this section, there is no alternative to detour due to the proximity of residential houses, however, the installation would not have a high level of disturbance from a wildlife conservation point of view, which was also assessed during the surveys.

5.5.4. Impacts of the operation and management of the facility

The impact on wildlife will be significantly higher than before, due to the fact that the areas concerned are not used for this purpose. Both noise and air pollution will have an impact on organisms in adjacent habitats.

Once the motorway is built, there is a risk of being run over by a car, and the possibility of running over protected and highly protected species. The possibility of running over protected animals is a potential hazard against which limited precautions can be taken. The area most at risk in this respect is the Drava and the surrounding semi-natural forests and grasslands. There are several known sections along the entire stretch of the planned route where this would be a priority if implemented, and where mass run overs could be expected in the future. The installation of anti-impact devices is proposed for these sections. Running over could occur at any time along the entire section affected by the construction on an occasional basis, affecting a small number of protected species.

In case of this project, there is a cross-border impact, as the planned motorway will cross the Drava River into neighbouring Croatia.

The new outdoor lights in the area of the nationally protected Danube-Drava National Park and its 100 m surroundings (between mile post 99+200 and the national border for Variant No. 7, between mile post 97+600 and the national border for Variant No. 3, and between mile post 96+600-97+300 sections in case of the common track) may affect the activity of protected insects and butterflies in the protected area. Insects flying to the light may be ecologically trapped by the light sources and may be more likely to be hit by them. To avoid this, and to

reduce the impact, new luminaires should be designed as described in the Recommendations chapter.

5.5.5. Proposed protection measures

It is recommended that any de-vegetation , tree felling or excavation work should be carried out before or after the breeding of protected birds and protected animals nesting on the ground, to prevent possible mortality. The recommended period for de-vegetation and foundation excavations is 1 October to 1 March. In addition, tree felling between 1 October and 1 March should be carried out with the involvement of the National Park Authority or a conservation expert for older trees which may have wintering animals such as small mammals or bats in their burrows or under their bark, and older trees should be assessed for these species before felling. In case of tree felling between 1 March and 1 October, the contractor's wildlife specialist and a representative of the National Park Authority shall jointly visit the areas where the trees would be felled and check for nesting or other protected species in the trees to be felled before felling.

Within the nationally protected area of the Danube-Drava National Park and within 100 m of it (between mile post 99+200 and the national border in case of variant No. 7 and between 97+600 and the national border in case of variant No. 3, between mile post 96+600 and 97+300 sections for the common track), as a natural habitat for protected insects and butterflies, new outdoor lighting in the vicinity of the tracks, detours and junctions, and branches may have an impact on the activity of protected insects and butterflies in the protected area. Insects flying to the light may be ecologically trapped by the light sources and may be more likely to be run over. To avoid this, and to reduce the impact, new outdoor lighting should meet the following criteria: it should be designed to be low-lighting for insects and bats; it should not emit light in the direction of the Danube-Drava National Park, and should be fitted with shading hoods in that direction; it should provide the minimum possible illumination (the minimum required by law).

It is forbidden to construct depots or material extraction sites outside the expropriation boundary in the nationally protected Natura 2000 habitats of ex lege protected marsh classification along the track (between mile post 99+200 and the national border on both sides in case of variant No. 7, between mile post 97+800 and the national border on both sides in case of variant No. 3, between mile posts 96+800-97+200 on the eastern side in case of the common route).

For bridge construction, it is currently not known exactly what technology will be used (only variants are known). If the track is to be built on an embankment, it is recommended to design the embankment crown in the smallest possible width of the available technologies in the core areas of the national park and Natura 2000 habitats. In case of Track No. 3, if the track is carried on a bridge structure, the area between the piers under the roadway should be rehabilitated by planting vegetation under the roadway after construction.

In the areas affected by the works, the disturbed surfaces in the sections indicated in the previous paragraph shall be rehabilitated after the completion of the works to prevent negative impacts caused by invasive plant species. Native, landscape-specific plant species approved by the Danube-Drava NPD may be used in these sections, and invasive plants may not be planted. Plants recommended for planting may include lime, ash, elm and poplar species in woody vegetation and grass seed mixes obtained from the National Park Authority (or from a source of supply specified by them) in the case of treeless vegetation. The planting plan must be agreed in advance with the Danube-Drava National Park Directorate and planting may only be carried out in accordance with the plan approved by them in areas belonging to a national park or classified as Natura 2000.

The habitat of thousands of hectares of protected plants in the immediate area of the works will be lost, so it will be necessary to relocate these plants before the commencement of the works . In the year of construction, in the light of the final design plans, it will be necessary to reassess

the location of the protected plants (including the temporary occupation of the area required for the construction of the bridge and the organisation roads to reach it) and, in the light of this, and after prior consultation with the Danube-Drava National Park Directorate, to plan the necessary transplanting of the protected plants. The protected plant transplantation plan shall include the methodology for the transplantation and shall be submitted to the nature conservation authority for approval. Transplanting of grasses is not an variant due to the forest vegetation and the large roots , only transplanting of individual specimens is expected to be feasible. This is not feasible for the 10,000 specimens of protected plants known to be present in case of the eastern track alternative No.3, which is one of the major reasons why this track alternative is not proposed for implementation.

In case of Track No. 7, in order to reduce the impact on wildlife, the possibility of shifting the route further west to reach the banks of the Drava (between mile post 99+100 and the border) was considered during the design phase, but only to the extent possible under the current track , given the geometry of the road, the significant additional cost of additional areas to be affected and the extent of additional intervention and destruction that would be required.

If the eastern track No. 3 is selected for further design and then construction, we consider that the road should be bridged over the most protected habitats, due to the impact on tens of thousands of protected plants and hundreds of protected animals, which means a more extensive use of the bridge piers of the Drava crossing in order to protect a significant part of the protected natural values and to maintain the future permeability of the nationally protected and Natura 2000 area. The use of a bridge instead of an embankment should be considered for the eastern track No. 3 between mile post 98+350 and the national border. When routing the highway at height, it is advisable to route the structure above the existing woody vegetation along the Drava, so that protected and highly protected species can pass underneath without hindrance. At mile post 98+350, there is a natural gradient, which is the natural terrain levelling of the Drava floodplain, and this is marked as the starting point of the bridge track.

In case of the bridge over the motorway over the Drava and, in the case of Track No. 3, the preceding track over a nationally protected area, the nature of the river and its airspace as a migration route and feeding area (and as a major ecological corridor) and the protection of the highly protected natural values (e.g. pond bat, Barbastrelle, little egret, night heron) that have been shown to use the area justify the construction of a bird protection wall on both sides of the motorway. For Variant No. 7, it is proposed to construct this between mile post 99+100 and the national border (above the Drava and its floodplain), and for Variant No. 3 between mile post 97+700 and the national border.

For each of the above sections, we consider it appropriate to build a bird protection wall at least as high as the height of the trucks on both sides of the motorway . Apart from its protective effect against noise and light pollution, its most important function will be to prevent the running over of protected and endangered species that breed, migrate and feed in the airspace of the Drava and its floodplain by diverting them away from traffic.

In case of the implementation of the western alternative No. 7, we consider the implementation of an ecological crossing at the crossing of the Zimóna stream between mile posts 97+550-97+600 to be justified. The crossing of the watercourse should be carried out in such a way that the watercourse is not subject to any negative impact, but preserves its current function as a habitat and ecological corridor in order to protect the protected species that use the habitat. A "bridge" should be built across the watercourse without affecting it.

If a new road bridge is built, its coastal part should be designed in a bat-friendly way, allowing bats (lake bats, common noctule, soprano pipistrelle) to roost, thus compensating for the long-term loss of shelter (forest areas!). The design of suitable roosting sites for bats should be agreed

with the Danube-Drava National Park Directorate during the planning stage, and the construction should be carried out on the basis of their recommendations.

In the immediate vicinity of the bridge piers of track No. 7, there are several microhabitats with soft sediments in which young individuals (larvae) of the highly protected Ukrainian brook lamprey develop for years, so a possible removal of soft sediments may cause their loss. . Electrofishing of these sections is recommended immediately prior to such interventions (up to 2 weeks before soft sediment removal). Relocation of larvae to a lower section of the Drava is justified in such cases.

In Natura 2000 areas (mainly grassland and wetlands), no depots, material extraction sites, machinery or new organisational paths may be established.

Transport and handling of materials can only take place on existing roads, agricultural roads or existing organisational roads, sites and depots, no new tracks can be established in Natura 2000 areas.

Afforestation (if any) should be limited to native tree species appropriate to the site, and should be carried out on the section crossing the Natura 2000 site. The use of invasive tree species for afforestation is prohibited.

Eradication of woody vegetation may only take place outside the growing season along the entire stretch of the truck affected by the development (between 1 October and 1 March).

If any work requires the use of a Natura 2000 area, the planned location of the work should be agreed in advance with the Danube-Drava NPD, and the needs expressed by them should be taken into account.

5.5.6. Monitoring

Conservation monitoring is proposed. It is recommended that the effectiveness of the proposed measures be monitored for at least 3 years after the construction of the road and after its operation. This monitoring study should include an assessment of the effectiveness of the proposed ecological crossings and the effectiveness of the proposed bird protection walls. If any of the structures are not having the desired effect, then future proposals should be made and implemented to either rebuild the structures or to find ways to eliminate the negative effects. The methodology for the monitoring studies should be developed in the light of future requirements of the nature conservation authority and the monitoring plan should be agreed with the authority prior to the implementation of the monitoring studies.

5.6. LANDSCAPE CONSERVATION

5.6.1. Area of influence

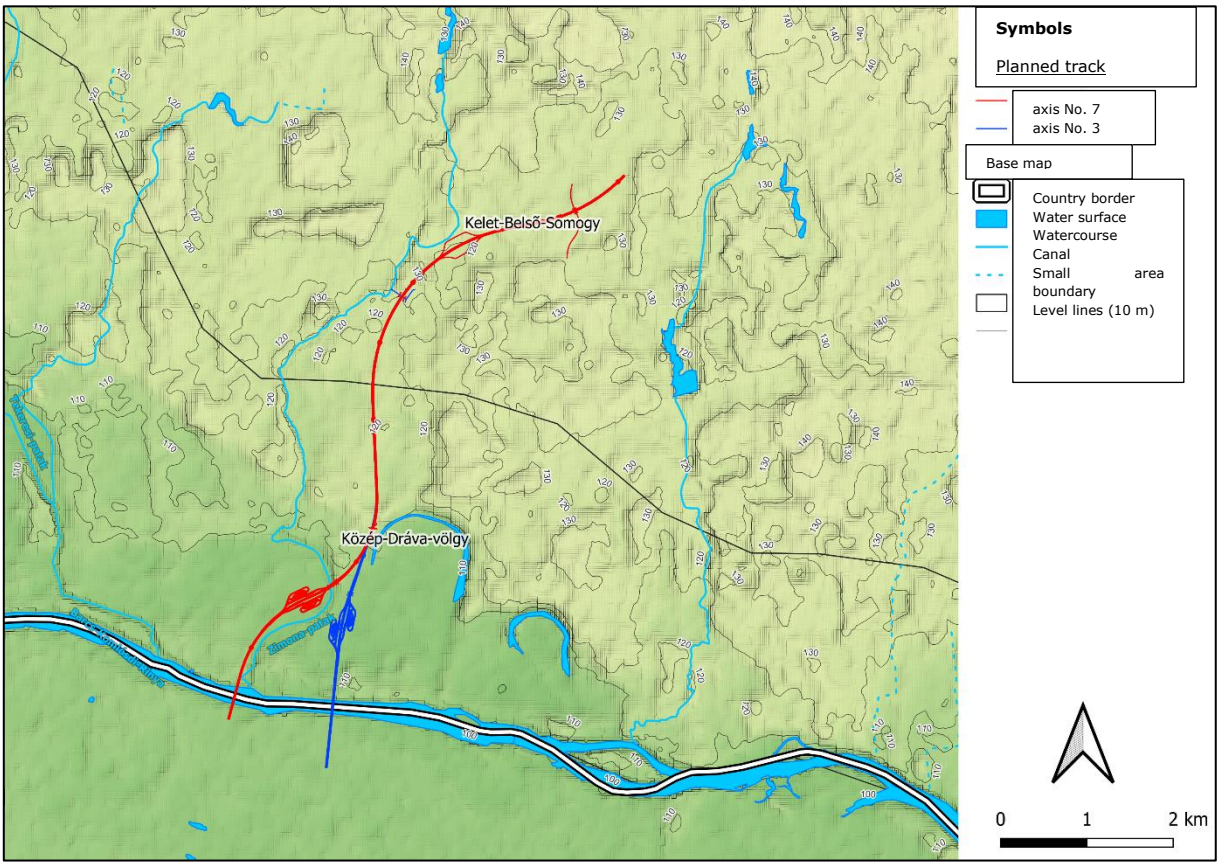
In terms of landscape conservation , the immediate **area of influence is the** same as the area of actual use. The indirect area of influence is the area from which the proposed track is visible, together with its associated facilities.

5.6.2. Current status

Landscape features

The planned investment is located in the Central Inner-Somogy region of the Transdanubian Hills, and within it in the Eastern-Upper Somogy and Central-Drava Valley sub-regions.

The planned bypass will affect the municipality of Barcs, both inland and outland, and will also cross the border into the Croatian municipalities of Terezino Polje and Katinka and Veliko Polje (which are administratively part of Lukač).



5.6.1: Topography of the area surrounding the planned intervention

Landscape character, landscape structure

The planning area is currently used for agricultural, forestry, urban and water management land uses. The track approaches non-irrigated cropland, pasture, primarily agricultural areas with significant natural formations, and industrial areas.

The dominant elements of the landscape structure are the Natura 2000 sites of the Drava River, the Central Drava (HUDD20056) and the Western Drava (HUDD10002).

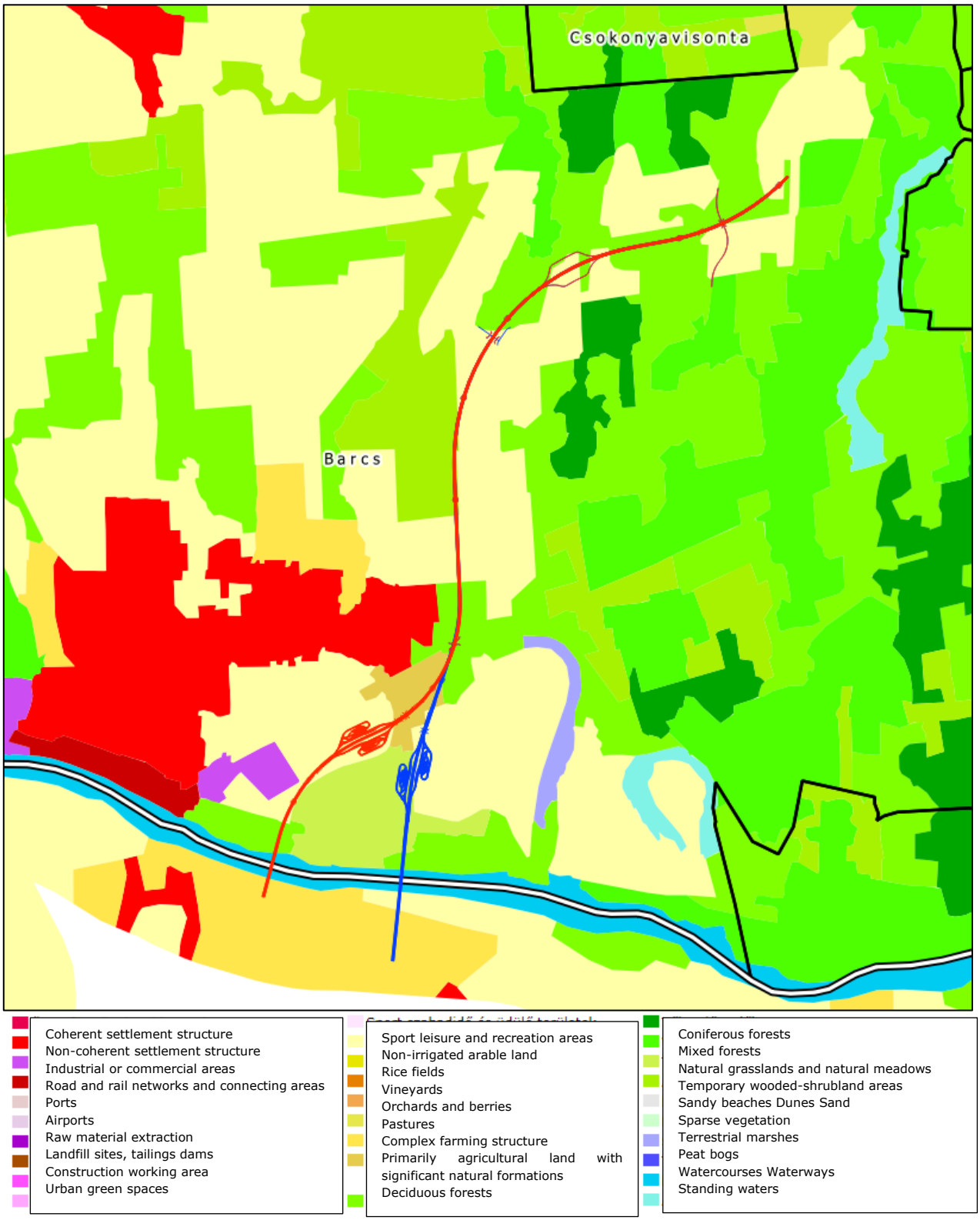
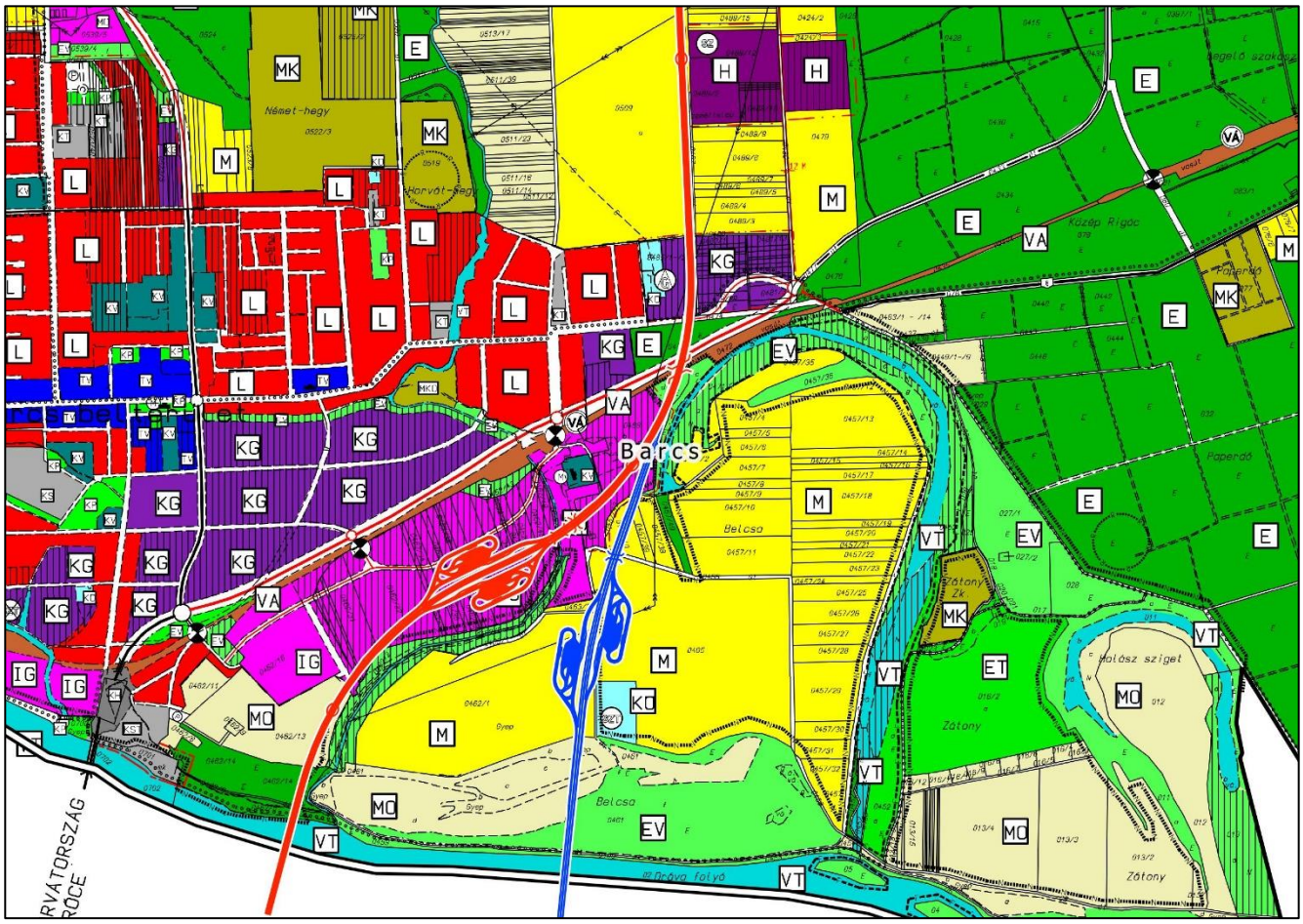


Figure 5.6.2 : Current land cover and land use based on CORINE
(Source: http://gis.teir.hu/teirgis_corine_2006_2012/)

According to the town structure plan of Barcs, the planned track is located in an agricultural area, an existing landfill area, a planned commercial area, a forest area, a protection area, an agricultural plant area, a planned industrial area, a planned protection area, a utility area, an agricultural area that cannot be developed and other existing water management areas.



L	Residential area planned
L	Residential area existing
TV	Settlement centre mixed area
TV	Settlement centre mixed area planned
KV	Central mixed area
KV	Central mixed area planned
KT	Special area, cemetery
KT	Special area, cemetery extension
KS KST	Special area sports area beach area
VA	Railway area
KG	Commercial economic area existing
KG	Commercial economic area planned
IG	Industrial economic area existing
IG	Industrial economic area planned
VT	Other water management area existing
VT	Other water management area planned

MA	Agricultural livestock area existing
MU	Agricultural livestock area planned
MO	Agricultural factory area
E	Forest land
ET	Forest land for tourism
EV	Forest land protection forest
EV	Forest land protection forest planned
M	Agricultural land
MK	Agricultural garden land
MKO	Agricultural garden land not buildable
MO	Agricultural land not buildable
KH	Special area, border crossing
KP	Public park
KO	Public utility area
B	Mining area
H	Waste storage area existing
H	Waste storage area extension

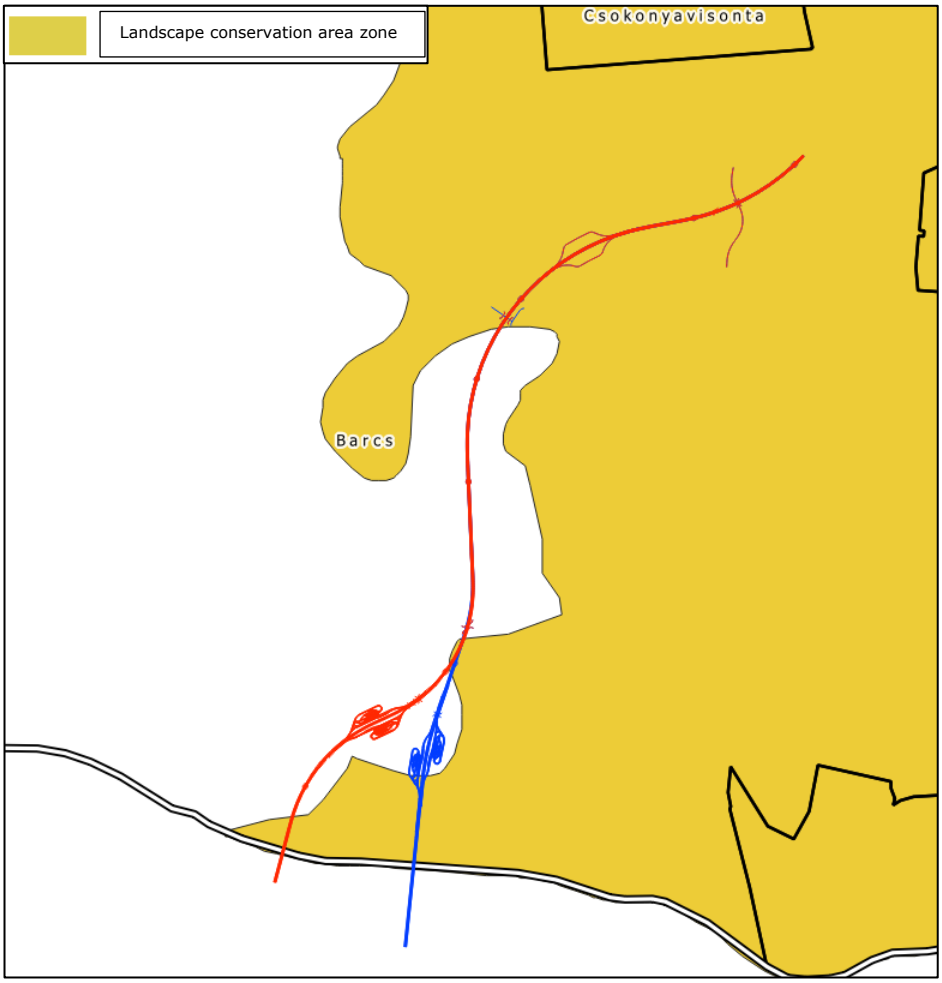
5.6.2: Settlement structure plan of Barcs, cut-out

The planned forest areas affected by the proposed track are detailed in chapter 2.3.3.

Landscape characterisation

According to the Annex to Decree No. 9/2019 (VI. 14.) of the Ministry of Agriculture and Forestry of the Republic of Hungary on the supplementary regulation of the preparation and application of spatial planning plans, the track of the planned expressway affects the zone of the landscape protection area.

In the zone of the landscape protection area, changes of cultivation and other land use are allowed only for the purpose of enhancing the production and landscape structure in accordance with traditional landscape use and the specific landscape character, as well as for the construction of public utilities and roads, and the natural topography and visibility of the established geomorphological forms are preserved. The siting of new buildings or structures may be integrated into the landscape, while preserving the historic landscape structure, landscape and scenic values and individual landscape values, enhancing landscape character and following local architectural traditions.



5.6.3: Landscape conservation area affected

(Source: Decree No. 9/2019 (VI. 14. of the Minister in Charge of the Prime Minister's Office)

The planned intervention starts with a 0.50% slope at the beginning of the section and runs close to the ground level with an embankment height of around 1 m. The track continues along a high embankment section, approaching 10 m in height in places. Thereafter the track runs in a notch, the depth of the notch varying, typically between 5 and 6 m. After the notch section, the planned length section continues in an embankment and ends at the end of the planning section, crossing the Drava riverbed.

Landscape values

The core area of the Danube-Drava National Park, the HUDD10002 West-Drava KMT, the HUDD20056 Central-Drava KJTT, the core area of the national Ecological Network, the buffer area and the transition zone of the Mura-Drava-Danube UNESCO Biosphere Reserve (MAB) are highlighted as valuable landscape elements or groups of elements in the immediate vicinity of the planned road development.

In addition to these, they can be considered as valuable and outstanding landscape elements or complexes of elements:

- the Drava and its backwaters,
- the wooded, forested areas surrounding the Drava,
- the allies .

Natural features, anthropogenic geological features or built monuments that are mostly found in the countryside and are not under any national or local protection, but whose conservation may be important to the local community, are considered to be of unique landscape value. Examples of such assets include stone crosses, draw-wells, water mills, sacral and historical monuments, boundary stones, stone bridges, legacy trees, allies , etc.

According to the OKIR database, the route of the proposed road does not affect any specific landscape values.

5.6.3. Landscape assessment

Sensitive areas from landscape conservation view

The areas considered sensitive for landscape conservation for this project are:

- inhabited areas,
- ecologically valuable areas,
- the landscape conservation area zone.

Land use conflicts

Various conflicts and problems may arise during the implementation of the planned motorway. The most important of these are:

- the planned road affects a Natura 2000 site,
- the planned road affects forested areas,
- the planned road affects the landscape conservation area,
- the negative landscape aesthetic impact of the planned motorway.

5.6.4. Construction and impacts of the facility

Expected changes in landscape use

The change in landscape use is mainly in the areas of permanent use: the loss of former land uses (arable, forest, pasture) and semi-natural areas and the development of transport areas in their place. The proposed development will not significantly change the use of the adjacent land, but the commercial, economic and service potential of the roadside areas may be improved by improved accessibility.

The most obvious changes to the landscape associated with the project are the complete loss of existing vegetation along the track at the proposed crown width; the partial or complete loss of agricultural land or forest areas directly affected by the track; the construction of a new roadway; the removal of existing dirt roads and the construction of new ones; and the construction of underpasses and overpasses.

The planned road and its associated facilities (e.g. junctions) will appear as a new linear landscape element of artificial origin in the landscape structure. In the longer term, this is expected to result in minor changes to the landscape structure.

The road development will transform the former connectivity of the area. The road network will be the main change, but the changes may also affect ecological connections. Changes in access to the cut-off areas may result in a reduction in farming intensity in some areas, while in other areas farming may increase and previously abandoned land may be recultivated.

Changes in biologically active surfaces

The current biologically active surfaces in the planning area are typically ploughland, woodland and grassland, parts of which will be fragmented or lost as a result of the land-use corridor of the proposed motorway. The planned road will also affect forest areas that have been planted and will therefore require the withdrawal from forestry. This is expected to result in a reduction of biologically active surfaces in the planning area. However, in staging areas along temporary transport routes, this impact is considered temporary. It is expected that tree felling and brush clearance will be required during road construction, the extent of which is not known at this design stage.

Changes in the landscape

The view of the earthworks, roadway and interchanges that will be built as part of the planned project will be a dominant feature in the landscape. New structures and overpasses are also planned. Roadside drainage ditches will have a negligible impact on the landscape. However, the road on the embankment is expected to be relatively visible.

Intersecting facilities in case of track No. 3:

- mile post 91+700 No 6623 municipal road - underpass
- mile post 94+007 No. F940K crossing dirt road - overpass
- mile post 96+465 No 6 main road - underpass
- mile post 96+770 No 60 railway line - underpass
- mile post 97+571 No. F975K crossing dirt road - underpass
- mile post 99+344 River Drava - overpass

Intersecting facilities in case of track No. 7 :

- mile post 91+700 No. 6623 municipal road - underpass
- mile post 94+007 No. F940K crossing dirt road - overpass
- mile post 96+646 No. 6 main road - underpass
- mile post 96+765 No. 60 railway line - underpass
- mile post 97+610 Zimóna stream crossing - overpass
- mile post 97+534 No. F975K crossing dirt road - underpass
- mile post 99+571 River Drava - overpass

Construction work will be visible from a distance in some sections where the road is being built in open, treeless agricultural land. In these locations, the visibility of construction excavation works and transport and dumping will be several hundred metres due to the reduced clearance.

In the immediate area of the project, where the road body and other associated structures (drainage ditches, culverts, embankments, etc.) will be constructed, the soil and vegetation will be removed during landscaping. A landscaped ground surface without vegetation and the visual impact of soil and building material deposits is clearly unfavourable. There will also be an adverse landscape impact from construction and transport vehicles, transport vehicles and staging facilities.

The planned investment will be visible from the direction of Barcs in residential areas.

Impacts of related facilities

From a landscape perspective, the required utility replacement will have an impact through land reservation of the new track sections, which is similar to the impact of road construction, but will result in additional land use.

5.6.5. Expected impacts during operation and management

The impact of the operation affects the landscape as a complex entity, through changes in the various environmental elements.

The construction of track facilities , such as roads, by destroying the surface and disturbing semi-natural vegetation, allows invasive species to enter the more natural habitats, thus making them more weeded and acting as a negative ecological corridor. During the operational phase, this can be avoided by managing the vegetation (eradication of any invasive species).

During the regular maintenance work, the structure gauge , the gullies and the side ditches are cleaned by mechanical or chemical means to remove any plants that have established there. Chemical residues can spread to adjacent areas if not used properly. Winter salting can have a negative impact on the health of roadside vegetation.

The expected disturbances due to the level of traffic during road operation may lead to an increase in the ecological barrier effect. The ecological stability of valuable habitats in the immediate vicinity of the track may be weakened.

5.6.6. Effects of the abandonment of the facility

The abandonment of the planned road facilities and activities will not in itself result in a positive change in the landscape: this can only be achieved by demolishing the built elements and recultivating the site. The maintenance, renovation and reconstruction of some of the built elements can be expected in the coming decades, but the complete abandonment of the facility is unlikely.

5.6.7. Recommended protection measures

Proper design of departure routes

The mobilisation routes should be designed in such a way that sensitive areas identified for landscape conservation (residential areas, areas of ecological value, landscape conservation area) are not permanently (substantially) and irreversibly damaged. It is also recommended that migration routes avoid habitats, forest and grassland areas that can be identified along the existing ecological network. Wherever possible, only existing paved roads and unpaved dirt roads should be used for transport during construction works. Where possible, older woody vegetation should be preserved. In the Natura 2000 area concerned and in the affected elements of the ecological network (mile posts 96+750-97+100, 97+750-98+900), the construction of dumps and material extraction areas is prohibited and their use during the works is to be kept to a minimum.

Rehabilitation

Efforts should be made to minimise the proportion of surfaces that become temporarily or permanently biologically inert.

The entire length of the planned track will be subject to rehabilitation of the remaining degraded surfaces. In addition, attention should be paid to the aftercare of the rehabilitated area and the vegetation (mainly manual eradication of weeds and invasive species) in these areas for 3-5 years after the landscaping and carrying out of the construction works.

In addition, the rehabilitation of the remaining degraded surfaces resulting from the construction of facilities necessary for the implementation of other activities related to the project (e.g. water management structures, utility replacements) should be ensured.

Priority stages for rehabilitation:

- sections within and bordering the Natura 2000 site (mile posts 96+750-97+100, 97+750-98+900),
- the relevant sections of the Ecological Network (mile posts 96+750-97+100, 97+750-98+900),
- sections within the landscape protection area (mile posts 91+000-94+100, 96+850-97+200, 98+100-98+900).

In case of Track No. 3, if a section of the track is carried on a bridge structure, the area between the piers under the roadway will be rehabilitated by planting treeless vegetation between the piers after construction.

Integration of slope areas into the landscape

The slope areas created by embankments/cuts of more than 5 m in height deserve special attention in terms of landscape integration, as they are subject to significant, permanent surface disturbance, which also has a long-term impact on the landscape. The best way to integrate high slopes into the landscape is to establish appropriate planting, which will also help to buffer the slopes .

Forms of planting

From a landscape point of view, the integration of the expressway and its associated facilities into the landscape can be solved by the proposed track and the proposed planting. The replacement of woody vegetation that will be cut down due to the construction of the road should be ensured, providing visual guidance that will also contribute to the safe movement of road users. In addition to landscape aesthetics, planting also helps to prevent harmful movements of air, water, snow and soil, and to reduce traffic pollution (e.g. by filtering dust and reducing air pollution by adsorbing CO, CO_2 , O_3).

To ensure the protection of the slopes against erosion, the use of engineering biology methods - mainly grassing and shrub planting - is recommended along the entire length of the planned track.

The plants used for planting must be resistant to the effects of transport, require little maintenance, be suited to the place of production and, as far as possible, be native species. In flat terrain, the planting of woody plants within 3 to 5 metres of the roadway to be constructed should be strongly discouraged for traffic safety reasons. Invasive species (e.g. acacia, green maple, etc.) should not be planted. In addition, from an agricultural point of view, host plants of pests and pathogens that pose a risk to the crop (e.g. plum trees, wild pears) should be particularly avoided.

The plants recommended for planting are lime, ash, elm and poplar species, as well as grass seed mixes obtained from the National Park Directorate (or from a source specified by them).

During the further planning of the planned investment, in case of later planning phases, such as the plantation section of the permit plan, it is necessary to separately request the preliminary nature conservation opinion of the competent Danube-Drava National Park Directorate on the species list to be used for plantation.

In addition to the above-mentioned planting methods, groups of signalling trees can be installed next to the exit branches of junctions, which will be prominent and will indicate traffic changes on the road section.

Trees that have been pre-grown and nursed at least twice should be planted during the road afforestation.

5.7. PROTECTION OF THE BUILT ENVIRONMENT AND CULTURAL HERITAGE

From the point of view of the built environment, **direct** impacts can be considered if the development of the road is likely to affect cultural heritage and archaeological sites along the track.

From the point of view of urban landscape protection, the **indirect** impact area is the area from which the planned investment will be perceived as a change from the settlements - this distance cannot be precisely defined, it varies in points.

5.7.1. Current status

On 30 November 2017, the M60 expressway from mile post 31+160 km (area of Pécs) to mile post 95+613 (No. 6623 municipal road and junction with main road 6) was granted an environmental permit under file number PE/KTF/4213-114/2017. The previous findings for this section remain unchanged. In this chapter, the section of the planned track variation between mile post 91+000 section and the national border is considered.

The planned bypass will run within the administrative boundary of Barcs, and will also cross the border into the Croatian municipalities of Terezino Polje and Katinka and Veliko Polje (which are administratively part of Lukač).

Municipal inland areas are affected by track No. 3 in the vicinity of mile post 97+800 , and by track No. 7 between mile posts 97+510-97+610 and 98+625-98+685 .

According to the Spatial Planning Plan of Somogy County, the planned changes do not affect the World Heritage and World Heritage Nominee area.

There are 2 protected architectural assets within 250 m of the proposed track variations, which are not affected by the variations. No monuments or historic environment will be affected by the proposed investment.

The Hungarian National Museum prepared the preparatory work part of the Preliminary Archaeological Documentation (ERD-I.) for the heritage protection assessment of the project in 2022 on behalf of Pannonway Építő Ltd. for the preparation of the "Study plan, environmental impact assessment and EIA for the preparation of the M60 expressway for the Barcs border intersection and the connection to the Drava Bridge".

Of the 2 archaeological sites identified in the total study area, 1 site is affected by the area of the complex control station of the Track variant no. 7. In addition, an area of archaeological interest - "RÉ 1" has been identified between mile posts 98+850 - 99+000of the No. 7 variant.

5.7.2. Impacts of construction, operation

The bypass sections of the planned road will reduce traffic on inland roads, thus improving the quality of life of the inhabitants of the settlements and helping to preserve the integrity of buildings and built environment.

Construction will have a significant impact on the built environment if it is directly adjacent to an inhabited area or if transport routes pass through inhabited areas.

The construction and operation of the proposed project will not have a direct impact on protected architectural values, but will directly affect an archaeological site and a site of archaeological interest. These sites could be affected by the proposed project.

Potential utility replacements will have no impact on the built environment.

5.7.3. Recommended protection measures

The recommendations of ERD-I should also be followed in further planning and implementation. Further heritage proposals may be subject to change in the light of the construction plans.

During the archaeological heritage assessment, no heritage features to be preserved in situ were identified anywhere along the proposed track , which must be avoided by excavation work in accordance with subsection (3) section 21 of the Government Regulation.

The archaeological sites are under general protection under the Nature Conservation Act According to subsection (2) section 19 of the Archaeological Heritage Act, elements of the archaeological heritage may only be moved from their original position within the framework of archaeological excavation.

Due to the methodological specificities of the surface survey, it must be taken into account that the identified sites are probably larger than they could be measured.

The proposed heritage evaluation for the site *Barcs - Belcsapuszta (19593)* and the designated area of archaeological interest **is a geophysical survey and trial excavation**.

The Hungarian National Museum is entitled to carry out trial excavations and geophysical research related to the Preliminary Archaeological Documentation, pursuant to subsection (3) section 23/C of the Act and subsection (3) section 3 of the Government Decree.

The organisation should pay particular attention to organising work in a way that minimises disruption to inhabited areas. In order to protect architectural and monumental heritage, construction should avoid inhabited areas when selecting transport routes that have the greatest impact on the built environment. Access to residential areas during construction shall be ensured when building sections of the road in the inhabited area.

If archaeological finds are discovered during excavation work, the relevant provisions of the Heritage Protection Act must be followed and the authority must be notified immediately through the notary.

5.8. NOISE PROTECTION

5.8.1. Description of the planning area environment

The planning area is located in Somogy County, east of the town of Barcs.

The main infrastructure network in the area is the main road 6 and the main road 68. In mile post 258+726 of the main road 6 there is a roundabout junction with the no. 6623 municipal road (mile post 25+916) and Darányi Street. The roundabout is located outside the centre of Barcs, to the east of it, on the north side of the railway line No 60. The two alternatives studied are classified as crossing economic, agricultural and forest areas.

The planned track variants No. 3 and No. 7 are identical from the beginning of the planning phase up to mile post 97+00, and there is no difference in traffic between the two tracks , so they were only examined separately from mile post 97+00.

In the immediate area of influence

In the vicinity of main road 6, there are commercial economic and rural inhabited areas on the north side and economic and forest areas on the south side. Residential buildings are typically located 15 to 20 meters away.

In the vicinity of Darányi Street there are rural inhabited areas. Residential buildings are typically located within 50 metres.

Road No. 6623 typically passes through agricultural and forested areas. Residential buildings are typically located more than 600 metres away.

In the immediate area of influence

variant No. 3

On both sides of the proposed M60 expressway, between mile posts 91+000 - 96+200 and 96+600 - 98+800, the area is typically classified as agricultural and forest land, with no buildings to be protected within 172 metres.

On both sides of the proposed M60 express way, between mile posts 96+200 - 96+600 km, a commercial economic area is planned, with no buildings to be protected within 172 metres.

variant No. 7

On both sides of the proposed M60 expressway, between mile posts 91+000 - 96+200 and 96+600 - 99+300, the area is typically classified as agricultural and forest land, with no buildings to be protected within 170 metres.

On both sides of the proposed M60 express way, between mile posts 96+200 - 96+600 km, a commercial economic area is planned, with no buildings to be protected within 172 metres.

The planning area and the nearest facilities to be protected according to Annex 3 of Joint Decree No. 27/2008 (XII. 3.) of the Ministry of Agriculture, Forestry, Environment and Water Management (hereinafter: ZR)

There are no buildings with protected functions to be installed in the planning area within the scope of this project.

Roads affected by the planned track:

- No. 6623 municipal road
- Highway 6
- Darányi Street

Design speed:

- In inner areas: 50 km/h,
- In outlying areas: 110/70 km/h.

5.8.2. Test methods, main legislation used

The current state was determined by measurement and calculation, the background noise exposure by measurement, and the noise exposure of the future state by calculation.

The relevant noise legislation does not require noise measurements to be carried out to determine noise exposure, but gives the possibility to determine noise exposure either by measurement or by calculation. Noise measurements involve an on-site investigation using a noise level meter, while calculations now typically involve the determination of noise exposure using a computer program (based on appropriate input data).

Measurement method

The measurements were used to "calibrate" the calculation. The measurement data thus available, given their abundance, their location in the impact area and their height, can be considered complete and suitable for the calculations of the noise mapping software, so that they provide valuable, validated results.

Noise measurements were carried out in accordance with Decree No. 93/2007 (XII. 18.) of the Ministry of Administrative Affairs.

Calculation method

Traffic noise calculations and propagation were calculated using the German SoundPlan 8.2 program. The SoundPLAN 8.2 program contains the Hungarian calculation specifications according to the Ministry of Environment Protection and Water Management decree No. 93/2007 (XII. 18.). The program also allows to take into account e.g. the shadowing effect of the building parts on each other or the effect of the slopes . The program not only traces 1-1 section, but also the whole section in a radial beam. The program calculates the noise emission from the traffic table data provided and determines the noise exposure for selected points of interest in the area, even for each floor of each building, based on a 3D site plan of the surrounding area and the planned project.

For buildings, the expected noise exposure was defined as the distance 2 metres in front of the facade. In the noise map figures , the expected noise exposure was depicted at a height of +1.5 m above ground level, which generally corresponds to the centre line of the ground floor windows.

The expected daytime and night noise emissions for each road section were determined on the basis of the traffic volume (the Average Daily Traffic (ADT) and vehicle type distribution calculated for each road section), the daily traffic distribution and the speed of the vehicles according to the traffic category, as specified in Decree No. 93/2007 (XII. 18.) of the Ministry of Transport and Communications.

The current, reference and long-term traffic data (see Traffic Annex) were taken into account on the basis of the data provided by the Client.

The daily ratios were taken into account according to Table 3 of Annex 5 to Decree No. 93/2007 (XII. 18.) of the Ministry of Agriculture, Forestry, Environment and Water Management.

Times of day used for calculation: day (06-22 h), night (22-06 h).

Traffic: classified in vehicle acoustic classes I, II, III according to the average daily traffic (see Traffic Annex).

For asphalt pavements, category "B" has been applied for all sections of the planned roads in the long term according to Table 6 of Annex 5 of Decree No. 93/2007 (XII. 18) of the Ministry of Transport and Communications, assuming that the road operator will carry out maintenance activities from time to time, which will not result in a category "C" (or worse) condition.

For current and future conditions, a category "B" has been applied for the approach road sections.

Emission calculation: determined at the speed corresponding to the area (as indicated in the documentation) and calculated from the specified traffic to 7.5 m.

According to Annex 3 of Joint Decree No. 27/2008 (XII. 3.) of the Ministry of Transport, Building and Urban Affairs, the assessment level of noise exposure from traffic $L_{AM'kö}$ is determined in front of the facades of buildings to be protected according to the ZR, in the case of rural, farm and forest areas:

- noise from expressways and trunk roads on the national road network

  Day **$L_{AM'kö}$ = 65 dB**

  night **$L_{AM'kö}$ = 55 dB**

should not exceed.

The reference time is 16.00 p.m during the day and 20.00 at night.

Calculation methods, literature used

SoundPLAN 8.2 c. German graphical computer program

Applied standards, regulations:

- Government Decree No. 284/2007 (X. 29.)
- Decree No. 93/2007 (XII. 18.) of the Ministry of Finance
- Joint Decree No 27/2008 (XII. 3.) of the Ministry of Agriculture, Forestry, Environment and Water Management
- MSZ 18150/1-98 Environmental noise testing and assessment - standard
- No. e-UT 03.07.42 Technical Specification for Roads entitled Calculation of road traffic noise
- Government Decree No. 314/2005 (XII. 25.)

Lack of data, uncertainty

The *accuracy of noise and vibration calculations* is closely related to the following uncertainty factors.

- traffic forecast,
- obeying or enforcing the speed limit on the road (especially at night).
- noise emissions from vehicles,
- meteorological conditions,
- noise calculation standards in force,
- pavement condition, etc.

Based on the uncertainty of the traffic forecast, the accuracy of the noise calculation can be estimated at ±1-2 dB. The noise emission of vehicles will decrease in the long term, so that noise exposure will be 2-3 dB lower than the values calculated with the present standard in 15-20 years.

Uncertainty in the *database on which noise is calculated arises* from the uncertainty in the modelling of the social and economic processes on which the forecast is based. In addition to determining the volume of the processes, there are factors that depend on the size (small and large), activity and activity of the economic agents (enterprises). The latter data are the basis for the creation of a database on the distribution of vehicle type, where the uncertainty is mainly in the forecast of the type distribution of lorry traffic.

There may be uncertainty about the *construction date and the date of placing in service.*

5.8.3. Delimitation of the area of influence

From the point of view of noise protection, the part of the area affected by the planned facility (the study area) is considered to be

- the direct impact area in which the proposed facility will cause noise pollution or changes in noise exposure,
- the area of influence of the associated roads on which the vehicular traffic associated with the planned facility will cause an additional noise nuisance or a change in the noise exposure.

Noise levels in the immediate area of influence were investigated in the following situations:

- current state (2022)
- in the planned future state (2037)
- without realisation in the long term (2037)

Direct area of influence

The noise study was carried out for the facilities to be protected in the direct impact area in accordance with the provisions of Articles 5, 6 and 7 of Government Decree No. 284/2007 (X. 29.) on certain rules for protection against environmental noise and vibration.

The planning area is illustrated in Figure H0.

The current noise situation of the study area is determined by the noise pollution from the main road 6, the 6623 j. connection road, the railway line 60 and the surrounding side roads , as well as the sounds of nature.

In order to determine the boundary of the area of influence , it is necessary to consider the background pressures in the vicinity of the planning area. The study location was defined to characterise the background loading in the areas along the track.

The test results for determining the background load are shown in the table below.

Table 5.8.1: Background noise test

Measurement point	***location***	***L_{Aeq} day (dB)***	***L_{Aeq} night (dB)***
MP3	Barcs 3 Belcsapuszta lot no.. 2802/1	40,7	33,9
MP2	Barcs, 35 Ady Endre Street lot no.. 2425/2	42,6	34,9

From the results of the background noise calculation, it can be concluded that the noise exposure in the assumed area of influence of the environmental noise source, without the operation of the planned (tested) noise source, but corresponding to the type of source, is typically at least 10 dB below the limit value.

In accordance with the above, the direct exposure zone was set at 45 dB at night in accordance with point a) subsection (1) section 6 of Government Decree No. 284/2007 (X. 29.). The area of influence designated by the object delimitation was determined on the basis of the noise criterion that provides the highest delimitation.

The direct area of influence is shown in **Hiba! A hivatkozási forrás nem található.** Table 5.8.2.2 "Area of influence distance" data.

Table 5.8.2 : Data of indirect area of influence

TOWN / ROAD SECTION (SEGMENT)	***Perspective (2037)***		
3./7. Variant of the track	Noise exposure limit value/area of influence attainment distance (m)	Noise exposure limit/ delimitation of area of influence at night (dB)	Speed (km/h) car/lorry
Track - (end of planning phase - main road 6) OUTLYING AREA	26/120	55/45	110/70

TOWN / ROAD SECTION (SEGMENT)	Perspective (2037)		
Track - (end of planning phase - main road 6) INNER AREA (ONLY IN CASE OF VARIANT 7)	18/85	55/45	50/50
Track - (main road 6 - road 6623)	30/140	55/45	110/70
Track - (road No. 6623 - start of planning phase)	55/256	55/45	110/70

The environment of the direct area of influence and the installations to be protected are illustrated in Figures ZH1 to ZH4 of the Noise Protection Annex. ***Area of influence of related roads***

From a noise and vibration protection point of view, the part of the area of influence affected by the planned facility (study area) is considered to be the area of influence of the associated roads where the vehicular traffic associated with the planned facility will cause an additional noise impact or a change in noise exposure. Such road section in this case is the no. 6623 municipal road, main road No. 6, Crane Road.

Area of influence of construction transport

The following conclusions can be drawn regarding the noise protection area of influence of the construction transport as defined in section 7 of Government Decree No. 284/2007 and in the chapter on construction impacts of the assessment document:

The noise protection zone for construction transport extends to the material handling and asphalt mixing plants. In the vast majority of cases, transportation is located along the construction of roadway track no. 6623 municipal road, main road No. 6 and the Darányi Street .

Transport and haulage activities in the vicinity of material access roads are not expected to cause an incremental noise change of more than 3 dB, and therefore no transport-related area of influence can be delineated.

The transport route must be chosen by the contractor in such a way as to minimise road and other environmental damage.

5.8.4. Assessment of the current situation

Direct area of influence

The current noise situation in the study area is determined by the noise pollution from the main road No. 6, the no. 6623 connecting road, the railway line 60 and the surrounding side roads , as well as the sounds of nature.

Test points

The current noise immissions of the buildings to be protected in the planning area and its area of influence were determined on the basis of noise tests carried out on site and by calculation. The following representative test point was selected to illustrate the changes.

Measurement point:

- H-7570 Barcs, 13 Ady Endre Street 2 m in front of the facade of the residential building to be protected, at ground level in the direction of the planned M60 track.

Measurement results

The noise exposure measurements are summarised below:

Table 5.8.3: Current road noise exposure - direct impact area of influence, measurement

MEASURING POINT	L_{AM} [DB]	
	Day	night
Barcs 13 Ady Endre Street, lot no.: 2433/1	49,4	42,9

Evaluation of measurement results

The results presented in the table show that noise levels in the immediate vicinity of the planning area do not exceed the limit values during the day or at night.

Calculation results

The noise exposure in its current state is illustrated in Table 5.8.4.

Table 5.8.4: Current road noise exposure in the immediate area of influence

Test points	Level	Current noise exposure to LAM [dB]		Limit value [dB]		Exceedance rate [dB]	
		Day	night	Day	night	Day	night
MP1-Barcs 13 Ady Endre Street, lot no.: 2433/1	ground floor	49,9	43,4	65	55	-	-
Barcs 13/B Ady Endre Street lot no.: 2434	ground floor	50,1	43,7	65	55	-	-
	1st floor	50,7	44,2	65	55	-	-
Barcs 45 Drava Street lot no.: 0462/9	ground floor	34,8	28,2	65	55	-	-
Barcs 17/2 Ady Endre Street lot no.: 2436/2	ground floor	49,2	42,6	65	55	-	-
	1st floor	49,7	43,1	65	55	-	-

Comparing the current noise exposure, the calculated noise exposure values with the limit values according to the Joint Decree No. 27/2008 (XII. 3.) of the Ministry of Transport, Building and Urban Affairs, it can be concluded that the road noise exposure in the immediate impact area does not exceed the prescribed limit values, neither during the day nor at night.

Indirect area of influence

Table 5.8.5: Current road noise exposure status - indirect area of influence calculation

Test points	Level	Current noise exposure to LAM [dB]		Limit value [dB]		Exceedance rate [dB]	
		Day	night	Day	night	Day	night
Barcs, 1 Ady Endre Street lot	ground floor	49,1	42,8	65	55		

Test points	Level	Current noise exposure to LAM [dB]		Limit value [dB]		Exceedance rate [dB]	
no..: 2402	1st floor	49,7	43,4	65	55		
Barcs, 30 Klapka György Street lot no..: 2470/1		56,4	49,7	65	55		

5.8.5. The impact of construction

The sources of environmental noise pollution from construction works are:

- construction technology
- construction machinery
- loading operation.
- transport traffic.

Compliance with the immission values depends on

- the conditions on the site,
- the noise power level of the machinery and equipment required for the construction process,
- the area and time of operation of machinery and equipment,
- technological order, etc.

The tables below provide information on the conditions, technology and machinery to be used for construction in the direct area of influence. As the contractor is not yet known, no more precise technological and technical specifications than those given in the tables are available.

The noise emissions from the machinery and equipment used during construction and the environmental noise exposure from the construction work are estimated on the basis of literature data and noise measurements previously carried out.

The estimated duration of the overall construction is expected to be between 1 month and 1 year, with the estimated duration of each phase of construction considered from a noise point of view being 1 month or less. The main phases of the construction work involving noise: excavation, construction of the road structure.

Noise pollution is caused by the movement of construction, transport and loading machinery. Noise from construction machinery is likely to cause problems within 26 m of the planning area.

In the immediate vicinity of the proposed building there are agricultural, forest and agricultural areas.

No night work is foreseen.

The limits for the duration of construction during the above construction phases towards the areas to be protected are as follows:

- in rural residential areas:
  - For work of less than 1 month: **65/50** dB (**day/night**)
- central mixed area
  - For work periods of 1 month to 1 year: **65/50** dB (**day/night**)

Table 5.8.6: Noise level data for some construction machinery

Demolition works ∑=106,6 dB

Machine type	Quantity	Working time, day (h)	L_{AW} (dB)
Rotary excavator with demolition head	1	4	109
Front loader	1	3	99
Lorry	1	2	100,5

Earthworks (Complex rest) ∑=107,3 dB

Machine type	Quantity	Working time, day (h)	L_{AW} (dB)
Excavator with deep-digging attachment	1	8	95,4
Liebherr-541 front loader	1	8	99,6
Boxer 111 vibro cylinder	1	8	100,4
Tatra tipping lorry	1	8	104,8

Earthworks ∑=104,4 dB

Machine type	Quantity	Working time, day (h)	L_{AW} (dB)
Excavator with deep-digging attachment	1	7	95,4
Liebherr-541 front loader	1	7	99,6
Boxer 111 vibro cylinder	1	4	100,4
Tatra tipping lorry	1	3	104,8

Asphalt base layer construction $\sum L_{AW}$ =102,1 dB

Machine type	Quantity	Working time (h)	L_{AW} (dB)
Grader	1	5	100,5
Vibrating road roller	1	5	99
Lorry	1	3	100,5

Asphalt binding layer construction $\sum L_{AW}$ =104 dB

Machine type	Quantity	Working time (h)	L_{AW} (dB)
Finisher	1	5	104
Vibrating road roller	1	5	99
Emulsion sprayer	1	4	86
Lorry	1	3	100,5

Asphalt wear layer construction $\sum L_{AW}$ =104 dB

Machine type	Quantity	Working time (h)	L_{AW} (dB)
Finisher	1	5	104
Vibrating road roller	1	5	99
Emulsion sprayer	1	4	86
Lorry	1	3	100,5

Expected noise exposure levels in each of the areas to be protected:

Earthworks (Complex rest) ∑=107,3 dB

Environment of the building to be protected	Area classification	Distance (m)	Leq (dB)	Exceedance (dB)	Limit value (dB)
			Day	Day	Day
Variants No. 3 and No. 7:17/2 Ady Endre Street lot no.: 2436/2	Lf	172	51,6	-	65
Variant No. 3 complex rest area: Barcs 3 Belcsapuszta lot no. 2802/1	Kv	230	49,1	-	65
Variant No. 7 complex rest area: Barcs 3 Belcsapuszta lot no. 2802/1	Kv	170	51,7	-	65

Earthworks ∑LAW=104,4 dB

Environment of the building to be protected	Area classification	Distance (m)	Leq (dB)	Exceedance (dB)	Limit value (dB)
			Day	Day	Day
Variants No. 3 and No.7: 17/2 Ady Endre Street lot no.: 2436/2	Lf	172	48,7	-	65

Asphalt base layer construction $\sum L_{AW}$ =102,1 dB

Environment of the building to be protected	Area classification	Distance (m)	Leq (dB)	Exceedance (dB)	Limit value (dB)
			Day	Day	Day
Variants No. 3 and No. 7: 17/2 Ady Endre Street lot no.: 2436/2	Lf	172	46,4	-	65

Asphalt wear layer and binding layer construction $\sum L_{AW}$ =104,0 dB

Environment of the building to be protected	Area classification	Distance (m)	Leq (dB)	Exceedance (dB)	Limit value (dB)
			Day	Day	Day
Variants No. 3 and No. 7: 17/2 Ady Endre Street lot no.: 2436/2	Lf	172	48,3	-	65

Protective distances for work processes

Work processes	*Protective distance [m]*
	65 dB
Demolition works	34
Earthworks (road construction)	26
Earthworks (Complex rest area)	36
Asphalt base layer construction	20
Asphalt wear layer and binding layer construction	25

No night work is planned.

Since the contractor, and therefore the exact technology, machinery, etc., is not yet known, the construction work can be estimated, taking into account the distance, that, if the estimated operational and noise parameters given above are maintained, **noise exposure above the limit value is not expected** due to the long distance to the nearest protected areas.

Once the currently indicative construction data have been refined and the calculations have been refined, the noise impact of the construction can be assessed and any necessary noise mitigation measures can be identified.

The following variants are available to reduce construction noise:

- use of machines and equipment with lower noise performance,
- limiting the propagation of the noise generated,
- transport routes should be designed to use the existing highway and side road network and minimise the impact on an already uncongested environment,
- the choice of low-noise construction technologies and procedures.

Transport

In addition to the above, noise from construction will also be generated by the passage of material transport vehicles. In the majority of cases, the transport will be on the truck of the road being built. road No. 6623, main road No.6.

The different transport activities (fill, pavement material) take place at different stages of the construction process, so only one type of transport activity has a simultaneous impact.

When organising the transport, it is possible to organise the transport of the material extracted from the felling as a return transport, so that the transport of the latter does not create a separate environmental burden.

Previous experience has shown that depending on the construction schedule, the planning area will receive around 2-3 lorries/hour of transport.

It can also be concluded that the transport of materials generally takes place on existing, already busy road sections, and with proper organisation, avoiding night transport, no significant increase in noise is expected.

Transport and haulage activities in the vicinity of material access roads are not expected to cause an incremental noise change of more than 3 dB, and therefore no transport-related impact area can be delineated.

Once the currently indicative construction data have been refined and the calculations have been refined, the noise impact of the construction can be assessed and any necessary noise mitigation measures can be identified.

5.8.6. Expected impacts without operation of the facility

The expected noise exposure values for the reference condition were calculated for the condition without the planned road, based on traffic data for the prospective year 2037.

Direct area of influence

The direct area of influence is defined as the residential areas and residential buildings to be protected in the vicinity of the planned road.

Assessment of the calculated noise impact on the direct area of influence:

Table 5.8.7: Road noise exposure status without perspective in the direct area of influence

Test points	*Level*	*Distance without LAM noise exposure [dB]*		*Limit value [dB]*		*Rate of exceedance [dB]*	
		Day	night	Day	night	Day	night
MP1-Barcs 13 Ady Endre Street, lot no.: 2433/1	ground floor	52,1	45,9	65	55	-	-
Barcs 13/B Ady Endre Street lot no.: 2434	ground floor	52,3	46,1	65	55	-	-
	1st floor	52,8	46,7	65	55	-	-
Barcs 45 Drava Street lot no.: 0462/9	ground floor	37,8	31,7	65	55	-	-
Barcs 17/2 Ady Endre Street lot no.: 2436/2	ground floor	51,3	45,1	65	55	-	-
	1st floor	51,8	45,6	65	55	-	-

Noise levels from road traffic in inhabited areas and around residential buildings do not exceed the limits during the day or night.

Indirect area of influence

In case of the indirect area of influence, we mean the study of the surroundings of the road sections affected by the traffic change in case of an expressway.

Table 5.8.8 Road noise exposure status without perspective in the indirect area of influence

Test points	*Level*	*Distance without LAM noise exposure [dB]*		*Limit value [dB]*		*Rate of exceedance [dB]*	
		Day	night	Day	night	Day	night

Test points	Level	Distance without LAM noise exposure [dB]		Limit value [dB]		Rate of exceedance [dB]	
Barcs, 1 Ady Endre Street lot no..: 2402	ground floor	51,2	45,2	65	55	-	-
	1st floor	51,7	45,7	65	55	-	-
Barcs, 30 Klapka György Street, Lot no..: 2470/1	ground floor	59,4	53,3	65	55	-	-

Comparing the reference noise exposure, the calculated noise exposure values with the limit values according to the Joint Decree No. 27/2008 (XII. 3.) of the Ministry of Transport, Building and Urban Affairs, it can be concluded that the road noise exposure in the vicinity of the indirect impact area of influence does not exceed the **prescribed limit values during daytime and night.**

5.8.7. Expected impacts during the operation and management of the facility

The expected noise exposure values in the distant state were calculated based on the traffic data for the prospective year 2037, taking into account the parameters of the planned road, permitted speed, changes in construction, etc.

The implementation of the planned utility replacement will not affect the operational noise exposure levels, so no specific assessment is required.

The planned track variants No. 3 and No. 7 are identical from the beginning of the planning phase up to mile post 97+00, and there is no difference in traffic between the two tracks, so they were only examined separately from mile post 97+00 .

Testing of variations up to mile post 97+00

track variant No. 3

Table 5.8.9: Long-range road noise exposure in the direct area of influence for track variant No. 3 from mile post 97+00

Test points	Level	Distance noise exposure to LAM [dB]		Limit value [dB]		Exceedance rate [dB]	
		Day	night	Day	night	Day	night
MP3-Barcs 3 Belcsapuszta lot no.. 2802/1 (230 m)	ground floor	44,3	38,2	65	55	-	-
	1st floor	45,2	39,0	65	55	-	-
Barcs 45 Drava Street lot no.: 0462/9 (1400 m)	ground floor	36,4	30,0	65	55	-	-

In the long term, the noise exposure from road traffic in the immediate vicinity of the proposed M60 expressway variant 3 after mile post 97+ 00 does not exceed the limit values during daytime and night-time periods.

track variant No. 7

Table 5.8.10: Long-range road noise exposure in the direct area of influence for track variant No. 7 from mile post 97+00

Test points	*Level*	*Distance noise exposure to LAM [dB]*		*Limit value [dB]*		*Exceedance rate [dB]*	
		Day	night	Day	night	Day	night
MP3-Barcs 3 Belcsapuszta lot no.2802/1 (170 m)	ground floor	44,1	38,5	65	55	-	-
	1st floor.	44,9	39,3	65	55	-	-
Barcs 45 Drava Street lot no.: 0462/9 (370 m)	ground floor	44,8	39,1	65	55	-	-

Indirect area of influence

In case of the indirect impact area, we mean the study of the surroundings of the road sections affected by the traffic change in case of the motorway and junction A.

Table 5.8.11 Long-range road noise exposure status indirect

Test points	*Level*	*Distance noise exposure to LAM [dB]*		*Limit value [dB]*		*Exceedance rate [dB]*	
		Day	night	Day	night	Day	night
Barcs, 1 Ady Endre Street Lot no.: 2402	ground floor	51,8	45,5	65	55	-	-
	1st floor	52,4	46,2	65	55	-	-
Barcs,30 Klapka György Street., Lot no..: 2470/1	ground floor	56,0	49,1	65	55	-	-

In the long term, the noise exposure from road traffic in the **indirect vicinity of the** proposed M60 expressway and **junction A does not exceed the limit values during daytime and at night.**

In the long term, the noise exposure from road traffic in the immediate vicinity of the planned M60 expressway, variant No. 7, after mile post 97+ 00 does not exceed the limit values during daytime and night-time.

In summary, the above tables and Figures ZT1-ZT4 show that

- there is no difference between the proposed M60 expressway variants 3 and 7 in terms of noise protection before mile post 97+00,

- Of the track variants No. 3 and No. 7 examined after mile post 97+00 , track variant No. 7 is slightly less favourable, but due to the distance of the buildings to be protected, no exceedance of the limit value is expected.

5.9. VIBRATION PROTECTION

5.9.1. Presentation of vibration sources

The sources of vibration are the same as those presented in the noise chapter.

5.9.2. Vibration protection requirements

According to section 8 of Government Decree No. 284/2007 (X. 29.) on certain rules for protection against environmental noise and vibration, the area of influence of an environmental vibration source is the area where the environmental vibration from the source causes an increase in the vibration exposure as defined by a separate legal act.

Depending on the propagation conditions in the ground, the vibration exposure from road traffic eases over a distance of a few tens of metres to such an extent that the change in vibration exposure becomes detectable within the margin of error. Accordingly, it can be stated that the vibration protection zone can in all cases be delimited close to the road track, within the noise protection zone.

The limit values for ambient vibrations are set out in Annex 5 of Joint Decree No. 27/2008 (XII. 3.) of the Ministry of Transport, Building and Urban Affairs. The weighted equivalent acceleration of vibrations in buildings shall not exceed the limit values specified in Joint Decree No 27/2008 (XII. 3) of the Ministry of Environment and Water and Ministry of Health), i.e. A_M = 10 mm/s^2 during the day, A_M = 5 mm/s^2 at night and the maximum A_{max} = 200 mm/s^2 . The relevant vibration exposure limits are met within a distance of < 5 m.

5.9.3. Current vibration load presentation

At present, the vibration load in buildings in and around the planning area do not exceed the relevant limits, based on many years of experience, due to the sufficient distance between the vibration source and the buildings to be protected.

5.9.4. Vibration exposure during construction

Damage from vibration often occurs during construction works. These damages are usually associated with the use of traffic and connecting roads as transport routes, which are not designed for high vehicle traffic.

Based on this experience, it is recommended that transport routes should avoid habitated areas in the vicinity as much as possible and use the main roads for this purpose.

The environmental impacts of road construction, including noise pollution, have been studied in detail by the Institute of Transport Sciences Ltd (now the Institute of Transport Sciences, a non-profit limited company). In the following, the conclusions of the study "*Environmental assessment of construction impacts for the environmental impact assessment of road construction projects - Final report" (KTI Ltd. working No. 250-055-1-1) are* used to present an assessment of the change in noise exposure during road construction.

During the construction of a road section, significant vibration loads are expected during excavation works, in particular during the operation of the vibro-roller, and during transport, when the road is installed close to the transport routes.

The effect and magnitude of the vibration depends on:

- the distance between the construction site and the facility to be protected,
- road characteristics:
  - route guidance (uphill, downhill, bend, etc.)
  - the type, design and condition of the pavement,
  - road sub- and superstructure structure (number of layers, thickness, type),
  - dynamic characteristics of the road sub- and superstructure (shear modulus, damping factor, density, Poisson's factor, natural frequency, wave propagation velocity).
- spreading (both at the furrow and in road construction):
  - type of soil (loose, rocky), texture, water content, temperature (freezing),
  - soil dynamic properties (shear modulus, wave propagation velocity, damping factor, density, Poisson's factor, natural frequency),
  - wave propagation shapes in the ground, body waves (shear, pressure),v surface waves (Rayleigh, Love) (see [14]),
  - structures in the ground (piling, grouting), pipes in the ground, sewers, old building fragments,
  - trees in the propagation area (root system).
- the foundation and transmission properties of the building to be protected.

During the tests carried out, it was found that during the road construction phases, vibration is generated from the deliveries and the operation of the vibro-roller within 30 m of the road.

However, this change in vibration load does not represent a vibration above the limit value.

Construction vibration can be considered tolerable.

5.9.5. Expected impacts during the operation and management of the facility

The planned road will not have a significant impact on the vibration load of existing buildings.

On the basis of the above, it can be concluded that the planned road will not lead to a detectable increase in vibration exposure in existing buildings, and the weighted equivalent acceleration of vibration will still not exceed the limit value of the joint decree No. 27/2008 (XII. 3.) of the Ministry of Transport, Building and Urban Affairs, i.e. A_M = 10 mm/s^2 during the day, A_M = 5 mm/s^2 at night, and the maximum value of A_{max} = 200 mm/s^2 .

5.10. WASTE MANAGEMENT

5.10.1. Area of influence

From a waste management point of view, the **direct area of influence is** the construction site where waste is likely to be generated during construction activities. The **indirect area of influence of the** project is the area that will receive waste from construction activities and waste generated during the operational period.

5.10.2. Waste in the current environment

Waste is not expected to occur at the planned project site in the baseline condition. The planned project will not affect any landfill site or an abandoned or rehabilitated landfill site. The route alternatives under consideration are passing by an existing wastewater treatment plant. Track no. 3 is closer to the treatment plant, while Track no. 7 is slightly further away.

The Dél-Kom Nonprofit Ltd. is responsible for the public waste management services in the municipalities affected by the planned investment.

5.10.3. Waste likely to be generated during construction works

Non-hazardous, hazardous and municipal waste is expected to be generated during the construction and finishing works of the facilities (including material extraction sites), throughout the entire project period, in accordance with the schedule of works.

The collection of waste will take place in the staging (organisation) area, and the implementation plan will include detailed requirements for the collection, treatment and documentation of waste.

The main categories of waste generated are:

- construction material (cement, concrete, bricks, etc.) scrap, waste,
- sealant, insulation waste,
- bitumen waste,
- waste paints, varnishes and other coating and anti-corrosion materials,
- contaminated diluents and solvents,
- scrap metal (iron, steel),
- wood waste,
- paper waste,
- plastic waste,
- oil and oily waste,
- other waste.

Depending on the construction techniques used, the above wastes are expected to be generated throughout the project period, according to the schedule of works. An estimate of the quantity of waste from the demolition activities is included in the environmental impact assessment. The exact quantity will be defined in the implementation plan.

Depending on the number of people working in the project area, municipal waste is generated continuously.

The majority of the waste generated is non-hazardous construction and demolition waste. Treatment of hazardous waste from construction and demolition works and their soil mixtures must be collected separately. Hazardous waste generated must comply with the provisions of Government Decree No. 225/2015 (VIII.7.) and may be handed over to an authorised recipient for treatment, in accordance with the principles of proximity and economy, in all cases giving preference to the treatment of waste by recovery.

If a significant proportion of the excavated demolition material can be recycled, the waste can be made into reusable material.

Construction waste can be recycled as excavated soil, concrete and asphalt debris from construction (demolition, construction).

If these excavated, demolished materials and soil are not used on the construction site, but are transported from there, they **are considered waste** and must be classified in accordance with the Decree No. 72/2013 (VIII. 27.) of Ministry of Agriculture and Rural Development on the list of waste.

Pursuant to subsection (4) section 2 of the Act on waste, uncontaminated excavated soil not used at the extraction site may be considered a by-product if the following provisions of the Act are met. Subsections (a) and (e) section 8 of the Act, or it undergoes recovery as waste and the conditions for the cessation of waste status laid down in Art. Articles 9 and 10.

The **excavated surplus soil** may be deposited at the place designated by the municipality only if it is in accordance with the provisions of the Act on waste. In other cases, it may only be transferred to a recipient holding a final waste management permit.

The inert waste generated during the construction process - as it does not undergo significant physical, chemical and biological transformation - can be used after sorting, crushing and grinding operations for the construction and consolidation of road bases, road bases of dirt roads, as aggregates for new asphalt mixtures, as concrete admixtures, as fillers. Their disposal in inert landfills is only justified if there is no possibility of recovery of the material.

According to the legislation in force on the management of demolition and construction waste, during the construction phase following the design phases, a record of the types of waste generated must be kept.

The excavated soil shall be used in accordance with the provisions of the soil protection plan.

The replacement of utilities in connection with the planned project may generate concrete waste, identified as 17 01 01, aluminium waste, identified as 17 04 02, and iron and steel waste, identified as 17 04 05. Subject to compliance with the relevant legislation detailed above, the impacts of utility replacements from a waste management perspective are considered negligible.

5.10.4. Waste from operations

The road section is expected to generate small quantities of hazardous and non-hazardous waste once it is constructed and put into use. The type of waste is currently only partially known or can be predicted, and the exact quantity by type is not known at this stage of the planning process.

Requirements for the operating period will be included in the management plans. During both the construction and the operational periods, the procedures and reporting obligations laid down in the relevant legislation must be respected.

The following activities generate waste during the operation of the road:

- cleaning,
  - the removal of municipal waste,
  - removal of fallen animal carcasses,
- green area maintenance,
- maintenance and repair,
  - maintenance, painting and washing of the track and road fittings (railings, posts),
  - repairing the road surface (extracted asphalt),
- during a possible accident.

Non-recyclable, non-hazardous waste should be treated in the same way as, or together with, municipal solid waste.

Activities related to hazardous waste must be organised in accordance with the provisions of Government Decree No. 225/2015 (VIII.7.) on hazardous waste.

5.10.5. Abandonment of the establishment

The facility is not expected to be abandoned. The demolition works resulting from the possible abandonment (demolition of asphalt pavement, concrete foundations and structures) may generate construction and demolition waste similar to construction works (identification codes 17 01 07 and 17 03 02), which should not cause environmental pollution, provided that the relevant legislation is complied with. In the event of abandonment of the installation, the demolition activity must be subject to authorisation in accordance with the legislation in force at the time.

5.10.6. Proposed protection measures

During the construction and demolition works, efforts shall be made to minimise the amount of waste generated and to use and recover the construction and demolition materials generated within the construction works. The waste generated shall be handed over only to a licensed waste

treatment operator, in accordance with the principles of proximity and economy, and in all cases with preference given to the treatment of waste by recovery.

Waste may only be transported on designated material transport routes.

Temporary containers for waste and hazardous waste generated during construction works, as well as fuel containers for earthmoving machinery, must be placed on a surface with a layer of insulation or already paved, using a containment vessel, in such a way as to avoid contamination of soil and groundwater.

On completion of construction, the construction site, including temporary use areas, must be cleared of waste, construction debris and surplus construction materials and get hem disposed .

The classification, treatment and disposal of the excavated material and the detailed rules for the management of the waste generated during the construction works shall be provided for in the implementation plan. It is recommended that the requirements for the operating period are laid down in the management plans.

Inert construction waste (construction debris not containing hazardous materials) must be disposed of in the nearest authorised municipal landfill for inert waste.

Municipal solid waste (municipal waste) generated during construction and operation must be collected in a closed landfill and regularly disposed of in a non-hazardous landfill (municipal landfill). The collection and disposal of the different types of municipal waste shall be the responsibility of the Contractor during construction and of the Road Operator during operation. Landfill should preferably take place in solid waste landfills operated by the county or municipal authorities.

Hazardous waste generated during construction and operation must be collected separately from each other in a non-polluting manner, as required by law, and must be recorded, reported and disposed of in a hazardous waste landfill. The transport and treatment of hazardous waste may be carried out only by authorised and licensed companies.

6. WATER FRAMEWORK DIRECTIVE TEST

Objective of the Water Framework Directive (WFD)

The development of the European Union's new water policy, the "Water Framework Directive" (Directive 2000/60/EC - WFD), entered into force in the EU Member States on 22 December 2000. It aims to achieve "good status" of surface and groundwater bodies by 2015. According to the framework directive, "good status" means not only the purity of water, but also the minimum possible disturbance of water-related habitats and the availability of sufficient water.

The general, main objectives of the WDF are:

- Protecting and improving habitats connected to water,
- Promote sustainable water use by protecting exploitable water resources in the long term,
- Improving water quality by reducing pollutant emissions,
- Progressively reduce groundwater pollution and prevent further pollution.

Some investments (water installations) can be implemented if they comply with the requirements for new infrastructure development (physical modifications) (Article 4.7 of the EU Water Framework Directive), if they do not compromise the achievement of good status in other water bodies, if they do not compromise the fulfilment of other EU legislation (including the protection of Natura 2000 sites and impact assessment).

This is determined by the so-called WFD 4.7 test, which aims to decide whether or not the planned interventions may have a significant impact on the status of the water body (this applies mainly to water bodies, not to infrastructure investments).

During the EIA procedures, compliance with the requirements of the WFD should almost always be checked, at least to the extent that a WFD 4.7 test (or WFD tests) is required.

If the proposed interventions will not have a significant impact on the status of water bodies, the detailed assessments required in Test 4.7 of the WFD do not need to be carried out.

The Water Framework Directive process diagram is illustrated in the following figure:

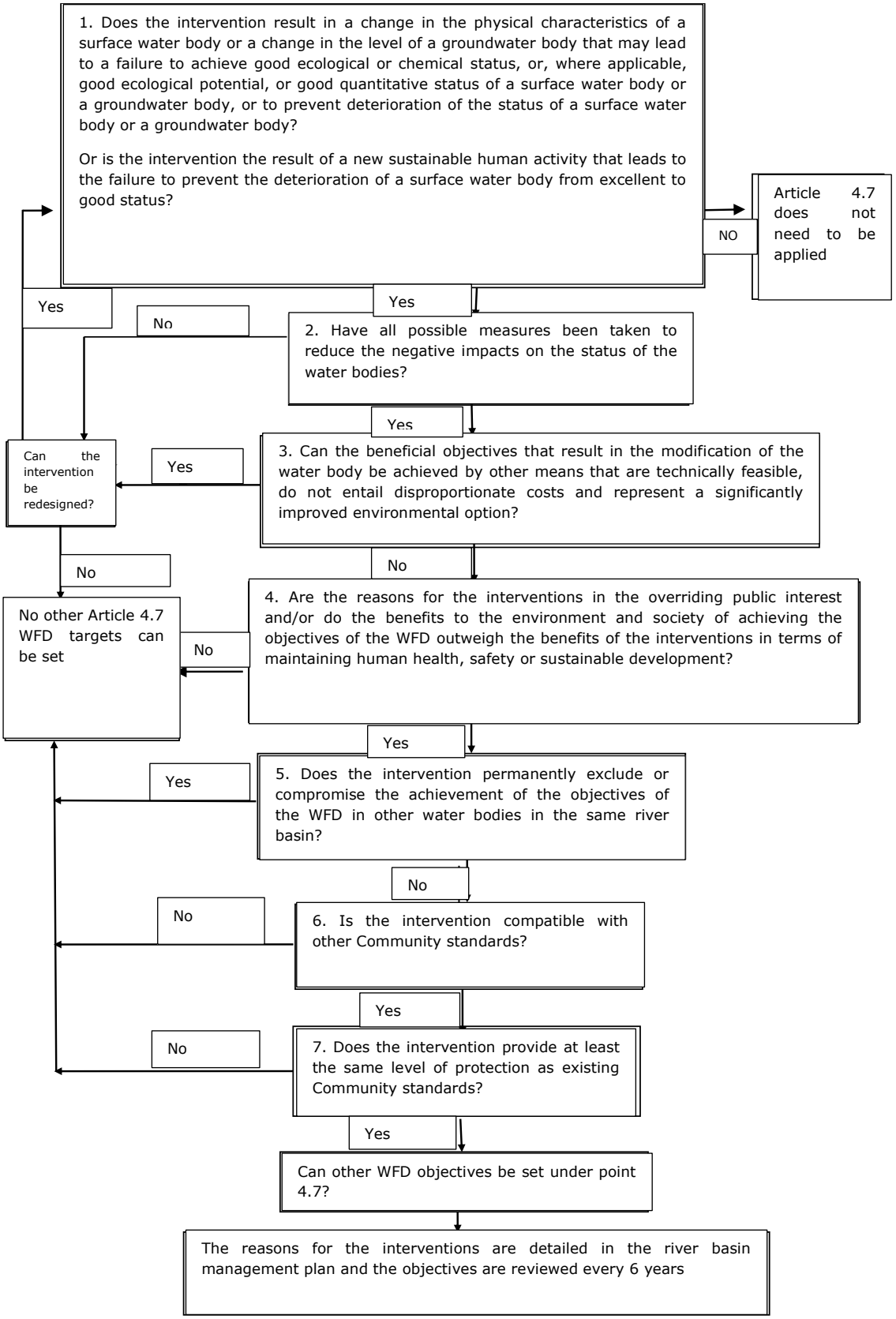


Figure 6.1: Water Framework Directive process diagram

In order to achieve the objectives of the European Union Water Framework Directive (WFD), a strategic plan and a programme of measures, a river basin management plan (hereinafter: RBMP)

must be prepared. The plans are reviewed by Member States every six years. The current one, covering the years 2022-2027, is the second review and was due on 22 December 2021. This is Hungary's third river basin management plan (RBM-3).

The WFD should include the characteristics of the river basins and the environmental objectives and measures necessary to achieve good water status. In all cases, the review and update will be based on the plan for the past period, which is currently the Programme of Measures 2016-2021, the RBM-2 and the changed water status as a result of the measures taken since then.

The objectives of RBM-3 have been taken into account in the assessment of the impacts on surface water and groundwater of the construction and operation of the project.

The implementation, and operation of the M60 expressway section between Barcs and the border with Hungary will not result in any changes to the physical properties of the surface water body or changes to the groundwater body level, and is not expected to have a negative impact on the chemical and ecological status of water bodies, therefore the CCI 4.7 test is not required.

In support of the above statement, the impacts of the proposed project are briefly described, considering the findings in Sections 5.1, 5.2 and 5.4:

I. Hydrology

According to the National River Basin Management Plan, the planning area is located in the sub-unit 3-2 Rinya Lake.

3-2 Rinya subdivision planning

The sub-unit is located in the county of Somogy (smaller part Zala), between Marcali and Barcs. It covers an area of about 2300 km^2 , partly the loess area of the Zala hills and partly the sandy area of the Rinya valley. The surface morphology is characterised by hills with small differences in level and wide valleys between them.

The paleozoic formations that form the subsoil of the area are impermeable. Among the Miocene sediments, the Lajtai Limestone Formation is considered to be a good water transmitter. The main groundwater aquifer assemblage is the Upper Pannonian stratigraphic group, whose sandy strata provide the practical recharge for the wells in the area. The deeper layers provide thermal water. The shallower wells tap Pleistocene-Holocene age layers of river gravel and sand. In the absence of a waterproof clay layer, the sandy surface allows contaminants to enter with precipitation, and there are many working, vulnerable drinking water sources in the area.

Groundwater is contaminated almost everywhere.

The Hungarian catchment area of the Drava is 6348 km^2 , which is 15.8% of the total catchment area. At medium water levels, the river is characterised by water depths of 2-3 metres, although the riverbed is rearranged annually due to the constantly migrating reefs.

The Rinya water system is located in Inner Somogy, covering an area of 905 km^2 . The catchment has both mountainous and lowland features. Due to the higher than national average precipitation, the water regime is more even than in the more eastern areas.

The Dombó canal is the main inlet to the western part of the planning area, and its basin is artificial.

The area's watercourses have many fishponds, many of which are long-fill ponds. Despite the large number of ponds (water uses), the water system of the Rinya is relatively extensive.

II. Surface water protection

The planned track variations cross the following watercourses:

Tested track variation	Crossed watercourse
track no. 3	Drava
	Zimóna western branch
track no. 7	Drava
	Cinnamon Creek
	Zimóna western branch

The following data are available for the surface watercourses concerned, based on Annex 7-1 of the 3-2 Rinya River Basin Management Plan :

Table 6.1: Watercourse classification

Name of water body	Upper Drava	Cinnamon Creek
VOR code	AEP439	AEQ151
Sub-unit	3-2	3-2
Category of water body	heavily modified	heavily modified
Status by biological elements	weak	bad
State by physico-chemical elements	excellent	data gap
Ecological certification	weak	bad
Chemical state	data gap	data gap
Status according to hydromorphological elements	good	good
Ecological objective	Good status to be achieved	Good potential to be achieved
Chemical objective	Good status to be achieved	Good status to be achieved
Measures to improve the physico-chemical status of watercourses	2.1;17.1;17.9;29.2;	2.1;17.1;29.2;

Description of measures to improve the status of the watercourse:

2.1 - General set of rules to reduce nutrient pollution from agricultural production, effective limitation of nutrient application in arable and plantation areas

17.1 - Reduction of run-off of pollutants and sediments by grassing, afforestation, terracing on sloping areas, infiltration surfaces, isolation of inland plantations

17.9 - Reducing erosion and run-off in forest areas by applying good forest management practices (closed canopy or undergrowth, no clearcutting, designation of forest roads)

29.2 - Upgrading of livestock farms under the EU Nitrates Directive

Based on the measures listed, the objective or measure that can be directly achieved by the proposed investment is not included in Annex 7.1 for the water body listed above.

Compliance with the Framework Directive in the context of the z M60 expressway section between Barcs and the border :

The planned expressway crosses the eastern branch of the Zimóna stream in both track variants, the Zimóna stream in track variant 7 and the Drava River in both track variants.

Stormwater runoff from the road surface either flows in sheets along the embankment and gullies or, in the case of larger lengths and embankment heights, collects along drainage verges and flows through gullies into the drainage ditch system alongside the road.

To protect the receptors; it is recommended to install a sediment trap before the reservoir basin inlets and to install booms to ensure the necessary containment in case of an emergency.

The limit values for the pollution of direct discharges to the receiving waters are laid down in Annex 2 to Decree 28/2004 (XII. 25.) of the Ministry Environmental Protection and Water Management. In the planning area there is a watercourse of the category of generally protected receptor 4, where the permitted level of organic solvent extract is 10 mg/l.

During operation, pollution of surface watercourses may occur mainly indirectly. This can be transmitted to watercourses via groundwater, metal from wear and tear on vehicle components, rubber and drip fuels, other oils and coolants, dust from road surface dusting and de-icing material splashed onto the pavement.

Direct pollution can affect watercourses in accidents, which can be localised and eliminated primarily through damage control. The most adverse impact of accidental pollution from road operations on water quality and, finally, on wildlife in watercourses may be caused by hydrocarbon derivatives. However, the probability of these accidents occurring and happening in the vicinity of watercourses is low.

The concentration of air pollutants precipitated diffusely by traffic is diluted and therefore does not have a significant effect in roadside areas.

Studies have shown that the water that washes off and infiltrates the roadway, through the pollutant retention effect of the earthen ditch, absorbs about 60% of any pollution that may be generated.

The operation of the road is not expected to cause any pollutant impact on the groundwater through infiltration and, through this, on the surface water, either in terms of quantity or quality.

The planned road construction will not alter the established water flow conditions and the relationship between surface water and groundwater.

On this basis, the implementation of the proposed relief road will not degrade or threaten the existing status of the watercourses created.

III. Protection of surface and groundwater

Based on the National River Basin Management Plan, the water bodies in the planning area are presented, of which the proposed project may have an impact primarily on near-surface water bodies (shallow porous and porous water bodies):

- sp. 3.2.2 - Drava valley above Barcs
- p. 3.2.2 - Drava valley above Barcs
- sp. 3.2.1 - Rinya - catchment area
- p. 3.2.1 - Rinya River basin
- pt. 3.1 - Southwest Transdanubia

The quantitative and chemical status of the water bodies is shown in the table below:

Table 6.2: Groundwater body classification

Name of water body	*Sub-unit*	*Water body code*	*Quantitative status*	*Chemical state*	*Measures to improve quantitative status*	*Measures to improve its chemical status*

sp. 3.2.2 - Drava valley above Barcs	3-2	AIQ521	good	good	7a.2;23.2;31.1; 33.2	2;3;21.10;21.9; 21.1;21.5;36
p. 3.2.2 - Drava valley above Barcs	3-2	AIQ520	good	good	7a.2;8.2;8.4;	36
sp. 3.2.1 - Rinya - catchment area	3-2	AIQ633	weak, cause: - earth and water FAVÖKO	good	7a.2;23.2;31.1; 33.2	2;3;21.10;21.9; 21.1;21.5;36
p. 3.2.1 - Rinya river basin	3-2	AIQ632	good	good	7a.2;8.1;8.2; 8.4;	36
pt. 3.1 - Southwest Transdanubia	1-11, 1-12, 1-15, 3-1, 3-2, 3-3, 4-1, 4-2	AIQ517	good	good	7a.2;7a.5;8.2; 8.4	31.2;36

Description of measures to improve the physico-chemical status of water bodies

2. - Reducing nutrient pollution from agriculture
3. - Reducing pesticide pollution from agriculture
7.1 - Modification of the inland water drainage system
7a.2 - Registration, review, modification, authorisation of groundwater abstractions
7a.5 - Utilisation of thermal waters, regulation, promotion and modernisation of the recovery of used thermal waters
8.1 - Application of water-saving solutions in crop production (crops, irrigation technology, energy efficiency)
8.2 - Reducing technological and network losses
8.4 - Water-saving solutions for industrial water supply
21.1 - Proper design, operation and control of municipal landfills
21.5 - Elimination of illegal landfills, landfill control, fines
21.9 - Promotion and implementation of additional sewer connections
21.10 - Reconstruction of sewerage networks
23.2 - Precipitation management, retention of water within slabs to increase infiltration and reduce run-off
31.1 - Regulation of groundwater enrichment
31.2 - Regulation of the injection of fluids from wells used for hydrocarbon production and exploration
33.2 - Special hydromorphological measures to improve the condition of protected natural areas, including special regulation of water abstraction, water management and water recharge to meet conservation needs
36 - Inspection, reconstruction and remediation of improperly constructed wells

The table above shows that the chemical and quantitative status of groundwater bodies is typically good.

Based on the measures listed, it can be seen that Annex 7.1 does not include any objective or measure directly achievable by the proposed investment in relation to the water bodies listed above.

Compliance with the Framework Directive in the context of the construction of the Barcs-Barcs cross-border section of the M60 expressway:

The potential pollutant impacts on soil and groundwater during the operation of the proposed road section are presented in Chapters 5.1.3, 5.1.4, 5.1.5, where it is concluded that the magnitude of the impacts is negligible.

The drainage solution for the track is determined by the essentially embankment nature of the track, its curvature, its vertical alignment, the subsoil and the material of the embankment. The drainage of the planned track is designed in most places with earthen embankments.

According to the Annex of the Decree No. 27/2004 (XII. 25.) of the Ministry of Agriculture, Forestry, Environment and Water Management on the classification of settlements in areas with sensitive groundwater status, Barcs in the planning area is included in a sensitive groundwater quality zone. According to Annex 2.1 of the revised 2022 Water Management Plan of Hungary and the map database of the National Water Directorate General, the investigated traces do not affect the protection area of groundwater abstraction.

During operation, pollution of soil and groundwater can occur mainly due to road traffic emissions, airborne particulate matter and oily particles along the roadside. These include abrasive materials, lubricants, petrol and diesel droplets, winter salting fluids and settling dust. In normal operation, these substances are carried off the road surface by precipitation and are collected by the roadside embankment and ditch.

The diffuse concentration of air pollutants precipitated by traffic is diluted and no longer has a significant effect in roadside areas.

During operation, winter de-icing can also contaminate soil and groundwater by infiltration. The risk of this is significantly reduced by the fact that this pollution occurs for a relatively short time, typically within a 10 to 15 m band from the road axis, with decreasing concentrations moving away from the road edge..

The implementation of the planned project will not alter the existing water flow conditions and the relationship between surface water and groundwater.

Provided that the protection measures are complied with (e.g. the use of modern, environmentally friendly machinery and technological equipment), the implementation of the road development will not have any negative impact on groundwater.

Based on the planned drainage and the above, no deterioration in the quality of the geological medium and groundwater is likely during the construction and operation of the M60 expressway section between Barcs and the border.

IV. Habitat protection

The track variants affect the core area of the Danube-Drava National Park, the **HUDD10002 West-Drava KMT, the HUDD20056 Central-Drava KJTT**, the core area of the National Ecological Network, the buffer area and the transition zone of the Mura-Drava-Danube UNESCO Biosphere Reserve (MAB).

A protected natural area of national importance is directly affected by the section of the development. The common track will cross the national park trunk area for about 160 m between mile posts96+800-97+000 at the southern boundary of the road bypassing Barcs from the south. The western track variant 7 runs for 175 m within the national territory of the Danube-Drava NP, while the eastern track variant 3 runs for 1 060 m within the habitats of the core area of the Danube-Drava NP.

Ex lege protected natural values are located in the vicinity of the development site. There is no direct impact, the nearest bog, Nagybók, is approached by the common track at a distance of 130 m at mile posts 96+800.

Protected natural areas of local importance within 100 m of the planned route Belcsapuszta.

SSSIs, HNVs: the entire administrative territory of Barcs affected by the project is part of the zone of priority sensitive natural areas and is not part of the high nature value area (HNV) scheme

Among the protected mammal species are the common mole (Talpa europaea), eastern hedgehog (Erinaceus concolor), wildcat (Felis silvestris), Eurasian beaver (Castor fiber), otter (Lutra lutra), squirrel (Sciurus vulgaris), soprano pipistrelle (Pipistrellus pygmaeus), Nathusus' pipistrelle (Pipistrellus nathusii), Kuhl's pipistrelle (Pipistrellus kuhlii), common pipistrelle (Pipistrellus pipistrellus), common noctule (Nyctalus noctula), serotine bat (Eptesicus serotinus), Daubenton's bat (Myotis daubentonii) and pond bat (Myotis dasycneme).

Species of birds of special conservation concern include the black- crowned night heron (Nycticorax nycticorax), the honey buzzard (Pernis apivorus), the white stork (Ciconia ciconia), the bee-eater (Merops apiaster), the red footed falcon (Falco vespertinus) and the little egret (Egretta garzetta).

Chapter 5.5 details the findings of the Habitats Assessment.

In summary, based on the previous sections of this chapter, it can be concluded that the *implementation and operation of the M60 expressway between Barcs and the border with Hungary will not result in any changes to the physical properties of the surface water body or to the groundwater body levels, and is not expected to have a negative impact on the chemical and ecological status of water bodies, and therefore does not contravene the WFD guidelines.* The answer to the first set of questions in Figure 4.7 of the WFD test procedure is therefore in all cases negative and Article 4.7 does not need to be applied.

7. CLIMATE RISK ANALYSIS

On 30 November 2017, the M60 expressway from mile post 31+160 km (area of Pécs) to mile post 95+613 km (junction of road No. 6623 municipal road and main road 6) was granted an environmental permit under file number PE/KTF/4213-114/2017. The previous findings for this section remain unchanged. In this chapter, the section of the proposed track alternatives between mile post 91+000 and the national border is considered.

The assessment takes the relevant provisions and content requirements of the Government Decree 314/2005 (XII. 25.) regarding the procedures of environmental impact assessment and the singe procedure of authorization of utilization of the environment into account. The analysis is based on the criteria of the *Non-paper Guidelines for Project Managers: Making vulnerable investments climate resilient (hereinafter referred to as the Guidelines).*

7.1. IMPACTS OF CLIMATE CHANGE

7.1.1. Sensitivity to climate change

In the sensitivity analysis, the sensitivity of the project to primary climate change drivers and secondary impacts/climate change risks was determined.

Table 7.1.1 : Sensitivity of roads to the expected impacts of climate change

Change of climate parameter	*Facility*	*Users*	*Transport links*
1. Slow increase in average surface air temperature	Medium	Low	Medium
2. Reduction in the number of frosty days (daily min. < 0 °C)	Low	Low	Low
3. Increase in the number of hot days (daily maximum ≥ 30 °C)	High	High	Medium
4. Increase in the number of heatwave days (daily mean temperature > 25 °C)	High	High	Medium
5. Increase in precipitation intensity	Medium	Medium	Medium
6. Increased UV radiation, reduced cloud formation	Medium	Medium	Medium
7. Increase in wind speed	Medium	Medium	Medium
8. Increase in the number and intensity of severe weather events	Medium	Medium	Medium
9. Increase in frequency and intensity of flooding	Medium	Medium	Medium
10. Increased frequency and intensity of flash floods	Medium	Medium	Medium
11. Increase in the incidence of flooding	Medium	Medium	Medium
12. More frequent occurrence of mass movements	Medium	Medium	Medium
13. Increase in the frequency of forest fires	Medium	Medium	Medium
14. Increase in the length of drought periods	Medium	Low	Low

The sensitivity of the planned investment is high, especially to the following weather impacts:

- 3. an increase in the number of hot days (daily maximum ≥ 30 °C),
- 4. increase in the number of heatwave days (daily mean temperature > 25 °C).

7.1.2. Exposure to climate change

Exposure was assessed by assessing and ranking the extent to which the medium to high rated facilities, users and transport links identified in the sensitivity assessment are or will be exposed to adverse climate factors, the expected impacts of changes in these factors in terms of geographical location.

Table 7.1.2: Exposure of the planned investment to the expected impacts of climate change

Change of climate parameter	*Exposure of the study area for the current (or past) period*	*Exposure of the study area for the period 2021-2050*
1. Slow increase in average surface air temperature	Medium	Medium
2. Reduction in the number of frosty days (daily min. < 0 °C)	Low	Low
3. Increase in the number of hot days (daily maximum ≥ 30 °C)	Low	Medium
4. Increase in the number of heatwave days (daily mean temperature > 25 °C)	Low	Medium
5. Increase in precipitation intensity	Medium	Medium
6. Increased UV radiation, reduced cloud formation	Medium	High
7. Increase in wind speed	Low	Low
8. Increase in the number and intensity of severe weather events	Medium	Medium
9. Increase in frequency and intensity of flooding	Medium	Medium
10. Increased frequency and intensity of flash floods	Medium	Medium
11. Increase in the incidence of flooding	Medium	Medium
12. More frequent occurrence of mass movements	Low	Low
13. Increase in the frequency of forest fires	Medium	Medium
14. Increase in the length of drought periods	Low	Medium

The road section and its associated facilities affected by the planned investment are *highly* exposed to the following factors in particular for the period up to the mid-21st century (2021-2050):

- 6. increased UV radiation, reduced cloud formation.

7.1.3. Vulnerability to climate change

Determination of vulnerability: a matrix is formed from the system sensitivity and the area exposure values to determine the vulnerability of the examined system.

Table 7.2.3: Vulnerability of the proposed investment to climate change

		Exposure for the period 2021-2050		
		Low	**Medium**	**High**
Sensitivity		**Facility**		
	Low	2.		
	Medium	7., 12.	1., 5., 8., 9., 10., 11., 13., 14.	**6.**
	High		**3., 4.**	
		Users		
	Low	2.	1., 14.	
	Medium	7., 12.	5., 8., 9., 10., 11., 13.	**6.**
	High		**3., 4.**	
		Transport links		
	Low	2.	14.	
	Medium	7., 12.	1., 3., 4., 5., 8., 9., 10., 11., 13.	**6.**
	High			

The proposed investment is considered vulnerable to the following impacts:

- 3. an increase in the number of hot days (daily maximum ≥ 30 °C),
- 4. increase in the number of heatwave days (daily mean temperature > 25°C),
- 6. increased UV radiation, reduced cloud formation.

7.2. RISK ASSESSMENT

Vehicles, road users, traffic and transport infrastructure will also be directly negatively affected by the expected climate change (primary impacts).

Table 7.2.1: Probability of occurrence and magnitude of impact

Type of risk, consequence	*Probability of occurrence*	*Magnitude of impact/consequence*
1. Shortening of pavement life, acceleration of pavement ageing	Probable	Medium
2. Pavement deformation, rutting	Probable	Little
3. Cracks and potholes	Probable	Little
4. Road base erosion, loss of embankment stability	Medium probability	Medium

Type of risk, consequence	*Probability of occurrence*	*Magnitude of impact/consequence*
5. Collapse of a road	Not likely	Large
6. Reduction in load capacity, subsidence	Medium probability	Medium
7. Flooding of low-lying road sections	Not likely	Large
8. Damage to ancillary infrastructure	Not likely	Medium
9. Poor visibility (sandstorms, fog)	Not likely	Medium
10. Deterioration of transport links	Medium probability	Medium

Table 7.2.2: Categorisation of risks

		Impact/consequence		
		Small	***Medium***	***Large***
Probability	***Not likely***		8., 9.	5., 7.
	Medium probability		4., 6., 10.	
	Probable	2., 3.	**1.**	

Based on the assessment, the **risks** and consequences **to be prioritised** are:

- 1. shortening of pavement life, acceleration of pavement ageing.

7.3. ADAPTATION MEASURES, PROPOSALS

The increasingly frequent extreme **heat waves** have an impact on traffic, as speed restrictions may be necessary on some sections due to excessive heating and deformation of road surfaces. Their role as heat traps may lead to shortened pavement life (cracks, deformed pavements). The increase in the number of heat days and heatwave days poses a high risk during both the construction and operation phases.

An increase in the number of heatwaves and heat days may contribute to deformation and rutting (in extreme cases, it may require the closure of certain sections and restrictions on traffic). Road damage may lead to deterioration of traffic links, increase the risk of accidents and have a negative impact on vehicles due to overheating, increased tyre wear and damage.

From the user's point of view, a reduction in comfort can lead to a higher risk of accidents, as temperatures inside means of transport can be several degrees higher than outdoors (this is particularly true for public transport users). Rising temperatures lead to an increase in the deformation of asphalt. The tendency to deformation depends primarily on the quality of the binder used, so this risk can be managed at the design stage.

Adaptation proposals:

- The use of stiffer binders, bitumen types with high temperature tolerance, can help to manage this effect.

- Careful selection of the quality of the construction and the formulation of the asphalt mix is recommended.
- The choice of grain structure, binder content and quality, modifiers should favour solutions that will give the pavement structure sufficient stiffness and fatigue resistance to high temperatures.
- It is proposed to meet the medium range for the definition of bitumen content, not just the minimum requirements.
- The information can be important during heat waves, drawing attention to the need to increase ventilation and cooling in the passenger compartment of vehicles, as heatwave periods can contribute to an increased risk of accidents.

Increased UV radiation can lead to accelerated ageing of the bitumen and can contribute to surface cracking. It also reduces the comfort level of the users. With increased ultraviolet radiation, the bitumen on the upper part of the wearing course ages faster and becomes more brittle. This makes it less able to absorb the stresses generated and causes the wear layer to crack from above.

Adaptation proposals:

- The design of the wear layer should be given special attention.
- Increased road surveillance may be necessary.
- Roadside vegetation can help to shade the road.

Increased winds are expected to increase the frequency of snow flurries, which may disrupt traffic . In addition, stormy winds may blow traffic lights, trees, etc. onto the road, causing serious damage. Most of the damage can be prevented by road maintenance measures.

Adaptation proposals:

- Continuous cleaning of the road may be necessary.
- A condition survey of the trees along the route and the removal of branches and trees that could cause an accident is necessary.

Increased precipitation intensity, an expected effect of climate change, could also cause problems. One of the main problems for the road structure of transport facilities is water retention. The destructive effect of **high intensity rainfall is** increased, so the road needs to be protected against leaching.

Increased rainfall intensity can lead to structural damage to roads (base washout, settlement, subsidence, loss of embankment stability) and contribute to an increased risk of damage from mass movement. Water entering and collecting in the road structure and not leaving results in the detachment of bitumen from the aggregate. In addition, an increase in water content can lead to a reduction in bearing capacity. If the water content in the road structure or earthwork increases to such an extent that the load-bearing capacity of the transport facility is adversely reduced, the traffic using the facility should be restricted, which may mean limiting or prohibiting traffic, and in extreme cases may require a complete road closure.

Track No.3 of the proposed road crosses the following watercourses:

- Drava,
- Zimóna eastern branch.

Track No. 7 of the proposed road crosses the following watercourses:

- Drava,
- Zimóna stream,
- Zimóna eastern branch.

In the Annex to the Joint Decree 18/2003 (XII. 9.) of the Ministry of Transport, Building and Urban Affairs on the classification of municipalities according to **flood and inland water risk,** Barcs, which is affected by the planning area, belongs to the highly endangered category "A". A municipality is classified as highly vulnerable category A if it has residential property on the floodplain or is subject to free flooding from the outflow of unprotected rivers and other watercourses.

According to the Spatial Planning Plan of Somogy County**,** the planned tracks along the Drava River affect the zone of the large water body.

In accordance with the obligation of the Member States under Directive 2007/60/EC of the European Parliament and of the Council, a Flood Risk Management Plan for Hungary has been prepared, which identifies the areas at risk from excess water, the hazard and risk maps and the risk management plans. The study area is not at risk of flooding according to the 30-year (3.3%), 100-year (1%) and 1000-year (0.1%) probability potential flooding maps, but the planned track changes along the Drava pass through the floodplain (source: www.vizugy.hu/Árvízi risk-management).

On this basis, the flood exposure of the planning area is classified as medium.

The area of the proposed investment is moderately exposed to **flash flood events.** In the event of flash floods, transport links are significantly impaired, e.g. by the submergence of transport facilities along watercourses. Water run-off from higher ground can wash away and undercut roads and other structures.

Adaptation proposals:

- Ensuring adequate drainage is the most important adaptation measure for climate change. Adequate drainage requires good quality meteorological, hydrological and geomorphological data. Adequate water management infrastructure must be in place to ensure efficient water containment and drainage away from the facility. Drainage planning should address groundwater flows, prepare for rainfall during intense rainfall events and plan for the run-off of resulting tidal surges.
- In the event of sudden heavy rainfall, the ditches and culverts should be checked by the road manager to ensure that they are back in working order.
- This effect can also be countered by minimising the permeability of the wearing course and by proper drainage of water within the track structure.

Damage to ancillary infrastructure due to **storm events** is mainly solved by additional repair works .

Adaptation proposals:

- Damage can be prevented by the proper design of drainage (slope, ditches, culverts) and by the selection and maintenance of roadside vegetation.
- Drainage ditches may need to be cleaned in the area affected by the planned project. These interventions cannot be ignored, as the large amounts of rainfall , which are becoming increasingly frequent in our country, can create serious problems and risk of accidents.
- For roadside vegetation, replacing fragile trees in poor condition can reduce problems from tree mortality.

The occurrence of **inland flooding is** influenced by many local factors, which is why forecasting changes in inland flood risk is subject to many uncertainties. However, the results of climate models clearly indicate an increase in the frequency of inland flooding. Roads are particularly vulnerable to the effects of inland water.

The amount of land covered by inland waters varies widely from year to year, reaching 200-400 thousand hectares during major flood events. This phenomenon, which causes serious damage, can lead to the flooding of surface transport infrastructure. Parts of the road and pavement network may be permanently covered by water, which could obstruct traffic. In addition, traffic restrictions may be necessary due to the loss of carrying capacity.

According to the Spatial Planning Plan of Somogy County, the planned changes to the route do not affect the zone of the regularly flooded area.

Adaptation proposals:

- The earthworks and structures of the proposed road shall be designed to ensure the drainage of inland water.
- It is recommended that drainage ditches, culverts and structures in the area affected by the proposed project are properly sized and maintained frequently during road operation.

A prolonged **period of drought** also impairs the stability and watertightness (causing subsidence) of structures, earthworks and culverts.

Adaptation proposals:

- In addition to contributing to adaptation to climate change (e.g. stabilisation of vegetation, protection against UV radiation through shading), the design of appropriate planting contributes to reducing the negative impact of road encroachment as an indirect risk factor.
- By planting vegetation alongside the road, the use of biologically active compensatory surfaces occupied by the road can be partially compensated. Landscape planting along the road also has an indirect soil protection and climate improvement effect.

The exposure to **forest fires is** low in Somogy County. The planned track variations affect several planned forest areas. From a fire risk point of view, the forest areas concerned are at low risk.

7.4. THE PROJECT'S IMPACT ON CLIMATE CHANGE AND THE CLIMATE CHANGE RESILIENCE OF THE AREA OF INFLUENCE

The proposed investment indirectly includes the following **climate change risk factors:**

- With rising temperatures and the increasing frequency of heatwave days, roads are increasingly acting as heat traps, with the heated asphalt further "heating" the already warm air around them.
- Road encroachment reduces the amount of biologically active compensatory surfaces, such as forests and agricultural land, which indirectly has a negative impact on climate change and the adaptive capacity of the impact area.
- Construction and operation also contribute to climate change through greenhouse gas emissions.

To reduce the climate change impact of the investment, the following measures are proposed:

- use of low or zero GHG emission machinery for construction and transport,
- the use of low or zero GHG technologies in the construction process,
- the planting of native plants typical of the landscape (including trees, shrubs, grass, etc.) during the plantation.

7.4.1. Projected greenhouse gas emissions

Execution

Construction works for motorway construction will result in emissions of up to 3234 tonnes of CO_2 eq./km[3] for the planned route, as shown in the table below; this will be spread over several years depending on the duration of the construction works.

Table 7.4.1: CO_2 emissions during construction

Track variant	*Length [km]*	*Total CO_2 emissions [t]*
Variant 3	8,605	27829
Variant 7	8,671	28042

Operation, determination of annual CO emissions$_2$

Based on the calculations, the following emission values are expected:

There is no difference in traffic between Track 3 and Track 7, so their carbon emissions are the same. Minimal differences are expected due to the junction design, which is described below.

Reference (without) condition on the existing road network: ~2466.41 t CO /year.$_2$

Removed with it Status on the existing road network: ~1434.40 t CO /year.$_2$

Therefore, ~1032.01 t CO_2 /year greenhouse gas emission reductions are expected on the existing road network.

Track 3 and 7 with intersection A

Emissions along the route of the proposed road are expected to be ~2987.79 t CO /year.$_2$

The combined annual CO_2 emissions of the proposed road and the existing road network, if the project is realised, would be ~4422.19 t CO /year.$_2$

The additional annual CO_2 emissions compared to the baseline are 1955.78 t CO /year.$_2$

Track 3 and 7 with intersection "C"

Emissions along the route of the planned road are expected to be ~2999.53 t CO /year.$_2$

The combined annual CO_2 emissions of the proposed road and the existing road network, if the project is realised, would be ~4433.93 t CO /year.$_2$

If the project is realised, the additional annual CO_2 emissions compared to the baseline are ~1967.52 t CO /year.$_2$

7.4.2. Greenhouse gas absorption by vegetation[4]

The land occupation of the proposed investment will reduce the amount of biologically active compensation surfaces, which will indirectly have a negative impact on climate change and the adaptive capacity of the impact area. The proposed investment will also take up permanently vegetated areas. In these areas, the surface cover will be altered, reducing the CO_2 sequestration capacity of vegetation in the planning area.

The reduction in the area covered by vegetation is shown in the table below.

[3] Source: The World Bank/EGIS (2010) Introduction to Greenhouse Gas Emissions in Road Construction and Rehabilitation

[4] Literature:Dezső Radó:The role of vegetation in environmental protection

Table 7.4.2: Land use of the planned track variants

Type of farming	***Land take [ha]***			
	Variant 3, The node	Variant 3, Node C	Variant 7, The node	Variant 7, Node C
arable land	31,7925	33,5033	43,1785	44,8893
pasture	10,7419	10,7419	2,8895	2,8895
forest and wooded area	19,0178	18,4657	19,6092	19,0571
watercourse	-	-	0,0143	0,0143

Table 7.4.3: CO_2 production of some vegetation types

Vegetation type	***CO_2 product$_2$ [tonnes/ha]***
Temperate forest	14,02
Alluvial forest and scrubland	6,47
Temperate grasslands	5,39
Arable land	6,74
Lakes, watercourses	5,39

The annual CO_2 uptake by vegetation in the area of the proposed road section is shown in the table below.

Table 7.4.4: Annual CO_2 uptake by vegetation in the investment area

Vegetation type	***Land take [ha]***				***The CO_2 area -production$_2$ [tonnes/year]***			
	Variant 3, A	Variant 3, C	Variant 7, A	Variant 7, C	Variant 3, A	Variant 3, C	Variant 7, A	Variant 7, C
Temperate forest	19,0178	18,4657	19,6092	19,0571	266,63	258,8891	274,921	267,1805
Temperate grasslands (grassland, pasture)	10,7419	10,7419	2,8895	2,8895	57,8988	57,8988	15,5744	15,5744
Arable land	31,7925	33,5033	43,1785	44,8893	214,2815	225,8122	291,0231	302,5539
Lakes, watercourses	-	-	0,0143	0,0143	-	-	0,0771	0,0771
Total					***538,8103***	***542,6001***	***581,5956***	***585,3859***

Lawning, shrub planting and the installation of tree planting and tree groups can be carried out to integrate the carriageway and the grassed areas into the landscape and to rehabilitate the ruined surfaces. The extent of the planned planting is not known at this stage, but it is expected to compensate to some extent for the negative impact of land use change on CO_2 absorption. Overall, it can be concluded that the climate change adaptation capacity of the impact area is expected to be slightly reduced as a result of the proposed activity.

8. SUMMARY EVALUATION

Soil and groundwater protection

The negative impacts of the construction period are the land occupation of the project, the scale of the excavation works, the impact on highly sensitive areas and water catchments.

The total length of track variant 3 is 8605 m, and the total length of variant 7 is 8671 m. The planned road is a 2x2 lane design with a planned crown width of 20 m. A complex rest area will be created around mile post 93+100 of the M60 expressway. For both planned variants, the construction of the Drava bridge will also be an intervention.

Although agricultural land is affected by the track changes, the negative impact of the land reservation is mitigated by the fact that no areas of prime farmland are affected.

According to the Annex of the Decree 27/2004 (XII. 25.) of the Ministry of Agriculture, Forestry, Environment and Water Management on the classification of settlements in areas with sensitive groundwater status, Barcs in the planning area is included in a sensitive groundwater quality zone. Based on Annex 2.1 of the revised 2022 Water Management Plan of Hungary and the map database of the National Water Directorate General, the investigated tracks do not affect the protection area of groundwater abstraction.

The magnitude of pollution during the operation of the proposed road may be significant mainly in relation to accidents involving trucks.

The operation of the road is not expected to cause any pollutant impact on the groundwater through infiltration and, through this, on the surface water, either in terms of quantity or quality.

Taking all this into account, the proposed investment is feasible from a land protection point of view, subject to the required environmental proposals.

Surface water protection

According to the revised National Watershed Management Plan, the planning area is part of the 3-2 Rinya River Basin Planning Subdivision.

The impacts on surface water status during both construction and operation are mainly determined by the way and efficiency of drainage of the new road section. Both track variants cross the eastern branch of the Zimóna stream, track variant 7 crosses the Zimóna stream 1 additional time and both track variants cross the Drava river at the border.

Stormwater runoff from the road surface either flows in sheets along the embankment and gullies or, in the case of larger lengths and embankment heights, collects along drainage verges and flows through gullies into the drainage ditch system alongside the road.

Direct pollution can affect watercourses in accidents, which can be localised and eliminated primarily through damage control. The most adverse impact of accidental pollution from road operations on water quality and, last but not least, on wildlife in watercourses may be caused by hydrocarbon derivatives. However, the probability of these accidents occurring and happening in the vicinity of watercourses is low.

The concentration of air pollutants precipitated diffusely by traffic is diluted and therefore does not have a significant effect in roadside areas. No polluting effects are expected from the operation of the road that would cause changes in the quantity or quality of groundwater through infiltration and, through this, surface water.

All this means that the proposed investment can be implemented in terms of water protection, while respecting the environmental proposals.

Air quality protection

At the nearest automatic monitoring station to the planning area (Pécs), there has been no exceedance of the annual limit value for any of the tested components over the last 5 years, so the air quality of the study area can be considered good.

Under average meteorological conditions during construction, during rough earthworks, road construction, junction construction and rest area construction, the 24-hour health limit for particulate matter (PM_{10}) at the distances investigated is not expected to be exceeded. The 24-hour health limit value is met with a high degree of certainty even with background exposure.

By following the air protection requirements during construction as described in section 5.3.11 Proposed Protection Measures, temporary dust exposure can be significantly further reduced.

The nearest residential building is located 172 m from the axis of the planned tracks for track variants 3 and 7. The calculations show that, in the long term, the hourly and 24-hourly health limits are expected to be met with a high degree of certainty for all three components considered.

At the distance from the nearest residential building to the nodes, air pollution from traffic is negligible. The hourly and 24-hourly health limit values are met with a high level of safety for all three components considered.

Overall, the development is not expected to cause any conflict from an air quality perspective.

Habitat protection

The planned project directly affects one nationally protected area (Danube-Drava National Park) and two Natura 2000 sites.

Ex lege protected wetlands are located in the immediate vicinity of the development site. A locally protected nature reserve is located within 100 m.

The loss of the following Natura 2000 sites is expected for the eastern route 3: 6440 Floodplain marsh: 87535.16 m^2 , i.e. 8.8 hectares; 91E0 Softwood forests, alder and ash woodland and wetland: 1569.77 m .^{2}

For the Western Route 7, the following loss of Natura 2000 sites is expected: 91E0 Softwood forests, alder and ash groves and mires: 1616.44 m^2 .

As the planned investment will take place entirely in habitats that have not been used for this purpose so far, it will be necessary to create separate organisational paths in protected Natura 2000 habitats and in northern non-protected forest areas. The de-vegetation of the expropriation area and the groundworks will entail the removal of the original vegetation, resulting in the loss of the protected plant habitats detailed below.

Protected plant species are affected, and their habitat will be lost if the project goes ahead. The implementation of the western track variant 7 will affect about 4,000 individuals of snowdrop (*Galanthus nivalis*), 4 hectares of hard shield fern (*Polystichum aculeatum)* and 1 hectare of narrow buckler fern (*Dryopteris carthusiana).* Alternative 3, Eastern Track, will eliminate habitat for about 75,000 stands of snowdrop (*Galanthus nivalis*) and 2,300 stands of rough horsetail (*Equisetum hyemale*). In addition to the above, the protected plant species affected by the northern shared track are: 272 ha of hard shield fern (*Dryopteris carthusiana)*, 1 ha of spiny knapweed (*Polystichum aculeatum)* and 210 ha of rose campion (*Lychnis coronaria).* The removal of several 100 ha of additional protected plant habitat in the temporary occupation areas required for the construction of the bridge on Track 3 is assumed to be a possibility, and will be clarified before construction.

The eastern variant of track 3 between mile posts 97+800-98+850 (up to the Drava) crosses nationally protected and Natura 2000 areas, which, if implemented, will eliminate habitats that provide habitat for several hundred protected insects (e.g. cone-headed grasshopper, protected butterfly species) and are regular feeding grounds for protected and highly protected bat species, protected and highly protected bird species.

The impact on wildlife during the operation will be significantly larger than hitherto, due to the unused nature of the area concerned, and it is important to stress that the many conservation measures (proposals) must be respected in order to protect wildlife.

Overall, even with the proposed standards, the proposed project will have an adverse impact on wildlife conservation.

Landscape protection

In terms of landscape protection, the planning area is currently used for agricultural, forestry, water management and urban landscape uses, as well as for nature conservation potential. The proposed road will occupy arable land, forest, pasture and set-aside lands. The planned intervention will also affect managed forest areas.

The main conflicts that may arise during the implementation of the planned road are: the planned road crosses a Natura 2000 site; it crosses forest areas; it crosses a landscape conservation area; and it has a negative aesthetic impact on the landscape.

Changes in land use patterns may occur mainly in the areas affected by land occupation: the loss of former land use (arable, forest, pasture) and semi-natural areas and the development of transport areas in their place. The planned road and its associated facilities (e.g. junctions) will be a new linear landscape feature of artificial origin in the landscape structure. In the longer term, this is expected to result in minor changes to the landscape structure.

The project is expected to result in a reduction of biologically active surfaces in the planning area. The use of planned forest areas will be required, as well as tree felling and brush clearance.

The planned intervention includes the construction of 4 underpasses, 2 overpasses for variant 3 and 3 overpasses for variant 7.

Subject to the proposed measures, and provided the road and its facilities are properly integrated into the landscape, the project is considered acceptable from a landscape point of view.

Protecting the built environment

According to the Spatial Planning Plan of Somogy County, the planned changes do not affect the World Heritage and World Heritage Triangle area.

There are 2 protected architectural heritage sites within 250 m of the proposed route variations, which are not affected by the variations. No monuments or historic environment will be affected by the proposed project.

Of the 2 archaeological sites identified in the entire study area, 1 site is affected by the 7th track variant. In addition, an area of archaeological interest - "RÉ 1" has been identified between mile posts 98+850 - 99+000 km of variant No. 7.

The proposed heritage evaluation for the site *Barcs - Belcsapuszta (19593)* and the designated area of archaeological interest **is a geophysical survey and trial trenching**.

Subject to the proposed safeguard measures, it can be concluded that **the proposed investment is feasible in terms of the protection of the built environment.**

Noise and vibration protection

From a noise protection point of view, the calculations carried out in the immediate area of influence show that, if the planned relief road is built, the noise exposure from road traffic in the vicinity of the road during operation is **not expected to exceed the limit values for either day or night for any of the alternatives.**

In the long term, **no traffic noise exposure above the limit values is expected in the indirect environment of any of the variants of the** proposed M60 expressway**, either during the day or at night.**

Since the contractor, and therefore the exact technology, machinery, etc., is not yet known, the construction work can be estimated, taking into account the distance, that, if the estimated operational and noise parameters given above are maintained, **noise exposure above the limit value is not expected** due to the long distance to the nearest protected areas. Noise exposure during operation will not be affected by the planned utility replacement

In conclusion, the project meets the relevant noise protection requirements.

Waste management

From a waste management point of view, the amount of waste can be minimised during the construction works by complying with the listed waste management principles and the relevant legal requirements. The waste generated will be collected and disposed of in accordance with the legal requirements applicable to the waste generated. Waste generated during construction and operation must be removed and treated by authorised specialist firms.

From a waste management point of view, the proposed investment is feasible if the proposed measures are complied with.

Conclusions of the climate risk analysis

From a climate change perspective, it can be concluded that the proposed investment is *vulnerable to the* expected impacts of climate change. Furthermore, the impact of the proposed investment on climate change is *small* due to its scale. The appropriate application of mitigation proposals could significantly mitigate the expected negative impacts of the proposed investment.

Budapest,