

## **C.V. COMPARISON OF THE VARIANTS OF THE PROPOSED WORKS AND PROPOSAL OF THE OPTIMAL VARIANT**

*Including comparison with zero variant*

### **C.V.1. CREATING A SET OF CRITERIA AND DETERMINING THEIR RELEVANCE FOR THE SELECTION OF OPTIMAL VARIANT**

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The variants of highway D4 in section Ivanka North – Záhorská Bystrica were assessed according to the following criteria:

- environmental
- technical and economic
- traffic

*The environmental criteria* and their importance are derived from importance of the impacts affecting the residents with emphasis on the impacts existing during operation of the project under review. The most important impacts on the residents are supplemented by the significant criteria of impact on fauna, flora and habitats, surrounding rock, air, water conditions mainly focused on hydrological changes, the importance of which is determined by the greatest risks in drifting and excavating the tunnels through the risks associated with the construction of the highway in the vicinity of the tunnel portals to the impact on drainage system in the area.

Other criteria included the criteria of impact on other components of the environment such as impacts on the land, soil, climate, supplemented by criteria of impacts on the urban environment, cultural and historical monuments, archaeological sites, palaeontological sites and cultural values.

*Technical and economic criteria* and their importance were based on difficulty and the construction of the drilled and excavated tunnel parts that represent the most significant limits in performing the project.

The significant economic criterion was the amount of the funds for constructing the individual variants.

*The traffic criteria* emphasise importance of the benefit of highway D4 for overloaded traffic network in Bratislava and its vicinity and for the development of the territory in the vicinity of the line structure. In the territory concerned any further urbanisation is currently almost impossible due to poor traffic situation. The entire D4 highway ring is important especially for development of Bratislava and represents the alternative connection of the municipalities at the moments of the traffic collapse across the city (continued D1 to D2 through Prístavný bridge).

### **C.V.2. SELECTION OF THE OPTIMAL VARIANT OR RANKING THE APPROPRIATENESS OF VARIANTS UNDER REVIEW**

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The project of highway D4 in section Ivanka North – Záhorská Bystrica was submitted in six active variants and zero variant.

Comparison of the individual variants of the project was processed based on the partial assessments and conclusions specified in the preceding chapters.

The zero variant, i.e. the existing status of the traffic network without highway D4, was included in the comparison for completeness sake and to comply with the conditions resulting from the Scope of Assessment issued for the structure concerned, as it is clear now that the existing traffic situation is unsustainable for the Capital City of Bratislava in the future. This fact can be documented by several limits (noise, immissions in urban areas and exceeding the capacity of the local roads), which were confirmed in the elaborated studies for the EIA Report.

In order to compare the variants under review of the project concerned the seven value scale was used. The variants under review were assigned a value based on the intensity and nature of the impact on the individual characteristics. The scale is as follows:

- +5 substantially positive impact
- +3 positive impact
- +1 slightly positive impact
- 0 neutral impact
- 1 slightly negative impact
- 3 negative impact
- 5 substantially negative impact

The individual assessment criteria, which are based on environmental components, were supplemented by the technical and economical criteria and another criterion of impact on the transport system was added<sup>1</sup>. The groups of the assessment criteria are as follows:

- Environmental criteria
- Technical and economic criteria
- Traffic criteria

*The environmental criteria* are assessed at the end of each chapter (C.III.1 to C.III.16), numerical assessment are then taken into the overall assessment and comparison *table C.V.2*.

*Technical and economic criteria* are elaborated separately in the following *table C.V.I*. The conclusions are taken from the overall assessment of the individual variants and expressed in numbers in *table C.V.2*.

*Traffic criteria* are in detail dealt with and evaluated by an individual study "Traffic and Engineering Documents", which is included in EIA Report as Text Annex 1. The conclusions of this study are included in the assessment of the individual variants and expressed in numbers in *table C.V.2*.

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<sup>1</sup> The criterion of *impact on the traffic system* was included in the assessment in particular due to the impact on the entire traffic context of highway D4. It concerns the impact of the individual assessed variants of the project (highway D4, Ivanka North – Záhorská Bystrica) on the connected traffic network (despite the criterion does not affect the overall ranking of the variants and emphasises only their overall impact, is necessary for the comprehensive review).

**Table C.V.I: Technical and economic criteria of the assessed variants**

type of work	units of measurement	quantity					
		variant 2a	variant 2b	variant 7a	variant 7b	variant 7c	SPL variant:
<b>ROADS</b>							
highways – on the embankment	km	8.037	6.859	3.849	3.104	4.141	10.021
– in excavations	km	1.828	1.384	1.784	1.289	0.942	3.250
roads	m <sup>2</sup>	166,303	133,328	95,030	113,778	128,828	410,850
1st class roads (2 and 4-lanes)	km	0.000	0.000	0.000	0.000	0.000	2.771
2nd and 3rd class roads	km	2.651	2.651	2.651	2.651	2.062	3.779
field roads, service, access roads, bypasses etc.	km	2.861	2.861	2.861	2.861	2.861	12.755
roads concurrent with highway D4 (collectors)	km	6.000	4.700	6.000	4.700	6.000	0.000
railway line	km	2	2	2	2	2	2
flyover interchange/length of branches	pc/km	4/8.208	4/8.208	4/8.208	4/8.208	4/7,991	3/5829
surplus (+) or shortage of materials (-)	m <sup>3</sup>	-11,918	480,456	993,599	1,324,918	1,190,532	1,250,985
<b>BRIDGES</b>							
bridges on highway (acreage)	m <sup>2</sup>	12,024	31,046	29,446	47,978	10,770	14,168
bridges over highway (acreage)	m <sup>2</sup>	3,116	2,214	1,643	2,214	1,643	3,100
Bridges on roads outside highway (acreage)	m <sup>2</sup>	5,365	5,365	7,738	7,738	-	1,345
retaining walls	m <sup>2</sup>	3,887	3,887	-	-	-	-
supporting walls	m <sup>2</sup>	6,310	6,310	6,331	6,331	4,975	1,440
noise barrier walls (length)	m	3,250	2,900	3,100	2,400	3,000	3,400
<b>TUNNELS</b>							
tunnels	km	8.062	8.987	9.950	10.500	10.500	14.250
technological equipment of tunnels	km	8.062	8.987	9.950	10.500	10.500	14.250
<b>RELOCATIONS, MODIFICATIONS, UTILITY LINES</b>							
relocation of distance water pipelines	m	-	-	-	-	-	-
relocation of local water pipelines	m	3,350	2,350	2,950	2,350	2,350	1,240
modifications of construction yards	m <sup>2</sup>	315,000	315,000	315,000	315,000	170,000	138,265
Sewer: highways, roads, interchanges, rest areas, maintenance centres etc.	m	10,850	9,100	9,050	7,300	7,900	17,750
demolition of buildings, bridges, towers, concrete, vegetation, liquidation of old roads etc.	m <sup>3</sup>	20,692	20,692	20,692	20,692	20,692	8,325
reclamation of roads, temporarily taken lands, old riverbeds etc.	m <sup>2</sup>	326,262	326,262	326,262	326,262	181,262	182,724
type of work	units of measurement	quantity					
		variant 2a	variant 2b	variant 7a	variant 7b	variant 7c	SPL variant:
vegetation around highways, other structures	m <sup>2</sup>	515,201	468,101	476,921	490,225	407,112	426,590
substitute planting of vegetation	€	1,198,434	1,198,434	1,198,434	1,198,434	1,198,434	524,286
reconstruction of irrigation, drainage systems	m	1,450	1,450	1,450	1,450	1,450	400
modifications of watercourses	m	380	380	800	800	900	1,950

fencing of the highway and all structures		m	15,694	14,594	12,844	11,744	11,744	26,500
Criteria		variant 0	variant 2a	variant 2b	variant 7a	variant 7b	variant 7c	SPL variant:
<b>Environment</b>								
residents (comfort factor, socio-econom. impacts)		-5	-1	-1	-1	1	0	-3
climate		0	-1	-1	-1	-1	-1	-1
air		-3	1	1	1	1	1	-1
surrounding rock		0	-3	-3	-3	-3	-3	-5
water conditions		-1	-3	-5	-3	-5	-3	-3
soil (taken soil)		-1	-3	-3	-3	-3	-3	-5
fauna, flora and their habitats		-1	-1	-1	-1	-1	-1	-3
landscape		0	-3	-3	-1	-1	-1	-3
special protection areas and their protective zones		-1	-1	-1	-1	-1	-1	-5
TSES		-1	-1	-1	-1	-1	-1	-5
urban complex and land use		-3	1	1	3	3	3	-1
cultural and historical monuments		0	-3	-3	-1	-1	-1	-1
archaeological sites		0	-1	-1	-1	-1	-1	-1
palaeontological sites		0	0	0	0	0	0	0
cultural values		0	0	0	0	0	0	0
<b>Interim assessment</b>	<i>sum</i>	-16	-19	-21	-13	-13	-12	-37
	<i>average</i>	<b>-1.06</b>	<b>-1.26</b>	<b>-1.40</b>	<b>-0.86</b>	<b>-0.86</b>	<b>-0.80</b>	<b>-2.46</b>
<b>Technical and economic</b>								
Technical requirements of construction		0	-3	-5	-3	-5	-3	-5
economic requirements of construction		0	-3	-3	-3	-3	-3	-5
<b>Interim assessment</b>	<i>sum</i>	0	-6	-8	-6	-8	-6	-10
	<i>average</i>	<b>0</b>	<b>-3</b>	<b>-4</b>	<b>-3</b>	<b>-4</b>	<b>-3</b>	<b>-5</b>
<b>Traffic system</b>								
traffic benefits/significance		<b>-5</b>	<b>+5</b>	<b>+5</b>	<b>+5</b>	<b>+5</b>	<b>+5</b>	<b>+1</b>
<b>Interim assessment</b>	<i>sum</i>	-5	+5	+5	+5	+5	+5	+1
	<i>average</i>	<b>-5.00</b>	<b>5.00</b>	<b>5.00</b>	<b>5.00</b>	<b>5.00</b>	<b>5.00</b>	<b>+1.00</b>
<b>comparison of variants</b>								
<b>Final assessment</b>	<i>sum</i>	<b>-21</b>	<b>-20</b>	<b>-24</b>	<b>-14</b>	<b>-16</b>	<b>-13</b>	<b>-46</b>
	<i>average</i>	<b>-1.17</b>	<b>-1.11</b>	<b>-1.33</b>	<b>0.77</b>	<b>0.88</b>	<b>0.72</b>	<b>-2.55</b>
sedimentation tanks etc.	pc	13	8	10	6	9	12	
fuel stations, discharge structures, sediment traps, retention tanks	m <sup>3</sup>	3,700	2,900	3,700	2,700	3,700	618	
traffic counters, TZD cables, accessories, ice detectors, alarm systems, outdoor lighting - poles, cabinets, equipment, lighting, etc.	km	16.840	16.840	16.772	16.772	16.772	28.065	
remote distribution lines of electricity – VHV	m	1,500	1,500	1,500	1,500	1,500	-	
remote distribution lines of electricity – HV	m	8,700	10,700	8,700	10,700	8,700	35,010	
remote distribution lines of electricity – LV	m	2,500	1,400	2,500	1,400	1,400	-	
remote gas pipeline – VTL	m	300	300	300	300	300	678	
local telecommunication distribution lines	m	1,100	1,000	1,000	1,000	930	700	
remote telecommunication networks and lines	m	4,950	4,500	4,500	4,500	4,200	2,870	
<b>total length</b> of the proposed section of highway D4	km	<b>16.840</b>	<b>16.840</b>	<b>16.772</b>	<b>16.772</b>	<b>16.772</b>	<b>28.065</b>	
<b>Total investment costs</b> of the proposed section of highway D4 (excl. VAT)	ths. €	<b>851,444</b>	<b>952,709</b>	<b>1,004,362</b>	<b>1,076,910</b>	<b>1,000,499</b>	<b>1,248,576</b>	
costs per 1 km	ths. €	50,561	56,574	59,883	64,209	59,653	44,489	
<b>Financial internal rate of return (IRR)*</b>	%	8.49	7.68	7.32	6.84	7.32	2.10	

\* - the value of IRR is calculated in combination with section I. (variant A – reference) and section III. of highway D4.

**Table C.V.2:** *Numerical summary of the multi-criteria analysis*

According to the aforementioned conclusions of the multi-criteria analysis, summed up in *table C.V.2*, we can set up **the ranking of variants according to their suitability** (ranked from most suitable to least suitable variant):

1. variant 7c
2. variant 7a
3. variant 7b
4. variant 2a
5. variant 0
6. variant 2b
7. SPL variant:

### **C.V.3. JUSTIFICATION OF PROPOSAL OF OPTIMAL VARIANT**

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According to the conclusions of EIA Report the most suitable variant of highway D4 in section Ivanka North – Záhorská Bystrica is **variant 7c**.

**Zero variant is unsuitable** due to its impact on the residents, traffic and related aspects.

**We recommend variant 7c for the following reasons:**

- in terms of traffic it is the most used variant
- from the viewpoint of impact on the residents it is one of the best variants
- it requires the least interference with the rare habitats
- in this variant the tunnel represents the smallest risks of drifting the tunnel and impact on the massif of the Little Carpathians
- in terms of impacts on groundwater it is one of the most favourable given the length of the Karpaty tunnel and non-construction of the Vajnory tunnel
- it has the least impact on the fragmentation of the territory, and the least impact on protected areas in its vicinity
- it is one of the most cost efficient variants from the financial viewpoint

## **C.VI. PROPOSED MONITORING AND POST-PROJECT ANALYSIS**

### **C.VI.1. PROPOSED MONITORING FROM START OF CONSTRUCTION, DURING CONSTRUCTION, DURING OPERATION AND AFTER THE OPERATION OF THE PROPOSED WORK**

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Monitoring of the individual components of the environment will serve for collecting the objective information about the assessed project and its impact on the environment. This will practically verify the analysis made during the preparation of the project under review in the selected variant and/or analysis made in the event that no project is implemented.

Anyway, the top objective of monitoring is to obtain the relevant information from the nationwide information system of environmental monitoring concerning impacts of the roads on the environmental components in the territory concerned.

Based on the conclusions obtained in assessing the impacts on the environmental components we propose monitoring of the selected variant of the project as follows (given the nature of the project the scope of the monitored components is identical before construction, during construction and during operation):

#### **Air**

According to the conclusions of the diffuse study it is necessary to monitor especially the imissions of NO<sub>2</sub> in both the short-term and long-term concentrations, particle PM<sub>10</sub> and/or particles PM<sub>2,5</sub>. At the request of the investor also the imissions of other pollutants from transport can be monitored, where concentrations do not currently require long term monitoring.

#### *Proposed monitoring locations*

Variants 2a,2b,7a,7b,7c

- eastern periphery of Vajnory municipality with regard to emission burden from highways D4 and D1
- periphery of Vajnory municipality at interchange of road III/5021 and Rybničná ulica
- southern edge of the built-up area in Čierna voda
- FOI Rača, surrounding vegetation of grapevine
- cottage settlements on both sides of highway D4 in variants 2a,2b at 6.000 km
- northern edge of Marianka municipality
- area around exhaust of the ventilation shaft of the Karpaty tunnel

SPL variant

- Šalaperska hora (mountain), crossing of D4 and D1, grapevine vegetation
- south-west edge of Viničné municipality
- northern edge of Slovenský Grob municipality
- area around exhaust of the ventilation shafts of the Karpaty tunnel
- southern edge of Lozorno municipality

#### **Noise**

According to the conclusions of the noise study it is necessary to monitor the noise level in the outdoor environment in relation to the permitted values defined in the applicable legislation (currently applicable Decree of the Ministry of Health SR No. 549/2007 Coll.).

### *Proposed monitoring locations*

#### Variants 2a,2b,7a,7b,7c

- eastern periphery of Vajnory municipality with regard to noise burden from highways D4 and D1
- southern edge of the built-up area in Čierna voda
- cottage settlements on both sides of highway D4 in variants 2a,2b at 6.000 km
- northern edge of Marianka municipality

#### SPL variant

- south-west edge of Viničné municipality
- northern edge of Slovenský Grob municipality
- southern edge of Lozorno municipality

### **Surface water and ground water**

Based on the anticipated impacts it is necessary to monitor the changes in the surface and ground waters caused by the drifted and excavated parts of tunnels (Karpaty, Katušiná, Vajnory - according to the selected variant) as well as changes in the drainage conditions at problematic courses of Šúr and Čierna voda channels. It is also necessary to monitor any changes in the water quality in the reservoirs.

The locations and structures will be monitored as determined during implementation of the hydro-geological monitoring system necessary for review of the zero status of the hydro-geological conditions prior to construction of the tunnels. The monitored structures will serve also during construction and operation of highway D4. The following locations will have to be monitored.

### *Proposed monitoring locations*

#### Variants 2a,2b,7a,7b,7c

- Šúrsky channel, monitoring of water quality behind FOI Ivanka North
- Vajnorský potok, monitoring of hydrological changes in the spring area
- Vidrica, monitoring of hydrological changes in the spring area
- Marianský potok, monitoring of hydrological changes in the watercourse

#### SPL variant

- Šúrsky channel, monitoring of water quality behind the bridging of the channel by highway D4 at approx. 10.300 km
- Limbašská vyvierka (resurgence), monitoring of changes in the hydrological regime
- Račí potok, monitoring of hydrological changes
- Stupavský potok, monitoring of hydrological changes in the spring area
- Suchý potok, monitoring of hydrological changes in the entire watercourse up to the Lozorno reservoir

### **Biota**

In the year-round monitoring of biota in the territory concerned, the rare locations for the occurrence of protected species of fauna and flora and valuable habitats were determined. Based on the selected variant it is necessary to monitor these locations from the viewpoint of qualitative and quantitative impacts on the affected zoocenoses and phytocenoses due to fragmentation of the territory and exposure to noise and/or immission factors.

It is necessary to individually monitor the impact of the newly built highway on the special protection areas and/or the protected objects.



It is also necessary to monitor functionality of all structures constructed for the purpose of protecting the biota (noise and light barriers, migration structures etc.)

*Proposed monitoring locations*

Variants 2a,2b,7a,7b,7c

- biocentre Háj nearby jazero na Lysom (Lyso lake)
- eastern portal of the Karpaty tunnel
- western portal of the Karpaty tunnel
- monitoring of animal mortality in the entire section of highway D4 outside the tunnels

SPL variant

- Šalapérska hora
- eastern portal of the Karpaty tunnel
- inter-portal section between the Karpaty tunnel and Katušiná tunnel
- western portal of the Katušiná tunnel
- crossing of the local biocorridor by highway D4 at 26.700 km

***It is necessary to commence monitoring shortly before construction of the road, continue during the construction and operation of the road in the selected variant.***

The detailed monitoring program must be prepared in line with the technical conditions TP 6/2008 "Handbook of monitoring the impacts of roads on the environment" for the selected variant of the project under review in detail and develop it in the next phase of project documentation (LUPD).

## **C.VI.2. PROPOSED MONITORING OF COMPLIANCE WITH SPECIFIED CONDITIONS**

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In the project of monitoring the impact on the construction and operation of highway D4 in section Ivanka North – Záhorská Bystrica the periodicity and mechanism of filing the reports from monitoring of the environment by the competent authorities in the field of protection of nature - District Environmental Authority, surface and ground waters - State Water Administration Department of EDA, noise and emissions - the relevant Regional Public Health Authority.

The report from monitoring the elements of the environment will be filed by:

- in the period before the construction it is the proposer NDS a.s.,
- in the period of construction NDS a.s. and operative monitoring by the constructor of the structure,
- in the operation period it is the structure operator NDS a.s..

Final monitoring reports must include, inter alia, proposals for measures to reduce the adverse impacts of the work as well as suggestions for possible improvement in further phases of the monitoring.

Activities to ensure compliance with the set conditions will be ensured by the aforementioned organizations in terms of finances and operations.

## **C.VII. METHODS USED IN THE IMPACT ASSESSMENT PROCESS OF THE PROPOSED ACTIVITIES ON THE ENVIRONMENT AND METHODS AND SOURCES OF OBTAINING DATA ON THE PRESENT STATUS OF THE ENVIRONMENT IN THE TERRITORY WHERE THE PROPOSED ACTIVITY IS TO BE CONSTRUCTED**

### **IMPACT ON RESIDENTS**

Estimate of the effects of various harmful factors on the residents was transferred using the procedure derived from conventional risk assessment.

### **IMPACT ON AIR**

Method of calculating the immission of burden described in the relevant chapter C.III.4.

### **IMPACT ON WATER**

Estimate of impacts on water conditions has been prepared on the basis of geological and hydro-geological studies, converted calculations and qualified assessment of the available documents and individual characteristics.

### **IMPACT ON SOIL**

Estimate of impacts on soil was reviewed based on converted calculations of taken lands and qualified review of the available documents.

### **IMPACT ON THE FAUNA, FLORA AND THEIR HABITATS**

Standard methods of research usually applied with regard to the species studied were used in the year-round monitoring of biota and research of fauna and flora.

### **IMPACT ON PROTECTED AREAS AND PROTECTION ZONES**

In assessing the impacts on the protected areas the standard methods were used and in assessing impacts on Natura 2000 system the methodology was used in line with provisions of Articles 6(3) and 6(4) of Directive on the conservation of natural habitats and of wild fauna and flora 92/43 / EEC, as well as a qualified assessment of the available documents.

## **C.VIII. SHORTCOMINGS AND UNCERTAINTIES IN KNOWLEDGE ENCOUNTERED IN THE PROCESSING OF THE ASSESSMENT REPORT**

Assessment of the impacts of the highway D4 in section Ivanka North – Záhorská Bystrica was performed in the scope required by Assessment Report under Section 31 of Act No. 24/2006 Coll. on Environmental Impact Assessment, as amended.

We used the maps and drawings provided by the investor, which form a part of the "Feasibility and Suitability Study for Route of Highway D4 Bratislava Jarovce – Ivanka North – Stupava South – State Border between Slovakia and Austria. The accuracy level of these

documents reflected the punctuality of the study without modelling the embankments and cuts of the assessed variants. These details were developed while elaborating the report.

All assessments and recommendations used the precautionary principle and the acreage of taken land as well as the impact of noise and emissions was deliberately overestimated to avoid omission and neglect of negative effects of some impacts.

## **C.IX. ANNEXES TO THE ASSESSMENT REPORT (GRAPHICS, MAPS, TABLES AND PHOTO-DOCUMENTATION)**

### **TEXT ANNEXES**

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*(Printouts included in counterparts 1-6, otherwise only on the included CD)*

- Text Annex no. 1:** Traffic and engineering documentation  
**Text Annex no. 2:** Noise study  
**Text Annex no. 3:** Dispersion study  
**Text Annex no. 4:** Impacts of the proposed activity on NATURA 2000 sites  
**Text Annex no. 5:** Impact on favourable status of habitats

### **GRAPHICAL ANNEXES**

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*(Printouts of Graphical Annexes 1 to 4.2 are included in all counterparts; Printouts of Graphical Annexes 5 to 9 are included in counterparts 1-6, otherwise on the attached CD)*

- Graphical Annex no. 1:** General situation of wider relations in M 1:120 000  
**Graphical Annex no. 2.1:** General situation 2a, 2b (1:30 000)  
**Graphical Annex no. 2.2:** General situation 7a, 7b (1:30 000)  
**Graphical Annex no. 2.3:** General situation 7c and SPL (1:30 000)  
**Graphical Annex no. 3:** Situation of the current status of environment - environmental characteristics (1:25 000)  
**Graphical Annex no. 4.1:** Situation of foreseen impacts on environment 2a, 2b, 7a, 7b, 7c (1:10 000)  
**Graphical Annex no. 4.2:** Situation of foreseen impacts on environment SPL (1:20 000)  
**Graphical Annex no. 5:** Geology map of the territory  
**Graphical Annex no. 6:** Compliance with Land Use Documentation (1:100 000)  
**Graphical Annex no. 7:** Longitudinal profiles  
**Graphical Annex no. 8:** Photographic documentation  
**Graphical Annex no. 9:** Visualization

## C.X. GENERAL FINAL SUMMARY

The presented Report on Activity Assessment under Article 31 of the Act No. 24/2006 Coll. on Environmental Impact Assessment as amended (hereinafter the EIA Report) is prepared for the project "**D4 Highway, Ivanka North - Záhorská Bystrica**".

The corridor of the entire highway D4 has been conceptually monitored and dealt with on a cross-border basis with the Republic of Austria in relation to its connection to the Austrian A6 highway and S8 expressway, which is to ensure the shortest route between Bratislava and Vienna.

Highway D4 in section Ivanka North – Záhorská Bystrica is assessed in six active variants, namely 2a,2b,7a,7b,7c and SPL (Senec-Pezinok-Lozorno), while maintaining the current status of the traffic network was equally assessed (zero variant). Variants 2a,2b,7a,7b,7c follow the corridor that has been delineated for highway D4 and/or zero ring for Bratislava for a long period and they were created by modification of the variants 2 and 7 as recommended in the project. Variant SPL is designed according to the requirements for verification of the new corridor northwards from its stabilized routes and connects the highway D1 and D2 highways in line Senec – Pezinok – Lozorno.

### DESCRIPTION OF THE ASSESSED VARIANTS

#### *Zero variant*

It comprises the existing road network composed of highways D1 and D2, 1st class roads I/2, I/61, I/63, 2nd class roads II/502, II/572 and lower category roads.

#### *Variant 2a*

From the interchange with D1 up to the eastern portal of the Karpaty tunnel highway D4 runs predominantly above the terrain level (**elevated routing**). From the western portal of the Karpaty tunnel the highway has **elevated routing** up to the interchange of highway D4 and road I/2 (FOI Záhorská Bystrica).

#### *Variant 2b*

Eastern part of highway D4 from the interchange with highway D1 up to the eastern portal of the Karpaty tunnel runs on the embankment, but the required section of highway D4 around Vajnory municipality, at crossing point with road III/5021 "FOI Čierna voda", runs through the tunnel (**subgrade routing**; from 0.900 km up to 1.600 km). After the exit from the western part of the Little Carpathian massif, highway D4 runs in the deep overlaid cut (extended tunnel near Marianka municipality; **subgrade routing**). Subsequently, highway D4 continues on a low embankment up to the interchange of highway D4 with road I/2.

#### *Variant 7a*

From the interchange with D1 highway D4 runs predominantly above the terrain level (**elevated routing**) up to the eastern portal of the Karpaty tunnel. From the western portal of the Karpaty tunnel the highway has **elevated routing** up to the interchange of highway D4 and road I/2 (FOI Záhorská Bystrica).

#### *Variant 7b*

Eastern part of highway D4 from the interchange with highway D1 up to the eastern portal of the Karpaty tunnel runs on the embankment, but the required section of highway D4 around Vajnory municipality, at crossing point with road III/5021 "FOI Čierna voda", runs through the tunnel (**subgrade routing**; from 0.900 km up to 1.600 km). From the western portal of the Karpaty tunnel at the edge of the built-up area in Marianka municipality (the tunnel extended up to 15.200 km) highway D4 runs in the cut for approx. 380 m (**subgrade routing**).

and subsequently up to the interchange of D4 with road I/2 it continues on a low embankment.

### **Variant 7c**

From the interchange with D1 up to the eastern portal of the Karpaty tunnel highway D4 runs above the terrain level (**elevated routing**). From the western portal of the Karpaty tunnel at the edge of the built-up area in Marianka municipality (the tunnel extended up to 15.200 km) highway D4 runs in the cut for approx. 380 m (**subgrade routing**) and subsequently up to the interchange of D4 with road I/2 it continues on a low embankment.

**In variant "Senec – Pezinok – Lozorno"** from the interchange with highway D1 up to the eastern portal of the Karpaty tunnel highway D4 runs almost at the terrain level. Ahead of the eastern portal highway D4 bridges over road II/502 and the railway line. In section from 23.100 km up to 23.600 km the highway bridges the valley between portals of the Karpaty tunnel and Katušiná tunnel. Behind the western portal of the Katušiná tunnel the highway runs at the terrain level up to the existing interchange of highway D2 and road I/2.

## BRIEF DESCRIPTION OF THE TERRITORY

The territory under review comprises the Bórska Lowland at the west as a part of Záhorská Lowland, the central part of the territory under review consists of the Little Carpathian massif and the eastern part of the territory comprises the Danube Lowland, whose northern edge is delineated by the Danube Upland.

The subsoil can be characterised by the crystalline of the Little Carpathian massif in the central part, bordered at the eastern and western sides by the neogenic and fluvial sediments. The soils originating in these circumstances have varying structure and value. In the area there have originated high-quality black soils, less fertile brown soils, fluvisols bound to the extensive plains of the rivers and the regosols that originated on the unpaved drifting sands in the western part of the monitored territory.

This quite extensive territory extends into the warm and moderately warm climate. The average annual air temperature ranges from 8.3 ° C in the highest locations up to 10.8 ° C in lowland locations. Conversely, precipitation grows with the altitude, where in the lowland area the rainfall is approx. 600 mm per year, while in the mountainous areas of the Little Carpathians it is almost 800 mm per year.

In the territory the watercourses are mostly regulated by a network of drainage channels. The western part of the territory is located partially in the basin of Morava River, eastern part in the basin of Váh River and /or Small Danube basin.

From the viewpoint of nature conservation the territory comprises both small and large protected areas. Under Act No. 543/2002 Coll. on Nature and Landscape Protection, as amended, the territory includes PLA Malé Karpaty, NNR Šúr, NR Jurské jazero, NR Pod Pajštúnom, NR Strmina, NR Zlatá studnička, PA Svätójurské hradisko, NM Limbašská vyvieračka; the following areas are included in NATURA 2000 sites: SKCHVU014 Malé Karpaty, SKUEV0104 Homoľské Karpaty, SKUEV0279 Šúr, SKUEV0388 Vydrica, SKUEV0089 Martinský les. With the exception of sites of natural depressions Šúr, they are mostly the forest and non-forest sites in the Little Carpathian massif.

The natural centre of the whole area is the capital city of Bratislava, which is currently experiencing considerable urban development caused mainly by a convenient location of Bratislava and related economic activities. The villages around Bratislava are attractive locations for development of modern family living. Their original functioning of the agricultural settlements is currently suppressed. There is enormously strong pressure on the transformation of the agricultural landscape for residential and industrial zones. The territory under review includes, without limitation, the following municipalities: Vajnory, Čierna voda,

Slovenský Grob, Chorvátsky Grob, Marianka, Záhorská Bystrica and other urban areas to a lesser degree.

At the eastern slopes of the Little Carpathians there is the centuries long grapevine growing tradition in the vineyards, which form and determine many economic and cultural activities in the area. It is also known as Little Carpathians wine region.

## BRIEF DESCRIPTION OF THE IMPACTS

The current traffic at supraregional traffic routes in the territory under review, which includes, without limitation, highways D1 and D2, is becoming with each year more complicated with a higher risk of accidents and the subsequent collapse of the transport virtually in the entire transport network of Bratislava.

Construction of the zero radial route around Bratislava will result in distribution of the traffic and positive impact on the traffic, diverting the considerable part of the transit transport away from the Bratislava municipalities and unburden the traffic in the centre of the city and routes crossing the city by highways D1 and D2. The territory affected by the urbanisation will be extended, but the benefits of the good functioning transport network outweighs this negative impact.

The new territory will be burdened by noise from the newly built highway D4, extreme values will therefore have to be minimised by the noise control measures in the form of noise barriers. In the vicinity of the selected variant the noise levels will be increased, but it will not exceed the statutory health limits.

In the area concerned the overall emissions will slightly grow due to highway D4, but it may be noted that the statutory hygiene limits will not be exceeded in the built-up areas even in their cumulative state. As a result, distribution of traffic will cause reduction in the immission burden the central parts of certain built-up areas (municipalities of Vajnory, Rača, Záhorská Bystrica), fluency of traffic will improve the dispersion of pollutants in the direct vicinity of roads.

Possible impacts on climatic characteristics are expected only at the local level, where the impacts of the active surface may alter the micro-circulation in the ground layer of the atmosphere. In this area in connection with the development of urbanization, the expansion of the phenomenon of "heat island city" can be expected more northwards.

The balance of the surface waters will be disrupted in the territory and therefore it will be necessary to reduce fast drainage of the water from the territory by applying the available technical and economic measures and thus prevent possible floods. Construction of the tunnels will result in disruption of the surrounding rock and impact on ground water, which must be specified in more detail by the hydro-geological and geological monitoring system in order to avoid undesirable effects during construction.

Construction of the selected variant will require taking the agricultural lands and small acreage of the forest lands. The soil should not become contaminated since several surveys confirmed that contamination decreases exponentially at a distance of 10 m from the road.

The territory concerned comprises locations and large areas protected by legislation at national or European level (PLA Malé Karpaty, NNR Šúr, SPA Malé Karpaty, SCI Homofské Karpaty and several small protected areas). None of these sites is affected significantly by the variants, the object of protection located in the territory is not endangered. The adverse impacts are considerably minimised by the fact that the most valuable sites in the route are crossed by tunnels.

Comparison of the variants proved that:

- **the least suitable is variant SPL**, which insufficiently addresses the critical traffic situation in the territory, requires the largest acreage of the land to be taken, it interferes with and damages the protected and rare natural sites the most and it is the most costly variant.
- **construction of variant 7c is recommended**, it sufficiently addresses the traffic problems in the territory, requires the smallest land take, smallest interference with the valuable and protected natural areas and it is not among financially most demanding, its impact on the residents directly affected is acceptable.

#### Compliance with the specific conditions determined in the Scope of Assessment:

1. The Assessment Report must ensure a high level of environmental protection and contribute to the integration of environmental aspects into the preparation of variants with a view to promoting sustainable development in line with <b>the European Sustainable Development Strategy</b> (EU SDS) and NATURA 2000.	<i>It is a standard approach to preparation of the Assessment Report.</i>
2. Justify in detail the <b>purpose of the structure</b> from the nationwide perspective, its justification and enclose a traffic forecasts for the corridor.	<i>The purpose and justification of the structure are set out in the introductory chapters and the traffic forecast is a part of the Text Annex 1 to the Assessment Report.</i>
3. Determine the size of the territory, for which the highway will serve, and attach long-term traffic studies concerning highway traffic in the Slovak Republic, interconnections of the regions in Slovakia, connection to foreign routes and the city of Bratislava.	<i>These data are set out in a separate Text Annex 1 to the Assessment Report – Traffic Engineering Documentation.</i>
4. Quantify the analysed impacts of the variants on the environment using the multi -criteria assessment.	<i>The multi-criteria assessment is set out in Chapter C.V. of the Assessment Report.</i>
5. Assess which of the proposed variants corresponds best to the principle of sustainable development with the smallest direct or indirect impact on the environment including the impact on health, flora, fauna, reduction of biodiversity, soil, climate, air, water, landscape, natural sites, material assets, cultural heritage and the interaction of these factors and propose compensatory measures to reduce negative impacts.	<i>This is the standard approach and it was elaborated in the relevant chapter of the Assessment Report.</i>
6. Assess the impact of the proposed works on the character of the landscape, the scenery of the naturally preserved area on the west side and Little Carpathian vineyard landscape on the east side of the proposed compensatory measures to eliminate and/or reduce significant negative impacts. Elaborate visualisation of the individual variants of the points defined by the affected municipalities and/or other parties. Elaborate visibility analysis (graphic and text) and add the layout plan with scale or description of the distance from the nearest residential area to the highway. Supplement visualisation of the tunnel exhausts, portals, construction yards and the construction routes of the structure.	<i>Assessment of the impacts on the nature of the landscape, including visualisation (graphic Annex No. 9) forms a part of the Assessment Report, in particular chapter C.III.8</i>
7. Perform indicative <b>stocktaking of flora and fauna</b> in the territory concerned and prepare the study of the " <b>Impact on the Favourable Status of Habitats</b> ".	<i>Stocktaking of flora and fauna were taken from the Monitoring of Biota in Territory and incorporated in chapter C.II.7 Impact on the favourable status of habitats forms a separate Text Annex 5 to the Assessment</i>



	<i>Report.</i>
8. Describe in detail the characteristics of the protected area in the route of the highway and assess the impact of the proposed works on the sites of the coherent European system of protected <b>Natura 2000</b> sites-Special Protection Area (SPA) Little Carpathians and site of Community importance (SCI) Homolské Karpaty. NATURA 2000, special protection areas, NNR Šúr, SPA Little Carpathians, Natural Reserve (NR) Pod Pajštúnom, NR Strmina, and propose measures for eliminating the impacts.	<i>Impacts on the protected areas are described in chapter C.III.9 Impact on the NATURA 2000 sites is elaborated in the separate Text Annex 4.</i>
9. Analyse the impact of the proposed works on other planned use of the territory. Assess impact of the individual variants on the social and economic development of the affected municipalities, in particular on the limit to the recreational use of the affected area for winter and summer tourism and sports (jogging, running, cross country skiing, cycling, trekking etc.), and the forthcoming project "Green Lungs of Bratislava" and Vajnory municipality development, with a proposal for compensatory measures.	<i>Impacts on the use of the territory and specific activities in the territory are described in chapters C.III.11 and C.III.16.</i>
10. Assess the <b>barrier effect</b> of individual variants on limiting the movement of migratory species of animals, with analysis of the impact of migration restrictions reducing the number of individuals per stock (please specify the number of animals in individual populations of migratory species) and the potential reduction of biodiversity and propose measures to minimize the impact.	<i>Impact on the migration in the territory is elaborated in chapter C.III.7</i>
11. Assess the impact of the barrier effect of the proposed works on transition pathways for agricultural machinery, pedestrians and cyclists in the territory concerned. Assess the impact of the proposed works on existing and planned cycling trails.	<i>Impacts of this type are described in chapter C.III.16</i>
12. Quantify the reduction in biodiversity by the combined negative effects during the construction and operation of the proposed works, e.g. land taking, increased noise, increased air pollution, flushing technological salts in the soil etc.	<i>Impacts on the potential reduction in biodiversity are described in chapter C.III.7</i>
13. Assess the impact of waste on the environment during construction indicating the length of the structure with the indicative specification of the said traffic routes working mode. Traffic routes of the structure should not burden the existing road.	<i>Environmental impacts during the construction of the motorway are described in various sub-chapters of C.III The construction site traffic is described in chapter B.I.5.</i>
14. Assess the impacts of tunnelling on water sources and <b>karst caves</b> and recommend tunnelling technologies that minimise these negative impacts.	<i>Impacts of this type are described in chapter C.III.2 and chapter C.III.5</i>
15. Define the territory concerned in terms of impact and impact on the residents.	<i>Affected residents are described in chapter C.III.1.</i>

16. Specify the indicative areas where the <b>construction yards</b> and dump sites should be established, and the routing of the access roads. Specify where the construction sites can be established.	<i>Location of the construction yards is described in chapter B.I.5</i>
17. Describe in detail how the excavated soil should be handled. Specify transportation variants and determine the site for depositing the excavated soil from the tunnel.	<i>Depositing the excavated soil and felling trees is described in chapter B.II.6</i>
18. Elaborate the <b>Noise Study</b> and <b>Diffuse Study</b> for a period during the construction and operation, for the day and night hours, compare the obtained data with the "zero" variant and on that basis propose compensatory measures.	<i>The Noise and Diffuse Studies were elaborated separately and form separate Text Annexes 2 and 3 of the Assessment Report (EIA).</i>
19. Perform the detailed geological and hydro-geological survey and assess the impact of the proposed works on the surface waters and flow of the groundwater especially in the tunnel sections and section of Vajnory municipality.	<i>For the purposes of preparing the EIA Report the separate geological and hydro-geological study, the detailed survey will follow at further level of the project preparation.</i>
20. Specify the results of hydrological analyses of changes in groundwater flow resulting from the proposed work.	<i>Elaborated in chapter C.III.5</i>
21. Specify the analysis of changes in the height of groundwater in the built-up area of Vajnory municipality resulting from the proposed work.	<i>Elaborated in chapter C.III.5</i>
22. Assess functionality of flood protection in Vajnory municipality in the case the proposed work is constructed.	<i>Elaborated in chapter C.III.5</i>
23. Assess the impact of vibrations from the proposed work on the stability of the dam of Šúrsky channel.	<i>The detailed survey concerning this issue will follow in the detailed geological survey at further level of the project documentation.</i>
24. Based on information from IGHP, describe in detail the impact of the proposed work on the surrounding rock and potential risks during tunnelling.	<i>Elaborated in chapter C.III.2</i>
25. Specify main areas of risk from the proposed work - the impact of air pollutants from traffic, flushing technical salts into the soil, the impact on drinking water supplies, leakage of fuel and lubricants, and propose measures.	<i>The issue is addressed in sub-chapters of C.III</i>
26. Specify the production of air pollutants from the tunnel exhaust located in mountain massif and the impact of air pollutants on the surrounding nature and vineyards. Propose compensation measures.	<i>The production of air pollutants from the tunnel exhaust is depicted in diagram and described in separate Text Annex 3</i>
27. Estimate the noise burden on the nature by the central tunnel exhaust.	<i>Elaborated in separate Text Annex 2</i>
28. Make estimate of <b>trees to be felled</b> with their indicative social value and propose the compensation measures.	<i>Elaborated in chapter B.II.6</i>
29. Include TSES map in the graphic annexes indicating the regional and supraregional bio-corridors.	<i>TSES is depicted in Graphic Annex 3.</i>

30. Include valid land-use plans of Bratislava , Bratislava municipalities and municipalities concerned in the graphic annexes.	<i>Elaborated in Graphic Annex 6</i>
31. Make a graphic map of the impacts of the proposed work on the affected environment and human health at scale 1:5000.	<i>The impacts are depicted in the Graphic Annexes 4.1 and 4.2</i>
32. Describe the solution of crossing with the railway line ( <i>Railway Regulatory Authority ÚRŽD</i> ).	<i>Elaborated in chapter A.II</i>
33. Describe the solution of crossing highway D4 with the 1st, 2nd, 3rd class roads, and ensure connection of the traffic from the nearby municipalities in flyover manner.	<i>Described in chapter A.II</i>
34. Resolve the interchange with the state road II/502 so that the reserve for TR 400/110/22 kV is ensured, including the connecting VHV lines in the area determined in the city's land-use plan.	<i>According to the Feasibility Study the routing of perspective "outlets" from the upcoming transformer station is unknown, the draft technical solutions (highway D4 and transformer station) should therefore be coordinated in the next step of the project documentation</i>
35. Describe the impact of proposed work on the increase in congestion on road II/502 in the section of the Svätý Jur municipality.	<i>This issue is described separately in Text Annex 1</i>
36. Assess the impacts of the highway on hunting grounds in the territory concerned.	<i>The impacts of the highway on hunting grounds is elaborated in chapter C.III.16</i>
37. Prepare for a public discussion the appropriate visual presentation of proposed works (e.g. maps, photo documentation, computer simulation of objects, etc.).	<i>The request was accepted at both public discussions</i>
38. Assessment of possible collisions with the route of the transit gas pipeline.	<i>Elaborated in chapter A.II</i>
39. Assess the impacts of construction and operation of the highway on the area of vineyards in the territory concerned, including changes to the landscape character of the vineyards.	<i>Elaborated in chapter C.III.8</i>
40. Assess the impacts of the highway on the hills Vrchná hora and Vajnorská hora.	<i>Elaborated in chapter C.III.16</i>
41. Assess other substantiated comments submitted on the project.	<i>All justified comments on the plan are addressed in the relevant chapters of the Assessment Report</i>

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## **C.XII. LIST OF SUPPLEMENTARY ANALYTICAL REPORTS AND STUDIES AVAILABLE FROM THE PROPONENT USED AS BASIS FOR PREPARING THE ASSESSMENT REPORT**

### Project studies - assessed technical solutions

- Technical Study "*Highway D4, Bratislava (D1, interchange Ivanka pri Dunaji - North) – Stupava (Road I/2)*", HBH Projekt spol. s r.o., Brno, May 2007.
- Technical Study - supplementation of variant 7 of "*Highway D4, Bratislava (D1, interchange Ivanka pri Dunaji - North) – Stupava (Road I/2)*", HBH Projekt spol. s r.o., Brno, August 2007.
- Feasibility and Suitability Study for Route of Highway D4 Bratislava Jarovce – Ivanka North – Stupava South – State Border between Slovakia and Austria, prepared by Dopravoprojekt, a.s., September 2009
- Technical Study "*Highway D4, interchange Ivanka North with highway D1, variant solution*", Geoconsult Bratislava, 2010.

### Other documents

- Project "*Highway D4, section Jarovce – Ivanka North*", Geoconsult, Bratislava, December 2007.
- Project "*Highway D4 Bratislava, interchange Ivanka North – Stupava*", HBH Projekt spol. s r.o., Brno, March 2008.
- Assessment Report "*Highway D4, section Jarovce – Ivanka North*", Geoconsult, Bratislava, April 2010.
- Biota annual monitoring "*Highway D4 Bratislava, Ivanka North0 – Záhorská Bystrica*", HBH Projekt spol. s r.o., Banská Bystrica, November 2010.
- Update and assessment of transport relations in the Bratislava region with reference to Trnava region
- Traffic study - assessment of interchanges on highways in the Bratislava region

Other background documentation, literature and studies prepared for the Assessment Report

- Landscape Atlas, SAV Bratislava, 2002
- Catalogue of habitats in Slovakia, 2002
- Habitats of Community Importance in Slovakia, 2003
- General plan of supraregional territorial system of ecological stability SR, 1992
- Report on the State of Environment SR, 2006
- Report on the State of Environment in Bratislava Region, 2002
- Report on air quality and share of individual sources of pollution in SR, 2004
- LUP of Bratislava Self-Governing Region, 1998 (Changes and Amendments, 2005)
- Land-use plan of the Capital City of SR Bratislava, 2007
- Land-use plans of the municipalities concerned
- Applicable laws, decrees and directives

Websites

- [www.sazp.sk](http://www.sazp.sk)
- [www.enviroportal.sk](http://www.enviroportal.sk)
- [www.sopsr.sk](http://www.sopsr.sk)
- [www.vupu.sk](http://www.vupu.sk)
- [www.vuvh.sk](http://www.vuvh.sk)
- [www.agroporadenstvo.sk](http://www.agroporadenstvo.sk)

Special studies

- Archaeological Study
- Geological Study

**C.XIII. DATE AND CONFIRMATION OF CORRECTNESS AND  
COMPLETENESS OF THE DATA BY SIGNATURE (STAMP) OF  
THE AUTHORIZED REPRESENTATIVE OF THE ASSESSMENT  
REPORT AND THE PROPOSER**

Place of preparation of the Assessment Report:                      Banská Bystrica

Date of preparation of the Assessment Report:                      December 2010

Coordinator of EIA Report:

**Mgr. Tomáš ŠIKULA**  
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## **Disclaimer**

This is an English translation of a document that was originally produced in the Slovak language. While we have exercised utmost care to make this translation accurate, it may contain typing or translation errors. Therefore, always consult the Slovak original before making decisions on the basis of this translation.

The name of this document in Slovak is *Správa o hodnotení*. The file name has not been changed.

We hereby confirm that the European Bank for Reconstruction and Development shall have no responsibility for the translated content.

Project Implementation Services, spol. s r. o.  
Consultant under Consultancy Contract C31934