SAOBRAĆAJNI INSTITUT CIP

INSTITUTE OF TRANSPORTATION CIP Ltd.
11000 BELGRADE, 6/IV NEMANJINA STREET

Tel.: 011/3618-134, fax: 011/3618-324, web site: www.sicip.co.rs

ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PRELIMINARY DESIGN OF NEW BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE

(FINAL DOCUMENTATION)

MAIN CONTRACTOR:

Belgrade Land Development Public Agency,
Njegoševa Street No. 84, Belgrade

Belgrade, 2021

INSTITUTE OF TRANSPORTATION CIP Ltd.
11000 BELGRADE, 6/IV NEMANJINA STREET

Tel.: 011/3618-134, fax: 011/3618-324, web site: www.sicip.co.rs

Number:
913-128/17

ENVIRONMENTAL IMPACT ASSESSMENT STUDY

FOR THE PRELIMINARY DESIGN OF NEW BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE (FINAL DOCUMENTATION)

GENERAL MANAGER:

Hand-written signature illegible
Milutin Ignjatović, MSc. Eng.

Official round stamp:
Institute of Transportation CIP d.o.o.
Nemanjina Street No. 6/IV
Belgrade

Belgrade, 2021

TABLE OF CONTENTS:

ENVIRONMENTAL IMPACT ASSESSMENT STUDY

FOR THE PRELIMINARY DESIGN OF NEW BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE (FINAL DOCUMENTATION)

I – GENERAL DOCUMENTATION

1. Decree on the fulfillment of requirements specified by IoT CIP for obtaining the license
2. Extract on the registration of business entity
3. IMS certificates
4. Decision on the appointment of study manager
5. Statement of the Study Manager on compliance with Laws, regulations and standards
6. List of persons participating in preparing the Environmental Impact Assessment Study

II - DECISION ON DETERMINING THE SCOPE AND CONTENT OF THE ENVIRONMENTAL IMPACT

III – TEXT DOCUMENTS

1. INFORMATION ON PROJECT HOLDER 1

1.1. **BACKGROUND TO DEVELOPING THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY**.....2
1.1.1. Subject of the study..... 2
1.1.2. The goal of the study development 2
1.1.3. Legal ground 3
1.1.4. Planning documents 5
1.1.5. Available technical documentation 5
1.1.6. Opinions and requirements of competent institutions 6

2. DESCRIPTION OF THE CLOSER AND WIDER LOCATION ON WHICH CONSTRUCTION PROJECT IS PLANNED 7
2.1 Description of the closer and wider location on which construction project is planned ... 7
2.2. Necessary land surface to be taken during the construction works and bridge operation..... **9**
2.3. The overview of geomorphological, geological, hydro-geological, seismic and pedological characteristics of the terrain..... 9
2.3.1. Geomorphological characteristics of the terrain..... 9
2.3.2. Geological characteristics of the terrain 10

2.3.3. Hydro-geological properties of the terrain 11
2.3.4. Seismic properties of the terrain 12
2.3.5. Pedological characteristics of the terrain 12
2.4. Vicinity of the sanitary protection zones, watercourses and sources of water supply 13
2.4.1. Vicinity of the sanitary protection zones and sources of water supply 13
2.4.2. Vicinity of watercourses 14
2.5. Climate characteristics of the area 14
2.6. Vegetation, fauna and protected natural goods 19
2.6.1. Vegetation – general characteristics 19
2.6.2. Fauna 19
2.6.3. Protected natural goods 19
2.7. Landscape 20
2.8. Protected immovable cultural and historical goods 22
2.9 Population, population density and demographic characteristics 22
2.10. Data on the existing economic and residential facilities of infrastructure and supra-structure 25
2.10.1 Existing economic and residential facilities 25
2.10.2 Infrastructure and supra-structure objects 27

3. DESIGN DESCRIPTION 33
3.1. Description of previous works on the design execution 33
3.1.1. Geological-geotechnical researches of the terrain 33
3.1.2. Hydraulic and morphological analysis of the Sava river in the zone of the designed bridge at the location of the Old Sava Bridge 36
3.1.3. Traffic analysis 37
3.2 Description of the structure, planned production process or activity, their technological and other characteristics 39
3.2.1. Bridge structure 39
3.2.2. Roads 42
3.2.3. Tram roads 43
3.2.4. Guiding of pedestrian and bicycle paths 44
3.2.5. Waterway 45
3.2.6. Bridge drainage 46
3.2.7. Protection and relocation of hydro-technical installations 47
3.2.8. Electrical installations 1KV 47
3.2.9. Protection, relocation and reconstruction of electric power cable lines 48
3.2.10. Electrical installations design – overhead contact system 49
3.2.11. Telecommunication and signal installation design 49
3.2.12. Mechanical installation design - elevators 50
3.2.13. Design of traffic signals and equipment on the bridge 52
3.2.14. The Sava river waterway signaling design 53
3.2.15. Landscaping 54
3.3. Review of the type and quantity of required energy and energy sources, water, raw materials, necessary construction material, etc. 55
3.3.1. Fuel characteristics 55
3.3.2 Consumption of natural resources 56
3.4. Review of the type and quantity of waste materials and noise level emitted during the exploitation of the bridge 56
3.4.1. Waste material 56
3.4.2. Noise levels emitted during the exploitation of the bridge 59

3.5. Review of treatment technology (processing, recycling, disposal, etc.) of all types of waste materials ... 59
3.6. Review of the impact on the environment of the selected and other considered technological solutions ... 61

4. MAIN ALTERNATIVES OVERVIEW ... 62
4.1. Location or alignment ... 62
4.2. Production processes or technology ... 62
4.2.1. Forecast of traffic load – NO INVESTMENT scenario ... 63
4.2.2. Forecast of traffic load – INVESTMENT scenario ... 65
4.3. Bridge construction metodology ... 66
4.4. Planning and design documentation ... 69
4.5. Types and selection of materials ... 70
4.6. Time frame for project execution ... 71
4.7. Functioning and cessation of functioning ... 71
4.8. Construction commencement and completion date ... 71
4.9. Production scope ... 71
4.10. Pollution control ... 72
4.11. Waste disposal management ... 72
4.12. Arrangement of access and traffic routes ... 73
4.13. Responsibility and procedure for environmental management ... 73
4.14. Training ... 73
4.15. Monitoring ... 73
4.16. Emergency plans ... 73
4.17. Method of decommissioning, site reinstating and further use ... 73

5. OVERVIEW OF THE STATE OF THE ENVIRONMENT AT THE SITE AND THE DIRECT VICINITY (MICRO AND MACRO LOCATION) ... 74
5.1. Population, population density and demographic characteristics ... 74
5.2. Flora and fauna ... 74
5.2.1. Vegetation – current condition ... 74
5.2.2. Fauna – current condition ... 75
5.3. Condition of soil, water, air, traffic noise ... 77
5.3.1. Soil ... 77
5.3.2. Condition of surface and groundwater ... 79
5.3.3. Current air quality status ... 80
5.3.4. Traffic noise – current condition ... 85
5.4. Climatic characteristics of the area ... 88
5.5. Protected assets (natural, cultural real estates and historical assetes) ... 88
5.5.1. Protected natural assets ... 88
5.5.2. Protected cultural real estates and historical goods ... 88
5.6. Landscape ... 88
5.7. The relationship between the specified environmental factors ... 90

6. DESCRIPTION OF POSSIBLE SIGNIFICANT IMPACTS OF THE PROJECT TO THE ENVIRONMENT ... 91
6.1. Air, water, soil, noise, heat and radiation ... 91
6.1.1. Impact on air ... 91
6.1.2. Impact on groundwater and surface water ... 94
6.1.3. Impact on soil pollution ... 98
6.1.4. Traffic noise ... 99

6.1.5. Heat and radiation....101
6.2. Impacts on population health....101
6.3 Micro climatic conditions on the bridge and the impact on the climatic characteristics of the area....103
6.4. Impact on flora and fauna (ecosystem)....104
6.4.1. Impact on vegetation....104
6.4.2. Impact on fauna....104
6.5. Impact on population (population, concentration and migration of population)....105
6.6. Impact on cultural real estate....106
6.7. Impact to landscape....106

7. ENVIRONMENTAL IMPACT ASSESSMENT IN DISASTER....107
7.1. Possible accidents during the construction phase and use of the bridge....108
7.1.1. Possible accidents during the construction phase....108
7.1.2. Possible accidents in the exploitation phase....108
7.1.3. Natural disasters....109
7.2. Accident prevention, readiness and liability measures....110
7.3. Remediation measures....111

8. DESCRIPTION OF MEASURES PROVIDED TO PREVENT, REDUCE AND REMOVE, WHERE POSSIBLE, ANY HARMFUL ENVIRONMENTAL IMPACT....112
8.1. Technical measures for environmental protection provided by law and other regulations (regulatory measures)....112
8.2. Мере заштите у удесним ситуацијама....120
8.3. Environmental protection plans and technical solutions....121
8.3.1. Protection measures during construction....121
8.3.2. Plans and technical solutions for environment protection in the exploitation phase....123
8.4. Other measures....127
8.4.1. Technical measures for general environmental protection....127
8.4.2. Administrative environmental protection measures....127

9. ENVIRONMENTAL IMPACT MONITORING PROGRAM....128
9.1 Air monitoring....128
9.2. Groundwater monitoring....128
9.3. Wastewater and surface water monitoring....130
9.4. Noise monitoring....132
9.5. Fauna monitoring....132

10. NON-TECHNICAL SUMMARY....133

11. INFORMATION ABOUT THE SHORTCOMINGS OF THE STUDY....137

IV GRAPHIC DOCUMENTATION

drawing no.	Drawing title	Scale
1	BRIDGE STRUCTURE PLAN ON THE CADASTRAL MAP	1:500
2	LOCATION PLAN PRESENTED ON A CADASTRAL AND TOPOGRAPHIC MAP	1:500
3	LAYOUT - LONGITUDINAL PROFILE AND PLAN OF THE BRIDGE (SECTION ABOVE THE ARCH)	1:500
4	LAYOUT LONGITUDINAL PROFILE AND PLAN OF THE BRIDGE (STRUCTURE AND PIERS)	1:500
5	CROSS-SECTIONS	1:100
6	LAYOUT LONGITUDINAL PROFILE AND PLAN OF THE BRIDGE (STRUCTURE AND PIERS)	1: 50
7	LONGITUDINAL BRIDGE PROFILE THROUGH THE AXIS OF THE PAVEMENT STRUCTURE, PEDESTRIAN AND BICYCLE PATH	1:500
8	LONGITUDINAL BRIDGE PROFILE THROUGH THE MIDDLE OF THE BRIDGE (LARGE ARCH) AND (SMALL ARCH)	1:500
9	BRIDGE VIEW	1:500
10	TRAFFIC NOISE – OLD BRIDGE NIGHT-TIME (LNIGHT)	1:2500
11	TRAFFIC NOISE – NEW BRIDGE NIGHT-TIME (LNIGHT)	1.2500
12	TRAFFIC NOISE – OLD BRIDGE IMPACT NIGHT-TIME (LNIGHT)	1.2500

V APPENDICES

1. **Location conditions issued by the Ministry of Construction, Transport and Infrastructure Reg. No. 350-02-00211/2019-14 dated 01.07.2019;**
2. **Conditions and consents of other competent bodies and organizations obtained in accordance with a special law:**
   - **Waterworks conditions** for the development of location conditions required for the construction of the bridge over the Sava River on the site of the old bridge, issued by the PUC „Belgrade Waterworks and Sewerage“ Reg.No.350- 02-00211/2019-14. B-489/2019. dated 10.06.2019.
   - **Conditions from the aspect of sanitary protection of the Belgrade water supply source** location conditions required for the construction of the bridge over the Sava River on the site of the old bridge, issued by the PUC „Belgrade Waterworks and Sewerage“ Reg.No.350-02-00211/2019-14. V- 490/2019. dated 31.05.2019.
   - **Sewerage conditions** for the development of location conditions required for the construction of the bridge over the Sava River on the site of the old bridge, issued by the PUC „Belgrade Waterworks and Sewerage“ Reg.No.K- 388/2019 dated 10.06.2019.
   - **Water conditions** for the construction of the bridge over the Sava River on the site of the old bridge, issued by the Ministry of Agriculture, Forestry and Water Management Reg.No..325-05-01065/2019-07 dated 27.06.2019.
   - **Conditions for creating site conditions** issued by the PUC City Sanitation Reg.No.8704 dated 31.05.2019.
   - **Decision** on the construction of the bridge over the Sava River on the site of the old bridge, issued by the Institute for Nature Protection of Serbia 03 Reg.No.020-1513/2 dated 19.06.2019.
   - **Conditions** for the purpose of issuance of the location conditions for the construction of a bridge over the Sava River on the site of the old bridge, issued by the PUC „Greenery-Belgrade“ Reg.No.49/158 dated 31.05.2019.
   - **Opinion** of the Ministry of Environmental Protection "Environmental Protection Agency", Reg.No. 011-00-0001/299/2018-02 dated 06.12.2018.
   - **Opinion** on the possibilities of forming the future construction site of the Sava Bridge, issued by the Institute for the Protection of Monuments of the City of Belgrade, Reg.No.P4814/19 dated 22.11.2019.
3. Annex to groundwater analysis.
4. Hydraulic Calculation for Determining Separator Capacity
5. Report “Monitoring of Birds and Bats in the Area of Construction of a New Bridge on the River Sava”, Stefan Škorić, P.h.D. in Biology, from August 2020, filed in the Institute of Transportation CIP Ltd. under No. k-913-94/17-1.

I GENERAL DOCUMENTATION

Republic of Serbia
MINISTRY OF CONSTRUCTION, TRANSPORT AND INFRASTRUCTURE
Number: 351-02-02009/2017-07
Date: 27.07.2017
Belgrade

Proceeding upon the request of the Institute of Transportation CIP D.O.O. Belgrade, Nemanjina Street No. 6/IV, company registration No. 07451342, TIN 100003172, to be granted the License for preparation of technical documentation for facilities for which the building permit is issued by the Ministry competent for construction works or competent authority of an autonomous province, subject to the authorization No.: 031-01-44/2017-02, dated 13.07.2017, and pursuant to the Article 23 of the Law on State Administration ("Official Gazette of RS" No. 79/2005, 101/2007, 95/2010), Article 6 of the Law on Ministries ("Official Gazette of RS" No. 44/2014), Article 126 and Article 150, paragraph 4 of the Law on Planning and Construction ("Official Gazette of RS" No. 72/09, 81/09-corrigendum, 64/10 – CC, 24/11, 121/12, 42/13 – CC, 50/13 – CC, 98/13 – CC, 132/14 and 145/14), Article 192 of the Law on General Administrative Procedure ("Official Gazette of FRY" No. 33/1997 and 31/2001 and "Official Gazette of RS" No. 30/2010) and the Rulebook on the manner, procedure and content of data for determining conditions for issuing license for elaboration of technical documentation and building licenses for buildings for which the building permit is issued by the ministry or autonomous province, as well as conditions for revoking such licenses ("Official Gazette of RS", No. 24/15), the Ministry of Construction, Transport and Infrastructure passes the following

D E C I S I O N

1. This is to establish that the Institute of Transportation CIP D.O.O. Belgrade, Nemanjina Street No. 6/IV, company registration No. 07451342, TIN 100003172, **MEETS THE REQUIREMENTS** for obtaining the License for elaboration of technical documentation for facilities for which the building permit is issued by the ministry competent for construction works or competent authority of an autonomous province, as follows:

- building structures for oil and gas processing facilities built outside exploitation sites subject to previously obtained consent of the ministry competent for the exploitation of mineral raw materials, production of biofuels and bioliquids in facilities having the capacity of more than 100 t per year, crude oil and product pipelines, gas pipelines of nominal operating overpressure of more than 16 bar if they cross the territory of two or more municipalities, crude oil, liquefied petroleum gas and petroleum products storage facilities, having the capacity of more than 500 tons, built outside the exploitation sites determined by the law governing the field of mining and geological investigations and main heating pipelines (P030G1);
- electric motor drive operation - automation, measurement and control of oil and gas processing facilities built outside exploitation sites subject to previously obtained consent of the ministry competent for the exploitation of mineral raw materials, production of biofuels and bioliquids in facilities having the capacity of more than 100 t per year, crude oil and product pipelines, gas pipelines of nominal operating overpressure of more than 16 bar if it crosses the territory of two or more municipalities, crude oil, liquefied petroleum gas and petroleum products storage facilities, having the capacity of more than 500 tons, built outside the exploitation sites

determined by the law governing the field of mining and geological investigations and main heating pipelines (P030E4);

- thermo-technical, thermo-power, processing and gas installations for oil and gas processing facilities built outside exploitation sites subject to previously obtained consent of the ministry competent for the exploitation of mineral raw materials (P031M1);
- thermo-technical, thermo-power, processing and gas installations for crude oil and product pipelines, gas pipelines of nominal operating overpressure of more than 16 bar if they cross the territory of two or more municipalities, crude oil, liquefied petroleum gas and petroleum products storage facilities, having the capacity of more than 500 tons, built outside the exploitation sites determined by the law governing the field of mining and geological investigations and main heating pipelines (P032M1);
- thermo-technical, thermo-power, processing and gas installations for main heating pipelines (P033M1);
- electric motor drive operation - automation, measurement and control for facilities intended for basic and processing chemical industry, ferrous and non-ferrous metallurgy, facilities for leather and fur processing, facilities for rubber processing, facilities for pulp and paper production and facilities for processing non-metallic mineral raw materials built outside the exploitation sites determined by the law governing the field of mining and geological investigations, except for facilities intended for primary processing of ornamental and other stone (P040E4);
- means of transport, storage facilities and mechanical structures and technologies intended for basic and processing chemical industry, ferrous and non-ferrous metallurgy, facilities for leather and fur processing, facilities for rubber processing, facilities for pulp and paper production and facilities for processing non-metallic mineral raw materials built outside the exploitation sites determined by the law governing the field of mining and geological investigations, except for facilities intended for primary processing of ornamental and other stone (P040M3);
- building constructions for structures having structural span over 50 m (P202G1);
- building constructions for structures higher than 50 m (P203G1);
- architectural projects of residential complexes intended for multi-family housing, where the Republic of Serbia has the capacity of the employer (P093A2);
- building structures for residential complexes intended for multi-family housing, where the Republic of Serbia has the capacity of the employer (P093G1);
- high and medium-voltage electrical installations for thermal power plants, capacity 10 MW or more (P052E1);
- electric motor drive operation - automation, measurement and control for thermal power plants, capacity 10 MW or more (P052E4);
- high and medium-voltage electrical installations for thermal power plants – heating plants, capacity 10 MW or more (P053E1);
- electric motor drive operation - automation, measurement and control for thermal power plants – heating plants, capacity 10 MW or more (P053E4);
- high and medium-voltage electrical installations for power lines, voltage 110 or more kV (P061E1);
- high and medium-voltage electrical installations for transformer substations lines, voltage 110 or more kV (P062E1);
- hydraulic designs for interregional and regional water supply and sewage facilities (P071G3);
- hydraulic designs for flood control works in urban areas and rural areas covering the surface of more than 300 ha (P080G3);
- architectural projects of facilities located within the territory of immovable cultural properties of exceptional importance and cultural goods included into the List of World Cultural and Natural Heritage and facilities located in the protected immediate surroundings of cultural properties of exceptional importance with certain boundaries of cadastral plots and facilities located in the protected immediate surroundings of cultural goods included into the List of World Cultural and Natural Heritage (P090A1);
- architectural projects of facilities located within the territory of national parks and facilities located in the protected immediate surroundings of natural goods of exceptional importance (except

family residential buildings, agricultural and commercial facilities and appurtenant infrastructure, built in villages), all in accordance with the law (P091A1);
- architectural projects of facilities located within protected areas in accordance with cultural property protection act (except for the conversion of common areas into an apartment, i.e. office space in the protected surroundings of cultural properties of exceptional importance and cultural goods included into the List of World Cultural and Natural Heritage) – P090A2;
- roads for passenger docks and ports (P120G2);
- I and II class state roads, road structures and junctions to those roads and border crossings (P131G2);
- traffic and road signalization and marking for I and II class state roads, road structures and junctions to those roads and border crossings (P131S1);
- engineering structures for road structures (bridges) on I and II class state roads, road structures and junctions to those roads and border crossings (P132G1);
- engineering structures for road structures (tunnels) on I and II class state roads, road structures and junctions to those roads and border crossings (P133G1);
- communications intended for public railway infrastructure with junctions (P141G2);
- traffic and road signalization and marking for public railway infrastructure with junctions (P141S1);
- high and medium-voltage electrical installations for public railway infrastructure with junctions (P141E1);
- electric motor drive operation - automation, measurements and control for public railway infrastructure with junctions (P141E4);
- mechanical components of point switches and railway equipment and tackle for public railway infrastructure with junctions (P141M4);
- engineering structures for public railway infrastructure with junctions (bridges) - P142G1;
- engineering structures for public railway infrastructure works with junctions (tunnels) - P143G1;
- engineering structures for metros (P144G1);
- communications for metros (P144G2);
- traffic and road signalization and markings for metros (P144S1);
- hydraulic designs for metros (P144G3);
- high and medium-voltage electrical installations for metros (P144E1);
- electric motor drive operation - automation, measurements and control for metros (P144E4);
- thermo-technical, thermo-power, processing and gas installations for metros (P144M1);
- electronic communication facilities, i.e. networks, systems of means of international or regional importance (P150E3);
- electronic communication facilities, i.e. networks, systems of means build in the territory of two or more local self-government units (P151E3);
- engineering structures intended for regional landfills, i.e. landfills for non-hazardous waste disposal landfills, foreseen for areas with the population of more than 200.000 people (P180G1);
- hydraulic structures intended for regional landfills, i.e. landfills for non-hazardous waste disposal landfills, foreseen for areas with the population of more than 200.000 people (P180G3);
- technological processes foreseen for regional landfills, i.e. landfills for non-hazardous waste disposal landfills, foreseen for areas with the population of more than 200.000 people (P180T1).

2. Upon passing this Decision, the Decision No. 351-02-00140_1/2012-07, dated December 17, 2012 shall cease to be in force.

Reasoning

Pursuant to the Article 23, paragraph 2 of the Law of State Administration, the Minister shall represent the Ministry, pass regulations and adopt decisions regarding administrative and other individual matters and all other matters falling under the competence of the Ministry.

The competence of the Ministry of Construction, Transport and Infrastructure is determined subject to the Article 6 of the Law on Ministries.

Pursuant to the Article 126, paragraph 1 of the Law on Planning and Construction, technical documentation for the construction of a facility can be prepared by a company or other legal entity, or a contractor entered into the appropriate register for the preparation of technical documentation. Pursuant to the paragraph 2 of the same Article, the technical documentation for the construction of a facility, for which the building permit is issued by the Ministry, i.e. the autonomous province, can be prepared by a company or other legal entity entered into the appropriate register for the preparation of technical documentation for this type of facility and which have employees holding the license of authorized designer, who have adequate professional results in the preparation of technical documentation for this type and use of facility. Pursuant to the paragraph 3 of the Article concerned, the professional results, in terms of the paragraph 2 of this Article, have persons who have prepared, or participated in preparing the technical documentation, or who have participated in the technical inspection of the technical documentation, on the basis of which relevant facilities of this type or intended purpose were built. Nevertheless, pursuant to the paragraph 4 of this Article the fulfillment of conditions referred to in the paragraph 2 of this Article is determined in a decision made by the minister competent for the field of construction.

Pursuant to the Article 126, paragraph 5 of the Law the decision referred to in paragraph 4 of this Article shall be considered final on the date of delivery.

Pursuant to the Article 192, paragraph 2 of the Law on General Administrative Procedure, on the basis of decisive facts established in the course of the procedure, the decision-making authority shall decide on the administrative matter which is the subject matter of the administrative procedure. Pursuant to the paragraph 2 of the same Article, in cases where a collegiate authority decides in the administrative matter, it may adopt decisions if more than a half of its members are present by a majority vote of the present members, unless a qualified majority is stipulated by the law or other regulation.

Pursuant to the Article 7 of the aforementioned Rulebook, in the process of determining the fulfillment of conditions for granting a license to prepare technical documentation for facilities for which the building permit is issued by the Ministry, i.e. autonomous province, the Committee shall determine whether employees holding the license of authorized designer have adequate references referring to the preparation of technical documentation for facilities of specific type and intended purpose. The fulfillment of minimum requirements referred to in the paragraph 1 of this Article means the following: 1) at least two employees holding relevant licenses have prepared or participated in preparing the technical documentation in the capacity of main designers, i.e. have performed the technical inspection of at least two main designs or building permit designs, detailed designs or 2) one employee holding a relevant license has prepared or participated in preparing the technical documentation in the capacity of the main designer, i.e. has performed the technical inspection of at least three main designs, building permit designs or detailed designs for relevant phase of each type of facilities referred to in the Article 133, paragraph 2 of the Law pursuant to which the license is required, and the other employee holding a relevant license has prepared or participated in preparing the technical documentation in the capacity of the main designer, i.e. has performed the technical inspection of at least one main design, building permit design or detailed design for relevant phase of each type of facilities referred to in the Article 133, paragraph 2 of the Law pursuant to which the license is requested.

Pursuant to the Article 11 of the aforementioned Rulebook, the license shall be revoked if based on a subsequent control it is determined that the company, i.e. other legal entity, has ceased meeting at least one of the requirements based on which the license was granted, or if it is determined that the license was issued based on inaccurate and incorrect data.

On June 22, 2017 the Institute of Transportation CIP D.O.O. Belgrade, Nemanjina Street No. 6/IV addressed this Ministry and submitted the request No. 351-02-02009/2017-07 as well as the supplement to this request dated July 26, 2017, thereby requesting to be granted the license for preparation of technical documentation for facilities for which the building permit is issued by the Ministry competent for construction works or competent authority of an autonomous province.

The application for license was supported by all required documents, as stipulated by the Article 126 of the Law on Planning and Construction ("Official Gazette of the RS", No. 72/2009, 81/2009 – corrigendum, 64/2010 - Decision of CC, 24/2011, 121/2012, 42/2013 - Decision of CC, 50/2013 - Decision of CC and 98/2013 - Decision of CC) and the Articles 4 and 9 of the Rulebook on the manner, procedure and content of data for determining conditions for issuing license for elaboration of technical documentation and building licenses for buildings for which the building permit is issued by the ministry or autonomous province, as well as conditions for revoking such licenses ("Official Gazette of RS", No. 24/15).

At the meeting of the Expert Committee established by the Minister, held on July 27, 2017, it was established that the Applicant fulfilled relevant requirements for being granted the aforementioned licenses referred to in the paragraph 1, pursuant to the provisions of the Article 126 of the Law on Planning and Construction and the Articles 7, 9 and 11 of the Rulebook on the manner, procedure and content of data for determining conditions for issuing license for elaboration of technical documentation and building licenses for buildings for which the building permit is issued by the ministry or autonomous province, as well as conditions for revoking such licenses.

The requirements for the following licenses are met: - building structures for oil and gas processing facilities built outside exploitation sites subject to previously obtained consent of the ministry competent for the exploitation of mineral raw materials, production of biofuels and bioliquids in facilities having the capacity of more than 100 t per year, crude oil and product pipelines, gas pipelines of nominal operating overpressure of more than 16 bar if they cross the territory of two or more municipalities, crude oil, liquefied petroleum gas and petroleum products storage facilities, having the capacity of more than 500 tons, built outside the exploitation sites determined by the law governing the field of mining and geological investigations and main heating pipelines (**P030G1**), based on one reference of Mirjana Lazić (310 H754 09), one reference of Rade Bogdanović (312 0964 03), four references of Vladimir Milićević (310 A976 05), one reference of Marina Pešić (310 9562 04) and one reference of Biljana (Rašeta) Čolić (310 9110 04);
- electric motor drive operation - automation, measurements and control of oil and gas processing facilities built outside exploitation sites subject to previously obtained consent of the ministry competent for the exploitation of mineral raw materials, production of biofuels and bioliquids in facilities having the capacity of more than 100 t per year, crude oil and product pipelines, gas pipelines of nominal operating overpressure of more than 16 bar if it crosses the territory of two or more municipalities, crude oil, liquefied petroleum gas and petroleum products storage facilities, having the capacity of more than 500 tons, built outside the exploitation sites determined by the law governing the field of mining and geological investigations and main heating pipelines (**P030E4**) based on four references of Slavko Bursać (352 A911 05) and one reference of Nebojša Stojaković (352 G573 08);
- thermo-technical, thermo-power, processing and gas installations for oil and gas processing facilities built outside exploitation sites subject to previously obtained consent of the ministry competent for the exploitation of mineral raw materials (**P031M1**) based on four references of Nikola Nešković (330 7250 04), one reference of Dragan Ilić (330 0842 03) and one reference of Zlatko Stevanović (330 B870 05);
- thermo-technical, thermo-power, processing and gas installations for crude oil and product pipelines, gas pipelines of nominal operating overpressure of more than 16 bar if they cross the territory of two or more municipalities, crude oil, liquefied petroleum gas and petroleum products storage facilities, having the capacity of more than 500 tons, built outside the exploitation sites determined by the law governing the field of mining and geological investigations and main heating pipelines (**P032M1**) based on five references of Nikola Nešković (330 7250 04), one reference of Dragan Ilić (330 0842 03) and one reference of Zlatko Stevanović (330 B870 05);
- thermo-technical, thermo-power, processing and gas installations for main heating pipelines (**P033M1**) based on seven references of Marija Varagić Stanić (330 5903 03) and three references of Dragan Ilić (330 0842 03);
- electric motor drive operation - automation, measurements and control for facilities intended for basic and processing chemical industry, ferrous and non-ferrous metallurgy, facilities for leather and fur processing, facilities for rubber processing, facilities for pulp and paper production and facilities for processing non-metallic mineral raw materials built outside the exploitation sites determined by the law

governing the field of mining and geological investigations, except for facilities intended for primary processing of ornamental and other stone (**P040E4**) based on four references of Slavko Bursać (352 A911 05) and one reference of Aleksandar Milošević (352 J129 10);
- means of transport, storage facilities and mechanical structures and technologies intended for basic and processing chemical industry, ferrous and non-ferrous metallurgy, facilities for leather and fur processing, facilities for rubber processing, facilities for pulp and paper production and facilities for processing non-metallic mineral raw materials built outside the exploitation sites determined by the law governing the field of mining and geological investigations, except for facilities intended for primary processing of ornamental and other stone (**P040M3**) based on two references of Nebojša Kostić (333 0923 03) and two references of Vladimir Simić (333 0925 03);
- building constructions for structures having structural span over 50 m (**P202G1**) based on two references of Siniša Mihajlović (310 4821 03), two references of Aleksandra Naumović (310 3046 03), one reference of Biljana Rašeta (310 9110 04), one reference of Dejan Srejić (310 F110 07) and three references of Nada Pavlović (310 5632 03);
- building constructions for structures higher than 50 m (**P203G1**) based on two references of Marina Janković (310 4148 03), one reference of Olivera Gajović Gojgić (310 2121 03) and two references of Biljana Rašeta (310 9110 04);
- architectural projects of residential complexes intended for multi-family housing, where the Republic of Serbia has the capacity of the employer (**P093A2**) based on one reference of Gordana Vasiljević Milovanović (300 7214 04), one reference of Anđa Saičić (300 8171 04), three references of Ivan Ranđelović (300 B213 05), one reference of Tatjana Purić Zafirovski (300 0566 03), three references of Vesna Knežević (300 1184 03), three references of Jelena Krpić (300 D016 06), two references of Nataša Lazarević (300 C773 06), two references of Gordana Vučić Parezanović (300 2585 03) and one reference of Tatjana Danilović (300 B800 05);
- building structures for residential complexes intended for multi-family housing, where the Republic of Serbia has the capacity of the employer (**P093G1**) based on two references of Olivera Gajović Gojgić (310 2121 03), two references of Slobodan Naumović (310 3056 03) and one reference of Mirjana Lazić (310 H754 09);
- high and medium-voltage electrical installations for thermal power plants, capacity 10 MW or more (**P052E1**) based on one reference of Andreja Mijalčić (351 N203 14), four references of Milan Šipetić (351 K881 12) and two references of Slavko Bursać (351 G246 08);
- electric motor drive operation - automation, measurements and control for thermal power plants, capacity 10 MW or more (**P052E4**) based on four references of Aleksandar Zlatanović (353 0745 03), two references of Nebojša Stojković (352 G573 08) and one reference of Slavko Bursać (352 A911 05);
- high and medium-voltage electrical installations for thermal power plants – heating plants, capacity 10 MW or more (**P053E1**) based on two references of Slavko Bursać (351 G246 08), two references of Andreja Mijalčić (351 N203 14) and three references of Milan Šipetić (351 K881 12);
- electric motor drive operation - automation, measurements and control for thermal power plants – heating plants, capacity 10 MW or more (**P053E4**) based on four references of Aleksandar Zlatanović (353 0745 03), two references of Nebojša Stojković (352 G573 08) and one reference of Slavko Bursać (352 A911 05);
- high and medium-voltage electrical installations for power lines, voltage 110 or more kV (**P061E1**) based on two references of Slavko Bursać (351 G246 08) and three references of Milan Šipetić (351 K881 12);
- high and medium-voltage electrical installations for transformer substations lines, voltage 110 or more kV (**P062E1**) based on two references of Slavko Bursać (351 G246 08) and two references of Milan Šipetić (351 K881 12);
- hydraulic designs for interregional and regional water supply and sewage facilities (**P071G3**) based on two references of Marina Bubalo (314 4255 03), two references of Jelena Nikolić (314 3134 03) and two references of Jelena Šuljagić (314 3133 03);
- hydraulic designs for flood control works in urban areas and rural areas covering the surface of more than 300 ha (**P080G3**) based on three references of Mirjana Kristoforović-Pavić (314 3119 03) and two references of Vojislav Bogdanić (314 D664 06);
- architectural projects of facilities located within the territory of immovable cultural properties of exceptional importance and cultural goods included into the List of World Cultural and Natural Heritage

and facilities located in the protected immediate surroundings of cultural properties of exceptional importance with certain boundaries of cadastral plots and facilities located in the protected immediate surroundings of cultural goods included into the List of World Cultural and Natural Heritage (**P090A1**) based on one reference of Branislav Lazović (300 1205 03), one reference of Svetlana Karanović (300 1200 03), two references of Branko Gržetić (300 4068 03) and Irena Ilić (300 8811 04), without references;
- architectural projects of facilities located within the territory of national parks and facilities located in the protected immediate surroundings of natural goods of exceptional importance (except family residential buildings, agricultural and commercial facilities and appurtenant infrastructure, built in villages), all in accordance with the law (**P091A1**) based on one reference of Irena Ilić (300 8811 04), one reference of Julija Nikolić (300 4009 03), one reference of Mirjana Samardžija (300 0801 03), three references of Snezana Šoškić (300 1206 03) and one reference of Branko Gržetić (300 4068 03);
- architectural projects of facilities located within protected areas in accordance with cultural property protection act (except for the conversion of common areas into an apartment, i.e. office space in the protected surroundings of cultural properties of exceptional importance and cultural goods included into the List of World Cultural and Natural Heritage) – **P090A2**, based on three references of Branko Gržetić (300 4068 03), Svetlana Karanović (300 1200 03), without references and one reference of Gordana Vasiljević (300 7214 04);
- roads for passenger docks and ports (**P120G2**), based on the fulfillment of requirements for licenses issued for I and II class state roads, road structures and junctions to those roads and border crossings (**P131G2**) and communications intended for public railway infrastructure with junctions (**P141G2**) in accordance with the Conclusion of the Committee determining the fulfillment of requirements for preparing technical documentation and building structures dated April 18, 2016;
- I and II class state roads, road structures and junctions to those roads and border crossings (**P131G2**), based on two references of Mira Gašić Momčilović (315 1150 03), one reference of Rade Bogdanović (312 0964 03), one reference of Miodrag Radeka (315 H780 09), one reference of Vidosav Stevanović (315 G155 08), two references of Dragoslav Dragićević (315 1151 03), one reference of Miodrag Radeka (315 H780 09), two references of Mira Gašić Momčilović (315 1150 03), two references of Marko Kovrlija (315 N569 14), two references of Rade Bogdanović (312 0964 03), one reference of Srđan Đokic (315 B624 05) and four references of Vladimir Trimčev (315 F827 08);
- traffic and road signalization and marking for I and II class state roads, road structures and junctions to those roads and border crossings (**P131S1**) based on two references of Petar Đapić (370 G123 08), two references of Slađana Marković (370 M354 13), two references of Aleksandra Radosavljević (370 J967 11) and Nevena Stević (370 O516 16) without references;
- engineering structures for road structures (bridges) on I and II class state roads, road structures and junctions to those roads and border crossings (**P132G1**), based on four references of Siniša Mihajlović (310 4821 03), two references of Marina Pešić (310 9562 03) and three references of Nada Pavlović (310 5632 03);
- engineering structures for road structures (tunnels) on I and II class state roads, road structures and junctions to those roads and border crossings (**P133G1**) based on two references of Dragana Rupar (310 C622 05) and three references of Jasmina Kostić (310 A144 04);
- traffic and road signalization and marking for public railway infrastructure with junctions (**P141G2**) based on two references of Radomir Matić (315 5702 03), two references of Milan Jelkić (315 0979 03), two references of Zorana Stanišić (315 3141 03) and two references of Milan Janjić (315 4273 03);
- traffic and road signalization and marking for public railway infrastructure with junctions (**P141S1**) based on two references of Tomislav Mihajlović (371 1313 03), two references of Tatjana Mikić (370 9293 04), three references of Dragana Stefanović (370 9553 04), four references of Danko Trninić (370 4467 03) and three references of Dragan Đorđević (370 G649 08);
- high and medium-voltage electrical installations for public railway infrastructure with junctions (**P141E1**) based on two references of Slavko Bursać (351 G246 08), two references of Milan Šipetić (351 K881 12) and two references of Andreja Mijalčić (351 N203 14);
- electric motor drive operation - automation, measurements and control for public railway infrastructure with junctions (**P141E4**) based on five references of Aleksandar Zlatanović(352 0774 03) and three references of Slavko Bursać (352 A911 05);

- mechanical components of point switches and railway equipment and tackle for public railway infrastructure with junctions (**P141M4**) based on three references of Mile Nikolić (330 B869 05) and two references of Nenad Đorđević (333 0924 03);
- engineering structures for public railway infrastructure with junctions (bridges) - **P142G1**, based on one reference of Siniša Mihajlović (310 4821 03), two references of Nada Pavlović (310 5632 03), two references of Aleksandra Naumović (310 3046 03), two references of Marina Janković (310 4148 03), two references of Dejan Srejić (310 F110 07), one reference of Slobodan Jaćović (310 J408 10), one reference of Miloš Jokić (310 C080 05) and three references of Ljubomir Vlaisavljević (310 C386 05);
- engineering structures for public railway infrastructure works with junctions (tunnels) - **P143G1**, based on one reference of Marina Janković (310 4148 03), three references of Jasmina Kostić (310 A144 04) and one reference of Dragana Rupar (310 C622 05);
- engineering structures for metros (**P144G1**) based on three references of Aleksandar Naumović (310 3046 03), two references of Marina Janković (310 4148 03), one reference of Marina Pešić (310 9562 04), three references of Ljubomir Vlaisavljević (310 C386 05), one reference of Dejan Srejić (310 F110 07), one reference of Slobodan Jaćović (310 J408 10) and one references of Miloš Jokić (310 C080 05);
- communications for metros (**P144G2**), based on four references of Milan Jelkić (315 0979 03), two references of Milan Janjić (315 4273 03) and one reference of Novica Gotovina (315 3140 03);
- traffic and road signalization and markings for metros (**P144S1**), based on two references of Dragana Stefanović (370 9553 04), Dragan Đorđević (370 G649 08) without references, five references of Danko Trninić (370 4467 03) and Aleksandar Radosavljević (370 J967 11) without references;
- hydraulic designs for metros (**P144G3**), based on seven references of Dragan Milosavljević (314 9242 04) and one reference of Jelena Nikolić (314 3134 03);
- high and medium-voltage electrical installations for metros (**P144E1**), based on four references of Slavko Bursać (351 G246 08) and three references of Milan Šipetić (351 K881 12);
- electric motor drive operation - automation, measurements and control for metros (**P144E4**), based on four references of Aleksandar Zlatanović (352 0774 03) and five references of Slavko Bursać (352 A911 05);
- thermo-technical, thermo-power, processing and gas installations for metros (**P144M1**), based on three references of Mile Nikolić (330 B869 05), one reference of Zlatko Stevanović (330 B870 05) and one reference of Snežana Matić (330 A078 04);
- electronic communication facilities, i.e. networks, systems of means of international or regional importance (**P150E3**), based on three references of Periša Prokopijević (353 4455 03) and one reference of Tatjana Knežević (353 A824 04);
- electronic communication facilities, i.e. networks, systems of means build in the territory of two or more local self-government units (**P151E3**), based on three references of Periša Prokopijević (353 4455 03) and one reference of Tatjana Knežević (353 A824 04);
- engineering structures intended for regional landfills, i.e. landfills for non-hazardous waste disposal landfills, foreseen for areas with the population of more than 200.000 people (**P180G1**), based on two references of Slobodan Naumović (310 3056 03) and two references of Olivera Gajović Gojgić (310 2121 03);
- hydraulic structures intended for regional landfills, i.e. landfills for non-hazardous waste disposal landfills, foreseen for areas with the population of more than 200.000 people (**P180G3**), based on one reference of Mirjana Kristoforović Pavić (314 3119 03), one reference of Dušica Majstorović (314 3194 03) and one reference of Bratislav Pešterac (314 3132 03);
- technological processes foreseen for regional landfills, i.e. landfills for non-hazardous waste disposal landfills, foreseen for areas with the population of more than 200.000 people (**P180T1**), based on two references of Ružica Ilić (371 4487 03) and two references of Jelena Sekulović (371 4485 03).

Based on all above mentioned, upon the proposal of the Expert Committee and subject to the Article 192 of the Law on General Administrative Procedure, it was decided as stated in the enacting terms of the Decision.

The fee for the above Decision, in the amount of 22,750.00 (twenty two thousand seven hundred fifty) Dinars, has been charged and collected.

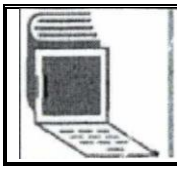
Instruction on Legal Remedy: The above Decision is final in administrative procedure and cannot be appealed. However, administrative dispute may be initiated by submission of complaint to the Administrative Court of Serbia, no later than 30 days after the date of its delivery.

STATE SECRETARY
Imre Kern

(hand-written signature illegible)

Official stamp:
Republic of Serbia
Belgrade
Ministry of Construction, Transport and Infrastructure

To be delivered to:
- the Applicant;
- the competent inspection;
- the Archives.



5000159147996

EXTRACT ON THE REGISTRATION OF BUSINESS ENTITY

Republic of Serbia
Business Registers Agency

BASIC IDENTIFICATION DATA	
Company / registration number	07451342

STATUS	
Status of the business entity	Active

LEGAL FORM	
Legal form	Limited Liability Company

BUSINESS NAME	
Business name	INSTITUTE OF TRANSPORTATION CIP DOO, BELGRADE (SAVSKI VENAC)

ADDRESS DATA	
Registered office address	
Municipality	Belgrade – Savski Venac
Place	Belgrade – Savski Venac
Street	Nemanjina
Number and letter	6/IV
Floor, office number and letter	/ /
Electronic mail address	
E-mail	office@sicip.co.rs

BUSINESS DATA	
Incorporation details	
Incorporation date	August 15, 1990
Duration	
Business entity duration period	Indefinite
Prevailing business activity	
Business activity code	7112
Business activity name	Engineering activities and related technical consultancy
Other identification data	
Tax Identification Number (TIN)	100003172
Data relevant for legal transactions	
Current accounts	190-0000000011520-56

	205-0000000002871-11 285-1001209902538-12 375-0000000004791-84 205-0070100301189-65 160-0000000927239-28 295-0000001242946-51 200-2712600101003-58 200-2712600101033-65 295-0000000104973-55 200-2712601501033-68 285-1001000000572-49 295-0000000000956-57 285-1001209892230-90

Contact Information	
Telephone 1	+38111 3618287
Telephone 2	+38111 3616929
Fax	+38111 3616757
Web address	www.sicip.co.rs

Statute / Memorandum of Association Data

Registration of changes to the Memorandum of association is not mandatory.	Current Statute Date	
	Current Memorandum of Association Date	February 2, 2015

Legal (statutory) representatives

Natural persons

1.	**Name**	Milutin	**Surname**	Ignjatović
	PIN	0104943710139		
	Title	Managing Director		
	Limitations by co-signature	No limitations by co-signature		

Members / Co-owners

Member data

Business name	Joint-stock Company Serbian Railways, Belgrade
Company / registration number	20038284

Capital

Cash capital

Amount	Date
Subscribed: RSD 573,094,011.75	
Amount	Date
Paid-in: EUR 2,480,348.30 in RSD counter-value RSD 202,575,502.43	June 8, 2007

Amount	Date	
Paid-in: EUR 1,230,106.41 in RSD counter-value RSD 98,834,867.68	June 19, 2019	
Amount	Date	
Paid-in: RSD 271,683,641.64	July 9, 2019	
Non-cash capital		
Value	Date	Description
Subscribed: EUR 407,689.48 in RSD counter-value RSD 4,784,236.05		
Value	Date	Description
Registered: EUR 407,689.48 in RSD counter-value RSD 4,784,236.05	December 31, 1999	
Amount (%)		
Share co-ownership	**100.0000000000**	

Company's initial capital		
Cash capital		
Amount	Date	
Subscribed: RSD 573,094,011.75		
Amount	Date	
Paid-in: EUR 2,480,348.30 in RSD counter-value RSD 202,575,502.43	June 8, 2007	
Amount	Date	
Paid-in: EUR 1,230,106.41 in RSD counter-value RSD 98,834,867.68	June 19, 2008	
Amount		
Paid-in: RSD 271,683,641.64	July 9, 2019	

Non-cash capital Value	Date	Description
Subscribed: EUR 407.48 in RSD counter-value RSD 4,784,236.05		
Value		
Registered: EUR 407,689.48 in RSD counter-value RSD 4,784,236.05	December 31, 1999	

Registrar, Miladin Maglov
Hand-written signature illegible
Official round stamp:
Serbian Business Registers Agency
Belgrade
Republic of Serbia

JUQS – COMPANY FOR QUALITY SYSTEM CERTIFICATION AND MONITORING ltd.

Crnogorska Street No. 3, Belgrade, Republic of Serbia

Based on the decision given in the Minutes of the meeting session of the Certification Committee number Z-29-02-19-492

issues the following

CERTIFICATE

Registration number Q-2097-IVR

This is to certify that the quality management system established and implemented by the organization

INSTITUTE OF TRANSPORTATION

CIP

NEMANJINA STREET 6/IV • 11000 BELGRADE • REPUBLIC OF SERBIA

is in compliance with the quality management system standard

SRPS ISO 9001:2015

and it refers to the

Sites specified in the Certification Decree R-Q-2097-IVR

Scope of Certification

Preparation of technical documentation, studies and investment documentation, preparation of planning and town development documentation, technical inspection of technical documentation, preparation of documentation related to environmental protection, energy efficiency and fire protection, geodetic surveying and geological investigation works, testing structures, laboratory tests in the field of environmental protection, technical supervision of works, engineering and consulting services, technical inspection of facilities

Belgrade

Issued on: **19/12/2019**
Expires on: **18/12/2022**
First certified on: **19/12/2017**
Previous certificate expired on: **18/12/2019**
Recertification audit date: **02-03/12/2019**

Official round stamp illegible

On behalf of the Director

Hand-written signature illegible
Aleksandar Đorđević

The authenticity of this certificate may be verified on the web site www.yuqs.org

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

YUQS has issued an IQNet recognized certificate that the organization:

SAOBRAĆAJNI INSTITUT "CIP"
Nemanjina 6/IV
SRB - 11000 Belgrade

has implemented and maintains a

Quality Management System

for the following scope:

Preparation of studies, technical and investment documentation, preparation of planning and town development documentation, technical verification of design documentation, preparation of documentation related to environmental protection, energy efficiency and fire protection, geodetic surveying and geological investigation works, testing of structures, laboratory tests in the field of environmental protection, technical supervision of works, engineering and consulting services, technical inspection of the facility

which fulfils the requirements of the following standard:

ISO 9001:2015

Issued on: 2019-12-19
First issued on: 2007-12-19
Expires on: 2022-12-18

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number : RS-Q-2097-IVR

Alex Stoichitoiu
President of IQNet

Aleksandar Djordjevic
for Director of YUQS

IQNet Partners*:
AENOR *Spain* AFNOR Certification *France* APCER *Portugal* CCC *Cyprus* CISQ *Italy*
CQC *China* CQM *China* CQS *Czech Republic* Cro Cert *Croatia* DQS Holding GmbH *Germany* EAGLE Certification Group *USA*
FCAV *Brazil* FONDONORMA *Venezuela* ICONTEC *Colombia* Inspecta Sertifiointi Oy *Finland* INTECO *Costa Rica*
IRAM *Argentina* JQA *Japan* KFQ *Korea* MIRTEC *Greece* MSZT *Hungary* Nemko AS *Norway* NSAI *Ireland*
NYCE-SIGE M xico PCBC *Poland* Quality Austria *Austria* RR *Russia* SII *Israel* SIQ *Slovenia*
SIRIM QAS International *Malaysia* SQS *Switzerland* SRAC *Romania* TEST St Petersburg *Russia* TSE *Turkey* YUQS *Serbia*

* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

JUQS – COMPANY FOR QUALITY SYSTEM CERTIFICATION AND MONITORING ltd.

Crnogorska Street No. 3, Belgrade, Republic of Serbia

Based on the decision given in the Minutes of the meeting session of the Certification Committee number Z-29-02-19-493

issues the following

CERTIFICATE

Registration number E-0709-IR

This is to certify that the environmental management system established and implemented by the organization

INSTITUTE OF TRANSPORTATION

CIP

NEMANJINA STREET 6/IV • 11000 BELGRADE • REPUBLIC OF SERBIA

is in compliance with the environmental management system standard

SRPS ISO 14001:2015

and it refers to the

Sites specified in the Certification Decree R-E-0709-IR

Scope of Certification

Preparation of technical documentation, studies and investment documentation, preparation of planning and town development documentation, technical inspection of technical documentation, preparation of documentation related to environmental protection, energy efficiency and fire protection, geodetic surveying and geological investigation works, testing structures, laboratory tests in the field of environmental protection, technical supervision of works, engineering and consulting services, technical inspection of facilities

Belgrade

Issued on: **16/12/2019**
Expires on: **15/12/2022**
First certified on: **16/12/2016**
Previous certificate expired on: **15/12/2019**
Recertification audit date: **02-03/12/2019**

Official round stamp illegible

On behalf of the Director

Hand-written signature illegible
Aleksandar Đorđević

The authenticity of this certificate may be verified on the web site www.yuqs.org

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

YUQS has issued an IQNet recognized certificate that the organization:

SAOBRAĆAJNI INSTITUT "CIP"
Nemanjina 6/IV
SRB - 11000 Belgrade

has implemented and maintains an

Environmental Management System

for the following scope:

Preparation of studies, technical and investment documentation, preparation of planning and town development documentation, technical verification of design documentation, preparation of documentation related to environmental protection, energy efficiency and fire protection, geodetic surveying and geological investigation works, testing of structures, laboratory tests in the field of environmental protection, technical supervision of works, engineering and consulting services, technical inspection of the facility

which fulfils the requirements of the following standard:

ISO 14001:2015

Issued on: 2019-12-16
First issued on: 2016-12-16
Expires on: 2022-12-15

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number : RS-E-0709-IR

Alex Stoichitoiu
President of IQNet

Aleksandar Djordjevic
for Director of YUQS

IQNet Partners*:
AENOR *Spain* AFNOR Certification *France* APCER *Portugal* CCC *Cyprus* CISQ *Italy*
CQC *China* CQM *China* CQS *Czech Republic* Cro Cert *Croatia* DQS Holding GmbH *Germany* EAGLE Certification Group *USA*
FCAV *Brazil* FONDONORMA *Venezuela* ICONTEC *Colombia* Inspecta Sertifiointi Oy *Finland* INTECO *Costa Rica*
IRAM *Argentina* JQA *Japan* KFQ *Korea* MIRTEC *Greece* MSZT *Hungary* Nemko AS *Norway* NSAI *Ireland*
NYCE-SIGE *M xico* PCBC *Poland* Quality Austria *Austria* RR *Russia* SII *Israel* SIQ *Slovenia*
SIRIM QAS International *Malaysia* SQS *Switzerland* SRAC *Romania* TEST St Petersburg *Russia* TSE *Turkey* YUQS *Serbia*

* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

JUQS – COMPANY FOR QUALITY SYSTEM CERTIFICATION AND MONITORING ltd.

Crnogorska Street No. 3, Belgrade, Republic of Serbia

Based on the decision given in the Minutes of the meeting session of the Certification Committee number Z-29-02-19-494

issues the following

CERTIFICATE

Registration number O-0483-IR

This is to certify that the occupational health and safety management system established and implemented by the organization

INSTITUTE OF TRANSPORTATION

CIP

NEMANJINA STREET 6/IV • 11000 BELGRADE • REPUBLIC OF SERBIA

is in compliance with the occupational health and safety management system standard

SRPS ISO 45001:2018

and it refers to the

Sites specified in the Certification Decree R-O-0483-IR

Scope of Certification

Preparation of technical documentation, studies and investment documentation, preparation of planning and town development documentation, technical inspection of technical documentation, preparation of documentation related to environmental protection, energy efficiency and fire protection, geodetic surveying and geological investigation works, testing structures, laboratory tests in the field of environmental protection, technical supervision of works, engineering and consulting services, technical inspection of facilities

Belgrade

Issued on: **16/12/2019**
Expires on: **15/12/2022**
First certified on: **16/12/2016**
Previous certificate expired on: **15/12/2019**
Recertification audit date: **02-03/12/2019**

Official round stamp illegible

On behalf of the Director

Hand-written signature illegible
Aleksandar Đorđević

The authenticity of this certificate may be verified on the web site www.yuqs.org

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

YUQS has issued an IQNet recognized certificate that the organization:

SAOBRAĆAJNI INSTITUT "CIP"
Nemanjina 6/IV
SRB - 11000 Belgrade

has implemented and maintains an

Occupational Health and Safety Management System

for the following scope:

Preparation of studies, technical and investment documentation, preparation of planning and town development documentation, technical verification of design documentation, preparation of documentation related to environmental protection, energy efficiency and fire protection, geodetic surveying and geological investigation works, testing of structures, laboratory tests in the field of environmental protection, technical supervision of works, engineering and consulting services, technical inspection of the facility

which fulfils the requirements of the following standard:

ISO 45001:2018

Issued on: 2019-12-16
First issued on: 2016-12-16
Expires on: 2022-12-15

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number : RS-O-0483-IR

Alex Stoichitoiu
President of IQNet

Aleksandar Djordjevic
for Director of YUQS

IQNet Partners*:
AENOR *Spain* AFNOR Certification *France* APCER *Portugal* CCC *Cyprus* CISQ *Italy*
CQC *China* CQM *China* CQS *Czech Republic* Cro Cert *Croatia* DQS Holding GmbH *Germany* EAGLE Certification Group *USA*
FCAV *Brazil* FONDONORMA *Venezuela* ICONTEC *Colombia* Inspecta Sertifiointi Oy *Finland* INTECO *Costa Rica*
IRAM *Argentina* JQA *Japan* KFQ *Korea* MIRTEC *Greece* MSZT *Hungary* Nemko AS *Norway* NSAI *Ireland*
NYCE-SIGE M xico PCBC *Poland* Quality Austria *Austria* RR *Russia* SII *Israel* SIQ *Slovenia*
SIRIM QAS International *Mulaysia* SQS *Switzerland* SRAC *Romania* TEST St Petersburg *Russia* TSE *Turkey* YUQS *Serbia*

* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

DECISION ON THE APPOINTMENT OF THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY MANAGER

Pursuant to the Article 19 of the Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04 and 36/09):

Gorica Aleksić Milosavljević, M.Sc. in Tech.

is hereby appointed as

M A N A G E R

of works on the preparation of the Environmental Impact Assessment Study for the project of construction of New Bridge across Sava River at the site of the old Sava Bridge.

Designer:	Institute of Transportation CIP d.o.o. Nemanjina Street No. 6/IV, Belgrade
Responsible person/representative:	Managing Director Milutin Ignjatović, Grad. Eng.
Stamp:	Signature:
Official round stamp imprint: Institute of Transportation CIP d.o.o. Nemanjina Street No. 6/IV Belgrade	*Hand-written signature illegible*
Technical documentation number:	2017-913-LAB-S01
Place and date:	Belgrade, 2021

STATEMENT OF THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY MANAGER

I, Gorica Aleksić Milosavljević, M.Sc. in Tech., having the capacity of the manager of works on the preparation of the Environmental Impact Assessment Study for the project of construction of New Bridge across Sava River at the site of the old Sava Bridge

HEREBY STATE AND CONFIRM

1. that the aforementioned Study has been prepared in all according to the Law on Environmental Protection, the Law on Environmental Impact Assessment, relevant regulations, standards and norms governing the matters related to environmental protection and professional rules;

2. that the Study contains statutory and established measures and recommendations to prevent, mitigate, and, where possible, completely eliminate all adverse environmental impacts.

Manager of the Study:	Gorica Aleksić Milosavljević, M.Sc. in Tech.
	Signature:
	Hand-written signature
Technical documentation number:	2017-913-LAB-S01
Place and date:	Belgrade, 2021

LIST OF PERSONS

PARTICIPATING IN PREPARING:

ENVIRONMENTAL IMPACT ASSESSMENT STUDY

FOR THE PRELIMINARY DESIGN OF NEW BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE (FINAL DOCUMENTATION)

Manager of the Study preparation works:	Gorica Aleksić Milosavljević, M.Sc. in Tech.
Chief Design Engineer:	Ljiljana Mišković, Grad.Civ.Eng.
Associates:	Stefan Skorić, P.h.D. in Bio. Dragica Ilić, M.Sc. in Mol. Bio. & Phys. Jelena Sekulović, M.Sc. in Tech. Eng. Aleksandar Gajicki, Grad. Trans. Eng. Elena Tanjević, Grad. Chem. Ruzica Ilić, Grad. Tech. Eng. Marija Grubor, Grad. Agri. Eng. Dejan Radulović, Grad. Spat. Plan. Miloš Milošević, M.Sc. in Env. Eng. Nataša Rosić, Chem. Tech.

Head of Sector LAB

Gorica Aleksić Milosavljević, M.Sc. in Tech.

II DECISION ON DETERMINING THE SCOPE AND CONTENT OF THE ENVIRONMENTAL IMPACT

Coat of arms of the Republic of Serbia
Republic of Serbia
MINISTRY OF ENVIRONMENTAL PROTECTION
Number: 353-02-1504/2019-03
Date: 16.08.2019
Belgrade

Pursuant to article 5a of the Law on Ministries ("Official Gazette of RS", No. 14/14, 14/15, 54/15 and 96/15 – other Laws 62/17), article 23, paragraph 2, of the Law on State Administration ("Official Gazette of RS", No. 79/05, 101/07 and 95/10 and 99/14), article 213, paragraph 1, of the Law on General Administrative Procedure ("Official Gazette of RS", No. 18/16), article 10, paragraph 4 and 32, of the Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04, 36/09), and following the request of the project holder "Belgrade Land Development Public Agency" PE, the Ministry of Environmental Protection have enacted this

D E C I S I O N

1. An environmental impact assessment is requested for the construction project of a new bridge, at the location of the Old Sava Bridge, at cadastral parcels No. 473/6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370, all of them being within the Cadastral Municipality (CM) of Savski Venac (Municipality of Savski Venac), and on cadastral parcels No. 2386/3, 2386/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/ 1, all of them within the CM Novi Beograd (Municipality of Novi Beograd).

2. The scope and content of the Environmental Impact Assessment Study has been determined for the project of construction of a new bridge at the location of the Old Sava Bridge, at cadastral parcels No. 473/6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370, all of them being within the CM Savski Venac (Municipality of Savski Venac), and on cadastral parcels No. 2386/3, 2386/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/ 1, all of them within the CM Novi Beograd (Municipality of Novi Beograd).

3. The project holder shall be obliged to develop the Study on the Environmental Impact Assessment, all in accordance with article 17 and 30, of the Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04, 36/09), as well as according to the Rulebook on the Content of the Environmental Impact Assessment Study ("Official Gazette of RS", No. 69/05).

4. The project holder shall be obliged to submit a request for giving a consent on the Environmental Impact Assessment Study referred to in point 1 of this Decision, at the latest within one year from the day of this Decision being final.

Belgrade Land Development Public Agency *other elements illegible*				
RECEIVED				
No.	53868		08 OCT 2019	
Department	*illegible*		Attachment	Value
09				

5. Pursuant to point 1 of this Decision, the project holder shall enclose within the Study, all the conditions and consents of other competent authorities and organizations, in accordance with the specific law, and shall fully obey these conditions.

6. The project holder is advised, within the development process of this Study, to elaborate to a higher degree those parts of the project which may be expected to exert impact in relation to the purpose of the surface concerned, or to those factors that may have the greatest impact from the point of view of sensitivity of the environment.

E x p l a n a t i o n

The project holder "Belgrade Land Development Public Agency" PE, have addressed this authority with the request No. 353-02-1504/2019-03 for deciding on the need for conducting an environmental impact assessment for the project of construction of a new bridge on the location of the Old Sava Bridge, on cadastral parcels No. 473/6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370, all of them within the CM of Savski Venac (Municipality of Savski Venac), and on cadastral parcels No. 2386/3, 2386/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1, all of them within the CM of Novi Beograd (Municipality of Novi Beograd).

The application is supported by filled-in questionnaires for deciding on the necessity of developing an Environmental Impact Assessment Study (part I and P), as well as by all necessary documents submitted.

According to the Regulation on determining the List of projects for which impact assessment is mandatory and the List of projects for which an environmental impact assessment may be required ("Official Gazette of RS" No. 114/2008), the project in question is on the List 11 - chapter 12 Infrastructure projects.

Acting on the present request, this authority has, in accordance with article 10, paragraph 1 and 2, and referring to article 29, of the Law on Environmental Impact Assessment, informed the public and the interested bodies and organizations with the advertisement in the daily newspapers "Politika", on 30.07.2019, as well as on the official website of the Ministry http://www.eko.šinpolj.gov.rs/obavestenja/procena-uticaia-na-zivotnu-sgedinu/.

In the process of considering the request, no opinions of the interested bodies and organizations, and of the interested public, were submitted within the legally set deadline.

Reasons for taking the Decision:

- After having an insight into the Central Registry of protected natural goods and into the documents of the Institute for Nature Conservation of Serbia, it has been stated that the newly designed bridge is located next to the area of ecological network, or the ecologically significant area, representing an important bird area (IBA area) - the confluence of the rivers of Sava and Danube is important for nesting, migration and wintering of birds, especially of those highly protected species. Also, the New Sava Bridge with its coastal area is an ecological corridor of international importance, according to the Regulation on Ecological Network ("Official Gazette of RS", No. 102/2010).

- Negative impact is expected on residential and business objects in the vicinity of this bridge, during its construction, due to an increased noise level, air pollution and pollution of the river of Sava. The project will be implemented next to the densely built and interactive area that is already suffering from pollution, and new negative cumulative impacts can be expected due to the project development.

- The project of the bridge over the river of Sava is implemented in the area belonging to the narrower and wider zone of sanitary protection of the water source (Zone P and Zone Š), PUC "Belgrade Waterworks and Sewerage".

Pursuant to article 10, Paragraph 5, 17 and 30 of the Law on the Environmental Impact Assessment ("Official Gazette of RS", No. 135/04 and 36/09), as well as on the basis of article 2 to 10 of the Rulebook on the Content of the Study of Environmental Impact Assessment ("Official Gazette of RS", No. 69/05), the scope and content of the present Study have been defined.

In view of the above, the obligation of the project holder has been determined, i.e., to submit, within one year from the finality of this Decision, a request for giving consent to the Environmental Impact Assessment Study referred to in point 1 of this Decision.

INSTRUCTION ON LEGAL REMEDY: An appeal may be lodged against this Decision to the Government of the Republic of Serbia, through this authority, within 15 days from the day of receiving this Decision, or from the day of informing the interested public on the Decision made.

-Official round seal-
Republic of Serbia - Belgrade -
Ministry of Environmental Protection-

MINISTER
Goran Trivan
personal signature

To be delivered to:
- The Archives
- The Project holder

III TEXT DOCUMENTS

1. INFORMATION ON PROJECT HOLDER

1	Contracting authority: City of Belgrade - City Administration of the City of Belgrade, Secretariat for Utilities and Housing Services - Belgrade Land Development Public Agency, PE Director Dušica Anđelkovic, B.Sc. Political Sciences	
2	Address: 84, Njegoševa Street, 11000 Belgrade, PAK 126016	
3	Contact person: Zdenka Sabljić, B.Sc. Arch.	Phone number: 011-2041-340
4	E-mail: zdenka.sabljic@beoland.com	Fax:
5	Data processed by: **INSTITUTE OF TRANSPORTATION CIP LTD.**	
6	Address: **6/IV, Nemanjina Street, Belgrade**	
7	Contact person: Gorica Aleksić Milosavljević, M.Sc. in Tech.	Phone number: +381 11 3245526

1.1. BACKGROUND TO DEVELOPING THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY

1.1.1. Subject of the Study

The subject of the Study is the environmental impact assessment of the construction project of the new bridge on the location of the Old Sava Bridge, on cadastral parcels No. 473/6,1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370, all of them within the CM of Savski Venac (Municipality of Savski Venac), and on cadastral parcels No. 2386/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1, all of them within the CM Novi Beograd (Municipality of Novi Beograd). Removal of the existing bridge and its pillars and construction of access roads are not subject of the construction project of the new bridge, on the location of the Old Sava Bridge, but separate projects are being developed for them, as well as separate environmental impact assessment procedure, all in line with the Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04, 36/09).

The environmental impact assessment is a preventive measure used to protect the environment and is based on the processing of the request and the questionnaire and the development of a study, along with the consultations that include the public opinion, and on the analysis of alternative measures, with the aim to collect data and predict detrimental impacts of specific projects on lives and health of the population, plants and animals, land, water, air, climate and landscape, material and cultural goods, and mutual effects of these factors, as well as to identify and propose the measures that may prevent, reduce or eliminate these detrimental impacts, by taking into account the feasibility of these projects.

The environmental impact assessment study has been developed in accordance with the Decision on the necessity of conducting an impact assessment and determining the scope and content, enacted by the Ministry of Environmental Protection (No. 353-02-1504/2019-03 of August 16, 2019), as well as with the available technical documents, publicly available data on the existing environmental situation within the zone of impact of the project in question, information and documents obtained from competent institutions.

The entire issue has been analysed through several separate units that include the following: bases for study development, description of the narrower and wider location on which the project implementation is planned, project description, overview of the main alternatives considered, overview of the environmental situation on the location and in the vicinity (micro and macro location), description of possible significant impacts of the project on the environment, environmental impact assessment in cases of incidents, description of measures envisaged for the prevention, reduction, and where possible, elimination of any significant detrimental environmental impact, as well as the environmental impact monitoring program.

1.1.2. The goal of study development

The goal of developing an environmental impact assessment study is to analyse and rate the quality of environmental factors and their sensitivity in a specific area and the mutual impacts of the existing, planned activities, to predict immediate detrimental impacts of the project on the environmental factors, as well as the measures and conditions for prevention, reduction and elimination of detrimental impacts on the environment and the health of the population, during the exploitation of the bridge.

The following are the objectives in this specific case:

- Environmental impact assessment of the construction of the new bridge over the river of Sava, on the location of the Old Sava Bridge,
- Defining the measures envisaged for reduction or mitigation of negative consequences during the stage of construction works, and later on, during the stage of exploitation of the bridge, if such measures are required,
- Defining the program of monitoring of the environmental situation during the construction and operation of the bridge.

1.1.3. Legal ground

The environmental impact assessment study has been developed on the basis of the following documents:

- Decision on the necessity of conducting an impact assessment and determining the scope and content of the environmental impact assessment study (No. 353-02-1504/2019-03 of August 16, 2019), enacted by the Ministry of Environmental Protection;
- The Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04, 36/09);
- The Law on Environmental Protection ("Official Gazette of RS", No. 135/04 and 36/09,36/09 - other law, 72/09 - other law, 43/11 - Decision of the CC, 14/16, 76/18 and 95/18 - other law);
- The Law on Construction and Planning ("Official Gazette of RS", No. 72/09, 81/09, 64/10, 24/11, 121/12, 42/13, 50/13, 98/13, 132/14, 145/14, 83/18, 31/19 and 37/19 - other law);
- The Regulation on determining the List of projects for which impact assessment is mandatory and the List of projects for which an environmental impact assessment may be required ("Official Gazette of RS" No. 114/2008);
- The Rulebook on the content of the environmental impact assessment study ("Official Gazette of RS", No. 69/05);

Interpretation of results and defining protective measures has been done in accordance with the following laws and by-laws:

- The Law on Environmental Protection ("Official Gazette of RS", No. 135/04 and 36/09,36/09 - other law, 72/09 - other law, 43/11 - Decision of the CC, 14/16, 76/18 and 95/18 - other law);
- The Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04, 36/09);
- The Law on Construction and Planning ("Official Gazette of RS", No. 72/09, 81/09, 64/10, 24/11, 121/12, 42/13, 50/13, 98/13, 132/14, 145/14, 83/18, 31/19 and 37/19 - other law);
- The Law on Nature Protection ("Official Gazette of RS", No. 36/09 and 88/10, 91/10, 14/16 and 95/18 (other law));
- The Law on Air Protection ("Official Gazette of RS", No. 36/09 and 10/13);
- The Law on Protection from Noise Pollution in the Environment ("Official Gazette of RS", No. 36/09 and 88/10);
- The Law on Waste Disposal Management ("Official Gazette of RS", No. 36/09, 88/10, 14/16 and 95/18 - other law);
- The Law on Water ("Official Gazette of RS", No. 30/10, 93/12, 101/16 and 95/18 - other law);
- The Law on Safety and Health at Work ("Official Gazette of RS", No. 101/05, 91/15 and 113/17);
- The Law on Cultural Goods ("Official Gazette of RS", No. 71/94, 52/11 - other laws and 99/11 - other law);

- The Law on Waste Disposal Management ("Official Gazette of RS", No. 41/18 and 18/95 (other law));
- The Law on Packaging and Package Waste ("Official Gazette of RS", No. 36/09 and 95/18 (other law));
- The Law on Fire Protection ("Official Gazette of RS", No. 111/09, 20/15, 87/18 (other law));
- The Rulebook on Methodology for Determining Acoustic Zones ("Official Gazette of RS", No. 72/10);
- The Rulebook on Methodology for Noise Measuring, Content and Scope of the Report on Noise Measuring ("Official Gazette of RS", No. 72/10);
- The Rulebook on Protection at Work during the Construction Works ("Official Gazette of RS", No. 53/9 and 9/14 - other regulation);
- The Rulebook on Waste Categories, Testing and Classification ("Official Gazette of RS", No. 56/10);
- The Rulebook on the Method of Storing, Packing and Marking Dangerous Waste ("Official Gazette of RS", No. 92/10);
- The Rulebook on Conditions and the Method of Collecting, Transporting, Storing and Treating the Waste Used as Secondary Raw Material for Obtaining Energy ("Official Gazette of RS", No. 98/10);
- The Rulebook on Conditions, Method and Procedure for Waste Oil Management ("Official Gazette of RS", No. 71/10);
- The Rulebook on the Method for Determining and Maintaining the Zones of Sanitary Protection of Sources of Water Supply ("Official Gazette of RS", No. 92/08);
- The Rulebook on the Forms for the Report on Packaging and Package Waste Management ("Official Gazette of RS", No. 21/10 and 10/13, 44/18 (other law));
- The Rulebook on the Form of Daily Records and Annual Report on the Waste with the Guidelines for Filling it in ("Official Gazette of RS", No. 95/2010, 88/15);
- The Rulebook on Indicators of Ecological and Chemical Status of Surface Water and Indicators of Chemical and Quantitative Status of Underground Water ("Official Gazette of RS", No. 74/11);
- The Rulebook on the Content and Form of the Request for Issuing Water-related Acts and the Content of the Opinion in the Procedure of Issuing Water Conditions and the Content of the Report in the Procedure of Issuing a Water Permit ("Official Gazette of RS", No. 72/17 and 144/18);
- The Regulation on determining the List of projects for which impact assessment is mandatory and the List of projects for which an environmental impact assessment may be required ("Official Gazette of RS" No. 114/2008);
- The Regulation on Conditions for the Monitoring of and Requirements for Air Quality ("Official Gazette of RS", No. 75-10, 11/10 and 63/13);
- The Regulation on Limit Values of Emissions of Polluting Substances in the Air from the Stationary Sources of Pollution, with the Exception of Combustion Plants ("Official Gazette of RS", No. 111/15);
- The Regulation on Limit Values of Emissions of Polluting Substances in the Air from Combustion Plants ("Official Gazette of RS", No. 6/16);
- The Regulation on Limit Values in Surface and Underground Water and Sediment and on Deadlines for Achieving them ("Official Gazette of RS", No. 50/12);
- The Regulation on Limit Values of Priority and Priority Hazardous Substances Polluting the Surface Water and Deadlines for Achieving them ("Official Gazette of RS", No. 24/14);
- The Regulation on Limit Values of Emissions of Polluting Substances in the Water and Deadlines for Achieving them ("Official Gazette of RS", No. 67/11, 48/12 and 1/16);

- The Regulation on Water Classification of Cross-republic Watercourses, Inter-state Watercourses and Water of the Coastal Sea of Yugoslavia ("Official Journal of SFRY, No. 6/78);
- The Regulation on Classification of Watercourses ("Official Gazette of RS", No. 5/68);
- The Regulation on Noise Indicators, Limit Values, Assessment Methods for Noise Indicators, Noise Nuisance and Detrimental Effects of Noise for the Environment ("Official Gazette of RS", No. 75/10).

1.1.4. Planning documents

When developing an environmental impact assessment study for the construction of the new bridge over the river of Sava, on the location of the Old Sava Bridge, the following existing planning documents have been used: the Plan for the general regulation of the construction area of the local self-government unit - the City of Belgrade (units I-XIX), ("Official Journal of the City of Belgrade, No. 20/16) and the Spatial plan of the area of specific purpose of arrangement of a part of the coastal area of the City of Belgrade - the coastal area of the river of Sava used for the "Belgrade Waterfront" project ("Official Gazette of RS", No. 7/15). Location conditions issued by the Ministry of Construction, Transport and Infrastructure (No. 350-02-00211/2019-14 of July 1, 2019), enclosed with Study annexes, have been also used for that purpose.

1.1.5. Available technical documents

Technical documents that are the integral part of the preliminary design of construction of the new bridge on the location of the Old Sava Bridge, have been also used for developing the environmental impact assessment study:

0	MAIN VOLUME	No. 2017-913
1	ARCHITECTURAL PROJECT	No. 2017-913-KO1
2/1	BRIDGE CONSTRUCTION PROJECT	No. 2017-913-KO2/1
2/2	ROAD AND RAILROAD CONSTRUCTION PROJECT	No. 2017-913-KO2/2
3/1	BRIDGE DRAINAGE PROJECT	No. 2017-913-KO3/1
3/2	HYDRAULIC-MORPHOLOGICAL ANALYSIS OF THE SAVA RIVER IN THE ZONE OF THE DESIGNED BRIDGE, AT THE LOCATION OF THE OLD SAVA BRIDGE	No. 2017-913-KO3/2
3/3	RPOJECT OF PROTECTION AND RELOCATION OF HYDROTECHNICAL INSTALLATIONS	No. 2017-913-KO3/3
4/1	1 kV ELECTRO-ENERGY INSTALLATIONS PROJECT	No. 2017-913-KO4/1
4/2	PROJECT OF PROTECTION, RELOCATION AND RECONSTRUCTION OF ELECTRO-ENERGY CABLE LINES	No. 2017-913-KO4/2
4/3	ELECTRO-ENERGY INSTALLATIONS PROJECT – CONTACT NETWORK	No. 2017-913-KO4/3
5	TELECOMMUNICATIONS AND SIGNALLING INSTALLATIONS PROJECT	No. 2017-913-KO5
6	MACHINING INSTALLATIONS PROJECT – ELEVATORS	No. 2017-913-KO6
8/1	TRANSPORT AND TRAFFIC PROJECT – ROAD SIGNS, MARKINGS AND SIGNALS AND EQUIPMENT ON THE BRIDGE	No. 2017-913-KO8/1
8/2	TRANSPORT AND TRAFFIC PROJECT – TRAFFIC SIGNALS ON THE NAVIGABLE WATERWAY OF THE SAVA RIVER	No. 2017-913-KO8/2
9	EXTERNAL DEVELOPMENT PROJECT	No. 2017-913-KO9
Project 01	PROJECT ON THE RESULTS OF GEOTECHNICAL EXPLORATIONS AND EXAMINATIONS OF THE TERRAIN	No. 2017-913-EO1
Study 02	JUSTIFICATION STUDY	No. 2017-913-CO1

The report of the Audit committee of the Ministry of Construction, Transport and Infrastructure, in charge of professional check of technical documents, is enclosed in the annex to the Study and concerns the conducted expert check of the Justification Study and the preliminary design: for the needs of building the new bridge on the location of the Old Sava Bridge, on cadastral parcels in CM of Savski Venac (Municipality of Savski Venac) and MC Novi Beograd (Municipality of Novi Beograd), No. 351-03-02930/2019-07 of November 18, 2019).

1.1.6. Opinions and requirements of competent institutions

The opinions and requirements of the following competent institutions have been used when developing the Study:

1. Location requirements of the Ministry of Construction, Transport and Infrastructure, No. 350-02-00211/2019-14 of July 1, 2019.
2. Conclusion of the Ministry of Construction, Transport and Infrastructure, No. 350-02-00211/2019-14 of July 5, 2019.
3. Requirements and agreement of other competent bodies and organizations collected in accordance with the specific law:
    - Decision of the Institute for Nature Conservation of Serbia, stat. 03 No. 020-1513/2 of June 19, 2019, ROP-MSGI-34773-LOCA-4-HPAP-12/2019 of June 25, 2019;
    - Requirements of the PUC “Belgrade Greenery”, No. 49/158 of May 31, 2019, ROP-MSGI-34773-LOCA-4-HPAP-13/2019 of June 5, 2019;
    - Requirements of the PUC “City Sanitation”, No. 8704 of May 31, 2019, ROP-MSGI-34773-LOCA-4-HPAP-15/2019 of May 31, 2019;
    - Water requirements of the Ministry of Agriculture, Forestry and Water Economy, Republic Directorate for Water, No. 325-05-01065/2019-07 of June 27, 2019, ROP-MSGI-34773-LOCA-4-HPAP-20/2019 of June 27, 2019;
    - Requirements from the aspect of sanitary protection of water sources, PUC “Belgrade Waterworks and Sewerage", No. 350-02-00211/2019-14, V-490/2019 of May 31, 2019, ROP-MSGI-34773-LOCA-4-HPAP-4/2019 of June 14, 2019;
    - Water supply requirements from the PUC “Belgrade Waterworks and Sewerage", No. 350-02-00211/2019-14, V-489/2019 of June 10, 2019, ROP-MSGI-34773-LOCA-4-HPAP-3/2019 of June 14, 2019;
    - Sewage requirements from the PUC “Belgrade Waterworks and Sewerage", No. K-388/2019 of June 10, 2019, ROP-MSGI-34773-LOCA-4-HPAP-5/2019 of June 14, 2019;
    - Opinion of the Ministry of Environmental Protection, “Environmental Protection Agency", No. 011-00-0001/299/2018-02 of December 6, 2019;
    - Opinion on the possibility of establishing a future construction site of the Sava bridge, issued by the Institute for the Protection of Cultural Monuments of the City of Belgrade, No. R4814/19 of November 22, 2019;

2. DESCRIPTION OF THE CLOSER AND WIDER LOCATION ON WHICH CONSTRUCTION PROJECT IS PLANNED

2.1. Description of the closer and wider location on which construction project is planned

The subject of the environmental impact assessment is the project of construction of a new arch bridge over the river of Sava, on the location of the Old Sava Bridge, which is developed by the Institute of Transportation CIP, in accordance with the award-winning design that won the contest for the development of the Urban-Architectural solution for the reconstruction of the Old Sava Bridge. There is the existing tram bridge - "The Old Sava Bridge" - on the location of construction of the future new bridge over the river of Sava, whose span length is L = 41,3+53,1+53,1+106,2 + 53,1+53, 1+41,3 = 401,2 m. Before building the future new bridge, it has been planned to remove completely the existing bridge and its pillars, which is the subject of a separate project and another environmental impact assessment study.

In terms of a macro-location, the bridge in question is located within the area of the Sava amphitheatre, stretching on the left bank of the river of Sava. The (Figure 2.1) shows the area of the Sava amphitheatre.

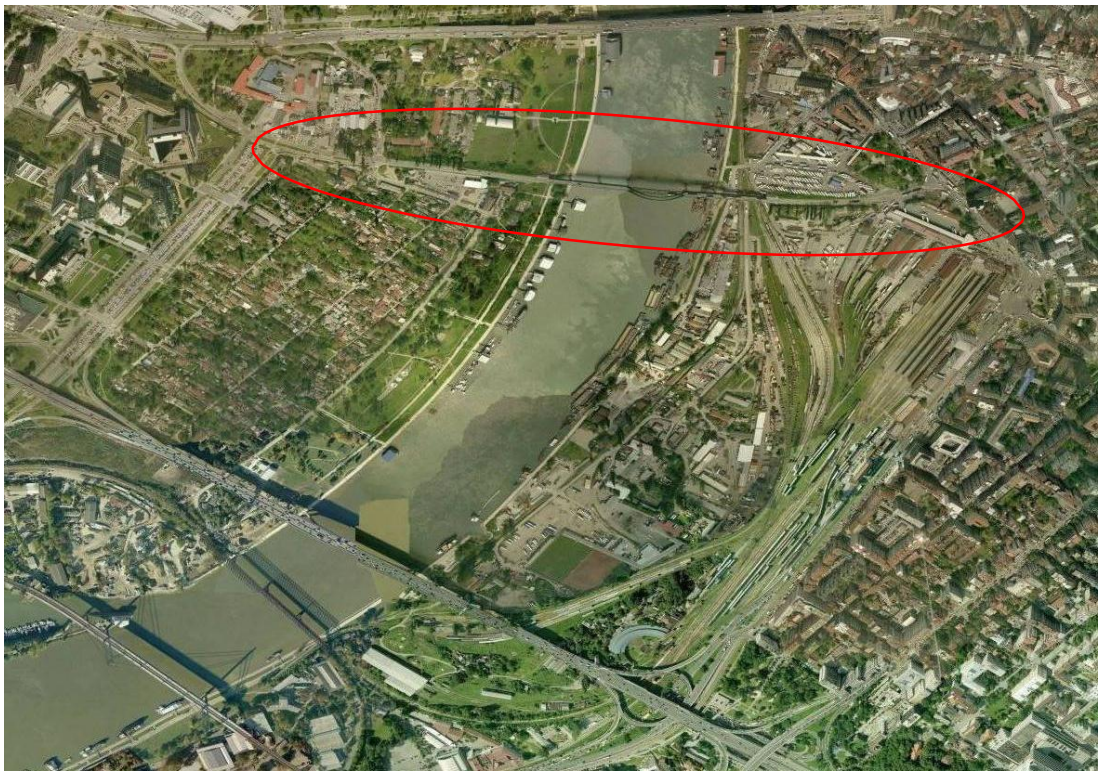
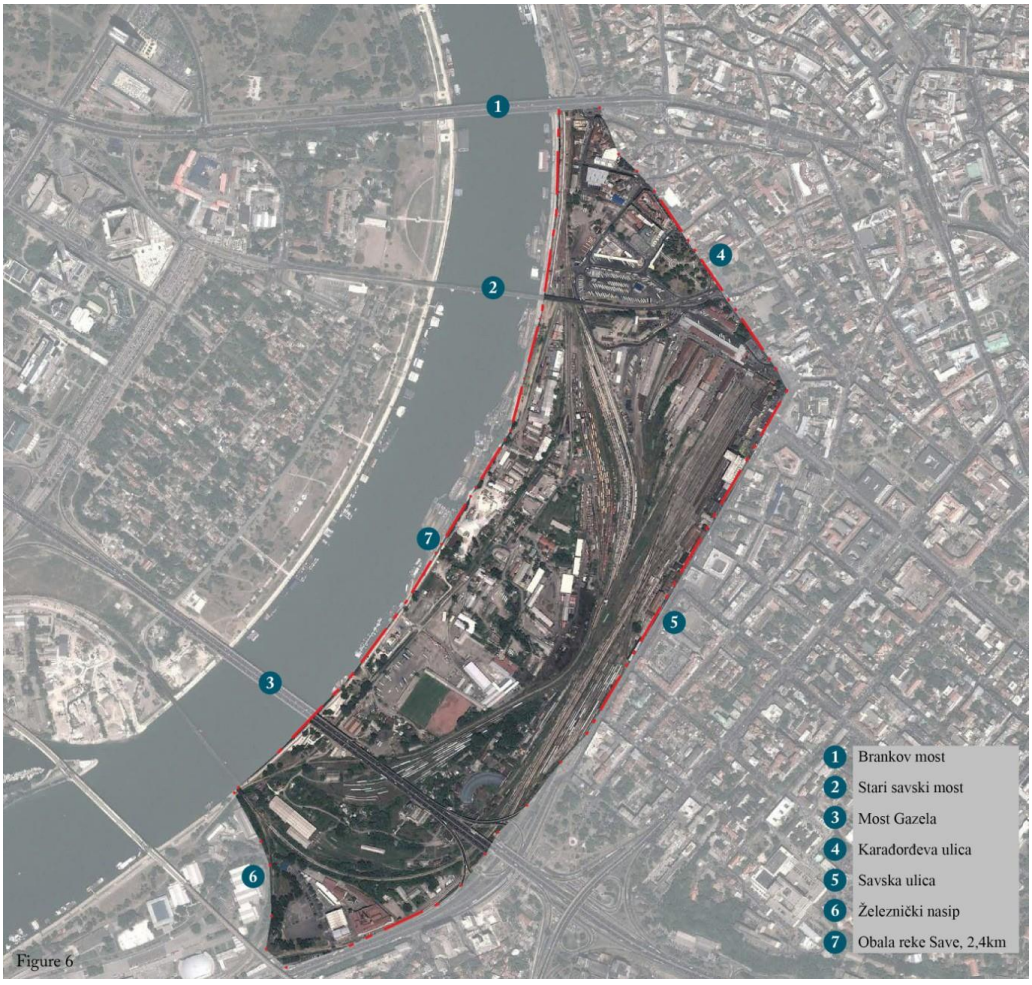


Figure 2.1 The area of the Sava amphitheatre
(Source: The Spatial plan of developing a special purpose area of the part of the coastal area of the City of Belgrade - the coastal area of the river of Sava, for the "Belgrade Waterfront" project)

According to the valid 2021 General Plan of Belgrade, which is the plan of the wider spatial unit, the planning area belongs to the central spatial zone, or more precisely, to the units of "Sava amphitheatre" and "Prokop". The unit of the "Sava amphitheatre" is the greatest potential for construction of the new central, commercial and public facilities. The prevailing purpose of this unit is a commercial zone and city centres. Residential and housing aspects make a compatible purpose. In addition to the commercial

and residential zone, there are surfaces intended for transport, public services, facilities and complexes, but there are green surfaces, too.

According to the Spatial plan of developing a special purpose area, i.e., developing the coastal area of the City of Belgrade - the coastal area of the river of Sava, for the "Belgrade Waterfront" project ("Official Gazette of RS", No. 7/15), the prevailing existing purpose of surfaces within the urban development project include the following: Commercial zones and city centres, infrastructure surfaces and objects and partly green and free areas. The area of project implementation is the location where almost all transport means and transport sub-systems gather together and mix, which is particularly evident on the right bank of the river of Sava (Figure 2.2).The primary street network in the area is made of the class I state roads (highway, main roads), class II streets, while secondary street network is made of access roads and local street network.



Legend:
1. Branko's Bridge
2. Old Sava Bridge
3. Gazela Bridge
4. Karađorđeva Street
5. Savska Street
6. Railroad embankment
7. River Sava bank, 2.4 km

Figure 2.2 Immediate surroundings of the analysed location

Micro-location of the new arch bridge over the river of Sava (Figure 2.3) has been envisaged on the location of the existing Old Sava Bridge.

Figure 2.3 Location of the construction of the new arch bridge over the river of Sava, at the place of the Old Sava Bridge

2.2. Necessary land surface to be taken during the construction works and bridge operation

The new bridge over the river of Sava will be built on cadastral parcels No. 473/6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370, all of them in the CM of Savski Venac, and on cadastral parcels No. 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (a part thereof), all of them in the CM Novi Beograd, in Belgrade.

2.3. The overview of geomorphological, geological, hydro-geological, seismic and pedological characteristics of the terrain

2.3.1. Geomorphological characteristics of the terrain

As for the geomorphological aspect of the terrain, the area that is subject to exploration, includes the river bed and the alluvial plain of the river of Sava, with all the characteristics of bigger rivers of the lowland type. The basic type of relief of this terrain was formed by the erosive and accumulative actions of the river of Sava. Cutting down of the river flow and its erosive effect continued with the quaternary sediments. Depositing of the sediments occurred in parallel to the cutting down or erosion of the river flow, thus forming the coastal alluvial valley. Main relief type of the right bank had been remodelled several times, since the end of the XIX century, by land filling, cutting down and excavation work. Land filling referred primarily to pond surfaces. The greatest of them was the then “Bara Venecija”, located immediately next to the Sava river bed, which caused the marsh to disappear and the terrain was converted into a useful ground, in terms of construction, but not completely into a developed surface. At the time of regulating the “Bara Venecija”, the terrain was filled at the elevation of 75.4-76.6 m, when the urban development of Savamala took place.

The relief of the left bank of the Sava river, at the micro-location of the new bridge, has been modelled intensely by filling the land immediately before the II World War, during the period from 1938 to 1941. It was at that time that the filling was done using the dredged sand, excavated from the river bed, until the elevation of 76.0-76.5m, which helped build the river wall and the quay on the Sava bank.

After the World War II, embankments were built in the urban area of the Sava river, along its entire flow, at several stages.

2.3.2. Geological characteristics of the terrain

The results of the latest exploration studies have confirmed the general geological composition of the terrain on the exploration site. The geological composition of the terrain in question is made of mesozoic and tertiary neogenic sediments covered by quaternary alluvial sediments and anthropogenic embankments. The cut-out of the Main geological card, i.e., the Belgrade sheet, is shown in Figure 2.3.2-1.

The MESOZOIC forms the wall base on the exploration site, presented on the massive chalky limestones (3K1) which are significantly karstified.

The NEOGENIC sediments have been identified in all exploration boreholes. The following units can be consequently singled out:

- Organogenic limestone (M31) with irregular occurrence of marl- and sand-type organogenic limestone.
- Marly complex (M32): made of clay marl, of massive texture.

Quaternary sediments are presented by holocene alluvial sediments consisting of the river basin fascia ($Q_2ap_{gp, p}$) and river bed fascia ($Q_2\,ak_p$ and $Q_2\,ak_{šp}$). The river basin fascia is made of clay dust and clay-sand dust located immediately beneath the embankment, on the terrain surface. Sediments of the river bed fascia build the deepest of alluvial sediments, and are made of sands and gravels of irregular vertical and lateral mutual crossings.

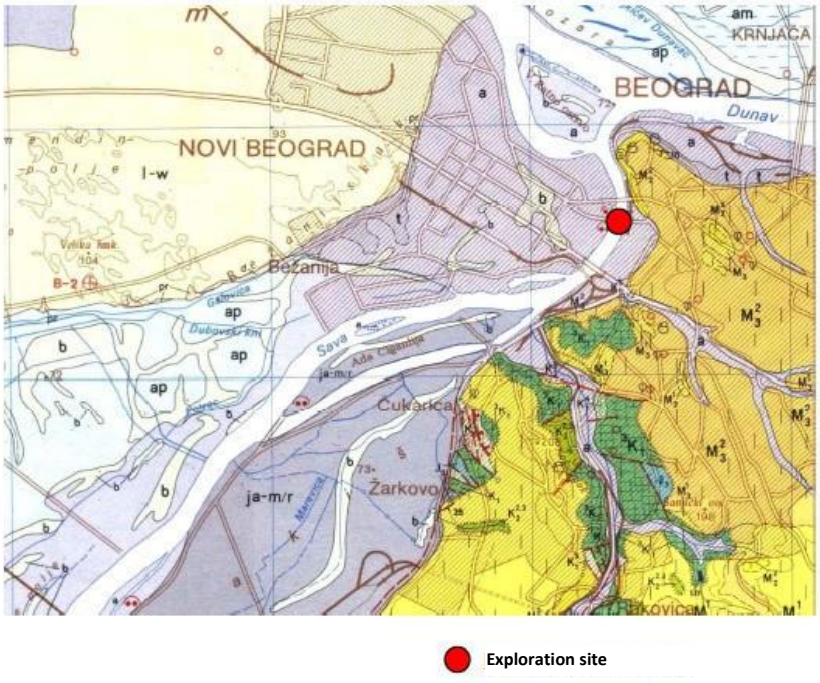


Figure 2.3.2-1 The cut-out of the Main geological card – the Belgrade sheet, 1:100 000

EMBANKMENTS - anthropogenic, technogenic materials covering the surface parts of the terrain, on the entire research site, with the exception of the river bed. They have been identified in all exploratory boreholes built on the land, in a layer of variable depth.

The maximum embankment thickness identified is 7.5 m. The composition is very heterogeneous on the right bank, consisting of non-fixed and fixed materials with unequal local participation of construction rubble (parts of reinforcement, concrete blocks, etc.), of variable consistency and degree of compaction. It ranges mainly from non-consolidated to feebly compacted. The embankment is however of more uniform composition on the left bank of the Sava river, and is made of the dredged sand that is mainly of medium compaction.

2.3.3. Hydro-geological properties of the terrain

The wall masses of the following hydro-geological categories, according to water permeability and structural type of porosity, are located on the exploration site:

- *Sediments of the water basin fascia (apgp, p)* are identified immediately beneath the embankment, on Sava banks. They are made of clay-dust material of medium water permeability, which can be grouped into conducting collectors, according to its hydro-geological characteristics. The aquifers of compacted type and variable level can be formed in them.
- *Sediments of the river bed (akpiakp, š)* form the lower parts of alluvial deposits and are identified immediately beneath the fascia of the river basin. They are represented by dusty sands with layers of muddy dusty and sandy gravel with inter-granular porosity type. The vertical profile accounts for a certain irregularity in terms of granular grading. Dusty-muddy sands appear in peak parts of the series, with the middle part being made of dusty sands, and the lower part - of sandy gravel of large size of grains. The water permeability of these sediments is in direct relationship with their granular composition and their vertical shifts. They are more water permeable in the lower parts of the profile, with the values of filtration coefficients corresponding to the sandy gravel (≈10^{-2}m/s). The water permeability gradually decreases upwards, and the water permeability of the upper parts of the series ranges from medium to low permeability. These sediments are completely water-saturated, and together with the deposits of the river basin fascia make a unique hydro-geological reservoir.
- *Neogenic marly clays and marls (M32L)* are located in the underlying stratum of the alluvial sediments. These sediments are almost completely waterproof, and with regard to their hydro-geological function, they can be considered hydro-geological insulators. Smaller quantities of water from alluvial deposits are infiltrated through crevice systems in marly clays contributing to the physical-chemical changes and decomposition of neogenic sediments.
- *Neogenic reef-like organogenic limestones (M31 K)* have been identified in the deepest parts of the exploration site and represent the wall basis of this terrain. The limestones are fairly decrepit, cracked and cavernous. Some of these crevices are of great dimensions, due to the karstification, and these parts of the limestones are characterized by the karstic type of porosity. The reef limestone can be grouped into underground water collectors - reservoirs, in terms of their hydro-geological function.

The exploration site is experiencing complex hydro-geological conditions. The main aquifer of the underground water is of compacted type, made of alluvial dusty sands and gravels of inter-granular porosity type. The waters from this aquifer are in direct hydraulic relationship with the waters of the Sava river, and the level of the ground water in it varies according to the same regime as the level of water in the river. Replenishment of aquifers is done by the Sava River, and partly by draining the underground water from the direction of the slope in the hinterland, partly by infiltrating the accelerated weathering, and partly by the “losses” from the water supply and sewerage network.

Littological composition and thickness of alluvial sediments allow for the accumulation of large quantities of water in this aquifer. During the period of conducting the exploration, the level of underground water at the location in question is at the depth of 4.30-5.20 m from the surface of the terrain, or on absolute elevations of 70.00-71.00 m of altitude, which corresponded to then level of the river of Sava.

Another, lower aquifer of underground water, isolated from the upper aquifer by a thick marly package, has been formed in the reef-like organogenic limestones.

2.3.4. Seismic properties of the terrain

Selection of the "oleata" seismic card relevant to the assessment of seismic activity of the location of the bridge in question, according to the National Rulebook, depends on the category of objects. The obligation of seismologists is, according to the National Rulebook, and in line with the category of objects, to select the "oleata" seismic card that should be the starting point for the assessment of seismic activity of the bridge location.

The bridge in question is of great importance, given its function, as nearly all transportation means and transport sub-systems mutually intersect at this location, according to the planning document. The value of this fact makes the bridge Category 1 object, according to the National Rulebook, and by taking into account the earthquake-related conditions, while according to the Eurocode EC8, the bridge is classified as "bigger than the average".

It should be stressed that the amount of seismic risk according to EC8, and also in the National Rulebook, is 10%, both in terms of the "Requirement for limited damage", and for the "Requirement against object collapsing". It means that, as far as the requirement for "limited damage" is concerned, it is expected to have an earthquake of that intensity once in 100 years, while the requirement "against the collapsing of the object", it is expected to have an earthquake of that intensity, once in 500 years. In our case, the earthquake of 7 degrees will occur for the reverse periods of earthquakes, from 50 years and 100 years and this fact indicates the increased seismic risk in relation to 10%. Also, the increased seismic risk in relation to 10% occurs with the requirement "against the collapsing of the object" as the same seismic risk occurs in 200 years and in 500 years.

The analysis performed has shown that seismic-tectonic requirements (vicinity of seismogeneous faults) for the location in question are not a limitation for the construction of the bridge at the given location.

2.3.5. Pedological characteristics of the terrain

Morphology-wise, the exploration site includes the river bed and the alluvial plain of the Sava River, with all the characteristics of bigger rivers, of lowland type.

The main relief of this terrain has been formed by erosive, accumulative action of the Sava River, even during the lower lake stages. Cutting down of the river flow and its erosive effect continued with the quaternary sediments. Depositing of the sediments occurred in parallel to the cutting down or erosion of the river flow, forming the coastal alluvial valley in that way. Main relief type of the right bank had been remodelled several times, since the end of the XIX century, by providing land filling, cutting down and excavating work. Land filling referred primarily to pond surfaces. The greatest of them was the then "Bara Venecija", located immediately next to the Sava river bed, which caused the marsh to disappear and the terrain was converted into a useful ground, in terms of construction, but not completely into a developed surface. At the time of regulating the "Bara Venecija", the terrain was filled at the elevation of 75.4-76.6 m, when the urban development of Savamala took place.

The relief of the left bank of the Sava River, at the micro-location of the new bridge, has been modelled intensely by filling the land immediately before the II World War, during the period from 1938 to 1941. It was at that time that the filling was done using the dredged sand, excavated from the river bed, until the elevation of 76.0-76.5m, which helped build the river wall and the quay on the Sava bank.

After the II World War, embankments were built in the urban area of the Sava river, along its entire flow, at several stages.

Pedological composition of the soil occurred under the influence of many pedo-genetic factors, such as: geological composition, relief, water, climate, vegatation, human and time factor.

Pedological base consists mainly of alluvial soil of different mechanical composition, and partly of marsh black soil. As for the soil types, there are mainly *solonec*, *solodj*, clay soil, and on drier terrains - marsh black soil, alluvium and brown forest soil.

2.4. Vicinity of the sanitary protection zones, watercourses and sources of water supply

2.4.1. Vicinity of the sanitary protection zones and sources of water supply

Providing drinking water for more than 1.5 million of users connected to the Belgrade water supply system is done by using the treated underground surface water. This system is managed by the PUC "Belgrade Waterworks and Sewerage". The total annual quantity of drinking water produced over a couple of past years (2005-2012) is about 200 million of m^3 of water, which is the equivalent to the annual average discharge of delivered water of about 6.400 l/s. The present Belgrade underground water source has been created as a long range of 99 water wells with the horizontal auger hole and some 50 bored water wells. The water wells are built on the banks of the Sava river and Sava lake. Belgrade water supply system uses the surface and underground water as a raw material. Notwithstanding the fact that the City is located on two big rivers, the water supply system relies more than 99% on the water from the Sava River. The water from the Sava River is used immediately as a raw material at the water plant PPV Makiš, Jezero and Bele Vode. Processing the underground water is another water treatment system. The water tapped in the water wells is transported to the following facilities for treatment of underground water: Bežanija, Banovo Brdo and Bele Vode. A very small quantity of water from the Danube river is tapped and treated at the facility Vinča at the place of Vinča (Data taken from the Project on sanitary protection zones of underground and surface water sources within the water supply system of the City of Belgrade (Institute "Jaroslav Černi", 2013)).

According to the requirements obtained from the PUC "Belgrade Waterworks and Sewerage", Development Department, for the purpose of issuing location conditions for construction of the bridge over the Sava river, at the location of the old bridge, and pursuant to the Decision on determining the sanitary protection zones in the administrative territory of the City of Belgrade, for the water sources of underground and surface water that are used for supplying water to the City of Belgrade (No.530-01-48/2014-10 of August 1, 2014, Ministry of Health of RS), it can be stated that a part of the bridge over the Sava river located in the territory of the Municipality of Novi Beograd is within the narrower sanitary protection zone (Zone II), while the second part of the bridge that is located in the territory of the Municipality of Savski Venac is partly within the wider sanitary protection zone (Zone III), and partly within the space that is not defined as a sanitary protection zone of the water source. The position of the bridge in relation to the sanitary protection zones of the Belgrade water source is shown in Figure 2.4.1-1.

Legend:
Yellow - Wider area of sanitary protection

Black - Position of the bridge across Sava River

Red - Narrower are of sanitary protection

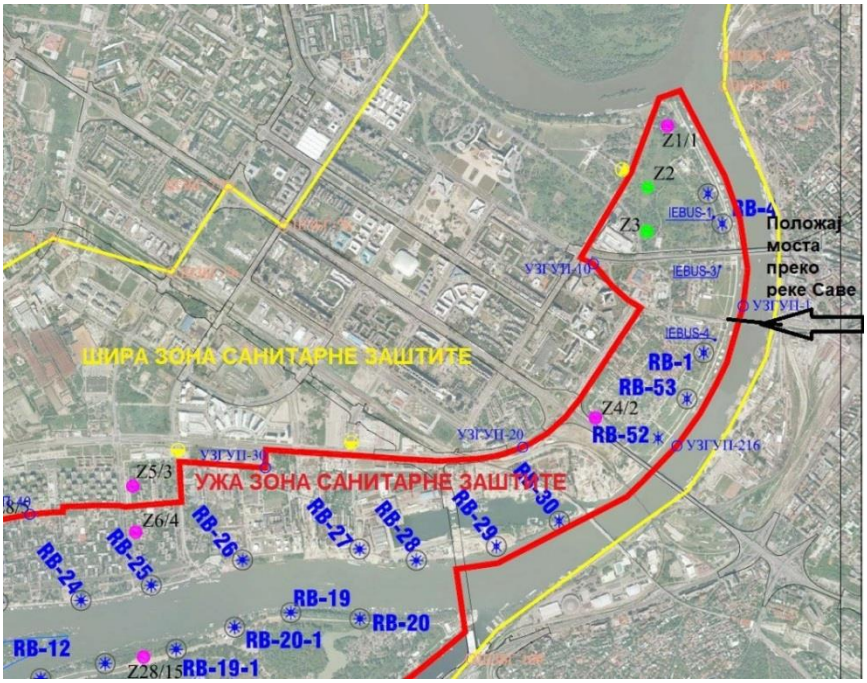


Figure 2.4.1-1. Position of the bridge in relation to the sanitary protection zones of the Belgrade water source
(Source: The Project on sanitary protection zones of underground and surface water sources within the water supply system of the City of Belgrade (Institute for Development of Water Resources "Jaroslav Černi", 2013)).

2.4.2. Vicinity of watercourses

The main hydrological property is given to the exploration site by the rivers of Sava and Danube that belong to the Black Sea basin. Pursuant to article 2 of the Regulation on determining the international and inter-state waterways ("Official Gazette of RS", No. 109/16) and article 1 of the Regulation on Classification of international and inter-state waterways ("Official Gazette of RS", No. 109/16), the Sava river has the status of an international waterway, Class Va, on the section in question. However, taking into account the vicinity of the Belgrade hydro-node and the Danube river, or in view of the water transport and considering the location concerned and the confluence of the rivers Sava and Danube, as a whole, the values of dimensions of the waterway applicable to the Danube river, within the confluence zone (Class VIc) are accepted for the given location of the Sava river.

Based on the water conditions, the characteristic discharge values have been obtained. Characteristic computable discharge values of the Sava River for the section in question are:

$Q_{0.1\%}$ = 8400m³/s - 1.000-year flood,
$Q_{1\%}$ = 6900 m³/s - 100-year flood
$Q_{2\%}$ = 6400 m³/s - 50-year flood

2.5. Climate characteristics of the area

Belgrade and its wider surroundings have moderate-continental climate that is mostly influenced by macro processes in the atmosphere. Climatic conditions are favorable throughout the year – In winter there are not many days with strong frost, and summers are moderately warm.

Air temperature

Based on the data processing of the Republic Hydrometeorological Service of Serbia, for the measuring station Belgrade Observatory, in the period from 1990 to 2019, the following data were obtained:

- the average annual air temperature is 13.17° C,
- the average maximum annual air temperature is 18° C,
- the average minimum annual air temperature is 9.01° C.

During the summer months, days with temperatures above 35° C (summer heat) also occur, as well as tropical nights (with temperatures above 20° C) from June to August. While during the winter months, there are days with temperatures below -7° C. The absolute annual maximum was in 2007 (43.6° C) and the absolute annual minimum in 2012 (-15.5° C).

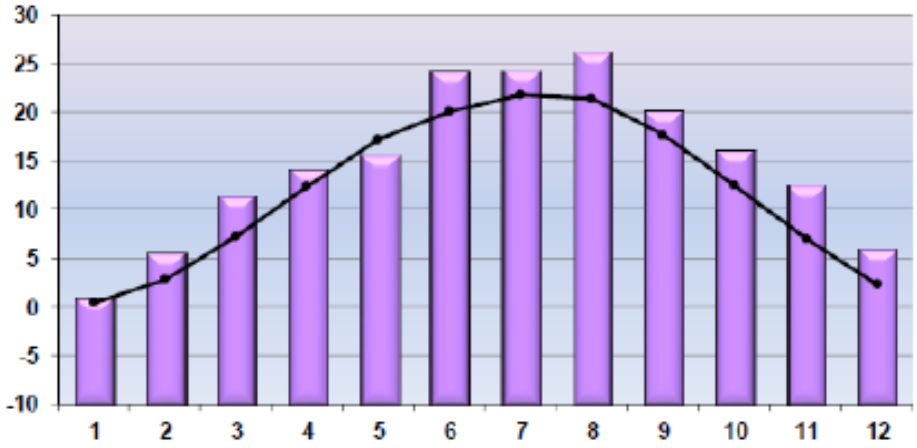
The average temperature of the warmest month in the period from 1989 to 2019 was recorded in August 1992 and July 2015 and it was 26.7° C, while the average temperature of the coldest month was recorded in January 2017 and it was -3.3° C.

When it comes to 2019:

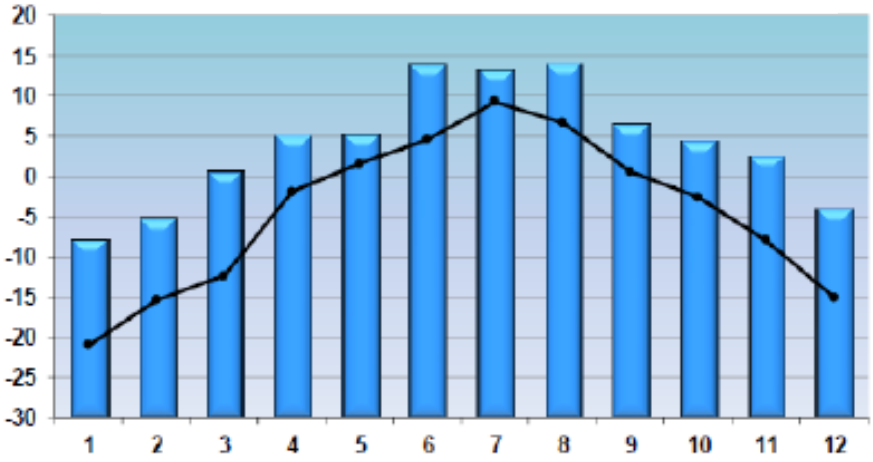
- the average mean annual temperature is 14.8° C;
- the average maximum annual temperature is 19.8° C;
- the average minimum annual temperature is 10.4° C;
- the absolute annual maximum is 37.5° C;
- the absolute annual minimum is -7.8 ° C;
- the number of days with a daily temperature above 30° C in the summer was 46 (of which 14 days in July and 22 days in August);
- the average temperature of the warmest month is 26.2°C (August);
- the average temperature of the coldest month is 0.8°C (January).

On the basis of data from the Republic Hydrometeorological Service of Serbia, contained in the Meteorological yearbook 1, 2015 Climatologic data, the charts below show the data on air temperatures and quantity of precipitations in 2019, in relation to the average data for the period 1961-1990.

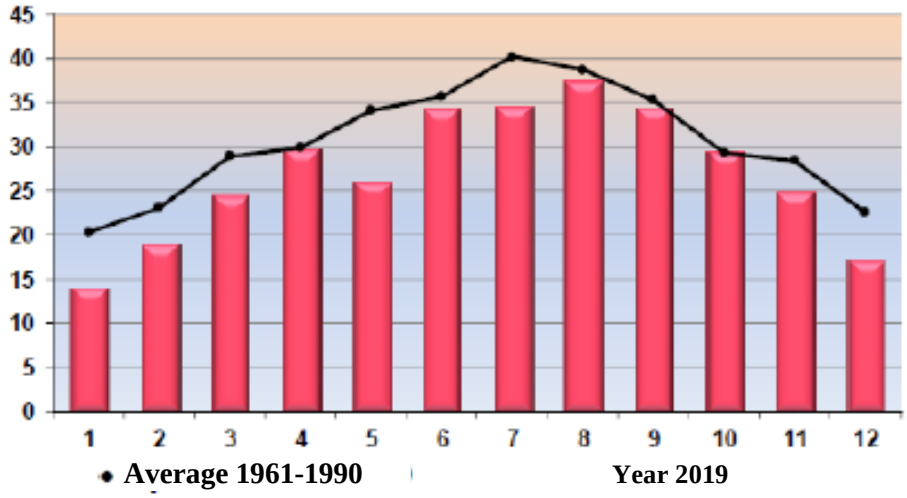
MONTHLY AVERAGE AIR TEMPERATURES, in °C



ABSOLUTE MINIMUM OF AIR TEMPERATURE, in °C



ABSOLUTE MAXIMUM OF AIR TEMPERATURE, in °C



Air humidity

The relative annual humidity obtained by processing data at the "Belgrade - Observatory" MS for the period from 1990 to 2019, is 67.5%. The month when the highest average monthly humidity occurs is December. It is followed by January and November. On the other hand, the lowest average monthly humidity most often occurs during the month of August. It is followed by July, April and March.

The highest average monthly humidity value, in the period from 1990 to 2019, was recorded in January 2009 and November 2015 and it was 85%. The lowest average monthly humidity was 41% in August 2012.

The greatest number of days with high average daily humidity (≥ 90%) were recorded in November and December. The month with the highest number of days with low mean daily humidity (≤ 40%) is August.

In 2019, the relative annual humidity was 66%. The highest average monthly humidity was in January (83%), and the lowest in March and August (53%). January had the most days (12) with high average

daily humidity (≥ 90%), while in March and August the most days with low average daily humidity (≥ 40%) were recorded.

Cloudiness, fog and smog

The average value of cloudy days decreases from winter months towards summer months and increases again, so the highest average number of cloudy days occurs in December (around 15 days) and January, while the smallest number is recorded in July and August – around 3.5 days. During the summer, days with the least cloudiness overlap with the days in which there appears the drought, summer heat and tropical days. The largest number of bright days is in the month of August (over 11 days), as well as July and September. The minimum such days is recorded in January and December – below 4 days. The highest monthly average number of days with fog is in the period from November to January, while the maximum value is in the month of December – over 6 days.

Precipitation

The annual course of precipitations has predominant characteristics of the continental type. The annual flow of precipitation has predominant characteristics of the continental type. Based on the data processing of the Republic Hydrometeorological Service of Serbia, for the measuring station Belgrade Observatory, in the period from 1989 to 2019, the average annual rainfall is 682,075 mm. The maximum amounts of monthly precipitation were recorded in June (followed by May, July and September), and the minimum amounts of monthly precipitation were recorded in February and March (followed by April, August and October). June is the month with the highest number of days with extreme rainfall (followed by July, and the others), while on average, the lowest number of days with extreme rainfall was recorded in January, February and December.

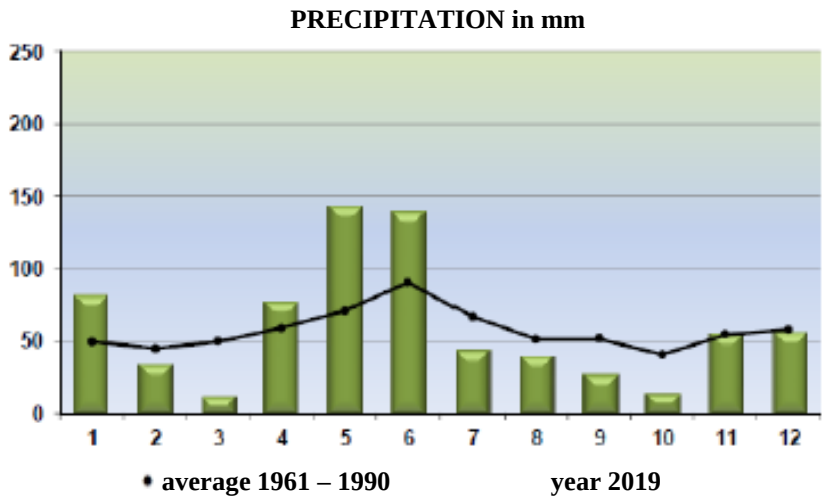
Also, according to the data obtained from the Belgrade Observatory Meteorological Station, maximum annual rainfall was recorded in 2014 (1095.1 mm) and 1999 (1051.2 mm), while the minimum annual rainfall was measured in 2000 and amounted to 367.7 mm. The maximum monthly amount of precipitation was recorded in May 2014 (280.4 mm). It is then followed by July 1999 (262.5 mm), July 2014 (250.6 mm) and June 1994 (212,2 mm). The minimum monthly amount of precipitation was recorded in October 1995 (0.3 mm). It is followed by February 1998 (2.3 mm), March 2012 (2.4 mm), December 2016 (2.8 mm) and July 2013 (2,9 mm). The maximum amount of precipitation during one day was recorded in May 2014 and was 109.8 mm.

According to the data taken from the Environmental Impact Assessment Study for the construction of the "Belgrade Tower " block 19 (on the cadastral parcel number 1508/411 CM Savski Venac, City of Belgrade, prepared by “Energoprojekt - Urbanizam i Arhitektura a.d.”, in November 2017), the highest number of days with snow cover is in January (15.5 days), while the maximum height of snow cover is in February (80 cm).

When it comes to 2019:

- the average annual rainfall is 716.5 mm,
- maximum monthly rainfall is 142.8 mm (May),
- the months with the highest rainfall are May and June,
- the minimum monthly rainfall is 11.5 mm (March),
- the months with the lowest rainfall are March and October,
- the maximum amount of precipitation in one day is 41.7 mm (June).

Based on the data of the of the Republic Hydrometeorological Service of Serbia published in the Meteorological Yearbook 1. Climatological data in 2019, the below graph shows data on precipitation in 2019 in relation to the average data in the period from 1961 to 1990.



Insolation

Based on data processing, the annual sum of solar irradiance recorded at the MS "Belgrade - Observatory" for the period from 1990 to 2015 (2016, 2017, 2018 and 2019 are incomplete data) is an average of 2175 hours. The month with the highest insolation is July (followed by August and June). The month with the lowest insolation is December (followed by November). The maximum monthly amount of irradiance was recorded in July 2007 and it was 359 h. The minimum monthly amount of irradiance was recorded in January 1997 and was 18.1 hours. The highest mean monthly values of insolation are in July (314,67 h), while the lowest are in December (56,05 h). In 2019, the maximum monthly insolation was recorded in August (323,2 h), and the minimum in December (79,2 h).

Wind

Analysing the data of the Republic Hydrometeorological Service of Serbia for MS Belgrade Observatory, for the period 1990-2019, it can be noticed that the prevailing winds for Belgrade are southeast (229°) and west (211°). The wind is mostly of low intensity. The annual frequency and wind speed for the period from 1990 to 2019 is shown in Figure 2.5.-1.

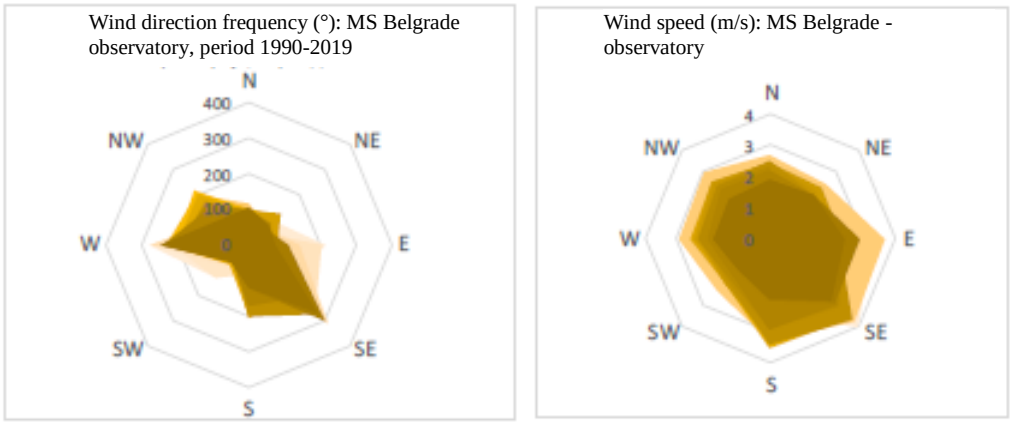


Figure 2.5.-1 Annual frequency and wind speed for the period from 1990 to 2019

Based on the processing of data from the Republic Hydrometeorological Service of Serbia (MS Belgrade Observatory) for 2018, southeast and west were blowing throughout the year. The southeast wind most often appeared during spring, autumn (with its maximum recorded in November) and winter, while during the summer it appeared the least . The west wind usually blew during the summer and winter, and the least during the fall. The winds with the highest average speed during the winter were the west, west-southwest and northwest ones. During the spring, the winds were east-southeast and east one, during the summer it was north-northwest, and during the autumn the winds were southeast and east. Quiet periods were rare.

Given that global warming has caused significant global, regional and local climate change, and taking into account the projections and effects of climate change, the Southern European region is ranked among the world's most vulnerable regions to climate change in an IPCC report. The analysis of air temperature on the territory of the city of Belgrade shows that a trend of growth of the average annual air temperature has been recorded. In terms of precipitation on the territory of the city of Belgrade, in the last 15 years, more and more extreme precipitation in the spring and a smaller amount of precipitation in certain periods during the year have been noticed. The change of these two important parameters certainly significantly affects the quality of life of people in urban environment. Primarily, these changes affect the general health of the population, especially of the parts of the population with higher health risks who adapt to the changes much harder.

2.6. Vegetation, fauna and protected natural goods

2.6.1 Vegetation - general characteristics

There are neither protected areas for which protection procedure has been completed or initiated, nor registered natural goods, at the location planned for the construction of the New Sava Bridge. The location is partly situated in the ecologically significant area of the “Confluence of Sava and Danube rivers”, within the ecological network of RS determined by the Regulation on Ecological Network (“Official Gazette of RS", No. 102/2010), and partly in its immediate vicinity. The Sava River with its coastal area in the natural and near-natural situation is the ecological corridor of the ecological network of RS, of international importance.

2.6.2 Fauna

The location intended for construction of the New Sava Bridge is the area for migration of rare and endangered bird species, that have been declared as strictly protected species, according to the Rulebook on declaration and protection of strictly protected and protected wild species of plants, animals and fungi (“Official Gazette of RS", No. 5/10, 47/11, 32/16 and 98/16). The most important of these include the Pygmy Cormorant i.e. *Phalacrocorax pygmaeus*, the Black-crowned night heron (*Nicticorax nicticorax*) and the white-tailed eagle (*Haliaetus albicilla*). As for the other fauna species, the area is populated by synanthropic animal species (except birds, there are small- and medium-sized mammals, several species of amphibians and reptiles).

2.6.3 Protected natural goods

According to the requirements issued by the Institute for Nature Conservation of Serbia, in the Decision stat. 03 No. 020-1513/2 of June 19, 2019, there are neither protected areas for which protection procedure has been completed or initiated, nor the registered natural goods, on the location planned for the construction of the New Sava Bridge. The location is partly situated in the ecologically significant area of the “Confluence of Sava and Danube rivers”, within the ecological network of RS determined by the Regulation on Ecological Network (“Official Gazette of RS", No. 102/2010), and partly in its immediate vicinity (Figure 2.6.4.-1).

Figure 2.6.4-1 Position of the project in relation to the protected natural goods in the wider area (Source: http://serbia.gdi.net/zzps/)

There is an ecologically significant area of the "Confluence of Sava and Danube river", downstream the New Sava Bridge, that is at the same time the area of international significance for birds (IBA area registered as RS017IBA "Confluence of Sava and Danube river"), where a total of 210 bird species is registered, they nesting there, or using it as a flying corridor for migration.

2.7. Landscape

The Old Sava Bridge stretches across the Sava River, connecting two Belgrade municipalities - Savski Venac and Novi Beograd (Figure 2.7-1). The access roads within the bridge are part of the City street named Zemunski put. On the right bank of Sava river, on the part of the old Belgrade, this street intersects with the Karađorđeva Street, while on the left bank, or in the part of Novi Beograd, it intersects with the Bulevar Mihaila Pupina Street.

The view from the Old Sava Bridge is of open type, with the dominant alluvial morphology of the Sava river valley, and the dominant water body making the basic characteristic of the landscape view. Two perimeter bridges - "Branko's Bridge" and "Gazela" are dominant in that space and determine visually the area of the Sava amphitheatre in relation to the remaining urban elements. Due to its exceptional position, in the first place, the area of the Sava amphitheatre represents the highest spatial value and potential of Belgrade, in relation to the river banks and the urban elements.

The most important views from the river are those enabling to overview completely the amphitheatre nature of the space on the right bank, or Šumadija river bank of the Sava river where the core of the old Belgrade and parks on the left bank of the Sava river are situated, stretching between the Sava bridge and "Gazela".

Figure 2.7-1 The overview of the Old Sava Bridge

Viewed from the old part of Belgrade, as a beginning of the alluvial plain and the new city, surfaces covered with parks are the unique visual value. The “Staro Sajmište” park, situated in the contact area, is a highly valued fixed element of the system of green surfaces of Belgrade. The area that is closer to the river is dominated by surfaces covered with grassland, where there are many-decades-old solitary trees and groups of deciduous trees.

The view from the Vračar ridge towards the Sava amphitheatre and Novi Beograd are made along the corridors of the street network, perpendicular to Sava street, depending directly on the height of the front in it. These visual breakthroughs, even located along the streets of narrow profile, have a significant effect on the spatial experience.

The view from the bridges and the Sava quay onto the Sava slope of the old Belgrade is made by the right bank of the Sava river and the line of horizon of Šumadija beam, from the “Victor” monument, Belgrade fortress, St. Michael Church, St. Marc Church, Moskva Hotel, Old and New Palace at Terazije, National Assembly, Belgrade Palace (“Beograđanka”), St. Sava Church, and further on to Topčider and Banovo Brdo.

The location of the Old Sava Bridge is particularly rich in views, specific features of the sight line and dynamics dictated by urban elements of the old city core placed on the right bank of the river, together with the new urban development of the Sava amphitheatre whose construction is still under way. Special value of the views is in the green surface on the left river bank, in the direction of “Branko's Bridge” and Kalemegdan park, on one side, and the views towards “Gazela”bridge and “Ada” bridge, on the other side.

2.8. Protected immovable cultural and historical goods

As for the protection of cultural goods, in line with the Law on Cultural Goods ("Official Gazette of RS", No. 71/94, 52/11 and 99/11), and on the basis of available data, it can be stated that a part of the cultural goods with previously assigned protection is situated in the vicinity of the location of the new bridge, it being the Unit of the "Coastal Zone of Novi Beograd" and cultural goods - cultural monument of Staro Sajmište - Gestapo Camp (Decision on the declaration is issued in the "Official Journal of the City of Belgrade", No. 16/87).

The "Coastal Zone of Novi Beograd" Unit encompasses a wide space stretching from "Gazela" bridge to the old tram bridge and "Branko's Bridge", then on the left bank of the Sava river and right bank of the Danube river, up to the confluence of these two rivers. It is entered into the register of goods under previously assigned protection. Rich cultural layers of Belgrade, as one of the cities with the longest-lasting urban tradition, its historically most significant and most valuable areas and rivers of Sava and Danube, make a part of the coastal area zone and are its integral part.

There are cultural monuments within the "Coastal Zone of Novi Beograd", just to name a few: Staro Sajmište - Gestapo Camp, Museum of Contemporary Art, as well as the Friendship Park, which is a goods with previously assigned protection. As material testimonies of the historical, culturology-related, social, sociological, urban, architectural and economic development, they represent exceptional and inherent values of the cultural heritage of the city.

Cultural heritage, together with the aquatorium of the confluence of the rivers of Sava and Danube, and the natural values of the Veliko Ratno Ostrvo (Great War Island), represent a visual, spatial dominant in the overall urban image of the area on which the project implementation has been planned.

2.9. Population, population density and demographic characteristics

The wider converging area of impact that the construction of the bridge across the river of Sava, at the location of the old bridge, have on the population, encompasses the City of Belgrade. Belgrade is organized in 17 city municipalities, having the territory of 3,234 km^2, where, according to the 2017 assessment, there are 1,687,132 inhabitants, or 522 inhabitants/km^2 (Table 2.9-1).

In 2011 (the Census), Belgrade had 1,658,151 inhabitants, which is 23% of the total population of the Republic of Serbia. The share of the population of the City of Belgrade in the total population of the Republic of Serbia grew constantly, starting from 9.7% in 1948. The annual average population growth rate for Belgrade was positive up until the interim census period 1991-2002 (-0.1%), after which, due to migrations, the annual average growth rate of the population resumed its positive value in the period between two censuses, or 2002-2011 (0.6%). This is also the only region in the country in which the number of inhabitants grew between 2011 and 2017.

Table 2.9-1 City of Belgrade (general data, 2017)

Region Area City - municipality	Surface, km^2	Number of inhabitants 2011	Number of settlements	Population, situation as of June 30, 2017		Cadastral parcels
				Total	Per 1 km^2	
REPUBLIC OF SERBIA	**88,499**	**7,236,519**	**6,158**	**7,020,858**	**79**	**5,822**
Belgrade region	**3,234**	**1,658,151**	**157**	**1,687,132**	**522**	**174**
Belgrade area *City of Belgrade*	**3,234**	**1,658,151**	**157**	**1,687,132**	**522**	**174**
Barajevo	213	27,048	13	26,964	127	13
Voždovac	148	158,156	4	168,242	1,137	8
Vračar	3	56,417	-	57,483	19,161	1
Grocka	300	83,633	15	86,391	288	14
Zvezdara	31	151,540	-	163,542	5,276	4
Zemun	150	167,749	1	173,460	1,156	4
Lazarevac	383	58,596	34	57,136	149	34
Mladenovac	339	53,090	22	52,159	154	19
Novi Beograd	41	214,587	-	213,985	5,219	1
Obrenovac	410	72,459	29	72,209	176	29
Palilula	451	173,347	7	181,414	402	11
Rakovica	30	108,522	-	108,477	3,616	3
Savski Venac	14	39,226	-	36,222	2,587	1
Sopot	271	20,338	17	19,870	73	16
Stari Grad	5	48,593	-	45,877	9,175	1
Surčin	288	43,664	7	46,115	160	7
Čukarica	157	181,186	7	177,586	1,131	8

Source: Municipalities and regions in the Republic of Serbia, 2018, Statistical Office of the Republic of Serbia, Belgrade

Since 1992, the population of Belgrade has not renewed naturally, or the birth rate has been negative. When comparing the two last census years, the City of Belgrade has shown a positive trend, even though the value of the rate is still negative, the difference between death and birth rates has dropped (from -2.00‰ to -1,5‰). In 2017, the birth rate was negative, i.e., -2,2‰, while the value of the same indicator at the level of the Republic was -5,5‰.

In the period 2001-2011, the number of newcomers in the City of Belgrade was higher than the number at the national level and in other regions, except in Vojvodina. Almost every eleventh person in the City of Belgrade was a newcomer at that time. Almost nearly half of the inhabitants in the City has not changed the place of residence since their birth (48.2%), according to the 2011 data.

Daily migrations are a specific form of spatial movement of the economically active population at work, pupils and students (Table 2.9-2 and 2.9-3). The volume and direction of daily migrations are influenced by a range of demographic, socio-economic, transport and other factors.

According to the 2011 Census methodology, daily migrations include those persons who work or study outside of their usual place of residence, but who return to it every day, or several times a week.

Table 2.9-2 Daily migrations of the active population at work, according to the 2011 Census

Administrative unit	Active population at work				
	Total	In the same area		In another area	In a foreign state
		In the same municipality	In another municipality		
Republic of Serbia	**615,990**	**341,959**	**178,172**	**93,705**	**2,154**
City of Belgrade	132,970	43,355	78,007	11,125	483

Source: Statistical Office of RS, Book 11, Daily migrations, 2011 Census

According to the 2011 Census, out of the total number of active population at work, there were 132,970 persons migrating on a daily basis, of which 43,350 worked in the same municipality, while 78,000 worked in another municipality, or 11,100 worked in another area. The biggest percentage of persons migrating on a daily basis, i.e., about 58.6%, work in another municipality of the same area.

Table 2.9-3 Daily migrations of pupils and students according to the 2011 Census

Administrative unit	Pupils, students being educated				
	Total	In the same area		In another area	In a foreign state
		In the same municipality	In another municipality		
Republic of Serbia	285,309	153,971	74,439	54,546	2,353
City of Belgrade	41,837	13,973	24,866	2,825	173

Source: Statistical Office of RS, Book 11, Daily migrations, 2011 Census

Of the total number of pupils and students in the wider converging area, that amounted to 41,873, according to the 2011 Census, 13,973 of them attended classes in the same municipality, while 24,866 attended lectures in another municipality.

Of the total population in Belgrade, there are 66.38% of the working age population, i.e., 1.12 million inhabitants, 7.38% are pre-school children, while school children make 7.53% of the total population. As far as the women in their fertile period are concerned, their share in the total population is just over the average of the Republic of Serbia, i.e. 23.58%.

The share of the population of the City of Belgrade that is economically active accounted for 43.5% of the total population, in 2011. According to this, Belgrade had advantage over other regions that recorded a bit lower values of this indicator. Of the total number of economically active population, 82.1% are employed, while 17.9% is unemployed, which is a more favourable situation than in other regions of Serbia (the percentage of unemployed ranges from 22.7 to 27.3%). Among the unemployed population of the City of Belgrade, 29.5% looked for a job for the first time in 2011. What is serious about that is the fact that 21.5% of the unemployed population tried to find a job for the first time, in economically most productive period of life (30–39). Belgrade is the least burdened with the share of dependant population (35.7%), of all the regions. Table 2.9-4 shows the structure of population per activity, according to the 2011 Census.

Table 2.9-4 Structure of inhabitants per activity, according to the 2011 Census

Administrative unit	Total	Economically active		Economically inactive			
		Employed	Unemployed	Retired people	Children, pupils, students	Housewives	Other
REPUBLIC OF SERBIA	**7,186,862**	**2,304,628**	**666,592**	**1,628,428**	**1,592,294**	**599,371**	**363.415**
Belgrade region	**1,659,440**	**593,021**	**129,087**	**392,906**	**374,689**	**86,568**	**79,529**
Belgrade area							
City of Belgrade	**1,659,440**	**593,021**	**129,087**	**392,906**	**374,689**	**86,568**	**79,529**
Barajevo	27,110	7,792	2,662	7,118	5,580	2,456	1,424
Voždovac	158,213	56,779	11,965	39,075	35,387	6,615	8,147
Vračar	56,333	21,238	3,771	15,424	11,795	1,240	2,708
Grocka	83,907	28,486	6,361	17,059	19,461	7,116	5,098
Zvezdara	151,808	56,599	12,462	34,747	35,472	5,243	7,016
Zemun	168,170	59,501	13,636	38,528	38,525	9,032	8,724
Lazarevac	58,622	20,847	3,563	12,364	13,417	5,985	2,309
Mladenovac	53,096	15,983	5,104	12,455	11,321	4,774	3,033
Novi Beograd	214,506	81,518	13,982	55,743	47,386	7,111	8,428
Obrenovac	72,524	22,663	5,970	15,691	15,915	7,996	3,956
Palilula	173,521	63,278	14,325	37,605	40,262	8,972	8,779
Rakovica	108,641	39,040	9,155	27,175	24,909	3,709	4,544
Savski Venac	39,122	14,516	2,489	10,317	8,619	1,180	1,897
Sopot	20,367	5,970	1,706	5,274	3,977	2,201	1,158
Stari Grad	48,450	18,382	3,343	13,680	9,719	1,285	1,890
Surčin	43,819	15,253	3,448	8,642	10,191	3,871	2,317
Čukarica	181,231	65,176	15,145	42,009	42,753	7,782	8,101

"Municipalities and regions in the Republic of Serbia, 2018", Statistical Office of the Republic of Serbia, Belgrade, 2019

2.10. Data on the existing economic and residential facilities of infrastructure and supra-structure

2.10.1 Existing economic and residential facilities

Thanks to its position, resources, human capital, economic potential, cultural values and institutional capacity, the City of Belgrade has significant and real perspectives of further growth and development, as well as specific responsibility for the development of the Republic of Serbia.

The implementation of planned solutions from the PPPPN for the development of the part of the coastal area of the City of Belgrade - the area of the coastal part of the Sava River for the "Belgrade Waterfront" project, will help change completely the current layout of the space within the narrower and wider zone of the Old Sava Bridge, and will also change completely its purpose (Figure 2.10.1-1 and 2.10.1-2).

LEGEND:

- Plan frame
- Residence and residential area
- Commercial zones and city centres
- Sava River Aquatorium
- Coastal land
- Public green and free surfaces
- Combined child institution

PUBLIC TRAFFIC SURFACES

- Public traffic surfaces
- Pedestrian corridors
- Bicycle paths
- Integrated traffic surface for vehicular and pedestrian traffic
- Green surfaces within regulated the regulated road network

Figure 2.10.1-1. Planned purpose of surfaces within the zone of the Old Sava Bridge
(Excerpt from the PPPPN for the development of the part of the coastal area of the City of Belgrade - the area of the coastal part of the Sava river for the "Belgrade Waterfront" project)

Figure 2.10.1-2 "Belgrade Waterfront"

Complete reconstruction of the Sava amphitheatre has been planned, as well as the relocation of the railroad hub, construction of business, residential, public objects and objects of mixed use. At the same time, the plan is to completely reconstruct and build the transport, water supply, energy and telecommunications infrastructure.

2.10.2 Infrastructure and supra-structure objects

Transport and traffic infrastructure

The existing situation of the road traffic is such that the connection between the old part of Belgrade, in relation to the Sava river, is achieved through 5 bridges: Branko's Bridge, Old Sava Bridge, "Gazela" bridge, Ada bridge at Ostružnica. There is a railroad connection across the railroad bridge. Public passenger transport lines are operating across all the bridges, but the tramway traffic is currently operated only across the Old Sava Bridge, while it is expected to establish tramway traffic across the Ada bridge mid 2019. All these connections are part of the primary traffic network of the City, according to their rank and importance. Other important directions within the area concerned are:

- Kneza Miloša - Takovska, Brankova - Terazijski tunel - Dečanska, as sections with the highest rank, or main roads, representing primary routes within the central urban zone, leading the traffic through City centre, and representing at the same time basic roads for connecting the Sava and Danube slopes.
- Bulevar Vojvode Mišića - Požeška, are also part of the city roads connecting, as such, the Cukarica slope and the City centre.
- Bulevar Zorana Đinđića - Milentija Popovića - Bulevar Mihajla Pupina, Bulevar Nikole Tesle, are also primary roads on the side of Novi Beograd, helping with the channelization of traffic flows out of the bridges.

Road characteristics shown in Table 2.10.2-1 are taken over from the implemented 2015 City of Belgrade Transport Model.

Table 2.10.2-1 Characteristics of the roads within the project zone

Road	Number of lanes in both directions	Capacity per directions, vehicles/hour	Operational speed in Morning Peak Hour (MPH), km/h
Branko's Bridge	6	7,220	21km/h
Old Sava bridge	2	2,746	25km/h
Gazela	6	12,420	30km/h
Ada bridge	6	10,260	48km/h
Karađorđeva	4	7,650	43km/h
Brankova	6	7,220	28km/h
Kneza Miloša	5	8,037	43km/h
Bulevar Mihajla Pupina	6	8,100	33km/h
Milentija Popovića	6	6,498	48km/h
Bulevar Nikole Tesle	4	7,110	43km/h
Vladimira Popovića	6	10,260	54km/h
Bulevar Vojvode Mišića	6	7,334	35km/h
Bulevar Zorana Đinđića	4	5,558	52km/h

Transport network in the observed zone is shown in Figure 2.10.2-1

Figure 2.10.2-1 Transport network of the observed zone

As for the existing situation, the length of the Old Sava Bridge is 420 m, and the width - 40 m. It has one traffic lane per direction and this is the only bridge in Belgrade carrying the traffic of passenger cars, buses and tramways. There are currently 4 tramways and 4 bus lines operating across the bridge. The purpose of the lanes is of mixed type, i.e., the same lane is used by tramways, buses and passenger cars. The average operational speed in the morning peak hour is 25 km/h.

Figure 2.10.2-2. Existing situation of the Old Sava Bridge

The Kneza Miloša direction is the main road carrying the traffic of public passenger transport, bus and trolleybus lines. The existing situation is such that there is a different number of lanes (minimum 2 per direction) along Kneza Miloša Street, with the possibility to change the regime of using some lanes on the part from Nemanjina Street to the entry to “Gazela” bridge.

At the same time, in order to reduce the impact of public transport stops on traffic flows, the stops have been separated using construction solutions, or adding additional traffic surfaces intended for the stops. Vehicle parking is arranged along the street fronts. The average operational speed in the morning peak hour is 43 km/h.

Figure 2.10.2-3 Existing situation in Kneza Miloša Street

In the Karađorđeva Street, where it is planned to build the entry/exit connection with the portal of the future tunnel on the side of the Sava slope (the tunnel that would link the zone around the Faculty of Economics with the zone around the Botanical Garden), the traffic is divided into four lanes, or two lanes per direction. As for the tramways, the current situation is such that the rails are located between two carriageways. The average operational speed in the morning peak hour is 43 km/h.

Figure 2.10.2-4 Existing situation, Karađorđeva Street

The Zemunski put - Vladimira Popovića - Milentija Popovića Street is an entry/exit direction from the Old Sava Bridge and connection with Novi Beograd. According to the functional importance within the network, all three roads are main roads. The Zemunski put and Milentija Popovića Street are carrying the tramway lines. The existing situation with the Vladimira Popovića and Milentija Popovića Street is such that they have 3 lanes per direction, while the Zemunski put Street has one lane per direction.

In view of the above, it can be noticed that the road infrastructure, that is directly connected to the Old Sava Bridge, on the left bank of the Sava river (Zemunski put) may be a limiting factor for more intensive traffic flows towards the Milentija Popovića and Vladimira Popovića Street, or if a broader perspective is taken, towards the Bulevar Mihajla Pupina and Nikole Tesle, which are parts of roads with high capacities in that part of Novi Beograd.

The average operational speed in the morning peak hour is 48 km/h.

Figure 2.10.2-5 Existing situation, the Zemunski put - Mihajla Pupina Street

Pedestrian traffic is present on all the roads. Higher-rank roads are equipped with pedestrian facilities, with developed pavements and clearly marked pedestrian crossings. Second-rank roads have pedestrian infrastructure that, in majority of cases, is not of adequate width for pedestrian walking or is occupied by illegally parked vehicles.

Hydrotechnical infrastructure

Water supply in the territory of Municipality of Novi Beograd

The area encompassed by the present project belongs to the height zone No. 1 of water supply in the City of Belgrade, with the following water supply network built:

- A pipeline of raw water V1Č 1,000 mm, along the Brodarska Street, directing all the water from the wells at Usce to the PPV “Bežanija”, wherefrom the entire area of Novi Beograd and Zemun is supplied.
- Primary pipeline V1L 500 mm.

Also, there are three Ranney wells (RB-1, RB-52 and RB-53) and one tubular well (IEBUS-4). The area of the present project is in the narrower zone of the sanitary protection of the Belgrade water source.

Water supply in the territory of the Municipality of Savski Venac

The area encompassed by the present project belongs to the height zone No. 1 of water supply in the City of Belgrade. A primary pipeline of Ø700 mm and secondary pipelines of Ø200 and Ø150 mm have been built, stretching from the water supply network. Since the bridge across the Sava River is in the immediate vicinity of the "Belgrade Waterfront" project, meetings were held with the representatives of the "Belgrade Waterfront” project. The projects that were carried out for the needs of the construction of the "Belgrade Waterfront”, and are located within the zone of covered activities, have been enclosed.

After having an insight into the projects enclosed, it was concluded that all the existing water supply systems were closed, and that the following pipelines were built along the SAO8:

- Primary pipeline DN500 mm
- Distribution pipelines DN200 mm.

Sewerage in the territory of the Municipality of Novi Beograd

The location concerned belongs to the central sewerage system of the City, with the separation system of channelling and a developed sewerage network: Secondary sewerage of Ø250 mm beneath the Old Sava Bridge.

Sewerage in the territory of the Municipality of Savski Venac

The location concerned belongs to the central sewerage system of the City, with the general system of channelling, and a developed sewerage network: sewer AAC300 mm, along the Zemunski put Street. Given that the bridge across the Sava River is in the immediate vicinity of the “Belgrade Waterfront” project, meetings were held with the representatives of the "Belgrade Waterfront” project. The projects that were carried out for the needs of the construction of the "Belgrade Waterfront”, and are located within the zone of covered activities, have been enclosed. After having an insight into the projects enclosed, it was concluded that the existing sewerage was closed, and that the following was built along the SAO8 (connection between the parcels SP13 and SP18):

- Sewage DN400 mm
- Rainwater sewer DN300 mm
- Collector DN1800 mm, also stretching along the parcel ZP10 (is built) up to the pump station on parcel IP-3.

A pump station was built on the parcel IP-3, with accompanying objects for the needs of evacuation of atmospheric water from the basin surfaces of the residential-business complex “Belgrade Waterfront”, while an outfall pipeline out of the pump station DN2000 mm was built on the parcel ZP-5.

Electro-energy infrastructure

Street lighting

According to the data of the PUC “Public Lighting”, the existing street lighting on the bridge and access roads, as well as the decoration light of the bridge, are supplied from the existing distribution racks of street light, located as follows:

- At the corner of Karađorđeva and Zemunski put Street, next to the transformer station B-680. Public decoration light at one portion of the bridge, as well as the street light of the access road entering the bridge on the side of Savski Venac, are supplied from that distribution rack.
- In No. 1, Brodarska Street, at the parking space in front of the restaurant “Pele", the rack has no label.

The street light and decoration light on the remaining part of the bridge are supplied from the rack.

Cable lines 1kV, 10 kV and 35 kV

There are underground electric power cables of 1 kV and 10 kV in the zone in question, on section No. 38469, connection with TS110/10kV “Belgrade 40” - TS10/0.4 kV, reg. No. B-2233 “Belgrade Waterfront", Tower B that is laid across the bridge. On the sections where the routes of the existing electric power cables of 1kV and 10kV overlap with the planned construction works, it is necessary to relocate and protect the cables, before the construction works start.

Contact network

The existing tramway contact network on the bridge is built of compensated overhead contact lines, with a contact conductor made of copper, type AS100, with a cross-section of 100 mm^2, and of a bearing rope made of bronze, BzII 65 mm^2, tightened with an automatic tensioning device. The contact conductors are hung on brackets made of synthetic insulating material. There is an AlČe (aluminium/steel) reinforcing line, with a cross-section of 240 mm^2 placed in parallel to the overhead contact lines.

Steel pillars of the contact network placed on the bridge structure, and the bridge structure itself, have been used for fastening the brackets and the cross-beams. The pillars of the contact network have been also used for carrying the street lighting lamps.

The contact network on the bridge is normally supplied from the rectifier station "Novi Beograd I", located in Milentija Popovića Street, but it can be also supplied from the rectifier station "Sava" located under the Branko's Bridge. There are no connection points on the bridge of the supplying lines coming from these rectifier stations, while the connection of the return line to the tracks is built along the rectifier stations, i.e., beyond the scope of the project.

3. DESIGN DESCRIPTION

The subject of the design is the construction of a new arched bridge over the Sava river instead of the Old Sava Bridge, all in accordance with the Terms of reference and the study awarded on the competition for the development of the urban-architectural solution for reconstruction of the Old Sava Bridge.

At the place of construction of the future new bridge over the Sava river, there is an existing tram bridge, "Old Sava Bridge" having spans L = 41.3 + 53.1 + 53.1 + 106.2 + 53.1 + 53.1 + 41.3 = 401.2 m. It was erected by the Germans during the World War II, after the existing bridge over the Sava river - the bridge of King Alexander I was destroyed in bombing in 1941.

The Old Sava Bridge was installed on wooden piers, which makes it unsafe for traffic. During 76 years of existence, it had been adapted several times. Further use of the old bridge would require frequent investments and rehabilitation interventions, which would significantly increase the costs of maintaining the bridge.

With its capacity, the old bridge cannot satisfy the existing traffic needs, while with the new bridge, its capacity will be multiplied.

The new bridge is intended for road and tram traffic, as well as for pedestrian and bicycle traffic, and it is planned that the subway will travel over it in the future. Namely, there will be two lanes (6.5 m each) in both directions, and two-track gauges (10.4 m) will be installed in the middle, which can be used by tram, as subway. There are 2 mixed pedestrian and bicycle paths (3 m each).

The realization of the subject design contributes to the reduction of the number of traffic accidents - because, unlike the existing situation, where the traffic takes place in mixed lanes for all types of travel (except for pedestrians), in the newly designed condition the road is separated by tram lanes and footpaths and bicycle paths are physically separated. In this way, conflicts between passenger cars and trucks and public transportation vehicles (trams and buses) and physical separation of directions nullify the risk of conflicts with the vehicles coming from the opposite direction.

3.1. Description of previous works on the design execution

The previous works on the construction of the new bridge at the location of the Old Sava Bridge can be divided into several phases: geological-geotechnical research of the terrain (field research works, geophysical examinations, laboratory tests and geodetic surveys of the location of research works); collecting substrates for the needs of analysis of hydraulic and morphological characteristics of the Sava river before and after the construction of the bridge, preparation of traffic analysis.

3.1.1. Geological-geotechnical researches of the terrain

Based on the Research design and PE Belgrade Land Development Public Agency, Department of Geotechnics of the Institute of transportation CIP d.o.o. Belgrade conducted detailed geological and geotechnical surveys of the terrain for the needs of the Preliminary Design and the Design for the construction permit of the bridge over the Sava River at the location of the Old Sava Bridge in Belgrade.

The purpose of the conducted researches was to investigate, document and analyse engineering-geological and technical conditions in the micro-location of the research area.

Field investigation works

On the micro-location of the newly designed bridge over the Sava river in Belgrade, during the period November-December 2018, field research was performed. These researches included engineering-geological mapping of the terrain, construction of exploratory boreholes, standard penetrations tests (SPT) and static penetration tests (CPT and CPTu).

In order to define geological material and take samples for the laboratory tests, a total of 17 (seventeen) exploratory boreholes with a total depth of 593.80 m were drilled. The boreholes were drilled on the land and on the river using barges. Furthermore, two exploratory boreholes were drilled near each pier location of the future bridge, as well as one borehole near the location of future elevators and bicycle ramps. Basic technical data on exploratory drilling are given in Table 3.1-1.

Table3.1-1.Basic technical data of exploratory boreholes:

No.	Design ation	Depth (m)	Level (m.a.s.l.)	Coordinates X	Coordinates Y	Place of execution	Date of drilling
1.	B-1	39,50	75,65	7456966,01	4963039,66	Pier S-1 / land	07-08.12.2018.
2.	B-2	38,50	75,61	7456964,76	4963067,82	Pier S-1 / land	10-11.12.2018.
3.	B-3	42,50	76,05	7456913.76	4963053.4	Pier S-2 / land	06-07.12.2018.
4.	B-4	42,50	75,87	7456909.74	4963070.93	Pier S-2 / land	05-06.12.2018.
5.	B-5	40,00	58,60	7456832.81	4963061.69	Pier S-3 / river	02-04.12.2018.
6.	B-6	40,00	57,05	456834.88	4963077.98	Pier S-3 / river	28.11.-01.12.2018.
7.	B-7	42,00	60,95	7456668.36	4963083.96	Pier S-4 / river	16-17.12.2018.
8.	B-8	40,00	64,95	7456669.29	4963098.55	Pier S-4 / river	14-15.12.2018.
9.	B-9	40,00	73,41	7456603.34	4963090.76	Pier S-5 / land	07-08.12.2018.
10.	B-10	40,00	73,44	7456605.86	4963111.17	Pier S-5 / land	08-09.12.2018.
11.	B-11	40,00	76,35	7456558.06	4963090.98	Pier S-6 / land	10.12.2018.
12.	B-12	40,00	76,27	7456559.72	4963131.54	Pier S-6 / land	05-06.12.2018.
13.	B-13	27,60	75,11	7457045.66	4963026.26	Berth – wall / land	12.12.2018.
14.	B-14	27,20	75.95	7456929.25	4963037.18	Bicycle ramp / land	01-03.12.2018.
15.	B-15	24,00	75.77	7456904.73	4963091.32	Staircase / land	03.12.2018.
16.	B-16	15,00	76.52	7456522.14	4963078.52	Bicycle ramp / land	11.12.2018.
17.	B-17	15,00	76.20	7456571.22	4963137.84	Staircase / land	07.12.2018.

Standard penetration tests (SPT)

In the exploratory boreholes, in unbound and clean sediments, as well as in the embankment, standard penetration was tested in order to define primarily the deformation properties of sediments in the construction of the terrain and to assess the degree of compaction of the embankment. The tests of standard penetration of boreholes were performed according to standard BS1377-9 – Determination of the penetration resistance using the split-barrel sampler (the standard penetration test (SPT). The tests were conducted with a standard cone. A total of 29 tests were performed. Disturbed samples from the test area were taken for laboratory identification.

Static penetration tests (CPT/CPTu)

In order to determine the properties of resistance and deformation, the "in situ" tests of static penetration according to standards SRPS.U.B1.031 and SRPS EN ISO22476-12 were performed. In addition to the classical (CPT) test, tests of static penetration with a sand cone (CPTu) were conducted on the selected testing sites. All tests were performed with a static penetrometer with a friction cone having the capacity of 200 kN, of the Italian manufacturer PAGANITG73-200. Eight (8) tests were performed in the immediate vicinity of the locations of previously drilled exploration boreholes, up to a depth of 20-26 m.

Geophysical surveys

In order to obtain more detailed engineering and geological characteristics of the terrain at the location of the bridge over the Sava river, at the location of the Old Sava Bridge in Belgrade, geophysical and seismic surveys were performed. Field geophysical surveys performed in the organization of the company Geofizicki inženjering from Belgrade, during December 2018.

The task of geophysical surveys consisted of:

- determining the depth and velocity of propagation of elastic longitudinal Vp and transversal Vs waves
- determining the thickness of the surface complex
- determining the spatial distribution and dip of individual lithological members

Seismic surveys along the profile were performed using refractive-seismic tests where the values of the propagation velocity of elastic longitudinal Vp and transverse Vs waves for mapped lithological environments were determined.
Along the left and right bank of the Sava River, perpendicularly on the future bridge, seismic profiles have been constructed (one along each bank).

Laboratory tests

Laboratory tests consisted of a series of tests on representative disturbed and undisturbed samples taken from exploratory boreholes. The tests included soil samples and rock samples. All laboratory tests were performed in accordance with the valid EN and SRPS standards. Laboratory and geomechanical tests were conducted in the accredited laboratory of the company DOO "GEOMEHANIKA", Dobropoljska 21, Belgrade.

Geodetic survey of locations of exploration works

After the field research works were carried out, a detailed survey of the levels and coordinates of each individual research work was carried out. The survey was performed by the geodetic service of the Institute of transportation CIP.

In the study on geotechnical conditions for the construction of the bridge over the Sava river at the location of the Old Sava Bridge the results of geotechnical field research are described, geotechnical sections of the terrain interpreted, certain parameters of physical and mechanical characteristics of the selected geotechnical environments needed for project design and construction of the structures determined and recommendations given. The opinions presented in the framework of the chapter "Description of the location" are taken from the mentioned research and given as the constituent part of this material, in order to provide a complete and informative basis on the existing condition.

3.1.2. Hydraulic and morphological analysis of the Sava river in the zone of the designed bridge at the location of the Old Sava Bridge

The analysis of hydraulic and morphological characteristics of the Sava river before and after the construction of the bridge was done within the framework of Volume 3/2, which is an integral part of the Preliminary design, which is the subject of assessment of the impact on the environment. The aim of this analysis is to determine to what extent the construction of the new bridge will affect the change of hydraulic and morphological regime of the Sava river on the subject section and to give recommendations for possible protection measures in the area of banks and bridge piers (stabilization of the riverbed) if this analysis determines that the stability of the bridge and the shore may be compromised.

For the needs of this analysis, geodetic, geological, hydrological and morphological substrates that were used during the preparation of this technical documentation were collected.

Geodetic substrates

For the needs of preparation of this technical documentation, a geodetic survey was performed, whereas a "working topographic map" in AutoCad, as a digital model of the terrain (TIN network) was formed, based on which cross sections and longitudinal profiles of the Sava River were constructed and used for hydraulic calculation and morphological analysis. The survey of the Sava riverbed was carried out in the length of 655 m downstream and around 1251 m upstream and in the width of about 250 m. The terrain in the zone of the Old Sava Bridge was also surveyed in the length of about 1,341 m, which is adequately connected to the digital model of the Sava riverbed.

Geological substrates

The "Report on the results of laboratory geomechanical tests of the soil samples for the new bridge at the location of the Old Sava Bridge was used as a geological basis, being prepared by "Geomehanika" d.o.o. on February 28, 2019. Samples for geotechnical research were taken from several boreholes from the bed and banks of the Sava River in the zone of the bridge. Granulometric curves, as well as other mechanical characteristics of the terrain in the zone of the Old Sava Bridge are given for each sample, which were used in this analysis.

Hydrological substrates

On the basis of the Opinion in the procedure of issuing Water Conditions by the Public Water Management Company "Srbijavode" - Water Management Center "Sava-Danube" Novi Beograd, characteristic flows were obtained which were used as hydrological bases for the needs of this analysis. Characteristic flows of the Sava River in the profile of the Old Sava Bridge (km 1 + 430):

Q0.1% = 8,160 m3/s - thousand-year-old high water
Q1% = 6,710 m3/s - hundred-year-old high water
Q2% = 6.210m3/s-fifty-year-old high water
Qsr = 1.540 m3/s - mean flow

Also, a large water probability was used, which is likely to occur once in a hundred years at the confluence of the Sava and the Danube (coincidence of large waters of the Sava and the Danube), which amounts to Z1% = 76.00 m above sea level.

Morphological substrates

For the subject analysis, data on profiles upstream and downstream of the observed bridge, obtained from the public institution for development and maintenance of waterways" Beograd Plovput". The period from 2007 to 2018 was covered. Morphological analysis of the entire Sava river water flow was used, from the confluence in the Danube to the border with Croatia, which was made by the Institute for Water Management "Jaroslav Černi", on the basis of surveyed profiles in the period from 2004 to 2014.

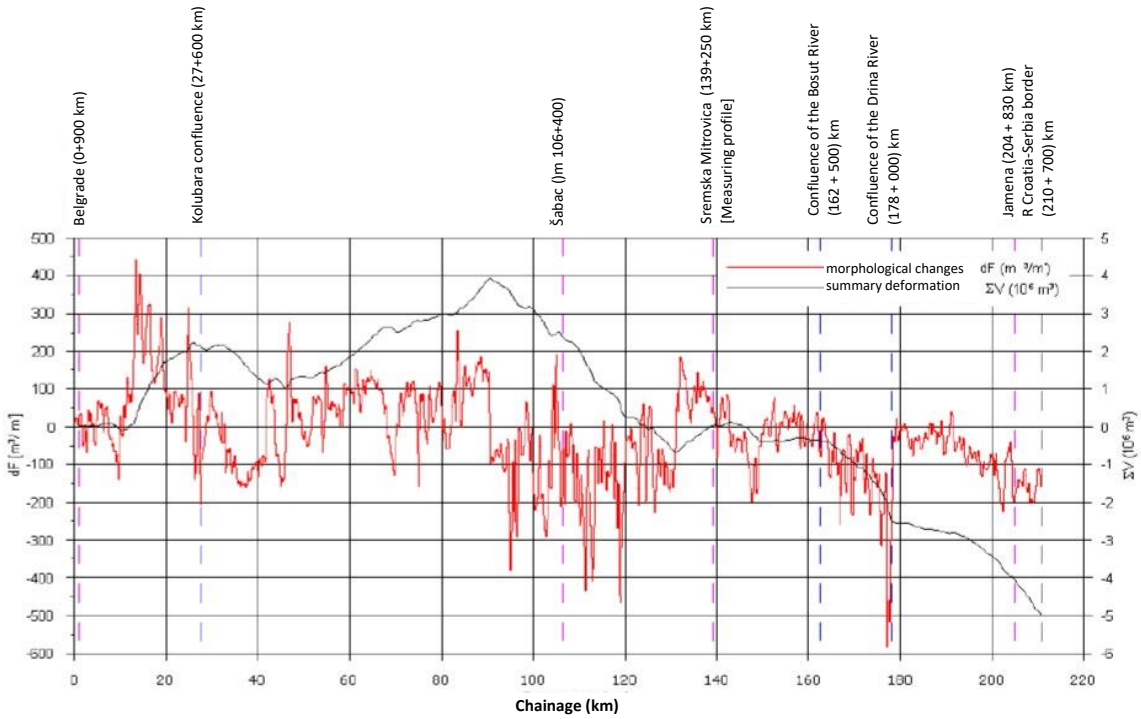


Figure 3.1.2-1. Morphological changes of the Sava riverbed from the confluence in the Danube to the state

Based on these data, a hydraulic calculation was performed, after which a morphological analysis of the Sava riverbed in the zone of the bridge was performed. Within the morphological analysis, general erosion of the riverbed was considered, as well as local erosion in the area of the bridge piers. On the basis of the obtained results of hydraulic and morphological calculations, a conclusion was reached that the newly designed bridge will not significantly disturb the flow of the Sava river in the hydraulic sense. The narrowing of the riverbed by the bridge construction is negligible, and the lower edge of the structure is placed at a safe level from the standpoint of authoritative high waters and navigation. Ice is not expected to have a significant impact on the bridge structure. General erosion of the riverbed is not expected, while the local erosion phenomenon can certainly be expected near two central piers of the bridge, which is why it is recommended that bridge piers should be provided with regulation works to prevent local erosion. The maximum depth of local erosion around the central piers is estimated at 7.78 m. In order to avoid undermining, piles should be foreseen for foundation of the piers in order to ensure safety, taking into account possible general local erosion obtained by this analysis.

3.1.3. Traffic analysis

The forecast of transport requests, for the needs of the Feasibility study, is based on the

forecasts made within the Transport Master Plan of Belgrade for 2033 (TMP). TMP has 3 forecast time sections: 2021, 2027 and 2033. For these sections, travel matrices for private and public modes of transport are forecast, i.e. for passenger car, 3 categories of trucks, bus, tram, train, trolley and subway. The forecast is done based on changes in socio-economic parameters (residents, workplace, degree of motorization) and changes in the purposes of areas (Belgrade Waterfront, Port of Belgrade, Ada Huja, Block 42 and Block 26 in Novi Beograd.).

Dynamics of realization and exploitation of the reconstructed Old Sava Bridge is defined in the following way based on the compliant attitude of the design team about the periods needed for preparation of an adequate technical documentation, as well as for construction):

- 2023 - the year of releasing the design for the first time
- 2048 - the last year of exploitation for the analysis of the costs and revenues.

Therefore, it was necessary to form models of intersecting years based on the existing years in TMP model. For the analysis of the effects of reconstruction, a forecast was made for each 5 years, namely for 2023, 2028, 2033, 2038, 2043 and 2048. For each of the above time sections, factors of traffic growth were calculated on the basis of the forecast from TMP for 2021, 2027 and 2033. The factors were calculated for each category of vehicles for public transportation in total and used for factorization of the forecast matrices from TMP. The total number of travels by time sections and types of transport is shown in the following table.

Table 3.1.3-1 Forecast of the number of travels in the morning peak hour

Transport type	2023	2028	2033	2038	2043	2048
PC (passenger car)	113,233	126,289	138,490	151,870	166,542	182,631
PT (public transportation)	125,718	130,071	138,371	147,201	156,594	166,586
LV (light vehicle)	2,346	2,641	2,915	3,217	3,551	3,919
HV (heavy vehicle)	906	1,021	1,126	1,243	1,372	1,514
AV (auto vehicle)	302	340	375	414	458	506

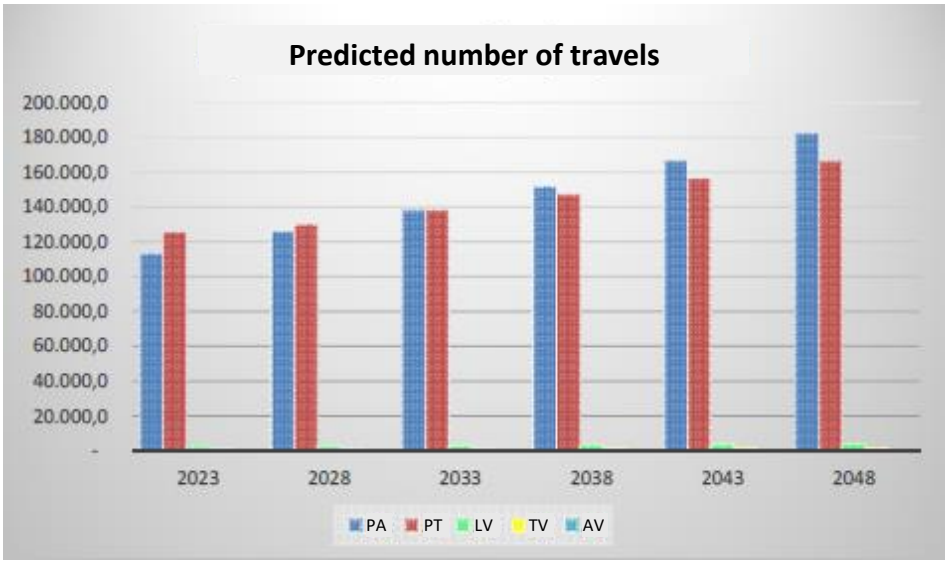


Figure 3.3.1-1 Forecast of the transport needs in the morning peak hour per sectional years

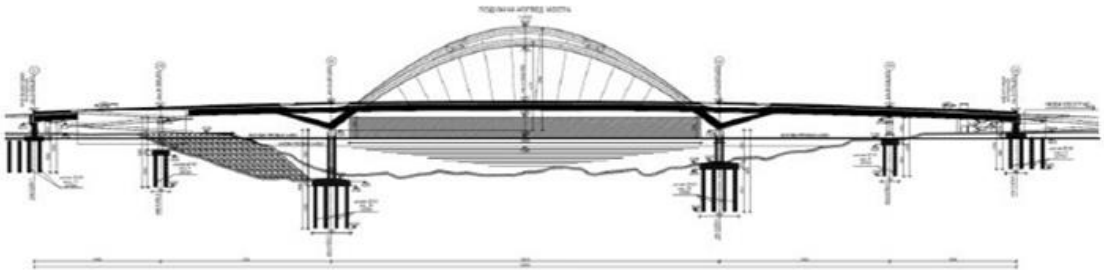
The term "travel" means the number of trips that all covered passengers make in a certain area in a certain period of time. In the specific case, the number of realized trips, in all the mentioned types of transport, during the morning peak hour, was considered. It is theoretically possible for a passenger to change several means of transport during peak hours.

3.2 Description of the structure, planned production process or activity, their technological and other characteristics

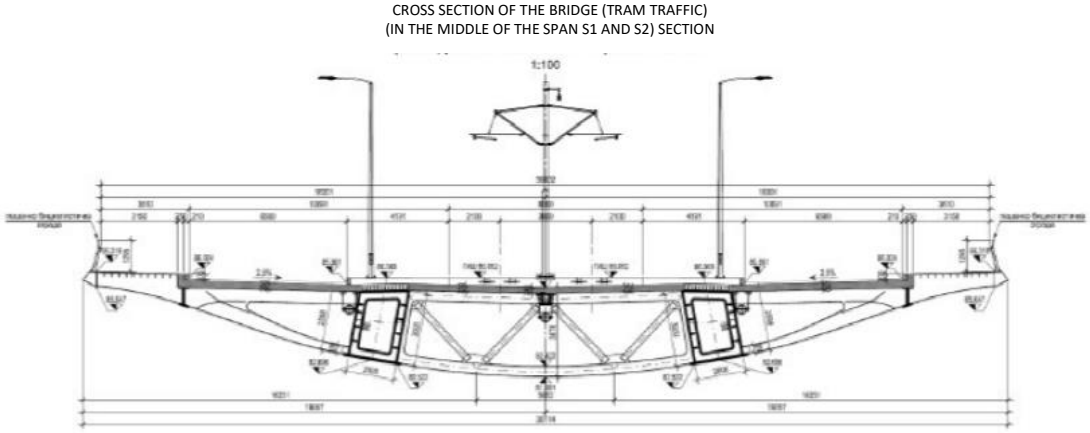
3.2.1. Bridge structure

Based on the Terms of Reference and Conceptual design, as well as other relevant bases, and in the framework of the development of the Preliminary design for the construction of the new bridge, the disposition of the bridge that will be built on the location of the old one was adopted.

Longitudinal layout of the bridge:



Typical cross section of the bridge:



Arches

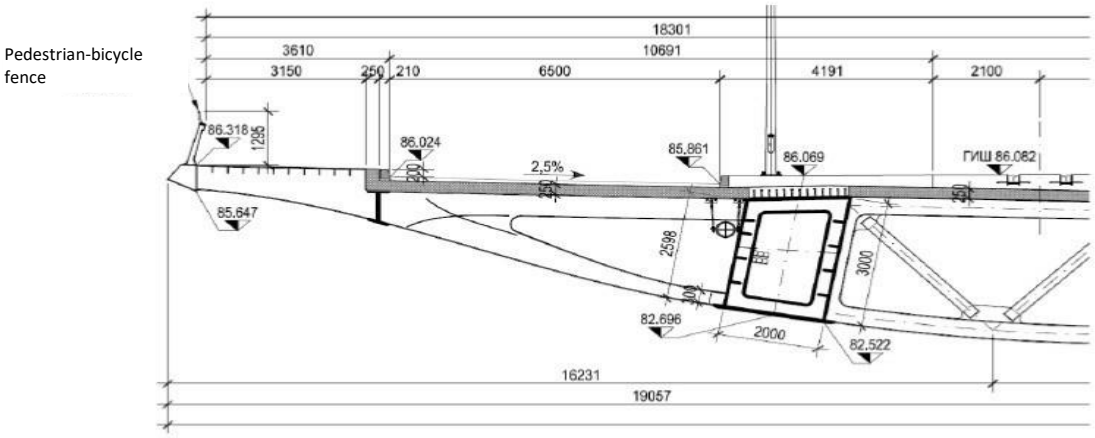
The static system of the new bridge is double-clamped arch with a chord, where the chord extends continuously along the entire length of the bridge at a constant static height. The total length of the bridge is L = 420.0 m, with spans L = 54.0 + 73.0 + 166.0 + 73.0 + 54.0 = 420.0 m.

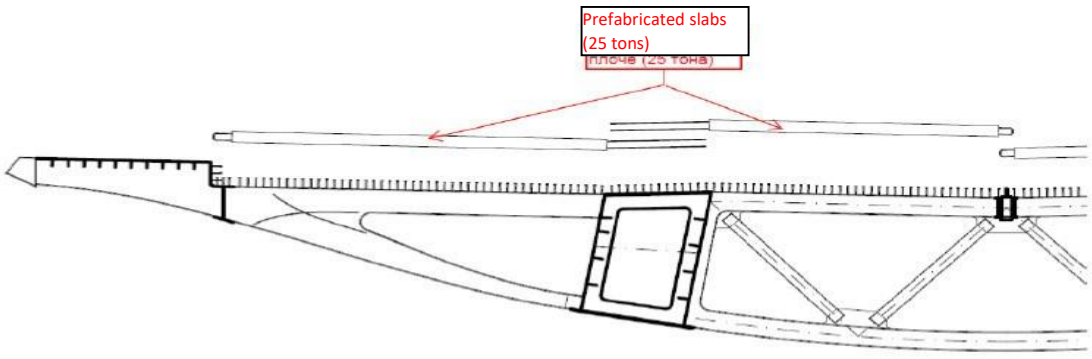
The total width of the bridge is B = 38.1 m (or B = 42.1 m at the location of the sightseeing platform for pedestrians). The main span of the structure over the required navigable profile of 150 m, formation by means of two steel arches having the span of L = 166.0 m. The cross-section of the arches is rectangular, having constant dimensions h x b= 3x2m, with a variable

thickness of the flanges and ribs. Arches are made of S355J2 steel (for elements whose thickness is larger than 40 mm, S355K2). Steel arches are bent one towards another, at an angle of α=10 ° in relation to the vertical, with different arrows. The arrow of the smaller arch (in his plane) is H1=41.0 m (f1≈L/4), while the arrow of the bigger arch is H2=47.0m (f2≈L / 3.5). Steel chord connects arches at the height of Hz≈8.5 m measured in the vertical plane of the support of the arch (the arches are suspended in relation to the brace). The chord length between arches is Lz≈145 m, and therefore arches having the height H'1≈30,0m and H'2≈36,0 m, this is, arrows *f1*≈L/4,8 i *f2*≈L/4 are obtained in the vertical plane (projection).

Chords

The chords are continuous box-like steel girders within the range of arches, supported by hangers at every 9.0 m, while outside the range of arches the chords rest on piers and bypass spans of L1=73.0 m and L2=54.0 m, respectively. At the span of 73.0 m, the chords are supported by struts connected to the support of arches, at the location of the river piers. The support for the chords was constructed at a horizontal distance of 25.0 m in relation to the axis of the river piers. The cross section of the chords is constant, having dimensions hxb=3x2 m, with a variable thickness of the flanges and ribs. Both chords follow the level of the bridge, i.e. the vertical curve having the radius of R = 4200.0, placed in parallel, at the interaxial distance of B=13.7 m, made of S355J2 steel (for elements thicker than 40 mm, S355K2).

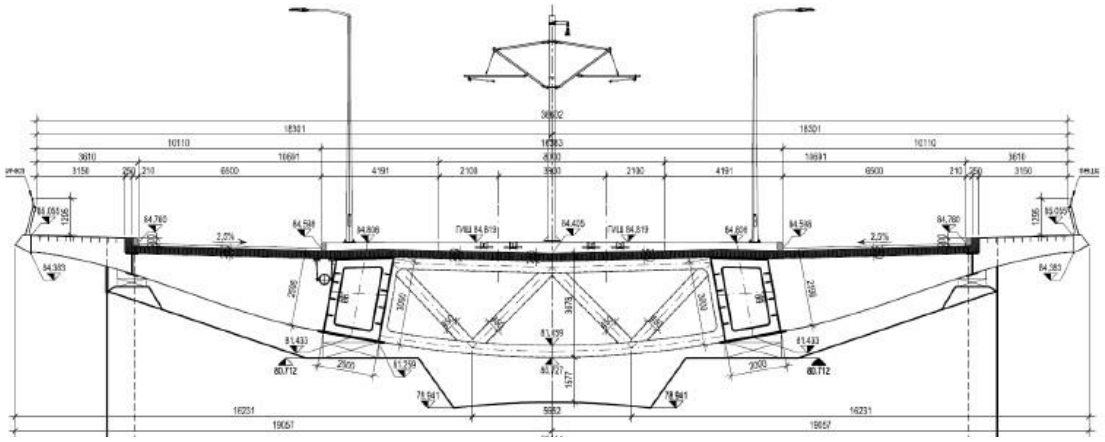




The deck slabs on the bridge are prefabricated, subsequently compressed with transverse girders and chords from the bridge. Concrete slab has a nominal thickness of dpl=25.0 cm, and it is intended for receiving all traffic on the bridge. The slabs conceived in this way have great advantages in terms of cost, quality of the concrete, but adequate mechanization is necessary for transport and installation of prefabricated slabs, which depends on the Contractor.
The thickness of the deck slab waterproofing layer is 10mm.

Cross members
The distance between chords defines the span of the braced cross member. The cross member is clamped in chords, so that the upper part is coupled to the concrete slab and connected to the chord at the level of the upper flange, while the lower part is connected to the chord at the level of the lower flange. Lower and upper part of the cross member have a cross section "I" with the fill made of tubular profiles. The total weight of the cross member is variable, from h1=3.3 m at the ends to h1=3.6 m in the middle. The distance of cross members is constant and amounts to b=6.0 m on the whole length of the bridge, so that there are 70 members on the bridge in total. At the locations of intersections of arches and chords, as well as at the locations of intersections of struts and chords, there are reinforced, box-shaped cross members having the dimensions of h x b=3.3x2 m. Also, reinforced cross members are adopted on the bridge ends by adopting box-like cross sections having dimensions of h x b≈45x100cm for fills for rods. All lower parts of the cross members are connected by a longitudinal bracing structure with " K " filling. The material foreseen for all steel elements of the cross member, as well as for the bracing structure is S355 J2 steel.

Cantilevers
Cantilever supports are installed at the same distance as the cross members, at 6.0 m, laterally in relation to the chords. Cantilevers are coupled to a concrete deck slab in the section for road traffic, with a variable steel cross-section type I and connected to the chord at the height of its upper flange. At the height of the lower flange of the chord, the strut having the cross-section type I is suspended, supporting the cantilever at a distance of Lkk = 6.5 m. In the zone above the river piers, the cantilevers are additionally extended by 2.5 m, in order to provide additional space for pedestrians, which will be discussed later. At the beginning and at the end of the bridge, where the cross members are reinforced, the reinforced cantilevers having box cross-section are adopted as well. The material intended for all steel elements is S355 J2 steel.



Hangers

There are 24 hangers on the bridge, 12 on each arch. They are located in the plane of the arches and enclose, in the transverse direction, an angle of a~10 ° in relation to the vertical.

They are distributed evenly and they support the chord at each 9.0 m, while the distance between them is variable at the location of the connection to the arch.

Hangers are formed from several parallel bundles made according to material specification Y1860 S7 + Z 15.7.

Piers

The subject bridge has six reinforced concrete piers of different height and width. Two coastal piers S1 and S6 are B1.6=2.5 m thick and H1.6=6.3 (4.8) m high. Middle piers S2 and S5 are AB canvases, having thickness of B2.5=3.5 m and height of H2.5=10.0 m, while the middle, river piers S3 and S4 on which the arches rest, are AB canvases having thickness of B3.4=3,5 m and height of H3=23.0m and H4 = 15.0m. At the top of each pier, bearings are placed, in such way that, in the longitudinal sense, there is a fixed bearing on the river pier S4, while on the other piers there are movable bearings. In the transverse sense, there is one lateral movable and one lateral immovable bearing on each pier.

Two additional auxiliary bearings (a total of 4 bearings on the pier) are placed on the end piers, movable in all directions. The role of auxiliary bearings, together with the reinforced first cross member and reinforced cantilevers, is to ensure the durability of the expansion joint and the comfort of traffic.

The piers are rounded, made of concrete class S30 / 37.

Foundation

Geoexploration works were performed at the subject location, which included the construction of several exploration boreholes with sampling for laboratory tests, as well as conduction of SPT and CPT tests. The obtained results (which are presented in detail in the Geotechnical study) required the application of deep foundation. The courses are arranged in depths, from a heterogeneous embankment, over clayey, i.e. sandy-gravel sediment to marly clays and marl, i.e. limestone, as the final courses in which the bases of the piles are located.

The diameter of the piles is 1500 mm, they have different length and their number varies depending on the load of the pier and the characteristics of the soil courses through which they pass. For medium piers S3 and S4, which are also the most loaded piers, and thus have the most loaded piles, (Fv=12500kN), the piles having the length of L=20.0 m (S3, limestone) and L=30.0 m (S4, marl) are provided , while other piers are founded on the piles having the length from L=20.0 m to L=28.0 m.

3.2.2. Roads

In the area in the immediate vicinity of the bridge, almost all traffic types and traffic subsystems intersect, which is especially noticable on the right bank of the Sava river. The primary street network is made up of Class I state roads (highway, main roads), Class I and Class II streets, while secondary street network is made up of access roads and local street network.

Layout drawing and levelling design

Access roads are not a part of this Preliminary design, but they are worth mentioning. One part of the access roads is located in the old part of the city, on the right bank of the Sava river, from the planned roundabout which will create the connection of the existing Karadjordjeva street with the Sava bridge. The roundabout belongs to the primary street network. The tram intersects the roundabout in the middle.

The access road on the right bank of the Sava river enters the roundabout on the tram line chainage at km 0 + 181,170 and extends to the front end of the bridge at km 0 + 334,933.

The second part of the access road is located on Novi Beograd side, on the left bank of the Sava river, and it connects the bridge structure with a roundabout in Vladimira Popovića street (Zemunski put street). A tram stop is planned on this part of the road. The beginning of the road is on the chainage of the tram line, at km 0 + 754.933 and it extends to the entrance into the roundabout at km 1 + 042.762.

The traffic section on the bridge envisages two lanes having the width of 6.5 m (right traffic lane having the width of 3.5 m and left traffic lane having the width of 3.0 m), a two-track tram corridor in the middle of the section, having the minimum width of 8.00 m, and double-sided pavements having the width of 3.30 m and including one-way bicycle paths.
For the needs of the Preliminary design, the road structure on the bridge road is adopted:

SMA curtain	0/11	c	ca 4 cm	PmB
AB11 with PmB protecting levelling course			4 cm	

The pavement surface and the surface of the bicycle path on the bridge are treated with an anti-skid coating in layers.

3.2.3. Tram roads

The integral part of the traffic profile on the bridge is also the tram line as a section of the route that connects Karadjordjeva street and Milentija Popovića street. The subject of this Preliminary Design is a tram line on the bridge, but it is shown together with access roads in the design in order to perceive the functional whole of the section.

The tram line has two tracks, with the axial spacing of 3.80 m between the tracks and it is located in a separate and raised tram lane having the width of 8.0 m, in the middle of the road.

The tram stop is planned on Novi Beograd side, directly in front of the roundabout in Vladimira Popovića street. The levels of the road and the tram tracks are defined and harmonized in order to satisfy the required height relations between the tram lane, road and pavement.

The tram structure on the bridge consists of:

- "Floating" concrete slab, having the average thickness of 35 cm, placed over MMA
- hydro-insulation of the bridge,

- submerged continuously elastically suspended track (continuous elastomeric tape under the foot rail) in steel rail channels with side dowels;
- rubber insulation elements (filler blocks) placed along the sides of the rails whose task is to dampen the noise and vibration,
- filling of rail channels with polyurethane-based mass, which ensures elastic sealing of the complete support system and its electrical insulation.

The tram structure on the accesses to the bridge with the superstructure as per the system of continuous elastic suspension of the rail on the bearing concrete slab. At the locations of the bridge extension joints (at the beginning and end of the bridge), track expansion joint devices are installed on each of the tram tracks (4 in total). This provides a synchronized work of the bridge and the tracks on the bridge and protects the track out of the bridge from additional stresses due to the expansion of the bridge.

3.2.4. Guiding of pedestrian and bicycle paths

At the subject location, along the left and right banks of the Sava river, there are already established pedestrian and bicycle paths at the level of the bank fortification at 76.00 m above sea level.

The designed solution envisages a direct connection of the existing paths with the newly designed pedestrian-bicycle routes on the New Sava Bridge. On the right bank (BG side), on the side of the bridge towards the newly built towers in Belgrade Waterfront, the connection is established by the ramps having the width of 2.3 m in their own cantilever construction, from which a pedestrian-bicycle path on the bridge is accessed via the platform. On the side of the bridge towards the confluence, the connection is established by a panoramic elevator and a two-legged staircase, the width of the leg being 2.3 m, on its own cantilever construction, from which a pedestrian-bicycle path on the bridge is accessed via the platform.

On the left bank (Novi Beograd side), on the side of the bridge towards Block 18, the connection was made with a ramp having the width of 2.3 m, on a cantilever construction, which is planned to be supported by the abutment of the newly designed road. There is a direct access from the ramp to the pedestrian-bicycle path in the extension of the bridge. On the side of the bridge towards the confluence, the connection is established by a panoramic elevator and a two-legged staircase, the width of the leg being 2.3 m, on its own cantilever construction, from which the pedestrian-bicycle path on the bridge is accessed via the platform.

With this solution, all types of vertical communication are represented, so that pedestrians, cyclists and mothers with baby carriages can choose to use the staircase, elevators or ramps adapted for the persons with disabilities. In this way, pedestrians and cyclists are able to move comfortably and in the shortest possible way from one river bank to another.

The position and method of suspension and carrying of these structures for vertical communication (ramps, staircase, elevators) are conditioned by geotechnical conditions and disposition of the constructed planned routes of underground installations in “Belgrade Waterfront” and "Block 18" which were not known during preparation of the Conceptual design for participation in the bidding process. On the bridge itself, along the pedestrian-bicycle paths, cantilever sightseeing platforms-terraces are formed, which provide the rest area with a view on the river and the city to pedestrians and cyclists. The terraces are located on each side of the bridge, two in the zone of the end of the arches above the supporting piers.

3.2.5. Waterway

The waterway on the subject section of the Sava river has the status of an international waterway class VA, which is defined by the prescribed dimensions. However, according to the conditions of the Directorate for Inland Waterways, it is necessary to take into account the proximity of the Belgrade hydro-technical facility and the Danube river, i.e. from the aspect of water transport, to consider the subject location and the Sava-Danube confluence as a whole, and therefore, for the subject location of the Sava river the values of dimensions of the waterway which are valid for the Danube river in the zone of the confluence - class VIc are adopted.

The required values of the parameters of the dimensions of the waterway for class VIc, according to the latest Recommendations of the Danube Commission (DK / SES 77/11) are:

– Minimum waterway depth relative to low decelerated waterway level (EN), without reserve 2,5m
- Minimum waterway width ..... 120 ÷ 150m
- Minimum radius of curvature of the waterway .....800 ÷ 1000m
– Minimum height of the navigable opening of the bridge in relation to the high decelerated waterway level (HDWL).....9,5m
– Minimum width of navigation span opening of the bridge (with horizontal lower edge of the structure) 150m

Based on the given design conditions, it was adopted that the width of the navigation span opening (axle distance) is 166 m, and the width of the waterway itself is 150 m. The level of the lower edge of the bridge structure is calculated so that it satisfies the conditions of the waterway class VI, according to the recommendations of the Danube Commission.

Marking of the waterway is in the function of maintaining and arranging the waterway for the needs of safe navigation. Since the structure of the bridge intersects the Sava river and hinders navigation and thus represents a critical sector from the point of view of navigation, it is necessary to mark the bridge for the needs of safe passage of vessels. Navigation on the Sava river is regulated by the international agreement. The bridge is marked in accordance with the provisions of the Convention, in order to ensure safe navigation.

The method of waterway designation is designed in accordance with the regulations that regulate this area of river traffic:

– International agreement of the Sava river basin countries
– UNECE European rulebook for inland waterways (CEVNI),
– Regulation on conditions for navigation and rules for navigation in inland waters ("Official Gazette of RS", no. 96/14),
– Law on navigation and ports on inland waters ("Official Gazette of RS" no. 73/10,121/12,18/15,96/15–state law,92/16i104/16 –state law, 113/2017-192 –state law)
– Amendments to the Law on navigation and ports on inland waters ("Official Gazette of RS" no.41/2018, 95/2018 – state law)
– According to the design conditions issued by the administrative bodies of the Ministry of Construction, Traffic and Infrastructure, the Directorate for Inland Waterways and the Public Water Management Company "Vode Vojvodine".

The marking of the bridge should be carried out with the prohibition signs and regulatory signs whose purpose is to direct the vessels in the zone of the bridge towards the safe passage. Signs should be installed on the bridge structure so as to mark the navigation span opening of the bridge, guide the vessel to the navigational span opening and prevent passage through openings that are not intended for passage and thus not safe for navigation.

3.2.6. Bridge drainage

Sewerage on the territory of the municipality of Novi Beograd

On the bridge structure, the atmospheric water from the road and the pavement is collected by the bridge gutters, while the rain water from the tram lane is collected by canals. The rainwater collected in this way is drained by the pipe system, which is hanged on the reinforced concrete bridge structure, to the left bank of the Sava river. The water that gravitates on the left bank is drained to the coastal pier, after which it is released from the coastal pier and drained to the separator of light oil derivatives, and after the treatment it is released in the recipient-the Sava river. 20% of the calculated inflow is purified in the separator. The relevant rains for determination of the size of the atmospheric sewerage of the bridge are rains from the rain gauge station Vračar, having the return period of T = 10 years, while the duration of rain was obtained as a function of concentration time for calculated drainage areas along the road, starting from tk = 5 min. For drainage of the access ramp low profile canals are foreseen and the water from these canals is drained by arched verticals to the terrain. Low-profile canals are foreseen for the drainage of the staircase and the water from these canals is collected in arched joints and drained to the manholes of the newly designed sewerage systems K21 and K20.

The capacities of the separators were determined based on the hydraulic calculation presented in the appendix to the Study.

The total calculated flow that gravitates to the left bank of the Sava is 330 l/s (135 l/s+135 l/s+60 l/s=330 l/s), a nominal flow separator of 70l/s was adopted, while the total flow is Qmax = 350 l/s.

Sewerage on the territory of the municipality of Savski Venac

On the bridge structure, the atmospheric water from the road and the pavement is collected in the bridge gutters, while the water from the tram lane is collected in canals. The rainwater collected in this way is drained by the pipe system, which is hanged on the reinforced concrete bridge structure, to the right bank of the Sava river. The water that gravitates on the right bank is drained to the coastal pier, after which it is released from the coastal pier and drained to the separator of light oil derivatives, and after the treatment it is released in the sewerage network of “Belgrade Waterfront”. 10% of the calculated inflow is purified in the separator. The relevant rains for determination of the size of the atmospheric sewerage of the bridge are rains from the rain gauge station Vračar, having the return period of T = 10 years, while the duration of rain was obtained as a function of concentration time for calculated drainage areas along the road, starting from tk = 5 min. For drainage of the access ramp low profile canals are foreseen and the water from these canals is drained by arched joints to the manholes of the newly designed sewerage systems K10, K9, K8 and K7. Low-profile canals are foreseen for the drainage of the staircase and the water from these canals is collected in arched joints and drained to the manholes of the newly designed sewerage systems K14, K13, K12 and K11.

The capacities of the separators were determined based on the hydraulic calculation presented in the appendix to the Study.

The total calculated flow that gravitates to the right bank of the Sava is 330 l/s (135 l/s+135 l/s+60 l/s=330 l/s), a nominal flow separator of 35 l/s was adopted, while the total flow is Qmax = 350 l/s.

3.2.7. Protection and relocation of hydro-technical installations

Within the project of the bridge over the Sava river on the territory of the municipality of Savski Venac and the municipality of Novi Beograd, it is necessary to provide for the relocation and protection of the existing hydro-technical installations.

Water supply system on the territory of the municipality of Novi Beograd
The existing water supply network will be kept in its existing condition.

Water supply system on the territory of the municipality Savski Venac
The constructed water supply system DN200mm within the design "Belgrade Waterfront" is in collision with the coastal pier of the designed bridge on the Sava river, so it is planned to be removed from VŠp to Č1 and reconnected from Č1 to Č2 (to the existing DN500 mm).

Sewerage system on the territory of the municipality of Novi Beograd
The existing secondary sewerage system Ø250 for used water will be kept in its current condition.

Sewerage on the territory of the municipality of Savski Venac
The constructed rain sewerage system DN300 mm within the design "Belgrade Waterfront" is in collision with the coastal pier of the projected bridge on the Sava river, for that reason its removal from the manhole Kp2 to the manhole Kp3 is planned. The existing gutters are reconnected to the newly designed sewerage system from the manhole K2 to the manhole K6, which is defined as part of the design K3.1, the Design on bridge drainage.

3.2.8. Electrical installations 1KV

Public (functional) lighting of the New Sava Bridge is designed to satisfy the highest class of the lighting of roads, lighting of pedestrian and bicycle paths. The project used the latest generation of lamps with LED light sources of high quality, long life and low power. A single-sided arrangement of poles has been applied, such that each road direction has its own single-sided arrangement. In addition to the functional lighting of the bridge roads, the Preliminary design envisages public lighting of the bridge staircase and ramps. With the concept of decorative lighting, it is foreseen that the carrier of the concept will show the shape of the arches through the dynamics of the surface lighting. In addition to the decorative lighting of the bridge, decorative lighting is also foreseen for the walls of the staircase and ramps, as well as the ambient lighting of the pedestrian path on the bridge and the pedestrian rest area. Lighting and socket installations within the bridge structure are located in the supporting structures of the bridge, so that their maintenance can be done as simple as possible.

The basic signs for marking the navigation span opening of the bridge must be visible at night. The design envisages power cables for power supply of LED reflectors, while the waterway markings and lamps and LED reflectors for their lighting are covered in the Design on navigation signals.

Supply of telecommunication cabinets, which are included in the Design of telecommunication - signal installations, is planned.

Two elevators for transport of persons, disabled persons, cyclists will be installed in the new structure of the bridge on the Sava river, near the staircase communications, along the pedestrian-bicycle path on both river banks. Power supply is planned for the elevators.

As protection of the bridge against atmospheric discharges, it is planned to connect the exposed metal elements on the structure and reinforced steel elements of the left and right side of the bridge structure into a single galvanic unit. Indirect touch protection is achieved by applying the TN-C-S protection system.

3.2.9. Protection, relocation and reconstruction of electric power cable lines

Cable lines 1kV, 10 kV and 35 kV

In the subject zone there are underground power cables 1kV and underground cable 10kV section no. 38469 connection TS110/10kV "Belgrade40" -TS10/0.4kV reg.no. B-2233 "Belgrade Waterfront" Tower B which is laid over the bridge. On the sections where the routes of the existing 1kV and 10kV power cables coincide with the planned construction works, it is necessary to relocate and protect the cables before the beginning of the construction works.

Due to dismantling of the old bridge and construction of the new bridge, it is planned to lay a new cable 10 kV type XHE49-A3x (1x150) mm 2.10 k V over the bridge. The cable is laid in free ground, under the road, through PVC pipes with a diameter of 100 mm and over the bridge on cable trays in the installation gallery.

In the installation gallery, there is a space for laying cable lines 1 kV, 10 kV, 35 kV and 110 kV. The space is foreseen for laying four 35 kV underground lines, as well as for laying six 10 kV underground lines, according to the conditions of EPS distribution.

Cable lines 110kV

The subject of the Preliminary Design is the replacement of the part of the existing cable line 110 kV no.172 TS Belgrade 6 – TE-TO Novi Beograd due to the construction of the New Sava Bridge. The section of the existing cable line no. 172, which is included in the Preliminary Design, is a high-voltage 110 kV cable line from connector no. 7 placed near the tram bridge on Belgrade side over the New Sava Bridge to the existing connector no. 6 on Novi Beograd side. The route of the high-voltage 110kV cable line, with single-core cables of 110kV voltage, starts from the cable connector 110kV number 7 placed near the tram bridge on Belgrade side and goes through the cable channel to the bridge and then goes on racks placed in the installation gallery on the New Sava Bridge. After laying high-voltage cables 110kV on the bridge, the cable line from the bridge goes into the cable channel to the second existing high-voltage connector 110kV number 6 on the side of New Belgrade. It is planned to install high-voltage single-core cables 110 kV with cross-linked polyethylene - XLPE insulation, aluminium conductors, type and structure A2XS (FL) 2Y3x (1x1000/95mm2), 64/110kV. It is planned to lay an optical cable having 48 mono-modal fibres on a non-metallic structures, which enables laying in the same trench with the cable line110 kV between cable connectors number 7 and number 6 on the side of Novi Beograd. The role of the optical cable is to cover all the needs of the telecommunication system of the transmission channels, signals of the technical control system and protection signals.

3.2.10. Electrical installations design - overhead contact system

The traffic direction from Karađorđeva Street to Milentija Popovića street, which is planned for reconstruction, consists of three individual sections, each of which is covered by separate technical documentation:

1. Access road to the bridge over the Sava river at the location of the Old Sava Bridge on the territory of the municipality of Savski Venac, which implies the construction of a new roundabout in Karađorđeva Street,
2. The bridge over the Sava river at the location of the Old Sava Bridge,
3. Access road to the bridge over the Sava river at the location of the Old Sava Bridge on the territory of the municipality of Novi Beograd, which implies the construction of a new roundabout in Vladimira Popovića Street.

The subject design includes only the new bridge over the Sava river at the location of the old bridge, i.e. the overhead contact system of the bridge, while the overhead contact system on the access roads will be covered by special designs. The existing bridge is planned for dismantling and removal according to the special design.

On the new bridge, the construction of a special tram lane for tram traffic in the middle of the bridge, two lanes in each traffic direction on both sides of the bridge, bicycle and pedestrian paths on the outer edges of the bridge are planned.

The design of the overhead contact system envisages the dismantling of the existing and construction of a completely new overhead contact system, with the poles installed in the middle of the tram lane and fitting into the access roads on both sides of the bridge.
Considering the small length of the section covered by the subject design (bridge length of 420 m), in order to determine the layout of the extension fields in the overhead contact system and location of the poles on the bridge, the principal arrangement of the supporting structures of the overhead contact system and access roads on both sides of the bridge is assumed. As the construction of the designed sections is at the very beginning, it is necessary to harmonize the solutions of the overhead contact system included in these designs with the overhead contact system designed for the bridge.

3.2.11. Telecommunication and signal installation design

The subject of this design is telecommunication and signal installation related to the construction of a new arched bridge over the Sava river. The planned works in the field of telecommunication installations can be divided into three functional wholes:

1. *Relocation and protection of TC infrastructure endangered by the construction of the bridge*
   Upon the analysis of the relevant conditions of public authorizations it was determined that there were no collisions of planned piers and the existing TC infrastructure on Novi Beograd side. On the side of old Belgrade, in the zone of construction of bridge piers, i.e. related foundation pits the following is endangered:
   – TC cable canalization "TELEKOM SRBIJA" a.d. with related optical/copper cable installation,
   – underground optical cable "SBB"

The new TC canalization is planned in the zone of the green surface and under the pavements which are located between the road SAO8-II-T2 (belonging to "Belgrade Waterfront") and planned pier closer to the Sava river. Also, transverse crossings under the road are planned, which continue further in the form of TC cable canalization parallel to the slip ramp of the bridge (on both sides). These parallel
routes should be used to pull the displaced copper and optical cables through to the location and to continue the endangered part of the cable installation (the zone at the beginning of the driving ramp and the future roundabout). A part of the cable span of the endangered optical cable "SBB" is removed because it is directly endangered by the formation of the foundation pit of the bridge pier closer to the Sava River. The "bypass" around the subject pit with manual revision TC manholes at each turn is planned.

2. *Telecommunication routes in the bridge trunk*

The transition of significant electrical installations, i.e. tracer accessories, such as power lines and telecommunication routes in the form of PVC pipes Ø110, is envisaged. By adopting a braced cross member and cantilevers with a support, a huge space is created to accommodate the gallery with all types of future installations. In this phase of the design, cable corridors are planned for accommodation of the installation in the chord box, as well as a console suspension of pipe supports/cables under the bridge structure, with the corresponding "cat path" for access to the installations. A total of 20 TC pipes can be installed on the left side of the bridge (towards Novi Beograd) and 10 TK pipes on the right side of the bridge.

3. *Telecommunication route accessories on the bridge and related cabinets in the function of the electronic communication network and video surveillance*

For the future realization of TC systems related to traffic safety, an electronic communication network is planned. In this design phase, cable trays are foreseen with the related accessories (pipes, hoses, racks ...) and (empty) cabinets for accommodation of future active components (switches, routers, power supplies, modems, converters ...). It is planned to install three TC cabinets on each side of the bridge, one at the beginning and one in the middle of the bridge.

3.2.12. Mechanical installation design- elevators

Two elevators of the following technical characteristics will be installed in the new structure of the bridge on the Sava river, for transport of persons, disabled persons, cyclists:

Type of elevator: Electric L1, L2
Number of pieces: 2 (two)
Purpose of the elevator: Transport of passengers, children and elderly people, disabled persons and cyclists.
Type of elevator: elevator without a mechanical room
Load capacity: Q=1000 kg/13 persons
Nominal speed: V=1.0 m/s
Lifting height: H=11.28 m
Number of stations: 2 (0, E, 1), main station „0“, (door E- evacuation)
Number of accesses: 2 (0, E, 1) from the same side
Access door: Automatic, telescopic, two-panel, 900/2100 mm, made of stainless steel. E120 min. (SRPS EN81-58)
Cabin door: Automatic, telescopic, two-panel, frequency-regulated, with protective photo-curtain for the entire door opening, 900/2100 mm, stainless steel.

Cabin: Side panels (back and lateral, opposite the bridge, made of laminate glass in the stainless steel frame; steel frame (painted in the colour of the bridge or at the request of the Investor). Impermeable cab, gray anti-slip floor (or at the architect's choice), cabin frame with gradual gripping device in both directions, indirect lighting min. 100 lx on the floor, emergency light, round handle (back and lateral, opposite the bridge), folding chair.

Cabin dimensions: -width 1100 mm, depth 2100 mm -height 2200 mm
Cabin guides: T89/B,
Counterweight guides: T89/B
Bumpers: 2 pcs under the cabin, 1 pc under the counterweight
Speed limiter + A3: Two-way action, rope diameter 6Ø mm
Gripping device: Two-way action, gradual action
Power machine: Without reducer, with power reel Ø420mm
Motion transmission: Steel wire ropes, 6xØ8mm, transmission 2:1
Engine: Electric, power 5.8 kW, 91 rpm, In = 24A, Ip = 28A, main
Fuse 25A, fuse command 16A, KONE type NMX11 or corresponding
Projected number of activation: 180 activations/hour (40% ED)
Signaling buttons:
In the cabin:
All buttons with Braille marks type Antivandal
Stainless steel register box in the panel along the entire height, micro-movable round buttons for selection of all stations, call confirmation light, LCD indicator of position (floor) of the cabin and direction of movement, door-open button, door-close button, alarm button, fan, sound and light overload signal, gong, emergency light, key lock for special-driving, intercom connection with control box, tele-alarm.

In the main station:
All buttons with Braille marks type Antivandal
Call confirmation signal light (single-call round button), LCD position indicator (floors "0" and "1") of the cabin and direction indicators.

In all stations:
All buttons with Braille marks type Antivandal
Call confirmation signal light (in all stations with a single-call round button), LCD position indicator (floors "0" and "1") of the cabin and direction indicators.
Elevator shaft: Concrete (bridge side and frontal side of the elevator) and steel painted structure with coating made of laminate glass (the back of the elevator and the opposite side of the bridge)
Elevator shaft dimensions: - width 1700 mm
- Depth 2600 mm
- Pit depth 1200 mm
- Top height 4220 mm
Position of the mechanical room: Engine is on the top, within the elevator shaft
Working environment: Normal, dry, +5 do +40°C
Power supply: 3h400/230V, 50Hz from the network
Additional equipment: At the back and on the side of the cabin round handrail, electronic scale for load control, fan with floor contact, alarm siren on the roof, key lock for special-driving, folding chair, intercom connection control cabinet-maintenance company, intercom

connection command cabinet - cabin; gong for arrival at the station. Power supply - from the network and safety UPS to complete the drive in the event of a power failure.

3.2.13. Design of traffic signals and equipment on the bridge

The subject Preliminary design includes only the bridge, whereas access roads to future intersections, as well as the intersections themselves are not part of the subject design.

The subject road on the bridge is provided with a transverse profile with two 6.50 m wide road surfaces with two lanes each (3.5 m wide right lane and 3.0 m wide left lane), 10.40 m wide tram lane and pedestrian paths on both sides and one-way bicycle paths. This design also envisages a two-way bicycle path under the bridge that enters the bicycle path which is foreseen within the framework of the Belgrade Waterfront design on both sides. Along the subject road, the design documentation includes elements of vertical and horizontal traffic, signalling and traffic equipment, as well as cable canalizations.

Speaking of vertical signalling, it is planned to install traffic signs by which the participants in the bicycle traffic are informed about the existence of a two-way bicycle path. These signs will be installed after every intersection, on the right side near the bicycle path. On the common pole, the traffic signs II-40 (bicycle path) and IV-25 (additional sign indicating the allowed directions of movement on the bicycle path) are designed.

Horizontal signalling is designed in accordance with SRPSU.S4.221 – SRPSU.S4.234 standards. According to the conditions of the Secretariat for transport, horizontal and vertical signalling needs to be designed with the highest quality technologies in terms of durability and visibility. In accordance with that, horizontal marking with retro-reflective materials is envisaged - thick-layer cold plastic (white), while marking of bicycle paths with symbols of cyclists and arrows is provided with applicative materials - cold plastic (white) without retro-reflective properties.

One-way bicycle paths are designed on 0.5 m from the road edge. The symbol of the bicycle on the bicycle path is placed at the beginning of the bicycle path (after each intersection) in each lane together with arrows indicating the direction of motion and is repeated approximately at every 50 meters of the path.

When installing a horizontal signalling, the Contractor is obliged to use a permanent colour with a reflective glass bead, which provides good visibility of the horizontal signalling in the applied weather conditions at night. On the bridge, next to its edge, decorative pedestrian fences are foreseen, which are not the subject of this design.

Alongside the right edge of the road, high curbs (0.20 m) have been designed, in order to increase the safety of traffic on the road, as well as the safety of cyclists. According to the conditions of the Secretariat for Transport, it is required to provide elements of bicycle/tourist signalling, bicycle counters, as well as the installation of info-tables of station locations for renting public bicycles in the immediate vicinity and installation of information maps showing 30-minute bicycle isochronous.

As intersections and access roads from them to the bridge are not the subject of the Detailed design, it is meaningful that the above-mentioned elements will be included in the technical documentation that will process intersections and accesses to the bridge, having in mind that the items of this equipment are not included in this design.

Along the subject section, in the gallery where the necessary installations will be placed, cable canalization is planned for the needs of traffic lights signalling, in order to enable the connection of traffic lights at the intersection on Novi Beograd side to their control centre. Positions are graphically presented in the Design of electrical installations, and the quantities of cable canalization are calculated within the framework of this design. According to the conditions of the Secretariat for Transport, 4 pipes of f110 mm are planned.

3.2.14. The Sava river waterway signalling design

The Preliminary design includes the technical solution for marking the waterway with the appropriate signalling in the function of safety of navigation and safety of the construction site. The design of navigation signalling in the zone of the bridge implies technical regulation of traffic with permanent signs that are installed after completion of works and which would permanently mark the waterway in the bridge zone.

Marking system

In accordance with Article 39 of the Law on Navigation and Inland Waterways ("Official Gazette of RS", No. 73/10, 121/12,18/15), a new bridge over the Sava river is an obstacle on the waterway, so that this obstacle must be marked with appropriate signs for daily and night navigation, as well as for navigation in the conditions of reduced visibility. In accordance with the position of the navigable route, on the considered section of local morphology, as well as in accordance with the above regulations, the design of marking the navigation span opening of the bridge is prepared, as follows:

- Basic signs for marking the navigation span opening of the bridge, and
- Additional marking for navigation with the use of radar-signs for marking bridge piers.

Basic signs for marking the navigation span opening of the bridge,

Types of basic signs for marking the navigation span opening and signs for marking the bridge piers: recommended opening of the bridge, prohibition of navigation outside the marked space. The basic signs for marking the navigation span opening of the bridge have to fulfill their function for unhindered navigation in the daily and night conditions. In this regard, the signs must be adequately lit for the needs of night sailing. The basic signs for marking the navigation span opening of the bridge have to be visible at night, i.e. they must be illuminated and constantly maintained in good condition, which is the obligation of the bridge owner.

Additional marking for navigation with the use of radar-signs for marking the bridge piers

Under conditions of reduced invisibility (fog, snow, rain showers, smoke etc.), only the vessels that are equipped with radar installation are allowed to continue their journey, using this equipment. The upper bridge structure gives a strong radar reflection from which it is necessary to separate the reflection of the bridge pier which limits the waterway.

For that purpose, marking with radar reflectors placed on carriers (cantilevers) which are installed on the piers of the navigation span opening of the bridge, in accordance with the recommendations of the Danube Commission and UNECE (European Economic Commission of the United Nations), is done.

In the case of the new bridge over the Sava river, the pillars S3 and S4 determine the boundaries of the navigation span opening, as well as the route of the waterway in the profile of the bridge, and it is needed, for safe navigation, at reduced visibility, to foresee their marking with cantilever radar reflectors.

The advantages of marking the bridge piers with radar reflectors on the cantilevers are multiple. They liberate the water space near the piers, they are permanently fixed in one place and, unlike the buoys, they are not exposed to the river deposit and errors of the participants in the navigation, which together contributes to increased reliability of the marking system, safety of navigation, bridge and traffic which runs over it.

3.2.15. Landscaping

The concept of landscaping free areas resulted from the environment and its potential. The formation of a larger whole was conditioned by the spatial position, which resulted in getting the space under the bridge on Belgrade side and the space on Novi Beograd side.

The basic purpose of the subject free areas is to connect pedestrian ramps and staircase of the New Sava Bridge and pedestrian flows under the bridge, by forming a network of functional and recognizable flows and points:

BELGRADE SIDE - the space under the New Sava Bridge is directly connected to the Sava Promenade within the “Belgrade Waterfront” design. Accordingly, the space is formed to represent a part of the Sava Promenade, taking into account pedestrian, bicycle and vehicle flows, as well as the applied materials and urban city furniture;

NOVI BEOGRAD SIDE - considering that the space under the bridge on Novi Beograd side of the Save river is a part of the old Sava promenade and its complete arrangement is planned in the near future, the space observed within this new design is designed to satisfy the function of connecting the pedestrian ramps and staircase from the bridge and pedestrian flows on the promenade. By reconstructing the existing pedestrian paths and forming new ones, necessary new communications were achieved and the existing ones supported. By replacing the final curtains with stone slabs, the visual impression of this space was improved.

Regulation and levelling of pedestrian areas was done in accordance with the situation on the terrain and the planned content. When resolving the subject location, the main pedestrian flows are taken into account, i.e. transit target movement of users, without architectural barriers. Horizontal regulation is defined by the boundaries of parcels and construction lines, surrounding objects and directions of transit movement of pedestrians.

The levelling solution originated from the situation in the field. The levels of planned communications were harmonized with the levels of the terrain and the surrounding existing and planned roads and paths.

The levelling of the terrain was done on the basis of an updated and verified geodetic survey in which required altitudes were indicated. Levels related to technical elements of the infrastructure (manhole covers, etc.) are integrated in the solution of levelling pedestrian areas. During the levelling, directing of atmospheric water towards the drains, gutters or green surfaces was taken into account.

For treatment of areas, materials are provided that are economically justified by their processing and installation technology and have properties such as: durability, endurance, resistance to various influences (wear, mechanical, physical and chemical damage), meet the optimal level of aesthetic criteria and suitable for maintenance (washing, replacement of damaged parts-surfaces, etc.)...

The green areas on Belgrade side, which represent a protective green belt, are covered with ground cover. On Novi Beograd side, the formation of a quality sown lawn is planned.

Architectural and construction elements, as well as elements of urban city furniture, are provided for in the design to the extent which is necessary to achieve the functional, design and visual quality of the considered area. Sufficient illumination of the area raises the representativeness, as well as the feeling of security, so an adequate disposition of lighting is proposed.

3.3. Review of the type and quantity of required energy and energy sources, water, raw materials, necessary construction material, etc.

This chapter presents the types and quantities of energy and energy sources, raw materials, and construction materials.

3.3.1. Fuel characteristics

The most important energy source necessary for operation of construction mechanization during execution of construction works, and later in the phase of using the new bridge is oil derivatives. Based on the data from the literature and technical characteristics of the planned construction machinery, Table 3.3.1-1. shows the consumption of fuels and lubricants for their operation, per working hour, and for trucks and tank trucks per kilometre travelled.

Table 3.3.1-1. Expected consumption of fuel and lubricants for the operation of the construction machinery, which will most likely be engaged in the construction of a new bridge over the Sava River.

No.	Machinery	Fuel consumption	Lubricant consumption
1	Loader	27.5l/h	1.0l/h
2	Truck	35l/100km	0.1l/100km
3	Bulldozer	25.6l/h	0.7 l/h
4	Tank lorry	35l/100km	0.1l/100km
5	Vibrating hammer	23.0l/h	0.3l/h
6	Vibrating roller	34.5l/h	0.5l/h

For the needs of regular traffic on the new bridge, motor vehicles use the following types of motor fuels: unleaded gasoline (europremium BMB95 and euro BMB 98), euro diesel (euro diesel and euro diesel F) and liquefied petroleum gas.

3.3.2 Consumption of natural resources

The data on the consumption of natural resources is an important indicator of possible impacts, which are the consequence of the construction of the new bridge over the Sava river. The effect of this parameter can be quantified through the volume of works, as well as the amount of installed materials. The review of the key positions for the construction of the bridge over the Sava river at the location of the Old Sava Bridge, is given in the following table (Table 3.3.2-1).

Table 3.3.2-1. Key positions and preliminary quantities of materials for the construction of a new bridge over the Sava river at the location of the Old Sava Bridge.

No.	Item	Material	Unit meas	Quantity
1.	Preparatory works	sand	m_3	2.000
		crushed stone aggregate with sand	m_3	4.000
		concrete, ribbed reinforcement (steel)	m_3	600
		concrete, ribbed reinforcement (steel)	m′	200
2.	Earthworks	earth material	m_3	40.340
		mixture of gravel and sand	m_3	630
3.	Concrete works	concrete	m_3	420
		concrete, ribbed reinforcement (steel)	m_3	21.352
		curbs	m′	1,680
4.	Metal works	steel structure	kg	6.603.000
		hangers on the bridge (steel cables)	kg	32.200
		ribbed reinforcement (steel)	kg	4.481.401
		expansion joints (steel)	m′	78
		steel fences	kg	84.000
		perforated sheet metal	m_2	5.500
5.	Other works	hydro-insulation of the upper surface of the concrete pavement slab	m_2	13.100
		hydro-insulation of all concrete surfaces that are in contact with the ground	m_2	5.217
		coating of all visible concrete surfaces with a protective hydrophobic coating for concrete	m_2	19.361
		elastic base under crushed stone	m_2	13.100

,

3.4. Review of the type and quantity of waste materials and noise level emitted during the exploitation of the bridge

3.4.1. Waste material

Liquid waste material

During regular traffic, liquid materials can be emitted from leaking tanks, or engine parts, and therefore fuel, motor oil and antifreeze will remain on the road. Estimation of emissions of these materials was performed on the basis of foreign experiences derived from 20-year research, based on which the quantities of solid and liquid deposit per unit of the road surface are given for reference traffic load (average annual daily traffic - AADT per 8700 vehicles). For the forecast traffic load on the newly designed bridge over the Sava river, the emissions of oil and lubricants were calculated proportionally and estimated to: 11.4 kg/ha per year.

Solid waste material

The research of the quantities of solid substances that occur due to traffic on the road was taken into account relatively late by professional audience and treated in the right way, unlike the problems of noise and air pollution, which led to the fact that there are still no clearly crystallized methodological procedures for their quantification.

In the phase of regular exploitation, it can be expected that the emissions of solid particles result from the following processes: deposition of particles from the exhaust system, tire wear, wear of the road structure, destruction of the body, spillage of cargo, disposal of organic and inorganic waste.

Speaking of the chemical composition of these materials, they are mainly heavy metals such as lead (fuel additive), cadmium, copper, zinc, mercury and nickel. Materials of different structure and characteristics make a significant part, too, and they appear in the form of precipitated, suspended or dissolved particles. It is also possible to register substances that result from the use of specific corrosion resistant materials.

To determine the quantities, the assumption was adopted that all solid substances are initially deposited on the road surface, and over time, through branching, spraying, rinsing and other processes, they reach the soil, surface and ground water, etc. In accordance with this, and based on foreign experiences, the emission of pollutants that are retained on the road surfaces has been assessed. The quantities of substances emitted by motor vehicles per year per hectare of road surface for reference traffic load (8700 vehicles per year) and forecast traffic, as well as the total quantities of pollutants on the newly designed bridge over the Sava river, are given in Table 3.4.1-1.

Table 3.4.1-1 Annual emissions of solid substances

Substance	Reference values (kg/ha/year)	Emitted quantities per unit of surface (kg/ha/year)
Suspended particles	145	734
Copper	0,01	0,051
Lead	0,042	0,062
Zinc	0,079	0,400

Gases

Combustion of petroleum products in motor vehicle aggregates produces gases, some of which contribute to air pollution at the local or global level. EURO classification (European emission standards) defines the upper limits for the emission of polluting gases from exhaust

pipes of the vehicles sold in the European Union. In particular, it defines the maximum emission of nitrous oxide, hydrocarbon, carbon monoxide and solid particles. In order to preserve the living environment, EURO standards are becoming stricter and stricter over years. Data on emissions of exhaust gases, depending on the category of vehicles, were taken from the doctoral dissertation "Model for evaluating the impact of traffic flows and meteorological parameters on the concentration of hazardous carbon monoxide" prepared by Mr Radoslav Kojić, University of Novi Sad, in 2016, and shown in Tables 3.4.1-2 to 3.4.1-5.

Table 3.4.1-2 European emission standards for pollutants for passenger cars

	EURO1	EURO2	EURO3	EURO4	EURO5	EURO6
Directives	91/441/EEC, 93/59/EEC	94/12/EC, 96/69/EC	98/69/EC,2002/80ECi 2003/76/EC		Regulation 715/2007/EC	
Applicatio	July 1992	January	January	January	September	September
Fuel	gasoline/dies	gasoline/diese	gasoline/diese	gasoline/diese	gasoline/diese	gasoline/dies
THC	-	-	0.2/-	0.1/-	0.1/-	0.1/-
NMHC	-	-	-	-	0.068/-	0.068/-
NO_x	-	-	0.15/0.5	0.08/0.25	0.18	0.08
HC+NO_x	0.97(1.13)	0.50/0.7	-/0.56	-/0.3	-/0.23	-/0.17
CO	2.72(3.16)	2.2/1.0	2.3/0.64	1.00/0.5	1.00/0.5	1.00/0.5
PM	-/0.14(0.18)	-/0.08	-/0.05	-/0,025	0,005	0.005/0.0025

Table3.4.1-3.European emission standards for pollutants for light duty vehicles having the mass of ≤1305 kg (Categories N1-I)

	EURO1	EURO2	EURO3	EURO4	EURO5	EURO6
Directives	93/59/EEC	93/116/EEC, 94/12/EC, 96/69/EC	70/220/EEC, 98/69/EC, 2003/76/EC		Regulation 715/2007/EC	
Application	October 1993	January 1997	January	January 2005	September	September
Fuel	gasoline/diesel	gasoline/diesel	gasoline/die sel	gasoline/diesel	gasoline/diesel	gasoline/diesel
THC	-	-	0.2/-	0.1/-	0.1/-	0.1/-
NMHC	-	-	-	-	0.068/-	0.068/-
NO_x	-	-	0.15/0.5	0.08/0.25	0.06/0.18	0.08
HC+NO_x	0.97 (1.13)	0.50/0.7(0.9)	-/0.56	-/0.3	-/0.23	-/0.17
CO	2.72 (3.16)	2.2/1.0	2.3/0.64	1.00/0.5	1.00/0.5	1.00/0.5
PM	-/0.14 (0.18)	-/0.08(0.1)	-/0.05	-/0.025	0.005(0.0045)/0.0045	0.0045

Table 3.4.1.-4 European emission standards for pollutants for light duty vehicles having the mass of 1305–1760 kg (Categories N1-II)

	EURO1	EURO2	EURO3	EURO4	EURO5	EURO6
Directives	93/59/EEC	93/116/EEC, 94/12/EC, 96/69/EC	70/220/EEC,98/69/EC, 2003/76/EC		Regulation 715/2007/EC	
Application	Odtober 1993	January 1997	January 2001	January 2006	September	September
Fuel	gasoline/diesel	gasoline/diesel	gasoline/diesel	gasoline/diesel	gasoline/diesel	gasoline/diesel
THC	-	-	0.25/-	0.13/-	0.13/-	0.13/-
NMHC	-	-	-	-	0.09/-	0.09/-
NO_x	-	-	0.18/0.65	0.1/0.33	0.075/0.235	0.75/0.105
HC+NO_x	1.4(1.6)	0.6/1.0(1.3)	-/0.72	-/0.39	-/0.295	-/0.195
CO	5.17 (6.00)	4.0/1.25	4.17/0.8	1.81/0.63	1.81/0.63	1.81/0.63
PM	0.19 (0.22)	-/0.12 (0.14)	-/0.07	-/0.04	0.005(0.0045)/0.005	0.0045

Table 3.4.1-5. European emission standards for pollutants for light duty vehicles having the mass of >1760 kg to max 3500 kg (Categories N1-III and N2)

	EURO1	EURO2	EURO3	EURO4	EURO5	EURO6
Directives	93/59/EEC	93/116/EEC, 94/12/EC, 96/69/EC	70/220/EEC,98/69/EC, 2003/76/EC		Regulation 715/2007/EC	
Application	October 1993	January	January	January	September	September
Fuel	gasoline/diese	gasoline/diese	gasoline/diese	gasoline/diese	gasoline/diese	gasoline/dies
THC	-	-	0.29/-	0.16/-	0.16/-	0.16/-
NMHC	-	-	-	-	0.108/-	0.108/-
NO_x	-	-	0.21/0.78	0.11/0.39	0.082/0.28	0.082/0.125
HC+NO_x	1.7(2.0)	0.7/1.2(1.6)	-/0.86	-/0.46	-/0.35	-/0.215
CO	6.9(8.00)	5.0/1.5	5.22/0.95	2.27/0.74	2.27/0.74	2.27/0.74
PM	0.25(0.29)	-/0.17(0.2)	-/0.1	-/0.06	0.005(0.0045)/ 0,005	0.0045

* for engines less than 0.75 dm_3 per cylinder and for revolutions per minute greater than 3000

3.4.2. Noise levels emitted during the exploitation of the bridge

Of all the sources of noise, the highest percentage belongs to the traffic noise, while the smaller part refers to other sources of noise (industry, construction activities, noise from leisure activities, etc.). Road traffic has a dominant role in comparison with other types of traffic and it grows constantly, resulting in the increase in the level of noise in the areas around roads. It is the most important non-material source of pollution in road traffic, it is a very complex phenomenon by origin and it has a stochastic character. All previous experiences in the fight against noise problems show that for now, the only and, at the same time, the most correct way is to timely identify the problem and consider it permanently through all planning and design phases.

The noise level of the vehicle in motion is the result of the collected factors, the most important of which are: vehicle exhaust system, vehicle intake system, engine-combustion and aggregate mechanical noise, cooling system, contact tire-road surface and air resistance. In order to quantify the participation of individual categories of vehicles in the total noise level, the OECD conducted tests, the results of which are shown in Table 3.4.2-1. The analysis of the data from the table shows that one truck or bus is emitting the same level of noise as 10 passenger cars in similar traffic conditions.

Table 3.4.2-1 Characteristic noise levels for vehicles per categories

Vehicle type	Middle noise level dB(A)	Noise level interval dB(A)
Passenger car up to 1100cm_3	70	67 - 75
Passenger car up to 1600cm_3	71	67 - 75
Passenger car over 1600cm_3	72	68 - 77
Delivery vehicle	73	68 - 77
BUS, truck	81	76 - 86

3.5. Review of treatment technology (processing, recycling, disposal, etc.) of all types of waste materials

Waste is generated during the construction and later also in the phase of exploitation of the New Sava Bridge. The expected types of waste generated during the construction works and later in the phase of exploitation of the New Sava Bridge are shown in Table 3.5-1. Waste categorization is done in accordance with the Rulebook on categories, testing and classification of waste ("Official Gazette of RS", No. 56/10).

Waste generated in the process of execution of construction works on the bridge is handled by the Contractor, in accordance with the procedures defined in the Waste Management Plan prepared by the Contractor in accordance with the Law on Waste Management ("Official Gazette of RS", 36/09,88/10,14/16 and 95/18) and by-laws adopted on its basis. According to the quantities of waste generated during construction, the construction waste is the most represented, and the quantity of packaging waste will be significant, while the quantity of municipal waste generated by the employees on the construction site will be smaller.

Construction waste and waste generated from demolition includes: excavated soil, demolition and construction waste (waste from ceramics, concrete, iron, steel, plastic, etc.), as well as waste asphalt concrete. According to the Rulebook on categories, examination and classification of waste ("Official Gazette of RS", No. 56/10), waste from construction and demolition is categorized as group 17, and this group contains construction and demolition waste, including excavated soil from contaminated sites.

During the construction of the New Sava Bridge, generating of non-hazardous construction waste (concrete, iron, steel ...), non-hazardous packaging waste (wooden pallets, plastic foils, paper and cardboard packaging, metal packaging, etc.) and municipal waste (consisting mainly of paper, food scraps, glass packaging, PET packaging, etc.) and hazardous waste including waste oils, oiled cloths, oiled plastic and metal packaging, etc. is expected. The above mentioned waste groups should be collected separately, i.e. primary collection on the spot introduced, disposed in appropriate containers and bins and temporarily stored at the location to be determined within the Waste Management Plan or defined in the Contract between the Investor and Contractor. Waste generated during the construction of the New Sava Bridge must be handed over/sold to an authorized operator only, i.e. to a legal entity that has a permit to manage a given type of waste.

Table 3.5-1. Expected types of waste that occur during construction works and later in the phase of exploitation of the New Sava Bridge.

INDEX NUMBE	WASTE NAME
10 1314	waste concrete and concrete sludge
13	**WASTE OILS AND LIQUID FUEL REMAINS (EXCLUDING COOKING OIL AND OILS FROM CHAPTERS 05, 12 AND 19)**
1301	waste hydraulic oils
1302	waste motor oils, gear oils and lubricating oils
1303	waste oils for insulation and heat transfer
1305	oil/water separator content
1307	waste liquid fuels
14	**WASTE ORGANIC SOLVENTS, COOLANTS AND PRESSURE GASES (EXCEPT 07 AND 08)**
15	**PACKAGING WASTE, ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE FABRICS, UNLESS OTHERWISE SPECIFIED**
1501	packaging (including specially collected packaging in municipal waste)
1502	absorbents, filter materials, wiping cloths and protective clothing
16	**WASTES WHICH ARE OTHERWISE SPECIFIED IN THE CATALOGUE**
17	**CONSTRUCTION AND DEMOLITION WASTE (INCLUDING EXCAVATED SOIL FROM CONTAMINATED LOCATIONS)**

1701	concrete, bricks, tiles and ceramics
1702	wood, glass and plastics
1703	bituminous mixtures, tar and tar products
1704	metals (including their alloys)
1705	soil (including soil excavated with contaminated sites), excavated stone
1706	insulation materials and construction materials containing asbestos
1708	gypsum-based construction material
1709	other construction and demolition waste
20	**MUNICIPAL WASTE (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL AND INDUSTRIAL WASTE), INCLUDING SEPARATELY COLLECTED FRACTIONS**
2003	**Other municipal waste**

In the phase of exploitation of the subject bridge, there is a communal waste from the participants in the traffic and waste generated during the maintenance of the built-in separators. Communal waste is collected, transported and disposed by the competent PUC. The generated waste oil and sludge from separators should be treated in accordance with the Law on Waste Management,Rulebook on the conditions, manner and procedure of waste oils management ("Official Gazette of RS",no.71/10)and Rulebook on the form of daily records and annual report on waste with instructions for its completion ("Official Gazette of RS" No. 95/10 and 88/15).

3.6. Review of the impact on the environment of the selected and other considered technological solutions

No technological solutions have been considered in order to reduce the consequences of emissions of pollutants from traffic. Protection measures are given in Chapter 8.

4. MAIN ALTERNATIVES OVERVIEW

4.1 Location or alignment

The location of the subject Project has been defined by the General Regulation Plan of the Construction Area of the head office local self-government unit - the City of Belgrade (units I-XIX), Spatial plan of the Special Purpose Area of the City of Belgrade coastline - the Sava River Bank area for the purpose of Belgrade Waterfront Project and the Location Conditions issued by the Ministry of Construction, Transport and Infrastructure. The position of the new Bridge over the Sava River has been defined by the Terms of Reference and within the first-prize winning work in the competition for the elaboration of the Urban and architectural solution for the reconstruction of the Old Sava Bridge. From the aspect of environmental protection, since it is a predefined location, there was no need for analysis of alternative solutions, since in the expected impacts, as well as in the planned protection measures, they do not differ significantly. The Old Sava Bridge cannot meet the existing traffic requirements with its capacity, while the new Bridge will increase its capacity many times over. Another reason for the construction of the New Bridge is safety, considering that the Old Sava Bridge was built during the Second World War, placed on wooden piles, making it unsafe for traffic. The third reason is aesthetics, because the current Bridge does not fit into the renovated Sava amphitheatre and modern Belgrade vision.

4.2. Production processes or technology

Almost all types of traffic are present on the New Bridge and the observed traffic network. The New Bridge will be used for road and tram, pedestrian, bicycle traffic, and the subway has been envisaged to travel across it in the future. Namely, **there will be** two traffic lanes in each direction (6.5 m each), and two rail tracks (10.4 m) will be placed in the middle of the Bridge, which can be used for tram and subway traffic. There are 2 mixed pedestrian and bicycle paths (3 m each).

Within the Traffic Analysis, which forms an integral part of the Preliminary Design of the Bridge over the Sava River on the site of the Old Sava Bridge-Feasibility Study (TI CIP, Belgrade, 2019) the future traffic network was considered in 2 scenarios:

- NO INVESTMENT scenario – implying the future planned network in the city area with the Old Sava Bridge in the existing traffic profile
- INVESTMENT scenario – implying the future planned network in the city area with the construction of a new bridge on the site of the existing Old Sava Bridge, with a broader traffic profile.

The future network in the NO INVESTMENT scenario has been taken from the forecast models of the Transport Master Plan of Belgrade and described in the following table.

Table 4.2-1. Network of Transport Master Plan of Belgrade 2033

	Tunnel connection of the Sava and the Danube	Internal main roads ring	BG train	External main roads tangent line	Subway
2021	o	o	o		
2027		o	o	o	o
2033				o	o

In addition to these capital interventions in the street network of Belgrade, the forecast TMP models also include additions and reconstructions of other parts of the primary and secondary network, such as street network within Belgrade Waterfront, designs that cover the expansion of Makenzijeva/Cara Nikolaja Street, Južni Bulevar and Dimitrija Tucovića Street, Kumodraška and Dragoslava Srejovića Street, among others (to the minimum TMP scenario)[1]

Since the cut-off years in the Study differ from the cut-off years in the TMP, versions of the 2023-2048 model network were made based on the TMP 2021-2033 model in the following manner:

- For network 2023 TMP 2021 network was adopted,
- For network 2028 TMP 2027 network was adopted,
- For networks 2033, 2038, 2043 and 2048 TMP 2033 network was adopted.

INVESTMENT NETWORK, i.e. option of the solution for the Old Sava Bridge has been modelled as provided for in the Preliminary Design, with the following characteristics:

- Bridge length - 420 m
- Bridge width - 40 m
- Number of traffic lanes - 2 per direction and tram isle, bicycle and pedestrian paths
- Carriageway lane width – 3,25 m

4.2.1. Forecast of traffic load - NO INVESTMENT scenario

Based on the formed transport models with and without investment, for all cut-off years, the future traffic load of the street network and the public transport network was generated. This chapter presents the results of the traffic load for the NO INVESTMENTS network. Traffic load was analysed for all 6 time sections, from 2023 to 2048 and the results have been displayed in the following table.

The results in the table show that the load on all bridges increases by years, both in the number of passengers in the PT and in the number of vehicles. It is also noticeable that the capacity of bridges, already in 2033, is close to or over 80% of utilization. Only the Ada Bridge has utilization degree of less than 50%. In 2048, the load on all Bridges exceeds the capacity, while on the Ada Bridge it makes 95% of capacity.

On the Old Sava Bridge, a larger increase in the number of passengers in public city transport is noticeable starting from 2033. The reason for that is the construction of Belgrade Waterfront, which has been modelled in full capacity from 2033 onwards.

[1] REPORT NO 170524_WJ_RP_FINAL REPORT_D_SER, 2017 EBRD

Table 4.2.1-1. Forecast of traffic load - NO INVESTMENT network

No investment network						
2023						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	9.806	5.579	35	-	2	78
Old Sava Bridge	5.831	2.288	9	8	2	84
Gazela	4.845	10.854	112	47	12	89
Ada Bridge	1.952	5.200	49	14	9	52
2028						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	9.129	5.979	26	-	2	83
Old Sava Bridge	6.721	2.483	17	5	2	92
Gazela	4.513	11.585	104	49	13	95
Ada Bridge	1.917	6.465	62	14	11	64
2033						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	5.657	6.328	37	-	2	88
Old Sava Bridge	15.708	2.756	15	5	2	102
Gazela	1.664	12.412	103	46	11	102
Ada Bridge	2.123	7.169	78	20	15	71
2038						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	6.051	6.721	56	-	5	94
Old Sava Bridge	16.688	3.248	11	6	2	76
Gazela	1.765	13.307	118	50	12	109
Ada Bridge	2.268	7.877	81	23	16	79
2043						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	6.461	7.240	49	-	3	101
Old Sava Bridge	17.773	3.624	24	6	3	86
Gazela	1.909	14.451	122	55	11	119
Ada Bridge	2.417	8.671	98	26	20	87
2048						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	6.860	7.866	63	-	4	110
Old Sava Bridge	18.923	3.890	16	6	2	143
Gazela	2.023	15.623	158	64	17	129
Ada Bridge	2.569	9.583	86	30	18	95

If the total value of the number of vehicles (excluding public transport vehicles) on the subject bridges is observed, it is noticeable that the initially expected 24 220 veh/h at peak time in 2023 increase to the final 37 426 veh/h in the busiest hour of 2048. This increase corresponds to an increase of 1.55 times for a period of 25 years, i.e., an average annual increase rate of about 1,756%.

Separately, on the Old Sava Bridge, as per the identical analysis, the number of vehicles increases from the base 2307 veh/h to 3914 veh/h, achieving an increase of about 1.70 times, with an average annual increase rate of about 1,8%.

4.2.2. Forecast of traffic load - INVESTMENT scenario

As described above, the INVESTMENT network consists of the NO investments network and the new bridge, according to the given cut-off years. The new bridge has been modelled with the characteristics from the Preliminary Design and with a capacity of 2600 vehicle/h in one direction and a free speed of 80 km/h. After the network load in the transport models, the traffic loads of the street network and the public passenger transport network were obtained, which have been presented in the following table.

Table 4.2.1-2. Forecast of traffic load - INVESTMENT network

Investment network						
2023						
Road	**PT pas/h**	**PC veh/h**	**LTV veh/h**	**TV veh/h**	**AV veh/h**	**q/C %**
Branko's Bridge	9.276	5.159	31	-	2	72
Old Sava Bridge	7.065	3.426	19	8	4	67
Gazela	4.276	10.381	106	47	11	85
Ada Bridge	1.911	5.014	49	14	9	50
2028						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	8.301	5.516	30	-	2	77
Old Sava Bridge	8.348	3.761	23	14	3	74
Gazela	3.975	11.161	91	46	11	92
Ada Bridge	1.821	6.151	65	18	10	61
2033						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	5.210	5.885	40	-	4	82
Old Sava Bridge	16.439	4.136	19	6	2	80
Gazela	1.526	11.866	102	47	11	97
Ada Bridge	2.069	6.850	75	19	13	68
2038						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	5.578	6.345	47	-	4	89
Old Sava Bridge	17.478	4.500	18	10	3	87
Gazela	1.616	12.831	125	47	12	105
Ada Bridge	2.210	7.556	77	23	16	75
2043						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	5.957	6.890	62	-	4	97
Old Sava Bridge	18.619	4.928	14	8	3	95
Gazela	1.733	13.883	144	55	15	114
Ada Bridge	2.361	8.380	73	26	17	83
2048						
Road	PT pas/h	PC veh/h	LTV veh/h	TV veh/h	AV veh/h	q/C %
Branko's Bridge	6.336	7.468	61	-	5	105
Old Sava Bridge	19.790	5.378	20	11	2	104
Gazela	1.838	15.146	143	60	14	124
Ada Bridge	2.510	9.209	99	30	20	92

As shown in the table, it can be concluded that the number of vehicles on the Old Sava Bridge in relation to the no investment network will increase from about 2500 veh/h to about 3500 veh/h in 2023, or from about 4200 veh/h to about 500 veh/h in 2048, which is an increase of about 45% and 30% respectively.

A similar conclusion can be reported for public transport, where the number of passengers in 2023 will increase by about 17%, and in 2048 by about 5%.

It is also noticeable that, unlike the Old Sava Bridge, where the traffic increases in the scenario with investments, on other bridges over the Sava the traffic decreases. So, for example, on Branko's Bridge, decrease is noticeable in the number of vehicles at peak hours by about 8%. The situation is similar on Gazela (5%) and Ada Bridge (4%).

If the total value of the number of vehicles (excluding public transport vehicles) on the subject bridges is observed, it is noticeable that the initially expected 24
280 vehicles/h in the peak hour of 2023 increase to the final 37 666 vehicles/hour in the busiest hour of 2048. This increase corresponds to an increase of 1.55 times for a period of 25 years, i.e. an average annual increase rate of about 1,772%.

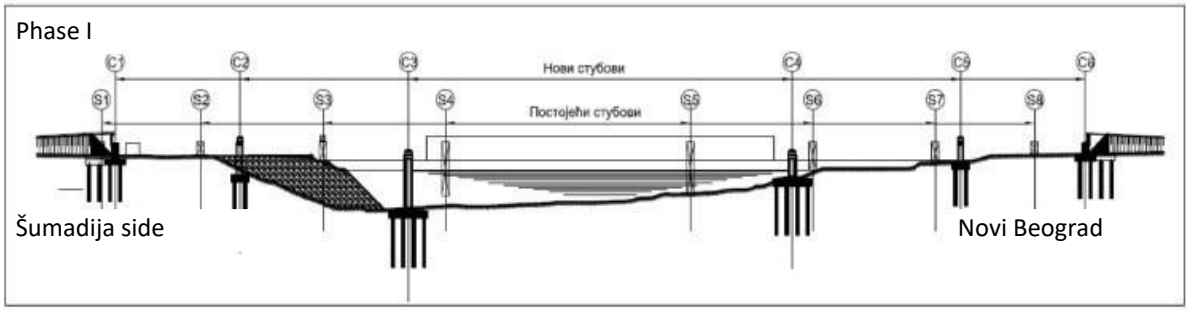
Separately, on the Old Sava Bridge, by identical analysis, the number of vehicles increases from the base 3457 veh/h to 5411 veh/h, achieving an increase of about 1.565 times, with an average annual increase rate of about 1,423%.

Conclusion:
From the aspect of environmental protection, the construction of the New Sava Bridge has positive effects. Savings in travel time and distance travelled by users directly affect the reduction of harmful gas emissions and savings in fuel consumption.

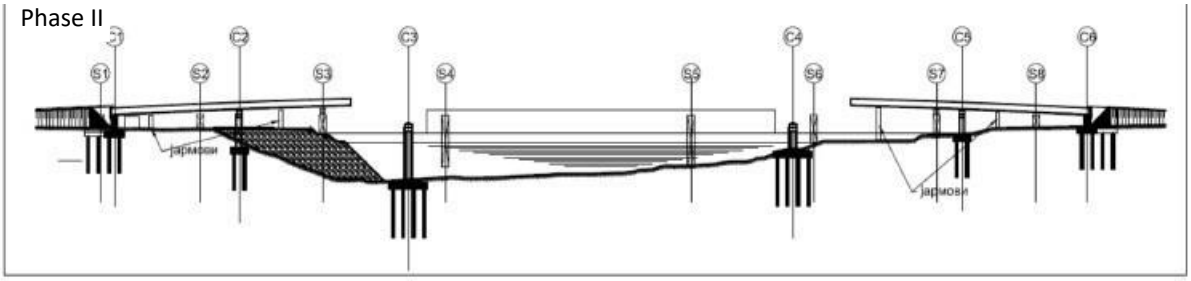
4.3. Bridge construction methodology

The construction of an arch bridge L=420.0 m long and B=37.2 m wide, with the main span over the Sava River Lr = 166.0 m is a serious construction undertaking, so the future Bridge Erection Design must be carried out with special care and in detail. At this level of the Design (Preliminary Design), the Designers will present their ideas on the main phases and the method of constructing the bridge. Also, the actions taken by the Designers during the designing of the structure will be described in more detail, which will enable easier construction of the bridge.

Before the construction of the new bridge, (Phase I) it is necessary to remove the span steel structure according to the Dismantling Design and relocate it to the planned location. As mentioned earlier, not all the pillars of the newly designed bridge (except Pillar S1) overlap with the pillars of the old bridge. At the end of this phase, all the pillars of the new bridge are constructed, with unfinished abutments over which the steel structure will be lifted.



As a space for the future construction site and the location where the construction will be carried out, the left bank of the Sava can be used between the Gazela Bridge and the current Old Sava Bridge (Block 18). This space is ideal because it is close to the final location of the future bridge, the infrastructure necessary for the construction site is available (electricity, water ...), there is a concrete plant nearby and the location is surrounded by major traffic flows (highway, railway, the Sava river and the Danube), which is very important if the parts of the future structure are to be delivered from a greater distance. On the right bank of the Sava, near pillar S1, a special, smaller construction site should be formed, which would include only space and equipment for lifting the structure.



The steel structure of the bridge is formed on the construction site into three independent units. At the main construction site, on the left bank of the Sava, the main span (L=216 m) and parts of the lateral steel structure (L=102 m) are being enlarged. The steel structure of the main span is mounted in its entirety (it contains arches, chords, struts, hangers, cross girders and cantilevers) and the final tightening of the hangers is performed. Also, on the left bank of the Sava, the beam part of the bridge between the pillars S4 and S6 is installed and longitudinally lifted by pushing (spans L=54.0 m and part of the span L=73.0 m). Existing pillars can serve as a support for the scaffold lifting, and yokes can also be placed in the provided places. On the right bank of the Sava, the beam part of the bridge between the pillars S1 and S3 is installed and longitudinally lifted by pushing (spans L=54.0 m and part of the span L=73.0 m). At the same time, with the enlargement of the beam parts of the bridge, they would be lifted from both banks towards the middle of the river (Phase II). Lifting is not conducted to the end, i.e. to the designed position, because it is necessary to leave space so that the installation of the main span of the bridge can be safely carried out.

After lifting the beam parts of the bridge, as well as the complete assembly of the arch part of the bridge, the main span is launched in the transverse direction and placed on barges that will transport the structure to the designed position (Phase III). It is planned to use 4 barges, two on each side. The main span of the structure is placed on bearings, i.e. in the designed

position where the final connection with the beam parts of the structure is made successively (Phase IV). In preparation for the transport of the main span structure, the arch-chord system is strengthened with additional temporary elements, in order to be able to be safely supported on the substructure located on the barges. After the completion of the installation of the steel structure, the installation of the pavement slab and other parts of the structure and equipment of the bridge continues. The described method of installation will enable unhindered navigation on the Sava, except in a short time interval when the main span structure will be mounted.

Figure 4.3-1. The position of the construction site on the left bank of the Sava between the Gazela Bridge and the current Old Sava Bridge (Block 18) is presented

Figure 4.3-2. The structure is to be transported to the designed position

As mentioned earlier, one of the main disadvantages of adopting a reinforced concrete slab as a pavement structure is the appearance of tensile forces in the slab, both transversely and longitudinally, which results in the appearance of cracks. With the classic method of construction, i.e. pouring the concrete slab in-situ, on the previously installed formwork, the mentioned unfavourable effects are seen even more. The construction of the slab, in which V≈3100 m3 (several hundred mixers) should be installed, will take place in several phases, depending on how much formwork the future Contractor has, as well as on how much concrete the one is able to pour in one phase. The slab constructed in this way will contain concrete of different ages and will be additionally loaded with tensile forces that will occur in the previously built segments of the slab, while the next segments will be concreted. It should be especially noted that in this way the segments of the slab are loaded in the most sensitive phase, while the concrete has not reached a higher strength class (fresh concrete), which is especially unfavourable from the point of view of cracks. Of course, there is also the possibility for the Contractor to take breaks (t> 15 days) between the concreting of the segments, in order for the concrete to reach the necessary properties, but all this drastically increases the cost and prolongs the construction time.

For these reasons, the Designers suggest that the pavement slab be constructed as a prefabricated reinforced concrete slabs.

This method of construction has many benefits:

- The construction time of the bridge is drastically shortened (for several months), and thus great savings in price are made. There is no need for the production of formwork, reinforcement and concreting on the construction site because the fabrication of the slab is made in the plant and their production can begin while other works on the construction site (production of pillars and foundations, installation of steel bridge structure...) are ongoing.
- By installing fabricated slabs, a pavement slab with uniform characteristics is obtained.
- A tensile strength is avoided in the concrete slab due to its own weight.

It is planned to mount slabs with a maximum weight of Q≈ 25 t. The slabs are placed over the upper flanges of the cross girders and cantilevers, in such a way as to provide a gap between them, which will be subsequently filled with concrete, which will monolithize or connect all fabricated slabs into a single unit.

The designer believes that the dismantling of the old bridge needs to be coordinated with the fabrication of the new one for several reasons:

- in order to use the same mechanization and construction site for both operations;
- due to the most efficient conduct of works, in order to shorten as much as possible the time period in which this, very important, traffic route will be left without the bridge.

4.4. Planning and design documentation

The Preliminary Design envisages the formation of a construction site on the left bank of the Sava on the location between the Gazela Bridge and the current Old Sava Bridge (Block 18) in the immediate vicinity of the bridge, which is the most favourable solution from the aspect of technical and economic analysis. However, from the aspect of environmental protection

it is not a favourable solution because the location in question is placed near two wells of BWS, and for these reasons, a new location was proposed for the formation of a construction site on the left bank of the Sava downstream from the bridge, i.e. on the section between the Old Sava Bridge and Branko's Bridge (Figure 4.4-1).

Figure 4.4-1. The position of the construction site on the left bank of the Sava on the section between the Old Sava Bridge

Practically the same technology of fabrication of the new bridge can be implemented on the new location of the temporary construction site, but it also has shortcomings because it is partly located within the "Coastal Area of New Belgrade", which has the status of property under prior protection. According to the Opinion of the Institute for the Protection of Cultural Monuments of the City of Belgrade, if the proposed location proves to be the only possibility, it is assumed that the intervention has a limited duration, that materials and techniques are to be used that will not endanger cultural heritage and natural values and that upon completion of the works, the subject location will be reinstated. When planning the future construction site, it is necessary to cooperate with the Institute for the Protection of Cultural Monuments of the City of Belgrade so that, in order to protect all values of space and its immediate environment, measures could be defined for technical protection of cultural property and goods that are under prior protection.

4.5. Type and selection of materials

The Preliminary Design defines the selection of basic materials for construction, so that all requirements are met from the point of view of technological processes, as well as energy efficiency and environmental protection.

When choosing materials for construction, special attention is paid to the environmental impact assessment in each segment of the activity, assessing the impact of the used materials to the environment.

The impact in all phases of construction, including the use of natural materials, the method of construction, the lifespan of the bridge itself, have been analysed. The selection of materials that meet the following environmental protection requirements has been made:

- Use of efficient materials, i.e. minimal use of materials,
- Use of high durability materials,
- Use of end-of-life recyclable materials,
- Use of reusable materials (scaffolding and formwork).

All materials used are of great durability and require little maintenance. The use of concrete and steel ensures a healthy and safe living and working environment, because there is no emission and dispersion of harmful substances during the operation of the bridge.

Materials containing toxic components will be used minimally during construction. In the production of concrete, a certain amount of energy is used during preparation (mixing) and transport, but the produced concrete waste can be recycled and used again. The basic properties of the sustainable life cycle of concrete are: affordability, durability, easy installation and shaping, fire resistance, good sound insulation, recyclability, moisture resistance, good energy efficiency, inert material that does not require finishing.

Also, one of the most common materials is steel, which is 100% recyclable, and has all the other required characteristics.

4.6. Time frame for project execution

The works will be performed in accordance with the Design Documentation and the Building Permit. During the preparation of the Study in question, there were no precise data on the commencement of works. The estimated construction time of the bridge is 36 months.

4.7. Functioning and cessation of functioning

The construction of the new bridge will be completed when the Use Permit is obtained, and the operation will be carried out in the coming decades. The planned lifespan of the structure is 25 years.

4.8. Construction commencement and completion date

At this stage, we are not in a position to determine the exact commencement date and completion date of the works. The exact dates will be defined in the contract documentation signed between the Employer and the Contractor.

4.9. Production scope

The construction of the new bridge does not imply the production of certain goods. Material that is necessary for construction, such as e.g. concrete mixtures, will be produced inside concrete plants with use permits and will be transported

to the installation site. The same will happen with the necessary materials for the embankment (sand or gravel), which will be delivered from the local material deposit areas or the existing material separation plant in the immediate vicinity. Other materials such as steel structure, drainage elements and other will be delivered to the site ready for installation.

4.10. Pollution control

The control of environmental pollution during the construction phase, as well as during the operation phase of the new bridge should be performed by the republic inspectors for environmental protection. During the construction phase, some control should be carried out by the Engineer, fully in accordance with the Law on Planning and Construction.

4.11. Waste disposal management

The main sources of waste materials from the construction site are: municipal waste, - construction waste, i.e. waste from excess material to be installed, including concrete waste. In order to prevent uncontrolled accumulation and distribution of waste materials, it is necessary to do as follows:

- collect, select and dispose off waste from the construction site on a daily basis at designated locations,
- hand over the generated waste to an authorized operator,
- it is strictly forbidden to burn waste on the construction site,
- a part of construction waste that can be recycled is to be installed on the construction site, and the rest is to be handed over to an authorized operator or transported to a registered deposit area.

During the design of the new bridge, the possibility of reducing waste generation and increasing the recycling of construction waste has been considered. The structure in question is planned with a long service life, the installed materials are also with a long service life, and it is designed so that it is possible to easily separate parts with a short lifespan, in order to facilitate the separation of waste.

When planning a construction site, it is necessary to coordinate all contractors who work at the same time, organize waste separation on site, organize reuse of certain materials and recycling. Also, it is necessary to take into account the economy and usability of materials, as well as the benefits of recycled materials.

Priority should certainly be given to materials with the least negative impact on the environment, which require less energy consumption, so that the construction process is as efficient as possible and to ensure as little waste as possible. Unfortunately, in the Republic of Serbia there is still no adequate legislation dealing with construction waste management, which means that there are no appropriate sanctions or penalties, so everything depends on the voluntarisms of the Contractor, i.e. the Engineer during the construction works.

4.12. Arrangement of access and traffic routes

New access roads will be formed to the construction site. Access for other purposes will be conducted directly across the already existing road, whether it is paved or of soil material.

4.13. Responsibility and procedure for environmental management

Responsibility for the implementation and application of environmental protection measures should be borne by: Employer, Contractor, Engineer and Republic Inspectors for Environmental Protection (Building Permit is issued by the competent Ministry). In addition, the Designer of the technical solution is responsible for the selection of the protection measures. The company that will be responsible for the construction of the new bridge, will also be responsible for conducting monitoring in the construction phase. The hierarchy of responsibilities should be confirmed by special contracts for all phases of design, construction, maintenance, monitoring and control of the results of the envisaged protection measures.

4.14. Training

During the construction of the structures, additional training will be necessary for all employees of the Contractor related to environmental protection, especially from the aspect of performing works in the areas of sanitary protection of water sources. Unfortunately, in the Republic of Serbia there are still no precise legal requirements regarding the protection of the environment during the execution of construction works. Also, additional training is needed for the Contractor's employees who monitor, collect, process and exchange further data.

4.15. Monitoring

Based on the analysis of the planned monitoring (Chapter 9 of the Study) and the schedule of measuring points that are already used for monitoring air quality, surface and groundwater quality, soil quality and noise levels, it is necessary to expand the number of measuring points for monitoring: groundwater by construction of new piezometers, waste water and surface water, noise levels and fauna.

4.16. Emergency plans

If certain emergencies occur, such as fire, flood or weather disaster, the main goal is certainly to save human lives, and only then the environment. The most endangered group are certainly the workers constructing the structure in question. Adequate protective equipment and compliance with the requirements related to safety at work during the construction works is a permanent obligation of each Contractor.

4.17. Method of decommissioning, site reinstating and further use

After the completion of the construction of the new bridge, it is necessary to repair all temporary roads as well as to reinstate the construction site to its original condition. Removal of all excess construction materials, rubble and waste from the construction site and the road area and their disposal is to be done by an authorized operator.

5. OVERVIEW OF THE STATE OF THE ENVIRONMENT AT THE SITE AND THE DIRECT VICINITY (MICRO AND MACRO LOCATION)

5.1. Population, population density and demographic characteristics

In the closer area of influence of the Bridge over the Sava River construction on the site of the Old Sava Bridge to the population, on the right bank of the Sava, there are buildings of "Belgrade Waterfront" Project. According to the Report on the Strategic Assessment of the Spatial Plan of the Special Purpose Area of the Belgrade Coastal Area - the Sava River Bank Area for the "Belgrade Waterfront" Project to the environment, dating from 2014, a total of 1,012 inhabitants lived in the planning area according to the 2002 Census. In the inter-census period, the number of inhabitants decreased by 2.4%, therefore according to the results of the 2011 Census, it amounted to 988 inhabitants.

Within large age groups, according to the results of both censuses, the population aged 27-65 dominates (52.4% in 2002 and 60.2% in 2011), with a tendency of further increase, while the share of children under 15 is low (13.3% in 2002 and 11.8% in 2011) and tends to decline further.

The implementation of the "Belgrade Waterfront" Project will increase the total population of the planned area by almost 18 times, with a simultaneous change in the demographic characteristics of the population. The mentioned changes will directly affect, first of all, the organization of public and communal services, as well as the organization of traffic, which will primarily reflect the impact of the population to the environment. In relation to the planned number of inhabitants within the scope of the Plan, which amounts to about 17,700, the approximate number of school-age children (primary school) in the total population is about 10%, i.e. 1,770 children, while the number of preschool children would be 1,858, i.e. 10.5% of the planned population.

5.2. Flora and fauna

5.2.1. Vegetation - current condition

The location is partly in the ecologically important area of the "Confluence of the Sava into the Danube" of the RS ecological network determined by the Decree on the Ecological Network ("Official Gazette of RS", No. 102/2010), and partly in its immediate vicinity. The Sava with the coastal area in its natural and close-natural state is an ecological corridor of the RS ecological network of international importance.

The area between the Sava Bridge and the Gazela, according to the current manner of use, as well as the Spatial Plan of the Special Purpose Area of the Coastline of the City of Belgrade - the area of the Sava River for the "Belgrade Waterfront" Project ("Official Gazette of RS", No. 7/2015) is a public green area - a park on the left bank of the Sava from the old bridge to the bridge "Gazela", in total area of 10,6 ha.

This public green area is an integral part of the cultural property under the prior protection "Coastal Area of New Belgrade", which is why it has the same degree of protection. The part of the park right next to the bank of the Sava is an integral part of the Ecologically significant area "The confluence of the Sava and the Danube" (a protected natural asset of international importance). Viewed from the old part of Belgrade, as the beginning of the alluvial plateau and the new city, this park represents a unique visual value. Park "Staro Sajmište" in the contact area, is a highly valued habitat (biotope), a fixed element of the Belgrade system of green areas - Figure 5.2.-1. View of a wider location.

In the area closer to the river, grass areas dominate and solitary trees of decades-old age, of weaker condition, in accordance with the characteristics of the species, and smaller groups of deciduous trees and shrubs are present.

Figure 5.2-1. Overview of a wider location.

Parts of the park at higher levels, closer to Brodarska Street, are more densely greened with larger groups of coniferous and deciduous trees and shrubs and equipped with playgrounds and accompanying furniture. The paths in this part are followed by the linear plantings of deciduous vegetation - mostly tree lines of tall and medium deciduous trees, of good condition and decorativeness.

The paths are of different dimensions and materials. The finishing represent mostly stone plates of different colours and sizes.

5.2.2. Fauna-current condition

Large cities, as the last stage in the development of populated areas, are characterized by a specific "urban" fauna. Its formation, development, composition and number of individual species are conditioned by a number of factors. In the first place, one should keep in mind the geographical position and immediately afterwards the composition and structure of the fauna in terms of history, i.e. before the foundation of the city. The development and

condition of urban infrastructure, urbanization and the degree of synanthropization of neighbouring areas are factors that externally affect the formation and specifics of urban fauna. Also of even greater importance are factors within the city itself such as the presence of green areas, rough grazing, parks, sports fields, water areas, rivers and lakes.

Belgrade, as one of the metropolises of Southern Europe and the Balkans, has a specific fauna the composition and structure of which are influenced by all the above factors. However, the presence of two large rivers and their banks and almost untouched islands at their confluence are something very specific that no other large city in the region has. Of the entire fauna of Belgrade, the most noticeable group of animals are certainly birds. Although records of the presence of certain bird species in the area of Belgrade date back to the 19th century, systematic monitoring of bird fauna dates from the second half of the 20th century. To this day, the bird fauna in the area of Belgrade has been and is regularly researched.
Previous research has established the presence of about 200 (196) bird species in the area of the Belgrade estuary, the Great and the Small War Island, while for the entire IBA area "Confluence of the Sava into the Danube" about 210 species have been recorded, however the actual wealth is probably up to 230 species.

The location planned for the construction of the Bridge over the Sava River on the site of the Old Sava Bridge is located about 2.5 km from the confluence of the Sava into the Danube. There are no protected natural assets at this location. The closest protected area is the "Great War Island" Landscape of outstanding features". In 2008, the Institute for Nature Protection of the Republic of Serbia protected the winter habitat of this species in a triangle, the lower peak of Ada Ciganlija-Belgrade Fair-Mala Ciganlijana, with the Decision on prior protection of the "Habitat of the *Phalacrocorax pygmaeus* on the Sava in Belgrade". This area is located about 2.3 km from the location planned for the construction of the bridge. Also, the location is partly placed in the ecologically significant area "Confluence of the Sava into the Danube" of the ecological network of the Republic of Serbia, as well as the internationally important area for birds with the same name and designation RS017IBA. The entire IBA (Important Birds Area) covers a surface of 10 km of the Sava River and 39 km of the Danube. It also includes the forests of Makiš, Sava Lake, Ada Ciganlija and Medjica, and along the Danube it connects the flooded complexes of Beljarica, Kožara, the islands at the confluence of the Sava (Great and Small War Islands) and the Tamiš (Forkontumac, Čakljanac, Štefanac and Donja Ada), as well as the area of the carp pond "Mika Alas" - the former Veliko Blato.

IBA area "The confluence of the Sava into the Danube" was identified on the basis of the presence of three bird species according to the criteria for regionally important areas at the European level (B criteria). These are the pygmy cormorant *(Phalacrocorax pygmaeus)*, the night raven *(Nicticorax nicticorax)* and the white-tailed eagle *(Haliaetus albicilla)*. The location of the construction of the Bridge over the Sava on the site of the Old Sava Bridge does not represent a significant area of any of these species at any time of the year (nesting, wintering, migration), nor a significant feeding area.

The largest habitat of pygmy cormorant in Serbia is located a few kilometres upstream from the location of the bridge construction, but this locality is important only during the winter period. For the last twenty years, night ravens have not nested on the Great and Small War Islands, but mainly around the "Mika Alas" fish-pond or the City Forest near Pančevo. At the location of the construction of the bridge, individual specimens can be found in the period from March to September. The white-tailed eagle is a species with a large range. The closest

site where this species nests, the location planned for the construction of the bridge, is the Great War Island where one pair nests. It occupies a territory of about 5-8 km around the nest. Individuals of this species are seen throughout the year in the vicinity of the Project site, but mostly at higher altitudes.

In Serbia, the presence of 31 species of bats has been recorded so far, within 10 genera and two families: horseshoe bats (Rhinolophidae) - all 5 European species and vesper bats (Vespertilionidae) - 26. This number is considered temporary because of its geographical location, climate and ecological characteristics of Serbia provide hope for the presence of at least 5 more species (Paunović et al., 2011). Some species have adapted well to the urban environment, where they can complete their entire life cycle, finding enough food and shelter. The city centre is most often characterized by intensive traffic and the densest human population. These are the oldest parts of the city with a large number of old buildings suitable for shelters. The outskirts of the city, due to the larger green and water areas, as well as less pollution, due to which is the higher density of insect populations, is an important area of bat nutrition. So far, the presence of 15 species of bats has been recorded in Belgrade, where they find adequate habitats, hunting territories and numerous shelters (Paunović et al., 2011).

In addition, in the area envisaged for the Sava bridge construction, several species of amphibians and reptiles can be found (primarily edible frog- *Rana esculenta*, dice snake - *Natrix tessellata* and grass snake - *Natrix natrix*), but since the banks of the Sava in the zone of the works are developed, there are no adequate habitats for the presence of a larger number of representatives of these groups of organisms, therefore, the impact of the bridge construction on them is negligible.

Of the other fauna species, the subject area is inhabited by synanthropic animal species (primarily, except for birds, small and medium-sized mammals).

5.3. Condition of soil, water, air, traffic noise

5.3.1. Soil

The soil pollution testing program on the territory of Belgrade is implemented by the City Institute for Public Health, Belgrade. Based on the results of the conducted research of land pollution on the territory of Belgrade in 2018 and expert consideration, the following can be stated:

- During the implementation of the Soil Pollution Testing Program on the territory of Belgrade in 2018, the City Institute of Public Health sampled and laboratory tested a total of 96 soil samples at 48 locations;
- Based on the conducted research, which included the examination of soil in the sanitary protection areas of central water supply sources, near major roads, on agricultural land, the area affected by existing landfills and unhygienic settlements, in the vicinity of hazardous industrial facilities and in public areas and playgrounds, we can state that at a larger number of locations there are deviations in terms of the content of hazardous and harmful substances in the soil in relation to the reference regulations;

- Observing all the results of soil pollution testing on the territory of Belgrade in 2018, the most common deviation was related to the increased content of nickel (Ni) in the soil (in 85 out of 96 analysed samples) in relation to the limit values according to the Decree "Official Gazette of RS" No. 30/2018). The increased nickel content in the soil is related to the specific geochemical composition of the surface soil layers in this area and in most cases, it is not predominantly caused by contamination of anthropogenic origin. This can be concluded based on the analysis of a large number of samples and long-term monitoring of soil pollution in the observed area, since similar nickel concentrations are recorded in most of the tested samples;
- Increased concentration of other metals: Lead (Pb) – 6 samples, Cadmium (Cd) 4 samples, Zink (Zn) – 10 samples, Copper (Cu) -18 samples, Chromium (Cr) and Arsenic (As) by 4 samples. The causes should be sought in the harmful impact of the environment, mainly as a result of purposes and activities in the immediate vicinity of sampling sites (point source pollution) and/or air pollution (diffuse spread of pollutants);
- Registered increase in the content of organic parameters: total Hydrocarbons (C10-C40) in 21 samples, as well as pesticide residues DDT 3 at three locations is not so significant in terms of the level of determined concentrations, but indicates that their presence in soil requires further monitoring.
- In the area of sanitary protection of central water supply sources, significant deviations in terms of concentrations of examined parameters were registered at two locations. These are the locations of: Public Fountain Radmilovac and artesian well "Boždarevac" in the city municipality of Barajevo;
- The presence of increased concentrations of certain examined parameters in the soil in the zones of immediate sanitary protection of springs-wells within the central water supply systems can be related to environmental influences and events from the previous period (historical pollution). Analyses of water conducted as part of regular monitoring of the health safety of drinking water from the wells in question, i.e. water supply, do not show the presence/excess of the content of parameters registered in the increased content in the soil in the immediate vicinity of the wells;
- Having in mind the importance of finding increased concentrations of harmful and dangerous substances in the soil at certain locations (especially if they exceed the remediation value), it is necessary to continue monitoring their content in the future, as well as taking appropriate prevention and remediation measures to prevent possible adverse effects to human health and the environment.

The remediation value was exceeded for the nickel content in the soil next to Renney well no. 21 on the left bank of the Sava (monitoring in the period 2011-2013), but the Nickel content determined is within the usual concentrations of this pollutant in our area The remediation value from the Decree was exceeded in this case due to the very low content of organic matter and clay used in the calculation formula, which in the specific case caused a very low remediation value. Therefore, this phenomenon has no significant implications for the condition of the soil and the quality of water taken from Renney well no. 21.

5.3.2. Condition of surface and groundwater

In the area of influence of the Project, the basic hydrological feature is given by the river Sava. Based on the Decree on the Categorization of Watercourses ("Official Gazette of the SRS", No. 5/68) the Sava River (from the border with Croatia to the confluence with the Danube River) belongs to the II class of watercourses. Class II includes waters that are suitable for swimming, recreation and water sports, for breeding less noble species of fish (cyprinids), as well as waters that can be used with normal treatment methods (coagulation, filtration and disinfection) to supply the populated areas with drinking water and for the food industry.

According to the Rulebook on Parameters of Ecological and Chemical Status of Surface Waters and Parameters of Chemical and Quantitative Status of Groundwater ("Official Gazette of RS", No. 74/11) the Sava River belongs to type 1 watercourses - large lowland rivers with fine sediment dominance. For the analysis of the existing surface water quality, the data of the Environmental Protection Agency were used (Opinion number 011-00-0001/299/2018-02 dated December 6, 2018 given in the Annex to the Study) and the data taken from the Report " Results of Surface Water Quality Testing for 2018 " from the web page of the Environmental Protection Agency (www.sepa.gov.rs/download/KvalitetVoda2018.pdf). The analysis of the water quality results of the Sava River, on the Ostružnica profile (coordinates: 4954350; 7445925), determined that the following parameters deviate from the envisaged limit values of pollutants for class II surface waters: Iron (III). Of the priority and priority hazardous substances, the following deviate from the prescribed limit values: Pb-increase in three samples (III/IV), Benzo(a)pyrene in two samples (III/IV), Benzo(g,h,i)perylene in one sample (V), Fluoranthene in one sample (III/IV).

Groundwater quality

The Design on "Operational Monitoring of the Republic of Serbia Groundwater" was implemented in the period November 2018 - April 2019 by the Department of Hydro-geology, Faculty of Mining and Geology in Belgrade and the Institute of Public Health in Kragujevac. This Design includes groundwater in Belgrade, the left bank of the Sava, located in the wider observed area. Sampling of groundwater for the purposes of chemical analysis was performed as part of two campaigns of site visits to monitoring points. Field research was conducted in the period of "low waters" from November 15, 2018 to December 1, 2018 and in the period of "high waters" from March 20, 2019 to April 15, 2019. In Figure no. 5.3.2.-1 the location where the groundwater sampling was performed - the left bank of the Sava is presented.

Figure no. 5.3.2.-1 Location of the monitoring point
The location of the monitoring point is marked with a red symbol (Taken from the Final Report "Operational Monitoring of the Republic of Serbia Groundwater" for the period November 2018 - April 2019)

Analyses of groundwater, of the left bank of the Sava conducted in the period of low (autumn) waters, (in the Annex - Results of field measurements and laboratory analyses conducted in the period November 19, 2018 to December 01, 2018, RB 41), showed an increased concentration of Manganese in relation to MAC for drinking water.

5.3.3. Current air quality status

Air quality control on the territory of Belgrade is carried out by a monitoring system which has established a state and local network of measuring stations and/or measuring points for fixed measurements. The state network of measuring stations and/or measuring points is established for monitoring air quality at the level of the Republic of Serbia. A local network of measuring stations and/or measuring points is established for air quality monitoring at the level of the local self-government unit. The local network consists of additional measuring stations and/or measuring points determined by the competent authority of the local self-government unit on the basis of measurements or assessment procedures for zones and agglomerations for which there are no data on the level of pollutants, in accordance with their requirements and possibilities. Air quality monitoring in the local network is performed according to the program adopted for its territory by the competent authority of the local self-government unit.

The air quality control program on the territory of Belgrade for 2018 and 2019 determines the monitoring of air quality in the local network on the territory of Belgrade. Data on the current status of air quality are taken from the publication "Environmental Quality in Belgrade in 2018", as follows:

1. Continuous fixed measurements of pollutant levels originating from stationary sources of air pollution in populated areas include: Soot, SO_2, NO_2, CO, TX, O_3, PM 2.5, PM_{10}, analysis of heavy metals and Benzo(a)pyrene in PM10, 24 hours every day throughout the year (Table 5.3.3-1);
2. Indicative measurements of the levels of pollutants originating from mobile sources of air pollution (Table 5.3.3-2);

3. Indicative measurements of pollutant levels in order to establish fixed measurements include: SO_2, NO_2 , PM_{10}, analysis of heavy metals and Benzo(a)pyrene in PM10, 24-hour measurements (Table 5.3.3-3)

Table 5.3.3-1. Network of measuring stations and measuring points for continuous fixed measurements of pollutant levels originating from stationary sources of air pollution in populated areas

Location Name	Address
Savski Venac	Miloša Pocerca Street No. 6
New Belgrade	Goce Delčeva Street No. 30
Vračar	Bojanska Street No.16
Rakovica	Primary School "Nikola Tesla", dr Milivoja Petrovića Street No. 6
Zemun	Avijatičarski Trg No. 7
Palilula, Krnjača	Blok Grge Andrijanovića No. 8
Čukarica	Požeška Street No. 72
Savski Venac	Clinical Hospital Center "dr Dragiša Mišović", Heroja Milana Tepića Street No. 1
Zvezdara	Olge Jovanović No. 11
Stari Grad	Obilićev Venac No. 2
Savski Venac	BUS Station – Železnička Street No. 4
Palilula, Krnjača II	Agricultural School, Pančevo Road No. 39
Savski Venac	Veterinary Faculty, Bulevar Oslobođenja No. 18
Lazarevac	Slobodana Kozareva Street No. 1
Zemun	Jerneja Kopitara Street
Ovča	Prvog Maja Street No. 2a
Veliki Crljeni	7 Jula Street No. 19
Ušće, Obrenovac	Mulicipality Ušće

Table 5.3.3-2. Network of measuring points for indicative fixed measurements of pollutants originating from mobile sources of air pollution

Measuring Points Names Location – crossroads
"London" – Kralja Milana Street and Kneza Miloša Street
"Tunnel" – Dečanska Street and Nušićeva Street
"City Hall" – Bulevar Kralja Aleksandra and Kneza Miloša Street
"Hayat" – Milentija Popovića Street Bulevar Mihajla Pupina
"Vuk's Monument" – Bulevar Kralja Aleksandra and Ruzveltova Street
"City Hospital" – Dimitrija Tucovića Street and Batutova Street
"Cvijićeva" – Bulevar Despota Stefana and Cvijićeva Street
"Karaburma" – Marijane Gregoran Street and Vojvode Micka Street
"Train Station" – Savski Trg
"Zeleni Venac" – Brankova Street, Jug Bogdanova Street and Kraljice Natalije Street
"Franš" – Bulevar Oslobođenja and Franš D'Eperea Street
"Studentski Grad" – Studentska Street and Tošin Bunar
"Zemun" – Glavna Street and Zmaj Jovina Street
"Mostar"
"Pančevački Bridge"

The analysis of the obtained results of continuous fixed measurements of pollutant levels originating from stationary sources of air pollution in populated areas within the State and Local Network during 2018 showed that as dominant pollutants in ambient air in Belgrade are present primarily suspended particles PM10 and Nitrogen Dioxide.

In the text below the data in the local air quality control network during 2018 are presented. In Table 5.3.3-3. and Graphs 5.3.3-1 to 5.3.3-5 the average annual concentrations of pollutants obtained by daily measurements are shown for the period from January 01, 2018 to December 31, 2018, minimum and maximum 24-hour values, number of measurements with exceeding the limit (LV), tolerance value (TV) and maximum allowed value (MAV for soot) for 24 hours, number of measurements with exceeding the limit and tolerance value for 1 hour (for automatic measuring stations), exceeding the average annual concentration in relation to the determined LV, TV and MAV for the calendar year at the nearest measuring point "BAS station" – 4 Železnička Street.

Table 5.3.3-3. Overview of statistical analysis of the results of measurements of pollutants in ambient air obtained by continuous fixed measurements (daily 24-hour measurements for the period January 01, 2018 – December 31, 2018)

Measuring Points	BUS Station, Železnička Street No. 4		
Parameters	Soot ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
Middle Value	19	70	<10
Lowest average 24-hour value	5	6	<10
Highest average 24-hour value	68	128	20
Number of measurements which exceeded the limit value	/	86	0
Number of measurements which exceeded the tolerant value	/	45	0
Number of measurements which exceeded the maximum allowed value	6	/	/

Chart 5.3.3-1. The lowest and highest average 24-hour value for soot in 2018

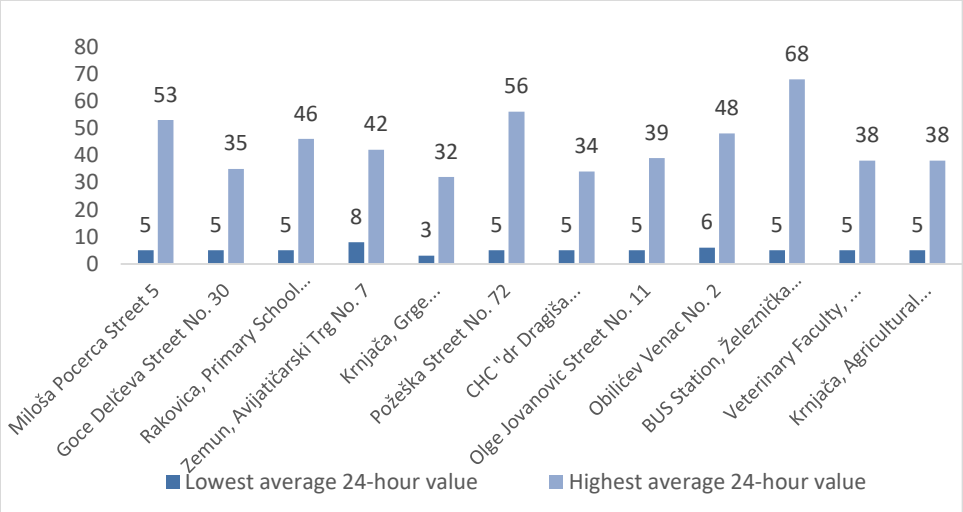


Chart 5.3.3.-2. Number of measurements with exceeding the MAV for 24 hours for soot in 2018

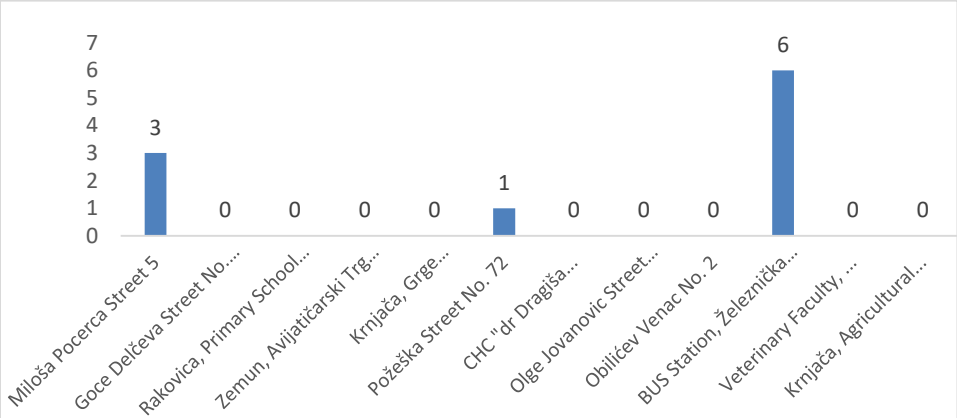


Chart 5.3.3-3. Lowest and highest average 24-hour value for Sulphur Dioxide (semi-automatic methods) in 2018

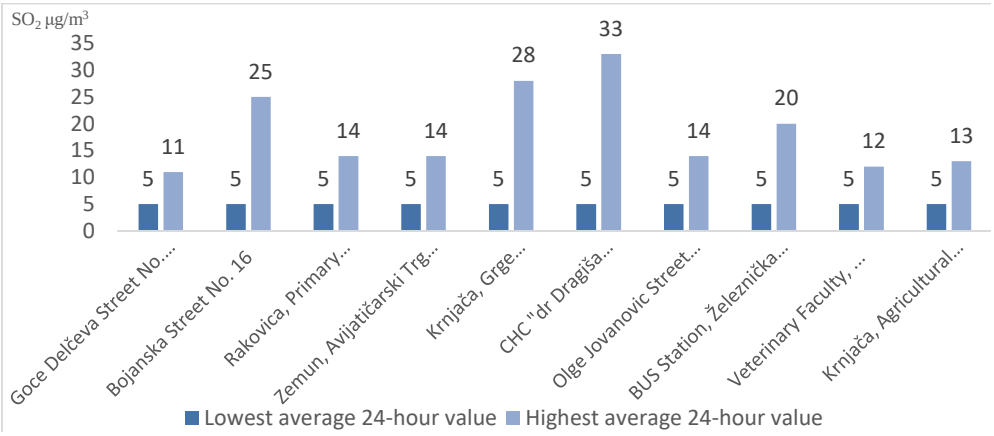


Chart 5.3.3-4. The lowest and highest mean 24-hour value for Nitrogen Dioxide (semi-automatic methods) in 2018

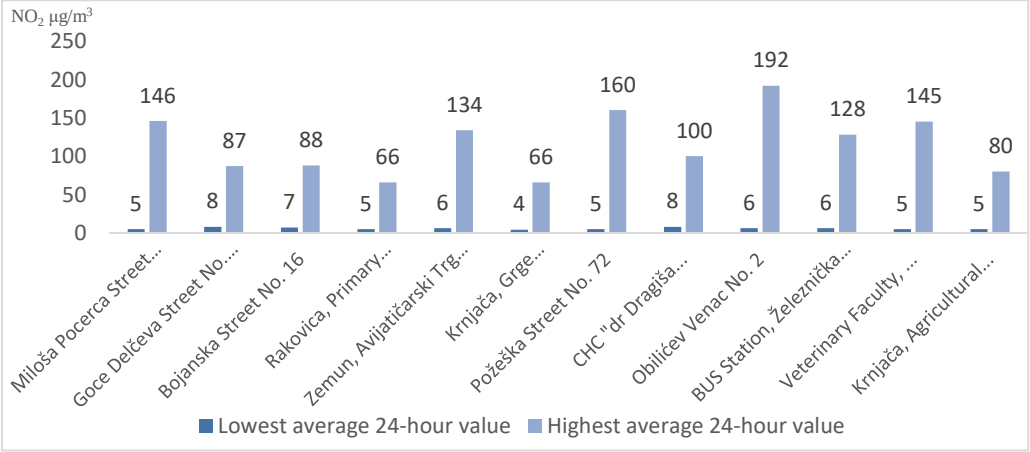


Chart 5.3.3.-5. The highest average 24-hour value for Sulphur Dioxide (automatic methods) in 2018

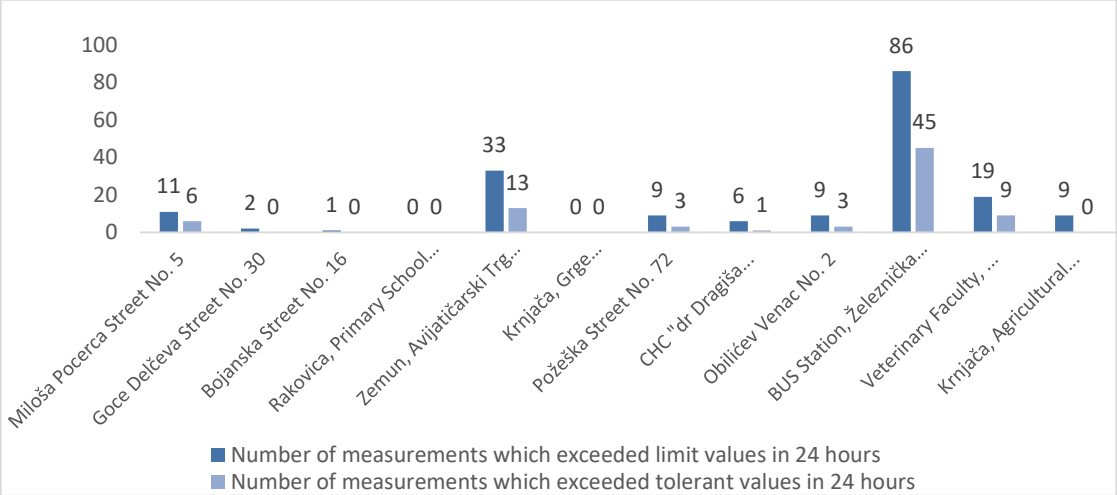


Table 5.3.3-4. and Charts 5.3.3-6. and 5.3.3-7. present the average annual concentrations of suspended particles of PM10, heavy metals and Benzo(a)pyrene in PM10 and Benzene obtained by measurements once a week in the period from January 01, 2018 to December 31, 2018, the lowest and highest 24-hour values, the number of measurements exceeding the limit value (LV) for 24 hours and exceeding the annual value in relation to the determined LV and target value (TV) for the calendar year.

Table 5.3.3-4. Presentation of statistical analysis of pollutants in ambient air obtained by continuous fixed measurements (24-hour measurements once a week for the period January 01, 2018 - December 31, 2018)

Measuring Points	BUS Station, Železnička Street No. 4						
Parameter	PM_{10} ($\mu g/m^3$)	As (ng/m^3)	Cd (ng/m^3)	Ni (ng/m^3)	Pb (ng/m^3)	B(a)P (ng/m^3)	Benzen ($\mu g/m^3$)
Average value	42.3	1.8	0.5	8.3	14.6	1.77	5.6
Lowest average 24-hour value	8.9	<1.0	<0.1	<3.0	<5.0	0.05	2.1
Highest average 24-hour value	117.8	4.4	1.9	29.6	30.6	8.89	9.2
Number of measurements which exceeded the limit values	14	/	/	/	0	/	/
Number of measurements which exceeded the tolerant values	14	/	/	/	0	/	/

Chart 5.3.3-6. Lowest and highest average 24-hour value for suspended PM10 particles (measured once a week) in 2018

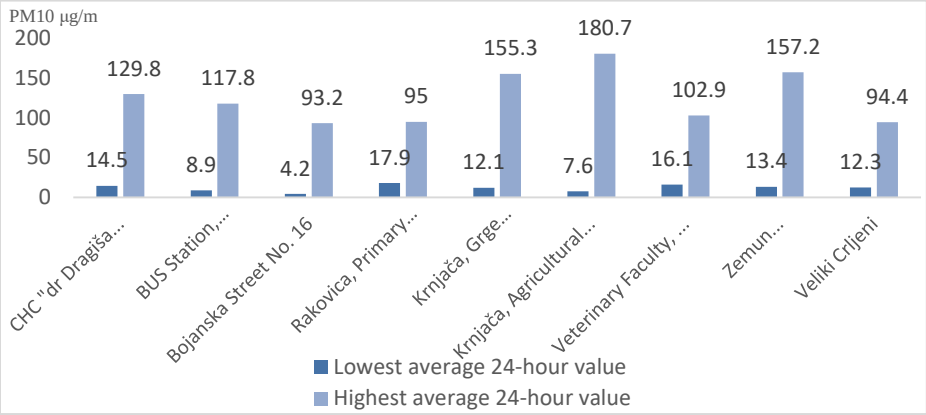
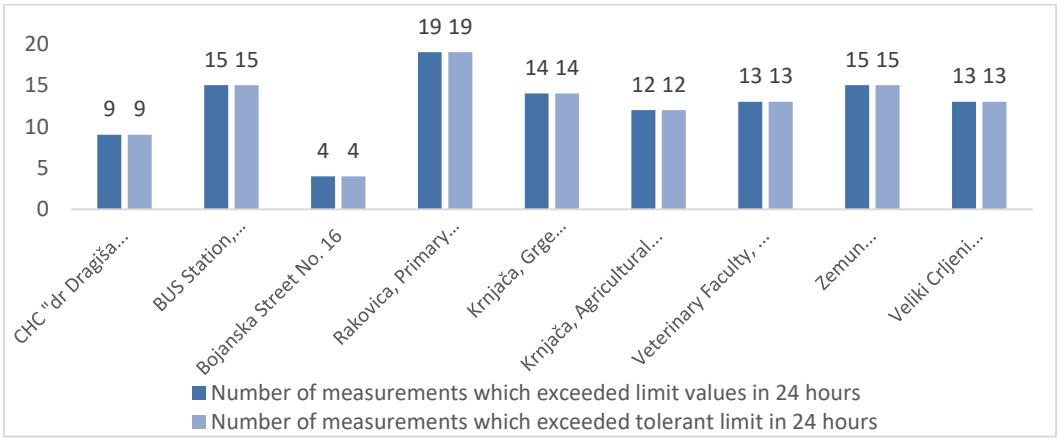


Chart 5.3.3-7. Number of measurements with exceeding the limit and tolerance value for 24 hours for suspended PM10 particles (measurements once a week) in 2018



In the Belgrade agglomeration, as well as at the nearest measuring point "BAS station", in 2018, limit values (LV) of air quality parameters were recorded and the air was excessively polluted.

5.3.4. Traffic noise-current condition

For the purpose of conducting traffic, the bridge has one lane for road vehicles, which is also used by trams. During the construction of the bridge, as well as its subsequent reconstructions, no special systems were considered to reduce the negative impact of noise and vibration originating from road and rail (tram) traffic.

Public city transport of passengers in the daily mode over the Old Sava Bridge is performed on bus lines number 78 and 83, tram lines number 7, 9, 11 and 13, as well as on minibus lines A1 and E1. In the night mode, the public city transport of passengers takes place on the tram line 7N.

The volume of public city transport is determined on the basis of the valid timetable for 2019 and the defined number of departures. The working day when a larger volume of traffic is expected was adopted as authoritative. The number of departures on lines 7, 9, 11, 13, 78, 83, A1 and E1 by periods of the day is shown in the table 5.3.4-1.

Table 5.3.4-1. Number of departures on lines, number of public transport by day periods

Period	Line							
	7	**9**	**11**[1)]	**13**[1)]	**78**	**83**	**A1**[2]	**E1**
Day	175	178	57	91	114	140	33	126
Evening	43	49	20	28	32	34	5	32
Night	39	29	7	16	12	20	6	--

1) Since July 2019 trams number 11 and 13 run over the bridge on Ada
2) Over the Old Sava Bridge it runs only in direction B

Additional volume of tram traffic occurs in the period before and after the end of work on daily lines when empty tram sets depart to regular daily traffic lines from the depot "Sava" in New Belgrade, or when they return from regular lines to the depot.

Due to the steel structure of the bridge and the lack of adequate systems for mitigating noise and vibration, the bridge "operates" during traffic and is an additional source of noise. This problem is especially noticeable when rail vehicles pass, where depending on their characteristics, condition and speed, the total equivalent noise levels during their passage can increase by more than 10 dB in relation to road traffic.

In order to determine the existing situation in the period from June 21 to June 22, 2019 the accredited laboratory of the Institute for Transportation CIP (ATS 01-379) measured the noise level at four measuring points near the Old Sava Bridge (Figure 5.3.4-1.). Measuring point number 1 was placed indoors on the nineteenth floor in the living room of the apartment 19.01, Lamellae A of the Belgrade Waterfront complex. Measuring point 2 was placed in the open space on the nineteenth floor on the terrace next to the living room of the apartment 19.01, Lamella A of the Belgrade Waterfront complex. Measuring point 3 was placed in the open space on the second floor within the terrace for rest and recreation of the residents of Lamellae A of the Belgrade Waterfront complex. Measurement point 4 was placed at the open space on the New Belgrade side of the Sava quay, at the height of Lamellae A of the Belgrade Waterfront complex.

Figure 5.3.4-1. Layout presentation of measuring

Measurements were performed in five 15-minute intervals during the day (24 hours), two measurements in the period from 6 am to 6 pm, one measurement in the period from 6 pm to 10 pm and two measurements in the period from 10 pm to 6 am. The relevant noise levels by measuring points, time periods and the shortest horizontal distance of measuring points from the Old Sava Bridge are provided in Table 5.3.4-2, while their layout is given in Figure 5.3.4-1. More detailed information on the performed noise level measurements can be found in the Test Report number 913-73/17 dated June 26, 2019.

Table 5.3.4-2. Relevant values of noise levels by measuring points and periods of the day

Measuring point designation	Distance from the bridge	Measuring period		
		Day	Evening	Night
	[m]	[dB(A)]	[dB(A)]	[dB(A)]
MT 1	140	37	37	36
MT 2	145	58	59	57
MT 3	145	56	55	56
MT 4	100	60	61	61

Relevant levels in Table 5.3.4-2 at which the limit values of indoor and outdoor noise indicators have been exceeded, in accordance with the Regulation on Noise Indicators, Limit Values, Methods for Assessing Noise Indicators, Disturbances and Harmful Effects of Noise in the Environment ("Official Gazette of RS", No. 75/10), are shaded.

Another problem from the aspect of noise, which was noticed during the measurement, is the problem of restaurants on the water. This problem is especially pronounced during the late evening and night hours. The noise levels they make contribute significantly to total levels at measuring points, i.e. result in significant exceeding of legally permitted levels.

5.4. Climatic characteristics of the area

The climatic characteristics of the investigated area are given in detail in point 2.5. Local factors are expressed in the anticyclonic type of weather when they modify meteorological elements, especially in the thin layer above the populated area. This influence is most often reflected in the horizontal distribution of temperature fields and precipitation.

Factors that influence the climate in Belgrade are:

- topography (vertical gradients),
- substrate (rivers, land, vegetation)
- city structure (city heat island).

The specificity of the location is that it is in the part of the city above which the thermal island of Belgrade is formed. It is more prominent during the minimum than at the maximum temperatures.

5.5. Protected assets (natural, cultural real estates and historical assets)

5.5.1. Protected natural assets

According to the conditions issued by the Institute for Nature Protection in the Decision under 03 no. 020- 1513/2, on June 19, 2019 at the location planned for the construction of the New Sava Bridge, there are no protected areas for which a protection procedure has been conducted or initiated, as well as no recorded natural assets. The location is placed partly in the ecologically significant area "Confluence of the Sava River into the Danube" of the RS ecological network determined by the Decree on the Ecological Network ("Official Gazette of RS", No. 102/10), and partly in its immediate vicinity.

The ecologically significant area "Confluence of the Sava into the Danube" is at the same time an area of international importance for birds (IBA area registered as RS017IBA "Confluence of the Sava into the Danube") where a total of 210 species of birds are registered, using this area for nesting, i.e. as a corridor for flight and for migration. The location intended for the construction of the New Sava Bridge is an area for migration of rare and endangered bird species, which in accordance with the criteria of the Rulebook on Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi ("Official Gazette of RS", No. 5/10, 47/11, 32/16 and 98/16) have been declared strictly protected species.

The Sava with the coastal area in its natural and close-natural state is an ecological corridor of the ecological network of RS of international importance. The position of the Project in relation to protected natural assets is shown in the figure 2.6.4-1.

5.5.2. Protected cultural real estates and historical goods

From the aspect of protection of cultural goods and in accordance with the Law on Cultural Heritage ("Official Gazette of RS" no. 71/94, 52/11 and 99/11) and on the basis of available data it can be concluded that near the location of the new bridge there is a part of the cultural goods under prior protection "Coastal Area of New Belgrade", cultural monument "Staro Sajmište-Gestapo Camp" and "Surroundings of cultural monument Staro Sajmište - Gestapo Camp" assets under prior protection (Figure 5.5.2-1).

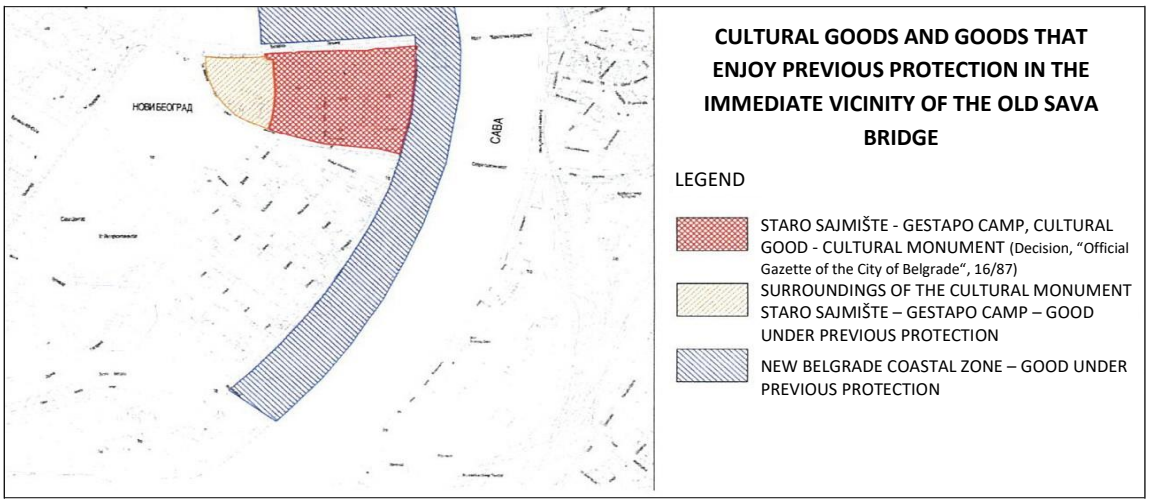


Figure 5.5.2-1. Cultural goods and goods that are under prior protection in the immediate vicinity of the Sava Bridge.

The whole "Coastal Area of New Belgrade" includes a wider area that stretches from the Gazela Bridge to the Old Tram and Branko's Bridge, then the left bank of the Sava and the right bank of the Danube to the mouth of the river. It has been entered in the records of goods under prior protection. The rich cultural layers of Belgrade, as one of the cities with the longest urban tradition, its historically most important and most valuable areas and the rivers Sava and Danube, form part of the coastal area and are an integral part thereof. As material evidence of historical, cultural, social, sociological, urban, architectural and economic development, they represent exceptional and inseparable values of the city's cultural heritage.

5.6. Landscape

Landscape image and landscape characteristics of the site are the result of all influential elements of the landscape - geomorphology, vegetation and hydrography of the area as well as the purpose of the surface, populated area locations, traffic infrastructure and the like. The Old Sava Bridge stretches across the Sava River, connecting two Belgrade municipalities - Savski Venac and New Belgrade. The access roads of the bridge are part of the city street Zemunski put. On the right bank of the Sava in the part of old Belgrade, this street intersects with Karadjordjeva Street, while on the left bank - part of New Belgrade, it intersects with Mihailo Pupin Boulevard.

The view from the Old Sava bridge is of the open type with the dominant alluvial morphology of the Sava river valley and the dominant water body which is the basic characteristic of the landscape view. The two coastal bridges, Branko's Bridge and "Gazela", represent spatial dominants that visually determine the space of the Sava amphitheatre in relation to the rest of the city. The area of the Sava amphitheatre, primarily with its exceptional position in relation to the shores and the urban site, represents the greatest spatial value and potential of Belgrade. The most significant are the views from the river from which the full amphitheatrality of the space is seen on the right, Šumadija bank of the Sava River, where the core of old Belgrade is located, and the park area on the left bank of the Sava - on the section between the Sava Bridge and Gazela.

Observed from old part of Belgrade, as the beginning of the alluvial plateau and the new city, the park areas represent a unique visual value. Park "Staro sajmište" in the contact area, is a highly valued fixed element of the green space system of Belgrade. Closer to the river, grass areas dominate where solitary trees of decades old and smaller groups of deciduous trees are present.

Views from the Vračar towards the Sava amphitheatre and New Belgrade are also realized along the corridor of the street network perpendicularly to Savska Street and directly depending on the height of its front. These visual penetrations, although along narrow-profile streets, have a significant effect on the experience of the space.

The view from the bridges and the Sava quay on the Sava slope of Old Belgrade is the right bank of the Sava River and the horizon line of the Šumadija, from "Pobednik", the Belgrade Fortress, the Cathedral, the Church of St. Marko, courtyards on Terazije - Old and New Palace, National Assembly, Palaces of Belgrade (Beogradjanka), Temple of Saint Sava and further towards Topčider and Banovo brdo.

The location of the Old Sava Bridge is special for the richness of views, the specificity of the view line and the dynamics dictated by the urban elements of the old town located on the right bank of the river together with the new urban arrangement of the Sava amphitheater which is still under construction. The green area of the left bank of the river in the direction of Branko's Bridge and Kalemegdan Park on one side and the view towards the Gazela Bridge and the Ada Bridge on the other side provide special valour to the view.

5.7. The relationship between the specified environmental factors

All analyses presented within the existing state of the environment within the spatial boundaries that include the area of influence of the new Bridge over the Sava River show that most of the impact comes from traffic and urbanization. Air pollution and exceeding the noise level is due to the traffic on the traffic network of the investigated area. In the agglomeration of Belgrade, as well as at the nearest measuring point "BAS station", in 2018, exceeding of the limit values (LV) of air quality parameters were recorded and the air was excessively polluted. Surface and groundwater pollution occurs due to inadequate waste disposal, inadequate treatment of municipal waste water and industrial waste water. The analysis of the current situation in the field of ecosystems, flora and fauna came to the conclusion that there was already an anthropogenic impact on plant and animal species.

6. DESCRIPTION OF POSSIBLE SIGNIFICANT IMPACTS OF THE PROJECT TO THE ENVIRONMENT

6.1. Air, water, soil, noise, heat and radiation

6.1.1. Impact on air

Impacts on air pollution were analysed in two aspects: construction phase and operation phase.

Construction phase

During the preliminary works and construction of structures (in terms of construction), construction machinery (trucks, excavators, mixers, etc.) will be present, propellant of which is diesel fuel, and as a result, the emission of pollutants into the atmosphere can be expected in increased work intensity. By engaging construction machinery, there is a different intensity of exhaust emissions depending on the type and number of mechanizations, fuel quality, operating mode and engine load. The specific emission of pollutants is characterized by the release of a large number of products of complete and incomplete combustion of petroleum products with internal combustion engines. The most important, from the aspect of air pollution are: CO, CN, NO_X and solid particles.

Table 6.1.1-1 Harmful substances in the combustion of diesel fuel[1]

Concentration kg/1000 lit of diesel fuel	CO	CH	NO_X	Solid Particles
DIESEL ENGINE	7,1	1,2	26,4	13,2

Table 6.1.1-2 Emission value of diesel fuel consumption from 15-20 lit/h2

Pollutant	CO	CH	NO_X	Solid Particles
Emission (g/sec)	0,04	0,007	0,15	0,073

[1] CRC Handbook of Environment Control, Volume 1 – Air Pollution, section Emission sources, 3,6, Transportation emission page 323; [2] CRC Handbook of Environment Control, Volume 1 – Air Pollution, section Emission sources, 3.7. traffic emissions study page 349

This impact cannot be precisely quantified, because it depends on the scope of mechanization and the duration of the works, but it can be said that the impact on air quality will be temporary. For this reason, during the works, we can expect a temporary increase in the concentrations of pollutants in the air in the immediate vicinity of the construction site. This impact can be considered temporary, i.e. it will last as long as the construction of the structure itself.

Impact during operation

For the purposes of this analysis, the emission of harmful gases in VISUM was calculated for two scenarios:

- NO INVESTMENT scenario – which implies the future planned network in the city area with the Old Sava Bridge in the existing, traffic profile and
- INVESTMENT scenario – which implies the future planned network in the city area with the construction of a new bridge on the site of the existing Old Sava Bridge, with a wider traffic profile.

Data on the forecast of traffic load for both given scenarios for 2023 have been taken from the Traffic Analysis, which is an integral part of the Preliminary Design of the Bridge over the Sava River on the site of the old Sava Bridge-Feasibility Study (SI CIP, Belgrade, 2019).

Forecast of traffic load - NO INVESTMENT scenario

Based on the formed transport models with and without investment, for all cross-sectional years, the future traffic load of the street network and the public transport network was generated. The traffic load for the NO INVESTMENTS network for 2023 as an output from the transport model is presented in Figure 6.1.1-1. The figure shows the designed total number of vehicles in the busiest, peak hour by direction of travel and the number of passengers in public transport.

Figure 6.1.1-1. Forecast of total number of vehicles in the busiest, peak hour by directions of movement and number of passengers in public transport [vehicles / h] – 2023
No investment

Forecast of traffic load - INVESTMENT scenario

As described above, the INVESTMENT network consists of the NO investment network and the new bridge. The new bridge is modelled with the characteristics from the Preliminary Design and with a capacity of 2600 veh/h per direction and a free speed of 80 km/h. After the load of the network in the transport models, the traffic loads of the street network and the public transport network of passengers were obtained (Figure 6.1.1-2).

Figure 6.1.1-2. Forecast of total number of vehicles in the busiest, peak hour by directions of movement and number of passengers in public transport [vehicles / h] – 2023
With investment

The calculation was made under the assumption that the emission is directly proportional to the distance travelled and the travel time. These calculations are under the assumption that the emission is directly proportional to the distance travelled and the travel time. The emission values of the basic pollutants for 2023, for both given scenarios are provided in the following table.

Table 6.1.1-3 Emissions of basic traffic pollutants, for both scenarios

Pollutant	No INVESTMENT	INVESTMENT network
Benzene	12.139	12.121
CH_4	9.595	9.580
CO_2	146,303,783	146,111,261
CO	2,237,579	2,235,455
HC	274.543	274.089
NMHC	264.949	264.509
NO_2	85.312	85.218
NO_x	791.385	790.662
PM	29.118	29.084
SO_2	773	772

As the Belgrade transport model covers the entire administrative area of the city (all 17 municipalities), the results of the emission are calculated for the entire city network, therefore, these results should be interpreted in a broader context, and not in the immediate area of influence.

The difference in the network with and without investment is practically only in the capacity and speed on the bridge, while the length is almost the same, the emission reduction is expected based on the improvement of the traffic flow. On the other hand, the number of vehicles on the bridge is growing, therefore, the effects of improved flow are diminishing. In that sense, savings of 0,15% at the level of the entire city territory are an indication that there are improvements, but more precise values of environmental impacts from the Belgrade Transport Model cannot be obtained.

Hypothetically, there is a possibility of local air pollution as a consequence of traffic. This hypothesis is theoretical, bearing in mind that it is a consequence of the arrival and departure of people to the planning area, for work or some other requirements. On the other hand, due to the construction of the New Sava Bridge, the route used by the users within the wider central area will change. These changes will lead to more efficient traffic flow and shortening travel times not only for bridge users but also for all users of the wider central area due to the reduction of traffic load. Savings in travel time and distance travelled by users directly affect both the reduction of harmful gas emissions and fuel consumption savings.

Having in mind the assumption that in the future newer generation passenger vehicles with reduced emissions will be used, it can be concluded that in the phase of using the New Sava Bridge, the impact of traffic to air quality will be more environmentally friendly compared to the current condition.

6.1.2. Impact on groundwater and surface water

During the construction of the Bridge over the Sava River and its subsequent operation, there may be temporary and permanent pollution of surface and groundwater.

Construction phase

During the construction of the newly designed bridge, negative impacts on surface and groundwater are possible as a consequence of the construction of the planned bridge. It should be emphasized that these pollutants are not permanent and after the cessation of works with the adoption of the necessary protection measures, these phenomena would be reduced or would disappear completely over time.

When performing construction works, there are a number of activities that can cause negative impacts on the flow regime and water quality:

- Construction works (deep excavations, destruction and removal of the natural surface layer, etc.). In this way, disturbances of natural feeding directions are possible, and at the same time by removing the surface layer and creating new catchment areas, turbid or otherwise polluted water is quickly drained into the ground, as well as into surface waters.
- Construction machinery - potential danger of spillage or accidental spills of petroleum and diesel derivatives, disposal of motor oils and similar waste.
- Uncontrolled disposal of excavated material, placement of mechanization plants or asphalt plants near surface waters.

- Use of unsuitable construction materials.
- Uncontrolled drainage of sanitary water at the location of facilities for accommodation of workers, where minor pollution is possible from the process of food preparation, as well as sanitary facilities.

Possible accidental and intentional local pollution due to non-compliance with work procedures or inadequate handling and transport of hazardous substances, which would constitute a breach of the law.

Impacts during the construction of the bridge on surface and groundwater are temporary and last until the works stop. The magnitude of the impact can be considered low while the sensitivity of the resources is considered high, so the significance of the impact in this case is moderate and temporary. Adherence to a range of proposed prevention measures during construction will reduce the negative impact on these sensitive areas. An overview of the necessary measures to reduce the negative impacts during the construction phase on the waters is provided in the chapter 8.

Operation phase

The main sources of pollutants in the operation of the Bridge over the Sava are: vehicles, rainfall, dust and precipitation.

In the operation phase of the bridge, it is logical to expect that water pollution will primarily be a consequence of the following processes:

- exhaust gas deposition,
- tire wear,
- car body destruction and cargo seepage,
- spillage of cargo,
- disposal of organic and inorganic waste,
- deposition from the atmosphere,
- wind blow,
- scattering due to the passage of vehicles.

Pollution that is a consequence of these processes in its time characteristics can be permanent, seasonal and accidental.

Permanent pollution is primarily related to the volume, structure and characteristics of the traffic flow. The consequence of the traffic is the permanent deposition of harmful substances on the road surface and the accompanying elements of the cross section, which are washed out when precipitation occurs. It is primarily about the deposition of harmful substances from exhaust gases, oils and lubricants, tire and road wear, car body wear, etc.

Seasonal pollution is related to a certain period of the year. A typical example of this type of pollution is the use of salt to maintain the road in the winter months. This type of pollution is characterized by the fact that in a very short period of time, which includes the salt pouring on the pavement and the consequences of melting, high concentrations of Sodium Chloride occur.

Accidental pollution most often occurs due to the transport of hazardous materials. It is most often diesel oil and its derivatives, although it is not uncommon for vehicles that transport very dangerous chemical products to be damaged. What is a special problem in this case is

the fact that these are almost current very high concentrations that cannot be predicted in time or space. The consequence of this is that from the point of view of protection, significantly wide areas must be protected, most often water supply areas, but also frequently high-category surface waters.

Types of pollution and form of presence

In the waters that flow from the road surfaces, a number of harmful substances are present in concentrations that are often above the maximum allowed for discharge into watercourses. These are primarily fuel components such as Hydrocarbons, organic and inorganic Carbon, Nitrogen compounds (Nitrates, Nitrites and Ammonia). A special group of elements is represented by heavy metals, i.e.: Lead (fuel additive), Cadmium, Copper, Zinc, Mercury, and Nickel. A significant part is represented by solid substances of different structure and characteristics that occur in the form of precipitates, suspended and soluble substances. It is also possible to register substances that are a consequence of the use of corrosion protection materials. A separate group of very carcinogenic materials are Polyaromatic Hydrocarbons (Benzo-a-pyrene, Fluoranthene) which are the product of incomplete combustion of fuel and used engine oil. For the indication of the present pollutants that occur in dissolved and undissolved form, there are a number of macro indicators such as: pH, electrical conductivity, suspended and sedimentary substances, HPK, BPK, grease and oils, etc. Table 6.1.2-1 shows the sources of pollution and typical pollutants in run-off from roads.

Table 6.1.2-1. Sources of pollution and typical pollutants that are found in run-off from roads.

Pollutants	Pollution sources
Solid particles	Wear of roads, vehicles, atmosphere and road maintenance
Nitrogen and	Atmosphere and application of artificial fertilizers
Lead	Lead in the form of Tetramethyl Lead from vehicle exhaust, tire wear
Zinc	Wear of tires, motor oils and lubricants
Iron	Rust from vehicles, metal structures on the highway (bridges, bumpers), moving engine parts
Copper	Metal protective coatings, wear of bearings and brushes on the engine, moving engine parts, wear of brake linings, fungicides and insecticides
Cadmium	Tire wear and pesticide use
Chrome	Metal protective coatings, moving engine parts, wear of brake linings
Nickel	Diesel fuel and petrol, lubricating oils, metal protective coatings, wear of brake linings and asphalt surfaces
Vanadium	Fuel additives
Titanium	Paint for painting road markings
Manganese	Moving engine parts
Sodium, Calcium and Chlorides	Defrosting salts
Sulphates	Pavement subgrade, fuel and defrosting salts
Petroleum and petroleum products	Spraying and leaking fuel, antifreeze and hydraulic oils, wetting the asphalt surface

Basics for determining the concentrations of pollutants

Basic ratios, which are of special importance for the calculation of pollutant concentration, can be systematized in the form of the following paragraphs:

- The highest concentrations of pollutants were registered in the waters that run off from the roads during the winter months, when the most intensive sprinkling of salt occurs;
- The concentration of most pollutants directly depends on the duration of the dry weather period before the rain and the traffic load. The highest concentrations are reached in the first 5 - 10 min. duration of rain and then decrease sharply;
- Concentrations of suspended solids are proportional to the intensity of rain and the highest concentrations are obtained during the highest flow;
- Water losses due to splashes during passing of vehicles do not exceed 10% of the total;
- Spillage of material from the road during the dry period, due to air currents as result of passage of vehicles, does not significantly affect the reduction of concentration;
- Pollution of surface waters, i.e. those that flow from the road surface is important and appropriate technical protection measures must be applied in certain conditions.

In order to start and evacuate all particles from the road, rain with a minimum intensity of 5.4 mm/h (15 l/s/ha) for at least 10 minutes is required. For the calculation of the highest possible concentrations of pollutants, an accumulation period (dry period) of 10 days has been adopted, followed by rain of a minimum duration of 10 minutes. It should be borne in mind that this is a theoretical value, i.e. that the probability of rain that will last and be of sufficient intensity to evacuate all pollutants from the road is very small. In accordance with the presented views (and on the basis of a certain number of foreign experiences), an estimate was made of the concentration of pollutants generated by the exploitation of the designed Bridge over the Sava River, for traffic load in the planning period (2023). The obtained results are shown in the table 6.1.2-2.

Table 6.1.2-2. Estimated concentration of pollutants in atmospheric waste water, generated by the use of the Bridge over the Sava River for traffic load in the planning period (2023)

Pollutants	The concentration of pollutants	Envisaged concentrations of pollutants in atmospheric waste water from 1 ha of road surface (mg/l)	GV* (mg/l)
Suspended particles	734.2	2235	25
Biochemical consumption of O2 (BPK5)	32.9	100	5.0
Chemical consumption of O2 (HPK)	248.1	755	10
Oil and grease	11.39	35	-
Copper (Cu)	0.051	0.15	0,005-0,112 depending on the hardness of the water according
Lead (Pb)	0.062	0.19	0,0012**
Zink (Zn)	0.400	1.22	0,3-2 depending on the hardness of the water according

* * Limit values of parameters are defined on the basis of legal regulations: Decree on limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement ("Official Gazette of RS", No. 50/12) and Rulebook on environmental

and chemical parameters, status of surface waters and parameters of chemical and quantitative status of groundwater ("Official Gazette of RS", no. 74/11)
** Average annual concentration - Decree on limit values of priority and priority hazardous substances that pollute surface waters and deadlines for their achievement, "Official Gazette of RS", no. 24/14

The literature used for the point of influence is as follows:

- Barrett, M.E., Malina, Jr., J.F., Charbeneau, R.J., Ward, G.H., 1995, Water Quality and Quantity Impacts of Highway Construction and Operation: Summary and Conclusions, Centre for Research in Water Resources, Technical Report No. 266, University of Texas at Austin, Austin, TX.
- Drainage of roads and city roads, Professional seminar, Faculty of Civil Engineering, University of Belgrade, Institute of Transportation and Geotechnics, Belgrade, December 17-19, 1987

Estimates of atmospheric waste water pollution are determined in accordance with the required class of watercourses. Recipients of atmospheric waste water from the bridge are the river Sava, which belongs to the II class of watercourses and city sewerage (the quality of waste water discharged into the city sewerage system must comply with the Decree on Limit Values for the Emission of Pollutants into Water and Deadlines for Their Achievement, III Municipal Waste Water ("Official Gazette of RS", no. 67/11, 48/12 and 1/16). By analysing the predicted values of pollutant concentrations in atmospheric waste water shown in Table 6.1.2-2, it can be concluded that during the operation of the future bridge there is a possibility of surface and groundwater pollution if atmospheric waste water is discharged in an uncontrolled manner and without adequate treatment into natural recipients.

However, the adopted concept of drainage, which envisages controlled collection and conduction of atmospheric water, and then their purification before entering open natural watercourses, reduces the negative effect of exploitation of the newly designed Bridge over the Sava River to the quality of surface and groundwater in the corridor. This achieves a certain degree of protection against pollution not only of the recipient but also of the water supply source of Belgrade.

The danger of occurrence of accidents during the operation of the New Sava Bridge is minimal, because the transport of hazardous substances is not planned across the bridge in question.

6.1.3. Impact on soil pollution

The overall problem of the relation between the road and the environment is determined by the relations that occur in the domain of soil pollution. Soil is a very complex system that is very sensitive to various influences, because it reacts to very small changes, and thus degradation of its basic characteristics occurs.

Construction phase

During construction, there can also be a breakdown of construction machines, i.e. to the discharge of oil and fuel to the soil. Such discharges cannot significantly endanger the soil, because they are in small quantities, and can be prevented by choosing an adequate location for filling fuel on a concrete plant or outside the construction site and regular maintenance of construction machinery, for which the Contractor is responsible. If oil and fuel are discharged to the soil, it is necessary to rectify it immediately, by sprinkling the spillage location with sorbent (e.g. sand, zeolite, wood sawdust, etc.) in order to collect spilled petroleum products.

Operation phase

In the operation phase, soil pollution in the close area is mainly a consequence of the following processes: pollution from surface waters from the road; exhaust deposits; disposal of organic and inorganic waste; spillage of cargo; deposition of particles from the atmosphere brought by the wind.

Any pollution, which is a consequence of these processes, according to its time characteristics (as pointed out in water pollution) can be permanent, seasonal and accidental.

Permanent (systematic) pollution is a consequence of traffic.

Seasonal pollution is related to a specific period of the year. A typical example of this type of pollution is the use of salt to maintain roads in the winter conditions. This type of pollution after a certain period of time leads to a significant increase in the salinity of the soil in the road area, so that the soil significantly loses its original properties.

Accidental pollution occurs mainly due to the transport of dangerous substances. It is most often petroleum and its derivatives, although it is not uncommon for vehicles transporting highly dangerous chemical products to get damaged.

The Design envisages controlled collection and treatment of atmospheric waste water and water from washing the road on the separators of light petroleum products, before entering the recipient-river Sava. In this way, the negative impacts to the quality of the soil in relation to the existing condition are significantly reduced.

6.1.4. Traffic noise

The impact on the noise level in the environment due to the construction of the Bridge over the Sava River can be divided into two segments. The first includes noise during the construction of the bridge, and the second noise due to traffic.

a) During the works

Prior to the construction of the future new bridge, it is planned to completely remove the existing Old Sava Bridge and its pillars, which is the subject of a special design and will not be considered here.

Noise levels during the construction of the New Bridge over the Sava River depend primarily on the organization of works on the construction site, the number and type of engaged construction machines, as well as their position and distance from residential buildings in the impact zone. Since during the planning of noise protection measures, the organizations and technologies of work on the construction site have not been defined, no acoustic modelling and analysis of the possible impact of noise to the environment was performed. In any case, during the construction of the new bridge, during normal working hours it will be necessary to perform noisy construction works where possible, it is necessary to use the quietest available machines for a certain type of work, where it is convenient and to use cost-effectively the temporary facilities for noise protection, to educate the engaged personnel on the construction site regarding the impact of noise, to remove the noisiest machines as much as possible from residential and other sensitive facilities, organize the delivery and removal of materials during working hours of the construction site, inform the affected population about the upcoming noisy works, etc. During the works, it is necessary to conduct periodic noise

measurements in order to determine that the generated levels do not exceed the legally permitted limits.

The Contractor or another person hired by the Contractor must prepare a Noise Impact Study during the execution of works on the construction site in accordance with the works to be performed, its technology of execution of works, engaged machines, equipment and tools, etc. In case it is determined that the works will endanger the population in terms of noise, the Study should provide for temporary noise protection measures.

It is necessary that the Employer, prior to the commencement of works, approves the Study on the impact of noise during the works on the construction site, and the Contractor organizes its business on the construction site in accordance with the Study.

b) During bridge operation

Noise during the operation of the bridge occurs as a consequence of road and rail traffic across it. The old bridge, due to its construction solutions, largely participated in the generation of noise, with its vibration during traffic. The New Sava Bridge, with its modern technological and construction solutions, has minimized its participation in the total noise levels.

The analysis of the impact of the construction and operation of the New Sava Bridge on the total noise levels in its environment in relation to the existing Old Sava Bridge was performed using the software package "Predictor-LimA Software Suite - Type 7810" (version V2019.3) manufactured by Brüel & Kjær. It was adopted to use the method "CNOSSOS-EU - Common Noise assessment method" for the calculation of noise produced by road and rail traffic (2012 edition). The method is in accordance with Directives 2002/49/EC and 2015/996/EC.

The calculation of the noise indicator was performed on a network of points 10 x 10 meters and a height of 2.25 meters above the ground. Measuring points for determining the noise level on the façades of residential and other buildings were placed 0.5 meters in front of them. The calculation of noise indicators was performed using the first degree of reflection, except for measuring points on façades for which reflection from the observed structure was not considered.

Acoustic simulations and calculation of noise indicators with the software package "Predictor-LimA Software Suite - Type 7810" were done with a maximum dynamic error of 0,5 dB(A).

No official acoustic zoning has been carried out in the observed area. In order to be able to analyse the impact of noise to the population and, if necessary, plan protection measures, it was required in compliance with the Decree on Noise Indicators, Limit Values, Methods for Assessing Noise Indicators, Disturbances and Harmful Effects of Noise in the Environment (Official gazette of RS", no. 75/10) to assume that the bridge with the associated access roads and the corresponding buffer zone belongs to the acoustic area 5 (City centre, crafts, trade, administrative zone with apartments, zone along highways, highways and city roads), the area of Belgrade Waterfront belongs to acoustic zone 4 (Business-residential areas, commercial-residential areas and children's playgrounds) and that the park on the left side of the Sava river belongs to acoustic zone 1 (Areas for rest and recreation, hospital zones and rehabilitation centres, cultural and historical sites, large parks). The limit values of the noise

indicator for acoustic zone 1 for the day period are Lday = 50 dB (A), the evening period Levening = 50 dB (A) and for the night period Lnight = 40 dB (A), for acoustic zone 4 for the day period are Lday = 60 dB (A), evening period Levening = 60 dB (A) and for night period Lnight = 50 dB (A) and for acoustic zone 5 for day period are Lday = 65 dB (A), evening period Levening = 65 dB (A) and for the night period Lnight = 55 dB (A).

The day period is defined in the time interval from 6 am to 6 pm, the evening period in the interval from 6 pm to 10 pm and the night period in the interval from 10 pm to 6 am.

Based on the data on the perspective volume of road and tram traffic, the characteristics of the bridge, the new road and track, as well as the 3D model of the terrain, the noise level was calculated. Technical data required for modelling and acoustic calculations were taken from the Preliminary Design of the Bridge over the Sava River on the site of the old Sava Bridge and the Feasibility Study (SI CIP, Belgrade, 2019).

In order to obtain comparable results for both the Old and the New Sava Bridge, the same volume of road and rail traffic was used together with their technical and operational characteristics.

The description of the existing condition of the bridge, as well as the description of the characteristics of the new bridge was performed with available parameters within the selected method of calculation of noise indicators (condition of the road structure, condition of the track, type of bridge structure, etc.).

Indicators of total noise (road and rail) when traffic takes place over the Old Bridge over the river Sava for the period of night, when the limit values of indicators are the least, presented graphically in the form of noise maps are provided in Figure C10 in the graphic appendices. Indicators of total noise for the period of the night after the construction of the new bridge and its commissioning in the form of noise maps are provided in Figure C11 in the graphic appendices. Modern technical solutions for the New Bridge over the Sava River enable the impact of the structure itself, which is caused by its vibration due to traffic, on the overall noise levels to be significantly reduced. Also, the new railway track structure will contribute to an additional reduction of noise levels at the source itself during road and rail traffic. The levels of reduction of total noise levels due to the construction of a new bridge and the flow of traffic over it in new, better conditions are shown in the form of noise maps in drawing C12 in the graphic appendices. Depending on the location of the receiver, its spatial position in relation to the bridge itself and the roads on it, the total noise levels in the vicinity of the new bridge are reduced by up to 17 dB. Given the proximity of residential buildings "Belgrade Waterfront" and other sensitive areas (promenade and park on the left side of the Sava River), traffic noise levels will exceed the legally allowed levels. As the construction of "Belgrade Waterfront" started before the construction of the new bridge, it is assumed that during the design and construction of facilities, they applied adequate noise protection measures from traffic and the old Sava Bridge. For these reasons, it is not necessary to install 4 m high sound barrier on the new bridge as additional noise protection measures. The construction of the new bridge is an additional measure of noise protection in relation to the current condition.

6.1.5 Heat and radiation

As this is an assessment of the impact of the bridge Project on the environment-heat, electromagnetic and light radiation does not need to be considered in the impact analysis.

6.2. Impacts on population health

The health impacts of the construction of the new Bridge over the Sava include the impacts on the population in residential buildings on the left and right banks of the Sava, as well as on motor vehicle drivers and other road users (passengers, co-drivers, pedestrians). These impacts include exposure to noise and air pollution during the construction and operation phases of the bridge.

Gädke distinguishes four effects of noise to the organism:

- I.(40-50 dB)-psychic reactions:
- II.(60-80 dB)-autonomic nervous system disorder:
- III.(90-110 dB)-hearing reduction:
- IV. (120 dB)-characteristic hearing impairment.

Traffic noise is characterized by a level of 40-100 dB (A), which means that all signs of harmful effects of noise can be found. The impact of noise on human health depends on a number of factors such as: individual sensitivity, total amount of acoustic energy, frequency composition, age, continuity or discontinuity, exposure. Physiological, non-specific effects of noise are reflected in the change in the frequency and rhythm of the heart and respiratory system. Noise causes changes in the cardiovascular system: it mostly leads to a decrease in blood pressure, and only with intense high-frequency noise is an increase in blood pressure found, sometimes accompanied by heart rhythm disorders and pain in the heart area. Under the influence of noise, disorders of the endocrine glands (thyroid, pituitary and adrenal glands) occur, as well as secretory and motor functions of the stomach. Changes in the blood have also been observed: hyper and hypoglycaemia, hypocaliemia and eosinophilia.

Under the influence of noise, the first changes (before the changes in the auditory analyser) occur in the brain in the form of spasm of blood vessels in the brain. As a consequence, there is an increase in pressure in the blood vessels of the brain, and if this lasts longer, functional changes occur in the central nervous system, especially in its vegetative functions. Headaches, tinnitus, dizziness, increased irritability and emotional instability occur in people exposed to noise. There is a close connection between the general fatigue of the organism and the exposure to noise. In addition, noise adversely affects concentration and communication during work, as well as at rest.

With acute exposure to noise of considerable intensity, there is a decrease in auditory sensitivity (auditory effects of noise). With intense and prolonged noise, there is a high risk of hearing damage. Sound trauma usually occurs progressively, with prolonged exposure to noise exceeding 80dB. Dilatation of the pupil, narrowing of the visual field and decrease in the speed of perception occur with eyes.

Exhaust gases from fuel combustion in internal combustion engines contain various amounts of Carbon Monoxide, Carbon Dioxide, Nitrogen Oxides and other gases. The path of

penetration of these gases into the body is the respiratory system, so the harmful consequences for the body are manifested mainly on the respiratory organs. Pulmonary oedema, bronchitis and bronchopneumonia can occur as a consequence of poisoning with these gases. Only in the case of extremely high concentrations, some of these gases can have harmful effects on other organs in the body (acute carbon monoxide poisoning causes death or coma followed by diffuse brain damage, carbon dioxide causes depression of the respiratory centre). Based on the significance of impacts from the aspect of population exposure to noise and air pollution, the significance of negative impacts on population health is low in the construction phase and in the phase of bridge use, assuming that general and technical protection measures provided in Chapter 8 of this Study are applied.

6.3. Micro climatic conditions on the bridge and the impact on the climatic characteristics of the area

Bridges represent features of special micro climatic conditions on roads. In the open, water evaporates at any temperature, so atmospheric air will always contain more or less moisture. The air can receive moisture until it is saturated, i.e. until the vapour voltage is established in the air, corresponding to its temperature. If the air contains a certain amount of steam, not yet saturated, during cooling a moment will occur when the air will be saturated with the same amount of moisture. Any further cooling leads to condensation of steam, because the air at a lower temperature cannot receive so much water vapour, and the excess must be evaporated in the form of fog, dew or hoarfrost, which is especially dangerous, because then we face icing on the road. This temperature, at which saturation occurs during air cooling i.e. condensation begins, is called the *dew point*. In the atmospheric air, cooling often occurs below the dew point, and excess water vapour appears in the form of rain, fog, dew, hoarfrost, etc.

The dew point of air is a parameter used in engineering terminology, and by definition it is the temperature at which the air just becomes saturated during the cooling process. At that point, moisture begins to separate in the form of fog or dew on the surrounding solid surfaces, such as bridges.

On the bridges, ice occurs earlier in comparison with other parts of the road route, because the air humidity above the water surfaces has increased, and there are no soil layers that would keep the temperature. Bridges with steel structure are more dangerous than concrete ones, because they cool faster. The appearance of ice on bridges is characteristic of late evening and early morning hours and is the main reason why bridges are potentially dangerous places on the roads.

Micro climatic changes on bridges do not have a strong impact on the climatic characteristics of the area and beyond, but are exclusively local in nature, and as stated, they have an impact on traffic safety on bridges.

6.4. Impact on flora and fauna (ecosystem)

6.4.1. Impact on vegetation

The main negative impact in the construction phase is the removal of one part of the vegetation, extensive earthworks and the formation of access roads. Construction is a process that will produce large quantities of dust, soot and other various products of the construction machinery, which can have undesirable consequences for the crops that are located nearby. This impact is temporary.

In the operation phase of the structure, a positive impact of performed works of biological type is expected, such as revitalization of surfaces after the completion of works, bioengineering of the area in the influence zone of the planned activities.

6.4.2. Impact on Fauna

The impacts of the construction and use of transport infrastructure on nature are multiple and include numerous aspects: they represent physical obstacles to the movement of animals; increased animal mortality due to running and collisions with vehicles on the road; cause habitat separation; cause loss and destruction of suitable habitats; cause changes in micro climatic and hydrological conditions in the area; represent a source of pollution with organic and inorganic pollutants, light and noise; cause an increase in human activity in areas near infrastructure (Roads of Serbia, 2012).

In order to examine in detail the appropriateness of protection measures prescribed in the conditions prescribed by the Institute for Nature Conservation of Serbia under ordinal numbers 8) and 9), monitoring of birds and bats was conducted in the area of construction of the new Sava Bridge in the period from October 2019 to July 2020. Attached to this Study is the report "Monitoring of birds and bats in the area of construction of the new Sava Bridge" in its entirety, prepared by Dr. Stefan Škorić, B.Sc. in August 2020, and registered at the Institute of Transportation CIP d.o.o. under no. k-913-94/17-1. The emphasis of this monitoring was on the birds species of relevance for the IBA area of the confluence of the Sava into the Danube (Pygmy Cormorant, Black-crowned night heron, white-tailed eagle) and all present species of bats. The research established that the birds fly high over the bridge and that they do not go low above the bridge structure when they fly over, which could lead to fatal outcomes. Bats are mostly registered on the New Belgrade side and mostly during the feeding activity above the Sava River and green areas in the area of Staro Sajmište.

Since this area does not represent a significant feeding area, the construction of the bridge should not have any negative impact on the white-tailed eagle. Despite the fact that the Sava and Danube rivers in the area of Belgrade represent a significant gathering place for waterfowl, especially in winter, the Sava River sector in the bridge construction zone is not a significant gathering place for larger aggregations of waterfowl, therefore, the impact of construction works is small.

The structure of the Old Sava Bridge, where the new bridge will be built, is not a gathering place for a large number of birds at any time of the year, nor is it a nesting place for some colonial species (e.g. rural and urban swallows), so removing the old and constructing the new one will not disturb birds nor destroy their nests.

The construction of the Bridge over the Sava on the location of the Old Sava Bridge will not lead to the disturbance of the surrounding natural habitats (felling of trees in the coastal area) or the demolition of old buildings in the area that serve as shelters for bats.

Under the points 3.2.8 and 3.2.9 of the subject Study, the technical solutions of the electrical installations envisaged by the project are presented. After their detailed consideration, it can be concluded that by using the envisaged lighting of the new bridge is (public, functional lighting of roads, pedestrian and bicycle paths, stairways and ramps of the bridge, decorative lighting of bridge arches, walls of stairways and ramps, as well as ambient lighting of pedestrian paths on the bridge and pedestrian rest areas) the so-called mirror effect is avoided, i.e. negative impact of bridge lighting on the fauna of birds and other animals in the bridge zone is minimized.

All electrical installations are insulated and guided in such a way as to prevent the settlement of birds and bats and their perishing. The cable is laid partly freely in the ground, under the roads through PVC and over the bridge on cable trays in the installation gallery. In the installations tray, there is space for laying 1kV, 10kV, 35kV and 110kV cable lines.

Conclusion: Considering that the pre-constructive monitoring was limited in time and realized in insufficient capacity due to the pandemic caused by the COVID-19 virus, the previous claims should be taken with a reserve, i.e. it is necessary to carry out constructional and post-constructional monitoring (see Chapter 9) and if the results of that monitoring indicate that birds and bats perish due to collisions with vehicles or the construction of the bridge itself, special visual and sound barriers need to be mounted on the bridge for prevention

6.5. Impact on population (population, concentration and migration of population)

Old Sava Bridge with its capacity cannot meet the existing traffic requirements, while with the new bridge the capacity will be multiplied. The construction of the new bridge achieves greater traffic safety, since the Old Sava Bridge was built during the Second World War, it was placed on wooden piles, which made it unsafe for traffic, and in 76 years of existence it has been reconstructed several times.

The construction of the new bridge is expected to reduce the number of traffic accidents - because unlike the existing situation, where traffic takes place in mixed traffic lanes for all types of travel (except pedestrians), in the newly designed condition the roads are separated by tram isles, and there are physically separate pedestrian paths, so that the collision between passenger and cargo cars and public transport vehicles (trams and buses) is avoided, and the physical separation of directions eliminates the risk of collisions with vehicles from the opposite direction. This will inevitably lead to savings for users and society as a whole.

The construction of the new road would lead to significant economic benefits, which are reflected in savings in travel costs, vehicle operating costs and savings in bridge maintenance. Further use of the old bridge would require frequent investments and remedial interventions, which would increase the costs of maintaining the same.

In addition to the direct economic effects, the construction of the New Bridge over the Sava brings a number of social benefits such as increasing the attractiveness of the area, creating new jobs, developing a number of accompanying commercial activities and services, etc.

6.6. Impact on cultural real estate

Cultural real estate and goods that are under prior protection located in the immediate vicinity of the new bridge may be directly and indirectly exposed to negative influences during construction.

According to the Opinion of the Institute for the Protection of Cultural Monuments of the City of Belgrade (No. R4814 / 19 of 22 November 2019), the proposed location for the formation of the future construction site of the Sava Bridge (on the right side of the bridge) is conditionally acceptable. The proposed location of the construction site is partly within the property that is under prior protection of the "Coastal Area of New Belgrade", it is necessary to cooperate with the Institute for the Protection of Cultural Monuments of the City of Belgrade in its planning, in order to protect all values of location and its immediate environment and adequately define protection measures.

6.7 Impact to landscape

Impacts on the morphology of the terrain and vegetation during construction are reflected in the temporarily reduced value of the visual image of the space due to the presence of the construction site (machinery, lighting, signalization) and environmental degradation within the boundaries provided for the works.

It is expected that during the operation the New Sava Bridge will merge into the existing image of the landscape thanks to the characteristics of the Conceptual Design and horticultural arrangement of the location.

The landscape image is dominated by the Sava River and its participation in the construction of the landscape is significant and impressive. At the entrance and exit of the planned bridge, the view of the landscape will - due to the presence of a water body which is in itself a valuable element of the landscape - together with the richly shaped structure of the bridge provide a special visual experience.

The visual figure of urban parts of the landscape can be disturbed only during the construction of the road, as already mentioned, due to the presence of construction machinery, lighting, the presence of large quantities of construction materials, traffic jams due to possible changes in traffic and the like. These negative effects are temporary.

Upon completion of the works, during the operation of the Bridge over the Sava, a modified landscape figure is expected, where the bridge structure will provide a new, enriched identity of the space.

7. ENVIRONMENTAL IMPACT ASSESSMENT IN DISASTER

For the purposes of Environmental Impact Assessment in Disaster in the construction phase and the operation phase of the New Sava Bridge, the following terms from the Law on Environmental Protection were used ("Official Gazette of the Republic of Serbia", No. 135/04 and 36/09, 36/09-and other laws, 72/09-and other laws, 43/11-Decision of the Constitutional Court, 14/16, 76/18 and 95/18-and other laws) and the Law on Disaster Risk Reduction and Emergency Management ("Official Gazette of the Republic of Serbia", No. 87/18):

- **an accident** is a sudden and uncontrolled event which occurs due to the release, spillage or dissipation of hazardous substances, performance of activities during production, use, processing, storage, disposal or long-term inadequate storage (hereinafter: chemical accident);
- **a natural disaster** is a phenomenon of hydrological, meteorological, geological or biological origin, caused by natural forces such as earthquakes, floods, torrents, storms, heavy rain, atmospheric discharges, hail, drought, landslides, snow drifts and avalanches, extreme air temperatures, ice accumulation on the watercourse, pandemics, infectious diseases epidemics, livestock infectious diseases epidemics and pests and other natural phenomena of a larger scale which can endanger the safety, lives and health of a great number of people, material and cultural goods or the environment on a larger scale;
- **an emergency situation** is a situation which begins with a declaration from the competent authority when the risks and threats or the resulting consequences for the population, environment and material and cultural goods are of such extent and intensity that their occurrence or consequences cannot be prevented or eliminated by regular action of competent authorities and services, which is why, for the purposes of their reduction and elimination, it is necessary to use special measures, forces and means with an intensified operating mode;
- **a technical-technological accident** is a sudden and uncontrolled event or series of events which got out of control during the management of certain work tools and while handling hazardous substances in the phases of production, usage, transport, traffic, processing, storage and disposal, such as fire, explosion, accidents, traffic accidents in road, river, railway and air traffic, accidents in mines and tunnels, delays of gondola lifts for transporting people, demolition of dams, accidents at power, oil and gas plants, accidents when handling radioactive and nuclear materials, severe soil, water and air pollutions, consequences of war, destruction and terrorism, the consequences of which may endanger the safety, lives and health of great number of people, material and cultural goods or the environment on a larger scale;
- **danger** is an activity or a condition, which can lead to loss of life, injury or negative impacts on human health and the environment;
- **risk** is a certain level of probability that an activity, directly or indirectly, can cause danger to the environment, human life and health;
- **risk assessment** is the determination of the nature and the degree of risk of potential danger, state of threat and its consequences, which can potentially endanger the lives and health of people, economy, service and the environment;
- **hazardous materials** are chemicals and other substances which have harmful and hazardous characteristics;
- **dangerous substance** is a substance defined by the European Union regulation which regulates the control of the danger from a major accident involving dangerous substances.

7.1. Possible accidents during the construction phase and use of the bridge

7.1.1. Possible accidents during the construction phase

In the construction phase of the new bridge, the following hazardous materials will be used: petroleum and petroleum products, fats and oils, antifreeze, thinners, acids, paints and varnishes, adhesives and additives...

During the construction of the new bridge, there are circumstances which can lead to accidents due to negligent handling of tools or accidents on construction machinery (oil and fuel leaks), negligent handling and storing of hazardous materials (thinners, acids, paints, varnishes, additives...), as well as other types of accidents, mostly those which pose a risk to the health and lives of the immediate participants in the construction.

The extent of possible negative environmental impacts of accidents during the construction works depends on the sensitivity of the environment in the given area. This includes soil composition, water permeability of the terrain, groundwater level height, proximity of water supply sources, proximity of larger and smaller surface watercourses, proximity to areas inhabited by sensitive and legally protected species of flora and fauna, proximity to populated areas, etc.

The planned location for the realization of the project is sensitive from the aspect of source protection. Part of the bridge over the Sava River located in the municipality of New Belgrade is in the narrower zone of sanitary protection (Zone II), while the other part of the bridge located in the municipality of Savski Venac is partly in the wider zone of sanitary protection (Zone III) and partly in an area that is not defined as a zone of sanitary protection of springs. The fact is that most pollutants, especially petroleum products, can reach groundwater through the soil, where they stay for a long time, because there is no significant dilution in contact with groundwater which would reduce their concentration. Since there is no biodegradation in groundwater contaminated with petroleum products, leaching from the aquifer is very slow. Groundwater pollution can also affect the water pollution of the Sava River due to its proximity and hydrological connections, and vice versa.

However, such discharges of oil and oil derivatives in the construction phase, cannot significantly endanger the land, or groundwater and Sava River water quality because there are very little quantities of them, and because it can be prevented by choosing an adequate location for refueling on a concrete base and regular maintenance of construction machinery, which the contractor is responsible for.

7.1.2. Possible accidents in the exploitation phase

Complying with all legally defined standards and conditions of design and execution of works on the installation of a new bridge, the risk of demolition is minimized. Upon completion of construction works, and before opening the bridge and access structures to traffic, the Investor is obliged to provide testing of the structure under test load, in all respects in accordance with the provisions of the rulebook for standard testing of bridges with test load SRPS U.M1.046. The test program should be made in cooperation with the bridge designer. The Study and the Report on performed testing with the results make an integral part of the Technical Documentation. All materials, basic, additional and binding must have the manufacturer's test certificate.

The assembly project must check and prove the stability of the structure as a whole, the stability and load-bearing capacity of all structural elements and joints (connections), through all phases of the structure assembly. The assembly project makes an integral part of the Detailed Design. The assembly project is prepared by the Contractor. The risks of the vessel impact (ship, barge) in the bridge pillar, and collision with the bridge structure by a vessel at high water levels are also minimized by the technical solutions given under points 3.1.2, 3.2.5 and 3.2.14. The subjective factor, i.e. the personal responsibility and caution of the vessel master, as well as the technical worthiness of the vessel is the risk that is minimized by regulatory measures, i.e. measures to control regulatory compliance.

The danger of accidents during the operation of the New Sava bridge is minimal, because the transport of hazardous substances across the bridge in question is not planned. Traffic accidents can occur, which can result in the leakage of small quantities of petroleum products from the tanks of motor vehicles and/or the occurrence of fires.

7.1.3. Natural disasters

A natural disaster which can endanger the environment during the construction phase is the flooding of the construction site. The location which the implementation of the project is planned for is in the operation plan for flood defense from the waters of the first order, for the year 2018, Water Unit 1 - "Belgrade", in accordance with the Rulebook on the designation of water units and its limits (Official Gazette of the Republic of Serbia" No. 8/18). According to the Operation Plan for Flood Defense for the year 2018, which PUC "Srbijavode" is carrying out, the subject section of the Sava river is included in the defense sector S.3.-section 1, the embankment on the right bank of the Sava from the confluence with the Danube to the Topčiderska river is 4.35 km and the defense sector S.1.1.-section 2, the embankment on the left bank of the Sava from the confluence with the Danube to the Stari železnički bridge is 2.68 km.

Left bank

On the section of the left bank from the bridge in Brankova street to the Old Sava bridge (km 1 + 430 downstream), the lower promenade of the quay was built at an elevation of 73.50 m above sea level, with a foot at an elevation of 70.00 m above sea level and the terrain in the hinterland at 76.20 m above sea level (filled to the level of the old embankment). In this part, the embankment was subsequently filled and arranged during the construction of the monument on the shore, so that the whole area has a slightly higher degree of protection against flooding in relation to the downstream section. The identical quay type as on the previous section was constructed on the section of the left bank from the Old Sava to the Old Tram bridge (at km 2 + 725 along the Sava), about 1250 m long. The existing protection levels are 0.3 to 0.35 m lower than the 100-year-old high water level (approximately 76.15 m above sea level).

Right bank

On the section from the bridge in Brankova street to the Old Sava bridge, there is an old embarkment from the Second World War period, where a walking path was added in the 1990s. It is practically a sloping quay with ramps for manual reloading. The profile is a two-stage, i.e. three-stage sloping quay with concrete and stone cladding. The elevation of the foot is 69.10 m above sea level, and the elevation of the final rim is 75.70 m above sea level, while the slopes are 1:1.25.

The banks of the Sava are in their current state regulated by high waters of the following hydrotechnical facilities: - the left bank of the Sava: embankment at elevations around 76.10-76.60 m above sea level and sloping quay wall with crown elevation around 75.80-76.00 m above sea level; and - the right bank of the Sava: sloping quay wall with a walkway elevation of about 73.50 m above sea level. For extreme flood protection conditions, construction sites should use additional mobile equipment to exceed the quay above observed maximum level (additional embankments with bags of earth).

7.2. Accident prevention, readiness and liability measures

Before the execution of works, it is indispensable to take all the necessary precautionary measures, which are primarily in the domain of the appropriate organization of the construction site.

The following available documentation is used to identify potential site accidents:

- Risk Assessment Act including - list of jobs with increased risk, list of employees in jobs with increased risk, list of employees trained for safe and healthy work;
- Study on the organization of the construction site, made in accordance with the Rulebook on the contents of the study on the organization of the construction site ("Official Gazette of the Republic of Serbia", No. 121/12 and 102/15), 121/12 i 102/15),
- Environmental impact assessment study,
- Expert findings on the examination and testing of different work equipment,
- Reports on meteorological parameters.

For all identified potential accidents on the construction site, it is necessary to determine the response procedure which will define: actions taken, the way the authorities are being informed and the manner in which consequences are being remedied. It is necessary to carry out training for the workers from the aspect of undertaking protection measures during construction in the zones of sanitary protection of springs and the zone of cultural property.

The construction works shall be performed according to the technical documentation on the basis of which the construction permit was issued, i.e. according to the technical measures prescribed by the Environmental impact assessment study, conditions of the competent authorities (especially BVK and the Institute for the Protection of Cultural Monuments of Belgrade), regulations, norms and standards which apply to the construction of the new bridge.

All materials used for the construction of the new bridge must be attested in the appropriate domestic accredited institutions in accordance with the "Law on Planning and Construction" ("Official Gazette of the Republic of Serbia", No. 72/09, 81/09, 42/13, 50/13, 98/13, 132/14, 145/14, 83/18, 31/19 i 37/19- other law) and regulations governing fire protection.

In accordance with the Rulebook on the manner of preparation and contents of the Accident Protection Plan ("Official Gazette of the Republic of Serbia", No. 41/19) based on the predicted scenario and vulnerability analysis, the possible level of accidents in the construction phase of the new bridge is level I, that is, on the parts of the construction site area and unlikely level II, on the entire construction site area. For the organization of corrective measures and repair of the caused damage, the funds of the contractor are sufficient, and no consequences for the community are expected. At all locations where flammable, dangerous and harmful substances are present, it is necessary to provide funds for localization and remediation of accidents in the form of water,

absorbent - sand, dog, brushes and rags, as well as various collection containers, always in a visible and accessible place and in sufficient quantities so that they can be applied directly in the event of an accident, in accordance with internal instructions and procedures.

7.3. Remediation measures

- If oil and fuel get discharged from the engaged construction machinery or means of transport to the land during the construction works, it is necessary to repair it immediately, by covering the spill site with sorbent (e.g. sand, zeolite, wood sawdust, etc.) in order to collect spilled petroleum products.
- Then the contaminated layer of soil should be removed and handed over to an authorized organization for further action in accordance with the Rulebook on the manner of storage, packaging and marking of hazardous waste ("Official Gazette of the Republic of Serbia", No. 92/10).
- The remediation procedure is performed in the presence of representatives of the mobile ecotoxicological unit and experts from the Sector for Emergency Situations of the Ministry of the Interior of the Republic of Serbia. The remediation procedure is performed by specialized business entities which have a license to perform interventions of this type.

8. DESCRIPTION OF MEASURES PROVIDED TO PREVENT, REDUCE AND REMOVE, WHERE POSSIBLE, ANY HARMFUL ENVIRONMENTAL IMPACT

The Environmental impact assessment study of the construction of the bridge over the Sava river shows that this road will achieve a certain level of impact on the existing state of the environment in the investigated corridor. Protection measures which would reduce the negative consequences to acceptable limits include a multitude of activities for each of the observed impacts, in the construction phase and the exploitation phase of the road.

This chapter describes measures to prevent, reduce and eliminate any significant adverse effects of the road on the environment. Environmental protection measures provided by law and other regulations (regulatory measures), protection measures in emergency situations, plans and technical solutions for environmental protection and other environmental protection measures are all included.

8.1. Technical measures for environmental protection provided by law and other regulations (regulatory measures)

Regulatory measures for environmental protection imply a synthesis of all measures which must be applied as "acquired obligations" from the valid planning documents. This group includes measures provided by law and other regulations, norms, standards and appropriate regulations which further define this issue.

Due to the rational management of the environment, it is necessary to ensure compliance with legal regulations regarding the limit values of certain impacts on air quality, soil quality, surface and groundwater, etc.

The project owner (Investor) is obliged to comply with all environmental protection measures prescribed in the conditions and opinions of the competent authorities and organizations both in the technical documentation preparation phase and in the construction and exploitation phases of the new bridge.

Technical measures for protection of water supply sources in the city of Belgrade

Rulebook on the manner of determination and maintenance of sanitary protection zones of water supply sources (Official Gazette of the Republic of Serbia No. 92/08, Article 27), states that in Zone III (wider zone of sanitary protection) it is not possible to build or use facilities and plants, use land or perform other activities, if it endangers the health of water at its source, in the following manners:

- the production, transport and handling of dangerous substances and substances which may not be introduced directly or indirectly into water,
- wastewater discharge,
- construction of roads without sewers,
- uncontrolled disposal of municipal waste, damaged vehicles, old tires and other substances and materials from which pollutants can be released by rinsing and leaking,
- surface and subsurface works, blasting of the soil, penetrating into the layer which covers the groundwater and removing the layer that covers the aquifer, etc.

In addition, this Rulebook (Article 27) states that in Zone II (narrower zone of sanitary protection) it is not possible to build or use facilities and plants, use the land or perform other activities, if it endangers the health of water at its source, in the following manners:

- constructing and using facilities and plants, using land or performing other activities referred to in Article 27 (previously described),
- using pesticides, herbicides and insecticides,
- camping, fairs and other gatherings of people,
- construction and use of catering and other facilities,
- deepening of the trough and extraction of gravel and sand, etc.

Based on the Decision on determination of sanitary protection zones on the administrative territory of the city of Belgrade for groundwater and surface water sources which serve as water supply of the city of Belgrade (Ministry of Health of the Republic of Serbia, No. 530-01-48/2014-10, dated 1 August 2014), the bridge over the Sava river on the site of the old bridge is located partly in the narrower (Zone II), partly in the wider zone (Zone III) and partly in a space not defined as a zone of sanitary protection of springs. The decision was made on the basis of the Study on the zones of sanitary protection of groundwater and surface water sources in the city of Belgrade (Institute "Jaroslav Černi", 2013).

The study on the zones of sanitary protection of groundwater and surface water sources in the city of Belgrade (Institute "Jaroslav Černi", 2013) presents in detail the conditions, measures and restrictions, as well as guidelines relating to the purpose, use and performance of certain activities in the area defined zones of sanitary protection of the source of Belgrade. Table 1 of the mentioned Study shows the proposed restrictions in the sanitary protection zones, for different groups of activities that can be connected to the subject facility. According to the mentioned table from the Study on the zones of sanitary protection of the water supply source of the city of Belgrade, construction with the application of standard technical measures and additional protection measures is allowed for the subject facility.

According to the conditions of PUC "Belgrade Waterworks and Sewerage", the Development Service, during the design, construction and use of the new bridge over the Sava river on the site of the old (tram) bridge, from the aspect of sanitary protection of springs, it is necessary to observe the following protection measures:

1. The construction of the new bridge over the Sava river with accompanying facilities and installations within the narrower and wider sanitary protection zone of the Belgrade spring (zone II and zone III) is acceptable, as well as the possibility of transformation and conversion, complete or partial removal of existing buildings and complexes around the site, as stated in the submitted Conceptual Design, in accordance with the relevant planning and technical documentation and with mandatory compliance with all the conditions, measures and restrictions listed below.
2. For all new and reconstructed facilities, the preparation of project documentation is required in accordance with the Law on Planning and Construction (Official Gazette of the Republic of Serbia No. 72/2009, 81/2009, 64/2010, 24/2011, 121/2012, 132/2014, 145/2014) and other applicable regulations and standards for this area, with a detailed description of all positions of technical solutions concerning direct or indirect environmental protection and the protection of surface and groundwater and soil at this location. In general, all new and reconstructed facilities should be equipped in such a way as to prevent any intentional or accidental contamination of groundwater and soil at this location, i.e. to minimize the risk of contamination from this location, i.e. to the smallest possible extent.

3. In the preparation phase of technical documentation for all facilities within the narrower zone of sanitary protection of springs (zone II), additional engineering geological and hydrogeological research ought to be conducted, in accordance with the valid Law on Mining and Geological Research (Official Gazette of the Republic of Serbia No. 101/2015) and its relevant bylaws. This additional research is obligatory for the planned (deep) foundation of the bridge on piles entrenched in a sandy-gravel aquifer, as well as in the case of a subsequently determined zone of high groundwater vulnerability at the subject location. Additional hydrogeological research to determine the presence, thickness and characteristics of the filled layer (with the so-called “Floating" aquifer), aquifer impervious rock layer; quality and condition of groundwater and soil; as well as other important elements, in order to define possible additional conditions, restrictions and measures for protection of the source at the subject location. If the new exploration works single out zones which correspond to the conditions of high vulnerability, the envisaged protection measures must be strengthened, including mandatory monitoring during the execution of works and later use of the facility.
4. If during the research or execution of works the presence of pollutants in groundwater and land/soil of unknown origin (historical pollution) is determined, it is obligatory to inform the competent authorities and take all necessary remediation measures, in accordance with the Law on Environmental Protection and its relevant bylaws.
5. Exploration, preparation and construction works for the purposes of construction of the planned facilities shall be organized and realized with the implementation of all necessary standard and additional measures for the protection of springs, which include the following: spatially limited execution of works with the least possible removal and penetration through the aquifer impervious rock layer; preventing the spillage of hazardous and harmful substances (oil and oil derivatives, fats and oils, antifreeze, thinners, acids, paints, varnishes, adhesives, additives, etc.) into the soil and groundwater; adequate storage of all hazardous and harmful substances in minimal quantities (in warehouses); hiring trained workers and using proper machinery, vehicles, equipment, etc.; limited movement of engaged machinery and prohibition of servicing them on site; minor interventions in terms of topping up working fluids, washing and cleaning of engaged machinery, equipment and tools should be limited to temporary watertight surfaces-plateaus, located along existing roads, with mandatory collection and treatment of wastewater on temporary separators and sandpits and evacuation of treated wastewater to the intended recipient; use of sanitary cabins with regular maintenance and emptying of the same by an authorized company; mandatory sorting and adequate collection and storage of (hazardous and non-hazardous) waste generated during construction (construction materials and rubble, packaging, municipal waste, etc.) at a designated location - watertight plateau, with organized regular removal by the competent utility service or authorized operator; providing funds for the remediation of possible minor accidents/accidents during the implementation of the planned works (courts, tanks, sand, rags, dogs, etc.); obligatory arrangement of the location according to the project of landscaping after the construction of the planned facilities; provide supervision over the implementation of all planned measures for the protection of springs during the execution of works.

6. For the purpose of installation or replacement of land/soil, embankment and leveling of the terrain on the location, it is allowed to deliver materials of exclusively known characteristics, which by their nature must not be dangerous for the source, i.e. that in no case endanger the quality of groundwater at this location.
7. All new facilities should be designed so that the lowest elevation of the planned facilities is in the backfill layer, i.e. above the elevation of the aquifer impervious rock layer. Only for the needs of the construction of the bridge girders, (deep) foundation on piles is allowed in the protective overlying layer or in the aquifer itself, with the application of additional conditions, measures and restrictions.
8. Parts of new and reconstructed facilities that are located below the ground surface, i.e. that are completely or partially in the zone of groundwater level oscillations (service rooms, engine rooms, pumping stations, etc.), must be completely isolated with waterproof coatings, in order to prevented any possible penetration of pollutants from the facilities into the environment.
9. In order to more effectively protect groundwater and soil from pollution by infiltration from the surface and/or leakages from new facilities and installations in the backfill, it is necessary to consider the need and possibility of isolating the lower sandy-gravel aquifer by installing resistant and permanent impermeable barriers from special natural and/or artificial materials. These barriers would be installed under and/or around the planned facilities, i.e. in the area of the aquifer at all locations where the absence of low water permeability was found, i.e. a separate zone of high groundwater vulnerability, as well as in those locations where during the preparatory works and construction locally, i.e. in the zone of the object itself, it significantly or completely reduces the protective role of the overlying layer (reduces the thickness, penetrates, partially or completely removes the natural protective coating, etc.).
10. The construction of new and the transformation of existing facilities should be performed only after the communal arrangement of locations, whereby the construction of the system of fecal and atmospheric sewerage represents the technical minimum.
11. If the construction of sanitary facilities (public toilet) is planned next to the bridge and its accompanying facilities, fecal water from all facilities should be collected and evacuated to the city sewage system, in all respects according to the conditions of PUC BVK. In some locations (for example, public transport terminals, part of the promenade under the bridge, etc.) it is allowed to install sanitary cabins with regular maintenance and emptying of the same by an authorized company.
12. Direct entry of atmospheric wastewater from the bridge, new and reconstructed existing facilities (roads, plateaus, access ramps, etc.) into the recipient is prohibited without prior processing. That is, all atmospheric water from precipitation, as well as water from washing, maintenance of facilities and the like, must be collected and treated at adequate wastewater treatment plants (sedimentation tanks, oil and grease separators, sandblasters, etc.), and further evacuated to the appropriate recipient - city sewerage, in accordance with the conditions of PUC BVK, or into the river Sava, in accordance with the conditions of the competent authorities.
13. It requires the design and construction of waterproof communal infrastructure (pipelines, manholes, chambers, devices and facilities for pre-treatment, etc.), as well as the installation of certified quality pipe material, devices and equipment, with multiple protection systems, which would ensure complete sealing and impermeability of internal and city sewerage system. After the construction of new and reconstructed facilities, all devices and equipment should be hydraulically tested for leaks and subsequently periodically inspected or after an accident, in accordance with legal obligations, manufacturer's recommendations, procedures and instructions.

14. The quality of purified water discharged into the recipient - fecal and atmospheric public sewage, i.e. the Sava river, should correspond to the valid regulations, ordinances and decisions.
15. It is obligatory to contract the maintenance and emptying of all devices for pre-treatment of wastewater (precipitators of separators, grease and oil, sand traps, etc.) with the competent utility service or a registered company for this activity. It is necessary to ensure adequate monitoring of the quantity and quality of wastewater before and after pre-treatment. After installation, the settling precipitator-separator should be hydraulically tested for leaks, and later periodically or after an accident, in accordance with legal obligations, manufacturer's recommendations, procedures and instructions.
16. The technical solutions should be considered in detail and the safety of the route and elements of the planned roads, as well as alternative possibilities of applying certain additional protection measures should be checked to make the route as safe as possible (additional lighting and marking of traffic lanes, slowing and directing traffic, horizontal and vertical signalization, etc.).
17. The transport of dangerous, harmful and flammable substances and cargo within the narrow zone of sanitary protection of springs (zone II) is prohibited. During the transition period, the transport of dangerous goods (cargo) should be avoided as much as possible, except for those quantities for the needs of normal functioning (regular operation, maintenance, etc.), and if this is not possible only with the application of additional protection measures (announcement, escort of specialized assistance vehicles). in case of an accident, etc.).
18. All new and existing traffic areas, plateaus, access ramps, platforms, parking lots, etc. should be made of waterproof reinforced concrete and paved or covered with some other material resistant to oil and oil derivatives, with high curbs and appropriate longitudinal and transverse slope towards (circumferential) gutters/channels for directing and receiving all "dirty" water from these surfaces, which are carried to the precipitator-separator, treated, and then evacuated to the appropriate recipient. For calculations of relevant precipitation (rain), it is necessary to take into account the extremes as a consequence of the present climate changes. These facilities must be equipped with high curbs, sidewalks and fences, for controlled and limited movement of vehicles.
19. For all new and existing transformer stations and diesel-electric generators (DEA), ancillary facilities in which only small quantities of hazardous, harmful and/or flammable substances will be stored as well as potential smaller quantities of hazardous and non-hazardous waste generated during regular operation, use and maintenance of facilities, it is mandatory to apply special protection measures (without pyralene-RSV and other hazardous and harmful oils, on a waterproof surface with high thresholds-protective curbs and adequate slope, especially within the secured (locked) facility or part of the facility, installation of tanks, tubs and/or concrete cassettes for oil and fuel tanks and distribution systems, double-walled tanks and distribution systems, signaling and notification systems, accident remediation facilities, fire protection, etc.), as well as mandatory groundwater and soil monitoring and production of piezometers in its immediate vicinity. It is obligatory to sort and adequately store its generated hazardous and non-hazardous waste until it is taken over by a communal or some other company registered for this activity (operator). The monitoring results must be submitted to the competent services of CUP BVK and other competent authorities.

20. It is obligatory to form objects, i.e. space for the (temporary) installation of appropriate municipal waste containers which may appear in regular operation and use of facilities until it is taken over by a communal or some other service company registered for this activity (operator). These spaces should be formed on a waterproof reinforced concrete or some other adequate base with similar characteristics, with high thresholds-protective curbs and adequate slope, solely outside the zones of influence of surface and groundwater level oscillations, in accordance with the conditions of the competent communal service company.
21. At all locations where flammable, dangerous and harmful substances are present, funds for localization and accident remediation must be provided in the form of water, absorbent - sand, plugs, brushes and rags, as well as various collection containers, always in a visible and accessible place and in sufficient quantities so that they can be applied directly in the event of an accident, in accordance with internal instructions and procedures.
22. The formation and maintenance of embankment slopes, as well as grass and other green areas, must be planned in a way which does not require the use of dangerous and harmful substances for the protection against weeds and pests on groundwater and surface water, especially in the narrower zone of sanitary protection. The development of a Pesticide Management Plan is mandatory, which includes appropriate monitoring and production of piezometers, as well as the implementation of the prescribed procedure for assessing the impact of applied maintenance measures and providing the results to the competent secretariat and PUC BVK.
23. Landscaped (cultivated) green areas with standard infrastructure and irrigation systems should be arranged in accordance with the issued conditions of the competent services. In general, the following works are allowed on existing and new green areas: sanitary felling of trees, reconstruction and new planting of plants, reconstruction, erection-installation and construction of garden-architectural elements, pedestrian and bicycle paths, overhangs, small playgrounds and polygons and existing buildings and park furniture, fountains and retentions, fencing, etc.
24. Exploration and exploitation of groundwater for the needs of irrigating the surrounding green areas can be approved with the application of standard and additional protection measures, defined later, i.e. in direct cooperation with PUC BVK and only if an acceptable and binding technical solution is applied, in compliance with all regulations in this area, mandatory monitoring and production of additional piezometers. Monitoring results must be submitted to the competent services of PUC BVK and other competent authorities.
25. Formation of smaller accompanying temporary catering facilities, within new or reconstructed intersections, public transport stations, etc. is allowed with the implementation of all the protection measures described above, and with the consent of the competent authorities.

26. It is necessary to enable the establishment of environmental monitoring of the subject area, in accordance with the regulations governing this area. In this sense, it is a requisite to establish an adequate monitoring network of at least 4 new piezometers (2 on each coast), located at risky locations, with an adequate monitoring dynamic of groundwater quality, defined in agreement with CUP BVK. Also, adequate monitoring of the quantity and quality of wastewater in the planned sewerage system (before and after pre-treatment) needs to be ensured. The monitoring results have to be submitted to the competent services of CUP BVK and the competent authorities.
27. Elaborate the necessary procedures and instructions of the present work activities, the manner of handling means and equipment, fire protection measures, occupational safety protection measures, as well as environmental protection measures (preventive and remedial measures) and acquaint all employees with them.

    The conditions, measures and restrictions set out here for defining location conditions for the construction of the new bridge on the site of the old (tram) bridge, from the aspect of sanitary protection of springs, should be a part of the investment-technical (project) documentation, and must be included in all instructions and procedures for regular operation of facilities, as well as in case of possible accidents. As these are planned facilities within the narrower (Zone II) and wider (Zone III) zone of sanitary protection of springs, consistent adherence to the prescribed conditions and conscientious implementation of measures of sanitary protection of springs during the design, construction and use of all planned facilities is required.

Protection measures prescribed by Water Conditions

Water conditions, issued by the Republic Water Directorate for the needs of this project, determine the technical and other requirements which must be met in the design, execution of road works and facilities, which may permanently, occasionally and temporarily affect changes in the water regime, i.e. endanger the goals of the environment, especially in watercourse terrain which the traffic objects intersect with, touch or partially pass through, in the following manner:

4.1. Technical documentation, based on previous works, must be prepared in accordance with the applicable law and regulations in water management and other laws, regulations, opinions and standards for this type of facilities;
4.2. Technical documentation should be done in accordance with the urban planning documentation;
4.3. Investor/user is obliged to resolve property legal relations, in the zone of construction and use of facilities in water land, with the competent CUP;
4.4. When preparing project documentation, it is necessary to take into account the existing and planned water facilities and the natural bed of the watercourse in a way which will ensure the protection of its stability and protection of the water regime;
4.5. Based on the conducted hydrological-hydraulic calculation, the necessary regulatory and other works must be predicted in the zone of the bridge (upstream and downstream) in order to stabilize the riverbed and coastal pillars, with the aim to providing a safe solution for the bridge in question;
4.6. An optimal flow opening of the bridge (span, height, lower edge of the structure) must be predicted which will allow the flow of calculated high waters with a probability of 1% (hundred years average) and control water with a probability of 0.1% (thousand years

average) of the Sava river without harmful effects on the surrounding terrain (floods, etc.) and which will be at the same time sufficiently safe for the construction of the bridge during the flow of large waters, sediments and ice, taking into account the impact of tributaries;

4.7. For the subject bridge over the river Sava, the necessary technical solutions will be provided, which will eliminate the effect of deceleration from the bridge pillars and backbone (in the watercourse's riverbed), ensuring that the lower edge of the bridge structure in the area of the navigable opening is not at an elevation lower than the elevation of the high decelerated navigation level which the required useful height of the bridge is added to. It must be foreseen that bridge pillars and backbone (in the watercourse or outside the riverbed) create the least resistance to water runoff, i.e, be hydraulically shaped (circular, elliptical, etc.) and parallel to the river flow, so as not to cause deep erosion (along the riverbed), local erosion (around the pillars of the bridge) and lateral erosion (on the banks), which could endanger the stability of the bridge and buildings, land;

4.8. The preparation of technical documentation must be aligned with the technical documentation according to which protective water facilities have been built or individual watercourses have been arranged, as well as with the planning and project documentation which envisages these facilities and works;

4.9. In case of deep and lateral erosion in the zone of banks, bridge pillars and backbone, it is necessary to prepare technical solutions which will further support the pillars and stabilize the river bottom upstream and downstream from the bridge and along the riverbed, i.e. for as long as the negative hydraulic impact of the bridge's narrowing to the water regime, sediment and ice runoff is felt at the expense of the bridge investor;

4.10. For the facilities of water supply, sewerage and treatment of conditionally oiled atmospheric waters, the necessary hydraulic calculations must be performed and properly dimensioned. It is vital to provide technical solutions for the collection, drainage, treatment and discharge of treated water from the road and bridge before entering the recipient, the Sava river and the city sewer. In order to protect water, and before entering the recipient, it is obligatory to provide appropriate precipitators and separators for oil and its derivatives in order to prevent possible pollution of surface and groundwater. The quality of discharged water must be such that it does not jeopardize the prescribed characteristics of the recipient's water;

4.11. At the place of the atmospheric sewage outflow, a proper outflow structure must be envisaged, which must be stable and functional even in the conditions of occurrence of high waters of the Sava river, while fitting into the existing lining;

4.12. Previously constructed facilities for the protection of the harmful effects of water must be aligned with the technical documentation and constructed defence line. The coastal fort at the place of construction of permanent pillars, on the left and right banks, after the construction works have been finished, needs to be restored to its original condition;

4.13. A detailed description of the bridge construction technology is to be provided in the project documentation in order to ensure the unimpeded flow of water through the riverbed, excluding any possibility of possible deterioration of the existing water regime in the bridge zone;

4.14. For all planned infrastructure installations, according to the conditions of the competent authorities, it is required to provide conditions regarding the provision of places and their protection;

4.15. For all other activities, an adequate technical solution must be provided in order to prevent surface and groundwater pollution.

4.16. After the completion of the technical documentation, it is required to address the relevant authority in charge of water management, with a request for the issuance of a water consent, while after the construction, it is necessary to turn in the request for the issuance of a water permit, in accordance with the regulations.

In addition to the technical measures envisaged by the Study on the zones of sanitary protection of groundwater and surface water sources of the city of Belgrade and the Rulebook on the manner of determining and maintaining zones and area of sanitary protection of water supply sources, it is necessary to apply the following additional protection measures:

- For accidents during the usage of the road, it is necessary to envisage prevention measures and protection measures against accidents. Law on Transport of Dangerous Goods ("Official Gazette of the Republic of Serbia", No. 88/10 and 104/16) regulates the authorizations of state bodies and specialized organizations in the transport of dangerous goods, special conditions under which the transport of dangerous goods is carried out, the manner in which the transport of dangerous goods is carried out, procedures in case of emergencies in the transport of dangerous goods and supervision of execution of this law in road, rail, air and water transport.

8.2. Protection measures in case of an accident

The project encompasses controlled collection and treatment of atmospheric wastewater and water from washing the road on the separators of light petroleum derivatives, before entering the recipient - river Sava. The expected small quantities of leaked oil derivatives and oils from motor vehicles in the event of traffic accidents will not reach the Sava river directly, but will be kept on separators.

During the execution of works, it is indispensable to take all necessary measures, which are primarily in the domain of the appropriate organization of the construction site:

- During the formation of the construction site and during the construction of the facility, it is necessary to ensure that in no case does oil, petroleum and petroleum compounds penetrate into the soil, i.e. groundwater.
- The construction site should be secured so that there are no possible accidents: the supply of the necessary construction materials should be minimal, the transport of substances which are harmful to groundwater in their composition (e.g. oil and oil derivatives) is allowed to be performed only by certified means of transport.
- All manipulations with oil and its derivatives during the construction process, supply of machines, must be performed in a specially defined place and with maximum protection measures in order to prevent spillage. All packaging for oil and other oil derivatives must be collected and handed over to an authorized operator.
- Parking of machines is allowed only in places reserved for this purpose. At the machines' parking places special measures of protection against soil pollution with oil, petroleum and petroleum derivatives will be taken.
- All measures to protect the land shall be taken in order to prevent possible land pollution due to the spillage of fuel and oil from vehicles and construction machinery.
- If oil and fuel are spilled on the ground, it is necessary to repair it immediately, by covering the place of spillage with sorbent (e.g. sand, zeolite, wood sawdust, etc.) in order to collect spilled petroleum products.

- The contaminated layer of soil shall be removed and handed over to an authorized organization for further action in accordance with the Rulebook on the manner of storage, packaging and marking of hazardous waste ("Official Gazette of the Republic of Serbia", No. 92/10).

8.3. Environmental protection plans and technical solutions

8.3.1. Protection measures during construction

During the construction of the planned bridge, it is necessary to take a series of measures which reduce possible impacts on the environment. These measures primarily include:

- The New Sava bridge should be built on the lots, in accordance with the spatial planning and urban documentation of the wider area. It is vital to ensure the protection of the public interest and determine the optimal framework for the formation and functioning of the planned contents within the areas meant for other purposes.
- The bridge should be designed so as to fully enable the uninterrupted flow of its planned traffic in a functional and safe way, as well as to be able to carry the required traffic load both in terms of carrying capacity and in terms of required dimensions.
- The technical solution of parallel management and the way in which the infrastructure lines that cross the bridge are to be combined, should be in accordance with all valid regulations.
- Predict a high level of environmental quality, in order to reduce the possible negative impacts of the construction and use of the New Sava Bridge on the near and far surroundings to the minimum.
- Prior to the construction of the new bridge, (Phase 1) it is necessary to remove the span steel structure and relocate it to a location where its repair will be undisturbed so that it can possibly be reused in some other locations.
- In all stages of construction, it is mandatory:
  - to organize the construction site on the minimum area required for its functioning, and spatially limit the handling areas;
  - to perform the works on the construction site and in accordance with the construction permit, and to report all stages of the works in a timely manner to the competent authorities, local self-government bodies, organizations which have conditioned supervision and other users of the space;
  - to make maximum use of existing traffic infrastructure to access the site;
  - to deposit the excavated layer of land separately in order to be used for terrain remediation after the completion of works;
  - to take all the necessary measures to protect the land in order to prevent the possible spillage of fuel and oil from vehicles and construction machinery;
  - in the event of an accident, to immediately clean the contaminated surface and remove the contaminated layer of soil so that the pollutants do not reach the groundwater and allow it to be taken to the landfill;
  - to systematically collect and dispose of solid waste which occurs during the construction and stay of workers in the construction site zone (food packaging, other solid waste) and remove all remaining construction materials, waste and equipment from the site upon completion of construction;
  - If, during the works, geological-paleontological or mineralogical-petrological objects are encountered, which are presumed to have the property of a natural good, the contractor is obliged to inform the Ministry of Environmental Protection within eight days, as well as to take all necessary measures to ensure the good would not be damaged until the arrival of an authorized person.

- The organization of the construction site within the green area for the purpose in question should be done in such a way that the border, and thus the damage, primarily on high vegetation, which is the most difficult to compensate component, is reduced to the necessary minimum.
- The green fund (trees, groups of shrubs), as well as the grass areas of the planned green areas need to be maximally preserved and protected during the execution of works, without permanent disturbance of the conditions for their further development and survival.
- Preserve the layer of soil in which the root develops within the treetop width, as well as the above-ground part of the plants, characteristic of the species. In that sense, before the commencement of works, it is necessary to perform horizontal and vertical protection of the vegetation within the boundaries of intervention and contact zone from damage due to the passage of machinery, disposal of tools, backfilling, etc., according to applicable norms and regulations.
- Preserve the fertile surface layer of soil, with an average thickness of 25 cm, from decay and burial during the works and use it for landscaping.
- The investor/contractor is obliged to inform the service of PUC “Zelenilo Beograd“(Belgrade Greenery), i.e. its green areas MAINTENANCE SECTOR about the beginning of works - contact tel. 2622-481 and arrange the presence of an expert (supervision) during the execution of works.
- When works are performed on the construction site by one employer or when the works are performed by several employers one after the other, each of the employers is obliged to prepare a report on the construction site which contains the construction site scheme, i.e. situation plan, description of works and measures for safety and health at work.
- During the construction works, it is necessary to ensure the implementation of the following measures to reduce the negative impact on air quality:
  - Prevention of the formation and spread of dust from exposed parts of the route and construction sites; this measure requires regular wetting of the open parts of the road in dry and windy weather conditions;
  - Prevention of uncontrolled distribution of construction materials from the construction site by means of transport; this measure requires cleaning of vehicles while driving from the construction site to public traffic areas, covering bulk cargo in transport on public traffic areas. This measure needs to be implemented in the entire construction area;
  - Compliance with emission standards when using construction machinery and means of transport; this measure requires the use of technically correct construction machinery and means of transport.
- The employer who performs works on the construction site where it is necessary to provide a plan of preventive measures in accordance with the regulations on safety and health at work prepares a report on the arrangement of the construction site which contains a description of works and measures for safety and health at work. from the Preventive Measures Plan.
- Rulebook on the contents of the report on the construction site arrangement ("Official Gazette of the Republic of Serbia", No. 121/12 and 102/15) prescribes the contents of the report on the arrangement of the construction site where the construction works are performed in accordance with the regulations on safety and health at work on temporary or mobile construction sites, and, in accordance with the risk assessment of occurrence of injuries and damage to health at workplaces and in the working environment (for the organization and technology of work) on the construction site where the work is performed, in accordance with project documentation and application of technical regulations and regulations on safety and health at work, performs detailed technical-technological elaboration of measures for the prevention, elimination or reduction of risks, in relation to the work and activities performed during the execution of works.

- Prohibition of servicing and maintenance of vehicles, construction machinery on the shores.
- Prohibition of disposal of municipal and other waste into watercourses and land,
- Temporary disposal of municipal waste along the route of the road in an appropriate manner by setting up appropriate special containers for its collection. During the execution of works, the Investor is obliged to maintain the maximum level of communal hygiene within the space.
- The supervision, which was actively present, should confirm in writing that all works were performed according to the applicable norms and regulations for this type of works and technical conditions prescribed by PUC "Zelenilo-Belgrade".
- All damages within the public green area as well as vegetation in the contact zone, caused by works on the construction of the facility, are the responsibility of the Investor. According to the scope of interventions, and in accordance with the Law on Planning and Construction, works on soft landscaping the public green area upon the completion of works, need to be performed according to the technical documentation.
- Upon completion of construction works, all waste material should be removed. It is forbidden to dispose of any type of waste in watercourses and land, as well as the permanent disposal of waste along the bridge.
- Construction waste and other waste is to be handled in accordance with the Law on Waste Management ("Official Gazette of the Republic of Serbia", No. 36/09, 88/10, 14/16 and 95/18- and other laws), the Rulebook on the conditions and manner of collection, transport, storage and treatment of waste used as a secondary raw material or for energy production "Official Gazette of the Republic of Serbia", No. 98/10) and the Rulebook on the manner of storage, packaging and marking of hazardous waste, "Official Gazette of the Republic of Serbia", No. 92/10.

8.3.2. Plans and technical solutions for environmental protection in the exploitation phase

Technical measures for land, groundwater and surface water protection

In order to reduce the negative effect of the exploitation of the bridge over the Sava, on land, surface and groundwater, the following general and technical protection measures are provided:

- All atmospheric water from precipitation, as well as water from washing, maintenance of the bridge with accompanying infrastructure must be collected and treated in a controlled manner at adequate wastewater pretreatment facilities, and further evacuated to the appropriate recipient - city sewer, in accordance with CUP BVK, or in the Sava river, in accordance with the conditions of the competent authorities.
- The concept of road drainage is based on the transverse drainage of rainwater to the drains, which are its primary recipients. Further transport of water takes place through a pipe sewer, then the pipes go down the coastal pillar and after the separator of light petroleum products they flow into the sewer network of the residential and business complex "Belgrade Waterfront" on the territory of the municipality of Savski Venac, while on the territory of the municipality of New Belgrade the pipes descend through the coastal pillar and after the separator of light oil derivatives flow into the river Sava.
- In order to efficiently maintain the drainage system, it is very important to monitor the condition of the plant in the operation phase. Oil and sludge from the separator must be handled in accordance with the Law on Waste Management ("Official Gazette of the Republic of Serbia", no. 36/09, 88/10, 14/16 and 95/18-and other laws), the Rulebook on the manner of storage, packaging and labeling of hazardous waste ("Official Gazette of the Republic of Serbia", No. 92/10) and the Rulebook on conditions, manner and procedure of waste oil management ("Official Gazette of the Republic of Serbia", No. 71/10).

- The frequency of cleaning the separator, as well as the removal of sediment, grease and oil, will be determined during the operation of the facility, and should be performed by the competent service provider. Oil and sludge from the separator should be collected and stored in special containers within the mobile storage of hazardous waste, according to the Rulebook on conditions, manner and procedure of waste oil management ("Official Gazette of the Republic of Serbia", No. 71/10) and the Rulebook on the manner of storage, packaging and marking of hazardous waste ("Official Gazette of the Republic of Serbia" number 92/10), until it is taken over by an authorized company which will transport the said waste to its further treatment prescribed by law. It is forbidden to dispose of the removed waste in the natural environment, to let it into water intakes or sewers. Surfaces which may become contaminated during emptying or maintenance work must be cleaned immediately.

Technical measures for air protection

Due to more efficient traffic and shorter travel times, not only for the users of the bridge, but also for all users of the wider central zone, the traffic load will be reduced. Savings in travel time and the distance traveled by users directly affect the reduction of harmful gas emissions and fuel economy. Having in mind the assumption that in the future newer passenger vehicles will be used, which will have reduced emissions, it can be concluded that in the operational phase of the New Sava bridge, the impact of traffic on air quality will be more environmentally friendly compared to the existing situation.

Technical measures for noise protection

The new bridge is a technical measure to reduce the negative impact of noise on the environment compared to the existing condition. The static system of the new bridge is a double steel arch with a tension. The cross-section of the bridge must be designed to be able to withstand the required traffic load, both in terms of load capacity and in terms of required dimensions. Rail traffic is located inside the arches, while the road and pedestrian-cycling traffic is located on consoles, on the outside of the arches. In this way, a relatively correct distribution is obtained between the supporting structural elements in the transverse sense (transverse girders and cantilevers). In addition to many benefits which characterize the cross-section of the bridge, there is one downside, i.e. the relative sensitivity of the system to torsion. This problem is solved by adopting a rigid, latticed transverse girder, coupled to a reinforced concrete pavement slab, which together with the tensioning and longitudinal couplings placed at the level of the lower belt of the transverse girder, makes the system extremely torsion-rigid.

As a pavement slab, a reinforced concrete slab was adopted with a number of conveniences in front of the steel ortho-slab. The benefits are, first of all, reflected in the faster and simpler workmanship, the lower cost price, the contribution to the higher rigidity of the system, as well as the lower sensitivity to fatigue compared to the ortho-slab. Also, reinforced concrete slab is a more favourable choice from the point of view of noise protection, as well as for easier construction of the future track for the tram/metro traffic (pavement on solid substrate, submerged rails, etc.). On the other hand, the disadvantage of choosing a reinforced concrete slab is primarily reflected in the increase in the total permanent load of the bridge. Also, a big problem is the tensile force which occurs in the slab, which is a consequence of the connection and joint work of the slab and the bracer. As a result of the occurrence of this tensile force, it is difficult to prove that the cracks will remain within the permissible values. Due to these problems, the designers decided to form a deck on the bridge in question from prefabricated precast concrete slabs, which have numerous advantages over in-situ cast slabs.

The tram track construction, which was the main source of noise and vibration on the old bridge, is improved by applying modern constructive solutions consisting of a "floating" concrete slab placed over the Methyl Methacrylate (MMA) bridge waterproofing, sunk continuously relying elastically on the track in steel rail channels with side dowels, rubber insulated elements placed along the sides of the rail which have the task of dampening noise and vibration and flooding the rail channels with a polyurethane-based mass.

In places of the bridge dilatations (at the beginning and the end of the bridge), modern "quiet" dilatation devices are installed, which produce lower noise levels when vehicles pass over them in relation to the classic solutions used so far.

Technical measures for fauna protection

- The choice of lighting for the future bridge must be such that the effect of attracting insects and bats is reduced to a minimum.
- In order to record the possible negative impact of the bridge on the fauna of birds and bats (primarily in the form of direct damage from collisions with installations, infrastructure elements and vehicles) it is necessary to monitor these groups in the construction phase and in the first year after putting the bridge into operation in order to record potential damage and take measures to prevent or reduce it.

It is not planned to transport hazardous substances across the new bridge, while atmospheric wastewater from the road on the bridge is to be drained to the grease and oil separator, so that the Sava river aquifer will not be endangered by hazardous substances and therefore the living world will not be endangered. In that sense, no additional measures are needed to protect the fauna of the Sava river.

Technical measures for population protection

Technical measures for population protection include all those measures which contribute to the safe traffic flow. Unlike the existing condition, where traffic is conducted in mixed traffic lanes for all types of travel (except for pedestrians), on the new bridge the tracks are separated by tram isles, and there are also physically separate cycling and pedestrian paths. In this regard, the conflict between passenger and freight cars and public transport vehicles (trams) is avoided in the first place. Secondly, the physical separation of routes negates the risk of conflicts with vehicles from the opposite direction. There are also no conflicts between vehicles and pedestrians (cyclists) by the existence of physically separated cycle paths. There is a possible conflict between vehicles when overtaking, changing lanes and keeping an unsafe distance. In this respect, the design should provide for the installation of device for measuring distances, radars and control ramps.

Landscape - Aesthetics of the bridge

The Conceptual Solution of the bridge has been made completely according to the Conceptual Task and the first awarded work on the competition for the Urban-architectural conceptual solution for the reconstruction of the Old Sava bridge, which is listed as the relevant basis for the design of the solution. Consequently, the adopted Conceptual Design of the Bridge retained the look and aesthetics described in the award-winning work (Figure 8.3.2-1. Panorama - Future appearance of the New Sava Bridge).

Figure 8.3.2-1. Panorama - Future appearance of the New Sava Bridge).

The competition task has already determined that the future bridge should be an arched system, which in itself is an extremely beautiful aesthetic choice. The river is in this specific case bridged by arches which go down to above water level and braces connecting the left and right banks of the Sava river, also slightly arched (following a level line that is in a vertical curve). Through the constructive measures described in the previous chapters, the Designers were able to maintain the same arch and bracer heights throughout the length of the bridge, which added to the overall elegance of the solution. Looking at the newly designed bridge from the aspect of the existing Belgrade bridges, which are located nearby, one can notice structural elements which can be visually linked to other bridges across the Sava.

Struts that protrude from the river pillars and support the bracers visually seem like the supports which hold the box cross section of the Gazela Bridge. Hangers being radially positioned on the newly designed bridge provide for an elegant appearance which can be compared to the sloping cables on the “Novi zeleznicki” bridge, and especially with the sloping cables of the Ada bridge. Also, the bracers connecting the shores in a gentle arch can be linked to the appearance of the Branko’s Bridge, where the river is bridged by a beam of variable cross-section.

With all this in mind, it can be concluded that the newly designed bridge will fit well into the "array" of existing bridges.

However, in addition to parts of the structure designed to connect the bridge to existing Belgrade bridges, the newly designed bridge also has a unique aesthetic. The main contribution to the aesthetics was the introduction of asymmetry, i.e. the adoption of arches of different height. The arch system line is different from the classic parabolic arch solution, giving the solution a unique look. The designers believe that this leveling of the arches at the top by 6 m, or by introducing asymmetry, will give the bridge a personal seal and a difference which sets it apart from other standard solutions.

8.4. Other measures

8.4.1. Technical measures for general environmental protection

General environmental protection measures include global knowledge in this domain that is appropriate to the global strategy and local spatial conditions and characteristics of the planned road.

- All activities proclaimed within the general development policy at the level of the Republic of Serbia, and which are concretized through the highest planning documents, must be taken into account in terms of rational environmental management for a specific investment venture,
- As part of the general development policy, it is necessary to ensure consistent compliance with regulations of wider importance in terms of limit values of individual impacts as well as regulations on the characteristics of the vehicle fleet in terms of noise levels and exhaust gas quality,
- Prerequisites for continuous maintenance of the bridge must be provided,
- Timely plans for bridge maintenance in the winter months must be provided.

8.4.2. Administrative environmental protection measures

Administrative protection measures include a number of activities in terms of administrative regulation of certain phenomena which, if not regulated in time, can cause certain negative consequences which are very difficult to bring within acceptable limits. These protection measures include the following activities:

- Provide instruments within the framework of the consent issued by the competent republic institutions (competent ministries) that during the execution of works, permanent control is performed in terms of possible impacts on the environment,
- Provide instruments, within the contractual documentation that the investor will form with the contractors, on the need to comply with all prescribed protection measures in the construction phase,
- Provide instruments to engage in the implementation of works in the field of construction and operation those entities that have professional staff to fulfill the defined tasks in the field of environmental protection,

9. ENVIRONMENTAL IMPACT MONITORING PROGRAM

The design and implementation of environmental quality monitoring in the impact zone of the bridge over the Sava river enables: reviewing the effectiveness of the envisaged protection measures, defining and taking additional protection measures in order to prevent or reduce further degradation of the quality of the environment and establishing an early warning system and introducing the necessary improvements.

9.1. Air monitoring

Air quality control on the territory of the city of Belgrade is carried out by a monitoring system which has established a state and local network of measuring stations and measuring points for fixed measurements. Considering that the air quality in Belgrade is carried out continuously by authorized organizations, and that there are measuring points that are located in the immediate vicinity of the Sava bridge, it is not necessary to envisage special air monitoring.

9.2. Groundwater monitoring

Groundwater quality requires monitoring of pollutants present in the soil, in order to determine the impact of soil pollution on groundwater pollution. In order to monitor the impact of the project of the bridge over the Sava river on the water supply source of the city of Belgrade, and in order to detect pollution in a timely manner, it is necessary to perform dedicated monitoring of groundwater and soil quality.

Monitoring of land and groundwater should be carried out in the phase of works execution and during the bridge usage phase, in accordance with the Decree on the program of systematic monitoring of soil quality, indicators for risk assessment of land degradation and methodology for remediation programs. (Off. Gazette of RS, no. 88/10), Decree on limit values of polluting, harmful and dangerous substances in the soil (Off. Gazette of RS, no. 30/18 and 64/19) and the Decree on limit values of pollutants in surface and groundwater and sediment waters and deadlines for their achievement ("Official Gazette of RS", 50/12). Potential sampling sites are in the zone of active construction sites.

During the works on the construction of the bridge, due to the possible influence of the use of mechanization and the human factor, it is necessary to monitor the quality of the land and groundwater. Sampling points should be in the zones of construction works and are determined depending on the project organization and technology of construction works and the works execution dynamics. Samples should be taken before the start of work "zero state", and then during the execution of works. Analyses should be performed four times a year during periods of high and low water levels. Potential sampling sites should be in the zone of active construction sites. The Supervisory Body, together with the representatives of the Investor and the Contractor, will accurately define the representative spots for taking soil samples.

For groundwater monitoring in the protection zones of groundwater and surface water supply sources in the city of Belgrade, the project envisages the construction of four new piezometers, two piezometers in the municipality of New Belgrade and two piezometers in the zone of influence of the bridge over the Sava river, in the municipality of Savski Venac (Table 9.2-1 and Figure 9.2-1).

Table 9.2-1. Locations of four new piezometers for groundwater monitoring.

Label	Coordinates	
	X	Y
Piezometer 1	7456547.4491	4963087.9106
Piezometer 2	7456568.3569	4963134.8279
Piezometer 3	7456900.2664	4963083.1363
Piezometer 4	7456893.0657	4963037.3673

The purpose of piezometers is to determine hydrogeological conditions, to ensure the collection of water samples and to enable the monitoring of pollutant movements.

Monitoring quantitative status means, above all, monitoring groundwater levels. In the monitoring of chemical status, according to the modern European approach, there is a similarity as in surface waters, supervisory and operational monitoring. Monitoring of groundwater levels as well as supervisory chemical monitoring must be carried out in the first phase, while the needs for operational monitoring depend on the obtained results of pressure and impact analysis (determine the existence of risks). Operational chemical monitoring should be carried out if, based on the analysis of the obtained results, it is determined that there is a negative impact on the quality of groundwater, both in the phase of exploitation and maintenance of the object in question.

Surveillance monitoring includes monitoring of the chemical status of the main and other parameters, and it is performed in accordance with the directive.

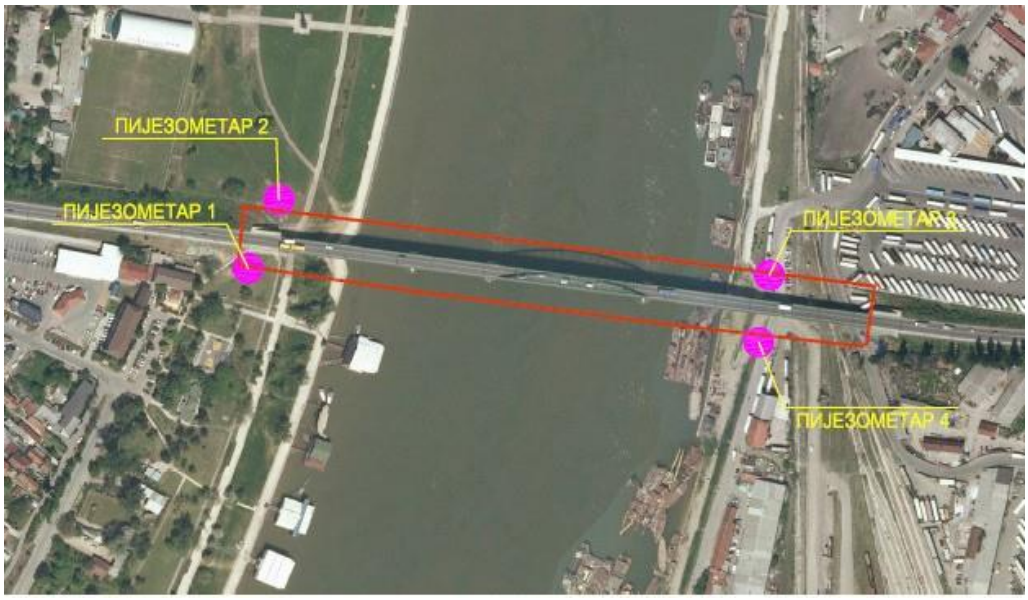


Figure 9.2-1. Position of piezometers in relation to the bridge over the river Sava.

The following main indicators should be analyzed in groundwater samples, namely: dissolved oxygen, pH, nitrates (NO_{3-}), ammonia (NH_{4+}), electrical conductivity. In addition to the main indicators, it is necessary to determine the indicators in the groundwater samples that indicate the possible impact of the facility during operation: heavy metals (Pb, Cu, Ni, Cd), hydrocarbon index (mineral oils from C_{10}-C_{40}), chloride (C_{l-}), sulfate (SO_{4-2}) and consumption of $KMnO_4$.

9.3. Wastewater and surface water monitoring

Surface water monitoring during works

During the construction of the bridge in the watercourse zone, it is necessary to monitor surface waters in accordance with the Decree on limit values of pollutants in surface and groundwater and sediment waters and deadlines for their achievement ("Official Gazette of RS", 50/12). Samples should be taken upstream and downstream of the construction site zone.

In the samples taken, it is necessary to determine the following parameters:

- air temperature, water temperature,
- barometric pressure, colour,
- odour,
- visible substances,
- sedimentary substances (after 2 hours),
- HPK,
- BPK5,
- pH value,
- oxygen content,
- dry residue,
- annealed residue,
- loss by annealing,
- suspended matter,
- electrical conductivity
- heavy metal content
- hydrocarbon index (mineral oils from C10-C40).

Monitoring of wastewater and surface water during the bridge usage phase

In accordance with the Law on Environmental Protection ("Official Gazette of the Republic of Serbia", No. 135/04 i 36/09, 36/09-and other laws, 72/09-and other laws, 43/11-Decision of the Constitutional Court, 14/16, 76/18, 95/18-and other laws and 95/18-and other laws), Law on waters ("Official Gazette of the Republic of Serbia", No. 30/10, 93/12, 101/16 and 95/18-and other laws) and the Rulebook on the manner and conditions for measuring the quantity and testing of wastewater quality and the content of the report on the performed measurements "Official Gazette of the Republic of Serbia", No. 33/16), during the use of the bridge over the Sava river, it is necessary to systematically monitor the amount of wastewater and wastewater quality and the report on the measurements is submitted to the public water company, the ministry responsible for environmental protection and the Environmental Protection Agency.

It is a legal obligation for a legal entity, i.e. an entrepreneur who discharges wastewater into a receiver and/or public sewer to monitor wastewater in accordance with the Rulebook on the manner and conditions for measuring the quantity and testing the quality of wastewater and the content of the report on measurements "Official Gazette of the Republic of Serbia", No. 33/16), through a legal entity authorized to test wastewater or independently if it meets the conditions for this in accordance with the law governing water: conditions for measuring the quantity and testing of wastewater quality and the content of the report on performed measurements ("Official Gazette of the Republic of Serbia", No. 33/16) and the Regulation on emission limit values for pollutants matter in water and deadlines for their achievement ("Official Gazette of the Republic of Serbia", No. 67/11, 48/12 and 1/16). Monitoring is performed before and after wastewater treatment.

The legal entity which collects, drains and treats wastewater and water protection is obliged to control the correctness of facilities for collection, drainage and treatment of wastewater, primarily in terms of watertightness, every five years, and in the case of devices for measuring the amount of wastewater once a year.

Properties to be monitored

The following parameters need to be specified:

- flow,
- air temperature, water temperature,
- barometric pressure, color,
- smell,
- visible matter,
- sedimentary substances (after 2 h),
- chemical oxygen demand (COD)
- biochemical oxygen demand (BOD)
- pH value,
- oxygen content,
- dry residue,
- annealed residue,
- loss on ignition,
- suspended matter,
- heavy metal content,
- electrical conductivity and
- hydrocarbon index (mineral oils from C_{10}-C_{40}).

Places, manner and frequency of measuring the determined parameters

Rulebook on the manner and conditions for measuring the quantity and testing of wastewater quality and the content of the report on the performed measurements ("Official Gazette of the Republic of Serbia", No. 33/16) determines the place of sampling of wastewater, taking into account changes in the composition of wastewater in time and space.

Samples must be taken at the following places:

- The place of wastewater discharge into the receiver (watercourses). The sampling point must be integrated in the separator or outside the separator and in both cases directly downstream of the separator.
- Samples should be taken 50 m upstream and downstream from the point of inflow of treated atmospheric wastewater from the separator.

The minimum number of sampling is determined in accordance with the above-mentioned Rulebook. Based on Table 2.2, annual frequencies of measurements and tests for other technological wastewaters with discontinuous discharge, according to the flow of wastewater at a single outlet, it is necessary to make at least four samples per year.

9.4. Noise monitoring

Monitoring of noise levels is determined on the basis of the Regulation on noise indicators, limit values, methods for assessing noise indicators, harassment and harmful effects of noise in the environment ("Official Gazette of the Republic of Serbia", No. 75/10).

The parameters of noise level monitoring at the location in question are determined according to the Rulebook on noise measurement methods, content and scope of the noise measurement report ("Official Gazette of the Republic of Serbia", No. 72/10), harassment and harmful effects of noise in the environment ("Official Gazette of the Republic of Serbia", No. 75/10).

Parameters for measuring environmental noise levels: Equivalent noise level LAeq, T [dB], Relevant noise level LRaeq, T [dB] and Residual noise level [dB].

Noise monitoring should be provided in residential and other sensitive areas/zones located in the immediate vicinity of roads on the bridge.

Measuring points are selected so that they are representative of the observed area and in case of justified complaints of the local population, the number of measuring points can be increased. If, on the basis of the measurement, additional transgressions of the legally permitted noise levels are determined in relation to the already determined ones, as well as new transgressions, the investor, i.e. the competent institution is obliged to act in accordance with the obtained results.

The first round of noise monitoring should be performed several months after the commissioning of the roads on the bridge, and then every year at regular intervals. Noise level measurements should be carried out at measuring points where measurements have been made in order to determine the existing condition.

9.5. Fauna monitoring

In order to determine the existing condition and assess the impact of the new bridge, i.e. the possibilities of collision of birds and bats with vehicles on the bridge, their monitoring was carried out in the area of construction of the new Sava Bridge in the period from October 2019 to July 2020. In order to record the possible negative impact of the bridge on the birds and bats fauna (primarily in the form of direct damage from collisions with installations, infrastructure elements and vehicles), it is necessary to continue with monitoring these groups during construction and in the first year after commissioning, in order to record potential losses and take measures to prevent or mitigate them.

It is necessary to monitor bats at least 3 times a month during the period from March to October, during the night, from dusk to dawn, depending on the season.

In case of breaks in monitoring due to the epidemiological or any other situation, it is necessary to extend its duration in order to compensate for the field dynamics. Monitoring of birds and bats should be performed by experts in the field who have adequate equipment and relevant references.

10. NON-TECHNICAL SUMMARY

The issue of environmental protection was analyzed as part of a special study - Environmental impact assessment study of the construction of a bridge over the Sava river on the site of the Old Sava bridge. The subject study is an impact assessment of bridge construction on the environment, which was done in accordance with the dynamics of the project, available technical documentation, publicly available data on the existing state of the environment in the study area, information and documentation obtained from relevant institutions.

The entire issue was analyzed in several separate sections which include: basis for the study, description of the narrower and wider location where the construction of the bridge is planned, project description, presentation of the main considered alternatives, presentation of the state of the environment at the location and the immediate environment, an environmental impact assessment in the event of an accident, a description of the measures envisaged to prevent, reduce and, where possible, eliminate any significant adverse effects on the environment, as well as an environmental impact monitoring program.

Through the bases for the preparation of the study, all relevant factors which had an impact on the subject study research were defined.

The performed geological-geotechnical examinations, research and analyzes were used for the needs of research and evaluation of the parameters of the existing condition which are of interest for the problems of environmental protection. Particularly interesting facts were related to the geomorphological, geological, hydrogeological, seismological and pedological characteristics of the analyzed area.

The data on climatic characteristics of Belgrade were taken from the website of the Republic Hydrometeorological Service of Serbia
http://www.hidmet.gov.rs/latin/meteorologija/klimatologija_godisnjaci.php.

The results of the Traffic Analysis, which is an integral part of the Feasibility Study, were used as input parameters for quantification of possible impacts resulting from the construction and later operation of the bridge over the Sava river.

The wider gravitational area of the impact of the bridge construction over the Sava river on the site of the old bridge on the population, includes the City of Belgrade. Belgrade is organized in 17 urban municipalities, where 1,687,132 inhabitants live on the territory of 3,234 km^2 according to the 2017 estimate, i.e. 522 inhabitants per one km^2.

The basic hydrological features of the researched area are given by the rivers Sava and Danube, which belong to the Black Sea basin. Based on Article 2. of the Regulation on determination of international and interstate waterways ("Official Gazette of the Republic of Serbia" No. 109/16) and Article 1. of the Regulation on the categorization of international and interstate waterways ("Official Gazette of the Republic of Serbia" No. 109/16), the Sava river on the subject section has the status of an international waterway, category Va. However, taking into account the proximity of the Belgrade hydroelectric power station and the Danube, i.e. from the aspect of water transport considering the subject location and the confluence of the Sava and the Danube as a whole, the values of the waterway are valid for the subject location of the waterway class VIc).

According to the Conditions obtained from PUC "Belgrade Waterworks and Sewerage", Development Service, for the purpose of issuing Location Conditions for the bridge construction over the Sava river on the site of the old bridge, and based on the Decision on determining sanitary protection zones in the administrative territory of Belgrade for underground and surface waters springs, used for water supply of the city of Belgrade (No. 530-01-48/2014-10 dated 1 August 2014, Ministry of Health of the Republic of Serbia), it can be stated that the part of the bridge over the Sava river located in the municipality of New Belgrade is in the narrow sanitary zone (Zone II), and the other part of the bridge which is located on the territory of the municipality of Savski Venac is partly in a wider sanitary zone (Zone III), and partly in an area that is not defined as a zone of sanitary protection of springs.

The location intended for the construction of the New Sava Bridge is a space for the migration of rare and endangered bird species, which are in accordance with the criteria of the Rulebook on proclamation and protection of strictly protected and protected wild species of plants, animals and fungi (Official Gazette of the Republic of Serbia, No. 5/10, 47/11, 32/16 and 98/16) have been declared strictly protected species. Of the other fauna species, the subject area is inhabited by synanthropic animal species (primarily except birds, small and medium-sized mammals).

According to the conditions issued by the Institute for Nature Conservation of Serbia in the Decision No. 03 020-1513/2, on 19 June 2019, at the location planned for the construction of the New Sava Bridge, there are no protected areas for which a protection procedure has been conducted or initiated, as well as no recorded natural assets. The location is in part in the ecologically important area "Estuary of the Sava into the Danube" of the ecological network of RS determined by the Regulation on the ecological network ("Official Gazette of the Republic of Serbia", No. 102/10), and in part in its immediate vicinity. The ecologically significant area "Estuary of the Sava into the Danube" is at the same time an area of international importance for birds (IBA area registered as RS017IBA "Estuary of the Sava into the Danube"). The Sava with the coastal belt in its natural and near-natural state is an ecological corridor of the ecological network of RS of international importance.

From the aspect of protection of cultural goods and in accordance with the Law on Cultural Heritage ("Official Gazette of the Republic of Serbia" No. 71/94, 52/11 and 99/11) and on the basis of available data it can be concluded that there is part of the cultural goods under previous protection of the "Coastal Zone of New Belgrade", cultural monument "Staro Sajmište-Gestapo Camp" and "Surroundings of cultural monuments Staro sajmište-Gestapo Camp" under previous protection near the location of the new bridge.

Within the chapter - Project description, the following is given: description of previous works on project execution; description of the object, i.e. new bridge with its supporting infrastructure, technical and other characteristics. This chapter also gives an overview of the type and amount of waste materials and noise levels emitted in the road operation phase, the methods of waste management in the construction works phase.

In the chapter - Overview of the main alternatives, it was stated that within the Conceptual Design, alternative locations for the construction of the New Sava bridge were not considered. The position of the new bridge over the Sava river is defined by the Conceptual Task and within the first-prize winning work in the competition for the development of the urban-architectural solution for the reconstruction of the Old Sava bridge. Two scenarios of the traffic network from the aspect of air pollutant emissions and traffic safety of participants were considered:

- NO INVESTMENT scenario - which implies a future planned network in the urban area with the Old Sava bridge in the existing traffic profile

- INVESTMENT scenario - which implies a future planned network in the urban area with the construction of a new bridge on the site of the existing Old Sava bridge, with a wider traffic profile.

Overview of the state of the environment at the location and the surrounding area (micro and macro locations was done based on the results of systematic monitoring of air quality, surface and groundwater and target measurements of traffic noise levels. For the analysis of the existing surface water quality, the data of the Environmental Protection Agency (Opinion No. 011-00-0001/299/2018-02 dated 6 December 2018 provided in the Annex to the Study) and the data taken from the Report "Results of surface water quality testing for 2018" were used from the website of the Environmental Protection Agency (www.sepa.gov.rs/download/KvalitetVoda2018.pdf). By analyzing of the results of the water quality of the Sava river, on the profile of Ostružnica (coordinates: 4954350; 7445925), it was determined that the following parameters deviate from the prescribed limit values of pollutants for class II surface waters: iron (III). From the priority and priority hazardous substances, from the prescribed limit values, deviate: Pb-growth in three samples (III/IV), Benzo (a) pyrene in two samples (III/IV), Benzo(g,h,i)perylene in one sample (V), Fluoranthene in one sample (III/IV). The project "Operational monitoring of groundwater of the Republic of Serbia" was implemented in the period November 2018 - April 2019 by the Department of Hydrogeology, Faculty of Mining and Geology in Belgrade and the Institute of Public Health in Kragujevac. This project included groundwater in Belgrade, the left bank of the Sava, which is located in a wider observed area. Groundwater sampling for the needs of chemical analysis was performed within two campaigns of field visits to monitoring points. Field research was conducted in the period of "low waters" from 15 November 2018 to 1 December 2018 and in the period of "high waters" from 20 March 2019 to 15 April 2019. Analyzes of groundwater of the left bank of the Sava, done in the period of low (autumn) waters, showed an increased concentration of manganese in relation to the Maximum Allowable Concentration (MAC) for drinking water.

Within the chapter - Description of possible significant impacts of the project on the environment, the possible impacts of the construction of a new bridge over the Sava river on the environment, the issues of noise, air pollution, water pollution, soil pollution, impact on flora and fauna, natural and cultural heritage in the construction phase and later in the use phase of the new bridge, were analyzed using a defined methodology.

The chapter describing the provided environmental protection measures describes the measures for prevention, reduction and elimination of any significant harmful impact of the bridge on the environment. Environmental protection measures provided by law and other regulations (regulatory measures), protection measures in emergency situations, plans and technical solutions for environmental protection and other environmental protection measures are included. Regulatory measures for environmental protection imply a synthesis of all measures which must be applied as "acquired obligations" from the valid planning documents. This group includes measures provided by law and other regulations, norms, standards and appropriate regulations that define this issue. Protective measures are provided in case of accidents during the construction of the bridge. Environmental protection plans and solutions include protection

measures during the execution of works as well as during operation. The project provides technical measures for the protection of land, surface and groundwater. The adopted concept of drainage and purification of atmospheric water to the required quality for discharge into the recipient achieves the quality preservation of soil, surface and groundwater.

Due to more efficient traffic and shorter travel times, not only for the users of the bridge, but also for all users of the wider central zone, the traffic load will be reduced. Savings in travel time and the distance traveled by users directly affect the reduction of harmful gas emissions and fuel savings.

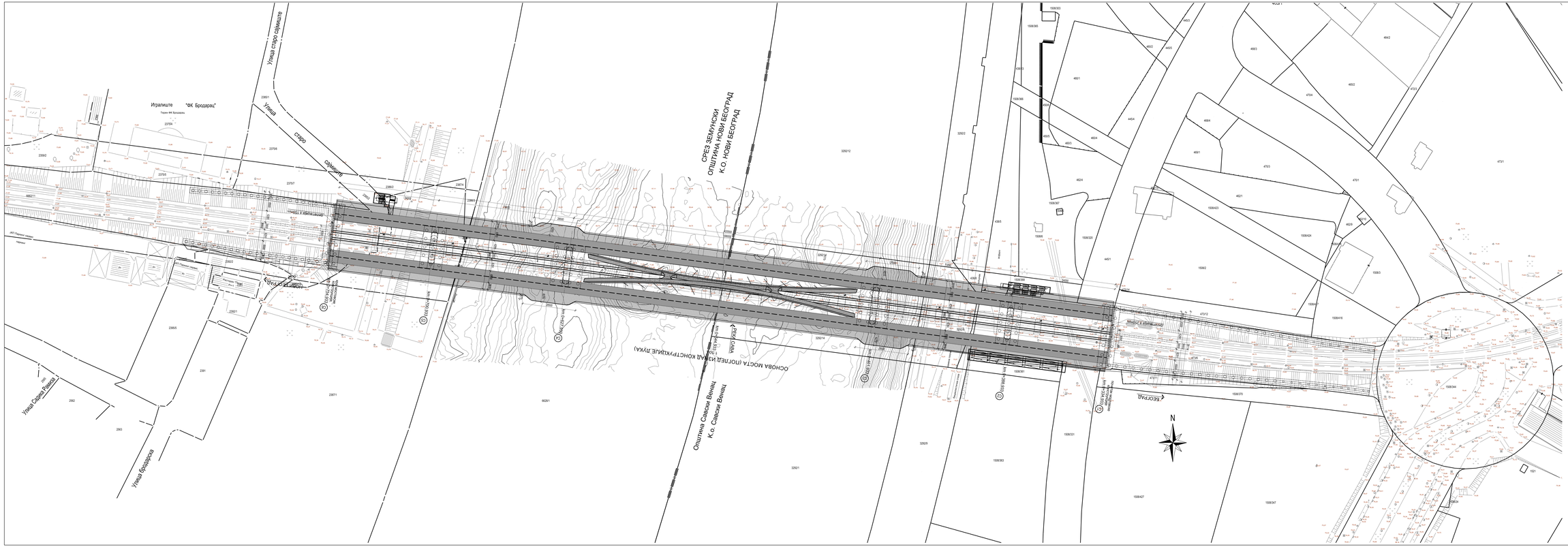
In accordance with the conditions obtained from the Institute for Nature Conservation of Serbia, measures for the protection of fauna, vegetation and ecologically important areas are provided. The works on the construction of the bridge must not violate the integrity and functionality of the Sava river as an international ecological corridor.

The impacts of the construction and operation of the New Sava Bridge on the quality of the environment (surface and groundwater, noise levels and fauna) will be completely controlled by conducting the planned monitoring given within the chapter 9 of this study.

11. INFORMATION ABOUT THE SHORTCOMINGS OF THE STUDY

During the preparation of the Environmental Impact Assessment Study, the multidisciplinary team of the Institute of Transportation, which participated in its preparation, did not encounter any special obstacles or difficulties.

IV GRAPHIC DOCUMENTATION



03		
02		
01	00.00.2016	Текст измене
Број	Датум	Опис

Решењем Блок

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.
Немањина 6; 11000 Београд, Србија
Тел.: 011/3616-124; Факс: 011/3615-334; web site: www.sicip.co.rs

Одговорни пројектанти за конструкцију
Од.инж.грађ.ИКС 310 (ИКС 13)
Слободан Јубовић, дипл.грађ.инж.
Од.инж.грађ.ИКС 310 (ИКС 13)
Дејан Срећић, дипл.грађ.инж.

Сарадници:
Дејан Бошковић, инж.грађ.

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.
Руководилац организационе јединице:
Љиљана Мишковић, дипл.грађ.инж.

Инвеститор:
Гама Виктиса, Секретаријат за комуналне и стамбене послове, Краљице Марије 1/ЦВ
Објекат:
Дунавски за трибинском комплексу и игралишу Београд 27, Ташмајдан 84, Београд.

Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА.

Део пројекта:
1-Пројекат моста

Назив:
ОСНОВА МОСТОВСКЕ КОНСТРУКЦИЈЕ на КАТАСТАРСКО ПОДЛОЗИ

Фаза пројекта: ДИПЗ | Број пројекта: 2017-013/КОН-4/21-Ц-ИП

Размера: 1:500

ZEMUN COUNTY MUNICIPALITY OF NOVI BEOGRAD C.M. NOVI BEOGRAD
BRIDGE PLAN (SECTION ABOVE THE ARCH)
Municipality of Savski Venac C.M. Savski Venac

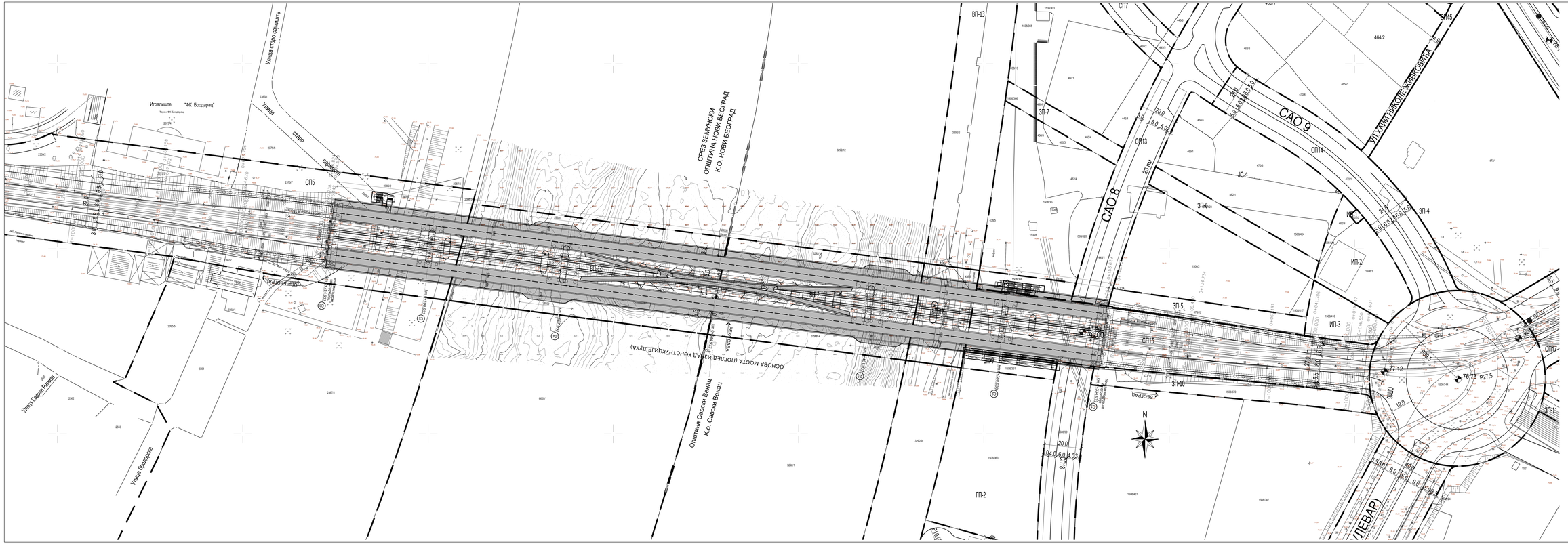
LEGEND:

Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10		Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07
03		
02		
01	00.00.2016	Variation text
Number	Date	Description

Revision block:

INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer: SCoE License No.: 310 J408 10 **Slobodan Jaćović, M.Sc. Civ. Eng.** SCoE License No.: 310 F110 07 **Dejan Srejić, M.Sc. Civ. Eng.**	Hand-written signatures	Employer: **City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII** Project client: **PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade**
Associates: **Dejan Bošković, Civ.Eng.**	Hand-written signature	Facility: **CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE** Part of the Project: **1- Bridge design**
Main Designer: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Drawing: **BRIDGE STRUCTURE PLAN ON THE CADASTRAL MAP** Scale: 1:500
Head of organizational unit: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Technical document type: **PD** Date: **06/2019** Drawing No.: 2017-913-KON-K2/1-C01


Игралиште "ФК Бродарац"
Терен 64 Бродарац
Улица стара сремчица
Улица Сарајева Равница
Улица Бродарска
СП5
СП7
СП13
СП14
СП15
СП16
СП17
ВП-13
ВП-5
ВП-6
ВП-7
ЗП-4
ЗП-5
ЗП-6
ЗП-7
ЗП-10
ЗП-11
ИП-2
ИП-3
САО 8
САО 9
УЛ. ХАЈМ-НИКОЛЕ ЖИВКОВИЋА
ЛЕВАР
СРЕЗ ЗЕМУНСКИ
ОПШТИНА НОВИ БЕОГРАД
К.О. НОВИ БЕОГРАД
Општина Савски Венац
К.о. Савски Венац
ОСНОВА МОСТА (ПОГЛЕД ИЗНАД КОНСТРУКЦИЈЕ ПУКА)
ЖЕЛЕЗНИЦА
N
464/2
76.73
77.12
76.65
76.75
76.80
76.85
76.90
76.95
77.00
77.05
77.10
77.15
77.20
77.25
77.30
77.35
77.40
77.45
77.50
77.55
77.60
77.65
77.70
77.75
77.80
77.85
77.90
77.95
78.00
78.05
78.10
78.15
78.20
78.25
78.30
78.35
78.40
78.45
78.50
78.55
78.60
78.65
78.70

ZEMUN COUNTY MUNICIPALITY OF NOVI BEOGRAD C.M. NOVI BEOGRAD
BRIDGE PLAN (SECTION ABOVE THE ARCH)
Municipality of Savski Venac C.M. Savski Venac

LEGEND:

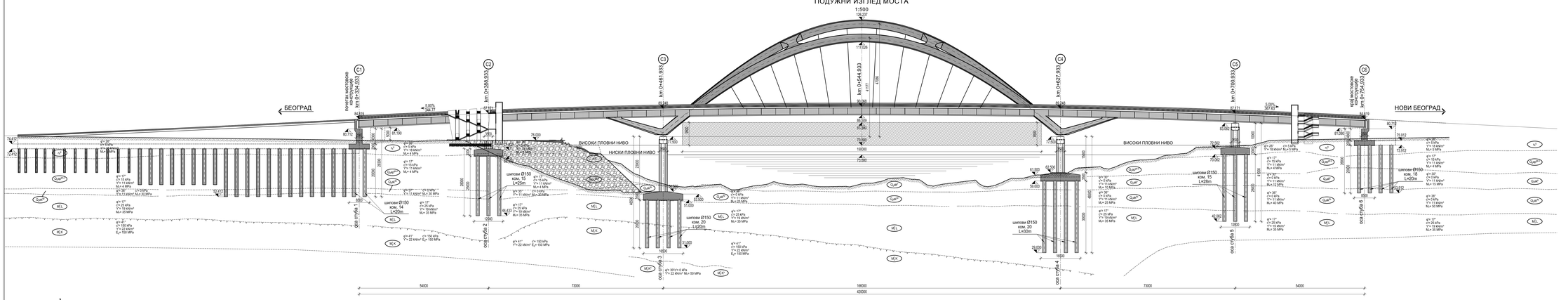
Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10		Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07
03		
02		
01	00.00.2016	Variation text
Number	Date	Description
Revision block:		

INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer: SCoE License No.: 310 J408 10 **Slobodan Jaćović, M.Sc. Civ. Eng.** SCoE License No.: 310 F110 07 **Dejan Srejić, M.Sc. Civ. Eng.**	Hand-written signatures	Employer: **City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII** Project client: **PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade**
Associates: **Dejan Bošković, Civ.Eng.**	Hand-written signature	Facility: **CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE** Part of the Project: **1- Bridge design**
Main Designer: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Drawing: **LOCATION PLAN PRESENTED ON A CADASTRAL AND TOPOGRAPHIC MAP** Scale: 1:500
Head of organizational unit: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Technical document type: **PD** Date: **06/2019** Drawing No.: 2017-913-KON-K2/1-C02

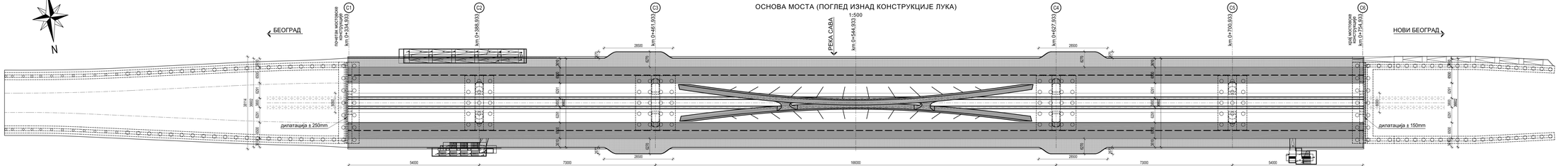
ПОДУЖНИ ИЗГЛЕД МОСТА

1:500



ОСНОВА МОСТА (ПОГЛЕД ИЗНАД КОНСТРУКЦИЈЕ ЛУКА)

1:500



Ревизиони блок:		
03		
02		
01	00.00.2016	Текст измене
Број	Датум	Опис

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.
Немањина 6; 11000 Београд; Србија
Тел: 011/3618-134; Факс: 011/3618-324; web site: www.sicip.co.rs

Одговорни пројектант за конструкције:
Вд.лиценца УКС: 310 J408 10
Слободан Јаћовић, дипл.грађ.инж.
Вд.лиценца УКС: 310 P113 07
Дејан Срећић, дипл.грађ.инж.

Сарадници:
Дејан Бошковић, инж.грађ.

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.
Руководилац организационе радионице:
Љиљана Мишковић, дипл.грађ.инж.

Инвеститор:
Град Београд, Секретаријат за комуналне и стамбене послове, Краљице Марије 1/ИВ
Пројектни пројекат:
Јавно предузеће Републичко земљиште и изградњу Београда Д, Ваткиљева 84, Београд
Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА
Део пројекта:
Т-Пројекат моста
Цртеж:
ДИСПОЗИЦИЈА ПОДУЖНИ ИЗГЛЕД И ОСНОВА (ПОГЛЕД ИЗНАД КОНСТРУКЦИЈЕ ЛУКА)
Размера: 1:500
Врста пројекта: ИП | датум: 06.2015 | шифра бр.: 2017-913-КОНЦ-К2/1-Ц20

LONGITUDINAL BRIDGE PROFILE								
BELGRADE	Beginning of the bridge structure km 0+334.933		HIGH NAVIGABLE WATER LEVEL LOW NAVIGABLE WATER LEVEL		HIGH NAVIGABLE WATER LEVEL		End of the bridge structure km 0+754.933	NOVI BEOGRAD
	Pier 1 axis Piles ∅150 14 pcs L=20m	Pier 2 axis Piles ∅150 15 pcs L=25m	Pier 3 axis Piles ∅150 20 pcs L=20m	Pier 4 axis Piles ∅150 20 pcs L=30m		Pier 5 axis Piles ∅150 15 pcs L=28m	Pier 6 axis Piles ∅150 18 pcs L=20m	

BRIDGE PLAN (SECTION ABOVE THE ARCH)				
BELGRADE	Beginning of the bridge structure km 0+334.933	SAVA RIVER	End of the bridge structure km 0+754.933	NOVI BEOGRAD
	Expansion joint ±250 mm		Expansion joint ±150 mm	

LEGEND:

Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10	Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07

Number	Date	Description
03		
02		
01	00.00.2016	Variation text

Revision block:

INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer:
SCoE License No.: 310 J408 10
Slobodan Jaćović, M.Sc. Civ. Eng.
SCoE License No.: 310 F110 07
Dejan Srejić, M.Sc. Civ. Eng.

Hand-written signatures

Employer:
City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII
Project client:
PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade

Associates:
Dejan Bošković, Civ.Eng.

Hand-written signature

Facility:
CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE

Part of the Project:
1- Bridge design

Main Designer:
Ljiljana Mišković, M.Sc. Civ. Eng.

Hand-written signature

Drawing:
LAYOUT LONGITUDINAL PROFILE AND PLAN OF THE BRIDGE (SECTION ABOVE THE ARCH)

Scale:
1:500

Head of organizational unit:
Ljiljana Mišković, M.Sc. Civ. Eng.

Hand-written signature

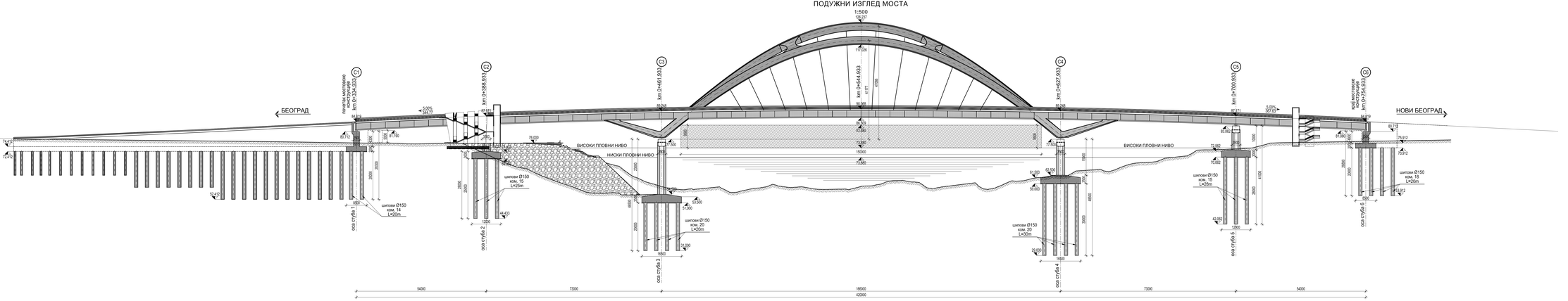
Technical document type:
PD

Date:
06/2019

Drawing No.:
2017-913-KON-K2/1-C03

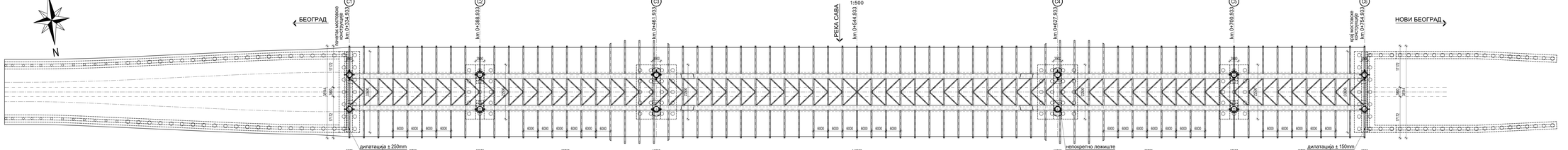
ПОДУЖНИ ИЗГЛЕД МОСТА

1:500



ОСНОВА МОСТА (КОНСТРУКЦИЈА И СТУБОВИ)

1:500



Број	Датум	Опис
03		
02		
01	00.00.2016	Текст измене

Ревизиони блок:

СЛОБОДАН ЈАЊОШЕВИЋ дипл. грађ. инж. 310 2408 10

ДЕЈАН СРЕЋКО дипл. грађ. инж. 310 F113 07

СЛОБОДАЊ Ј. ЈАЊОШЕВИЋ дипл. грађ. инж. 310 2408 10

ДЕЈАН Ђ. СРЕЋКО дипл. грађ. инж. 310 F113 07

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.
Немањина 6; 11000 Београд; Србија
Тел: 011/3618-134; Факс: 011/3618-324; web site: www.sicip.co.rs

Одговорни пројектанти за конструкцију:
Вд.лиценце ИКС: 310 2408 10
Слободан Јањошевић, дипл.грађ.инж.
Вд.лиценце ИКС: 310 F113 07
Дејан Срећко, дипл.грађ.инж.

Сарадници:
Дејан Бошковић, инж.грађ.

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.
Руководилац техничке радионице:
Љиљана Мишковић, дипл.грађ.инж.

Инвеститор:
Града Београда, Секретаријат за комуналне и стамбене послове, Краљице Марије 1/ИВ
Пројектни пројекат:
Јавно предузеће "Републичко земљиште и путеви Београда" Ул. Хајдучка 84, Београд

Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА

Део пројекта:
Т-Пројекат моста

Цртеж:
ДИСПОЗИЦИЈА ПОДУЖНИ ИЗГЛЕД И ОСНОВА (КОНСТРУКЦИЈА И СТУБОВИ)

Размера: 1:500

Врста техн.док.: ИП | датум: 06.2016 | шифра бр.: 2017-013-КОНЦ-КЗ/1-Ц04

LONGITUDINAL BRIDGE PROFILE								
BELGRADE	Beginning of the bridge structure km 0+334.933		HIGH NAVIGABLE WATER LEVEL LOW NAVIGABLE WATER LEVEL		HIGH NAVIGABLE WATER LEVEL		End of the bridge structure km 0+754.933	NOVI BEOGRAD
	Pier 1 axis Piles ∅150 14 pcs L=20m	Pier 2 axis Piles ∅150 15 pcs L=25m	Pier 3 axis Piles ∅150 20 pcs L=20m	Pier 4 axis Piles ∅150 20 pcs L=30m		Pier 5 axis Piles ∅150 15 pcs L=28m	Pier 6 axis Piles ∅150 18 pcs L=20m	

BRIDGE PLAN (STRUCTURE AND PIERS)					
BELGRADE	Beginning of the bridge structure km 0+334.933	SAVA RIVER		End of the bridge structure km 0+754.933	NOVI BEOGRAD
	Expansion joint ±250 mm		fixed base	Expansion joint ±150 mm	

LEGEND:

Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10	Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07

Number	Date	Description
03		
02		
01	00.00.2016	Variation text

Revision block:

INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer:
SCoE License No.: 310 J408 10
Slobodan Jaćović, M.Sc. Civ. Eng.
SCoE License No.: 310 F110 07
Dejan Srejić, M.Sc. Civ. Eng.

Hand-written signatures

Employer:
City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII
Project client:
PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade

Associates:
Dejan Bošković, Civ.Eng.

Hand-written signature

Facility:
CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE

Part of the Project:
1- Bridge design

Main Designer:
Ljiljana Mišković, M.Sc. Civ. Eng.

Hand-written signature

Drawing:
LAYOUT
LONGITUDINAL PROFILE AND PLAN OF THE BRIDGE (STRUCTURE AND PIERS)

Scale:
1:500

Head of organizational unit:
Ljiljana Mišković, M.Sc. Civ. Eng.

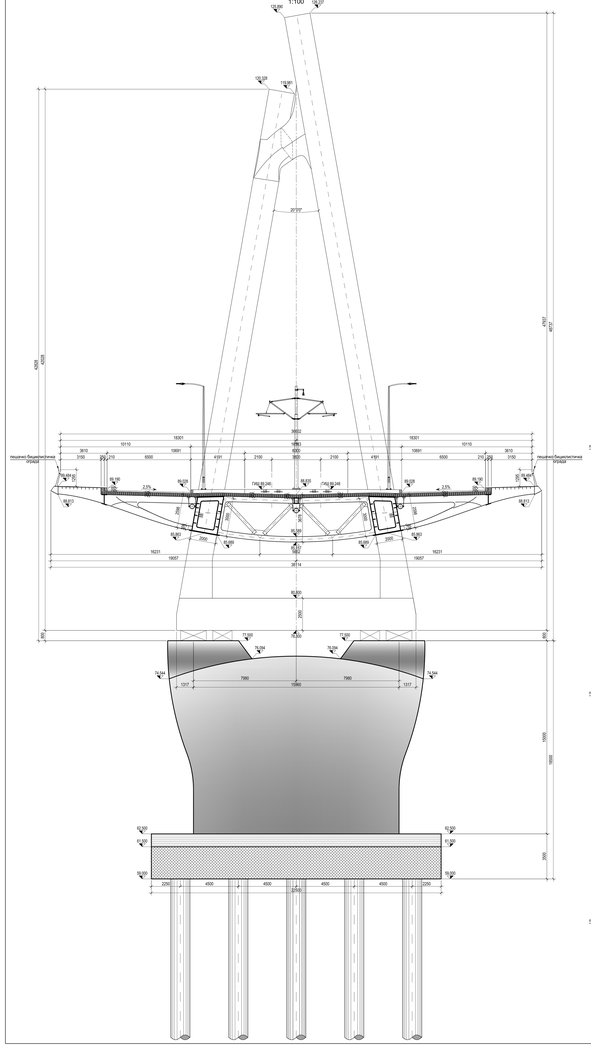
Hand-written signature

Technical document type:
PD

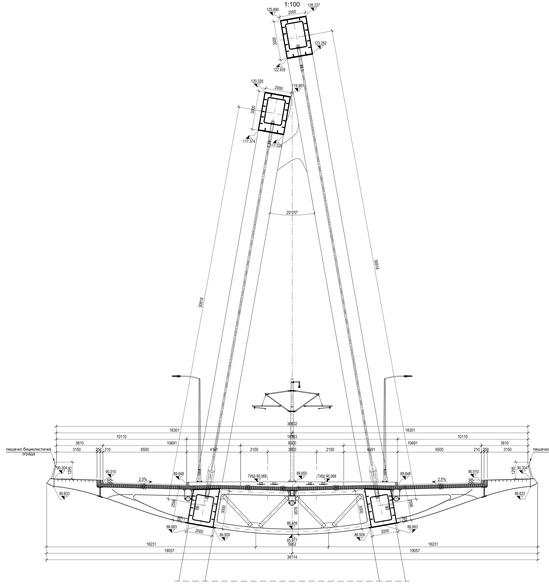
Date:
06/2019

Drawing No.:
2017-913-KON-K2/1-C04

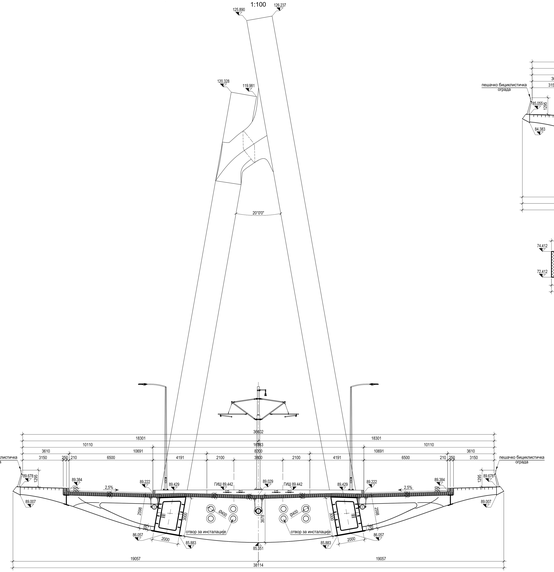
ПОПРЕЧНИ ПРЕСЕК МОСТА (ТРАМВАЈ САОБРАЋАЈ)
(СТУБ С4) ПРЕСЕК "1-1"
1:100



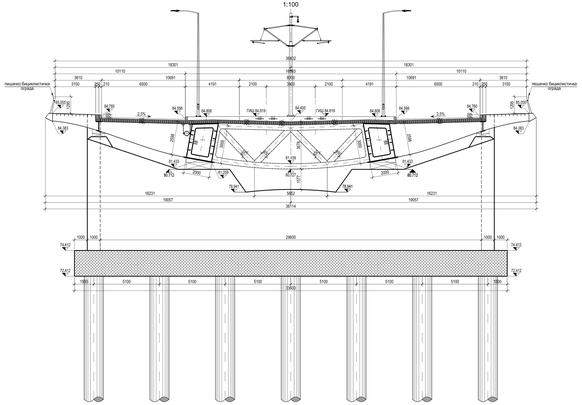
ПОПРЕЧНИ ПРЕСЕК МОСТА (ТРАМВАЈ САОБРАЋАЈ)
(У СРЕДИНИ ГЛАВНОГ РАСПОНА) ПРЕСЕК "3-3"
1:100



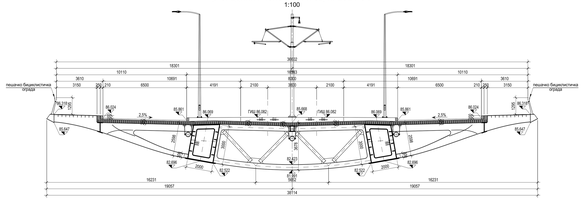
ПОПРЕЧНИ ПРЕСЕК МОСТА (ТРАМВАЈ САОБРАЋАЈ)
(НА МЕСТУ УКРШТАЊА ЛУКА И ЗАТЕГЕ) ПРЕСЕК "6-6"
1:100



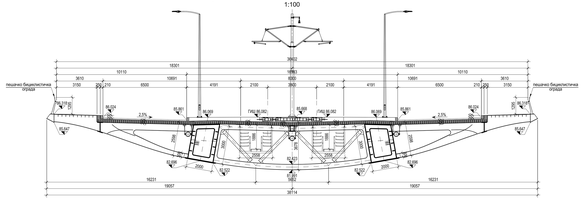
ПОПРЕЧНИ ПРЕСЕК МОСТА (ТРАМВАЈ САОБРАЋАЈ)
(ОБАЛНИ СТУБ С1) ПРЕСЕК "4-4"
1:100



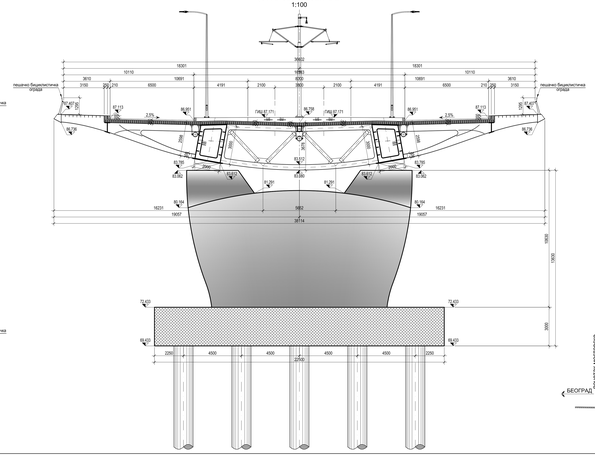
ПОПРЕЧНИ ПРЕСЕК МОСТА
(У СРЕДИНИ РАСПОНА С1 И С2) ПРЕСЕК "5-5"
1:100

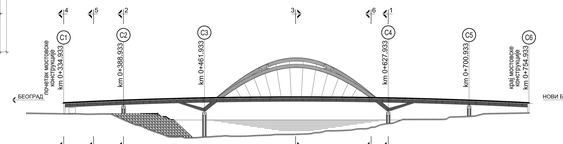


ПОПРЕЧНИ ПРЕСЕК МОСТА
(У СРЕДИНИ РАСПОНА С1 И С2) ПРЕСЕК "5-5"
1:100



ПОПРЕЧНИ ПРЕСЕК МОСТА (ТРАМВАЈ САОБРАЋАЈ)
(СТУБ С2) ПРЕСЕК "2-2"
1:100





03		
02		
01	00.00.2016	Текст измене
Број	Датум	Опис

Руководилац Пројекта:

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.
Немањина 6, 11000 Београд, Србија
Тел: 011/3615-134; Факс: 011/3615-224; web site: www.sicip.co.rs

Одговорни пројектант за конструкције:
Слободан Јаћовић, дипл.грађ.инж.
Одговорни пројектант:
Дејан Срећић, дипл.грађ.инж.

Сарадници:
Дејан Бошковић, инж.грађ.

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.

Руководилац пројектантске јединице:
Љиљана Мишковић, дипл.грађ.инж.

Главни пројекат
Саобраћајно, Стратегијат за изградњу и стамбене насеље, Блокови Мостар 1/3В
Општина Стари Град
Урбанистичко архитектонско инжењерска и инфраструктурна Београд, ул. Кнеза Михаила 6/II, Београд

Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА

Део пројекта:
1-Пројекат моста

Садржај:
ПОПРЕЧНИ ПРЕСЕЦИ

Фаза пројекта: **ИДП**
Датум: **мај 2016.**
Број пројекта: **2017-01/3-MOH-KQ-1-ИДП**

Размера: **1:100**

BRIDGE CROSS-SECTION (TRAM TRACKS) (PIER S4) CROSS-SECTION “1-1” 1:100		BRIDGE CROSS-SECTION (TRAM TRACKS) (IN THE MIDDLE OF THE MAIN SPAN) CROSS-SECTION “3-3” 1:100		BRIDGE CROSS-SECTION (TRAM TRACKS) (AT THE ARCH – CHORD CROSSING) CROSS-SECTION “6-6” 1:100		BRIDGE CROSS-SECTION (TRAM TRACKS) (ABUTMENT S1) CROSS-SECTION “4-4” 1:100	
Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails
		BRIDGE CROSS-SECTION (TRAM TRACKS) (IN THE MIDDLE OF THE S1 AND S2 SPAN) CROSS-SECTION “5-5” 1:100		BRIDGE CROSS-SECTION (TRAM TRACKS) (PIER S2) CROSS-SECTION “2-2” 1:100			
		Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails		
		BRIDGE CROSS-SECTION (TRAM TRACKS) (IN THE MIDDLE OF THE S1 AND S2 SPAN) CROSS-SECTION “5-5” 1:100					
		Pedestrian and cyclist guardrails	Pedestrian and cyclist guardrails				

BELGRADE	Beginning of the bridge structure km 0+334.933		End of the bridge structure km 0+754.933	NOVI BEOGRAD

LEGEND:

Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10	Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07

03		
02		
01	00.00.2016	Variation text
Number	Date	Description

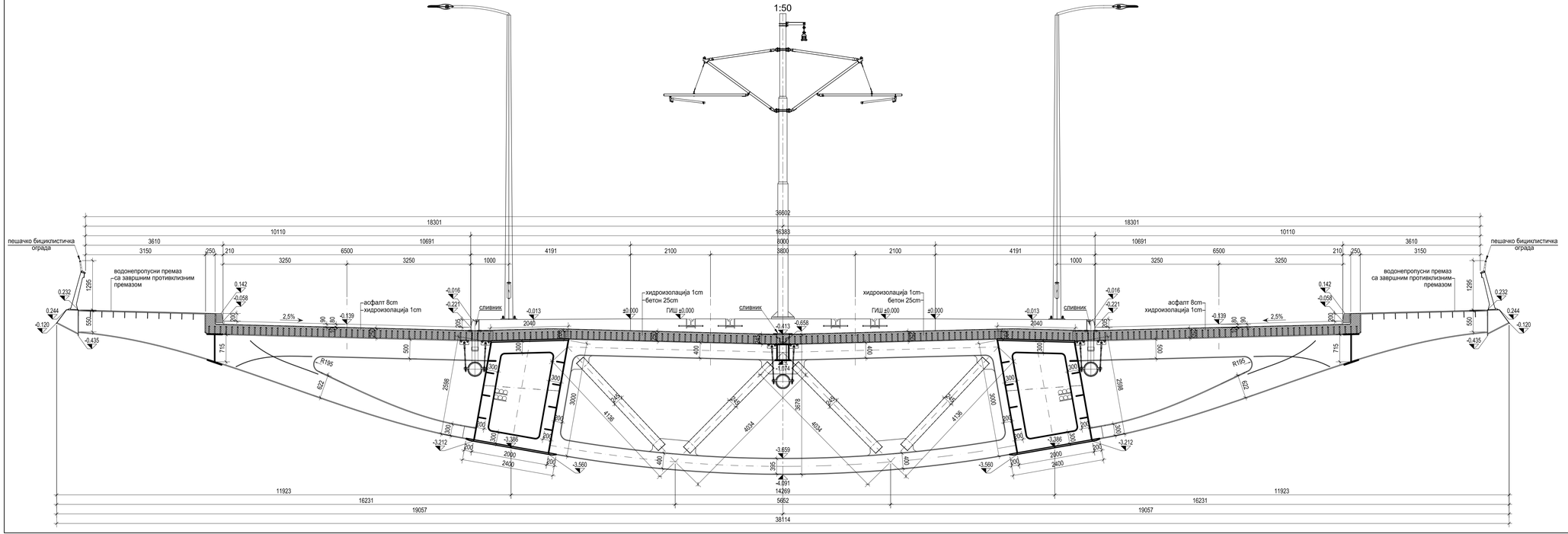
Revision block:

INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer: SCoE License No.: 310 J408 10 **Slobodan Jaćović, M.Sc. Civ. Eng.** SCoE License No.: 310 F110 07 **Dejan M. Srejić, M.Sc. Civ. Eng.**	Hand-written signatures	Employer: **City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII** Project client: **PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade**	
Associates: **Dejan Bošković, Civ.Eng.**	Hand-written signature	Facility: **CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE** Part of the Project: **1- Bridge design**	
Main Designer: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Drawing: **CROSS-SECTIONS**	Scale: 1:100
Head of organizational unit: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Technical document type: **PD**	Date: **06/2019** Drawing No.: 2017-913-KON-K2/1-C05

КАРАКТЕРИСТИЧНИ ПОПРЕЧНИ ПРЕСЕК МОСТА

1:50



03		
02		
01	00.00.2016	Текст измене
Број	Датум	Опис

Ревизиони блок:

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.
Немањина 6; 11000 Београд; Србија
Тел: 011/3618-134; Факс: 011/3618-324; web site: www.sicip.co.rs

Одговорни пројектанти за конструкцију:
Лиценце ИКС: 310 J408 10
Слободан Јаћовић, дипл.грађ.инж.
Лиценце ИКС: 310 F110 07
Дејан Срејић, дипл.грађ.инж.

Сарадници:
Дејан Бошковић, инж.грађ.

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.

Руководилац организационе јединице:
Љиљана Мишковић, дипл.грађ.инж.

Инвеститор:
Град Београд, Секретаријат за комуналне и стамбене послове, Краљице Марије 1/XIII

Наручилац пројекта:
Дирекција за грађевинско земљиште и изградњу Београда ЈП, Његошева 84, Београд

Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА

Део пројекта:
1-Пројекат моста

Цртеж: **КАРАКТЕРИСТИЧАН ПОПРЕЧНИ ПРЕСЕК**

Размера: **1:50**

Врста техн.док.: **ИП**

датум: **06.2019.**

цртеж бр.: **2017-913-КОН-К2/1-Ц06**

TYPICAL BRIDGE CROSS-SECTION										
Pedestrian and cyclist guardrails	Waterproofing coat with anti-slip finish coating	Asphalt 8cm Waterproofing 1cm	Gully	Waterproofing 1cm Concrete 25cm	Gully	Waterproofing 1cm Concrete 25cm	Gully	Asphalt 8cm Waterproofing 1cm	Waterproofing coat with anti-slip finish coating	Pedestrian and cyclist guardrails

LEGEND:

Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10	Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07

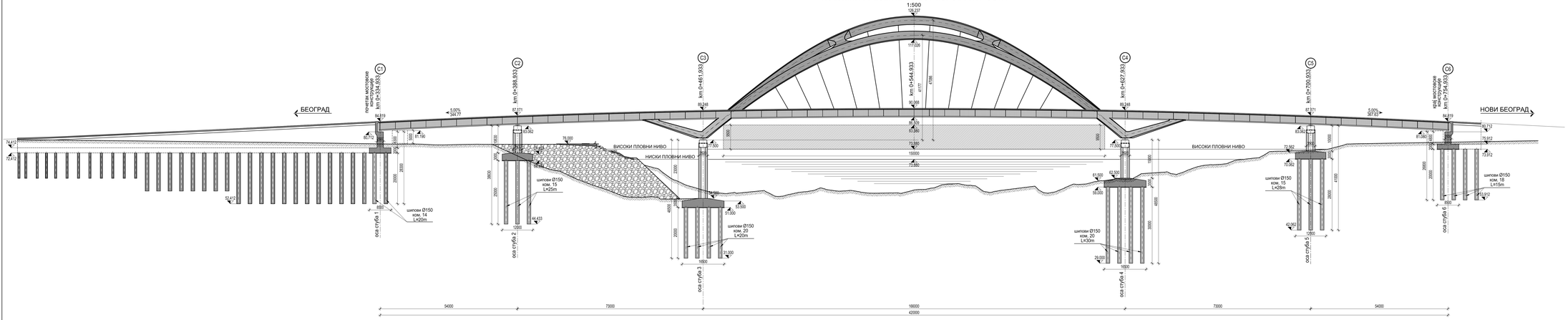
03		
02		
01	00.00.2016	Variation text
Number	Date	Description

Revision block:

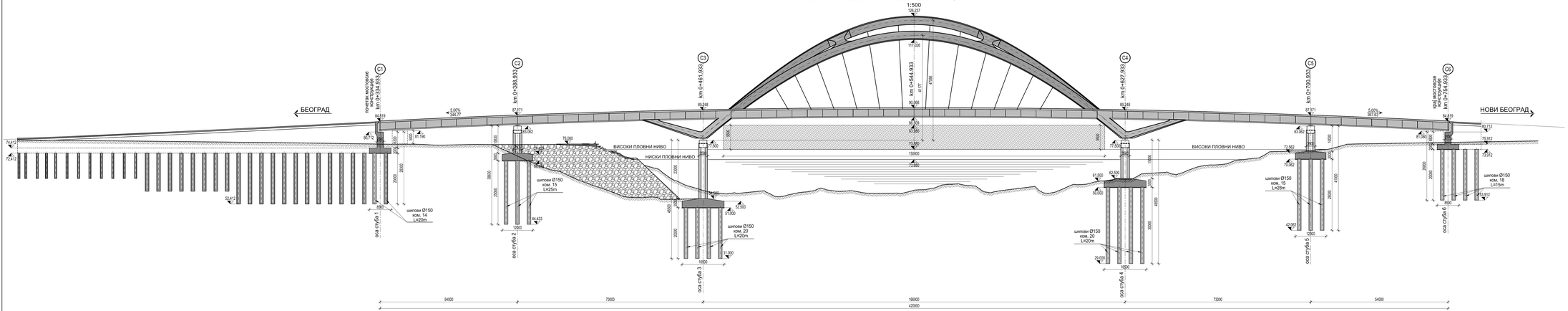
INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer: SCoE License No.: 310 J408 10 **Slobodan Jaćović, M.Sc. Civ. Eng.** SCoE License No.: 310 F110 07 **Dejan Srejić, M.Sc. Civ. Eng.**	Hand-written signatures	Employer: **City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII** Project client: **PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade**
Associates: **Dejan Bošković, Civ.Eng.**	Hand-written signature	Facility: **CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE** Part of the Project: **1- Bridge design**
Main Designer: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Drawing: **TYPICAL BRIDGE CROSS-SECTION** Scale: 1:50
Head of organizational unit: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Technical document type: **PD** Date: **06/2019** Drawing No.: 2017-913-KON-K2/1-C06

ПОДУЖНИ ПРЕСЕК КРОЗ ОСУ КОЛОВОЗА МОСТА



ПОДУЖНИ ПРЕСЕК КРОЗ ПЕШАЧКУ И БИЦИКЛИСТИЧКУ СТАЗУ



Број	Датум	Опис
03		
02		
01	00.00.2016	Текст измене

Ревизиони блок:

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.
Немањина 6; 11000 Београд; Србија
Тел: 011/3618-134; Факс: 011/3618-324; web site: www.sicip.co.rs

Одговорни пројектанти за конструкцију:
Бројеви лиценци ИКС: 312 J439 09
Слободан Ђурђевић, дипл.грађ.инж.
Број лиценце: 401 J338 07
Дејан Срећић, дипл.грађ.инж.

Сарадници:
Дејан Бошковић, инж.грађ.

Инвеститор:
Град Београд, Секретаријат за комуналне послове, посебне послове, Трг Николе Пашића 11/XIII
Картонски профили:
Дирекција за грађевинско земљиште и изградњу Београда ЈП, Булевар ослобођења 84, Београд

Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА

Део пројекта:
1-Пројекат моста

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.

Руководилац организационе јединице:
Љиљана Мишковић, дипл.грађ.инж.

Цртеж: **ПОДУЖНИ ПРЕСЕК КРОЗ ОСУ КОЛОВОЗА МОСТА, ПЕШАЧКУ И БИЦИКЛИСТИЧКУ СТАЗУ**

Размер: 1:500

Врста техн.док.: ИП | датум: 06.2019. | шифра бр.: 2017-913-КОН-КЖ/1-ЦД7

LONGITUDINAL BRIDGE PROFILE THROUGH THE AXIS OF THE PAVEMENT STRUCTURE								
BELGRADE	Beginning of the bridge structure km 0+334.933		HIGH NAVIGABLE WATER LEVEL / LOW NAVIGABLE WATER LEVEL		HIGH NAVIGABLE WATER LEVEL		End of the bridge structure km 0+754.933	NOVI BEOGRAD
	Pier 1 axis Piles ∅150 14 pcs L=20m	Pier 2 axis Piles ∅150 15 pcs L=25m	Pier 3 axis Piles ∅150 20 pcs L=20m	Pier 4 axis Piles ∅150 20 pcs L=30m		Pier 5 axis Piles ∅150 15 pcs L=28m	Pier 6 axis Piles ∅150 18 pcs L=20m	

LONGITUDINAL BRIDGE PROFILE THROUGH PEDESTRIAN AND BICYCLE PATH								
BELGRADE	Beginning of the bridge structure km 0+334.933		HIGH NAVIGABLE WATER LEVEL / LOW NAVIGABLE WATER LEVEL		HIGH NAVIGABLE WATER LEVEL		End of the bridge structure km 0+754.933	NOVI BEOGRAD
	Pier 1 axis Piles ∅150 14 pcs L=20m	Pier 2 axis Piles ∅150 15 pcs L=25m	Pier 3 axis Piles ∅150 20 pcs L=20m	Pier 4 axis Piles ∅150 20 pcs L=30m		Pier 5 axis Piles ∅150 15 pcs L=28m	Pier 6 axis Piles ∅150 18 pcs L=20m	

LEGEND:

Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10	Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07

Number	Date	Description
03		
02		
01	00.00.2016	Variation text

Revision block:

INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer:
SCoE License No.: 310 J408 10
Slobodan Jaćović, M.Sc. Civ. Eng.
SCoE License No.: 310 F110 07
Dejan Srejić, M.Sc. Civ. Eng.

Hand-written signatures

Employer:
City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII

Project client:
PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade

Associates:
Dejan Bošković, Civ.Eng.

Hand-written signature

Facility:
CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE

Part of the Project:
1- Bridge design

Main Designer:
Ljiljana Mišković, M.Sc. Civ. Eng.

Hand-written signature

Drawing:
LONGITUDINAL BRIDGE PROFILE THROUGH THE AXIS OF THE PAVEMENT STRUCTURE, PEDESTRIAN AND BICYCLE PATH

Scale:
1:500

Head of organizational unit:
Ljiljana Mišković, M.Sc. Civ. Eng.

Hand-written signature

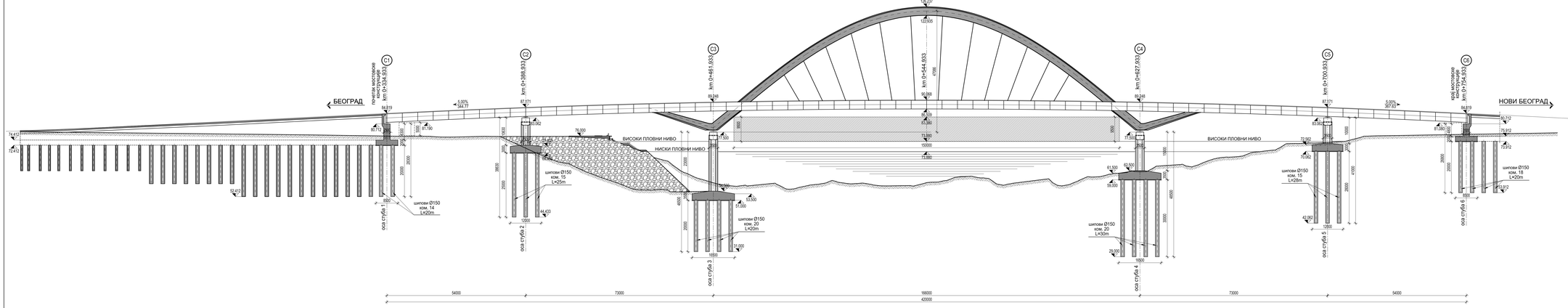
Technical document type:
PD

Date:
06/2019

Drawing No.:
2017-913-KON-K2/1-C07

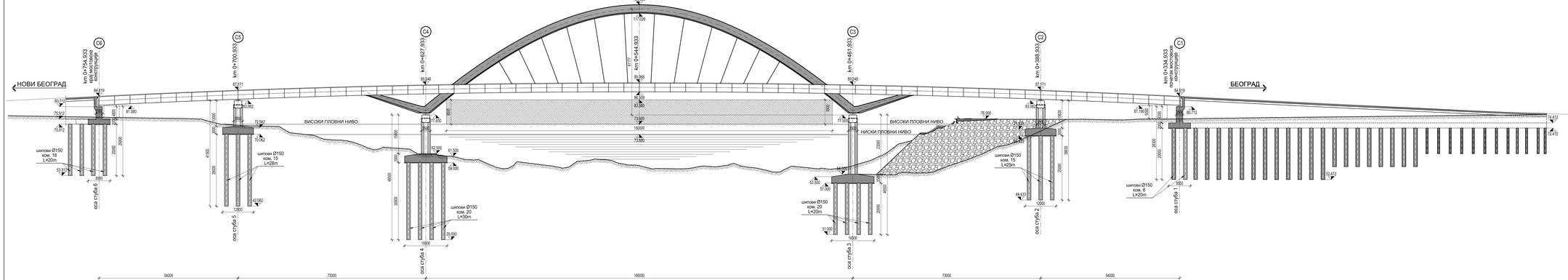
ПОДУЖНИ ПРЕСЕК МОСТА КРОЗ СРЕДИНУ (ВЕЛИКИ ЛУК)

1:500



ПОДУЖНИ ПРЕСЕК МОСТА КРОЗ СРЕДИНУ (МАЛИ ЛУК)

1:500



Број	Датум	Опис
03		
02		
01	00.00.2016	Текст измене

Ревизиони блок:

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.
Немањина 6; 11000 Београд; Србија
Тел: 011/3618-134; Факс: 011/3618-324; web site: www.sicip.co.rs

Одговорни пројектанти за конструкцију:
Лиценца број 310 JA08 10
Слободан Јаћовић, дипл.грађ.инж.
Лиценца број 310 P110 07
Дејан Срејић, дипл.грађ.инж.

Сарадници:
Дејан Бошковић, инж.грађ.

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.

Руководилац организационе јединице:
Љиљана Мишковић, дипл.грађ.инж.

Инвеститор:
Град Београд, Секретаријат за комуналне и стамбене послове, Краљице Марије 1/XIII

Наручилац пројекта:
Дирекција за грађевинско земљиште и изградњу Београда ИТ, Кнегиње Љубице 64, Београд

Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА

Део пројекта:
1-Пројекат моста

Цртеж:
ПОДУЖНИ ПРЕСЕК КРОЗ СРЕДИНУ МОСТА (ВЕЛИКИ ЛУК) И (МАЛИ ЛУК)

Размера: 1:500

Врста пем.док.: ИП | датум: 06.2015. | цртеж бр.: 2017-913-КОНЗ/1-Ц.док

LONGITUDINAL BRIDGE PROFILE THROUGH THE MIDDLE (LARGE ARCH)								
BELGRADE	Beginning of the bridge structure km 0+334.933		HIGH NAVIGABLE WATER LEVEL / LOW NAVIGABLE WATER LEVEL		HIGH NAVIGABLE WATER LEVEL		End of the bridge structure km 0+754.933	NOVI BEOGRAD
	Pier 1 axis Piles ∅150 14 pcs L=20m	Pier 2 axis Piles ∅150 15 pcs L=25m	Pier 3 axis Piles ∅150 20 pcs L=20m	Pier 4 axis Piles ∅150 20 pcs L=30m		Pier 5 axis Piles ∅150 15 pcs L=28m	Pier 6 axis Piles ∅150 18 pcs L=20m	

LONGITUDINAL BRIDGE PROFILE THROUGH THE MIDDLE (SMALL ARCH)								
NOVI BEOGRAD	End of the bridge structure km 0+754.933		HIGH NAVIGABLE WATER LEVEL		HIGH NAVIGABLE WATER LEVEL / LOW NAVIGABLE WATER LEVEL		Beginning of the bridge structure km 0+334.933	BEOGRAD
	Pier 6 axis Piles ∅150 18 pcs L=20m	Pier 5 axis Piles ∅150 15 pcs L=28m		Pier 4 axis Piles ∅150 20 pcs L=30m	Pier 3 axis Piles ∅150 20 pcs L=20m	Pier 2 axis Piles ∅150 15 pcs L=25m	Pier 1 axis Piles ∅150 14 pcs L=20m	

LEGEND:

Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10	Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07

Number	Date	Description
03		
02		
01	00.00.2016	Variation text

Revision block:

SAOBRAĆAJNI INSTITUT CIP

INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer:
SCoE License No.: 310 J408 10
Slobodan Jaćović, M.Sc. Civ. Eng.
SCoE License No.: 310 F110 07
Dejan Srejić, M.Sc. Civ. Eng.

Hand-written signatures

Employer:
City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII

Project client:
PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade

Associates:
Dejan Bošković, Civ.Eng.

Hand-written signature

Facility:
CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE

Part of the Project:
1- Bridge design

Main Designer:
Ljiljana Mišković, M.Sc. Civ. Eng.

Hand-written signature

Drawing:
LONGITUDINAL BRIDGE PROFILE THROUGH THE MIDDLE OF THE BRIDGE (LARGE ARCH) AND (SMALL ARCH)

Scale:
1:500

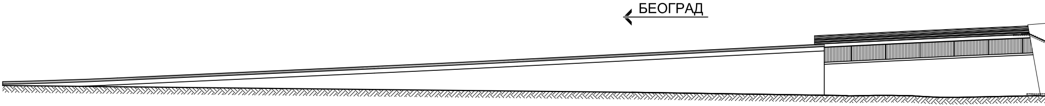
Head of organizational unit:
Ljiljana Mišković, M.Sc. Civ. Eng.

Hand-written signature

Technical document type:
PD

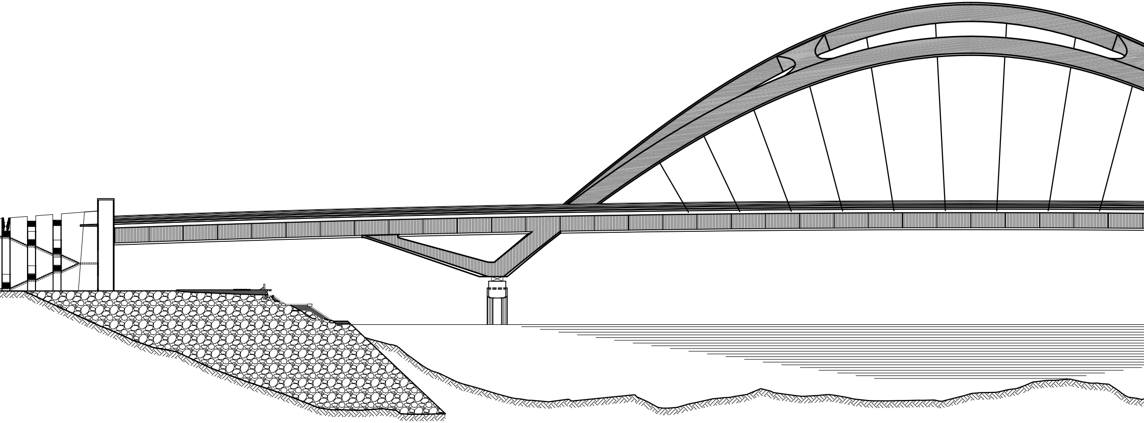
Date:
06/2019

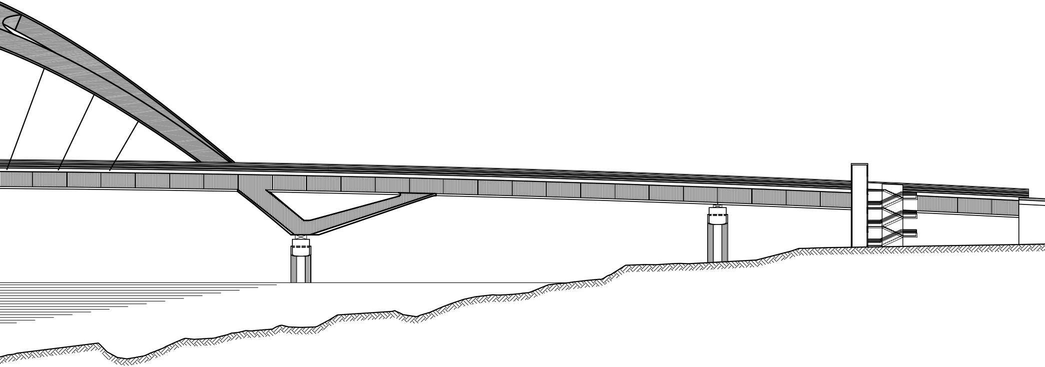
Drawing No.:
2017-913-KON-K2/1-C08

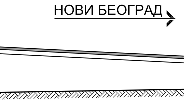


ИЗГЛЕД МОСТА

1:500







Слободан
Ж. Јаћовић
дипл. грађ. инж.
310 Ј408 10

Дејан
М. Срејић
дипл. грађ. инж.
310 F110 07

03		
02		
01	00.00.2016	Текст измене
Број	Датум	Опис

Ревизиони блок:

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.

Немањина 6; 11000 Београд; Србија
Тел: 011/3618-134; Факс: 011/3618-324; web site: www.sicip.co.rs

Одговорни пројектанти за конструкцију:
Бр.лиценце ИКС: 310 Ј408 10
Слободан Јаћовић, дипл.грађ.инж.
Бр.лиценце ИКС: 310 F110 07
Дејан Срејић, дипл.грађ.инж.

Инвеститор:
Град Београд, Секретаријат за комуналне и стамбене послове, Краљице Марије 1/XIII
Наручилац пројекта:
Дирекција за грађевинско земљиште и изградњу Београда ЈП, Његошева 84, Београд

Сарадници:
Дејан Бошковић, инж.грађ.

Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА

Део пројекта:
1-Пројекат моста

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.

Цртеж:
ИЗГЛЕД МОСТА

Размера:
1:500

Руководилац организационе јединице:
Љиљана Мишковић, дипл.грађ.инж.

Врста техн.док.: **ИП**
датум: **06.2019.**
цртеж бр.: 2017-913-КОН-К2/1-Ц09

BRIDGE VIEW		
BELGRADE		NOVI BEOGRAD

LEGEND:

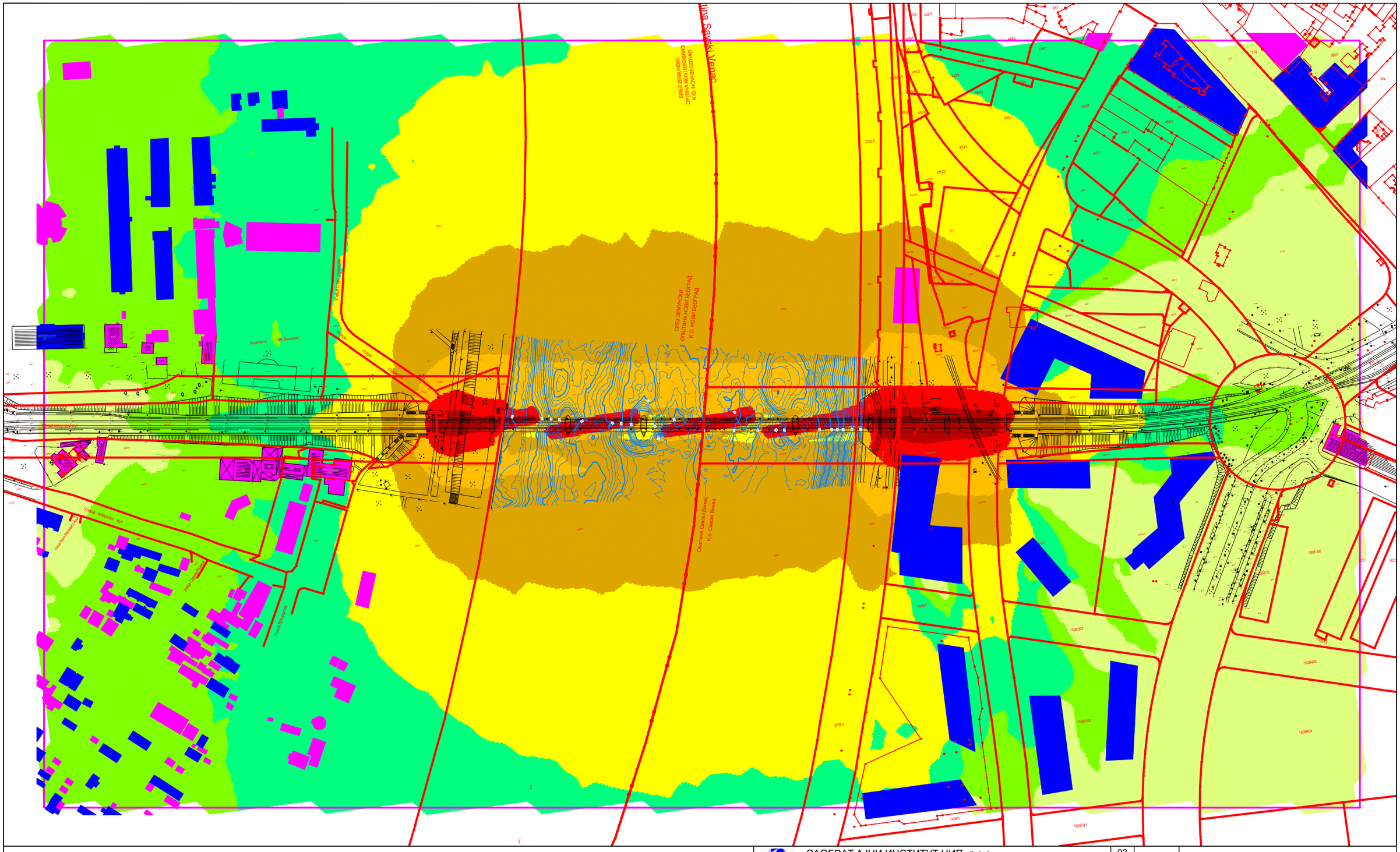
Stamp: Serbian Chamber of Engineers Responsible Designer Slobodan Ž. Jaćović M.Sc. Civ. Eng. 310 J408 10	Stamp: Serbian Chamber of Engineers Responsible Designer Dejan M. Srejić M.Sc. Civ. Eng. 310 F110 07

Number	Date	Description
03		
02		
01	00.00.2016	Variation text

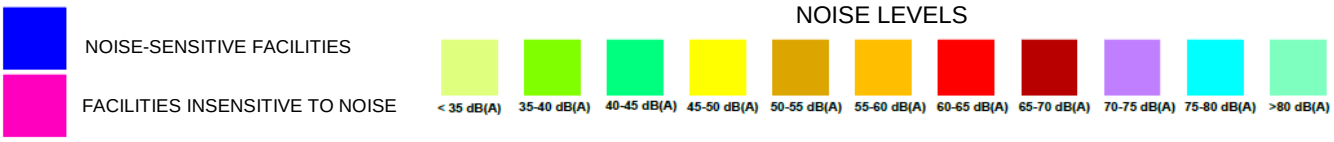
Revision block:

INSTITUTE OF TRANSPORTATION CIP, d.o.o.
Nemanjina Street No. 6; 11000 Belgrade; Serbia
Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs

Responsible structural designer: SCoE License No.: 310 J408 10 **Slobodan Jaćović, M.Sc. Civ. Eng.** SCoE License No.: 310 F110 07 **Dejan Srejić, M.Sc. Civ. Eng.**	Hand-written signatures	Employer: **City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII** Project client: **PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade**
Associates: **Dejan Bošković, Civ.Eng.**	Hand-written signature	Facility: **CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE** Part of the Project: **1- Bridge design**
Main Designer: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Drawing: **BRIDGE VIEW** Scale: 1:500
Head of organizational unit: **Ljiljana Mišković, M.Sc. Civ. Eng.**	Hand-written signature	Technical document type: **PD** Date: **06/2019** Drawing No.: 2017-913-KON-K2/1-C09


ОПШТИНА СВЕТОГ САВЕ
ОПШТИНА САВСКИ ВЕНАЦ
ОПШТИНА ЗЕМУН
ОПШТИНА НОВИ БЕОГРАД
ОПШТИНА ЧУКАРИЦА
ОПШТИНА ВОЖДОВАЦ
ОПШТИНА ПАЛИЛУЛА
ОПШТИНА ВРАЧАР
ОПШТИНА САВСКИ ВЕНАЦ
ОПШТИНА СТАРИ ГРАД
ОПШТИНА САВСКИ ВЕНАЦ
ОПШТИНА ЗЕМУН
ОПШТИНА НОВИ БЕОГРАД

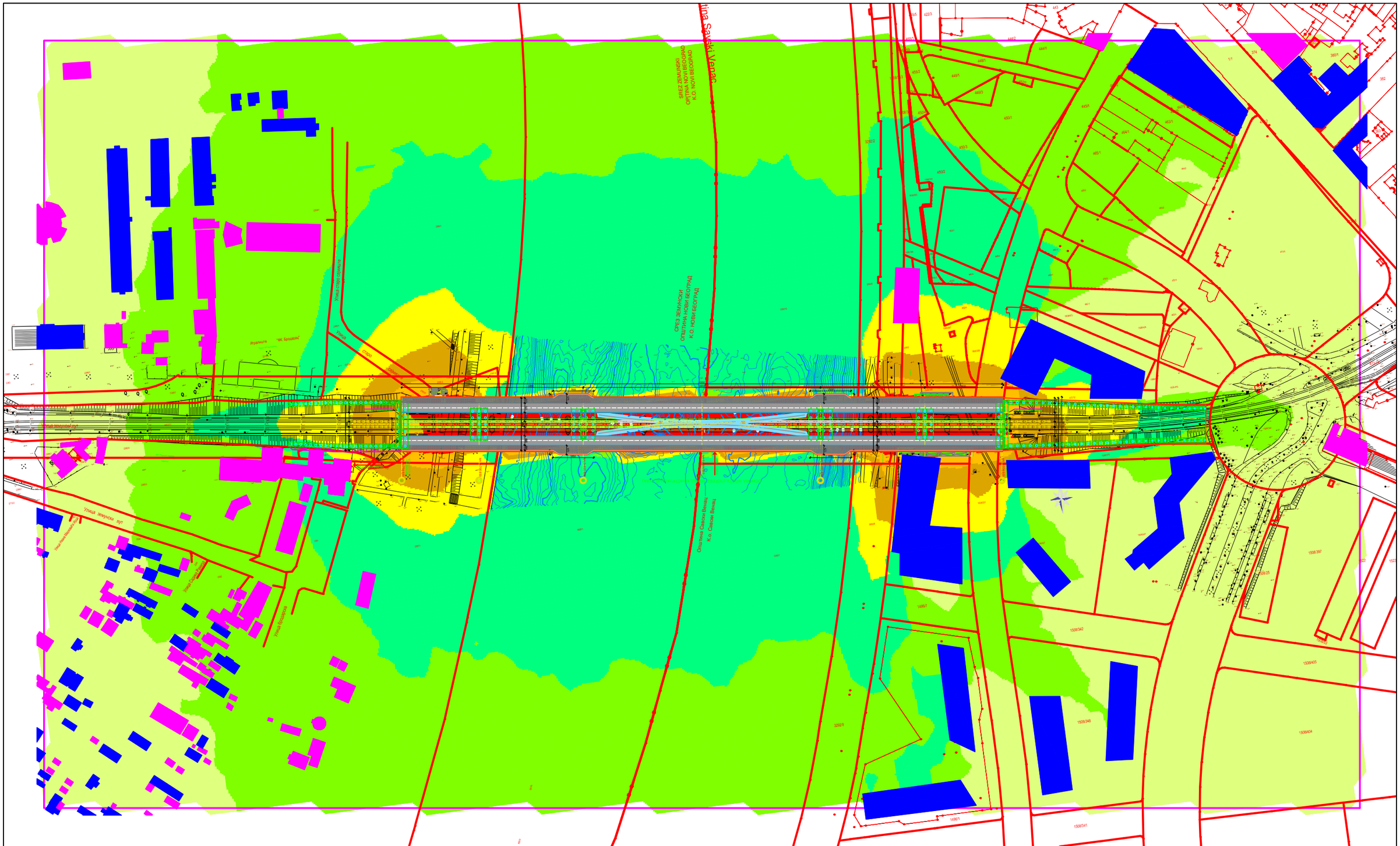
LEGEND



	INSTITUTE OF TRANSPORTATION CIP, d.o.o. Nemanjina Street No. 6; 11000 Belgrade; Serbia Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs		
Employer:	**City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII**		
Project client:	**PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade**		
Organizational unit: Sector LAB			
Study preparation manager: **Gorica Aleksić Milosavljević, M.Sc. in Tech.**	*Hand-written signature*	Noise map design: **Aleksandar Gajicki, Grad. Eng.**	*Hand-written signature*
		Chief Design Engineer: **Ljiljana Mišković, Grad.Civ.Eng.**	*Hand-written signature*
Associates:		Head of Organizational unit: **Gorica Aleksić Milosavljević, M.Sc. in Tech.**	*Hand-written signature*

03		
02		
01		
Number	Date	Description
Revision block:		
Facility: **CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE**		
Part of the Project: ENVIRONMENTAL IMPACT ASSESSMENT STUDY		
Drawings: TRAFFIC NOISE – OLD BRIDGE NIGHT-TIME (Lnight)		Scale: 1:2500

Project phase: STUDY	Date: 2019	Drawing No.: 2017-913-LAB-S2-C10



ЛЕГЕНДА

ОБЈЕКТИ ОСЕТЉИВИ НА БУКУ

ОБЈЕКТИ КОЈИ НИСУ ОСЕТЉИВИ НА БУКУ

НИВОИ БУКЕ

< 35 dB(A)	35-40 dB(A)	40-45 dB(A)	45-50 dB(A)	50-55 dB(A)	55-60 dB(A)	60-65 dB(A)	65-70 dB(A)	70-75 dB(A)	75-80 dB(A)	>80 dB(A)

САОБРАЋАЈНИ ИНСТИТУТ ЦИП, д.о.о.
Немањина 6; 11000 Београд; Србија
Тел: 011/3618-134; Факс: 011/3618-324; web site: www.sicip.co.rs

Инвеститор:
Град Београд, Секретаријат за комуналне и стамбене послове, Краљице Марије 1/XIII, Београд

Наручилац пројекта:
Дирекција за грађевинско земљиште и изградњу Београда ЈП, Његошева 84, Београд

Организациона јединица: Сектор ЛАБ

Руководилац израде Студије:
Горица Алексић Милосављевић, дипл.хем

Сарадници:

Израда карата буке: /Noise map disign:
Александар Гајицки, дипл.инж.

Главни пројектант:
Љиљана Мишковић, дипл.грађ.инж.

Руководилац организационе јединице:
Горица Алексић Милосављевић, дипл.хем

Бр.	Датум:	Опис:
03		
02		
01		

Ревизиони блок:

Објекат:
ИЗГРАДЊА МОСТА ПРЕКО РЕКЕ САВЕ НА МЕСТУ СТАРОГ САВСКОГ МОСТА

Део пројекта:
СТУДИЈА О ПРОЦЕНИ УТИЦАЈА НА ЖИВОТНУ СРЕДИНУ

Цртеж: САОБРАЋАЈНА БУКА - НОВИ МОСТ ПЕРИОД НОЋИ (Lnight)

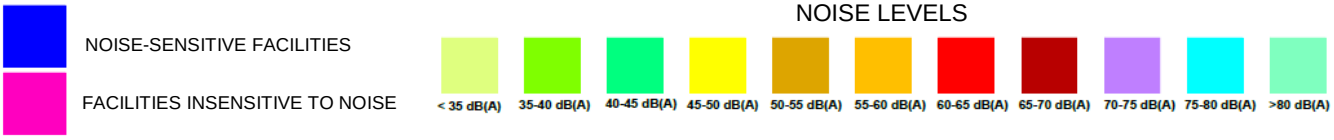
Размера: 1:2500

Фаза пројекта: СТУДИЈА

Датум: 2019.

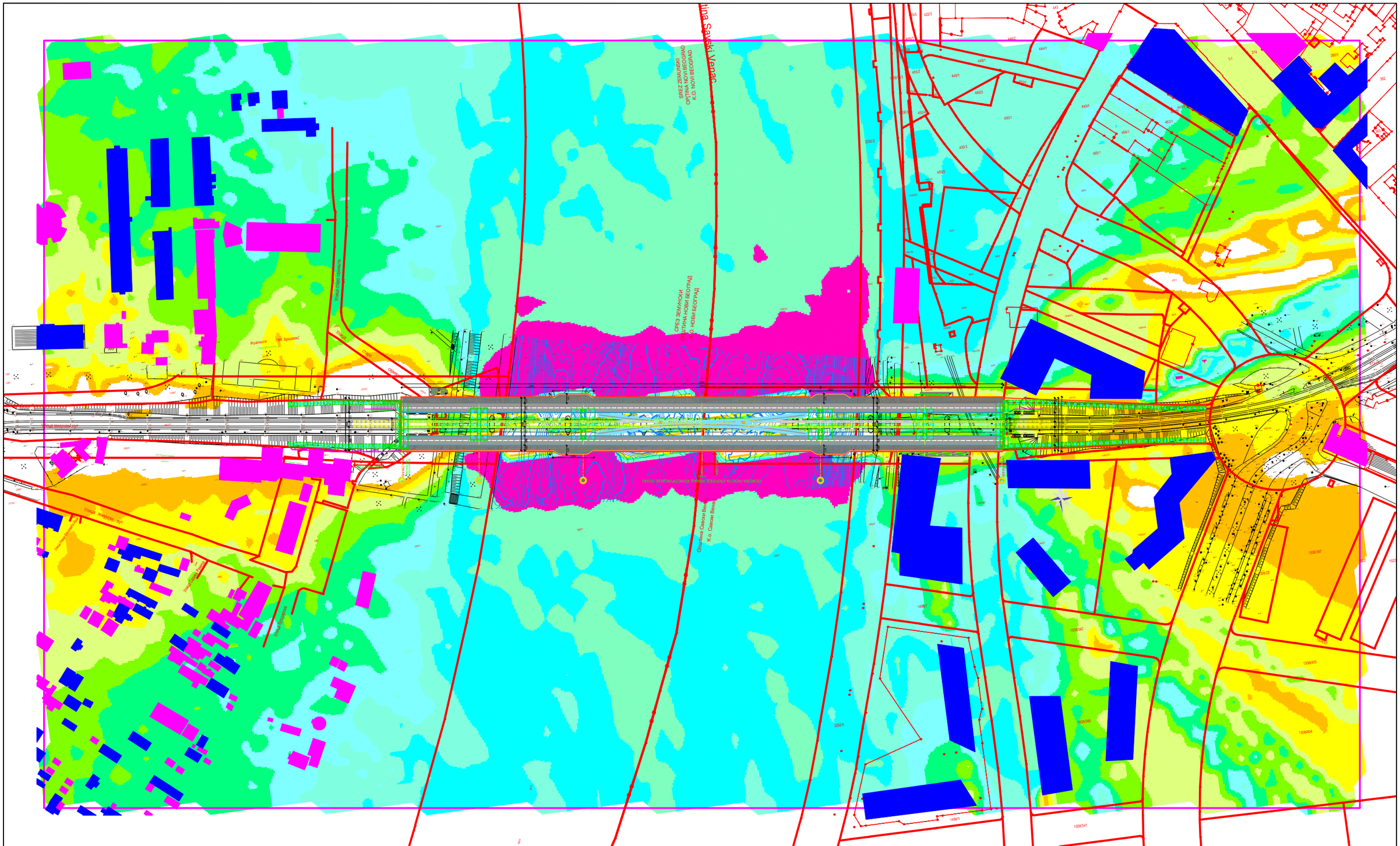
Цртеж бр. 2017-913-ЛАБ-С2-Ц11

LEGEND



	INSTITUTE OF TRANSPORTATION CIP, d.o.o. Nemanjina Street No. 6; 11000 Belgrade; Serbia Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs		
Employer:	**City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII**		
Project client:	**PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade**		
Organizational unit: Sector LAB			
Study preparation manager: **Gorica Aleksić Milosavljević, M.Sc. in Tech.**	*Hand-written signature*	Noise map design: **Aleksandar Gajicki, Grad. Eng.**	*Hand-written signature*
		Chief Design Engineer: **Ljiljana Mišković, Grad.Civ.Eng.**	*Hand-written signature*
Associates:		Head of Organizational unit: **Gorica Aleksić Milosavljević, M.Sc. in Tech.**	*Hand-written signature*

03		
02		
01		
Number	Date	Description
Revision block:		
Facility: **CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE**		
Part of the Project: ENVIRONMENTAL IMPACT ASSESSMENT STUDY		
Drawings: TRAFFIC NOISE – NEW BRIDGE NIGHT-TIME (Lnight)		Scale: 1:2500
Project phase: STUDY	Date: 2019	Drawing No.: 2017-913-LAB-S2-C11


Улица Зидарска пут
Улица Зидарски пут
Улица Зидарска
Улица Зидарски пут
Улица Зидарска пут
Улица Зидарски пут
Улица Зидарска пут
Улица Зидарски пут
Улица Зидарска пут
Улица Зидарски пут
Улица Зидарска пут
Улица Зидарски пут
Улица Зидарска пут
Улица Зидарска пут
Улица Зидарска

LEGEND

SAOBRAĆAJNI INSTITUT CIP	INSTITUTE OF TRANSPORTATION CIP, d.o.o. Nemanjina Street No. 6; 11000 Belgrade; Serbia Tel: 011/3618-134; Fax: 011/3618-324; web site: www.sicip.co.rs
Employer:	**City of Belgrade, Secretariat for Utilities and Housing Services, Kraljice Marije Street No. 1/XIII**
Project client:	**PE Belgrade Land Development Public Agency, Njegoševa Street No. 84, Belgrade**

Organizational unit: Sector LAB

Study preparation manager: **Gorica Aleksić Milosavljević, M.Sc. in Tech.**	*Hand-written signature*	Noise map design: **Aleksandar Gajicki, Grad. Eng.**	*Hand-written signature*
		Chief Design Engineer: **Ljiljana Mišković, Grad.Civ.Eng.**	*Hand-written signature*
Associates:		Head of Organizational unit: **Gorica Aleksić Milosavljević, M.Sc. in Tech.**	*Hand-written signature*

Number	Date	Description
03		
02		
01		

Revision block:

Facility:
CONSTRUCTION OF THE BRIDGE ACROSS SAVA RIVER AT THE SITE OF THE OLD SAVA BRIDGE

Part of the Project:
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

Drawings:	Scale:
TRAFFIC NOISE – OLD BRIDGE IMPACT NIGHT-TIME (Lnight)	1:2500

Project phase:	Date:	Drawing No.:
STUDY	2019	2017-913-LAB-S2-C12

V APPENDICES

Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT, AND INFRASTRUCTURE
Case number: ROP-MSGI-34773-LOC-4/2019
Registry number: 350-02-00211/2019-14
Date: July 1, 2019
Belgrade, 22-26, Nemanjina Street

The Ministry of Construction, Transport and Infrastructure, acting upon the request of the **City of Belgrade, Secretariat for Utilities and Housing Services - Directorate for Construction Land and Development of Belgrade, from Belgrade, Vračar, 84, Njegoševa Street,** for the modification of location conditions pursuant to articles 6 and 37, paragraphs 8, 9 and 10 of the Law on Ministries of the Law on Ministries ("Official Gazette of the RS", no.44/14), article 53a., and in conjunction with Article 133 paragraph 2, item 14 of the Law on Planning and Construction ("Official Gazette of the RS" nos. 72/09, 81/0 ` - corrigendum, 64/10 - CC decision, 24/11, 121/12, 42/13- CC decision, 50/13- CC decision, 98/13- CC decision, 132/14, 145/14 and 83/18), Decree on location conditions "Official Gazette of RS", nos. 35/15, 114/15 and 117/17), Rulebook on the procedure for conducting the unified procedure electronically ("Official Gazette of RS", no. 113/15, 96/16 and 120/17), in accordance with the General Regulation Plan for the construction area of the seat of the local self-government unit - the city of Belgrade (units 1 - XIX), "Official Journal of the City of Belgrade" no. 20/16) and the Special Purpose Area Spatial Plan for the Regulation of the Sava River Coastal Part of the City of Belgrade for the project "Belgrade Waterfront" ("Official Gazette of RS", No. 7/2015) and the authorization issued by the Minister's decision No. 031-01-17/2018-02-2 dated 26/11/2018, herewith issues these:

LOCATION CONDITIONS

I For the **purpose of construction of a new bridge on the site of the old Sava bridge, namely, on the cadastral parcels in: C.M. Savski vsnac (Municipality of Savski venac) and C.M. Novi Beograd (Municipality of New Belgrade), the numbers of which are listed in the Request entered in the unified procedure system,**required for the preparation of the Conceptual Design, design for obtaining building permit, and detailed design, in accordance with General Regulation Plan for the construction area of the seat of the local self-government unit (units I - XIX), "Official Journal of the City of Belgrade" no. 20/16) and the Special Purpose Area Spatial Plan for the Regulation of the Sava River Coastal Part of the City of Belgrade for the "Belgrade Waterfront" project ("Official Gazette of RS", No. 7/2015).

II Type of structure: Bridge

Building category: G

III

Building classification number: 214101 Road and railway bridges (metal, reinforced concrete or other materials) and viaducts.

IV RULES OF DEVELOPMENT AND BUILDING FROM THE PLANNING DOCUMENT

The traffic route over the Old tram bridge that connects the left and the right bank of the Sava is planned as class I street, as well as the planned extension of Zoran-Đinđić-Boulevard from Milentija Popovića Street to Vladimira Popovića Street.

At the location of the Old Sava bridge, the realization of a road-rail bridge over the Sava River is planned, with its the main role of increasing the capacity of the road for connecting the Srem and Šumadija parts of the city, as well as for introducing traffic flows within the Spatial Plan boundaries.
Bearing in mind that the Old Sava Bridge is an important element of the silhouette and visual identity of the city, the constructive solution of the bridge with elements of architectural design must be defined through a public competition.
Access to the planning area is planned primarily from the traffic route which consists of the following streets: Karađorđeva - Savska - Vojvode Mišića Boulevard, from the traffic route over the Old Sava Bridge (via the planned roundabout). From Karađorđeva Street, access is planned on the position of the planned intersection with a full programme of connections with the SAO 1 road in the area of the Faculty of Economics.

The Old Sava Bridge, i.e. the Tram Bridge that connects the Bus Station and the Old Fairground (Staro Sajmište) was built by the Germans during the Second World War, after the then bridge over the Sava River called the bridge of King Alexander I was destroyed in the April 1941 bombing. They named it Prince Eugene Bridge, and the citizens of Belgrade called it the German Bridge after the war.

Public traffic areas:

Access to the "Belgrade Waterfront" area is planned primarily from the traffic route consisting of Karadjordjeva - Savska - Vojvode Mišića Boulevard, from the traffic route over the Old Sava Bridge (via the planned roundabout) and from the "Gazela" bridge over the existing exit ramp to the Vojvode Mišića Boulevard. From Karađorđeva Street, access is planned to two positions, one of which is a planned intersection with a full program of connections with the street i.e. road (hereinafter: SAO 1) in the area of the Faculty of Economics, while the second inflow-outflow type intersection with the street SAO 6 was planned in the area of the existing BAS Bus Station.
The traffic route over the old tram bridge that connects the left and the right bank of the Sava is planned as class I street, as well as the planned extension of Zoran-Djindjić-Boulevard from Milentija Popovića Street to Vladimira Popovića Street. Namely, at the location of the old Sava bridge, the realization of a road-rail bridge (with maintaining the existing bridge structure) over the Sava River is planned, with its main role of increasing the capacity of the road for connecting the Srem and Šumadija parts of the city, as well as for introducing traffic flows within the Spatial Plan boundaries
The traffic route over the Old Sava Bridge is planned in a new profile. In the middle of the new profile, the existing 10,4 m wide bridge for rail traffic is retained, and one 6,5 m wide road on special structures is added on each side, together with a 1 m wide technical lane, on the side towards the Old Sava Bridge and pedestrian-bicycle lane of m on the other side. This traffic route descends on the Šumadija part of the city down the reconstructed slip ramp with a 5% slope to the planned roundabout with SAO 1, SAO 5 and SAO 9, and on the New Belgrade side, down the existing road level to the roundabout with Vladimir Popović Street.
The planned ramp of 5% slope towards the roundabout and Karađorđeva Street enables the passage of the planned SAO 8 road under the structure of the new bridge with 5 m high clearance.
Upon completed inspections and analyses (constructive and hydraulic), it is also possible to design a new bridge structure with the same profile content within the defined regulation. The planning of this traffic route with a new, larger capacity is in accordance with the requirements of the planned purposes, and with the conclusions of the Urban Plan Program for the first phase of the Sava Amphitheatre.

Bearing in mind that the Old Sava Bridge is an important element of the silhouette and visual identity of the city, the constructive solution of the bridge with elements of architectural design **must be defined through a public competition.**

Until the application for the Building Permit, it is necessary to perform re-subdivision of GP SP 5 and GP SP 15, in order to separate building parcels for the bridge and for access roads that are under the jurisdiction of the Secretariat for Urban Planning.

Building rules

General building rules:

The road structure of the route should be planned as a flexible structure with road base of asphaltic concrete and dimensioned according to the expected load. The road curtain for bicycle lanes should be planned from asphaltic concrete with red pigment added or from prefabricated concrete elements.

For pedestrian paths, the asphalt curtain should be applied or paved with natural materials or prefabricated elements in accordance with the applicable technical regulations. All elements of the cross-section that are functionally different are physically separated by the corresponding edging details.

Curb height to be dimensioned in accordance with the applicable technical regulations.

Carriage lane width planned for the movement of public transport is 3,5 m, and of those without public transport 2,7 5 m (for Vr ≤60 km/h). The width of tram isles for two-way traffic is at least 7,3 m, and 4,2 m for one-way traffic.

The minimum width of the bicycle lane for two-way traffic is 3,0 m, and 1.1m for one-way.

The minimum internal turning radius for the relevant vehicle, i.e. fire truck is R> 7 m.

The minimum value of the longitudinal slope, from the point of adequate drainage of atmospheric water, is i=0,3 while the maximum is a function of the road rank: for the city highway imax = 3%, for the city highway imax = 5%, for the class I streets imax = 6% and for the class II streets imax= 7%

Longitudinal slopes for functional bicycle lanes are the length of the section under the slope:

- if the section is 20-25 m, the allowed slope is up to 10%;
- for 25-65 m distances - up to 6%, for distances over 250 m - up to 4%

Within the profile of the reconstructed and widened Old Sava Bridge, 3 km wide bilateral pedestrian and bicycle paths are planned.

Inland waterway traffic:

When regulating the area within the boundaries of the Spatial Plan, it is necessary to respect the size of the waterway, as shown in Graph 11 of the Plan. Restrictions on urban development and all conditions related to navigation safety.

The position of the pillars of the new bridge must be completely harmonized with the existing dimensions of the waterway, which is conditioned by the pillars of the existing Old Sava Bridge over the Sava River.

DESCRIPTION OF THE CONCEPTUAL DESIGN

The subject of the Conceptual Design is the construction of a new arch bridge over the Sava River, on the site of the Old Sava Bridge, and in accordance with the awarded solution in the competition for the development of an Urban-Architectural solution for the reconstruction of the Old Sava Bridge.

Current state

At the construction site of the future new bridge over the Sava River, there is an existing tram bridge, the so called "Old Sava Bridge" with spans L=41,3+53,1+53,1+106,2+53,1+53,1+41,3=401,2 m. Prior to the construction of the new bridge, the complete removal of the existing bridge and its piers has been envisaged, which is the subject of a separate Design and will not be considered here.

Disposition - Description of the structure
The disposition of the bridge to be built on the site of the old one was adopted.

Structural system of the new bridge
The structural system of the new bridge is a double steel arch with braces, where the braces are extending continuously over the entire length of the bridge with a constant static height.
The total length of the bridge is L = 420,0 m, with spans L = 54,0 + 73,0 + 166,0 + 73,0 + 54,0 = 420,0 m. The total width of the bridge is W = 37,2 m (At pedestrian viewing points W = 42,5 m).
The main structure span over the required 150 m floating profile is formed by two steel arches of the span L = 166,0 m. The cross-section of the arches is rectangular, of constant dimensions h x b = 3 x 2 m, with variable thickness of the flanges and ribs.
The arches are made of steel. The steel arches are inclined towards each other at an angle of $\alpha = 10°$ with respect to the vertical, with different arrows. The steel bracing joins the arches at a height of Hz ~ 8.5 m measured in the vertical plane from the arch support (the arches are missed relative to the bracing). The length of the tension between the arches is Lz ~ 145 m, thus making arches H'1~ 30.0 m high in the vertical plane (projection), and H'2 ~ 36,0 m, respectively; arrow f1 ~ L/4,8 and f2 ~ L/4.

Braces
The braces are continuous box steel supports, within the range of arches held by hangers every 9,0 m, while outside the arch span, the braces rely on pillars and bridge the spans of L1 = 73,0 m and L2 = 54,0 m, respectively. In the 73,0 m span, the braces are supported by beams that are connected to the arch support, where river pillars stand. The braces support is carried out at a horizontal distance of 25,0 m with respect to the river pillars axis. Both braces follow the bridge level, i.e. the vertical curvature of radius R=4200.0, set in parallel, at a distance of B = 13,7m.

Bridge deck
The bridge decks are designed as prefabricated, pre-stressed on the track and subsequently coupled to the transverse supports and bridge tensioners. The concrete slab is of nominal thickness dpl=25,0 cm, which is intended for the reception of all traffic on the bridge. Bridge deck waterproofing layer is 10mm thick.

Cross girders
Spacing between braces defines the cross grid girder span. The cross girder is braced in such a way that the upper belt connects to the concrete slab and at the level of the upper flanges connects to the tension, while the lower belt is connected to the tension at the level of the lower flanges. The lower and upper belts of the cross member are of cross section "I", with tubular profile. The transverse girder is of variable total height, from X1= 3,3 m at the ends to the middle X1 = 3.5 m. The transverse beam is constant and is b=6,0 m along the entire length of the bridge, so that there are a total of 70 supports on the bridge. Reinforced cross beams of dimension h x b = 3,3 x 2 m and h x b = 3,3 x 2 m, respectively, are installed at the cross sections of the arches and clamps, as well as at the cross sections of the beams and clamps. All transverse beams in the lower level of the belt are connected by a longitudinal spacing "K" to the left. Cantilevers
On the same grid as the cross girders, to 6,0 m, laterally in relation to the braces the cantilever beams are placed. The cantilevers are coupled to the pavement slab, with an overhang of Lk = 11,0 m with a type I variable cross-section, connected by a tie at the height of its upper flanges. At the height of the lower flange of the tie, a crossbar of cross-section I is supported, supporting the cantilever at a distance of Lkk = 6,5 m In the zone above the river pillars, the cantilevers are further extended by 2,5 m to provide additional pedestrian space, which will be discussed later.

Hangers

There are 24 hangers on the bridge, 12 on each arch. They are in the plane of the arches and close, in the transverse direction, an angle of a~10° to the vertical. They are air-spaced, maintaining a brace every 9,0 m, while their distance between the two at the point of connection with the arch is variable. The hangers are formed of multiple parallel bundles.

Pillars

The bridge has six reinforced concrete pillars of different height and width. Two S1 and S6 abutments are V1, 6 = 2,5 m thick and H1,6 = 4,8 m heigh. The middle pillars S2 and S5 are RC walls, of thickness: V2.5 = 2,5 m and height: H2 = 15,0 m and H5 = 10,0 m, while the middle river pillars are S3 and S4 on which the arches rely. They are RC walls, of thickness: V3,4 = 3,5 m and height: H3 = 23,0 m and H4 = 15,0 m. At the top of each pillar, bearings are placed in such a way that, longitudinally, there is a fixed bearing on the river pillar S5, while on the other pillars there are movable bearings. In the transverse sense, on each pillar there is one laterally movable and one laterally non-movable bearing.

Foundation

As no geotechnical investigation works were carried out at this level of the Project design, the geological structure of the terrain at the location of the bridge was determined based on the results of previous geological and geotechnical investigations carried out in a narrower and wider zone of the future facility.

Having all this in mind, the bridge or pillars of the bridge are based on piles of diameter Ø1500 mm of different length and number, depending on the load of the pillar. For the S3 and S4 middle pillars, piles of length L = 20,0 m are envisaged, while the other pillars are based on piles L = 15,0 m.

Structural System

The spans of the existing Old Sava Bridge, whose demolition was envisaged, is as follows L = 41,3 + 53,1 +53,1 + 106,2 + 53,1 +53,1 + 41,3 = 401,2 m. The request is that the future new bridge provides a free floating profile for ships in dimensions: 150,0 m x 955 m. The designers took under consideration and accepted the recommendations of the Waterways Directorate, "Plov put", to move the axis of the 150 m wide future waterway towards the centre of the river, i.e. to the left bank of the Sava River (in relation to the axis of the existing waterway) and that the future waterway approximately covers two spans of the existing Old Sava Bridge (spans 4 and 5, L = 106,2 + 53,1 = 159,3 m), with necessary deviations to facilitate the construction of the future bridge. Complying with the recommendations of the Directorate, and bearing in mind the method of construction of the future bridge (especially the dimensions and position of the existing and future river pillars and foundations), the value of L = 166,0 m was adopted for the middle span of the new bridge. The future river pillars of the new S3 and S4 bridge, which make the mentioned span, are positioned in the river so that the pillar S3 of the new bridge (and therefore the entire span) is moved approximately 16 meters to the right bank of the Sava, in relation to the existing pillar S4 of the Old Sava Bridge. This correction (which is in line with Directorate recommendations) avoided not only the collision of new pillars S3 and S4 with the existing pillars S4 and S6, but also the collision of their foundations, i.e. piles, which will significantly facilitate the construction of the future bridge. After defining the size of the mid-span, a 166,0 m steel arch was adopted as the appropriate static system. It is customary for the braces to join the ends of the arches, but in this particular case, the braces, which follow the bridge level, are in a vertical bend to allow the lower edge of the structure to be above the free floating profile, and especially above the free profile of the SA08 road and the future road in New Belgrade side. Therefore, from the beginning of the bridge to the middle of the bridge there is an elevation height of

more than 5 m. Coupling such braces with the ends of the arches would require an additional and unnecessary increase in the height of the pillars, which was not acceptable either from the aesthetic side or for stability reasons, because such pillars would be additionally burdened due to the large horizontal forces in case of an earthquake. As an acceptable solution, it was agreed that the braces connect the arches at a height of HZ = 8,5 m measured in the vertical plane from the beginning of the arches, and the arches rely on columns placed at a height of 0.5 m above the millennial water levels (arches passed under the braces). Due to the stability of the arches in space, but also for aesthetic reasons, the arches are agreed to be inclined towards each other by $\alpha = 10\ °$ and joined in two places. For aesthetic reasons alone, arches of different heights were adopted (H1 = 41,0 m and H2 = 47,0 m).

Bridge spans

Other spans of the bridge, as well as its total length, are determined by the condition that the existing and future pillars do not coincide, that the optimal number of new pillars has to be adopted, and that the embankment heights at the beginning and end of the bridge has to be within acceptable limits. Following the given criteria, a bridge of total length Luk = 420,0 m was adopted, of mean span length L = 166,0 m, which, in addition to the aforementioned, has symmetrical lateral spans L = 73,0 m and L = 54,0 m. By adopting such spans, the total number of pillars were reduced to 6 (the old bridge had 8) and it was ensured that almost all newly designed pillars and foundations bypassed the existing. Partial overlapping occurs only with the initial S1 pillar, but it is on dry land, accessible and does not pose a special problem to first remove the old pillar during future construction and start construction of a new one in its vicinity.

The adopted spans, now as the main supporting structural element, bridge the tension (continuous beam). In order to successfully bridge the span of 73,0 m, or to maintain the dimensions between the arches (h = 3.3 m) and not to disrupt the horizontal line of the bridge, a strut was designed, connected to the beginning of the arches and supporting the bracers at a horizontal distance of 25,0 m with respect to the river pillars. In this way, the bracers range was reduced to acceptable LZ-50,0 m (first bridge span L = 54,0 m), the braces kept the same section height along the entire length of the bridge, and an aesthetically beautiful triangular shape was formed above the water, made of bracers, arch and strut.

Cross section

The cross-section of the bridge must be designed to be able to withstand the required traffic load, both in terms of load capacity and in terms of required dimensions. The terms of reference, as well as other relevant data required the provision of a corridor for two tracks for rail connection (10,4 m), two traffic lanes in both directions (6,5 m each), two service lanes (1,0 each). m), two pedestrian - biking trails (3,0 m each). Also, it was requested that different types of traffic be separated using a "New Jersey" type crash barrier. The designers have adopted the cross-section of the bridge where the rail connection is located inside the arches while the road, pedestrian and biking ones are on the cantilevers, on the outsider side of the arches. In this way, a relatively correct distribution is obtained between the supporting structural members in the transverse sense (transverse supports and cantilevers). The axial span of the transverse girder is Bpn = 13,7 m, while the span of the cantilever is BkZ = 11,0 m, although the cantilever is supported by the strut at a distance of Lkk = 6,5 m, i.e. at the part below the road traffic. In addition to the many benefits regarding this cross-section of the bridge, there is one downside, namely, the relative sensitivity of the system to torsion. This problem was solved by adopting a rigid, lattice-type cross member, coupled to a reinforced concrete pavement slab, which together with the tensioning and longitudinal couplings placed at the level of the lower belt of the transverse girder, makes the system extremely torsion-rigid. As a pavement slab, a reinforced concrete slab was adopted with a number of conveniences in front of the steel ortho-slab. The benefits are primarily reflected in faster and simpler workmanship, lower costs, contribution to the better system rigidity and lower

sensitivity to fatigue related to the ortho-slab. In addition, reinforced concrete slab is a more favourable choice when it comes to noise protection, as well as for easier construction of the future track for the tram/metro traffic (pavement on solid substrate, submerged rails....). Designers decided to form a deck on the subject bridge from prefabricated precast concrete slabs, having numerous advantages over in-situ cast slabs.

Functioning and safety of traffic

The bridge is so designed to fully enable the smooth operation of its intended communication in a functional and safe manner. All the required dimensions for accommodating rail, road and pedestrian and bicycle access were complied with, and even additional space was provided for service tracks located above the bracers, ensuring that their width is 2.0 m instead of the required 1.0 m. In addition, a cycling distance of 1.3 m is foreseen for the cycling track instead of the required 1.0 m, which will allow for a safer cycling even if pedestrians stay on the cycle path along the bridge guardrails. Otherwise, for pedestrian-viewers who want to pause on the bridge and enjoy the view or take photos, extra space is provided. Space is provided by increasing the bridge cantilevers by an additional 2.5 m (and damping), to a length of 30.0 m. There are four such extensions on the bridge and they are located above the river pillars. Different types of traffic are separated by New Jersey" type barriers for safety reasons.

Conducting installations

Important installations, such as power (110 kV) and telecommunication cables (pipes 2x16ø110), are envisaged for laying across the bridge. The crossing of other installations (heating, water supply…) is not required. With the adoption of the lattice transverse girder and brackets with supports, a huge space was created to accommodate the galley with all kinds of future installations. At this stage of the design project, it is envisaged to accommodate installations within the bracing (h x b = 3.3 x 2 m)

Bridge drainage

The longitudinal drainage of the structure is solved by the levelling itself, which is in a vertical circular curve. As the entire pavement slab longitudinally follows the levelling, all the water collected through the drainage system is drained through the pipes from the centre to the ends of the bridge. Transversely, drainage is provided by a 2.5% pavement inclination that runs from the centre of the bridge to the arches (drainage of the rail section) and from the ends of the cantilever to the arches (drainage of the road and pedestrian-bicycle sections). The gutters are located at the beginning of the cantilevers, along the arch. In order to enable unobstructed transverse drainage, it is necessary to install New Jersey barriers with appropriate openings at the point of contact of the barrier with the asphalt. The entire surface of the pavement is protected by waterproofing.

Bridge lighting

The public lighting on the bridge envisages the installation of public lighting poles with double lamps in the space between the road and the rail junction (protected by New Jersey type barriers). In that way, the part of the bridge intended for pedestrian and bicycle traffic will be successfully illuminated, together with the part of the bridge intended for road and rail traffic. Decorative lighting is also envisaged to be installed on the bridge, but it will be part of a separate design, and provides space for accommodation for installations and equipment for decorative lighting. Overview of the bridge

Due to the need for regular and extraordinary inspections of the bridge structure on the underside, **the construction of inspection trolleys is envisaged.**

Bridge construction method

The construction of an arched bridge of length L = 420,0 m and width W = 37,2 m, with the main span Lr = 166,0 m across the Sava River, is a serious construction undertaking, so the future Bridge Erection Design must be made with special care and in many details.

Prior to the construction of the new bridge, **(Phase I)**, it is necessary to remove the span steel structure and relocate it to a location where its repair will be undisturbed so that it can eventually be reused in some other locations. As stated earlier, all pillars of the newly designed bridge (except pillar S1) are bypassed with the pillars of the old bridge. This drastically lowers the cost and shortens the work time because it will not be necessary to remove the foundations of the old pillars, and also allows the old pillars to be removed at the most convenient moment during the construction of the new bridge. At the end of this phase, all pillars of the new bridge will have been constructed, with unfinished abutments over which the steel structure will be pushed.

The left bank of the Sava between the Gazela Bridge and the present Old Sava Bridge can be used as a space for the future construction site and the place for the construction of the structure will be carried out (Block 18). This location is ideal because it is close to the final location of the future bridge, the infrastructure necessary for the construction site (electricity, water ...) is available, a batching plant is nearby, and the site is surrounded by major traffic flows (highway, railway, Sava River and Danube), which is very important if parts of the future structure are to be brought from a greater distance. On the right bank of the Sava, a special mini-construction site should be formed at the S1 pillar, which would cover only the space and equipment for pushing the structure.

The steel structure of the bridge is formed at the construction site in three independent units. At the main construction site, on the left bank of the Sava, the main span (L = 216 m) and part of the lateral steel structure (L = 102 m) are extended. The steel structure of the main span is mounted in its entirety and final tightening of the hangers is carried out. Also, on the left bank of the Sava, the girder section of the bridge between columns S4 and S6 is longitudinally mounted (columns L = 54,0 m and part of span L = 73,0 m). Existing columns can serve as the support of the scaffolding, and yokes are also installed at the intended locations. On the right bank of the Sava, the girder section of the bridge between columns S1 and S3 is erected and longitudinally pushed (spans L = 54,0 m and part of span L = 73,0 m). At the same time, with the extension of the girder sections of the bridge, they would be pushed from both shores towards the middle of the river **(Phase II)**. The pushing is not done to the end, i.e. to the designed position, as space must be left in order to safely mount the main span of the bridge.

After the girder sections of the bridge are pushed, as well as the complete assembly of the arched section of the bridge, the main span is pushed in the transverse direction and placed on barges that will transport the structure to the designed position **(Phase III).** Using 4 barges is planned, two on each side. The main span of the structure is placed on the bearings, i.e. into the designed position where the final connection to the girder structural members **(Phase IV)** is made. In preparation for the transport of the main span structure, an arch-tensioning system with additional temporary elements is reinforced, so that it can be safely rested on the sub-structure located on the barges. Upon completion of the steel structure assembly, the installation of pavement slab and other parts of the bridge structure and equipment will follow. The described installation method will enable smooth sailing on the Sava River, except during a short period when the main span structure will be mounted.

As mentioned earlier, one of the main disadvantages of adopting a reinforced concrete slab as a pavement structure is the appearance of tensile forces in the slab, which also results in cracking. The classic way of building, i.e. pouring concrete slabs in-situ, on the previously installed formwork,

produces adverse effects. For these reasons, the Designers propose that the pavement slab be constructed on the track of prefabricated reinforced concrete slabs.
There are many benefits to this type of construction:

- The construction time of the bridge is shortens drastically (for several months) and consequently, large cost savings are made. There is no need for the construction of formwork, reinforcement and concrete at the construction site because the assembly of the slab is made at the factory and their construction can begin while other works on the site are in progress (construction of pillars and foundations, erection of steel bridge structures...)
- Installation of mounting slabs provides for a pavement slab of uniform characteristics
- Avoid applying tensile strength to the concrete slab due to its own weight
- Pre-stressing on the track in the slab introduce pressure forces (around 3MPa after pre-stressing), which will counteract the bad tensile forces that the slab is exposed to as a result of working together in the global system. Approximate annulling of the applied compressive and tensile forces results in fewer cracks and also a decrease in the quantity of reinforcement.

Slabs of approximate dimensions 5.0 m x 5.5 m and weight Q = 17t are planned to be installed. The slabs are mounted over the upper flanges of the transverse girders and cantilevers, in such a way as to provide a gap between them, which will subsequently be filled with concrete, which will monolithisize or merge all the mounting slabs into a single whole. To ensure the stability of the transverse girders and cantilevers, installation of temporary couplings is designed and those will only be removed upon completion of monolithization.

Bridge aesthetics

The solution of the bridge was made completely according to the Terms of Reference and the first awarded work on the competition for the design of Urban-architectural solution for the reconstruction of the Old Sava Bridge, which is listed as a relevant basis for the design of the solution. Consequently, the adopted Conceptual Design of the Bridge retained the appearance and aesthetics described in the award-winning work.
The competition task had already determined that the future bridge should be an arched system, which in itself is an extremely beautiful aesthetic choice. The river is in the specific case bridged by arches that go down to above water level and braces connecting the left and right banks of the Sava River, also slightly arched (following a level line that is in a vertical curve). By constructive measures, the designers managed to keep the same arch and bracers heights, along the entire length of the bridge, which added to the overall elegance of the solution.
Perceiving the newly designed bridge from the aspect of the existing Belgrade bridges, which are located nearby, one can notice structural elements that can be visually linked to other bridges across the Sava.
However, in addition to parts of the structure designed to connect the bridge to existing Belgrade bridges, the newly designed bridge also has a unique aesthetic. The main contribution to the aesthetics was the introduction of asymmetry, i.e. the adoption of arches of different height. The arch system line is different from the classic parabolic arch solution, giving it a unique look. The designers believe that such levelling of the arches in the top by 6 m, or by introducing asymmetry, will create sense of uniqueness to the bridge and make difference that sets it apart from other standard solutions.

Pedestrians and cyclists movement

At this location, along the left and right banks of the Sava River, there are already formed pedestrian and bicycle paths at the level of the coast of 76.00 mhm.
The designed solution envisages a direct connection of these existing trails to the newly designed pedestrian-bicycle routes on the New Sava Bridge. On the left

side of the bridge, towards the newly built towers within Belgrade Waterfront, the connection is made by 3m wide ramps on own structure, from which the pedestrian-bicycle path on the bridge is accessed by means of a platform. On the right side of the bridge, towards the confluence, the connection is made by a double staircase and panoramic elevators on own structure, from which a pedestrian-bicycle path on the bridge is accessed by means of a platform.

This solution represents all forms of vertical communication so that pedestrians, cyclists and mothers with baby strollers can optionally use stairs, lifts or ramps adapted for persons with special needs. This allows pedestrians and cyclists to walk comfortably and in the shortest possible way from one side to the other.

The position of these structures for vertical communication (ramps, stairs, elevators) was conditioned by the disposition of constructed and planned routes of underground installations within "Belgrade Waterfront" and "Block 18".

Along the perimeter of pedestrian-bicycle paths, cascade outpoints are formed - observation deck/terraces, providing rest areas for pedestrians and cyclists overlooking the river and the city.

The terraces are positioned on each side of the bridge, two in the zone of the arches' ends above the supporting pillars.

Materialization

For the processing of pedestrian-bicycle surfaces on the bridge and terrace-resting places, materials with properties such as durability, sustainability, resistance to various influences are envisaged (wear, mechanical, physical and chemical damage), as they meet aesthetic criteria and are also suitable for maintenance (washing, replacement of damaged parts of surfaces, etc.), also in accordance with the materials already applied in the immediate environment.

Rail and road traffic

The subject matter of the competition is the urban-architectural solution for the reconstruction of the Old Sava Bridge.

In the area within the Plan boundaries, almost all kinds of interconnections and traffic subsystems are interconnected, which is especially emphasized on the right bank of the Sava River. The primary street network of the area consists of class I state roads (highway, main roads), Class I and II streets, and the secondary access roads and local street network.

Layout and levelling solution

The road in question is located partly in the old part of the city on the right bank of the Sava River from the roundabout that connects the existing Karadjordjeva Street with the Sava Bridge. The roundabout belongs to the primary street network. The tram intersects the roundabout in the middle so that space for the tram isle is reserved in the inner circle.

The other part of the road is located on the New Belgrade side, on the left bank of the Sava River, and connects the structure of the bridge with the roundabout at Vladimira Popovića Street (Zemunski Put Street). A tram stop is planned at this part of the road.

The traffic route envisages two pavement lanes of 6,5m width (right carriageway 3,5 m wide and left carriageway 3.0 m wide), tram isle, two-track tramway, subway corridor, in the middle of 8m minimum profile and two-sided sidewalks of 3m each that include one-way bike lanes.

The pavement structure of the road is planned as a flexible structure with bearing layers of asphalt concrete. Asphalt layers are foreseen on footpaths. The pavement track on the bike lanes is planned from asphalt concrete with the possibility of adding red pigment.

All elements of the cross-section that are functionally different are physically separated by the corresponding edging details.

Drainage

Collection of precipitation water is designed by transverse inclinations along the curbs of the pavement and gravitationally to the drainage channels and further to the rainwater system.

Description of elevator structure

Apart from stair communications, along the pedestrian-bicycle paths on both banks of the river, two elevators are to be installed in the new structure of the Sava bridge for the transport of citizens, persons with disabilities and cyclers.

This is an elevator without a machine room. The propulsion machinery is mounted inside the drive shaft on the cab and counterweight guides.

The elevator is located in a drive shaft made of reinforced concrete, the side (opposite the bridge) as well as the back are made of tempered stop-sol glass in its frame chosen by the architect.

The drive shaft is dry and ventilated. Ventilation openings are designed to remove gases and smoke in case of fire and are protected by blinds and mosquito nets. The shaft temperature should be maintained within the range of + 5° C to + 4 ° C.

Under the drive shaft ceiling, there are brackets (hooks) for the crane that lifts the heavy parts of the elevator to the installation site.

The control cabinet (on the top floor) is envisaged to be connected to the foundation earthling of the structure, as well as the propulsion machine inside the drive shaft.

The automatic door of the elevator shaft (together with the cab door) closes automatically after the set time has elapsed if no driving command was given.

The propulsion machine with a stand is a compact unit anchored on the top of the driving shaft on the cab guides and counterweights via rubber supports, to reduce noise and vibration. This propulsion machine features low energy consumption, does not require oil, thus eliminating the risk of pollution and fire.

Cab

A self-supporting, impenetrable metal cabin is installed. The interior finish of the cabin walls is of stainless steel, while there is glass from the plinth to the ceiling on one side and in the back, in positions facing the river. On the cab wall, there is a command box adjusted for the disabled people (box register).

Hard landscaping:

When hard landscaping, the main pedestrian flows were taken into account, i.e. transit target movement of users, without architectural barriers, as well as connection with existing and planned pedestrian and bicycle routes.

Horizontal regulation is defined by the boundaries of parcels and construction lines, surrounding facilities and roads, as well as the directions of transit movement of pedestrians. The levelling solution was made in accordance with the situation on the site and with the planned contents. During levelling, special care was taken to direct the atmospheric water in a natural way towards the green surfaces, gratings and drains. For hard landscaping of pedestrian surfaces, envisaged materials must have the following properties durability, sustainability and resistance to various influences (wear, mechanical, physical and chemical damage), as they both meet aesthetic criteria and are also suitable for maintenance (washing, replacement of damaged parts of surfaces, etc.). They are also in accordance with the materials already applied in the immediate environment. Architectural and construction elements, as well as urban furniture elements (benches, drinking fountains, garbage dumps, bicycle sheds, etc.), are envisaged to the extent necessary to achieve the functional, design and visual quality of the considered space. Sufficient lighting of the space adds to its representativity as well as the sense of safety in it, so adequate functional and decorative lighting is proposed.

Tram line

The tram structure on the bridge consists of:

- bearing concrete slab d = 20sm; or concrete base
- sunken continuous elastically supported track in steel rail ducts that are fixed to the concrete slab; rubber insulation elements mounted along the side rails.
- filling of rail ducts with polyurethane-based mass
- rail track concrete fill.

Through further analysis and elaboration of all impacts, it is possible to change the proposed tram structure in the next stages of drafting technical documentation.

HYDROTECHNICS

Within the hydro-technical design of the bridge over the Sava river with access roads on the territory of the Municipality of Savski Venac and the Municipality of New Belgrade, drainage of the subject area must be envisaged, together with relocation and protection of the existing hydro-technical installations. Furthermore, in all designs, compliance with water management conditions and conditions for water traffic must be observed.

Water management on the territory of the Municipality of New Belgrade

On the section from Branko's Bridge (Brankov most) to the Old Railway Bridge, there is an old coastal fortification in the form of a sloping quay. The profile of this fortification consists of a quay construction made of concrete and stone lining with slopes at a 1: 1,5 slope. The crown of the foot of the embankment is at 70 mnm, the elevation of the embankment is at 73,50 mnm, while the final crown of the embankment is at elevations between 75,80 and 76 mnm.

Water management on the territory of the municipality of Savski Venac

On the right bank of the Sava River, facilities of various types and purposes have been made, which also serve as protection from external waters. On the section from Branko's Bridge to the Old Railway Bridge, there is a stone embankment in the form of a slanted quay with 75,50 mnm elevation level of the final crown.

Navigable waterway

The waterway of the Sava River in the zone of the Belgrade Hydro Node corresponds to category IV. Given that vessels from the Danube River enter the Sava River, it is recommended that, wherever possible, the parameters of the dimensions of the Danube waterway be adopted. The Danube waterway has the status of an international waterway (category VIc).

DESIGNED SOLUTION

Water management on the territory of the Municipality of New Belgrade

The existing water supply network is maintained in its existing state.

Water management on the territory of the municipality of Savski Venac

The DN200 mm water supply system as built for the "Belgrade Waterfront" is in collision with the pillar of the designed bridge on the Sava, and for that reason its relocation is planned.

Water management on the territory of the Municipality of New Belgrade

The elevation of the lower edge of the bridge structure is 4,70 m above the elevation of the final crown

of the embankment. **Water management on the territory of the Municipality of Savski Venac**

The elevation of the lower edge of the bridge structure is 5,0 m above the elevation of the final crown of

the embankment. **Navigable waterway**

The required parameters of the navigable waterway dimensions were adopted according to the recommendations of the Danube Commission for class VIc, i.e. the width of the navigable opening of the bridge 150m and the height of the navigable opening of the bridge in relation to the high navigable level of 9,5 m were adopted.

Relocation of the existing telecommunication network within the new bridge over the Sava River on the site of the old Sava bridge

The existing telecommunication cable installation is jeopardized by the planned dismantling of the existing bridge over the Sava River. Primarily, it is necessary to state that the existing telecommunication infrastructure - telecommunication cable sewerage and telecommunication cable network, which is jeopardized by the planned construction, is located on an important highway.
The existing telecommunication fiber-optic and copper-wire cable installation is mainly placed in the protective pipes hung on the bridge structure. The installation belongs to telecommunication operators of fixed and mobile telephony and broadband services, KDS providers, state institutions (MIA, SAF, SIA...), the optical network of state authorities, the Secretariat for Traffic and other users. The relocation of the existing (as well as the laying of new) telecommunication cables is envisaged by their pulling/blowing into the installation pipes of the cable corridor within the construction of the new bridge. The schedule of pipe usage by different users will be defined in the technical documentation of a higher level of processing and in accordance with the Conditions and legal regulations.
The cable corridor within the bridge (for telecommunication cables) is planned to be realized as a package of 16 x PVC pipes ø110 (4 rows x 4 pipes) from both sides of the bridge, as a natural continuation of the cable ducts in the access roads. Pipes need access every 50m to form inspection chambers or (if possible) continuous access along the entire length. There must be no height discontinuity (de-levelling) at the transition from the bridge to the roads (due to the critical bending radius of the cable bundles). The telecommunication cable corridor must not be near medium and high voltage power cables.

OVERHEAD CONTACT LINE

Existing condition

The section on which the reconstruction is planned consists of three parts:

- access road to the bridge on the territory of the Municipality of Savski Venac
- road on the existing tram bridge
- access road to the bridge on the territory of the Municipality of New Belgrade

The contact wires are hung on cantilevers made of synthetic insulating material. In parallel with the overhead contact line, a reinforcement line made of AlSt rope, cross section 240mm2, was installed. At intersections, overhead lines are made of uncompensated contact conductors with a cross-section of 100 mm2, suspended on transversal made of steel or paraphilic rope.
Steel poles of the catenary were used for fastening of the cantilevers and crossbars. These pillars were placed on the sidewalks on both sides of the street on the road in the Municipality of Savski Venac, as well as on the construction of the bridge, i.e. between the tracks on the territory of the Municipality of New Belgrade. Contact network poles were also used to carry public lighting lamps, as well as power lines.
The contact network on this section is supplied from two rectification stations, RS "Sava" located under Branko's bridge, and RS "Novi Beograd I", located in Milentija Popovića Street. Along the subject section, there are several connection points for the supply lines from the specified rectification stations.

Newly designed state

With the planned construction of a new bridge over the Sava and the reconstruction of access roads on both sides, the reconstruction of the tram line is also envisaged. Scope of the Conceptual Design includes a section of the new roundabout in Karađorđeva Street. a new bridge, and a section to the new roundabout in Vladimira Popovića Street.

The Conceptual Design of the overhead contact line envisages the complete dismantling of the existing one and construction of the new OHL as a whole, which includes poles, overhead lines, cantilevers, tensioning devices, crossbars, disconnectors, and connections for supply and return cables.
The new poles of the overhead contact line network are envisaged to be placed in the belt between the tram tracks on the entire section.
The new overhead lines are intended to be hung on fiberglass brackets, or on crossbars made of synthetic insulating rope at intersections.
Public lighting luminaires can be placed on the pillars of the tram OHL network to illuminate tram tracks, roads and sidewalks.
The locations and terminals of the supply and return lines of the OHL are intended to be maintained at the existing locations.

TRAFFIC SIGNALS AND EQUIPMENT

Current state

The Old Sava Bridge (also called the Tram Bridge) stretches across the Sava River into two Belgrade municipalities: Savski Venac and New Belgrade. Access roads of the bridge are part of the Zemunski put Street. On the right bank of the Sava River in the part of the old part of Belgrade, this street intersects with Karadjordjeva Street, while on the left bank, i.e. the New Belgrade part, it intersects with Mihaila Pupina Boulevard, i.e. IIA Class state road. After passing the bridge, looking towards New Belgrade, at the intersection of Zarija Vujosevica Street, Zemunski put and Sajmiste, the traffic is regulated by traffic lights. Almost all forms of communication are represented on the observed traffic network.
The bridge is approximately 401 m long and the span between the two main pillars is 106 m. The width of the bridge is 11 m. The bridge has one lane per direction for mixed traffic intended for traffic of both trams and road vehicles. There is also a footpath to the right of the bridge, looking towards New Belgrade.

Future condition

The subject road on the bridge has been provided with a cross-section including two 6,50m wide carriageways with two lanes each, a 10,40m wide tram isle and two-pedestrian and bicycle paths. The design documentation will include elements of vertical and horizontal traffic signalling and emergency equipment, as well as cable ducts along the designed section. The Conceptual Design envisages adequate protective systems for vehicles (the awarded solution envisages steel fences of the H2W4 type on the slip ramps, as well as the concrete New Jersey type). Along the subject section, it is possible to envisage cable ducts for the installation of fibre optic cables, which is necessary for connecting traffic lights on the New Belgrade side with their control centre, depending on the attitude of the competent utility company. For the purpose of drafting the technical documentation following the Conceptual Design, competent institutions will issue the relevant conditions document, that will define define their requirements and conditions, from the aspect of traffic signalling and equipment, or traffic solution in general. In line with the above, and the construction solution, the design documentation will include elements of vertical and horizontal signalling and traffic equipment.

Traffic signals and fairway equipment

The design documentation envisages a bridge over the Sava River. In accordance with the above, special technical documentation dealing with the signalling intended for the waterway will be prepared in line with the class of the waterway of the Sava River on the respective part of its flow, in accordance with the conditions of competent utility companies, given in the preliminary design.

Public and decorative lighting

According to the data of the PUC Public Lighting, the power supply for the existing public lighting on the bridge and access roads as well as the decorative lighting of the bridge is provided from the existing public lighting distribution cabinets.

The new public lighting concept envisages the use of the latest generation of high quality luminaires with LED lights, long life and low power that fit into the bridge architecture with their design. The luminaires are controllable via a tele management system that allows monitoring and control of the luminaires so that in the late night hours, during low traffic intensity, the regulation of the light intensity achieves additional savings in electricity consumption. A two-sided, opposite arrangement of public lighting poles with double lamps is planned, one for lighting the road and the other on a short lyre for lighting pedestrian and bicycle paths.

It is planned that the power supply of the newly designed installation of public and decorative lighting of the new bridge and access roads be performed from the previously mentioned existing public lighting cabinets.

Protection and reconstruction of electric power facilities

Within the area of planned construction works, there are underground power cables 1kV, 10kV and 110kV and overhead lines 1kV and 10kV. The existing 110kV cables were laid over the old Sava bridge, and this represents the connection of TS 110/35kV HP New Belgrade and TS 110/35 kV Belgrade 6 and is of great importance for powering vital facilities in the city centre.

All reconstructions, relocations and new constructions are planned under the conditions and supervision of the competent public companies.

III INFRASTRUCTURE CONNECTIONS

Conditions for connection to the electric power network

For those facilities for which a building permit is issued by the ministry responsible for construction, the conditions for design and connection in terms of connection to the distribution or transmission power system is not obtained by the competent authority within the unified procedure, but by the investor in accordance with the law governing energy, and in accordance with Article 14, paragraph 4 of the Decree on location conditions

The responsible designer is responsible to make the preliminary design, construction permit design and Conceptual Design in accordance with the conditions for design and connection in terms of the connection to the distribution or transmission system of electricity, obtained outside the unified procedure.

For the issuance of building permit for the works, it is necessary to submit a contract concluded with the holder of public authorizations, if the conditions obtained outside the unified procedure specified the requirement to build the missing infrastructure.

Crossing and parallel guidance

Prepare technical documentation in all respects according to the conditions:

No. ODS:80.1.1.0.-D.08.02-176376/1-2019 dated 07 June 2019, EPS Distribution Belgrade/Centre, ROP-MSGI- 34773-LOCA-4-HPAP-10/2019 dated 25 June 2019.

Prepare technical documentation in all respects according to the conditions:

No. 130-00-UTD-003-669/2019-003 dated 26 June 2019 JSC Elektromreža Srbije (Power Network of Serbia) ROP-MSGI-34773-LOCA-4-HPAP-9/2019 dated 26 June 2019.

Conditions for connection to the water supply network:

Prepare technical documentation in all respects according to the conditions:

No. V-489/2019 dated 10 June 2019, PUC "Belgrade Waterworks and Sewerage", ROP-MSGI-34773-LOCA-4-HPAP-9/2019 dated 26 June 2019,

If connection is performed to the water supply network that needs to be reconstructed, when submitting the request for the issuance of building permit, a contract for the construction of the missing infrastructure must be submitted.

Conditions for connection to the sewage system network:

Prepare technical documentation in all respects according to the conditions:

No. K-388/2019 dated 10 June 2019, PUC "Belgrade Waterworks and Sewerage", ROP-MSGI-34773-LOCA-4-HPAP-9/2019 dated 26 June 2019,

Conditions from the aspect of sanitary protection of water sources:

Prepare technical documentation in all respects according to the conditions

No. V-490/2019 dated 31 May 2019, PUC "Belgrade Waterworks and Sewerage", ROP-MSGI-34773-LOCA-4-HPAP-9/2019 dated 14 June 2019,

Conditions for connection to the telecommunication network

Prepare technical documentation in all respects according to the conditions

No. 256772/2-2019 dated 20 June 2019 JSC „Telekom Srbija", ROP-MSGI-34773-LOCA-4-HPAP-24/2019 dated 20 June 2019.

„SBB Srpske kablovske mreže"(SBB Serbian Cable Networks), ltd, ROP-MSGI-34773-LOCA-4-HPAP-22/2019 dated 03 June 2019

„Telenor" ltd, ROP-MSGI-34773-LOCA-4-HPAP-25/2019 dated 26 June 2019.

Conditions of crossing and parallel guidance in relation to the heating network:

Prepare technical documentation in all respects according to the conditions

No. II-5365/2 dated 26 June 2019. PUC "Beogradske elektrane" (Belgrade power plants), ROP-MSGI-34773-LOCA-4-HPAP-9/2019 dated 26 June 2019,

Conditions regarding gas infrastructure:

It is necessary to adhere to the following conditions:

No. OP255/19(595/19) dated 04 June 2019, PU „Srbijagas", ROP-MSGI-34773-LOCA-4-HPAP-23/2019 dated 06 June 2019.

Conditions for connection to the transport system network:

Prepare technical documentation in all respects according to the conditions

IV-08. No. 344.5-267/2019 dated 25 June 2019, Secretariat for Transport of the City of Belgrade, ROP-MSGI-34773-LOCA-4-HPAP-8/2019 dated 27/06/2019.

Br.350-3847/19 dated 31 May 2019. PU „Putevi Beograd"(Roads of Belgrade), ROP-MSGI-34773-LOCA-4-HPAP-16/2019 dated 31 May 2019

Conditions regarding navigable waterway:

It is necessary to adhere to the following conditions

No.11/45-1 dated 03 June 2019, RS Ministry of Construction, Transport and Infrastructure, Directorate for Inland Waterways, ROP-MSGI-34773-LOCA-4-HPAP-21/2019 dated 03 June 2019, No.342-6-58/2019-02 dated 12 June 2019, RS Ministry of Construction, Transport and Infrastructure, Sector for Water Transport and Navigation Safety, Port Authorities. ROP-MSGI-34773-LOCA-4-HPAP-17/2019 dated 12 June 2019.

Railway infrastructure conditions:

No.2/2019-789 dated 04 June 2019. JSC "Infrastruktura železnice Srbije"(Serbian Railways Infrastructure) ROP-MSGI-34773-LOCA-4-HPAP-11/2019 dated 05 June 2019.

Waste disposal:

Prepare technical documentation in all respects according to the conditions

No. 8704 dated 31May 2019, PUC “Gradska čistoća“ (City Sanitation), ROP-MSGI-34773-LOCA-4-HPAP-15/2019 dated 31May 2019.

Public lighting:
Prepare technical documentation in all respects according to the conditions
No. T 3023 on 30 May 2019. PUC “Javno osvetljenje” (Public Lighting), ROP-MSGI-34773-LOCA-4-HPAP-14/2019 dated 30 May 2019.

Landscaping and greening
Prepare technical documentation in all respects according to the conditions

No. 49/158 dated 31 May 2019. PUC “Zelenilo Beograd“ (Belgrade Greenery), ROP-MSGI-34773-LOCA-4-HPAP-13/2019 dated 05 June 2019

Public transport conditions
When planning the construction of a new Sava bridge on the site of the existing one in Belgrade, it is necessary to take into account the elements of public transport lines that serve the subject area, all in accordance with the issued conditions.

No. 346.9-36/2019 dated 18 June 2019. Secretariat for Public Transport of the City of Belgrade, ROP-MSGI-34773-LOCA-4-HPAP-9/2019 dated 28 June 2019.

The Preliminary Design must contain an accurate description of the existing and planned connection of the following installations: thermal, technical and gas installations, hydro-technical facilities and installations, water supply and sewerage, rain sewerage and track sliding, electric power installations, telecommunications, signalling and safety devices, contact networks, all in accordance with the issued conditions of the holder of public authorizations, i.e. according to applicable legal acts, i.e. regulations, norms, rules and standards.

I SPECIAL CONDITIONS

Environmental protection:
The subject construction can be planned in accordance with the Law on Environmental Impact Assessment ("Official Gazette of RS", no. 135/04 and 36/09) and the Decree on determining the List of projects for which an impact assessment is mandatory and the List of projects for which an environmental impact assessment may be required ("Official Gazette of RS", no. 114/08)

Protection of Nature:
During design and construction, the conditions of the Institute for Nature Conservation of Serbia in all respects must be adhered to under 03 No. 020-1513/2 dated 19 June 2019, ROP-MSGI-34773-LOCA-4-HPAP-12/2019 dated 25 June 2019.

Fire protection measures:
During design and construction, the conditions regarding fire protection measures 09/7 no.217-332/2019 dated 03 June 2019, issued by the RS Ministry of the Interior, Sector for Emergency Situations, Directorate for Emergency Situations in Belgrade must be adhered to in all respects.

Defence related conditions:
Documentation for the construction of the Sava Bridge in Belgrade must be prepared in accordance with Conditions No. 10766-4, dated 28 June 2019 of The Ministry of Defence, ROP-MSGI-34773-LOCA-4-HPAP-18/2019 dated 28 June 2019.

Water conditions:
When designing and building, water conditions must be fully adhered to:

No.325-05-1065/2019-07 dated 30 May 2019, Ministry of Agriculture, Forestry and Water Management, Serbian Water Directorate, ROP-MSGI-34773-LOCA-4-HPAP-20/2019 dated 27 June 2019.

Special accessibility conditions

The facility should be planned in accordance with the Rulebook on technical standards of planning, design and building of facilities, ensuring unobstructed movement and access for persons with disabilities, children and the elderly ("Official Gazette of RS", no. 22/15).

The Preliminary Design must include description of geotechnical surveys and testing.

V CONDITIONS OBTAINED FOR DESIGN AND CONNECTION

For the purposes of design and connection, the Ministry of Construction, Transport and Infrastructure obtained the following conditions ex officio:

- EPS Distribution Belgrade/Centre, ROP-MSGI-34773-LOCA-4-HPAP-10/2019 dated 25 June 2019.
- JSC Elektromreža Srbije (Power Network of Serbia) ROP-MSGI-34773-LOCA-4-HPAP-9/2019 dated 26 June 2019.
- PUC "Belgrade Waterworks and Sewerage" - waterworks, ROP-MSGI-34773-LOCA-4-HPAP 3/2019 dated 14 June 2019.
- PUC "Belgrade Waterworks and Sewerage"-sewerage, ROP-MSGI-34773-LOCA-4-HPAP-5/2019 dated 14 June 2019.
- PUC "Belgrade Waterworks and Sewerage"-protection of water sources, ROP-MSGI-34773-LOCA-4-HPAP-4/2019 dated 14 June 2019.
- JSC „Telekom Srbija", ROP-MSGI-34773-LOCA-4-HPAP-24/2019 dated 20 June 2019.
  03.06.2019. "SBB Srpske kablovske mreže" (SBB Serbian Cable Networks), ltd, ROP-MSGI-34773-LOCA-4-HPAP-22/2019 dated 25 June 2019.
- "Telenor" ltd, ROP-MSGI-34773-LOCA-4-HPAP-25/2019 dated 26 June 2019.
- PUC "Beogradske elektrane" (Belgrade power plants), ROP-MSGI-34773-LOCA-4-HPAP-6/2019 dated 27 June 2019,
- PU „Srbijagas", ROP-MSGI-34773-LOCA-4-HPAP-23/2019 dated 06 June 2019.
  27.06.2019. Secretariat for Transport of the City of Belgrade, ROP-MSGI-34773-LOCA-4-HPAP-8/2019 dated 27 June 2019.
- PU "Putevi Beograd" (Roads of Belgrade), ROP-MSGI-34773-LOCA-4-HPAP-16/2019 dated 31 May 2019
- RS Ministry of Construction, Transport and Infrastructure, Directorate for Inland Waterways, ROP-MSGI-34773-LOCA-4-HPAP-21/2019 dated 03 June 2019,
- RS Ministry of Construction, Transport and Infrastructure, Sector for Water Transport and Navigation Safety, Port Authorities, ROP-MSGI-34773-LOCA-4-HPAP-17/2019 dated 12 June 2019.
  05.06.2019. JSC "Infrastruktura železnice Srbije"(Serbian Railways Infrastructure) ROP-MSGI-34773-LOCA-4-HPAP-11/2019 dated 05 June 2019.
- PUC "Gradska čistoća" (City Sanitation), ROP-MSGI-34773-LOCA-4-HPAP-15/2019 dated 31 May 2019
- PUC "Javno osvetljenje" (Public Lighting), ROP-MSGI-34773-LOCA-4-HPAP-14/2019 dated 30 May 2019
- PUC "Zelenilo Beograd" (Belgrade Greenery), ROP-MSGI-34773-LOCA-4-HPAP-13/2019 dated 05 June 2019
- Secretariat for Public Transport of the City of Belgrade, ROP-MSGI-34773-LOCA-4-HPAP-7/2019 dated 28 June 2019.

- Institute for Nature Conservation of Serbia, ROP-MSGI-34773-LOCA-4-HPAP-12/2019 dated 25 June 2019.
- Ministry of the Interior, Sector for Emergency Situations, Directorate for Emergency ROP-MSGI-34773-LOCA-4-HPAP-19/2019 dated 13 June 2019.
- Ministry of Agriculture, Forestry and Water Management, Serbian Water Directorate, ROP-MSGI-34773-LOCA-4-HPAP-20/2019, dated 27 June 2019.
- The Ministry of Defence, ROP-MSGI-34773-LOCA-4-HPAP-18/2019 dated 28 June 2019.

VI Location conditions also include the "Conceptual Design of the Bridge over the Sava on the site of the old Sava Bridge", prepared by the Institute of Transportation CIP ltd. 6/IV, Nemanjina Street, Belgrade.

VII These Terms and Conditions are valid for 24 months from the date of issuance.

VIII Along with the request for the issuance of a building permit, the investor is obliged to submit the Design for building permit with technical control made in accordance with Article 118a and 129 of the Law, proof of appropriate right on the land or facility in accordance with Article 135, of the Law and the Report of the Review Commission, in accordance with Articles 131 and 135, paragraph 13 of this Law

IX The responsible designer is obliged to make the Conceptual Design, the Design for building permit issuance and Detailed Design in accordance with construction rules and all other conditions contained in the location conditions.

X Before submitting the request for works notification, it is necessary to obtain the consent from the ministry responsible for environmental protection to the environmental impact assessment study.

XI An objection to the issued location conditions may be filed to the Government of the Republic of Serbia, through this ministry, within three days from the date of delivery.

ASSISTANT MINISTER

Jovanka Atanacković

JOVANKA ATANACKOVIĆ
2402976767010 -2 67010
402976767010 +02'00''

Digitally signed by Jovanka Atanacković 2402976767010-24029767
Date: 2019.07.02 15:09:12

Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
Number 350-02-00211/2019-14
ROP-MSGI-34773-LOCA-4/2019
Date: 05 July 2019
22 - 26 Nemanjina Street

The Ministry of Construction, Transport and Infrastructure, acting ex-officio, herewith amends a technical error in the Location Conditions number ROP-MSGI-34773-LOCA-4/2019; 350-02-00211/2019-14 dated 01 July 2019, and pursuant to Article 6 of the Law on ministries ("Official Gazette of the RS" 44/14 14/2015, 54/2015, 96/2015 and 62/2017), articles 144 and 146 of the Law on general administrative procedure ("Official Gazette of the RS" nos. 18/2016), Article 3, Of the Rulebook on the procedure for conducting the unified procedure electronically ("Official Gazette of RS", no. 113/2015, 96/2016 and 120/2017) and the authorization issued by the Minister's decision No. 031-01-17/2018-02-2 dated 26/11/2018, herewith issues this:

C O N C L U S I O N

In the Location Conditions number ROP-MSGI-34773-LOCA-4/2019; 350-02-00211/2019-14 dated 01 July 2019, determining conditions for the construction of a new bridge on the site of the old Sava bridge, namely, on the cadastral parcels in CM Savski Venac (Municipality of Savski Venac) and CM Novi Beograd (Municipality of New Belgrade), the numbers of which are listed in the Request entered in the unified procedure system, required for the preparation of the Conceptual Design, design for obtaining building permit, and Detailed Design, in accordance with General Regulation Plan for the construction area of the seat of the local self-government unit (units I - XIX), "Official Journal of the City of Belgrade" no. 20/16) and the Special Purpose Area Spatial Plan for the Regulation of the Sava River Coastal Part of the City of Belgrade for the "Belgrade Waterfront" project ("Official Gazette of RS", No. 7/2015), error is herewith corrected as follows :

I In the section Description of the Conceptual Design, namely:

- Paragraph 12, Cross section, line 6, "using a "New Jersey" type crash barrier" herewith changes to read as follows: "using high curbs".
  Paragraph 13, Functioning and safety of traffic, lines 12 and 13, the wording: "New Jersey" type crash barrier" herewith changes to read as follows: "high curbs".
- Paragraph 15, Bridge drainage, line 8, the wording: "New Jersey" type crash barrier" herewith changes to read as follows: "high curbs".
- Paragraph 16, Bridge lighting, lines 2 and 3, the wording: "protected by New Jersey type barriers", herewith changes to read as follows: "protected by high curbs".

II In the section Traffic signals and equipment, namely:

- Paragraph 2, Future condition, line 7, the wording: "New Jersey" type crash barrier" herewith changes to read as follows: "high curbs".

E x p l a n a t i o n

In the Location Conditions number ROP-MSGI-34773-LOCA-4/2019; 350-02-00211/2019-14 dated 01 July 2019, determining conditions for the construction of a new bridge on the site of the old Sava bridge, namely, on the cadastral parcels in CM Savski Venac (Municipality of Savski Venac) and CM Novi Beograd (Municipality of Novi Beograd (Municipality of New Belgrade), the numbers of which are listed in the Request entered in the unified procedure system, required for the preparation of the Conceptual Design, design for obtaining building permit, and detailed design, in accordance with General Regulation Plan for the construction area of the seat of the local self-government unit (units I - XIX), "Official Journal of the City of Belgrade" no. 20/16) and the Special Purpose Area Spatial Plan for the Regulation of the Sava River Coastal Part of the City of Belgrade for the "Belgrade Waterfront" project ("Official Gazette of RS", No. 7/2015), it was determined that technical omission was made, so that in the section Description of the Conceptual Design, namely: Paragraph 12, Cross section, line 6, “using a "New Jersey" type crash barrier” was written by omission, instead of “using high curbs”; also, under paragraph 13, Functioning and safety of traffic, lines 12 and 13, the wording: “New Jersey" type crash barrier” was written by omission, instead of: “high curbs”; under paragraph 15, Bridge drainage, line 8, the wording: “New Jersey" type crash barrier” was written by omission instead of: “high curbs”; in paragraph 16, Bridge lighting, lines 2 and 3, the wording: “protected by New Jersey type barriers”, was written by omission instead of: “protected by high curbs”. Furthermore, under the section: Traffic signals and equipment, Paragraph 2, Future condition, line 7, the wording: “New Jersey" type crash barrier”was written by omission instead of: “high curbs”.

Article 3, paragraph 10 on the procedure for conducting the unified procedure electronically ("Official Gazette of RS", no. 113/2015, 96/2016 i 120/2017) prescribes that the correction of errors in location conditions and other acts issued by the competent authority, as well as in the conditions for design and connection, is made in form of a conclusion drawn up in accordance with paragraph 2, which is made ex officio, or at the request of a party, accordingly applying provisions of the law regulating general administrative procedure, governing the correction of errors made in decisions.

The provisions of Article 144 of the Law on general administrative procedure (“Official Gazette of the RS” nos. prescribe that a body may at any time correct errors of its decisions or its certified transcripts, so as to correct errors made in the names or figures, text or calculations, as well as other plain errors. The corrections shall produce legal effect from the date of effectiveness of the corrected decision, or if the correction is unfavourable for one of the parties, from the date when such party was notified thereof. Therefore, within the meaning of the above provision, it was been decided as in the enacting clause of this conclusion.

Instruction on Legal Remedy: An objection to the issued location conditions may be filed to the Government of the Republic of Serbia, through this ministry, within three days from the date of

ASSISTANT MINISTER
Jovanka Atanacković

Digitally signed by JOVANKA ATANACKOVIĆ
2402976767010-2402976767010

PUBLIC UTILITY COMPANY
"BEOGRADSKI VODOVOD I KANALIZACIJA"
(Belgrade Waterworks and Sewerage)

PUC "BEOGRADSKI VODOVOD I KANALIZACIJA" (Belgrade Waterworks and Sewerage)
Kneza Miloša 27
11000 Belgrade, Serbia
TIN: **100346317,** CRN: 07018762
Contact centre: **3 606 606**
email: INFO@BVK.RS
Date : **June 10, 2019**

Technical documentation department
Kneza Miloša 27, 11000 Belgrade
Tel: 2065 018 Fax: 3612 896
email: INFO@BVK.RS

Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
Belgrade, 22-26 Nemanjina Street,

ROP-MSGI-34773-LOCA-4/2019
Registry number: 350-02-00211/2019-14
V-489/2019

SUBJECT MATTER: Waterworks conditions for the development of location conditions required for the construction of the bridge over the Sava River on the site of the old bridge on cadastral parcels 473/6, 1508/368, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370 CM Savski Venac and 6628/1 (part), 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11 CM Novi Beograd, in Belgrade

With reference to your request, the investor, the City of Belgrade, the Secretariat for Com Public Utilities and Housing Affairs - Directorate for Construction Land and Development, 48, Njegoševa Street, registered in the Technical Service documentation of PUC "BWS" under no. V-937/2018 dated 30 November 2018, requesting waterworks conditions for the construction of the bridge over the Sava River on the site of the old bridge on cadastral parcels 473/6, 1508/368, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370 CM Savski Venac and 6628/1 (part), 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11 CM Novi Beograd, in Belgrade, in accordance with the **Decision on water purification and distribution** ("Official Gazette of the City of Belgrade no.23/2005, 2/2011 and 29/2014) these

C O N D I T I O N S

a r e h e r e w i t h i s s u e d

Data on the facility from the submitted Conceptual Design:

After reviewing the submitted Location Conditions ROP-MSGI-34773-LOC-1/2018, (registry number: 350-02-00465/2018-14 dated 29 January 2019) and consultation with holders of public authorizations who participated in the issuance of Location Conditions, it was established that it is necessary to amend the conditions issued by:

a) Ministry of Construction, Transport and Infrastructure - in the part in which the list of parcels was given, as well as the name of the Investor
b) Institute for Nature Conservation of Serbia - the part describing the installation of protective barriers on the bridge
c) PUC "Belgrade Waterworks and Sewerage" - the part describing the construction of two pipelines with a diameter of **Ø 500 mm**

PUC "Belgrade Waterworks and Sewerage"- waterworks, within its conditions, inter alia, prescribes construction of two pipelines with a diameter of Ø 500 mm along the route of the bridge. Considering that these pipelines are not part of the existing Special Purpose Area Spatial Plan for the Regulation of the Sava River Coastal Part of the City of Belgrade for the "Belgrade Waterfront" project ("Official Gazette of RS", No. 7/2015), it is necessary to exclude them from the technical conditions of PUC BWS - Waterworks. With regard to the request that the pipelines be a part of the infrastructure on the bridge, consultations were held with the representatives of PUC BWS, who agreed to cancel the subject pipelines. WS gave up the construction of two pipelines with a diameter of Ø 500 mm across the bridge.

ZA 40103000001/09

The plan regards the construction of a bridge of "G” category, classification code: 214101, length: 420 m, width: 37,2 m, viewpoint site width: 42,5 m, spans L=54+73+166+73+54, larger arch: H=47 m, smaller arch: H=41 m.
Road surface area on the bridge: Railway (Tramway/Subway) 4368 m2, Road 5460 m2, Pedestrian, Cycling 2772 m2
The subject of the Conceptual Design is the construction of a new arch bridge over the Sava River. The subject road on the bridge is envisaged with two road surfaces 6.50m wide with two traffic lanes each, a tram isle 10.40m wide and pedestrian and bicycle paths on both sides. The two-track tram line is also a part of this Conceptual Design.
Displacement of part of the existing water supply system in the zone of pillar S1 is envisaged.
At the construction site of the future new bridge over the Sava River, there is an existing tram bridge, the so called "Old Sava Bridge" with spans L=41,3+53,1+53,1+106,2+53,1+53,1+41,3=401,2 m.
Prior to the construction of the new bridge, the complete removal of the existing bridge and its piers is envisaged, which is the subject of a separate Design and will not be considered here. Also, until the application for the Building Permit, it is necessary to perform re-subdivision of GP SP 5 and GP SP 15, in order to separate the construction parcels for the bridge and for the access roads that are under the jurisdiction of the Secretariat for urban planning.
Apart from stair communications, along the pedestrian-bicycle paths on both banks of the river, two elevators are to be installed in the new structure of the Sava bridge, for the transport of citizens, persons with disabilities and cyclers.
The conducting of significant installations, that is, energy (110 kV) telecommunication cables (pipes 2x16ø110) is foreseen across the bridge. The crossing of other installations (heating, water supply…) is not required. With the adoption of the lattice transverse girder and brackets with supports, a huge space was created to accommodate the galley with all kinds of future installations. At this stage of the design project, placement of installations within the bracing (h x b = 3.3 x 2 m) is envisaged.
Water management on the territory of the Municipality of New Belgrade
The area covered by the subject design belongs to the first altitude zone of water supply of the city of Belgrade with the constructed water supply network:
- raw water pipeline VČ1000 mm along Brodarska Street: this pipeline directs all water from the water well Ušće (Confluence) to WTP "Bežanija", from which the entire area of New Belgrade and Zemun is supplied;
- primary pipeline VL500 mm. Also in the immediate vicinity along the banks, there are three Renny wells (RW-1, RW-52 and RW-53) and one tubular (IEBUS-4). The area of the subject design project is located in the narrower sanitary protection zone of the Belgrade water source.
Water management on the territory of the municipality of Savski Venac
The area covered by the subject design belongs to the first altitude zone of water supply of the city of Belgrade. The water supply network includes the built primary pipeline of Ø700mm and secondary pipelines Ø200 and Ø150 mm. Considering that the bridge over the river Sava with access roads is in the immediate vicinity of the "Belgrade Waterfront” development project, meetings were held with the representatives of "Belgrade Waterfront". Designs made for the "Belgrade Waterfront" project that is situated in the coverage area, were submitted. Having reviewed the submitted design projects, it was concluded that all existing water supply systems were cancelled and that along SA08, the following was built:
- primary pipeline **DN500 mm**
- - distribution pipelines BP200 mm
DESIGNED SOLUTION
The existing water supply network is maintained in its existing condition.
Water management on the territory of the Municipality of Savski Venac
The DN200 mm water supply system as built for the "Belgrade Waterfront" is in collision with the pillar of the designed bridge on the Sava, and for that reason its relocation is planned.

Current state
In the graphic part of the conditions, the data on the existing water supply network in the subject area is submitted. The water supply network in this area belongs to the altitude zone I of the Belgrade water supply system, with working pressures in the network for the left bank of 4,0-6,0 bar, and 6.0 bar for the right bank.

The following pipelines are situated on the left bank: Ø500mm of cast iron material and steel pipeline of raw water Ø1000mm and BWS wells (three Renny wells RB-1, RB-52 and RB-53 and tubular IEBUS-4 well).
The following pipelines are situated on the right bank: Ø700mm made of cast iron material, Ø500mm and Ø200mm made of ductile cast iron, constructed within the Belgrade Waterfront complex, which is being realized in phases.
PUC BWS does not have as-built design of the water supply network. **Planned and design state:**

For the subject location, the planning documentation is in force:
- *Master Plan of Belgrade 2021 (Official Gazette of the City of Belgrade, no. 27/03,25/05,63/09 and 70/14)*
- *General Regulation Plan of the Construction Area of the Headquarters of the Local Self-Government Unit - City of Belgrade (Entities I in XIX) (Official Gazette of the City of Belgrade No. 2016);* 20/16)
- *Special purpose spatial plan of the part of coastline arrangement of the City of Belgrade – coastal line of the Sava River for the „Belgrade Waterfront" project (Off. Gazette of RS No. 7/2015)*
- *Conceptual Design for traffic and public areas on the Sava river bank within the "Belgrade Waterfront" project (Investor: Belgrade Land Development Public Agency (Beoland), Designer: CeS.COWI no. 1747-4/15)*.

An integral part of the subject conditions include the conditions of the Water Supply Development Service of PUC "BWS", from the aspect of the concept and from the aspect of the sanitary protection zones of the Belgrade water supply system. An integral part of the subject conditions include the Minutes from the meetings regarding the coordination of the design of the new tram bridge and BW infrastructure, in order to harmonize Design documentation. These also defined the method of resolving collisions of bridge elements, ramps, stairs, elevators, pillars, pedestrian and bicycle communication with all water supply installations, both existing and future (in terms of their protection and providing access for maintenance)...
Adopt the design solution in accordance with the hydro-technical and new solution related to transportation, according to the planning documentation, taking into account the harmonization of water supply installations with structural elements-foundations of pillars, with elements of ground floor arrangement and with all other installations. It is necessary to harmonize the Design documentation and the dynamics of the design and construction of the water supply network of the bridge, access ramps and the water supply network of the Belgrade Waterfront complex. Design documentation must provide all prescribed protection measures applicable for the narrower zone of sanitary protection of the Belgrade water source, during the construction and future operation of the facility.
Design and selection of construction technology must anticipate and present the designed protection measures of the existing and future water supply network, to ensure functionality, stability and unobstructed access for maintenance in the operation phase and especially in the construction phase, and if necessary to anticipate their relocation. For the purpose of mutual harmonization of existing and designed installations, the design should provide a minimum allowed distance for parallel guidance of 1,0m from the outer edge of distribution pipelines (water supply network diameter up to Ø300mm), and 1,5m from the outer edge of main pipelines (water supply network diameter over Ø300mm), and especially in the places of the manholes. For the intersection of installations with existing and designed water supply installations (water supply network and connections), the minimum allowed distance in the vertical sense is 0.5 m.
The levels of the existing facilities on the water supply network should be harmonized with the designed levels of landscaping of all surfaces.
In case of damage to water pipes and loss due to undelivered water to users during the execution of works, all costs will borne by the investor.
The adopted design documentation from the aspect of water supply should be submitted to PUC BWS for issuance of the opinion, further use and archiving.
During the execution of all works, provide supervision by the Supervision Sector and Water Distribution Sector of the PUC BWS, and upon completion of works, for updating the PUC BWS database, the as built design documents of the water supply network must be submitted.
Providing the property and legal basis for all works on the execution of hydro-technical installations according to the future design documentation is under the competence of the body issuing building and use permits.

ZA 40103000001/09

General standards and regulations of PUC BWS for designing ROADS and water supply installations:

- during the design and construction of the water supply network, it is necessary to adhere to the existing standards and regulations for this type of work in accordance with technical and legal regulations;
-the network must be dimensioned according to the hydraulic calculation. The minimum diameter of the water supply network in the city centre is Ø150mm, and Ø100mm outside of it, exceptionally Ø80mm;
- primarily, it is necessary to design a ring, hydraulically more favourable water supply network, and adhere to the “from-to” principle, but only exceptionally, to branched water supply network, which must end with a hydrant;
- the route of the designed pipeline must be envisaged in the public area and harmonize it with the routes of other installations. Attention must be paid to mutual harmonization of water supply installations and other installations in the situational and levelling sense, respecting the minimum allowed distances from the outer edges of the pipeline, especially at the places of manholes;
- the minimum depth of burial of the water supply network is 80 cm;
- safety in the functioning and durability of the pipeline is to be ensured by choosing a suitable material that corresponds to the working pressure in the network;
- in accordance with the geometry of the water supply network, envisage the installation of appropriate shaped pieces, pipe fittings and hydrants, necessary for the operation and maintenance of the water supply network;
-connections of the designed water supply network with the existing water supply network should be provided with the necessary reinforcement, and for the planned water supply network, separation branches should be provided;
- the design envisages the linkage of all existing connections, if any, and the details of such connection must be enclosed;
- the design envisages rinsing and disinfection of pipelines;
- adequate protection measures must be designed to ensure stability, functionality and access for the maintenance of all existing water supply installations, in the construction phase, as well as in the operational phase of the future network and water supply facility. Mandatory appendices to the Design should include all relevant details of protection measures according to the choice of construction technology (substructure, water pumping, construction site organization ...)
- The as built design of the water supply network should include all the necessary appendices, namely: geodetic survey of the built pipeline, certificate of the Republic Geodetic Authority, certificate of the pipeline pressure testing, certificate of performed disinfection of the pipeline and bacteriological analysis of water quality...
-report about all works fully in accordance with the instructions of the expert from the Supervision and Water Distribution Sector of the PUC "Belgrade Waterworks and Sewerage";
- when calculating the control of bearing capacity and stability of the existing pipeline in accordance with the geo-mechanical characteristics of the soil and the characteristics of the pipe material of the existing pipeline and with the working pressure in the pipeline, the impact of traffic load (maximum unload the pipeline)must be taken into account;
- depending on the scope of works, i.e. if the level of the road changes in relation to the existing condition, the level of the existing water supply network must be harmonized with the existing facilities on the network (water shafts, shutters, hydrants) with the new level of the road;
-mandatory appendices to the design should include all relevant details of protection from the aspect of the choice of construction technology and construction site organization...
- In case of damage to water pipes and loss due to undelivered water to users during the execution of works, all costs will borne by the applicant, i.e. investor;
- costs in the procedure shall be borne by the applicant, i.e. the investor according to the price determined by PUC "Belgrade Waterworks and Sewerage".

ZA 40103000001/09

Connection / cooperation fee:

	code according to the valid price list of PUC BWS	fee amount [dinars]	notes:
cooperation in the design of the road-water supply	**14030**	**65,127.65**	The price of costs is approximate, in accordance with the scope and level of data from the submitted Conceptual Design with accompanying the request, and does not include the price of designing and construction of the street water supply network. The price of the missing external water supply network will be an integral part of the contract with the PU Belgrade Land Development Public Agency (Beoland). The prices quoted are listed in the price list of PUC BWS applicable on the date of conditions issuance.

Appendices:

- situation of the existing water supply network, Scale = 1: 2500
- Overview situation with wells and sanitary protection zones, Scale = 1: 5000
- excerpt from the overall utility plan-drawings from the Special purpose spatial plan of the part of coastline arrangement of the City of Belgrade – coastal line of the Sava River for the „Belgrade Waterfront" project (Off. Gazette of RS No. 7/15).

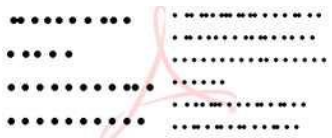
The validity period of the condition number V-489/2019 is 2 (two) years from the date of issuance.

Prepared by:

Dragica Pantelić,B.Sc.C.E.

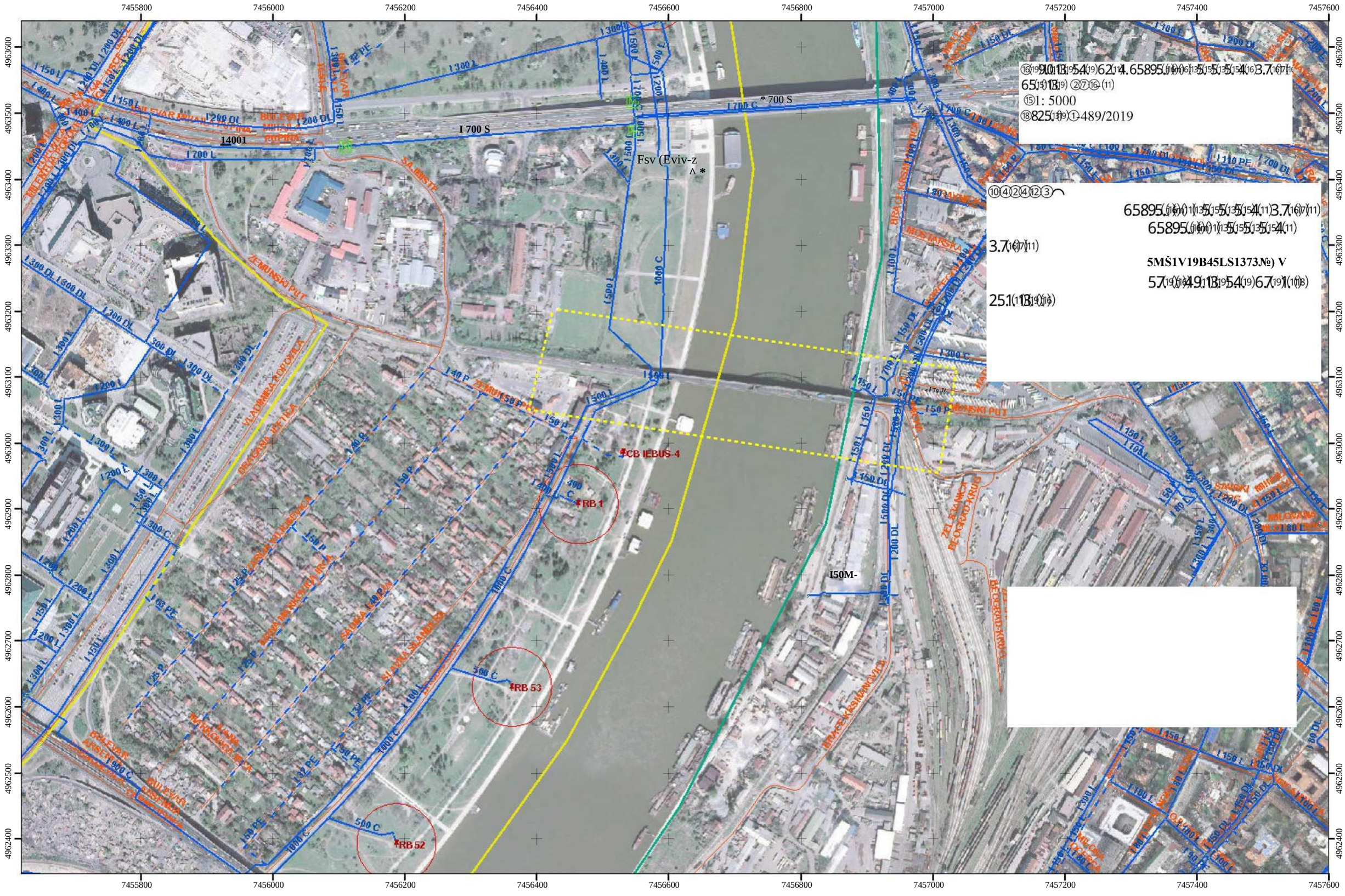
HEAD OF
TECHNICAL DOCUMENTATION DEPARTMENT:

Aleksandra Tušup, B.Sc.C.E.



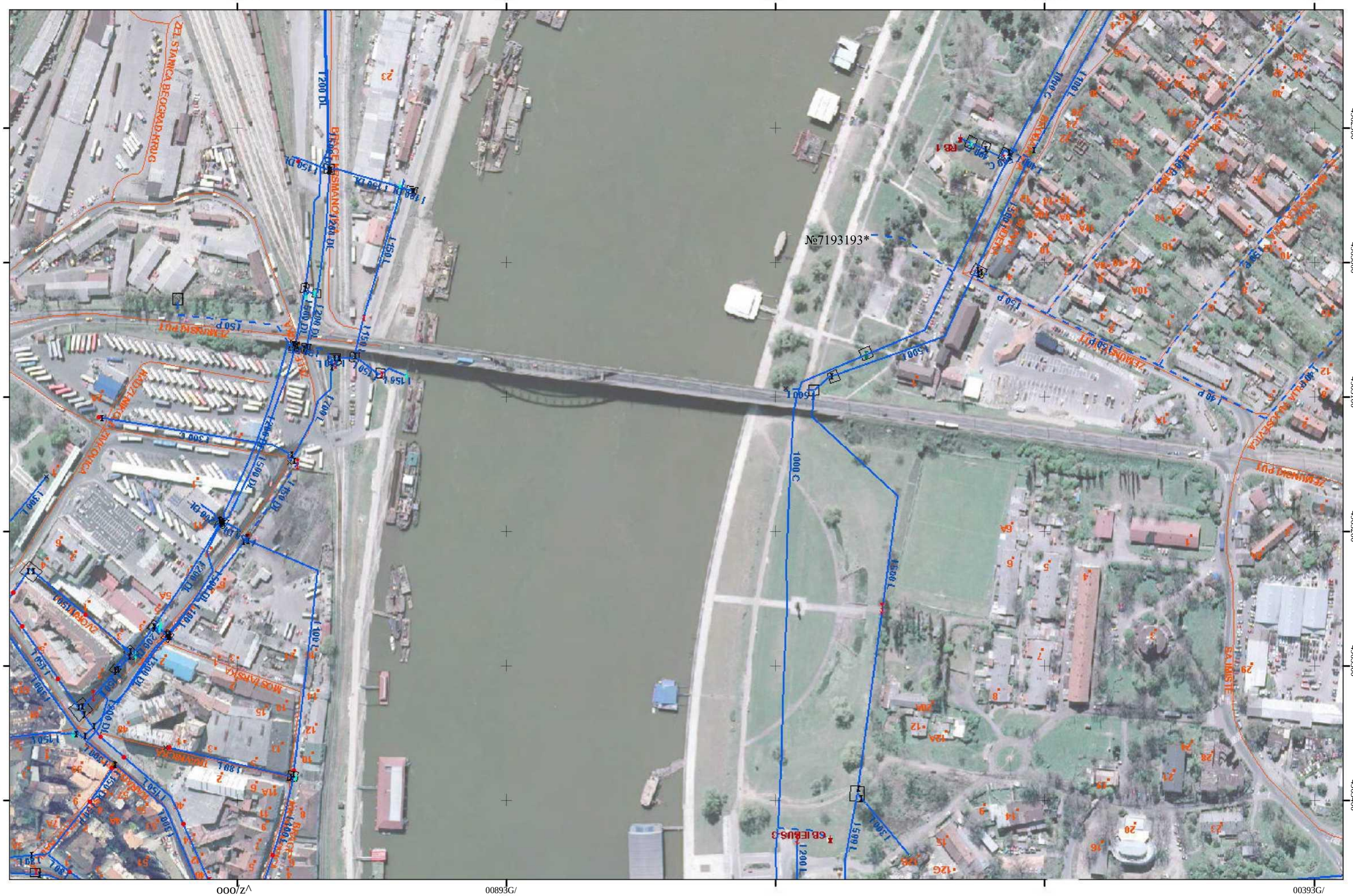
ZA 40103000001/09

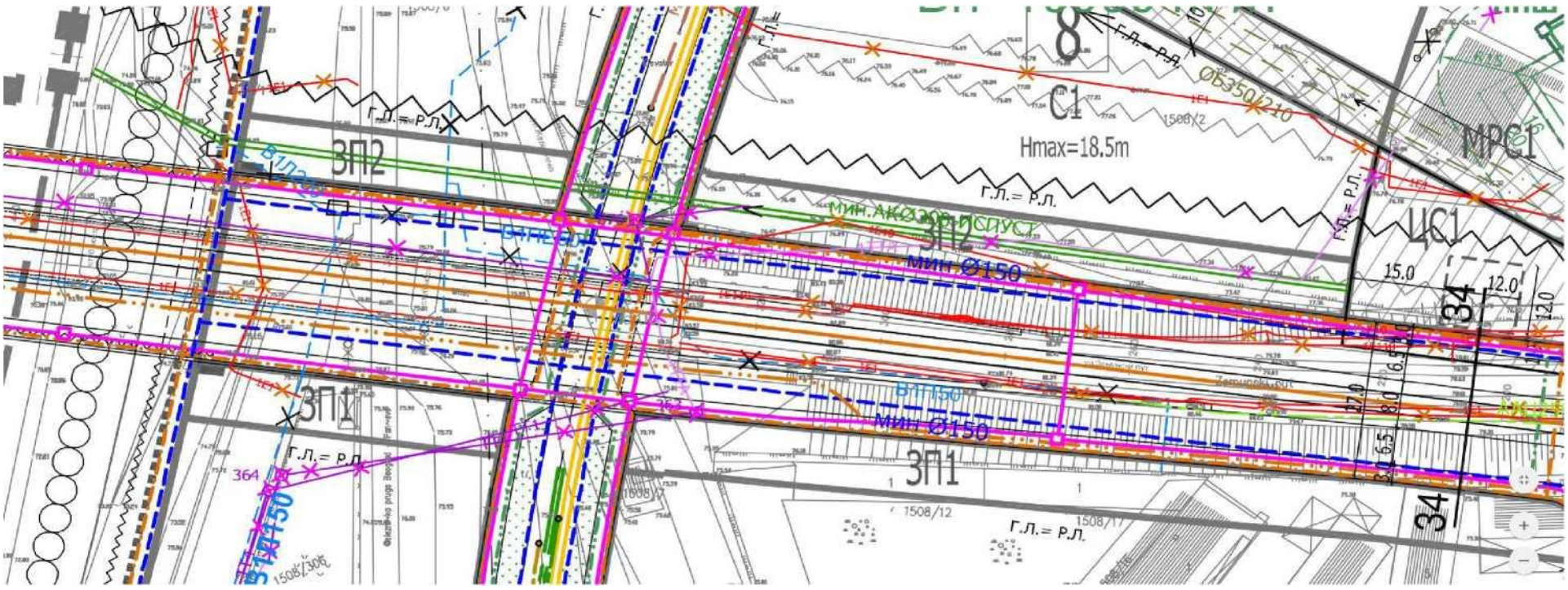
1-489/2019, 11-589.4 11 16 11 13 19



Existing water supply network layout

Date 27 Dec 2018





JKL PARJ-MNG SERVIS

SMALL WATER REGULATION LINE

UPPER ELEVATION LINE OF THE COASTAL FORTIFICATION

BUILDING LINE

BUILDING LINE OF THE UNDERGROUND GARAGE

BUILDING LINE OF VISUAL PENETRATIONS

GREEN AREAS IN ROAD REGULATION

ZONE I - IMMEDIATE ZONE OF SANITARY PROTECTION

ZONE II - NARROWER ZONE OF SANITARY PROTECTION

ZONE III - NARROWER ZONE OF SANITARY PROTECTION

EXISTING WATERWORKS

EXISTING WATERWORKS (cancelled)

PLANNED DISTRIBUTION WATERWORKS

PLANNED MAIN WATERWORKS

Special purpose spatial plan of the part of coastline arrangement of the City of Belgrade – coastal line of the Sava River for the „Belgrade Waterfront“ project (Off. Gazette of RS No. 7/15).

Case no. V-489/2019

PUBLIC UTILITY COMPANY
BELGRADE WATERWORKS AND SEWERAGE

PUC "BEOGRADSKI VODOVOD I KANALIZACIJA" (Belgrade Waterworks and Sewerage)
27, Kneza Milosa St.
11000, Belgrade, Serbia
TIN: 100346317. Company registration number: 07018762
Contact centre: 3 606 606
email: info@bvk.rs
Date: 31/05/2019

www.bvk.rs

Development Service
Deligradska 28, 11000 Beograd
Tel: 3606 846
Fax: 3610 953
e-mail: ana.popovic@bvk.rs

Number: **V-490/2019**

Republic of Serbia
MINISTRY OF CONSTRUCTION, TRANSPORT AND INFRASTRUCTURE,
Belgrade, Nemanjina 22-26

Case number: ROP-MSGI-34773-LOCA-4/2019
Registry number: 350-02-00211/2019-14

SUBJECT: **Location conditions for the construction of the bridge over the river Sava on the site of the Old Bridge at cadastral parcels: 473/6, 1508/368, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370, all in CM Savski Venac and cadastral parcels 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (part) all in CM Novi Beograd, The City of Belgrade - Conditions from the aspect of sanitary protection of the Belgrade water supply source**

You approached us with your request for issuance of the Location Conditions for the construction of the bridge over the river Sava on the site of the Old Bridge at cadastral parcels: 473/6, 1508/368, 1508/361, 3292/8, 438/8, 3292/14, part of 1508/331, part of 445/1, part of 473/12, part of 473/11, part of 1508/370, all in CM Savski Venac and cadastral parcels 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (part) all in CM Novi Beograd, The City of Belgrade - from the aspect of sanitary protection of the Belgrade water supply source.

The documentation of the Preliminary design for construction is available on the CEOP portal (Central evidence of unified procedures for issuance of construction permits).

PRESCRIBED MEASURES AND RESTRICTIONS WITHIN WATER SOURCE PROTECTION ZONES

Water source protection means taking all necessary measures in order to preserve the quality of water sources, i.e., protection of surface and groundwater from accidental or intentional pollution or harmful effects that may temporarily or permanently affect potability of water sources. Protection of springs and reserves of surface and groundwater is provided by the formation of sanitary protection zones, defining conditions, restrictions and protection measures, monitoring the quantity and quality of water, as well as control of their implementation and compliance by users of space. Water source protection is performed in accordance with:

1. *Decision on Determining the Sanitary Protection Zones on the Administrative Territory of the City of Belgrade for Groundwater and Surface Water Sources Serving for the Water Supply of the City of Belgrade (Ministry of Health of the Republic of Serbia, No.* 530-01-48/2014-10, dated 01/08/2014)
2. *Rulebook on the manner of determining and maintaining the sanitary protection zones of the water supply sources (Official Gazette of RS no.* 92/2008)
3. *Study on the zones of sanitary protection of groundwater and surface water sources of the City of Belgrade (Jaroslav Černi Institute, 2013)*

*Pursuant to the Decision on Determining the Sanitary Protection Zones on the Administrative Territory of the City of Belgrade for Groundwater and Surface Water Sources Serving for the Water Supply of the City of Belgrade (Ministry of Health of the Republic of Serbia, No. 530-01-48/2014-10, od 01.08.2014.),*the bridge over the Sava River on the site of the old bridge is located partly in the narrower (Zone II), partly in the wider zone (Zone III) and partly in an area that is not defined as a zone of sanitary protection of water sources.

According to the Rulebook on the manner of determining and maintaining the sanitary protection zones of the water supply sources (Official Gazette of RS no. 92/08, Article 27), it is stipulated that in Zone III (wider zone of sanitary protection) it is prohibited to build or use facilities and plants, use land or perform other activities, if such activities are hazardous for potability of water at the water source, namely:

- production, transport and handling of dangerous substances and substances that may not be introduced directly or indirectly into water,
- wastewater discharge,
- construction of roads without sewers,
- uncontrolled disposal of municipal waste, damaged vehicles, old tires and other substances and materials from which pollutants can be released by rinsing and leaking,
- surface and subsurface works, soil blasting, penetration into the layer that covers the groundwater and removal of the layer that covers the aquifer, etc.

Furthermore, this Rulebook (Article 27) also stipulates that in Zone II (narrow zone of sanitary protection) it is not allowed to build or use facilities and plants, use land or perform other activities, if such activities are hazardous for the potability of water at the water source, as follows:

- Construction and use of facilities and plants, use of land or performance of other activities referred to in Article 27, (as previously described),
- Use of pesticides, herbicides and insecticides,
- Camping, fairs and other gatherings of people,
- Construction and use of catering and other facilities,
- River bed deepening and extraction of gravel and sand, etc.

The Decision was issued in accordance with the Study on the zones of sanitary protection of groundwater and surface water sources of the City of Belgrade (Jaroslav Černi Institute, 2013). The Study presents in detail the conditions, measures and restrictions, as well as guidelines related to the purpose, manner of use and performance of certain activities and actions in the area of defined sanitary protection zones of the Belgrade water source. An overview of the proposed restrictions in the sanitary protection zones, for different groups of activities that can be related to the subject facility, is presented in Table 1.

Table 1: Lists of activities and proposed restriction measures in the sanitary protection zones of the Belgrade water source

No	Activities in source protection zones	Groundwater intake			Surface water intake		
		Sanitary protection zone					
		I II		III			
URBANISATION AND CONSTRUCTION WORKS							
1	***Urbanisation***						
1.5.	Transforming existing industrial zones into green areas	A	A	A			
2	***Construction excavation works and excavation of raw materials***						

2.1	Excavations of river material (deepening of the riverbed, extraction of gravel and sand) which are not in the function of maintaining water supply facilities	P	P	AA	P		
2.2	Ground blasting, surface and subsurface works, penetration into the layer covering the groundwater and removal of the layer covering the aquifer, excavations in the aquifer that are not in the function of water supply	P	P	P	P		
2.3	Construction and operation of mineral borrowings (sand, stone ...)	P	P	P	P		
3.	***Construction and operation of special facilities***						
3.1	Transformer substations	P	P-AA	AA	P		
PUBLIC UTILITY ACTIVITIES							
1	***Wastewater collection and treatment***						
1.1	Sewer construction	P	AA	AA	P-AA		
1.2	Discharge of untreated municipal wastewater	P	P	P	P		
1.4	Construction of collectors and discharge of atmospheric wastewater	P	AA	A	P		
2	***Waste disposal:***						
2.1	Uncontrolled disposal of municipal waste, damaged vehicles, old tires and other materials from which pollutants can be released by leaching or leaking	P	P	P	P		
INDUSTRIAL ACTIVITIES							
1	***Processing of mineral raw materials***						
1.1	Operation of facilities for disposal, grinding and processing of raw materials and tailings (gravel pits, landfills and sand separations)	P	P	AA	P		
2	***Industrial plants***						
2.10	Concrete mixers and asphalt bases	P	P	AA	P		
3	***Energy sector***						
3.4	Technical infrastructure facilities (gas pipeline, oil pipeline, provided by the GUP, with the implementation of protection measures)	P	P	AA	P		
3.5	Technical infrastructure facilities (heating pipelines, TT and power lines) provided by the GUP, with the implementation of protection measures	P	AA	AA			
AGRICULTURE AND FORESTRY							
2	***Agronomy***						
2.4	Irrigation with treated wastewater	P	P	P	P		
2.6	Natural grass cultivation without using fertilizers and other agrotechnical means	A	A	A	P		
3	***Forestry***						
3.1	Uncontrolled deforestation	P	P	P	P		
TRAFFIC AND TRANSPORT							
1	***Traffic***						
1.1	Construction of traffic corridors, roads, railways	P	AA	AA	P		
1.2	Parking lots, car parks	P	dd	dd	P		
1.3	Construction and operation of bus stops and terminuses	P	AA	A	P		
1.7	Telecommunication infrastructure outside the water supply function	P	AA	A	P		
1.8	Transport and handling of hazardous substances and substances that must not be introduced directly or indirectly into water	P	P-AA	P-AA	P		
SPORT, RECREATION AND TOURISM							
1.1	Construction and use of sports facilities	P	AA	A	P		
1.2	Camping, fairs and other forms of organized gathering of people	P	P-AA	AA	P		
1.3	Outdoor sports fields	P	AA	A	P		
1.5	Car and motorcycle racing	P	P-AA	NR	P		
1.10	Construction and use of catering facilities	P	AA	A	P		

Legend:
P - Prohibited, -prohibited regardless of the application of protection measures
NR - Not recommended - requires the application of standard, additional and location-specific protection measures,
AA - Allowed, with the application of standard technical measures and additional protection measures,
A - Allowed, with standard technical protection measures
P-AA - Prohibited formation of new and implementation of additional protection measures for existing ones

MEASURES, CONDITIONS AND RESTRICTIONS FROM THE ASPECT OF SOURCE PROTECTION

During design, construction and use of the New Bridge over the river Sava on the site of the Old (Tram) Bridge, from the aspect of sanitary protection of the spring, it is necessary to observe the following:

1. The construction of a new bridge over the Sava River with accompanying facilities and installations within the narrower and wider sanitary protection zone of the Belgrade spring (zone **II** and zone **III),** is acceptable, as well as the possibility of transformation and conversion, complete or partial removal of existing buildings and complexes subject locations, as stated in the submitted Conceptual Design, in accordance with the relevant planning and technical documentation and with mandatory compliance with all the following conditions, measures and restrictions.
2. For all new and reconstructed facilities, the preparation of project documentation is required in accordance with the *Law on Planning and Construction* (Official Gazette of RS No. 72/2009, 81/2009, 64/2010, 24/2011, 121/2012, 132/2014, 145/2014,) and other applicable regulations and standards for this area, with a detailed description of all positions of technical solutions concerning direct or indirect environmental protection and protection of surface and groundwater and soil at this location. In general, all new and reconstructed facilities should be equipped in such a way as to prevent any intentional or accidental contamination of groundwater and soil at this location, i.e. to minimize the risk of contamination from this location, i.e. to reduce it to the smallest possible measure.
3. In the phase of preparation of technical documentation for all facilities within the narrower zone of sanitary protection of springs (zone **II),** conduct additional engineering geological and hydrogeological research, in accordance with the valid *Law on Mining and Geological Research* (Official Gazette of RS and relevant bylaws. This additional researches is obligatory for the planned (deep) foundation of the bridge on piles supported in a sandy-gravel aquifer, as well as in the case of a subsequently determined zone of high groundwater vulnerability at the subject location. Additional hydrogeological research will determine the presence, thickness and characteristics of the filled layer (with the so-called "floating" aquifier), the overlying (protective) natural layer and the aquifer itself; quality and condition of groundwater and soil; as well as other important elements, in order to define possible additional conditions, restrictions and measures for protection of the source at the subject location. If the new reserach works single out zones that correspond to the conditions of high vulnerability, the envisaged protection measures must be strengthened, including mandatory monitoring during the execution of works and later use of the facility.
4. If during the research or execution of works the presence of pollutants in groundwater and land/soil of unknown origin (historical pollution) is determined, it is obligatory to inform the competent authorities and take all necessary remediation and remediation measures, in accordance with the *Law on Environmental Protection* (Official Gazette of RS No. 135/2004, 36/2009, 14/2016) and relevant bylaws.
5. Organize and realize exploration, preparatory and construction works for the needs of construction of the planned facilities with the implementation of all necessary standard and additional measures for protection of springs, which include the following: spatially limited execution of works with the least possible removal and penetration through the overburden; preventing the spillage of hazardous and harmful substances (oil and oil derivatives, fats and oils, antifreeze, thinners, acids, paints, varnishes, adhesives, additives, etc.) into the soil and groundwater; adequate storage of all hazardous and harmful substances in minimal quantities (handy warehouses); hiring trained workers and using proper machinery, vehicles, equipment and more; limited movement of engaged machinery and prohibition of servicing them on site; less intervention in terms of topping up working fluids, washing and cleaning of engaged machinery, equipment and tools should be

limited to temporary watertight surfaces-plateaus, located along existing roads, with mandatory collection and treatment of wastewater on temporary separators and sandpits and evacuation of treated wastewater to the intended recipient; use of sanitary cabins with regular maintenance and emptying of the same by an authorized company; mandatory sorting and adequate collection and storage (hazardous and non-hazardous) of waste generated during construction (construction materials and rubble, packaging, municipal waste, etc.) at a designated location - watertight plateau, with organized regular removal by the competent utility service or authorized operator; providing funds for the remediation of possible minor accidents during the implementation of the planned works (vessels, tanks, sand, rags, tow, etc.); obligatory arrangement of the location according to the project of landscaping after the construction of the planned facilities; provide supervision over the implementation of all planned measures for the protection of springs during the execution of works.

6. For the purpose of installation or replacement of land/soil, embankment and levelling of the terrain on the location, it is allowed to deliver materials of exclusively known characteristics, which by their nature must not be dangerous for the source, i.e. that in no case endanger the quality of groundwater at this location.
7. Design all new facilities so that the lowest elevation of the planned facilities is in the backfill layer, i.e. above the elevation of the protective (natural) layer of the aquifer. Only for the needs of the construction of the bridge girder is allowed (deep) foundation on piles in the protective overlying layer or in the aquifer itself, with the application of additional conditions, measures and restrictions.
8. Parts of new and reconstructed facilities that are located below the surface of the terrain, i.e. that are completely or partially in the zone of groundwater level oscillations (service rooms, engine rooms, pumping stations, etc.), must be completely insulated with waterproof coatings, so as to prevent any possible penetration of pollutants from buildings into the environment.
9. In order to more effectively protect groundwater and soil from pollution by infiltration from the surface and/or leakage from new facilities and installations in the backfill, consider the need and possibility of isolating the lower sandy-gravel aquifer by installing resistant and permanent impermeable barriers from special natural and/or artificial materials. These barriers would be installed under and/or around the planned facilities, i.e. in the flooding of the aquifer at all locations where the absence of low water permeability was found, i.e. a separate zone of high groundwater vulnerability, as well as in those locations where during the preparatory works and construction locally, i.e. in the zone of the object itself, the protective role of the overlying layer is significantly or completely reduced (reducing the thickness, penetrating, partially or completely removing the natural protective coating, etc.).
10. Construction of new and transformation of existing facilities should be performed only after the communal arrangement of locations, whereby the construction of the system of fecal and atmospheric sewerage represents the technical minimum.
11. If the construction of sanitary facilities (public toilet) is planned next to the bridge and accompanying facilities, fecal water from all facilities should be collected and evacuated to the city sewage system, in all respects according to the conditions of PUC BWS. In some locations (for example, public transport terminals, part of the promenade under the bridge, etc.) it is allowed to install sanitary cabins with regular maintenance and emptying of the same by an authorized company.
12. It is forbidden to directly enter atmospheric wastewater from the bridge, new and reconstructed existing facilities (roads, plateaus, access ramps, etc.) into the recipient without prior processing. That is, all atmospheric water from precipitation, as well as water from washing, maintenance of facilities and the like, must be collected and treated at adequate wastewater pre-treatment plants (sedimentation tanks, oil and grease separators, sand traps, etc.), and further evacuate to the appropriate recipient - city sewerage, in accordance with the conditions of PUC BWS, or to the Sava River, in accordance with the conditions of the competent authorities.

13. The design and construction of watertight communal infrastructure (pipelines, inspection shafts, chambers, devices and facilities for pre-treatment, etc.) is required, as well as the installation of certified quality pipe material, devices and equipment, with multiple protection systems, which would ensure complete tightness and impermeability of the internal and city sewerage system. After the construction of new and reconstructed facilities, all devices and equipment should be hydraulically tested for leaks, and later periodically inspected or after the accident, in accordance with legal obligations, manufacturer's recommendations, procedures and instructions.
14. The quality of purified water discharged into the recipient - fecal and atmospheric public sewage, i.e. the Sava River, should correspond to the valid regulations, Rulebooks and decisions.
15. It is obligatory to contract the maintenance and emptying of all devices for pre-treatment of wastewater (separator, grease and oil precipitators, sand traps, etc.) with the competent utility service or a registered company for this activity. Ensure adequate monitoring of the quantity and quality of wastewater before and after pre-treatment. After installation, the settling tank-separator should be hydraulically tested for leaks, and later periodically or after an accident, in accordance with legal obligations, manufacturer's recommendations, procedures and instructions.
16. Consider in detail the technical solutions and check the safety of the route and elements of the planned roads, as well as alternative possibilities of applying certain additional protection measures to make the route as safe as possible (additional lighting and marking of traffic lanes, slowing and directing traffic, horizontal and vertical signalization, etc.).
17. The transport of dangerous, harmful and flammable substances and cargo within the narrower zone of sanitary protection of springs (zone II) is prohibited. During the transition period, the transport of dangerous goods (cargo) should be avoided as much as possible, except for those quantities for the needs of normal functioning (regular operation, maintenance, etc.), and if this is not possible only with the application of additional protection measures (announcement, escort of specialized aid vehicles in case of accidents, etc.).
18. All new and existing traffic areas, plateaus, access ramps, platforms, parking lots, etc. they should be made of waterproof reinforced concrete and asphalt covered with some other material resistant to oil and oil derivatives, with high curbs and appropriate longitudinal and transverse slope towards (circumferential) gutters/channels for directing and receiving all "dirty" water from these surfaces, which are carried to the separator, and then the treated ones are evacuated to the appropriate recipient. For the calculations of the relevant precipitation (rain), take into account the extremes as a consequence of the present climate changes. These facilities must be equipped with high curbs, sidewalks and fences, for controlled and limited movement of vehicles.
19. For all new and existing transformer stations and diesel-electric generators (DEA), ancillary facilities in which only small quantities of hazardous, harmful and/or flammable substances will be stored as well as possible smaller quantities of generated hazardous and non-hazardous waste generated during regular operation, use and maintenance of facilities, it is mandatory to apply special protection measures (without pyralene-RSV and other hazardous and harmful oils, on a waterproof surface with high thresholds-protective curbs and adequate fall, necessarily within the secured (locked) facility or part of the facility, installation tanks, tubs and/or concrete cassettes for oil and fuel tanks and distribution systems, double-walled tanks and distribution systems, signalling and notification systems, accident remediation facilities, fire protection, etc.), as well as mandatory groundwater and land monitoring and making piezometers in the immediate vicinity.

It is obligatory to sort and adequately store its generated hazardous and non-hazardous waste until it is taken over by a communal or some other company registered for this activity (operator). Submit the monitoring results to the competent services of PUC BWS and other Competent Institutions.

20. It is obligatory to form objects, i.e. space for (temporary) for the installation of appropriate vessels/containers for municipal waste that may occur in the regular operation and use of facilities until the takeover of the same by the utility or another company registered for this activity (operator). These spaces should be formed on a waterproof reinforced concrete or some other adequate base with similar characteristics, with high thresholds-protective curbs and adequate fall, obligatorily outside the zones of influence of surface and groundwater level oscillations, in accordance with the conditions of the competent utility company.
21. At all locations where flammable, dangerous and harmful substances are present, provide funds for localization and remediation of accidents in the form of water, absorbent - sand, dog, brushes and rags, as well as various collection vessels, always in visible and accessible in place and in sufficient quantities so that they can be applied directly in the event of an accident, in accordance with internal instructions and procedures.
22. Plan the formation and maintenance of embankment slopes, as well as grass and other green areas in a way that or does not require the use of groundwater and surface water dangerous and harmful means of protection against weeds and pests, especially in the narrow zone of sanitary protection. The development of a Pesticide Management Plan is mandatory, which includes appropriate monitoring and development of piezometers, as well as the implementation of the prescribed procedure for assessing the impact of applied maintenance measures and providing results to the competent secretariat and PUC BWS.
23. Arranged (cultivated) green areas should be equipped with standard infrastructure and irrigation system in accordance with the issued conditions of the competent services. In general, the following works are allowed on existing and new green areas: sanitary felling of trees, reconstruction and new planting of plants, reconstruction, erection-installation and construction of garden-architectural elements, pedestrian and bicycle paths, canopies, smaller playgrounds and polygons and existing facilities and park furniture, fountains and retentions, fencing, etc.
24. Research and exploitation of groundwater for the needs of irrigation of the surrounding green areas can be approved with the application of standard and additional protection measures, defined later, i.e. in direct cooperation with PUC BWS and only if an acceptable and binding technical solution is applied, in compliance with all regulations in this area, mandatory monitoring and production of additional piezometers. Submit the monitoring results to the competent services of PUC BWS and other Competent Institutions.
25. Formation of smaller accompanying temporary catering facilities, within new or reconstructed intersections, public transport stations, etc. is allowed with the implementation of all the protection measures described above, with the consent of the competent authorities.
26. Enable the establishment of environmental monitoring of the subject area, in accordance with the regulations governing this area. In that sense, it is necessary to establish an adequate monitoring network of at least 4 new piezometers (2 on each bank), located at risky locations, with adequate dynamics of groundwater quality monitoring, defined in agreement with PUC BWS. Also, ensure adequate monitoring of the quantity and quality of wastewater in the planned sewerage system (before and after pre-treatment).
27. Develop the necessary procedures and instructions for the present work activities, the manner of handling means and equipment, fire protection measures, protection measures - safety at work,

    as well as environmental protection measures (preventive and remedial measures) and familiarize all employees with the same.

The conditions, measures and restrictions set out here for defining location conditions for the construction of the New Bridge on the site of the Old (tram) Bridge, from the aspect of sanitary protection of springs, should be implemented in investment-technical (project) documentation, and must be included in all instructions and procedures for regular operation of facilities, as well as in case of possible accidents. As these are planned facilities withinthe narrower (Zone II) and wider (Zone III) zone of sanitary protection of springs, consistent adherence to the prescribed conditions and conscientious implementation of measures of sanitary protection of springs during the design, construction and use of all planned facilities is required.

You can get a more detailed explanation if you contact the Development Service— Department of Groundwater Source Development, Sector for Development and Design of PUC BWS, at 360-68-48.

Processed by:

Uroš Uročević, B.Sc.Eng.Geol. *(signed)*

Nenad Vrvić, B.Sc.Eng.Geol. *(signed)*

Head of Development Service

Ana Popović Miljić, B.Sc.Civ.Eng.

(signed)

Ana Popović Miljić 100057571 060197371 5244

Digitally signed by Ana Popović Miljić 100057571.-060 1973715244
Date: 2019.05.31 08:25:43 +02'00'

Director of the
Sector for Development,
Design and Investments

Dušan Gnjidić, B.Sc.Civ.Eng.
(seal and signature)

ZA 13200000001 / 08

Public Utility Company
Belgrade Waterworks and Sewerage

PUC "Belgrade Waterworks and Sewerage"
Kneza Miloša 27
11000 Belgrade Serbia
TIN: 100346317, Company No.: 07018762
Contact center: 3606 606
E-MAIL: INFO@BVK.RS

WWW.BVK.RS

Technical Documentation Service
Kneza Miloša 27 11000 Belgrade
Tel: 2065 018
Fax: 3612 896
E-MAIL: SID@BVK.RS

Date: 10.06.2019

Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
22-26 Nemanjina Street

Belgrade

ROP-MSGI-34773-LOCH-4/2019

SUBJECT: **Sewerage conditions for the development of location conditions for the construction of a bridge over the Sava River on the site of the old bridge at c.p. 473/6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/14, part 1508/331, part 445/1, part 473/12, part 473 / 11, part 1508/370, all CM Savski venac and c.p. c.p. 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (part), all CM New Belgrade, in Belgrade**

Regarding request no. 350-02-00211 / 2019-14, dated 27 May 2019, City of Belgrade, Secretariat for Communal and Housing Affairs - Directorate for Construction Land and Construction of Belgrade from Belgrade, 84 Njegoševa Str., registered in the Technical Documentation Service of PUC "BWS" under No. K-388/2019 of 30.31.2019, requesting conditions for the construction of a bridge over the Sava River on the site of the old bridge at c.p. 473/6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/14, deo1508/331, part 445/1, part 473/12, part 473 / 11, part 1508/370, all CM Savski venac and c.p. c.p. 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (part), all CM New Belgrade, in accordance with the Decision on drainage and treatment of atmospheric and wastewater on the territory of the City of Belgrade ("Official Gazette of the City of Belgrade", No. 6/10, 29/14 and 29/2015), we issue the following:

C O N D I T I O N S

Data on the facility from the submitted preliminary design:
After considering the submitted Location Conditions VOR-M8SG34773-EOS-1/2018 (official number: 350-02-00465/2018-14 dated January 29, 2019) and consultation with the holders of public authorizations who participated in the issuance of Location Conditions, it was established that it is necessary to change the conditions issued by:
a) Ministry of Construction, Transport and Infrastructure - the part in which the list of plots is given, as well as the name of the Investor
b) Institute for Nature Protection of Serbia - the part which describes the installation of protective barriers on the bridge
c) PUC "Belgrade Waterworks and Sewerage" - the part that describes the construction of two pipelines with a diameter of 500 mm
PUC "Belgrade Waterworks and Sewerage" - waterworks within its conditions, among other things, prescribes to provide two pipelines with a diameter of 500 mm along the route of the bridge. Since these pipelines are not part of the valid Spatial Plan of the special purpose area of the coast of the city of Belgrade - the area of the Sava River for the project "Belgrade on Water" ("Official Gazette of RS", No. 7/2015), it is necessary to remove them from technical conditions of PUC BWS- waterworks. In connection with the stated requirement that the pipelines be part

of infrastructure on the bridge, consultations were held with the representatives of PUC BWS who agreed to abolish the mentioned pipelines. VK gave up the construction of two water pipes 500 over the bridge.

1.5.1.1 Current situation

At the construction site of the future new bridge over the Sava River, there is an existing tram bridge, "Old Sava Bridge" with spans B = 41.3 + 53.1 + 53.1 + 106.2 + 53.1 + 53.1 + 41 , 3 = 401.2 m.

Prior to the construction of the new bridge, the complete removal of the existing bridge and its piers has been envisaged, which is the subject of a separate Design and will not be considered here. Also, until the application for the Building Permit, GP SP 5 and GP SP 15 will be re-parceled, in order to separate the construction plots for the bridge and for the access roads that are under the jurisdiction of the Secretariat for Urbanism.

The bridge is designed so that it fully enables the smooth flow of its planned traffic in a functional and safe way. All the required dimensions for accommodating rail, road and pedestrian-bicycle traffic were respected, and even additional space was provided for service tracks that are located above the tension, thus ensuring that their width is 2.0 m instead of the required 1.0 m. Also, a width of 1.3 m is planned for bicycle traffic, instead of the required 1.0 m, which will enable bicycle traffic even if pedestrians are kept on the bicycle path, next to the bridge fence. Otherwise, for pedestrian-watchers who want to stay on the bridge, enjoy the view or take photos, extra space is provided. The space is provided by increasing the bridge consoles by an additional 2.5 pt (and thickening), along the length of 30.0m. There are four such extensions on the bridge and they are located above the river pillars.

Pillars

The bridge has six reinforced concrete pillars of different height and width. The two coastal pillars S1 and S6 are of thickness B1.6 = 2.5 m and height H1.6 = 4.8 m. The middle pillars S2 and S5 are AB lattice, thickness B2.5 = 2.5 m and height H2 = 15.0 m and H5 = 10.0 m, while the middle, river pillars S3 and S4 are supported by arches, AB canvas thickness H3.4 = 3.5 m and height H3 = 23.0 m and H4 = 15.0 m. At the top of each pillar, bearings are placed, in such a way that, in the longitudinal sense, there is a fixed bearing on the river pillar S5, while on the other pillars there are movable bearings. In the transverse sense, on each pillar there is one laterally movable and one laterally non-movable bearing. The pillars are rounded, made of concrete class C30/37.

Bridge drainage

The longitudinal drainage of the structure is solved by the leveling itself, which is in a vertical circular curve. As the entire pavement slab longitudinally follows the leveling, all the water collected through the drainage system is piped with the pipes from the middle to the ends of the bridge. In the transverse sense, drainage is provided by a 2.5% pavement inclination that runs from the middle of the bridge to the arches (drainage of the rail section) and from the ends of the cantilever to the arches (drainage of the road and pedestrian-bicycle sections). The gutters located at the beginning of the cantilevers, along the arch. In order to enable unobstructed transverse drainage, it is necessary to install New Jersey barriers with appropriate openings at the point of contact of the barrier with the asphalt. The entire surface of the pavement is protected by waterproofing.

1.5.4 ACCESS ROAD

The subject of the preliminary design is the access road to the bridge over the Sava River, at the site of the Old Sava Bridge, in the New Belgrade Municipality, and the road itself on the bridge structure, in accordance with the awarded work for the competition for the development of the Urban-architectural solution for the reconstruction of the Old Sava River bridge. In the area within the Plan border, almost all kinds of interconnections and traffic subsystems are interconnected, which is especially emphasized on the right bank of the Sava River. The primary street network of the area consists of state roads of the 1st rank (highway, main roads), I and II rank streets, and the secondary access roads and local street network. Precipitation water is designed to be collected by transverse inclinations along the curbs of the pavement and gravitationally to the drainage channels and further to the rainwater system.

1.5.2.8 Description of the lift installation

In the new building of the bridge on the Sava, for the transport of persons, disabled persons, persons with bicycles, two elevators are to be installed, next to the stair communications, along the pedestrian-bicycle path on both banks of the river. The lift is located in the drive shaft made of reinforced concrete, the side (opposite of the bridge) as well as the back are made of tempered stop-sol glass in its frame chosen by the architect.

1.5.1.5 Bridge construction method

As a space for the future construction site and the place where the construction of the structure will be carried out, the left bank of the Sava can be used between the Gazela Bridge and the present Old Sava Bridge (Block 18). This space is ideal because it is close to the final location of the future bridge, the infrastructure necessary for the construction site (electricity, water ...) is available, a batching plant is nearby, and the site is surrounded by major traffic flows (highway, railway, Sava River and Danube), which is very important if parts of the future structure are to be brought from a greater distance. On the right bank of the Sava, a special mini-construction site should be formed at the S1 pillar, which would cover only the space and equipment for pushing the structure.

HYDROTECHNICS

1.5.5.2 DESIGNED SOLUTION

1.5.5.2.3 Sewerage on the territory of the municipality of New Belgrade

For the reception of rainwater from the road and sidewalks, from the access road of the bridge, street drains are planned, while for the collection of rainwater from the rails, tram rail drains are planned. The newly designed drains are connected to the newly designed street rain sewer. The final recipient is the existing collector AB1000 mm in Vladimira Popovića Street.

The authoritative rains for dimensioning the atmospheric sewerage of the access road to the bridge are the rains from the rain gauge station Vračar, return period T = 2 years, tk = 25 min.

On the bridge construction, atmospheric water from the road and sidewalks is collected through the bridge drains, while rainwater from the tram garden is collected through the tram rail drains and canals. The rainwater collected in this way is drained to the left and right banks of the Sava River by a system of pipes, which is mounted on a reinforced concrete bridge structure.

The waters from the bridge that gravitate to the left bank are led to the coastal pillar, after descending through the coastal pillar they are led to the separator of light petroleum products, and after the treatment they enter the recipient-river Sava. 10% of the calculated inflow is purified in the separator.

The relevant rains for dimensioning the atmospheric sewage of the bridge are rains from the rain gauge station Vračar, return period T = 10 years, while the duration of rain was obtained as a function of concentration time for calculated catchment areas along the road, starting from tk = min.

The existing secondary sewer Ø250 for used water is kept in its existing condition.

1.5.5.2.4 Sewerage on the territory of the municipality of Savski venac.

For the reception of rainwater from the road and sidewalks, from the access road of the bridge, street drains are planned, while for the collection of rainwater from the rails, tram rail drains are planned. The newly designed drains are connected to the newly designed street rain sewer. After the treatment in the separator of light petroleum products, the final recipient is the planned collector Ø1800, in the zone of the planned roundabout. 10% of the calculated inflow is purified in the separator.

The authoritative rains for dimensioning the atmospheric sewerage of the access road to the bridge are the rains from the rain gauge station Vračar, return period T = 2 years, tk = 25 min.

On the bridge construction, atmospheric water from the road and sidewalks is collected through the bridge drains, while rainwater from the tram garden is collected through the tram rail drains and canals. The rainwater collected in this way is drained to the left and right banks of the Sava River by a system of pipes, which is mounted on a reinforced concrete bridge structure.

The waters from the bridge that gravitate to the right bank are led to the coastal pillar, after descending through the coastal pillar they are connected to the sewerage network of the "Belgrade Waterfront" project, with increasing capacity of the separator built within the "Belgrade Waterfront" project. 10% of the calculated inflow is purified in the separator. The relevant rains for dimensioning the atmospheric sewage of the bridge are rains from the rain gauge station Vračar, return period T = 10 years, while the duration of rain was obtained as a function of concentration time for calculated catchment areas along the road, starting from tk = min.

The constructed rain sewer DN300 mm of the project "Belgrade Waterfront" is in collision with the pillar of the projected bridge on the Sava, for that reason its relocation is planned.

Current account: 160-6789 -79,
265-1100310003551-66, 170-30019841000-41,
325-9500700032854 -88

Current situation:
On the territory of the municipality of New Belgrade, where the separation sewerage system is present, there is no city sewerage network at the location of the access road, except for the fecal sewerage Ø250mm in block 18 near the Sava bank, under the current bridge and further towards the Old Fair.
On the right bank of the Sava, the adopted border of the sewerage subsystems is around the Old Sava Bridge, so a general, and a separation system for drainage of used and atmospheric water is planned in the area north of it. According to our data, there is a rain sewer Ø300mm, 400mm and collector Ø1800mm, all within the Belgrade Waterfront complex. Its functioning depends on the realization of KCS Belgrade Waterfront and the outflow pipeline with a diameter of Ø2000mm into the river Sava, which is outside the competence of PUC BWS.

Projected and planned situation:
The location of the bridge is included in the SP of the special purpose area of the coastal part of the city of Belgrade, the area of the Sava river bank for the project "Belgrade Waterfront" ("Official Gazette of RS", No. 7/15).
According to the plan, the left bank of the Sava River belongs to the catchment area of blocks 18, 18a and 17, in which there is no built sewerage network and so far it has not been fully considered through the preparation of planning and technical documentation. All used waters from the above-mentioned blocks are planned to be oriented towards KCS "Ušće", which is dilapidated and of insufficient capacity, so the construction of a new one is planned. For atmospheric waters, a pumping station should also be planned, the capacity of which should be defined according to the planned purposes and on the basis of technical documentation. The unique hydro-technical solution for the arrangement of the left bank, which includes the arrangement of the embankment and the clear definition of the sewerage network and facilities within the boundaries of the catchment area, will be the subject of a special planning document.
For the right side of the Sava River, in order to evacuate atmospheric waters, two atmospheric sewage stations with a discharge into the Sava River are planned. The locations of pumping stations CS1 (plot IP-3) and CS2 (plot IP6) are planned in blocks 8 and 293a of the need to collect atmospheric water, the construction of street sewerage is planned along all planned roads. The minimum diameter of the planned atmospheric sewage is Ø300mm. Separators for purification of rainwater from the road within the traffic area will be defined by the project documentation. All water treated in this way is taken to the pumping station and as such can be discharged into the Sava River, because it meets the legal criteria in terms of quality, without compromising the characteristics of the water in the recipient.

The following project documentation is in force for the location in question:

- Study of hydro-technical installations-hydraulic analysis of the sewerage of the location Belgrade on the water (investor Directorate for construction land and construction Belgrade, designer Total engineering, number 2398),
- Excerpt from the preliminary design of roads within the scope of the project "Belgrade on Water" with hydraulic calculation of atmospheric sewage (CESTRA doo, 2017, no. 2451)

Sewerage conditions for the development of location conditions for the needs of the construction of the pumping station for atmospheric water CS1 with accompanying facilities on the construction plot IP-3 and the outflow pipeline on the construction plots IP-3, ZP-5, SP13, ZP-8, VP-12 and VP- 13, in Belgrade, were issued under no. K-475/2018, ROP-BGDU-18929-LOCH-2/2018, of September 13, 2018.
PUC BWS does not have projects of the constructed condition of the sewerage network and sewerage facilities.
An integral part of the subject conditions are the Minutes from the meetings regarding the coordination of the project of the new tram bridge and BW infrastructure, which defined the concept and method of rainwater drainage to the right and left banks of the Sava, input parameters for hydraulic calculation-the amount of water of the access roads of the bridge and the bridge, return period, concentration time, capacities of previously designed CD and sewerage of the BW complex, in terms of receiving additional quantities of water and their previous treatment (in order to avoid pressure leakage, especially spillage of water from sewage to the surface), and defined the way of resolving collisions of bridge elements, ramps, stairs, elevators, pillars, pedestrian bicycle communication with all sewage installations, existing and future (in terms of their protection and providing access for maintenance)...

Work on project documentation in accordance with the submitted CS, planning and project documentation, listed minutes and water management conditions. For waters that gravitate to the left coast (water from the bridge and parts of the access roads), the project must ensure that the treated ones (via separators) are directed into the Sava River. Direct the remaining part of the access roads to the sewerage network (existing and planned), also with special treatment. For the waters that gravitate to the right bank, it is necessary to harmonize the project documentation and the dynamics of the design and construction of the rain sewer of the bridge, access ramps and rain sewer of the Belgrade Waterfront complex.

For the sewerage network, which is part of the Belgrade sewerage system and part of the maintenance of PUC BWS, the project will provide a public area, a protective corridor with unobstructed access to vehicles of the Belgrade sewerage (car-pedestrian path with a minimum width of 3.5m and free space above 4.5m) for maintenance purposes and case of intervention, especially at places of revision descents. The minimum allowed diameters in the Belgrade sewerage system should be taken into account (for atmospheric water Ø300mm and for used water Ø250mm). Please note that the construction of facilities over the city sewerage network is not allowed.

The quality of wastewater discharged into the city sewerage system must comply with the Decree on limit values for emissions of polluting substances into water and deadlines for their achievement, III Municipal wastewater ("Official Gazette of RS", No. 67/11 and 48/12).

Attention is drawn to the protection of the existing sewerage and facilities on it during the demolition of the old bridge. Also during the construction of the bridge, which is stated in the submitted preliminary design, as a space of the future construction site where the construction will be performed - the left bank of the Sava on the stretch between the Gazela Bridge and the current Old Sava Bridge (Block 18), is a move with the existing sewage Ø250mm which is in operation and for which access and maintenance must be provided.

The levels of the existing facilities on the sewerage network should be harmonized with the projected levels of arrangement of all surfaces.

Adopt the project solution in accordance with the hydro-technical and new traffic solution, according to the planning documentation and taking into account the harmonization of sewage installations with the elements of the construction - the foundations of the pillars, with the elements of the ground floor arrangement and with all other installations. By designing and selecting the construction technology, anticipate and present the designed measures for the protection of existing and future sewers, to ensure functionality, stability and unobstructed access for maintenance and interventions and, if necessary, anticipate their relocation.

In order to harmonize the existing and projected installations, the project should provide the minimum allowed distance for parallel guidance of 1.0 m from the outer edge of the canal, and 1.5 m from the outer edge of the collector, especially at the places of street descents (for drains only 0.3 m). For crossing with existing and designed sewage installations (sewage network, drains, drain connections, connections), the minimum allowed distance in the vertical sense is 0.5 m. Mutual harmonization of installations at the level of planned installations is within the competence of the body that issues the construction permit.

The adopted project documentation from the aspect of sewerage should be submitted to PUC BWS for opinion, use and archiving. The project documentation clearly divides the competencies in future maintenance in accordance with the status of sewerage installations-networks and facilities on the network (separators, sedimentation tanks, gutters, rail gutters...).

During the execution of all works, provide supervision of PUC BWS-Supervision Sector and Sewerage Network Sector, and upon completion of works, for updating the database of PUC BWS, the Project of the performed condition of the sewerage network is submitted.

General standards and regulations of PUC BWS for ROAD design and sewerage installation:

- Conduct the project in accordance with the adopted planning documentation and issued conditions, in compliance with the applicable regulations and norms for the design of the city sewer in Belgrade.
- Dimensioning should be performed according to the hydraulic calculation, provided that the diameter of the street general sewerage cannot be less than Ø300 mm. The minimum diameter of the separation sewer network for fecal sewage is Ø250 mm, and for rain sewage it is Ø300 mm.

- When determining the minimum drill depth, take care to enable the connection of all users via short, properly designed sewer connections.

- Boundary revision descent (GRS) should be 1.5m within the regulation line and cascading should be performed in it with obligatory horizontal revision (minimum value of protective cascade is 60cm, and maximum 300cm). GRS with one connection and cascade is 1.0m in diameter, and 1.2m with two. In case of coincidence of the regulation and construction line of the facility, design the GRS in the facility, while providing access for unobstructed maintenance. The connection from the GRS to the street sewerage network should be designed and reported with a drop of 2% to 6%, perpendicular to the street canal, exclusively in a straight line (i.e. without horizontal and vertical fractures). The connection must be designed so that it does not degrade the stability and function of the street channel, as follows:

a) in the street inspection descent - in the side bank with processing (groove) to the entrance to the half-round gutter

b) in the body of the collector - at 0.5-0.6 m from the bottom in smaller collectors

c) in the body of the collector - at 0.8-1.0 m from the bottom in larger collectors

d) via standardized fittings (forks) to the pipe street channel-existing connection.

-Revision descents on the street sewer should be accessible at all times, for the purpose of maintenance by Belgrade sewerage vehicles.

- The quality of wastewater discharged into the city sewerage system must comply with the Decree on limit values for emissions of polluting substances into water and deadlines for their achievement, III Municipal wastewater ("Official Gazette of RS", No. 67/11 and 48/12). This is especially valid for groundwater, from its own wells that are discharged into the sewer after thermo-technical treatment;

-Facilities on the sewerage network, connecting and overflow buildings, should be hydraulically shaped;

-Connection of drainage water should be done through the sedimentation tank for control and maintenance, before the border inspection descent.

-Depending on the leveling solution of the traffic surface, design the appropriate number and layout of street drains for road drainage.

-Design adequate protection measures to ensure stability, functionality and access for maintenance of all existing sewer installations, in the construction phase and in the phase of operation of the future network and sewage facility. Mandatory contributions to the Project should be all relevant details of protection from the aspect of the choice of construction technology, substructure, water pumping, construction site organization...

-Conduct the project on clear and updated bases. The graphic part of the project must contain an overview situation in the scale R = 1: 500 or R = 1: 1000 and a longitudinal profile of the sewer, with the entered absolute elevations of the terrain and the bottom of the pipe.

-The project of the constructed condition of the sewerage network should contain all the necessary attachments: geodetic survey of the constructed canal with connections, certificate of the Republic Geodetic Authority, minutes of hydraulic testing and flushing of the network, certificates of installed material...

-Perform all works in accordance with the instructions of the expert of PUC "Belgrade Waterworks and Sewerage". Supervision Sector and Sewerage Network Sector.

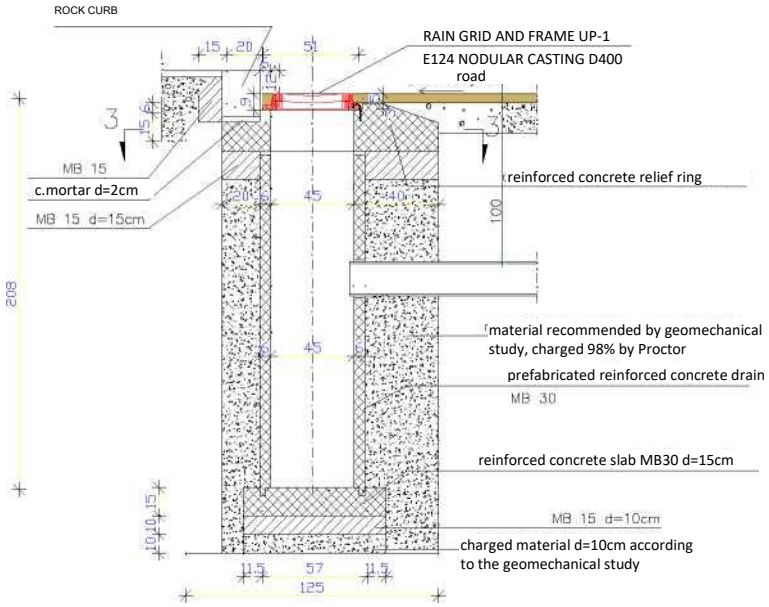
Connection/cooperation fee:

	code according to the valid price list of PUC BWS:	amount of fee [dinars]	notes:
cooperation in the design of the road-sewerage	14228	65127.65	The cost estimate is approximate, in accordance with the scope and level of data from the submitted preliminary design with the request, it does not include the price of design and construction of the street sewerage network. The construction of the missing external sewerage network will be an integral part of the contract with the Directorate for Construction Land and Construction of Belgrade, PE, which is in charge of harmonizing the route at the level of planned investments. The prices are from the valid price list of PUC BWS on the day the conditions are issued.

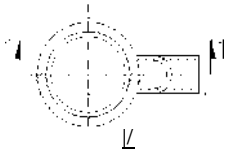
ZA 40103000 001/011

Detail of a street drain

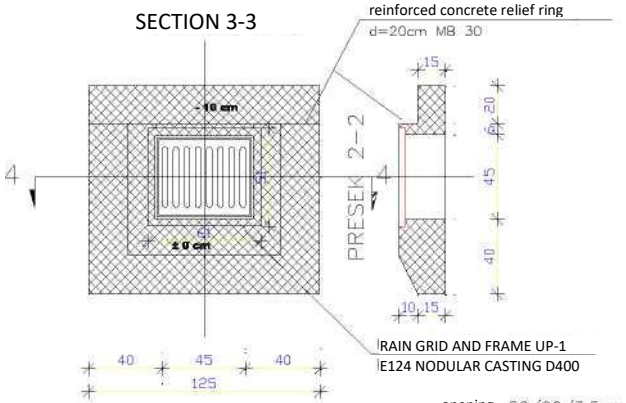
SECTION 1-1



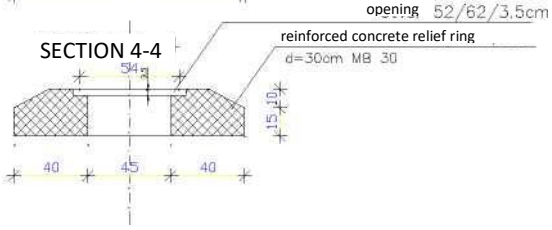
SECTION 2-2



SECTION 3-3



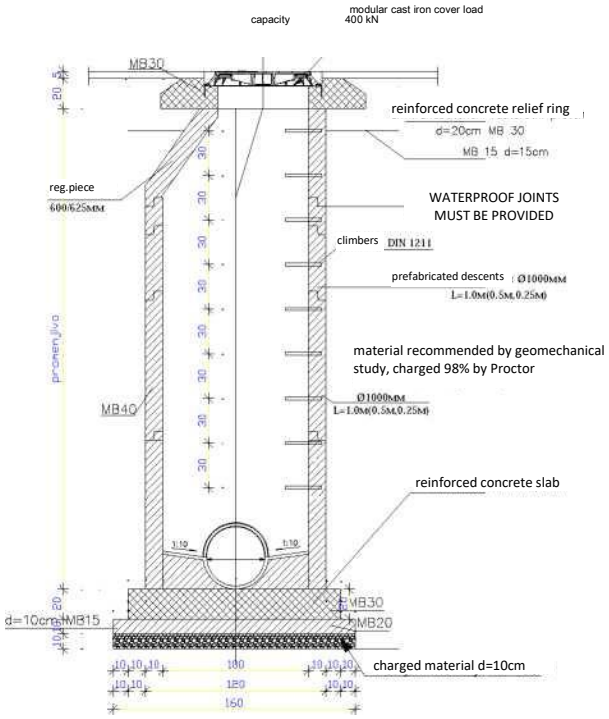
SECTION 4-4



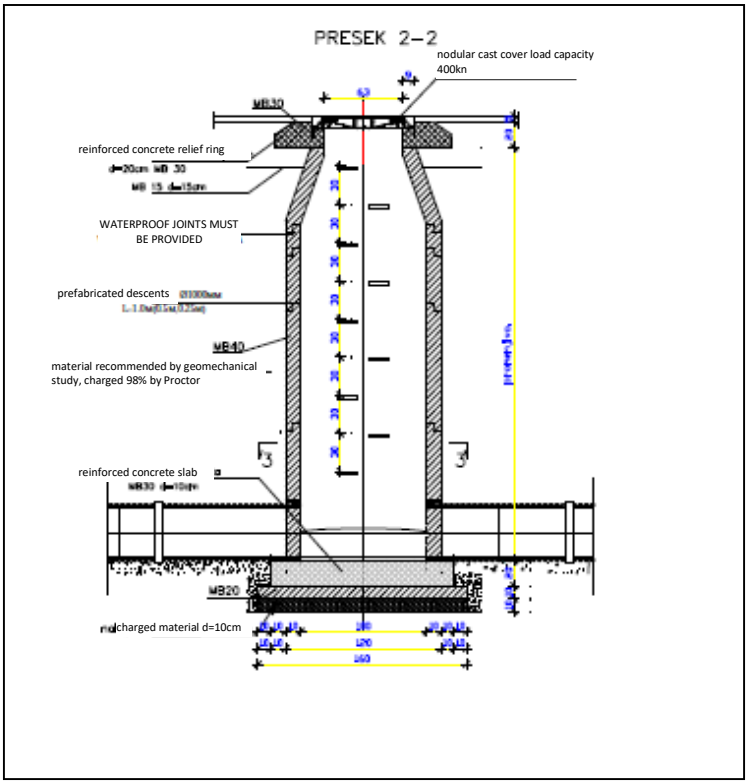
ZA 40103000 001/011

Detail of a street revision descent

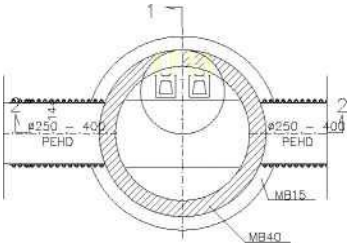
SECTION 1-1



SECTION 2-2



SECTION 3-3



ZA 40103000 001/011

Appendices:

- situation plan of the existing sewerage, left bank of the Sava R = 1.1000
- situational plan of the existing sewerage system, right bank of the Sava R = 1.1000
- Excerpt from the synchronous plan from the SP area for special purposes of arranging the part of the coast of the city of Belgrade - the area along the Sava river for the project "Belgrade on the water" ("Official Gazette of RS", No. 7/15).

The validity period of the condition number K-388/2019 is two years from the date of issue.

Processed by:

Mirjana Antić

HEAD OF THE

TECHNICAL DOCUMENTATION SERVICE

Aleksandra Tušup, B.Sc.Civ.Eng.

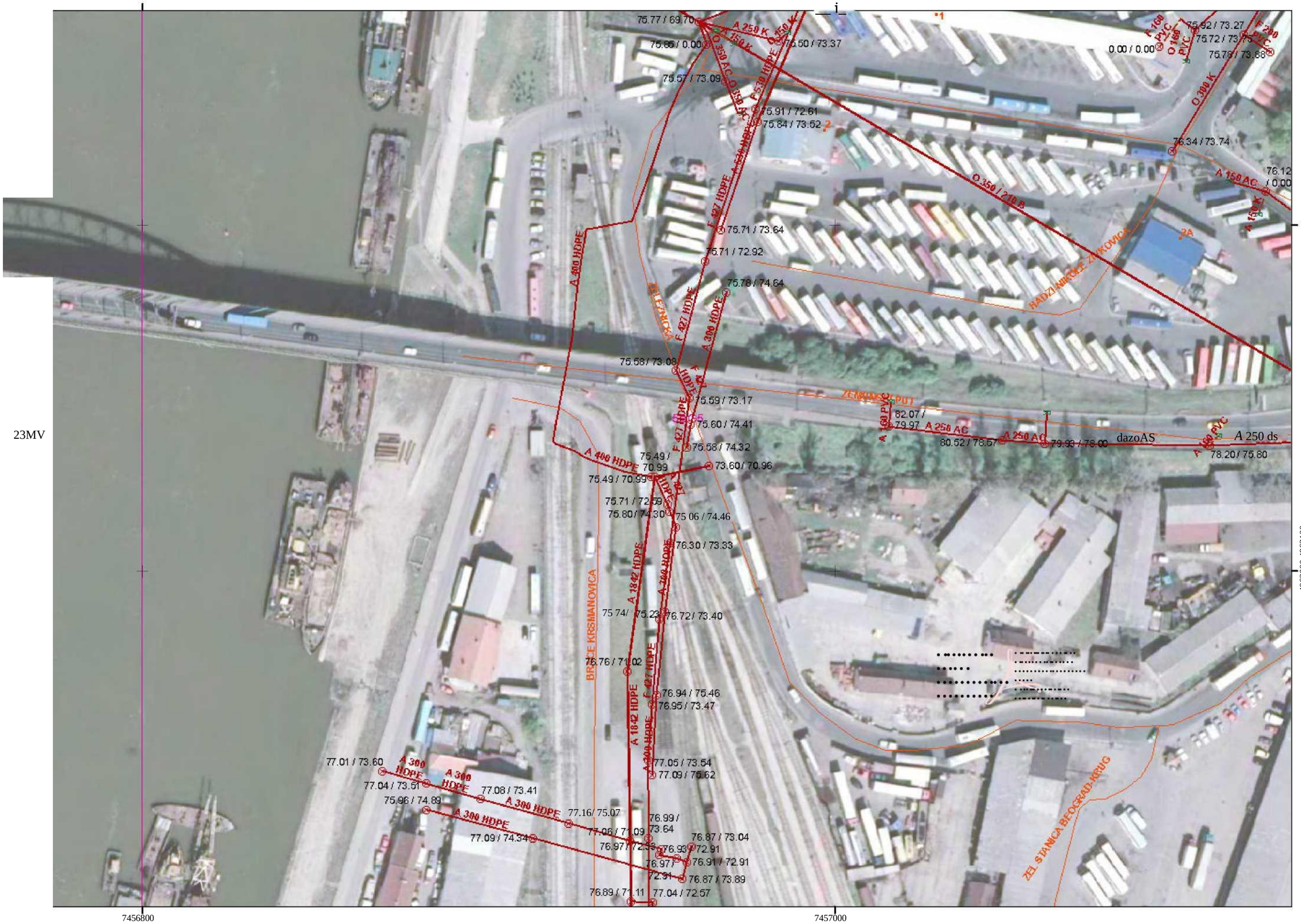
ZA 40103000 001/011

BRIDGE OVER THE SAVA - RIGHT BANK

Date: 19 December 2018

7456800

7457000



23MV

4963000 4963100

4963000 4963100

7456800

7457000

0 10 20 40 Meters

1:1,000

Belgrade Waterworks and Sewerage

BRIDGE OVER THE SAVA - LEFT BANK

Date: 19 December 2018

7456400 7456600

F 250 K
73.97 / 72.17
F 250 K
74.07 / 72.47
F 250 K
73.73 / 72.83
F 250 K
74.59 / 73.09
F 250 K
76.34 / 73.24
F 250 K
76.90 / 73.45
F 250 K
75.86 / 73.41
F 250 K
76.03 / 73.93
F 250 K
76.23 / 74.00
F 250 K
76.50 / 74.32
F 250 K
76.69 / 74.69
F 250 K
76.73 / 74.95
F 250 K
76.57 / 75.27

28NB

ZEMUNSKO PUT
SADIKA RAMIZA
SLAVKA STANOJEVIĆA
BRODARSKA

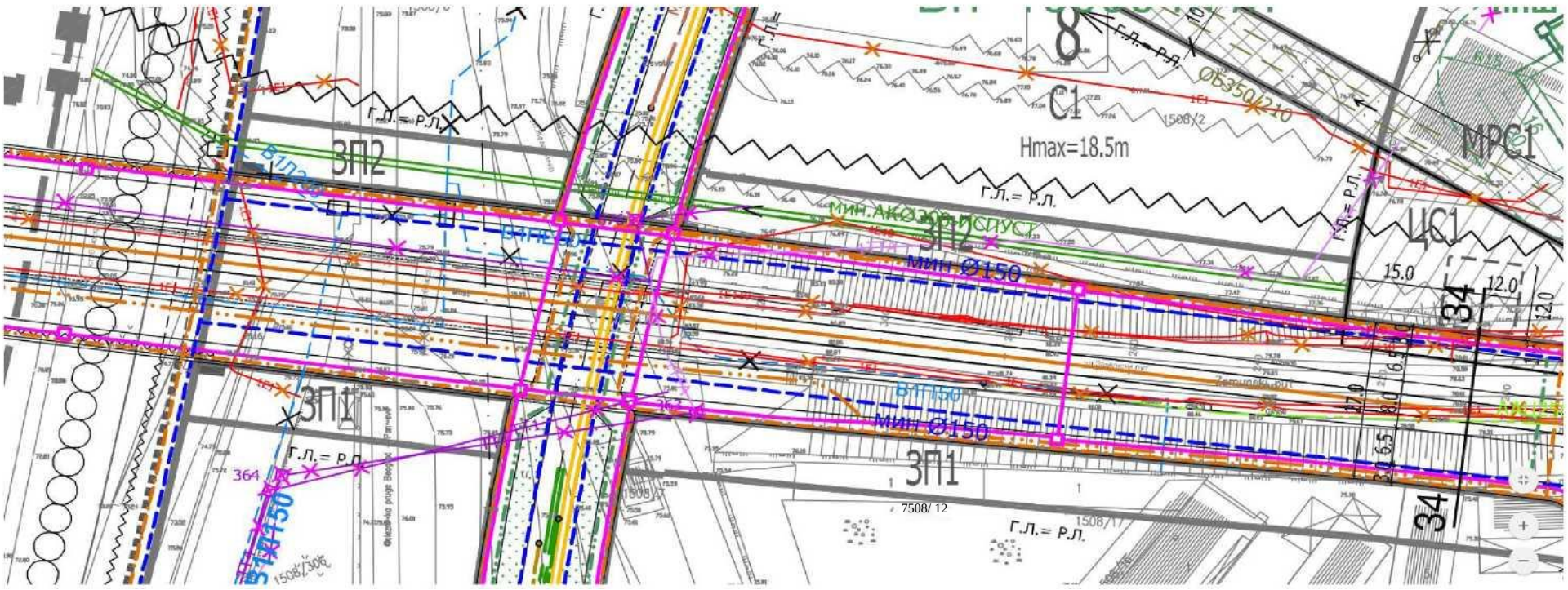
4963000 4963100

7456400 7456600

0 10 20 40 Meters

1:1,000

Belgrade Waterworks and Sewerage



SEWERAGE SYSTEM BOUNDARY

EXISTING PUMPING STATION

PLANNED PUMPING STATION

PROTECTIVE CORRIDOR EXISTENCE OF EXISTING SEWERAGE FACILITIES

EXISTING ATMOSPHERIC COLLECTOR

EXISTING ATMOSPHERIC SEWERAGE

EXISTING ATMOSPHERIC SEWERAGE (abolished)

PLANNED ATMOSPHERIC COLLECTOR OF TREATED WATER

PLANNED ATMOSPHERIC SEWERAGE

PLANNED ATMOSPHERIC SEWERAGE- DRAINAGE

EXISTING FECAL SEWERAGE

EXISTING FECAL SEWERAGE (abolished)

PLANNED FECAL SEWERAGE

EXISTING GENERAL COLLECTOR

EXISTING GENERAL SEWERAGE

EXISTING GENERAL SEWERAGE (abolished)

PLANNED GENERAL SEWERAGE

Special purpose spatial plan of the part of coastline arrangement of the City of Belgrade – coastal line of the Sava River for the Project “Belgrade Waterfront“ (Off. Gazette of RS No. 7/15).

with the case K-388/2019

Republic of Serbia
MINISTRY OF AGRICULTURE,
FORESTRY AND WATER MANAGEMENT
Republic Water Directorate
Number: 325-05-01065/2019-07
June 27, 2019
Belgrade

Pursuant to Art. 113 , 115 and 117 of the Law on Waters ("Official Gazette of RS" No. 30/2010), the Law on Amendments to the Law on Waters ("Official Gazette of RS" No. 93/2012, 101/2016, 95 / 2018), Article 30, paragraph 2 of the Law on State Administration ("Official Gazette of RS'' No. 79/2005 and 101/2007), Article 5 of the Law on Ministries (" Gazette of RS" No. 44/2014, 14/2015, 54/2015, 96/2015, 60/2017), Law on Planning and Construction ("Official Gazette of RS" No. 72/2009, 81/2009-correction, 24/2011, 121/2012, 42/2013-CC, 50/2013-CC, 98/2013-CC, 132/2014, 145/2014, 83/2018),
Rulebook on the procedure for conducting the unified procedure electronically ("Official Gazette of RS" No. 113/2015, 96/2016 and 120/2017) and Instructions on the manner of action of competent authorities and holders of public authority who conduct the unified procedure with regard to water acts in the procedures of exercising the right to construction (number: 110-00-163 / 2015-07, dated May 19, 2015), deciding at the request of the Ministry of Construction, Transport and Infrastructure on behalf of the City of Belgrade, the Secretariat for Communal and Housing Affairs - Directorate for building land and construction of Belgrade, 84 Njegoševa Street, Belgrade, Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate, Acting Director Natasa Milić, according to Government Decision 24 number: 119-5011/2019 dated May 23, 2019, issues

WATER CONDITIONS

1. Water conditions are issued in the process of technical preparation for the construction of the bridge over the Sava River, on the site of the old Sava bridge at c.p. no.473 / 6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/1 (part) all CM Savski Venac and c.p. No.2386 / 3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (part) all CM Novi Beograd.

2. Water conditions are issued for construction, reconstruction of existing facilities and performance of other works that may affect changes in the water regime;

3. This decision is entered in the Register of water conditions for the water area "Sava", under number 102 of June 27, 2019.

4. Water conditions determine the technical and other requirements that must be met in the design, execution of road works and facilities, which may permanently, occasionally and temporarily affect changes in the water regime, or endanger the goals of the environment, especially in water land watercourse with which the traffic object intersects, touches or partially passes, as follows:

4.1. Prepare technical documentation, based on previous works, in all respects according to the valid law and regulations in water management and other laws, regulations, opinions and norms for this type of facilities;

4.2. Technical documentation should be done in accordance with the urban planning documentation;

4.3. The investor/user is obliged to resolve property legal relations, in the zone of construction and use of facilities in the water land, with the competent PPE;

4.4. When preparing project documentation, take into account the existing and planned water facilities and the natural bed of watercourses in a way that will ensure the protection of their stability and protection of the water regime;

4.5. Based on the conducted hydrological-hydraulic calculation, provide in the zone of the bridge (upstream and downstream), the necessary regulatory and other works, in order to stabilize the riverbed and coastal pillars, so as to provide a safe solution for the bridge in question;

4.6. Provide an optimal flow opening of the bridge (span, height, lower edge of the structure) that will allow the calculated high waters with a probability of 1% (hundred years of water) and control water with a probability of 0.1% (thousand years of water) of the Sava River without harmful effects on the surrounding terrain floods, etc.) and at the same time to be sufficiently safe for the construction of the bridge in the flow of large waters, sediments and ice, taking into account the impact of tributaries;

4.7. For the subject bridge over the river Sava, provide the necessary technical solutions, which will eliminate the effect of deceleration from bridge pillars and supports (in the watercourse bed), ensuring that the lower edge of the bridge structure (LES) in the navigable opening zone must not be lower than elevation of high decelerated navigable level (HDNL to which the required useful height of the bridge is added) and parallel to the streams of the river flow, so as not to cause deep erosion (along the riverbed), local erosion (around the pillars of the bridge) and lateral erosion (on the banks), which could endanger the stability of the bridge and buildings, land;

4.8. To harmonize the preparation of technical documentation with the technical documentation according to which protective water facilities have been built or the arrangement of individual watercourses, as well as with the planning and project documentation which envisages these facilities and works;

4.9. In case of deep and lateral erosion in the zone of banks, bridge pillars and supports, provide technical solutions that will provide supports and pillars and stabilize the river bottom upstream and downstream of the bridge and along the riverbed, i.e. as long as the negative hydraulic impact of the bridge is felt. narrowing to the regime of water, sediment and ice runoff at the expense of the bridge investor;

4.10. For the facilities of water supply, sewerage and treatment of conditionally oiled atmospheric waters, perform the necessary hydraulic calculations and properly dimension them. Provide technical solutions for the collection, drainage, treatment and discharge of treated water from the road and bridge before entering the recipient, the Sava River and the city sewer. In order to protect water, and before entering the recipient, it is obligatory to provide appropriate precipitators and separators for oil and its derivatives in order to prevent possible pollution of surface and groundwater. The quality of discharged water must be such as not to jeopardize the prescribed characteristics of the recipient's water;

4.11. At the place of the outflow of the atmospheric sewerage, envisage a proper outflow structure, which must be stable and functional even in the conditions of occurrence of high waters of the Sava River, with fitting into the existing lining;

4.12. To harmonize the previously constructed facilities for protection of the damaging effect of water with the technical documentation and the constructed defensive line. The coastal fort at the place of construction of permanent pillars, on the left and right banks, after the works have been restored, to its original condition;

4.13. Provide a detailed description of the bridge construction technology in the project documentation in order to ensure the unimpeded flow of water through the riverbed, excluding any possibility of possible deterioration of the existing water regime in the bridge zone;

4.14. For all planned infrastructure installations, according to the conditions of the competent institutions, provide conditions regarding the security of places and their protection;

4.15. For all other activities, an adequate technical solution must be provided in order to prevent surface and groundwater pollution.

4.16. After the completion of the technical documentation, address this Ministry, with a request for the issuance of a water permit, and after the construction, to address a request for the issuance of a water permit, in accordance with the regulations.

Rationale

The Ministry of Construction, Transport and Infrastructure on behalf of the City of Belgrade, the Secretariat for Communal and Housing Affairs - Directorate for building land and construction of Belgrade, 84 Njegoševa Street, Belgrade, submitted to this ministry request no. 350-02-00211/2019-14 dated May 27, 2019, in the process of preparation of technical documentation for the construction of the bridge over the river Sava, on the site of the old Sava bridge at c.p. which belong to CM Savski Venac and New Belgrade.

In accordance with Opinion No. 5857/1 of June 7, 2019. from PUC "Srbijavode" which is issued in the procedure of issuing water conditions, water conditions that we issued on December 27, 2018, under No. 325-05-1244/2018-07 remains unchanged, i.e. we repeat them with these water conditions, for the following reasons:

The change of the submitted Conceptual Design, i.e. the issued location conditions, in the sense of harmonization with the current situation in the cadastre, also refers to the plots that belong to the regulated riverbed of the Sava (riverbed and bank). The plots that represent water land in the cadastre are river by culture. They are located whole or in parts under the bridge structure and must retain their original purpose, as given in the Conceptual Design of the water surface.

Along with the request and amendments to the request, the following was submitted:

- - Opinion No. 5857/1 of June 7, 2019, PWC "Srbijavode", WMC "Sava-Danube", New Belgrade;
- - Opinion No. 10885/1 of December 12, 2018, JWP "Srbijavode", WMC "Sava-Danube", New Belgrade;
- Hydrometeorological Institute no. 922 -1-273/2018 of December 06, 2018;
- Opinion of the Environmental Protection Agency, number 011-00-0001/299/ 2018-02 dated December 6, 2018;
- Location information number 350-01-00465/2018-14 dated November 27, 2018, issued by the Ministry of Construction, Transport and Infrastructure;
- Copy of line plan no. 956-01-2191/18, by RECS Belgrade, RGA;
- Copy of line plan no. 952-04-225-8803/2018, by RECS New Belgrade, RGA;
- Copy of line plan no. 953-2-106/2018, by RECS Savsi Venac, RGA;
- Conceptual Design - Conceptual Design for the construction of a bridge over the Sava River, on the site of the old Sava bridge at no.473/6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/1 (part) all CM Savski Venac and c.p. No.2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (part) all CM New Belgrade, done by the Traffic Institute CIP llc, Belgrade;
- preliminary design-Main volume, 2018, made by the Traffic Institute CIP llc, Belgrade.

Pursuant to Art. 117 par. 1, item 7. of the Law on Waters, the building belongs to the type of building No. 7) bridge over the river Sava. Pursuant to Art. 43 of the Law on Waters, the determined water activities are regulation of watercourses and protection from the harmful effects of water and protection of water from pollution. The nearest watercourse is the river Sava, which, in accordance with the Decision on determining the list of waters of the first order ("Official Gazette of RS" No. 83/10), is classified as the 1st interstate water. The Sava - right tributary of the Danube, Sava River Basin District, in accordance with Art. 27 of the Law on Waters and the Rulebook on Determining the Boundaries of Sub-Basins ("Official Gazette of RS", No. 54/2011). The subject location is in the operational plan for flood defense for first-class waters, for 2018, Water Unit 1 - "Belgrade", in accordance with the Rulebook on determining water units and their boundaries ("Official Gazette of RS" No. 8/2018). According to the Operational Plan for Flood Defense for 2018, which is implemented by PWC "Srbijavode", the subject section of the Sava River is included in the defense sector S.3.-section

1. The embankment on the right bank of the Sava from the confluence with the Danube to the Topčiderska river 4.35 km and the defense sector S.1.1.-section 2, the embankment on the left bank of the Sava from the confluence with the Danube to the old railway bridge 2.68 km.

Based on the attached documentation, the following was stated:

At the construction site of the future new bridge over the Sava River, there is an existing tram bridge, the old Sava Bridge. Before the construction of the bridge in question, it is planned to completely demolish the existing bridge, which is a special project. The road is partly on the right bank of the Sava River from the roundabout - the connection of Karadjordjeva Street with the old Sava bridge, and partly on the left bank of the Sava, on the New Belgrade side - the connection of the existing bridge with the roundabout in Vladimira Popovića Street. Rail, road and pedestrian-bicycle traffic is planned on the new bridge. The total width of the bridge is 37,138 m, and the length is 420 m.

According to the Information on the location number 350-01-00465 / 2018-14 of November 27, 2018, the c.p. no.473 / 6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/1 (part) all CM Savski Venac and c.p. No.2386 / 3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (part) all CM New Belgrade.

Opinion No. 10885/1 of December 12, 2018, PUC "Srbijavode", WMC "Sava-Danube", New Belgrade, provides hydrographic and hydrological data, a description of the existing situation, a description of the planned works, data of importance for the issuance of water conditions and the same are fully accepted.

The Opinion of the Hydrometeorological Institute no. 922 -1-273/2018 of December 06, 2018 states the characteristic calculation of the Sava River water: Q0.1% =8400 m3/s, Q1%=6900 m3/s and Q2%=6900 m3/s. Also, the characteristic observed levels of the Sava in the profile of h.s. Belgrade: minimum elevation level 67.67 m.a.s.l., average elevation level 71.11 m.a.s.l. and maximum elevation level 75.66 m.a.s.l..

The opinion of the Environmental Protection Agency, number 011-00-001/299/2018-02 of December 6, 2018, is given data on water quality for the Sava River.

Based on the necessary and appropriate bases (previous works) it is necessary to make technical documentation, at the project level, according to the provisions of the Law on Waters, Law on Planning and Construction and applicable regulations and standards for this type of facilities and these water conditions, in order to maintain and improve water regime, in accordance with the conditions 4.1.-4.3. of the wording, with obligatory attachments:

-proof that the company, shop or other legal entity is registered in the register for the preparation of technical documentation with attached valid and appropriate licenses of responsible designers,

-technical solutions for all facilities, works and measures, stability calculations, etc.;

-technical description, situations, longitudinal and transverse profiles of all bridge structures, culverts, etc.

Condition no.4.4. of the wording obliges the investor to harmonize the project solutions with the technical documentation on the basis of which the regulation of individual watercourses was performed (if these works were performed), or, on the basis of planning and project documentation, construction of protective water facilities, regulation works is planned. or arranging watercourses.

Upon completion of the preparation of technical documentation and performed technical control, it is necessary to submit to this ministry a request for issuance of water consent for technical documentation, and after construction, address the request for issuance of water permit in accordance with regulations, and condition 4.16 is given in the wording.

Based on the Rulebook on the content, manner of keeping and form of the water book ("Official Gazette of RS", No. 86/2010), this act was introduced in the Register of water conditions for the Sava river basin by condition number 3 of the wording.

The administrative fee is not paid for the decision on the request for the issuance of water acts in accordance with the provisions of Article 18, item 2. Law on Amendments to the Law on Republic Administrative Fees ("Official Gazette of RS", No. 43/2003 and 50/2011).

Appendices:
- Opinion of PWC “Srbijavode”

SUBMIT TO:
-MCTI, Belgrade
-PWC "Srbijavode", WMC " S-D "
-Water inspection
-Water Book
-Archive

ACTING DIRECTOR

Nataša Milić, B.Sc.Eng.For.

4 Mije Kovačevića
Stret 11050
BELGRADE Serbia

Current account: 205-487 -82
TIN:100003603
Company No:
07045000

Public Utility Company

CITY SANITATION

Republic of Serbia
MINISTRY OF CONSTRUCTION, TRANSPORT AND INFRASTRUCTURE
11000 Belgrade
22-26 Nemanjina Street

Our no.: 8704
Your no.: K0R-M801-34773-B0SA-4-NRAR-15/2019
date: May 31, 2019

SUBJECT: Conditions for creating Site Conditions

On the occasion of the request number K.0R-M801-34773-B0SA-4-NRAR-15/2019 dated May 27, 2019, by which the City of Belgrade, Secretariat for Communal and Housing Affairs - Directorate for Construction Land and Construction of Belgrade, from Belgrade 84 Njegoševa Street, addressed for the issuance of Site Conditions for the construction of the bridge over the Sava River on the site of the old bridge, at CP 473/6, 1508/368, 1508/361, 3292/8, 438/8, 3292/14, part 1508 / 331, part 445/1, part 473/12, part 473/11, part 1508/370, all CM Savski venac and CP 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385 / 2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1 (part), all CM Novi Beograd, we would like to inform you that the roads on which the movement of special communal vehicles for garbage collection is planned, overall dimensions: 8.60x2.50x3.50m, with a shaft pressure of 10 tons and a turning radius of 11.00m, must be a minimum width of 3.5m-for one-way and 6.0m-for two-way traffic. The slope must not exceed 7%.

For the construction of new facilities along the roads in question, it is necessary to procure garbage containers in accordance with the current technology and according to the conditions that PUC "City Sanitation" will issue for each facility individually. According to the valid regulations and the *Decision on maintaining sanitation* ("Official Gazette of the City of Belgrade" ("Official Gazette of the City of Belgrade" No. 79/2015 and 19/2017), courts for newly built facilities must be located outside public traffic areas, within the boundaries of the plot or in the facility to which they belong.

There are no other conditions for PUC “City Sanitation”.

We would like to inform you that, during the tour of the subject plots, no street containers were found that would interfere with the works envisaged by the Conceptual Design.

Processed by:
Vera Jankov

Digitally signed by Božidar Karastanković
100045886.-1112968890057
Date: 2019.05.31 11:50:15 CEST

Tel: +381 11 3314 000; Fax: +381 11 2084 375;
e. infocentar@gradskacistoca.rs W. www.gradskacistoca.rs

R e p u b l i c o f S e r b i a
INSTITUTE FOR NATURE PROTECTION OF SERBIA
NEW BELGRADE, 91 Dr Ivana Ribara
Street
Tel: +381 11/2093-802; 2093-803;
Fax: +381 11 / 2093 -867

Institute for Nature Protection of Serbia, Belgrade, 91 Dr Ivana Ribara Street (author.person Goran Drmanović, Decision 04 No. 035-784/1 dated March 29, 2019), pursuant to Art. 9 of the Law on Nature Protection ("Official Gazette of RS", No. 36/2009, 88/2010, 91/2010-correction, 14/2016 ı 95/2018-other law), regarding Art. 8ϭ of the Law on Planning and Construction ("Official Gazette of RS", No. 72/2009, 81/2009-correction, 64/2010-decision of the Constitutional Court, 24/2011, 121/2012, 42/2013-decision of the Constitutional Court, 50/2013-decision of the Constitutional Court, 98/2013-Decision of the Constitutional Court, 132/2014, 145/2014 and 83/2018), Rulebook on the procedure for conducting the unified procedure electronically, "Official Gazette of RS", No. 130/2015, 96/2016 and 120/2017), the Decree on location conditions ("Official Gazette of RS", No. 35/2015, 114/2015 and 117/2017), and Article 136 of the Law on General Administrative procedure ("Official Gazette of RS", No. 18/2016) acting on request No. KOR-M5S1-34773-EOSA-4/2019, registration number: 350-02-00211 / 2019-14 dated May 27, 2019 of the Ministry of Construction, Transport and Infrastructure, 22-26 Nemanjina Street, for the issuance of nature protection conditions for the needs of making location conditions for the construction of the bridge over the Sava River on the site of the old Sava Bridge in CM New Belgrade and CM Savski Venac, on June 19, 2019 under 03 No. 020-1513/2, issues the following

D E C I S I O N

1. At the location planned for the construction of the bridge over the Sava River on the site of the old Sava Bridge, at c.p. no. 473/6, 1508/368, 1508/361, 3292/8, 438/8, 3292/14, part 1508/331, part 445/1, part 473/12, part 473/11, part 1508/370 CM Savski Venac and c.p. no. 2386/3, 2386/4, 2387/5, 2387/3, 2386/2, 2385/2, 2387/2, 2375/7, 2392/2, 6662/11 and 6628/1 (part) CM New Belgrade hereinafter: Plots) there are no protected areas for which a protection procedure has been carried out or initiated, as well as no recorded natural assets. The site is located partly in the ecologically important area "Estuary of the Sava into the Danube" of the ecological network of RS, and partly in its immediate vicinity. The Sava with the coastal area in its natural and near-natural state is an ecological corridor of the ecological network of RS of international importance. Site conditions for the construction of the bridge over the Sava River on the site of the old Sava Bridge (hereinafter: the New Sava Bridge) on the Plots shall be done in accordance with the following nature protection conditions:
    1) Build a new Sava bridge on the plots, in accordance with the spatial-planning and urban documentation of the wider area. Ensure the protection of the public interest and determine the optimal framework for the formation and functioning of the planned contents within the areas for other purposes.
    2) The bridge should be designed in such a way that it fully enables the uninterrupted flow of its planned traffic in a functional and safe way, as well as to be able to bear the required traffic load both in terms of carrying capacity and in terms of required dimensions.
    3) Harmonize the technical solution of parallel management and the manner of crossing of infrastructure lines crossing the bridge with all valid regulations.
    4) Predict a high level of environmental quality, in order to reduce the possible negative impacts of the construction and use of the New Sava Bridge on the near and far surroundings to the minimum.

5) Define appropriate procedures and measures for protection, accident prevention and reduction of negative effects (noise, air pollution, vibrations, light pollution).
6) The lighting of the bridge should be directed towards the ground or towards the surfaces of the structure, as well as to avoid the effect of weathering, in order to preserve the fauna of birds and other animals in the area of the bridge.
7) Provide electrical installations in a way that prevents the settlement of birds and bats and their suffering in the zone of electrical installations.
8) Provide for the installation of sound and visual barriers in the road zone over the bridge in the amount of up to 4 m in order to prevent collisions of birds and bats with vehicles on the bridge, if it proves necessary after the Environmental Impact Assessment Study.
9) Barriers should be made of a material that does not create a mirror effect. If the barrier material is transparent, silhouettes of birds or bats should be installed.
10) Before the construction of the new bridge (Phase I), it is necessary to remove the span steel structure and move it to a location where its rehabilitation will take place unhindered so that it can be used again in some other locations.
11) In all stages of construction, it is mandatory to:
    - organize the construction site on the minimum area required for its functioning, and limit the manipulative areas;
    - perform the works on the construction site and in accordance with the construction permit, and report all stages of the works in a timely manner to the competent services, local self-government bodies, organizations that have conditioned supervision and other users of the space;
    - make maximum use of existing traffic infrastructure to access the site;
    - deposit the excavated layer of land separately in order to be used for remediation of the terrain after the completion of works;
    - take all measures to protect the land in order to prevent possible spillage of fuel and oil from vehicles and construction machinery;
    - in case of an accident, immediately clean the contaminated surface and remove the contaminated layer of soil so that pollutants do not reach the groundwater and allow it to be taken to the landfill;
    - systematically collect and dispose of solid waste that occurs during the construction and stay of workers in the construction site zone (food packaging, other solid waste) and remove all remaining construction materials, waste and equipment from the site upon completion of construction;
    - if during the works geological-paleontological or mineralogical-petrological objects are encountered, which are presumed to have the property of a natural asset, the contractor is obliged to inform the Ministry of Environmental Protection within eight days, as well as to take all measures to the natural good would not be damaged until the arrival of an authorized person.

2. This decision does not release the applicant from obtaining other conditions, permits and consents provided by positive regulations.
3. If the applicant does not start the works and activities for which this decision was issued within two years from the day of delivery of this decision, it is obliged to submit a request for the issuance of a new decision.
4. When changing the location conditions for the construction of the New Sava Bridge, it is necessary to submit a new request.

5. The Applicant is exempted from paying the fee for issuing this decision in accordance with Article 4, paragraph 1, item 2 of the Rulebook on the amount and manner of calculation and collection of fees for issuing acts on environmental protection conditions ("Official Gazette of RS", No. 73/2011 and 106/2013)

Reasoning

The competent authority - the Ministry of Construction, Transport and Infrastructure, addressed the Institute for Nature Protection of Serbia with a request registered under 03 No. 020-1513/1 dated May 29, 2019, for the issuance of nature protection conditions for the needs of making location conditions for the construction of the bridge over the Sava River on the site of the Old Sava Bridge on the plots. The request for the issuance of location conditions for the subject construction was submitted to the Ministry of Construction, Traffic and Infrastructure by the City Administration of Belgrade, Secretariat for Communal and Housing Affairs - Directorate for Construction Land and Construction of Belgrade, from Belgrade, 84 Njegoševa Street.

The Conceptual Design, submitted with the request for the issuance of nature protection conditions for the development of the stated location conditions, envisages the construction of a new arch bridge on the site of the Old Sava Bridge in Belgrade. The terms of reference, as well as other relevant data, required the provision of a corridor for two tracks for rail connection (10.4 m), two traffic lanes in both directions (6.5 m each), two service lanes (1.0 each). m), two pedestrian biking trails (3.0 m each). Also, it was requested that different types of traffic be separated by a fence, rail traffic located inside the arches, and road and pedestrian bicycle traffic on consoles, on the outside of the arches.

The total length of the bridge is L = 420 m. The total width of the bridge is W = 37.2 m, and in the places of pedestrian lookouts W = 42.5 m. The main span of the structure over the required navigable profile of 150 m, is formed with two steel arches spanning L = 166 m of different heights. The height of the arch towards Branko's Bridge is H1 = 41 m, and towards the Gazela Bridge H2 = 47 m. The length of the tension between the arches is Lz≈145 m, so in the vertical plane (projection) arches of height H'1≈30 m, and H'2≈36 m are obtained. The bridge has six reinforced concrete pillars of different height and width and 70 bearings. On the right side of the bridge, there is a connection to the confluence of the Sava and the Danube with a double staircase and panoramic elevators on its own construction, from which the pedestrian-bicycle path on the bridge is accessed via a platform.

Significant installations, i.e. energy (110 kV) and telecommunication cables (pipes 2 x 16Ø110) are planned over the bridge. Crossing of other installations (heating, water supply…) is not required. The public lighting on the bridge envisages the installation of public lighting poles with double lamps in the space between the road and pedestrian-bicycle traffic.

At the location planned for the construction of the New Sava Bridge, there are no protected areas for which a protection procedure has been carried out or initiated, as well as no recorded natural assets. The site is partly in the ecologically important area "Confluence of the Sava and the Danube Rivers" of the RS ecological network determined by the Decree on the ecological network ("Official Gazette of RS", No. 102/2010), partly in its immediate vicinity. The ecologically significant area "Confluence of the Sava and the Danube Rivers" is at the same time an area of international importance for birds (IBA area registered as RS017IBA "Confluence of the Sava and the Danube Rivers"), where a total of 210 species of birds use it

as a nesting place, as a flight corridor and for migration. The location intended for the construction of the New Sava Bridge is an area for migration of rare and endangered bird species, which are in accordance with the criteria of the Rulebook on the proclamation and protection of strictly protected wild species of plants, animals and fungi ("Official Gazette of RS" No. 5/2010 , 47/2011, 32/2016 and 98/2016) declared as strictly protected species.

The Sava with the coastal area in its natural and near-natural state is an ecological corridor of the ecological network of RS of international importance.

The conditions from the wording of the Decision are determined in accordance with the regulations governing the field of nature protection. Legal and planning basis for making the Decision:

- Law on Nature Protection;
- Ecological Network Regulation;
- Rulebook on the proclamation and protection of strictly protected wild species of plants, animals and fungi;
- Law on Planning and Construction;
- Regulation on location conditions;
- Rulebook on the procedure for conducting the unified procedure electronically;
- Law on Environmental Protection ("Official Gazette of RS", No. 135/2004, 36/2009, 72/2009, 43/2011-Decision of CC, 14/2016 and 76/2018);
- Law on Roads ("Official Gazette of RS", No. 41/2018);
- Spatial plan of the special purpose area of the coastal part of the city of Belgrade - the area of the Sava river bank for the project "Belgrade Waterfront" ("Official Gazette of RS", No. 7/2015);
- Plan for the general regulation of the construction area of local self-government head office – City of Belgrade (Official Gazette of the City of Belgrade No. 20/2016).

Based on all the above, it was decided as in the enacting clause of this decision.

Instruction on legal remedy: An appeal against this decision may be lodged with the Ministry of Environmental Protection within 15 days from the day of receipt of the decision. The appeal is submitted in writing or stated orally on the minutes of the Institute for Nature Protection of Serbia.

HEAD OF THE DEPARTMENT
Goran Drmanović, MA of Laws

Goran Drmanović 340855-2203971710522

Digitally signed by Goran Drmanović 340855-2203971710522 Date: 2019.06.19 09:24:38 +02'00'

by the Director Decision 04 No. 035-784/1 dated March 29, 2017

PUC "Greenery-Belgrade" Belgrade
Address: Mali Kalemegdan 8, 11000 Belgrade
Phone/Fax: +381 11 66 76 776; 26 30 506
Company No.: 07066597
TIN: 101511244
e-mail: info@zelenilo.rs
web: www.zelenilo.rs

Number: 49/158 Date: May 31, 2019

Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
Case number: **ROR-M5S1-34773-1.OS-1/2018**
Belgrade
22 - 26 Nemanjina Street

Subject: Conditions for the purpose of issuance of the location conditions for the construction of a bridge over

the Sava River in the location of the Old Sava Bridge

Planning basis

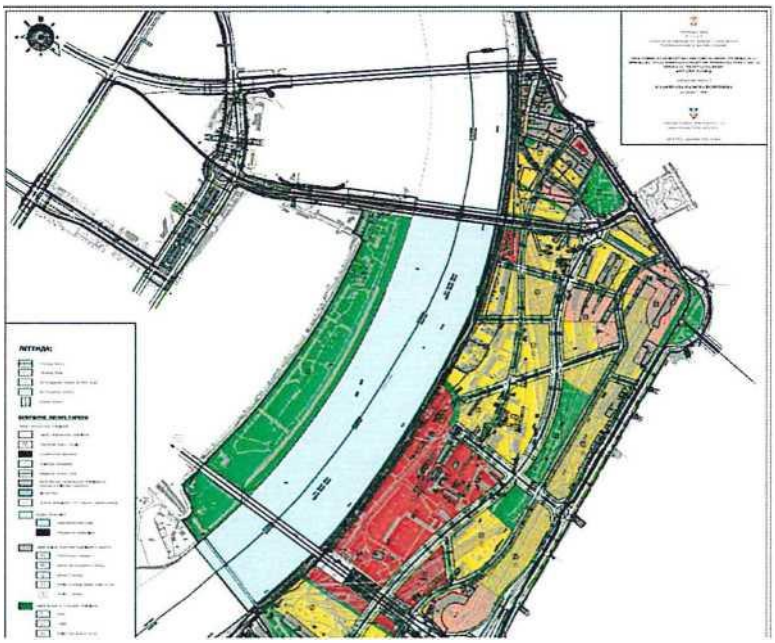
- Plan of general regulation of the construction area of the seat of the local self-government unit - the city of Belgrade (units I and XIX), (Official Gazette of the City of Belgrade No. 20/16)
- Special purpose spatial plan of the part of coastline arrangement of the City of Belgrade – coastal line of the Sava River for the "Belgrade Waterfront" Project (Off. Gazette of RS No. 7/2015).

According to the submitted CD, the construction of an arch bridge of length L = 420.0 m and width, W = 37.2 m, with the main span over the Sava River Lw = 166.0 m, is planned at CM Savski Venac 473/6, 1508/368, 1508/369, 1496/14, 1508/361, 3292/8, 438/8, 3292/1 and CM New Belgrade, 386/3, 2386/4, 2387/5, 2387/3, 2386/2 , 2385/2, 2387/2, 2375/7, 2392/2, 6662/11, 6628/1.

Current situation

As a space for the future construction site and the place where the construction of the structure will be carried out, the left bank of the Sava can be used between the Gazela Bridge and the present Old Sava Bridge (Block 18). On the right bank of the Sava, a special mini-construction site should be formed at the S1 pillar, which would cover only the space and equipment for pushing the structure.

The area between the Sava Bridge and the Gazela, according to the existing use, as well as the Spatial Plan of the special purpose area of the coast of the city of Belgrade - the area of the Sava River for the project "Belgrade Waterfront" ("Official Gazette of RS", No. 7/2015) , represents a public green area - a park on the left bank of the Sava from the old bridge to the bridge "Gazela", with a total area of 10.6 ha.



This public green area is an integral part of the cultural property under the previous protection of the "Coastal Zone of New Belgrade", which is why it enjoys the same level of protection. The part of the park directly along the bank of the Sava is an integral part of the Ecologically significant area "The Confluence of the Sava and the Danube" (a protected natural asset of international importance). Viewed from old Belgrade, as the beginning of the alluvial plateau and the new city, this park represents a unique visual value.

Park "Staro Sajmište" in the contact area, is a highly valued habitat (biotope), a fixed element of the system of green areas of Belgrade.

In the area closer to the river, grass areas dominate, where solitary trees of decades old, weaker condition, in accordance with the characteristics of the species, and smaller groups of deciduous trees and shrubs are present.

Parts of the park at higher elevations, closer to Brodarska Street, are more densely greened with larger groups of coniferous and deciduous trees and shrubs and equipped with playgrounds and accompanying city furniture. The paths in this part are accompanied by linear plantations of deciduous vegetation - mostly tree lines of tall and medium deciduous trees, in good condition and decorativeness.

The paths are of different dimensions and materialization. The finishing touches are mostly stone slabs of different colors and sizes.

Conditions:

- The existing public green area is fully retained and protected by the Plan.
- Work on the project on an updated substrate with geodetically recorded vegetation within the intervention boundaries and an area at least 5 m wide in relation to the boundary.
- The organization of the construction site in the scope of the green area for the purpose in question should be done so that the border, and thus the damage, primarily due to high vegetation, which is the most difficult to compensate component, is reduced to the necessary minimum.
- The green fund (trees, groups of shrubs), as well as the grass areas of the planned green areas, need to be maximally preserved and protected during the execution of works, without permanent disturbance of the conditions for their further development and survival. Preserve the layer of soil in which the root develops in the width of the canopy, as well as the above-ground part of the plants, characteristic for the species. In that sense, before the start of works, it is necessary to perform horizontal and vertical protection of vegetation within the intervention and contact zone, from damage due to the passage of machinery, tool disposal, backfilling from excavations, etc., according to applicable norms and regulations.
- Preserve the fertile surface layer of soil, with an average thickness of 25 cm, from decay and backfilling during the works and use it for landscaping.
- The investor/contractor is obliged to inform the service of PUC "Greenery-Belgrade" of the SECTOR OF MAINTENANCE OF GREEN AREAS about the start of works - contact phone 2622-481 and arrange the presence of an expert (supervision) during the execution of works. The supervision that was actively present, should confirm in writing that all works were performed according to the valid norms and regulations for this type of work and technical conditions of PUC "Greenery-Belgrade".
- All damages within the public green area as well as vegetation in the contact zone, caused by works on the construction of the facility, are the responsibility of the Investor. According to the scope of interventions, and in accordance with the Law on Planning and Construction, works on arranging the public green area after the completion of works, should be performed according to the technical

documentation prepared by an authorized designer with a license for this type of work (landscape architecture, horticulture engineer), with respect to the existing concept, dimensions and materialization.

- For vegetation directly endangered by the newly designed solution, the Investor is obliged to apply to the City Commission with a request for approval for felling trees through the competent city municipality, in order to obtain a decision on the basis of which felling can be realized. The expert commission performs valorization and determines the compensation for felled trees in accordance with the provisions of Article 14 of the Decision on arrangement and maintenance of parks, green and recreational areas ("Official Gazette of the City of Belgrade" number 12/1, 15/1, 11/5, 23/05). 29/07, 2/11 and 44/14, 17 / 15,35 / 15 and 19/17).

Expert associate:

Ivana Pavlović, B.Sc.Eng.Lands.Arch.
(signed)

HEAD OF DESIGN PU

Mirjana Štulić, B.Sc.Eng.Arch.
(signed)

DIRECTOR OF THE DEVELOPMENT, PLANNING AND DESIGN SECTOR

Bojana Rogulja
100045276.-24
12983375018

Digitally signed by Bojana Rogulja
100045276-2412983375018
DN: dc=rs, dc=posta, dc=ca, ou=Pravno lice (PL), ou=JKP Zelenilo Beograd 07066597, cn=Bojana Rogulja 100045276-2412983375018
Date: 2019.06.03 08:52:30 +02'00'
cn=Bojana Rogulja

100045276-2412983375018 Date: 2019.06.03 08:52:30 +02'00'

Republic of Serbia

Ministry of Environmental Protection

Number: 011-00-0001/299/2018-02
Belgrade, 6 December 2018

ENVIRONMENTAL PROTECTION AGENCY

Ministry of Agriculture, Forestry and Water Management
REPUBLIC WATER DIRECTORATE 2a Bulevar Umetnosti Str.
11070 Belgrade

SUBJECT: Opinion in the procedure of issuing water conditions for the construction of the bridge over the Sava River, CM Savski Venac and CM New Belgrade.

According to your request, your number 325-05-1244/2018-07 of November 30, 2018, and on the basis of the Rulebook on the content and form of requests for issuing water acts, the content of the opinion in the procedure of issuing water conditions and the content of the report on the issuance of water permit (Official Gazette of RS, No. 72/2017), we submit to you the requested OPINION attached.

DIRECTOR
Filip Radović
(seal and signature)

- applicant - archive

E-mail: office@sepa.sr.gov.yu
http : //wwrv.sepa.sr. gov.yu
11160 Belgrade Republic of Serbia
Tel: 011 2861080
Fax: 011 2861077

Form 3

Ministry of Environmental Protection

ENVIRONMENTAL PROTECTION
AGENCY No: 011-00-0001/299/2018-02

Pursuant to Article 117 and Article 118 of the Law on Waters *("Official Gazette of RS" No. 30/2010)* and Article 63 of the Law on Amendments to the Law on Waters ("*Official Gazette of RS" No. 101/2016*), the Rulebook on the content and the form of the request for issuance of water acts, the content of the opinion in the procedure of issuing water conditions and the content of the report in the procedure of issuing water permit ("Official Gazette of RS" No. 72/2017) and the Regulation on limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement ("*Official Gazette of RS" No. 50/2012*), deciding at the request of the Ministry of Agriculture, Forestry and Water Management/Republic Water Directorate for issuing water conditions in the process of preparing technical documentation for the construction of the bridge over the Sava River, CM Savski Venac and CM New Belgrade, number 325-05-1244 / 2018-07 dated November 30, 2018, "Environmental Protection Agency", issues

O P I N I O N

I. General information:

1.1 Name:

- Facility: construction of a bridge over the Sava, CM Savski Venac and CM New Belgrade
- Technical documentation: Conceptual Design - construction of the bridge over the Sava, CM Savski Venac and CM New Belgrade.

1.2 Hydrographic data:

Nearest watercourse: Sava, Danube
Basin: Danube, Black Sea
Water area: Bačka, Banat, Srem, Sava, Belgrade, Lower Danube
Water body: D_5, D_6, SA_1

I. GENERAL INFORMATION

Table 1

GENERAL INFORMATION					
User location					
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	STAT_DESCR_LOCATION_SAMPLING	STAT_X	STAT_Y
-	Danube, Black Sea	-	construction of a bridge over the Sava, CM Savski Venac and CM New Belgrade	-	-
Upstream profile - state monitoring					
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	STAT_DESCR_LOCATION_SAMPLING	STAT_X	STAT_Y
Ostružnica_Sava	Danube	8A_1	1 km upstream of the bridge	4954350	7445925
Zemun_Danube	Black Sea	D6	Kapetanija	4967310	7453939
Downstream profile - state monitoring					
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	STAT_DESCR_LOCATION_SAMPLING	STAT_X	STAT_Y
Belgrade_Vinča	Danube	D5	At water intake	4958275	7470388

II. WATERFLOW QUALITY

Table 2.1. _____

WATERFLOW QUALITY Profile: User location								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of measure	Period			MAC
					*Cmax	*Cmin	*Cavg	
-	Danube, Black Sea	-	-	-	-	-	-	-

Table 2.2.

WATERFLOW QUALITY								
Upstream profile - state monitoring								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of measure	Parameter 2015/2016			MAC
					*Cmax	*Cmin	*Cavg	
Ostružnica_Sava	Danube	SA_1	Water temperature	^{0}C	27.8	3.5	14.5	
			Turbidity	NTU	74.9	<1.0	18.0	
			Suspended matter	mg/l	90	<4	18.0	25
			Dissolved oxygen (02)	mg/l	12.2	5.9	9.2	7.0
			Percentage of water saturation with oxygen	%	117	74	88	
			Alkalinity	mmol/l	4.02	2.83	3.50	
			Total hardness	mg/l	240	164	205	
			Dissolved CO2	mg/l	13.2	0.0	3.9	
			Carbonates (C03--)	mg/l	3.0	0.0	0.2	

*Notes: C - concentration of water quality parameter/element
^{o}- MAC - Note: a/b, a-the first value in the MAC column represents the prescribed average annual concentration (PAC), b-the second value represents the prescribed maximum allowable concentration (MAC)

WATERFLOW QUALITY								
Upstream profile - state monitoring								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of measure	Parameter 2015/2016			MAC
					*Cmax	*Cmin	*Cavg	
			Bicarbonates (HC03-)	mg/l	243	173	213	
			Total alkalinity (CaCO3)	mg/l	201	142	175	
			pH	-	8.28	7.61	8.01	6.5.-8.5
			Electrical conductivity	µS/cm	512	308	403	1000
			Total dissolved salts	mg/l	302	180	237	1000
			Ammonium (NH4-N)	mg/l	0.32	<0.02	0.11	0.30
			Nitrites (NO2-N)	mg/l	0.027	<0.004	0,012	0.03
			Nitrates (NO3-N)	mg/l	1.20	0.50	0.73	3.0
			Organic nitrogen (N)	mg/l	2.04	<0.1	0.61	
			Total nitrogen (N)	mg/l	2.84	0.73	1.45	2
			Orthophosphates (PO4-P)	mg/l	0.100	0.031	0.058	0.10
			Total phosphorus (P)	mg/l	0.230	0.041	0.109	0.20
			Dissolved silicates (STO2)	mg/l	8.0	2.9	5.6	
			Natrium (Na+)	mg/l	16.7	4.2	8.8	
			Potassium (K+)	mg/l	2.3	1.1	1.8	
			Calcium (Ca++)	mg/l	76	37	62	
			Magnesium (Mg++)	mg/l	20.9	6.6	12.2	
			Chlorides (Cl -)	mg/l	40.0	6.0	16.9	100
			Sulphates (SO4- -)	mg/l	25	12	18	100
			Iron (Fe)	µg/l	1299.0	109.8	425.0	500
			Manganese (Mn)	µg/l	100.9	15.2	36.9	100
			Iron (Fe)-dissolved	µg/l	42.0	<20.0	15.4	
			Manganese (Mn)-dissolved	µg/l	28.1	<10.0	9.4	
			Zinc (Zn)	µg/l	106.0	4.5	26.9	300 (T=10) 700 (T=50) 1000 (T=100) 2000 (T=500)

WATERFLOW QUALITY								
Upstream profile - state monitoring								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of measure	Parameter 2015/2016			MAC
					*Cmax	*Cmin	*Cavg	
			Copper (Cu)	µg/l	11.7	<1.0	4.2	5 (T=10) 22 (T=50) 40 (T=100) 112 (T=300)
			Chromium (Cr) -total	µg/l	4.9	<0.6	1.8	50
			Lead (Pb)	µg/l	23.9	<1.0	2.7	
			Cadmium (Cd)	µg/l	0.27	<0.03	0.05	
			Mercury (Hg)	µg/l	<0.1	<0.1	<0.1	
			Nickel (Ni)	µg/l	10.3	<2.0	3.96	
			Aluminum (A1)	µg/l	826.3	50.2	313.9	
			Cobalt (Co)	µg/l	1.3	<0.5	0.70	
			Antimony (Sb)	µg/l	1.4	<0.5	0.6	
			Zinc (Zn)	µg/l	17.2	<10.0	<10.0	
			Copper (Cu)-dissolved	µg/l	9.8	<1.0	2.0	
			Chromium (Cr) -total dissolved	µg/l	3.4	<0.6	0.7	
			Lead (Pb) - dissolved	µg/l	2.3	<1.0	<1.0	1.2/ 14
			Cadmium (Cd) - dissolved	µg/l	0.05	<0.03	<0.03	<0.08 / 0.45 (class 1) 0.08 / 0.45 (class 2) 0.09 / 0.6 (class 3) 0.15 / 0.9 (class 4) 0.25 / 1.5 (class 5)
			Mercury (Hg) - dissolved	µg/l	<0.1	<0.1	<0.1	<0.7
			Nickel (Ni) - dissolved	µg/l	4.5	<2.0	<2.0	4/ 34
			Aluminum (A1) - dissolved	µg/l	23.8	<10.0	<10.0	
			Cobalt (Co) - dissolved	µg/l	1.3	<0.5	0.53	
			Antimony (Sb) - dissolved	µg/l	0.5	<0.5	<0.5	
			Arsenic (As)	µg/l	3.8	<1.0	1.59	10
			Arsenic (As) - dissolved	µg/l	2.2	<1.0	1.1	
			Boron (B)	µg/l	55.1	<10.0	23.80	1000
			Boron (B) - dissolved	µg/l	55.1	11.8	28.5	

WATERFLOW QUALITY								
Upstream profile - state monitoring								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of	Period: 2015/2016			MAC
					*Cmax	*Cmin	*Cavg	
			Chemical oxygen demand from KMnO4 (HPKMn)	mg/l	7.0	1.9	3.45	10
			Chemical oxygen demand from K2Cr2O7 (HPKCr)	mg/l	17	10	13.1	15
			Biological oxygen consumption (BPK-5)	mg/l	3.8	1.0	1.90	5.0
			Total organic carbon (TOC)	mg/l	9.9	2.5	4.42	5.0
			UV extinction (254nm)	cm-1	0.123	0.038	0.0731	
			Anion of active substance	mg/l	0,070	<0,010	0,029	0.2
			Petroleum hydrocarbons	mg/l	<0.010	<0,010	<0.010	
			Phenolic index	mg/l	0.001	<0.001	<0,001	0.001

Table 2.2.

WATERFLOW QUALITY								
Upstream profile - state monitoring								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of measure	Period: 2015 - 2016			MAC
					*Cmax	*Cmin	*Cavg	
Zemun_Danube	Black Sea	D6	Water temperature	oC	25.2	1.9	13.7	
			Turbidity	NTU	90.0	2.5	19.2	
			Suspended matter	mg/l	100	<4	21.1	25
			Dissolved oxygen (O2)	mg/l	12.4	5.9	9.1	7.0
			Percentage of water saturation with oxygen	%	105	72	85	
			Alkalinity	mmol/l	4.28	2.39	3.23	
			Total hardness	mg/l	234	159	192	
			Dissolved CO2	mg/l	6.6	0.0	2.8	
			Carbonates (C03")	mg/l	6.0	0.0	0.9	
			Bicarbonates (HC03‘)	mg/l	249	146	195	
			Total alkalinity (CaCO3)	mg/l	214	120	161	
			pH	-	8.45	7.85	8.08	6.5.-8.5
			Electrical conductivity	µS/cm	590	314	405	1000
			Total dissolved salts	mg/l	348	185	238	1000

WATERFLOW QUALITY

Upstream profile - state monitoring

STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of measure	Parameter 2015 - 2016			MAC
					*Cma	*Cmin	*Cavg	
			Ammonium (NH4-N)	mg/l	0.39	0.07	0.21	0.30
			Nitrites (NO2-N)	mg/l	0,037	<0,004	0,015	0.03
			Nitrates (NO3-N)	mg/l	1.40	0.30	0.94	3.0
			Organic nitrogen (N)	mg/l	2.41	<0.1	0.94	
			Total nitrogen (N)	mg/l	3.47	1.07	2.11	2
			Orthophosphates (PO4-P)	mg/l	0,128	0,041	0,066	0.10
			Total phosphorus (P)	mg/l	0,272	0,063	0,113	0.20
			Dissolved silicates (STO2)	mg/l	8.3	2.2	5.6	
			Natrium (Na+)	mg/l	20.4	6.2	13.0	
			Potassium (K+)	mg/l	4.5	1.6	2.9	
			Calcium (Ca++)	mg/l	78	40	56	
			Magnesium (Mg++)	mg/l	18.9	8.3	13.3	
			Chlorides (Cl -)	mg/l	21.0	12.0	16.3	100
			Sulphates (SO4- -)	mg/l	37	15	28	100
			Iron (Fe)	µg/l	810.1	65.0	380.5	500
			Manganese (Mn)	µg/l	95.0	11.7	35.5	100
			Iron (Fe)-dissolved	µg/l	49.0	<20.0	<20.0	
			Manganese (Mn)-dissolved	µg/l	25.0	<10.0	<10.0	
			Zinc (Zn)	µg/l	63.0	6.4	24.4	300 (T=10) 700 (T=50) 1000 (T=100) 2000 (T=500)
			Copper (Cu)	µg/l	7.1	<1.0	3.8	5 (T=10) 22 (T=50) 40 (T=100) 112 (T=300)
			Chromium (Cr) -total	µg/l	2.3	<0.6	1.0	50
			Lead (Pb)	µg/l	3.6	<1.0	1.1	
			Cadmium (Cd)	µg/l	0.12	<0.02	0.05	
			Mercury (Hg)	µg/l	<0.1	<0.1	<0.1	

WATERFLOW QUALITY								
Upstream profile - state monitoring								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of	Period: 2015 - 2016			MAC
					*Cma	*Cmin	*Cavg	
			Nickel (Ni)	µg/l	4.1	<2.0	2.22	
			Aluminum (A1)	µg/l	471.5	35.9	250.5	
			Cobalt (Co)	µg/l	0.7	<0.5	<0.5	
			Antimony (Sb)	µg/l	1.3	<0.5	<0.5	
			Zinc (Zn)	µg/l	18.0	<10.0	<10.0	
			Copper (Cu)-dissolved	µg/l	4.6	<1.0	2.0	
			Chromium (Cr) -total dissolved	µg/l	2.1	<0.6	<0.6	
			Lead (Pb) - dissolved	µg/l	1.0	<1.0	<1.0	1.2/ 14
			Cadmium (Cd) - dissolved	µg/l	0.07	<0.03	<0.03	<0.08 / 0.45 (class 1) 0.08 / 0.45 (class 2) 0.09 / 0.6 (class 3) 0.15 / 0.9 (class 4) 0.25 / 1.5 (class 5)
			Mercury (Hg) - dissolved	µg/l	<0.1	<0.1	<0.1	<0.7
			Nickel (Ni) - dissolved	µg/l	2.8	<2.0	<2.0	4/ 34
			Aluminum (A1) - dissolved	µg/l	30.3	<10.0	11.3	
			Cobalt (Co) - dissolved	µg/l	<0.5	<0.5	<0.5	
			Antimony (Sb) - dissolved	µg/l	<0.5	<0.5	<0.5	
			Arsenic (As)	*µg/l*	3.3	<1.0	1.66	10
			Arsenic (As) - dissolved	*µg/l*	2.9	<1.0	1.3	
			Boron (B)	*µg/l*	30.3	<10.0	21.44	1000
			Boron (B) - dissolved	*µg/l*	27.3	17.9	22.6	
			Chemical oxygen demand from KMnO4 (HPKMn)	mg/l	7.8	2.0	3.81	10
			Chemical oxygen demand from K2Cr2O7 (HPKCr)	mg/l	17	10	13.5	15
			Biological oxygen consumption (BPK-5)	mg/l	4.3	1.1	2.11	5.0
			Total organic carbon (TOC)	mg/l	8.8	2.7	4.97	6.0
			UV extinction (254nm)	cm-1	0.111	0.044	0.0708	
			Anion of active substance	mg/l	0,040	<0.010	0.026	0.2
			Petroleum hydrocarbons	mg/l	0.020	<0.010	0.0065	

WATERFLOW QUALITY								
Upstream profile - state monitoring								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of measure	Parameter 2015 - 2016			MAC
					*Cmax	*Cmin	*Cavg	
			Phenolic index	mg/l	0.002	<0.001	<0.001	0.001

Table 2.3.

WATERFLOW QUALITY								
Upstream profile - state monitoring								
STATION_RIVER_NAME	BASIN_NAME	WATER_BODY_ID	Parameter	Unit of measure	Parameter 2015-2016			MAC
					*Cmax	*Cmin	*Cavg	
Belgrade_Vinča_Danube	Black Sea	D5	Water temperature	oC	28.6	2.2	15.1	
			Turbidity	NTU	142.0	1.3	19.1	
			Suspended matter	mg/l	99	<4	16	25
			Dissolved oxygen (02)	mg/l	12.5	4.4	8.8	7.0
			Percentage of water saturation with oxygen	%	111	62	87	
			Alkalinity	mmol/l	4.02	2.46	3.30	
			Total hardness	mg/l	234	144	193	
			Dissolved CO2	mg/l	13.7	0.0	3.7	
			Carbonates (C03--)	mg/l	6.0	0.0	0.5	
			Bicarbonates (HC03-)	mg/l	237	147	199	
			Total alkalinity (CaCO3)	mg/l	201	123	165	
			pH	-	8.40	7.75	8.04	6.5.-8.5
			Electrical conductivity	µS/cm	519	325	395	1000
			Total dissolved salts	mg/l	301	181	233	1000
			Ammonium (NH4-N)	mg/l	0.36	<0.02	0.17	0.30
			Nitrates (NO3-N)	mg/l	0.160	0.004	0.016	0.03
			Nitrates (NO3-N)	mg/l	1.60	0.40	0.88	3.0
			Organic nitrogen (N)	mg/l	2.18	<0.1	0.72	
			Total nitrogen (N)	mg/l	3.18	1.05	1.81	2

Orthophosphates (PO4-P)	mg/l	0.100	0.026	0.067	0.10
Total phosphorus (P)	mg/l	0.266	0.062	0.108	0.20
Dissolved silicates (STO2)	mg/l	8.9	2.8	5.8	
Natrium (Na+)	mg/l	14.3	6.0	10.1	
Potassium (K+)	mg/l	13.9	1.3	3.0	
Calcium (Ca++)	mg/l	89	33	56	
Magnesium (Mg++)	mg/l	26.4	7.0	13.5	
Chlorides (Cl -)	mg/l	36.7	9.5	17.1	100
Sulphates (SO4- -)	mg/l	35	13	24	100
Iron (Fe)	*µg/l*	682.3	52	368.258333	500
Manganese (Mn)	*µg/l*	83.3	16	37.7307692	100
Iron (Fe) - dissolved	*µg/l*	35	<20.0	<20.0	
Manganese (Mn)-dissolved	*µg/l*	59.1	<10.0	14.84	
Zinc (Zn)	*µg/l*	69.0	6.8	27.84	300 (T=10) 700 (T=50) 1000 (T=100) 2000 (T=500)
Copper (Cu)	*µg/l*	8.8	<1.0	4.13	5 (T=10) 22 (T=50) 40 (T=100) 112 (T=300)
Chromium (Cr) -total	*µg/l*	3.7	<0.6	1.41	50
Lead (Pb)	*µg/l*	4.1	<1.0	1.38	
Cadmium (Cd)	*µg/l*	0.14	<0.02	0.048	
Mercury (Hg)	*µg/l*	<0.1	<0.1	<0.1	
Nickel (Ni)	*µg/l*	6.2	<2.0	2.78	
Aluminum (A1)	*µg/l*	343	49.1	220.9	
Cobalt (Co)	*µg/l*	1.1	<0.5	0.53	
Antimony (Sb)	*µg/l*	1.2	<0.5	<0.5	
Zinc (Zn)	*µg/l*	1983.0	<10.0	186.6	
Copper (Cu)-dissolved	*µg/l*	53.6	<1.0	6.18	
Chromium (Cr) -total dissolved	*µg/l*	34.9	<0.6	3.375	
Lead (Pb) - dissolved	*µg/l*	1.1	<1.0	<1.0	1.2/ 14

Cadmium (Cd) - dissolved	*µg/l*	0.07	<0.03	0.034	<0.08 / 0.45 (class 1) 0.08 / 0.45 (class 2) 0.09 / 0.6 (class 3) 0.15 / 0.9 (class 4) 0.25 / 1.5 (class 5)
Mercury (Hg) - dissolved	*µg/l*	<0.1	<0.1	<0.1	<0.7
Nickel (Ni) - dissolved	*µg/l*	57.0	<2.0	5.85	4/ 34
Aluminum (A1) - dissolved	*µg/l*	27.7	<10.0	10.68	
Cobalt (Co) - dissolved	*µg/l*	0.6	<0.5	<0.5	
Antimony (Sb) - dissolved	*µg/l*	<0.5	<0.5	<0.5	
Arsenic (As)	*µg/l*	3.3	<2.0	<2.0	10
Arsenic (As) - dissolved	*µg/l*	3.0	<2.0	<2.0	
Boron (B)	*µg/l*	36.7	<10.0	20.55	1.000
Boron (B) - dissolved	*µg/l*	24	5	15.1666667	
Chemical oxygen demand from KMnO4 (HPKMn)	mg/l	12.6	1.42	3.48103093	10
Chemical oxygen demand from K2Cr2O7 (HPKCr)	mg/l	34	9	13.7272727	15
Biological oxygen consumption (BPK-5)	mg/l	5.1	0.84	1.97263158	5.0
Total organic carbon (TOC)	mg/l	8.9	2.8	4.54782609	6.0
UV extinction (254nm)	cm-1	0.124	0.042	0.07098039	
Anion of active substance	mg/l	0.050	<0.010	0.0222	0.2
Petroleum hydrocarbons	mg/l	<0.010	<0,010	<0,010	
Phenolic index	mg/l	0.001	<0.001	<0.001	0.001

III OTHER DATA

Note:

a) Environmental Protection Agency pursuant to Article 117 and Article 118 of the of the Law on Waters *("Official Gazette of RS" No. 30/2010)* and Article 63 **of the Law on Amendments to the Law on Waters "Official Gazette of RS" No. 101 / 2016), submitted data on water quality in the water act, which refer to the rivers:** Sava (upstream profile Ostružnica, water body 8A_1 Table 2.2.1. and Danube (upstream profile Zemun, water body B5 Table 2.2.2. and downstream profile Belgrade_Vinča, water body B5, Table 2.3).

b) Data for the table Watercourse Quality (Table 2.1.) on the user profiles, are not contained because they are not included in the monitoring programs.

IV CONCLUSION

The project documentation envisages all measures that will ensure that the planned works are in accordance with the Regulation on limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement ("*Official Gazette of RS" No. 50/12)* and the Regulation on Boundary values of priority and hazardous substances that pollute surface waters and deadlines for their achievement ("*Official Gazette of RS" No. 24/14).*

Director
Filip Radović
(seal and signature)

To be delivered to:
- the applicant
- the archive

PU Belgrade Land Development Public Agency
Project Implementation Unit
84Njegoševa Street
Belgrade

Belgrade Land Development Public Agency BELGRADE				
RECEIVED				
No.	63832		27 NOV 2019	
Department	Code		Attachment	Value
09				

INSTITUTE FOR THE PROTECTION OF MONUMENTS OF THE CITY OF BELGRADE:
No. P7814/19
November 22, 2019
BELGRADE
Kalemegdan Gornji grad 14

Link: Your number 59111/6-09
of November 4, 2019

Subject: Opinion on the possibilities of forming the future construction site of the Sava Bridge

Letter No. 59111/6-09 dated November 4, 2019, sent to the Institute for the Protection of Cultural Monuments of the City of Belgrade, registered under no. R4884/19 dated November 5, 2019, you informed us that the PU Belgrade Land Development Public Agency was the investor of the Preliminary Design and Environmental Impact Study for the construction of a new bridge on the site of the Old Sava Bridge, as well as that the Preliminary Design is made in accordance with the awarded work in the competition for urban-architectural design of the Old Sava Bridge.

From the aspect of protection of cultural goods and in accordance with the Law on Cultural Heritage ("Official Gazette of RS" No. 71/94, 52/11-other law and 99/11-other law), the proposed location for the formation of the future construction site of the Sava Bridge is within

the whole Coastal Zone of New Belgrade, which enjoys the status of property under previous protection.

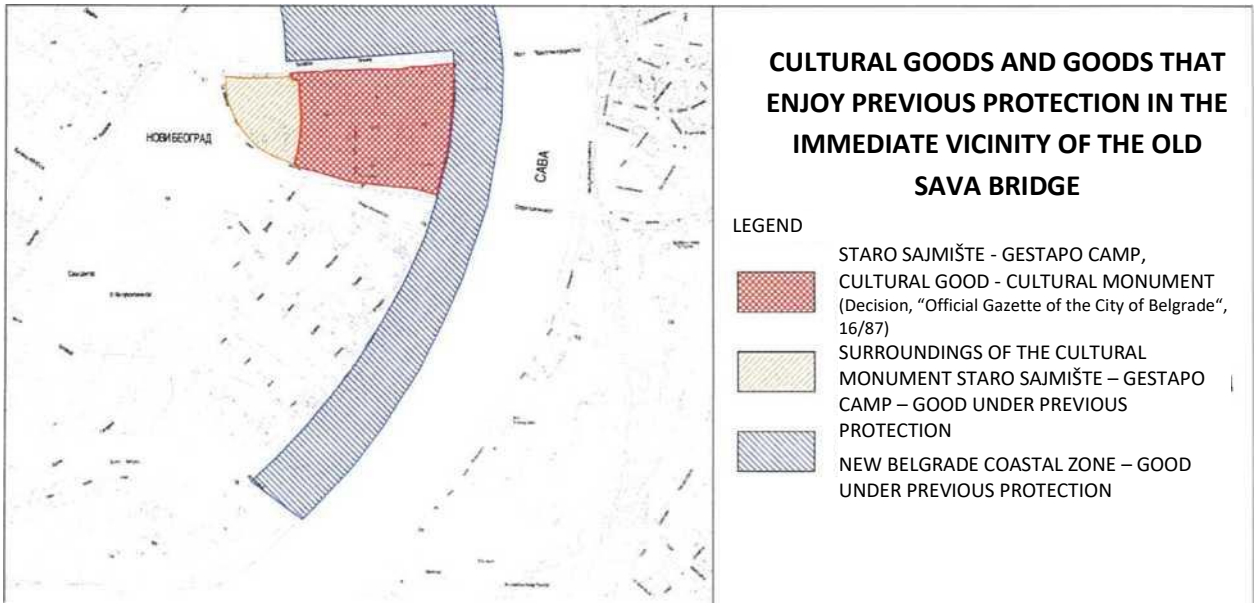
Along the border of the proposed location there are:

Staro Sajmište - Gestapo Camp, cultural property - cultural monument New Belgrade (Decision on Proclamation, "Official Gazette of the City of Belgrade[41] No. 16/87).

Bearing in mind that the proposed location for the formation of the future construction site of the Sava Bridge to a lesser extent falls within the above-mentioned property under previous protection, ie that it is located along the Sava River and partly in the riverbed, as well as temporary occupation of the area, we are of the opinion that, only if there are no other possibilities in the environment, it is possible to consider the formation of a future construction site within the subject location. The construction site and the access roads to it are not allowed to be organized within the border of the cultural property **Staro Sajmište - Gestapo Camp.** If the proposed location proves to be the only possibility, it is assumed that the intervention in question has a limited duration, that materials and techniques are used that will not endanger the cultural heritage and natural values of the area, and that, after completion, the subject location is returned to the previous state.

When planning the future construction site, it is necessary to cooperate with the Institute for the Protection of Cultural Monuments of the City of Belgrade in order to, in order to protect all values

of the space and its immediate environment, defined measures for technical protection of cultural property and goods that enjoy prior protection.



Graphic representation of the boundaries of cultural property and goods that enjoy prior protection

DIRECTOR
Olivera Vučković
(seal and signature)

Submit to:
- Title
- Archive

Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE

Number: 351-03-02930/2019-07 Date:
November 18, 2019
Audit Commission for
Expert Control of Technical Documentation

Pursuant to Article 131, paragraph 1 and Article 132, paragraph 2 of the of the Law on Planning and Construction ("Official Gazette of RS", No. 72/09, 81/09, 64/10 -US, 24/11, 121/12 , 42/13-US, 50/13-US, 98/13-US, 132/14, 145/14, 83/18, 31/19 and 37/19-other laws) and the Rulebook on the Manner and Procedure of Election members of the commission, the right and amount of remuneration for work in commissions, conditions, methodology, manner of work and decision-making of the audit commission and content of the report on professional control ("Official Gazette of RS", No. 46/2019), Audit commission for professional control of technical documentation (hereinafter: the Audit Commission) provides the following:

R E P O R T

on the performed expert control of the Feasibility Study and Conceptual Design:

FOR THE PURPOSE OF CONSTRUCTION
OF THE NEW BRIDGE ON THE PLACE OF THE OLD SAVA BRIDGE

ON CADASTRAL PLOTS

IN C.M. SAVSKI VENAC (MUNICIPALITY OF SAVSKI VENAC)

AND C.M. NEW BELGRADE (MUNICIPALITY OF NEW BELGRADE)

INVESTOR: BELGRADE CITY
Secretariat for Public Utility and Housing of
1/XIII Kraljice Marije Str., Belgrade
Directorate for Construction Land and Construction of Belgrade
PC 84 Njegoševa Str., Belgrade

PROJECT ORGANIZATION: TRAFFIC INSTITUTE CIP^4 LLC
6/IV Nemanjina Str., Belgrade

TECHNICAL DOCUMENTATION

CONTENT:

0 Main book
1 Architecture project
2/1 Bridge construction project
2/1 Bridge construction project
2/2 Road and tram road project
3/1 Bridge drainage project
3/2 Hydraulic-morphological analysis of the Sava River in the zone of the projected bridge on the site of the Old Sava Bridge
3/3 Project of protection and relocation of hydrotechnical installations 4/1 Project of electric power installations
4/2 Project for protection, relocation and reconstruction of power cable lines
4/3 Power installation project - contact network
5 Project of telecommunication and signal installations
6 Mechanical installation project - elevators
8/1 Traffic and traffic signalization project - project of traffic signalization and equipment on the bridge
8/2 Traffic and traffic signalization project - Sava River waterway signaling project 9 Exterior design project
Study on the results of geotechnical research and field testing Feasibility study

BRIEF DESCRIPTION OF THE FACILITY:

A new road-tram bridge over the Sava in Belgrade is planned on the site of the existing bridge, whose upper machine will be previously dismantled and moved to another location, and the lower machine will be demolished. The bridge is intended for road, tram and pedestrian-bicycle traffic.

The solution of the new bridge was chosen at a public competition organized by the Investor - the City of Belgrade. The structural system of the new bridge is a double steel arch with braces, where the braces are extending continuously over the entire length of the bridge with a constant static height.

The total length of the bridge is 420.0m, with ranges L = 54.0 + 73.0 + 166.0 + 73.0 + 54.0 = 420.0m. The total width of the bridge is 38.1m (at the lookout points for pedestrian bridges, it has been widened, so the total width is 42.1m). The main span of the structure over the required navigable profile of 150 m, is formed with two steel arches spanning L = 166 m. The cross section of the arches is rectangular, of constant dimensions h/b = 3000/2000mm, with variable thickness of the belt lamellae and ribs. The arches are made of S355J2 steel (for elements over 40mm thick, S355K2). The steel arches are inclined towards each other at an angle of $\alpha=10°$ with respect to the vertical, with different arrows. The smaller arch (in its plane) has an arrow of 41.0m, and the arrow of the larger arch is 47.0m. The arches are rigidly connected to each other in approximately one-third of the range. A steel clamp connects the arches at a height of about 8.5m above the level of the arch support. Tensioners are continuous box steel girders that are hung on arches within the range of arches by hangers provided at every 9.0m. Outside the range of the arches, the tensioners pass into supports supported by pillars and supported by struts in larger spans (73.0m). The tension support is carried out at a horizontal distance of 25.0 m with respect to the river pillars axis. The cross section of the arches is of constant dimensions h/b = 3000/2000mm, with variable thickness of the belt lamellae and ribs. Both braces follow the bridge level, i.e. the vertical curvature of radius R=4200.0, set in parallel, at a distance of B = 13.7m, made of S355 J2 steel (for elements over 40mm thick, 5355K2).

The pavement slabs of the bridge are made as prefabricated, subsequently coupled with transverse girders and bridge tensions. The concrete slab has a nominal thickness of 25.0m. The pavement slab is protected by a layer of waterproofing 10mm thick.
The cross members are clamped in the tensions. The upper belt is connected to the concrete slab and connected to the tension at the level of the upper flange, while the lower belt is connected to the tension at the level of the lower lamella. The lower and upper belts of the cross member are of cross section "I", with hollow profiles. The cross member has variable total height, from 3.3m at the ends, to 3.6m in the middle with a lower belt that follows the circular contour. The grid of transverse girders is constant and amounts to 6.0m. Reinforced, box-shaped transverse girders, dimensions h/b = 3300/2000m, have been installed at the intersections of arches and tensions, as well as at the intersections of struts and tensions. Also, reinforced cross girders were adopted at the ends of the bridge. All transverse beams in the lower level of the belt are connected by a longitudinal spacing "K". The material intended for all steel elements is S355 J2 steel.
On the same grid as the cross girders, to 6.0 m, laterally in relation to the braces, the cantilever beams are placed. The cantilevers are coupled to the pavement slab, with a variable cross-section of type I, connected by a tightening at the height of its upper flanges. At the height of the lower lamella of the tension, the mower of the I cross section is supported, which supports the bracket at a distance of 6.5 m. In the area above the river pillars, the consoles have been further extended by 2.5m, to provide additional space for pedestrians.
There are 24 hangers on the bridge, 12 on each arch. They are in the plane of the arches and close, in the transverse direction, an angle of a-10° with respect to the vertical. They are air-spaced, maintaining a brace every 9.0 m, while their distance between the two at the point of connection with the arch is variable. The hangers are formed of multiple parallel bundles made according to material specification Y1860 S7 + Z 15.7.
The bridge has six reinforced concrete pillars of different height and width. The two coastal pillars S1 and S6 are of thickness 2.5 m and height (6.3) 4.8 m. The middle pillars S2 and S5 are AB lattice, thickness 3.5 m and height 10.0 m, while the middle, river pillars S3 and S4 are supported by arches, AB canvas thickness 3.5 m and height 23.0 m and 15.0 m. At the top of each pillar, bearings are placed, in such a way that, in the longitudinal sense, there is a fixed bearing on the river pillar S4, while on the other pillars there are movable bearings. In the transverse sense, on each pillar there is one laterally movable and one laterally non-movable bearing. On the end pillars there are two additional auxiliary bearings (a total of 4 bearings on the pillar), movable in all directions. The role of the auxiliary bearings is, together with the reinforced first cross member and reinforced brackets, to ensure the durability of the expansion joint and the comfort of traffic. The pillars are rounded, made of concrete class S30/37.
Geo-exploration works were performed at the subject location, which included the construction of several exploration wells with sampling for laboratory tests, as well as the development of SPT and CPT tests. The obtained results (which are presented in detail in the Geotechnical Study) required the application of deep funding. The layers are distributed in depth, from a heterogeneous embankment, through clayey, ie sandy and gravelly deposits to marly clays and marls, i.e. limestones as final layers in which the bases of piles are located. The piles are of diameter 1500mm, of different lengths and different numbers, depending on the load of the column and the characteristics of the soil layers through which they pass. For the middle pillars S3 and S4, which are also the most loaded pillars, and thus have the most loaded piles, (Fv = 12500kN) piles of 20.0m (S3, limestone) and 30.0m (C4, marl) are planned, while the others pillars founded on piles of length from 20.0m to 28.0m.

Roadway

The subject of the project is only a part of the roads on the construction of the bridge from km 0 + 150,831 to km 0 + 574,326, and in accordance with the awarded work on the competition for the development of the Urban-architectural solution for the reconstruction of the Old Sava Bridge.

The primary street network of the area consists of state roads of the 1st rank (highway, main roads), I and II rank streets, and the secondary access roads and local street network.

The part that is not covered by this project, i.e. belongs to another project, refers to the area in the immediate vicinity of the bridge on both sides of the Sava River, where almost all types of traffic and traffic subsystems meet and intertwine, which is especially true on the right bank of the Sava.

One part of the road is located in the old part of the city on the right bank of the Sava River from the planned roundabout that connects the existing Karadjordjeva Street with the Sava Bridge. Roundabout belongs to the primary street network. The tram intersects the roundabout in the middle. The access road from the right bank of the Sava fits into the roundabout at the tram line km 0 + 181.170 and extends to the start of the bridge at km 0 + +334.933. The other part of the road is located on the New Belgrade side, on the left bank of the Sava River, and connects the structure of the bridge with the roundabout at Vladimira Popovica Street (Zemunski put). A tram stop is planned at this part of the road. The beginning of the road is, at the tramway station, at km 0 + +754.933 and extends to the roundabout at km 1 + 042.762.

The traffic route envisages two carriageway lanes of 6.5m width (right lane 3.5m wide and left lane 3m wide), tram isle, two-lane tramway, metro corridor in the middle of 8m minimum profile and 3m sidewalks which include one-way bike lanes.

For the purpose of the competition, the pavement structure on the bridge deck is adopted:

- Road surface CMA 0/11 s with PmB 4cm
- Protective leveling layer AB 11 saPmB 4cm

The pavement surface and the surface of the bike path on the bridge are treated with anti-skid coating in layers.

Tramway

An integral part of the bridge profile is the tram line as a section of the route connecting Karadjordjeva Street and Milentija Popovica Street.

The subject of the project is only the tram line on the bridge, but through the project it is shown with access roads in order to see the functional whole of the section.

The tram line is two-wheeled, with a wheelbase distance of 3.80m and is located in an isolated and elevated tramway isle 8.0m wide in the middle of the road. The tram stop is foreseen on the New Belgrade side, just before the roundabout on Vladimira Popovica Street.

The levels of the road and tram tracks are defined and harmonized so as to satisfy the required height relations between the tram isles, the road and the sidewalk. The tram structure on the bridge consists of:

- "floating"[44] concrete slab, average thickness 35cm, placed over the MMA waterproofing of the bridge;
- recessed continuously elastically supported track (continuous elastomeric strip under the rail leg) in steel rail channels with side dowels;
- rubber insulation elements (filler blocks) placed along the sides of the rail, which have the task of dampening noise and vibration;
- filling of rail channels with polyurethane-based mass, which ensures elastic sealing of the complete support system and its electrical insulation.

The tram construction at the approaches to the bridge is with the upper machine according to the system of continuous elastic support of the rail on the supporting concrete slab.

At the places of bridge dilatations (at the beginning and end of the bridge), track dilatation devices are placed on each of the tram tracks (4 in total). This ensures synchronized operation of the bridge and the track on the bridge and the track outside the bridge protects against additional stresses due to the expansion of the bridge.

The total investment value of the project is 6,601,730,505.47 RSD (55,946,868 EUR).

REPORTERS
OF PROFESSIONAL CONTROL: Prof. Zlatko Marković, Ph.D.Civ.Eng.
Branko Milosavljević, Ph.D.Civ.Eng.
Prof. Milan Glišić, Ph.D.Arch.Eng.
Vladimir Gucić, B.Sc.Civ.Eng.
Prof. Miloš Stanić, Ph.D.Civ.Eng.
Prof. Veran Vasić, Ph.D.El.Eng.
Goran Marković, Ph.D.El.Eng.
Vlada Gašić, Ph.D.Mech.Eng.
Prof. Dalibor Pešić, Ph.D.Traff.Eng.
Prof. Katarina Vukadinović, Ph.D.Traff.Eng.
Miroslava Živanović, B.Sc.Civ.Eng.
Selimir Lelović, Ph.D.Civ.Eng.
Prof. Gojko Rikalović, Ph.D.Econ.Eng.

At the session held on **November 15, 2019**, the Audit Commission, based on the report of the coordinator of the expert control rapporteurs for the Feasibility Study and the preliminary design: FOR THE PURPOSE OF CONSTRUCTION OF THE NEW BRIDGE ON THE PLACE OF THE OLD SAVA BRIDGE

ON CADASTRAL PLOTS

IN C.M. SAVSKI VENAC (MUNICIPALITY OF SAVSKI VENAC)

AND C.M. NEW BELGRADE (MUNICIPALITY OF NEW BELGRADE), concluded that the technical documentation is **accepted.**

When preparing the next phase of technical documentation, the Investor is obliged to apply the following measures:

2/1 Bridge construction project
1. During the global analysis of the construction of the arch bridge, it is necessary to analyze the case when the stiffness of the AB pavement slab in the tension zone is completely excluded.
2. It is necessary that the details of the intersection of arcs and tensions, the connections of arches and beehives above the supports and the connection of bends and tensions are corrected based on the results of detailed analysis, using finite element methods (FEM).

3/1 Bridge drainage project
Separator 82 is set at too low an elevation. It is necessary to change the location. Consider the possibility of being installed before the cascade projected into shaft K19.

3/2 Hydraulicmorphological analysis of the Sava River in the zone of the projected bridge on the site of the Old Sava Bridge
1. Considering the estimated significant deformations in the zone of bridge pillars, it is necessary to make a project for the protection of bridge pillars, where the quantities and granulometric composition of the material should be written, technical conditions for performing works, etc. would be clearly defined.
2. It is necessary to make a more complex (20 and/or 30) model for a more accurate assessment of deformations in the area of the bridge on which to check the technical solutions for the protection of columns.
3. The project of protection of bridge pillars should prescribe the intervals of geodetic surveying of the river bottom in the profile of the bridge, in order to monitor deformations and prescribe remedial measures when deformations exceed critical values.

Notes:

2/2 Road and tram road project

Considering that the Preliminary Design in question covers only the bridge over the Sava River and not the associated road, there is a need to do the following on the remaining part of the Preliminary Design:

- Traffic analysis and forecast for the entire complex from the entrance to the future tunnel near the Faculty of Economics, through the intersections with Gavrila Principa and Karadjordjeva streets, the roundabout in the zone "Belgrade Waterfront", the bridge on the river Sava, and on the New Belgrade side the intersection with Zemunska street and roundabout in Vladimira Popovića Street. In that way, a real level of services would be obtained and the capacity would be checked for all approaches to the mentioned intersections;
- Based on the data obtained in this way, check the need for a variant solution of the main direction with a leveled object on the bridge-tunnel stretch. In case this variant proves unnecessary, check the possibility of leveling only Gavrila Principa Street in relation to the main bridge-tunnel direction;
- Make a variant solution of a traffic light intersection instead of a roundabout. In that way, by coordinating the work of light signals, the main flow on the stretch New Belgrade - Belgrade - tunnel would be better solved. A special problem is the intersection of motor, tram and pedestrian traffic in a roundabout where there are no priority rights;
- A possibly adopted variant with traffic lights, i.e. without a roundabout, would enable the reduction of access ramps to the bridge from 5% to 3.5%, 4%;
- Check the justification for keeping the tram station on the main bridge-tunnel route. This would reduce pedestrian traffic on the main route between the two intersections, which are a short distance away;
- Check the variant solution with a concrete structure on the access ramps of the bridge, instead of the planned embankment with a double-sided concrete wall given in the CD. *The reason is of an aesthetic nature in a centralized urban area.*

When preparing the next phase of the project documentation, it is necessary to check and prove the justification of the solution from the planning documentation, the roundabout consisting of the road leading from the bridge, Sao 1 and Sao 9. Otherwise, those responsible will bear the consequences in case such a solution proves inappropriate.

Based on this project, which is harmonized with the location conditions, the case number: KOR-M8O1-34773-EOSA-4/2019, reg. number: 350-02-00211/2019-14 of July 1, 2019 and the Conclusion on the correction of technical errors case number: R.OR-M8O1-34773-EOSA-4/2019, reg. number: 350-02-00211/2019-14 dated July 5, 2019, the Investor may proceed to the preparation of the next phase of technical documentation.

CHAIRMAN OF THE AUDIT COMMISSION
Imre Kern, B.Sc.Eng.Techn.
(signed)
STATE SECRETARY
Aleksandra Damnjanović, Bachelor of Laws
(seal and signature)

No.	23	24	25	26	27	28	29	30	31a	316	33	34	35	36	37	38	39	40	41	42	43	MAC*
T water (°C)	15.4	14.9	6.4	12.6	12.8	12.5	12.6	11.9	17.3	16.1	13.9	10.8	13.6	13.8	9.4	13.3	12.4	15.9	15.6	12.9	13.8	/
odor	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
color	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	/
flavor	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
pH	7.33	7.66	7.3	7.4	7.43	7.25	7.28	7.59	7.28	7.72	7.69	7.53	7.72	7.4	8.01	7.25	7.64	7.33	7.59	7.68	7.53	6.8.-8.5
Turbidity (NTU)	0.38	0.64	0.87	1.27	1.11	0.74	4.94	1.6	0.45	2.94	0.52	1.14	0.54	0.07	1.07	0.33	0.9	0.33	0.78	0.72	0.101	1
spec.cond. (µS/cm)	541	484	1148	672	620	1554	748	837	583	521	740	477	561	553	404	965	579	667	664	461	444	1000
Redox. potential Eh (mV)	138.	169.7	188.6	205.3	185	134	190.	153.7	201.4	195.2	151.8	88.5	75.6	127.6	217.9	140.6	110.	14.4	161.4	153.8	134.5	/
Total hardness (ppm)	96	97	112	105	102	154	109	143	115	113	132	34	117	87	100	128	145	103	144	85	94	/
Total alkalinity (ppm)	317	hi	hi	hi	319	316	316	hi	302	315	304	122	313	286	282	hi	311	305	308	259	292	/
Dissolved oxygen O2 (mg/l)	3.26	3.53	2.21	3.05	20.5	12	27.5	25.8	28.3	4.32	2.68	2.01	2.38	2.99	4.69	1.74	4.11	1.36	47.6	3.78	3.46	/
Calcium Ca2+(mg/l)	86	93	178	118	110	218	122	116	112	108	89	44	62	75	85	137	79	78	86	94	94	200
Hydrocarbonates HCO3 - (mg/l)	353.8	320.25	475.8	411.75	344.65	573.4	359.9	497.15	384.3	341.6	353.8	189.1	317.2	317.2	237.9	549	390.4	494.1	335.5	295.85	295.85	/
Ammonia NH3 (mg/l)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.1
Nitrites NO2 - (mg/l)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.005	<0.003	<0.003	0.03
Nitrates NO3 - (mg/l)	8.97	5.32	57.65	14.46	11.66	9.8	26.92	3.34	9.2	7.56	22.22	37.9	14.43	13.25	3.99	18.59	1.14	1.31	1.73	2.65	3.03	50
Consumption of KMnO4 (mg/l)	1.26	0.63	2.53	1.58	1.9	5.69	1.26	7.27	0.95	2.21	1.26	6.95	4.11	3.79	1.9	2.53	1.58	2.53	3.84	3.82	1.59	8
Chlorides Cl- (mg/l)	3.99	3.97	77.4	17.61	12.97	59.88	12.4	13.47	6.13	1.99	19.31	17.56	14.97	13.97	4.99	36.37	8.38	8.03	36.43	2.84	3.19	200
Sulphates SO4 2- (mg/l)	7.6	10.6	110.4	44.7	56.9	356.4	98.7	75.4	8.9	5.8	97.8	46.8	30.6	24.6	10.9	76.5	14.2	16.7	34.5	12.5	3.18	250
Iron Fe2+ (µg/l)	<10	10	18	27.9	58.4	60.2	390	236	<10	<10	12	30	<10	<10	<10	<10	<10	73.8	<10	<10	<10	300
Manganese Mn3+ (µg/l)	<10	<10	<10	<10	<10	<10	<10	733	<10	<10	<10	<10	<10	<10	<10	<10	<10	30.6	132	<10	<10	50
Arsenic As (µg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.2	<1.0	1.7	1.00	10
Mercury Hg (µg/l)	<0.2	<0.2	0.54	0.21	<0.2	<0.2	0.6	0.3	<0.2	<0.2	0.93	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.23	<0.2	<0.2	1
Cadmium Cd (µg/l)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3
Nickel Ni (µg/l)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	20
Zinc Zn (µg/l)	<5.0	6.5	31.8	6.2	46.9	27.9	78	38.8	6.1	<5.0	<5.0	16.4	17.5	27.5	<5.0	<5.0	<5.0	<5.0	5.00	5.00	5.60	3000
Copper Cu (µg/l)	<10.0	<10.0	23.7	<10.0	<10.0	17.3	10	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	2000
Boron (µg/l)***																						300
Pesticides (total) (µg/l)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	500
Aldrin (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	30
4,4'-DDD (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100
4,4'-DDE (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100
4,4'-DDT (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100
Dieldrin (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	30
Endrin (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100
Endosulfan sulphate (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100
α-HCH (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100
β-HCH (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100
γ-HCH (lindane) (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	200
δ-HCH (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100
Heptachlor (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	30
Heptachlorperoxide B (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	30
4,4 '- Methoxychlor (µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	100

Table 4.1. Results of field measurements and laboratory analyzes conducted during the implementation of the Project, period 11/19/2018. to 12/01/2018 (Part 2)

***MAC - Maximum allowable concentrations according to the "Rulebook on the hygienic safety of drinking water (Official Gazette of the FRY, No. 42/98 and 44/99)" or elevated arsenic content, established during the implementation of previous projects**

HYDRAULIC CALCULATION FOR DETERMINING SEPARATOR CAPACITY

It is adopted that the separator on the New Belgrade bank purifies 20% of the calculated inflow due to the fact that the area of the subject design is in the narrower zone of sanitary protection of the Belgrade water source, while in the Municipality of Savski Venac, it is in the wider zone of sanitary protection of Belgrade water source, and as such it is adopted to purify 10% of the calculated inflow.

Separator capacities are determined based on hydraulic calculation.

Relevant rains for dimensioning the stormwater sewage of the bridge include the rains as measured from the raingauge station Vračar, return period T = 10 years, while the duration of rain was obtained as a function of concentration time for calculated catchment areas along the road, starting from t_K = 5 min. The calculation is obtained using rational method:

0 = j• R ^ (1/5)

Where:

i – rain intensity,
F – runoff surface,
Ψ- runoff coefficient, adopted ψ= 0.9.

The results of the hydraulic calculation are presented in the table below.

SECTION CARRIAGEWAY-LEFT-BELGRADE SIDE

WIDTH OF CARRIAGE WAY	SECTION		LENGTH OF SECTION L	REDUCED BASIN AREA		FLOW TIME		INTENSITY OF RAIN I	Q AT SECTION END	PIPE DIAMETER Φ	PIPE SLOPE I	WATER DEPTH h	SPEED OF WATER			α
	FROM	TO		OWN	TOTAL	TO UPSTR. END	IN SECTION						H/D	IN PIPE V	MANNING N	
			(M)	(HA)	(HA)	(S)	(S)	(L/S/HA)	(L/S)	(MM)	(M)	(CM)	(-)	(M/S)	($M^{-1/3}XS$)	
16.0	M.SL.LB.1	M.SL.LB.2	6.00	0.009	0.009	300	7	548	5	200	1.00	4.7	0.24	0.84	0.011	1.01
16.0	M.SL.LB.2	M.SL.LB.3	6.00	0.009	0.017	307	6	544	9	200	1.00	6.7	0.34	1.02	0.011	1.24
16.0	M.SL.LB.3	M.SL.LB.4	6.00	0.009	0.026	313	5	541	14	200	1.00	8.3	0.42	1.13	0.011	1.40
16.0	M.SL.LB.4	M.SL.LB.5	6.00	0.009	0.035	318	5	538	19	200	1.00	9.8	0.49	1.22	0.011	1.55
16.0	M.SL.LB.5	M.SL.LB.6	6.00	0.009	0.043	323	5	535	23	200	1.00	11.1	0.56	1.29	0.011	1.68
16.0	M.SL.LB.6	M.SL.LB.7	6.00	0.009	0.052	328	4	532	28	200	1.00	12.5	0.62	1.34	0.011	1.82
16.0	M.SL.LB.7	M.SL.LB.8	6.00	0.009	0.060	332	4	529	32	200	1.00	13.8	0.69	1.38	0.011	1.97
16.0	M.SL.LB.8	M.SL.LB.9	6.00	0.009	0.069	337	4	527	36	200	1.00	15.4	0.77	1.40	0.011	2.14
16.0	M.SL.LB.9	M.SL.LB.10	6.00	0.009	0.078	341	4	524	41	200	1.00	17.6	0.88	1.40	0.011	2.43
16.0	M.SL.LB.10	M.SL.LB.11	6.00	0.009	0.086	345	4	522	45	250	1.00	14.6	0.58	1.52	0.011	1.74
16.0	M.SL.LB.11	M.SL.LB.12	6.00	0.009	0.095	349	4	520	49	250	1.00	15.5	0.62	1.55	0.011	1.81
16.0	M.SL.LB.12	M.SL.LB.13	6.00	0.009	0.104	353	4	517	54	250	1.00	16.3	0.65	1.58	0.011	1.88
16.0	M.SL.LB.13	M.SL.LB.14	6.00	0.009	0.112	357	4	515	58	250	1.00	17.3	0.69	1.60	0.011	1.96
16.0	M.SL.LB.14	M.SL.LB.15	12.00	0.017	0.130	361	5	513	66	250	2.80	13.5	0.54	2.47	0.011	1.65
16.0	M.SL.LB.15	M.SL.LB.16	12.00	0.017	0.147	366	5	510	75	250	2.80	14.5	0.58	2.54	0.011	1.73
16.0	M.SL.LB.16	M.SL.LB.17	12.00	0.017	0.164	370	5	507	83	250	2.80	15.5	0.62	2.60	0.011	1.82
16.0	M.SL.LB.17	M.SL.LB.18	12.00	0.017	0.181	375	5	505	92	250	2.80	16.6	0.66	2.65	0.011	1.90
16.0	M.SL.LB.18	M.SL.LB.19	12.00	0.017	0.199	379	4	502	100	250	2.80	17.7	0.71	2.69	0.011	2.00
16.0	M.SL.LB.19	M.SL.LB.20	12.00	0.017	0.216	384	4	499	108	250	2.80	18.8	0.75	2.72	0.011	2.10
16.0	M.SL.LB.20	M.SL.LB.21	12.00	0.017	0.233	388	4	497	116	250	4.30	16.8	0.67	3.29	0.011	1.93
16.0	M.SL.LB.21	M.SL.LB.22	12.00	0.017	0.251	392	4	495	124	250	4.30	17.7	0.71	3.33	0.011	2.00
16.0	M.SL.LB.22	M.SL.LB.23	12.00	0.017	0.268	396	4	493	132	250	4.30	18.6	0.75	3.36	0.011	2.08
16.0	M.SL.LB.23	M.SL.LB.24	12.00	0.017	0.268	399	4	490	131	250	4.30	18.6	0.74	3.36	0.011	2.08
16.0	M.SL.LB.24	M.SL.LB.25	6.00	0.009	0.276	403	2	488	135	250	4.30	19.0	0.76	3.37	0.011	2.12

SECTION-CARRIAGEWAY-RIGHT- BELGRADE SIDE

WIDTH OF CARRIAGE WAY	SECTION		LENGTH	REDUCED BASIN AREA		FLOW TIME		INTENSITY	Q	PIPE	PIPE	WATER	SPEED OF WATER			α
	FROM	TO	OF SECTION L (M)	OWN (HA)	TOTAL (HA)	TO UPSTR. END (S)	IN SECTION (S)	OF RAIN I (L/S/HA)	AT SECTION END (L/S)	DIAMETER Φ (MM)	SLOPE I (%)	DEPTH H (CM)	(-)	IN PIPE V (M/D)	MANNING N ($M^{-1/3}XS$)	
16.0	M.SL.DB.1	M.SL.DB.2	6.00	0.009	0.009	300	7	548	5	200	1.00	4.7	0.24	0.84	0.011	1.01
16.0	M.SL.DB.2	M.SL.DB.3	6.00	0.009	0.017	307	6	544	9	200	1.00	6.7	0.34	1.02	0.011	1.24
16.0	M.SL.DB.3	M.SL.DB.4	6.00	0.009	0.026	313	5	541	14	200	1.00	8.3	0.42	1.13	0.011	1.40
16.0	M.SL.DB.4	M.SL.DB.5	6.00	0.009	0.035	318	5	538	19	200	1.00	9.8	0.49	1.22	0.011	1.55
16.0	M.SL.DB.5	M.SL.DB.6	6.00	0.009	0.043	323	5	535	23	200	1.00	11.1	0.56	1.29	0.011	1.68
16.0	M.SL.DB.6	M.SL.DB.7	6.00	0.009	0.052	328	4	532	28	200	1.00	12.5	0.62	1.34	0.011	1.82
16.0	M.SL.DB.7	M.SL.DB.8	6.00	0.009	0.060	332	4	529	32	200	1.00	13.8	0.69	1.38	0.011	1.97
16.0	M.SL.DB.8	M.SL.DB.9	6.00	0.009	0.069	337	4	527	36	200	1.00	15.4	0.77	1.40	0.011	2.14
16.0	M.SL.DB.9	M.SL.DB.1S	6.00	0.009	0.078	341	4	524	41	200	1.00	17.6	0.88	1.40	0.011	2.43
16.0	M.SL.DB.1S	M.SL.DB.11	6.00	0.009	0.086	345	4	522	45	250	1.00	14.6	0.58	1.52	0.011	1.74
16.0	M.SL.DB.11	M.SL.DB.12	6.00	0.009	0.095	349	4	520	49	250	1.00	15.5	0.62	1.55	0.011	1.81
16.0	M.SL.DB.12	M.SL.DB.13	6.00	0.009	0.104	353	4	517	54	250	1.00	16.3	0.65	1.58	0.011	1.88
16.0	M.SL.DB.13	M.SL.DB.14	6.00	0.009	0.112	357	4	515	58	250	1.00	17.3	0.69	1.60	0.011	1.96
16.0	M.SL.DB.14	M.SL.DB.15	12.00	0.017	0.130	361	5	513	66	250	2.80	13.5	0.54	2.47	0.011	1.65
16.0	M.SL.DB.15	M.SL.DB.16	12.00	0.017	0.147	366	5	510	75	250	2.80	14.5	0.58	2.54	0.011	1.73
16.0	M.SL.DB.16	M.SL.DB.17	12.00	0.017	0.164	370	5	507	83	250	2.80	15.5	0.62	2.60	0.011	1.82
16.0	M.SL.DB.17	M.SL.DB.18	12.00	0.017	0.181	375	5	505	92	250	2.80	16.6	0.66	2.65	0.011	1.90
16.0	M.SL.DB.18	M.SL.DB.19	12.00	0.017	0.199	379	4	502	100	250	2.80	17.7	0.71	2.69	0.011	2.00
16.0	M.SL.DB.19	M.SL.DB.2S	12.00	0.017	0.216	384	4	499	108	250	2.80	18.8	0.75	2.72	0.011	2.10
16.0	M.SL.DB.2S	M.SL.DB.21	12.00	0.017	0.233	388	4	497	116	250	4.30	16.8	0.67	3.29	0.011	1.93
16.0	M.SL.DB.21	M.SL.DB.22	12.00	0.017	0.251	392	4	495	124	250	4.30	17.7	0.71	3.33	0.011	2.00
16.0	M.SL.DB.22	M.SL.DB.23	12.00	0.017	0.268	396	4	493	132	250	4.30	18.6	0.75	3.36	0.011	2.08
16.0	M.SL.DB.22	M.SL.DB.23	12.00	0.017	0.268	399	4	490	131	250	4.30	18.6	0.74	3.36	0.011	2.08
16.0	M.SL.DB.24	M.SL.DB.25	6.00	0.009	0.276	403	2	488	135	250	4.30	19.0	0.76	3.37	0.011	2.12

TRAM LANE- BELGRADE SIDE

WIDTH OF CARRIAGE WAY	SECTION		LENGTH	REDUCED BASIN AREA		FLOW TIME		INTENSITY	Q	PIPE	PIPE	WATER	SPEED OF WATER			a
	FROM	TO	OF SECTION L	OWN	TOTAL	TO UPSTR. END	IN SECTION	OF RAIN I	AT SECTION END	DIAMETER Φ	SLOPE I	DEPTH h	I/O	IN PIPE V	MANNING N	
			(M)	(HA)	(HA)	(S)	(S)	(L/S/HA)	(L/S)	(MM)	(%)	(CM)	(-)	(M/D)	($M^{-1/3}XS$)	
7.0	CANAL B.1	CANAL 6.2	6.00	0.004	0.004	300	9	548	2	200	1.00	3.1	0.16	0.66	0.011	0.81
7.0	CANAL 6.2	CANAL 6.3	12.00	0.008	0.011	309	13	543	6	200	1.00	5.4	0.27	0.90	0.011	1.09
7.0	CANAL 6.3	CANAL 6.4	12.00	0.008	0.019	322	12	535	10	200	1.00	7.0	0.35	1.04	0.011	1.26
7.0	CANAL 6.4	CANAL 6.5	12.00	0.008	0.026	334	11	529	14	200	1.00	8.3	0.42	1.13	0.011	1.40
7.0	CANAL 6.5	CANAL 6.6	12.00	0.008	0.034	345	10	522	18	200	1.00	9.5	0.48	1.21	0.011	1.52
7.0	CANAL 6.6	CANAL 6.7	12.00	0.008	0.042	355	9	517	21	200	1.00	10.6	0.53	1.26	0.011	1.63
7.0	CANAL 6.7	CANAL 6.8	12.00	0.008	0.049	364	9	511	25	200	1.00	11.7	0.59	1.31	0.011	1.74
7.0	CANAL 6.8	CANAL 6.9	12.00	0.008	0.057	373	6	506	29	200	2.80	9.3	0.47	2.00	0.011	1.50
7.0	CANAL 6.9	CANAL 6.10	12.00	0.008	0.064	379	6	502	32	200	2.80	10.0	0.50	2.06	0.011	1.57
7.0	CANAL 6.10	CANAL 6.11	12.00	0.008	0.072	385	6	499	36	200	2.80	10.6	0.53	2.11	0.011	1.63
7.0	CANAL 6.11	CANAL 6.12	12.00	0.008	0.079	391	6	495	39	200	2.80	11.2	0.56	2.16	0.011	1.70
7.0	CANAL 6.12	CANAL 6.13	12.00	0.008	0.087	396	5	492	43	200	2.80	11.9	0.59	2.21	0.011	1.76
7.0	CANAL 6.13	CANAL 6.14	12.00	0.008	0.095	402	5	489	46	200	2.80	12.5	0.62	2.24	0.011	1.82
7.0	CANAL 6.14	CANAL 6.15	12.00	0.008	0.102	407	4	486	50	200	4.30	11.4	0.57	2.69	0.011	1.71
7.0	CANAL 6.15	CANAL 6.16	12.00	0.008	0.110	411	4	483	53	200	4.30	11.8	0.59	2.73	0.011	1.76
7.0	CANAL 6.16	CANAL 6.17	12.00	0.008	0.117	416	4	481	56	200	4.30	12.3	0.62	2.77	0.011	1.81
7.0	CANAL 6.17	CANAL 6.18	12.00	0.008	0.125	420	4	478	60	200	4.30	12.8	0.64	2.80	0.011	1.86

Total calculated flow gravitating towards the right bank of the Sava is 330 l/s (135 l/s+135 l/s+60 l/s=330 l/s), adopted separator of nominal flow is 35 l/s, while total flow is Qmax=350 l/s.

SECTION-CARRIAGEWAY-LEFT-NEW BELGRADE SIDE

WIDTH OF CARRIAGE WAY	SECTION		LENGTH	REDUCED BASIN AREA		FLOW TIME		INTENSITY	Q	PIPE	PIPE	WATER	SPEED OF WATER			a
	FROM	TO	OF SECTION L (M)	OWN (IA)	TOTAL (IA)	TO UPSTR. END (S)	IN SECTION (S)	OF RAIN I (L/S/HA)	AT SECTION END (L/S)	DIAMETER Φ (MM)	SLOPE I (%)	DEPTH h (CM)	Š (-)	IN PIPE V (M/S)	MANNING N ($M^{-1/3}XS$)	
16.0	M.SL.LNB.1	M.SL.LNB.2	6.00	0.009	0.009	300	7	548	5	200	1.00	4.7	0.24	0.84	0.011	1.01
16.0	M.SL.LNB.2	M.SL.LNB.3	6.00	0.009	0.017	307	6	544	9	200	1.00	6.7	0.34	1.02	0.011	1.24
16.0	M.SL.LNB.3	M.SL.LNB.4	6.00	0.009	0.026	313	5	541	14	200	1.00	8.3	0.42	1.13	0.011	1.40
16.0	M.SL.LNB.4	M.SL.LNB.5	6.00	0.009	0.035	318	5	538	19	200	1.00	9.8	0.49	1.22	0.011	1.55
16.0	M.SL.LNB.5	M.SL.LNB.6	6.00	0.009	0.043	323	5	535	23	200	1.00	11.1	0.56	1.29	0.011	1.68
16.0	M.SL.LNB.6	M.SL.LNB.7	6.00	0.009	0.052	328	4	532	28	200	1.00	12.5	0.62	1.34	0.011	1.82
16.0	M.SL.LNB.7	M.SL.LNB.8	6.00	0.009	0.060	332	4	529	32	200	1.00	13.8	0.69	1.38	0.011	1.97
16.0	M.SL.LNB.8	M.SL.LNB.9	6.00	0.009	0.069	337	4	527	36	200	1.00	15.4	0.77	1.40	0.011	2.14
16.0	M.SL.LNB.9	M.SL.LNB.10	6.00	0.009	0.078	341	4	524	41	200	1.00	17.6	0.88	1.40	0.011	2.43
16.0	M.SL.LNB.10	M.SL.LNB.11	6.00	0.009	0.086	345	4	522	45	250	1.00	14.6	0.58	1.52	0.011	1.74
16.0	M.SL.LNB.11	M.SL.LNB.12	6.00	0.009	0.095	349	4	520	49	250	1.00	15.5	0.62	1.55	0.011	1.81
16.0	M.SL.LNB.12	M.SL.LNB.13	6.00	0.009	0.104	353	4	517	54	250	1.00	16.3	0.65	1.58	0.011	1.88
16.0	M.SL.LNB.13	M.SL.LNB.14	6.00	0.009	0.112	357	4	515	58	250	1.00	17.3	0.69	1.60	0.011	1.96
16.0	M.SL.LNB.14	M.SL.LNB.15	12.00	0.017	0.130	361	5	513	66	250	2.80	13.5	0.54	2.47	0.011	1.65
16.0	M.SL.LNB.15	M.SL.LNB.16	12.00	0.017	0.147	366	5	510	75	250	2.80	14.5	0.58	2.54	0.011	1.73
16.0	M.SL.LNB.16	M.SL.LNB.17	12.00	0.017	0.164	370	5	507	83	250	2.80	15.5	0.62	2.60	0.011	1.82
16.0	M.SL.LNB.17	M.SL.LNB.18	12.00	0.017	0.181	375	5	505	92	250	2.80	16.6	0.66	2.65	0.011	1.90
16.0	M.SL.LNB.18	M.SL.LNB.19	12.00	0.017	0.199	379	4	502	100	250	2.80	17.7	0.71	2.69	0.011	2.00
16.0	M.SL.LNB.19	M.SL.LNB.20	12.00	0.017	0.216	384	4	499	108	250	2.80	18.8	0.75	2.72	0.011	2.10
16.0	M.SL.LNB.20	M.SL.LNB.21	12.00	0.017	0.233	388	4	497	116	250	4.30	16.8	0.67	3.29	0.011	1.93
16.0	M.SL.LNB.21	M.SL.LNB.22	12.00	0.017	0.251	392	4	495	124	250	4.30	17.7	0.71	3.33	0.011	2.00
16.0	M.SL.LNB.22	M.SL.LNB.23	12.00	0.017	0.268	396	4	493	132	250	4.30	18.6	0.75	3.36	0.011	2.08
16.0	M.SL.LNB.23	M.SL.LNB.24	12.00	0.017	0.268	399	4	490	131	250	4.30	18.6	0.74	3.36	0.011	2.08
16.0	M.SL.LNB.24	M.SL.LNB.25	6.00	0.009	0.276	403	2	488	135	250	4.30	19.0	0.76	3.37	0.011	2.12

SECTION CARRIAGEWAY-RIGHT- NEW BELGRADE SIDE

WIDTH OF CARRIAGE WAY	SECTION		LENGTH	REDUCED BASIN AREA		FLOW TIME		INTENSITY	Q	PIPE	PIPE	WATER	SPEED OF WATER			a
	FROM	TO	OF SECTION L	OWN	TOTAL	TO UPSTR. END	IN SECTION	OF RAIN I	AT SECTION END	DIAMETER Φ	SLOPE I	DEPTH h	I/O	IN PIPE V	MANNING N	
			(M)	(HA)	(HA)	(S)	(S)	(/Z/IA)	(L/S)	(MM)	(%)	(CM)	(-)	(M/S)	($M^{-1/3}$XS)	
16.0	M.SL.DNB.1	M.SL.DNB.2	6.00	0.009	0.009	300	7	548	5	200	1.00	4.7	0.24	0.84	0.011	1.01
16.0	M.SL.DNB.2	M.SL.DNB.3	6.00	0.009	0.017	307	6	544	9	200	1.00	6.7	0.34	1.02	0.011	1.24
16.0	M.SL.DNB.3	M.SL.DNB.4	6.00	0.009	0.026	313	5	541	14	200	1.00	8.3	0.42	1.13	0.011	1.40
16.0	M.SL.DNB.4	M.SL.DNB.5	6.00	0.009	0.035	318	5	538	19	200	1.00	9.8	0.49	1.22	0.011	1.55
16.0	M.SL.DNB.5	M.SL.DNB.6	6.00	0.009	0.043	323	5	535	23	200	1.00	11.1	0.56	1.29	0.011	1.68
16.0	M.SL.DNB.6	M.SL.DNB.7	6.00	0.009	0.052	328	4	532	28	200	1.00	12.5	0.62	1.34	0.011	1.82
16.0	M.SL.DNB.7	M.SL.DNB.8	6.00	0.009	0.060	332	4	529	32	200	1.00	13.8	0.69	1.38	0.011	1.97
16.0	M.SL.DNB.8	M.SL.DNB.9	6.00	0.009	0.069	337	4	527	36	200	1.00	15.4	0.77	1.40	0.011	2.14
16.0	M.SL.DNB.9	M.SL.DNB.10	6.00	0.009	0.078	341	4	524	41	200	1.00	17.6	0.88	1.40	0.011	2.43
16.0	M.SL.DNB.10	M.SL.DNB.11	6.00	0.009	0.086	345	4	522	45	250	1.00	14.6	0.58	1.52	0.011	1.74
16.0	M.SL.DNB.11	M.SL.DNB.12	6.00	0.009	0.095	349	4	520	49	250	1.00	15.5	0.62	1.55	0.011	1.81
16.0	M.SL.DNB.12	M.SL.DNB.13	6.00	0.009	0.104	353	4	517	54	250	1.00	16.3	0.65	1.58	0.011	1.88
16.0	M.SL.DNB.13	M.SL.DNB.14	6.00	0.009	0.112	357	4	515	58	250	1.00	17.3	0.69	1.60	0.011	1.96
16.0	M.SL.DNB.14	M.SL.DNB.15	12.00	0.017	0.130	361	5	513	66	250	2.80	13.5	0.54	2.47	0.011	1.65
16.0	M.SL.DNB.15	M.SL.DNB.16	12.00	0.017	0.147	366	5	510	75	250	2.80	14.5	0.58	2.54	0.011	1.73
16.0	M.SL.DNB.16	M.SL.DNB.17	12.00	0.017	0.164	370	5	507	83	250	2.80	15.5	0.62	2.60	0.011	1.82
16.0	M.SL.DNB.17	M.SL.DNB.18	12.00	0.017	0.181	375	5	505	92	250	2.80	16.6	0.66	2.65	0.011	1.90
16.0	M.SL.DNB.18	M.SL.DNB.19	12.00	0.017	0.199	379	4	502	100	250	2.80	17.7	0.71	2.69	0.011	2.00
16.0	M.SL.DNB.19	M.SL.DNB.20	12.00	0.017	0.216	384	4	499	108	250	2.80	18.8	0.75	2.72	0.011	2.10
16.0	M.SL.DNB.20	M.SL.DNB.21	12.00	0.017	0.233	388	4	497	116	250	4.30	16.8	0.67	3.29	0.011	1.93
16.0	M.SL.DNB.21	M.SL.DNB.22	12.00	0.017	0.251	392	4	495	124	250	4.30	17.7	0.71	3.33	0.011	2.00
16.0	M.SL.DNB.22	M.SL.DNB.23	12.00	0.017	0.268	396	4	493	132	250	4.30	18.6	0.75	3.36	0.011	2.08
16.0	M.SL.DNB.23	M.SL.DNB.24	12.00	0.017	0.268	399	4	490	131	250	4.30	18.6	0.74	3.36	0.011	2.08
16.0	M.SL.DNB.24	M.SL.DNB.25	6.00	0.009	0.276	403	2	488	135	250	4.30	19.0	0.76	3.37	0.011	2.12

TRAM LANE- NEW BELGRADE SIDE

WIDTH OF CARRIAGE WAY	SECTION		LENGTH OF SECTION	REDUCED BASIN AREA		FLOW TIME		INTENSITY OF RAIN	Q AT Section end	PIPE DIAMETER	PIPE SLOPE	WATER DEPTH	SPEED OF WATER			
	FROM	TO		OWN	TOTAL	AT END	IN SECTION						Š	IN PIPE	MANNING N	a
			L					I		Φ	I	H		V		
			(M)	(HA)	(HA)	(S)	(S)	(L/S/HA)	(L/S)	(MM)	(%)	(CM)	(-)	(M/S)	($M^{-1/3}XS$)	
7.0	CANAL NB.1	CANAL NB.2	6.00	0.004	0.004	300	9	548	2	200	1.00	3.1	0.16	0.66	0.011	0.81
7.0	CANAL NB.2	CANAL NB.3	12.00	0.008	0.011	309	13	543	6	200	1.00	5.4	0.27	0.90	0.011	1.09
7.0	CANAL NB.3	CANAL NB.4	12.00	0.008	0.019	322	12	535	10	200	1.00	7.0	0.35	1.04	0.011	1.26
7.0	CANAL NB.4	CANAL NB.5	12.00	0.008	0.026	334	11	529	14	200	1.00	8.3	0.42	1.13	0.011	1.40
7.0	CANAL NB.5	CANAL NB.6	12.00	0.008	0.034	345	10	522	18	200	1.00	9.5	0.48	1.21	0.011	1.52
7.0	CANAL NB.6	CANAL NB.7	12.00	0.008	0.042	355	9	517	21	200	1.00	10.6	0.53	1.26	0.011	1.63
7.0	CANAL NB.7	CANAL NB.8	12.00	0.008	0.049	364	9	511	25	200	1.00	11.7	0.59	1.31	0.011	1.74
7.0	CANAL NB.8	CANAL NB.9	12.00	0.008	0.057	373	6	506	29	200	2.80	9.3	0.47	2.00	0.011	1.50
7.0	CANAL NB.9	CANAL NB.10	12.00	0.008	0.064	379	6	502	32	200	2.80	10.0	0.50	2.06	0.011	1.57
7.0	CANAL NB.10	CANAL NB.11	12.00	0.008	0.072	385	6	499	36	200	2.80	10.6	0.53	2.11	0.011	1.63
7.0	CANAL NB.11	CANAL NB.12	12.00	0.008	0.079	391	6	495	39	200	2.80	11.2	0.56	2.16	0.011	1.70
7.0	CANAL NB.12	CANAL NB.13	12.00	0.008	0.087	396	5	492	43	200	2.80	11.9	0.59	2.21	0.011	1.76
7.0	CANAL NB.13	CANAL NB.14	12.00	0.008	0.095	402	5	489	46	200	2.80	12.5	0.62	2.24	0.011	1.82
7.0	CANAL NB.14	CANAL NB.15	12.00	0.008	0.102	407	4	486	50	200	4.30	11.4	0.57	2.69	0.011	1.71
7.0	CANAL NB.15	CANAL NB.16	12.00	0.008	0.110	411	4	483	53	200	4.30	11.8	0.59	2.73	0.011	1.76
7.0	CANAL NB.16	CANAL NB.17	12.00	0.008	0.117	416	4	481	56	200	4.30	12.3	0.62	2.77	0.011	1.81
7.0	CANAL NB.17	CANAL NB.18	12.00	0.008	0.125	420	4	478	60	200	4.30	12.8	0.64	2.80	0.011	1.86

Total calculated flow gravitating towards the left bank of the Sava is 330 l/s (135 l/s+135 l/s+60 l/s=330 l/s), adopted separator of nominal flow is 70l/s, while total flow is Qmax=350 l/s.

Institute of Transportation – CIP Ltd. BELGRADE		
RECEIVED August 20, 2020		
illegible	*illegible*	Value
4	913-94/17-1	

MONITORING OF BIRDS AND BATS IN THE AREA OF CONSTRUCTION OF A NEW BRIDGE ON THE RIVER SAVA

(on the site of the Old Sava Bridge)

Report prepared by:

Stefan Skorić, PhD
(*signed*)

Official stamp of Stefan Skorić ENT
CONSULTING ACTIVITY
CLEAN ENERGY CONSULTING
Belgrade

Belgrade, August 2020

INTRODUCTION

The impacts of the construction and use of transport infrastructure on nature are multiple and include numerous aspects: they represent physical obstacles to the movement of animals; increased animal mortality due to running and collisions with vehicles on the road; cause habitat separation; cause loss and destruction of suitable habitats; cause changes in microclimate and hydrological conditions in the area; represent a source of pollution with organic and inorganic pollutants, light and noise; cause an increase in human activity within the areas close to infrastructure (Roads of Serbia, 2012).

Large cities, as the last stage in the development of settlements, have specific "urban" fauna. Its formation, development, composition and number of individual species are conditioned by series of factors. In the first place, one should keep in mind not only the geographical position but also the composition and structure of the fauna in the historical context, i.e. before the creation of a city. The development and condition of urban infrastructure, urbanization and the degree of synanthropization of nearby areas are factors that externally affect the formation and specific features of urban fauna. Also of even greater importance are factors within the city itself, such as the presence of green areas, common grasslands, parks, sports fields, water surfaces, rivers and lakes.

Belgrade, as one of the metropolises of southern Europe and the Balkans, has a specific fauna whose composition and structure are influenced by all the above factors. However, the presence of two large rivers and their banks and almost untouched islands at their confluence are something very specific that no other large city in the region has. Birds are certainly the most noticeable group of animals of the entire Belgrade fauna. Although records of the presence of certain bird species in the area of Belgrade date back to the 19th century, systematic monitoring of bird fauna dates back to the second half of the 20th century. To this day, the bird fauna in the area of Belgrade is regularly explored.

Previous research established the presence of about 200 (196) bird species in the area of the Belgrade confluence, the Great and Little War Islands, while for the entire IBA area of the confluence of the Sava into the Danube, about 210 species have been recorded, while the actual species richness goes probably up to 230 species.

The location envisaged for the construction of the bridge over the Sava River on the site of the old Sava Bridge is located about 2,5 km from the confluence of the Sava and the Danube. There are no protected natural resources at this location. The closest protected area is the "Great War Island", an

"Habitats of the Pygmy Cormorant i.e. *Phalacrocorax pygmaeus* on the Sava river in Belgrade" i.e. the wintering site of this species in a triangle from the lower peak of Ada Ciganlija Lake-Belgrade Fair-Mala Ciganlijana. This area is located about 2,3 km from the site envisaged for the construction of the bridge. Also, the location is partly situated in the ecologically important area of the "Confluence of the Sava into the Danube", a part of the ecological network of the Republic of Serbia, as well as the internationally important area for birds under the same name and classification code: RS017IBA. The entire IBA (Important Bird Area) covers an area of 10 km of the Sava River and 39 km of the Danube flow. It also includes the forests of Makiš, Sava Lake, Ada Ciganlija and Međica, and along the Danube, it connects the floodplain complexes of Beljarica, Kožara, the islands at the confluence of the Sava (Great and Little War Islands), and the Tamiš (Forkontumac, Čakljanac, Štefanac and Donja ada), as well as the area of the carp pond "Mika Alas" - former Veliko Blato.

The IBA area of the confluence of the Sava and the Danube was identified based on the presence of three bird species according to the criteria for regionally important areas at the European level (B criteria). Include the Pygmy Cormorant i.e. *Phalacrocorax pygmaeus*, the Black-crowned night heron *(Nicticorax nicticorax)* and the white-tailed eagle *(Haliaetus albicilla).* The location designated for the construction of the bridge over the Sava on the site of the old Sava bridge does not represent a significant area in any period of the year (nesting, wintering, migration), nor a significant feeding area.

The largest night roosts of Pygmy Cormorants in Serbia is located a few kilometres upstream from the location of the construction of the bridge, but this locality is important only during the winter period. Since there is already an old bridge at the location of the new bridge over the Sava, the birds are already used to this barrier, so no negative effect of this building on this species is expected. Upon arrival at their night roosts, Pygmy Cormorants move along the rivers (Sava and Danube) and cross all the existing bridges on the Sava (Branko's Bridge, Old Tram bridge, Gazela, Railway bridge) before landing. For that reason, the works on raising the supporting pillars and other structures should not have any impact on this species.

For the last twenty years, Black-crowned night heron have not nested on the Great and Little War Islands, but mainly around the Mika Alas fishpond or the City Forest near Pančevo. At the bridge construction site, individual specimens can be found in the period from March to September.

The white-tailed eagle is a species with a large distribution range. The nearest nesting site of this species to the site planned for the bridge construction is the Great War Island where one pair nests. It occupies a territory of about 5-8 km around the nest. Individual specimens of this species are seen

throughout the year around the design location site but mostly at higher altitudes. Since this area does not represent a significant feeding area, the construction of the bridge should not have any negative impact on this species.

The rivers Sava and Danube in the area of Belgrade represent an important gathering place for birds of water habitats, especially in the winter. During previous research, the presence of about 40 bird species ranging from the orders of Gaviiformes, Podicipediformes, Pelecaniformes, Ciconiformes, Anseriformes and Gruiformes was noted. The total number of species is highest in late autumn, winter and early spring. Winter visitors that leave in February and March by far outnumber the number of migrants who return in that period. The smallest number of species is present in early autumn, only to start growing abruptly in late autumn. The most important gathering place for birds in the winter is around the Little War Island, along the right bank of the Great War Island all the way to the middle of the waterway (Paunović, 1991). This indicates that the sector of the Sava River in the zone of the bridge construction works does not represent a significant gathering place for larger aggregations of waterfowl, therefore, the impact of construction is small.

The construction of the old Sava bridge, where the new bridge will be built, is not a gathering place for a large number of birds at any time of the year, nor is it a nesting place for some colonial species (e.g. rural and urban swallows), therefore, removal of the old and building the new bridge will disturb the birds or their nests.

So far, 29 species of bats have been recorded in Serbia, within 10 genera and two families, as follows: Horseshoe bats (Rhinolophidae) - all 5 European species and Vespertilionidae - 24. This number is considered temporary, because the geographical position, climatic and ecological characteristics of Serbia give hope for the presence of at least 5 more species (Paunović et al., 2011).

Some species have adapted well to the urban environment, where they can complete their entire life cycle, finding enough food and shelter. The city centre is most often characterized by intensive traffic and the densest human population. These are the oldest parts of the city with a large number of old buildings suitable for shelters. The outskirts of the city is an important bat feeding area, due to larger green and water surfaces and less pollution that result in higher insect population density. So far, the presence of 15 species of bats has been recorded in Belgrade, where they find adequate habitats, hunting territories and numerous shelters (Paunović et al., 2011).

METHODOLOGY

Data on the presence of birds (primarily birds of aquatic habitats), as well as their numbers were collected in the period from October 2019 to July 2020. Details on the period of field data collection are presented in Table 1. Since the largest number of birds on Belgrade's rivers is present during migration and the winter period, in the period from October to April, bird counting was done twice a month in the morning, as well as monitoring the evening flight of Pygmy Cormorants to the night roost. In other months, monitoring was performed once a month. During observation, special care was taken to ensure that the meteorological conditions were adequate (good visibility, no precipitation, no strong wind), which was not always possible during the winter months. The birds were observed and counted in the sector of the Sava River from Branko's Bridge to the Gazela Bridge. The flight of Pygmy Cormorants was recorded from the Sava promenade at the level of the Old Sava Bridge.

Data on the presence of different species of bats in the area envisaged for the construction of a new bridge over the Sava River is planned to be conducted in the period from March to July 2020. Due to the "emergency" situation caused by the COVID-19 virus epidemic, monitoring was conducted from May to July. Details on the period of field data collection are presented in Table 1. Data on the presence of bats were collected using bat detectors (automatic and manual). Ciel CDP 102 R3 Box and hand-held Pettersson D240X automatic detectors were used. Automatic detectors are placed at the same points each time, namely: detector 1 - N44.812930°, EO20.445305°; detector 2 - N44.809945°, EO20.444658°. Using a hand-held detector, the activity of bats on the 1.2 km long transect on the stretch from Branko's bridge to Gazela was recorded. Batsound 4.1 software was used to analyse the recorded material and identify the species. The recording was carried out in the period of half an hour before sunset and an hour after sunset, on the New Belgrade bank of the Sava from Branko's bridge to the Gazela bridge. In addition, a visual inventory of the existing construction of the Old Sava Bridge and old trees in the Staro Sajmište park was performed in order to determine possible shelters for bats.

Table 1. Calendar of birds and bats exploration in the area envisaged for the construction of the New Bridge on the Sava

	October	November	December	January	February	March	April	May	June	July
Birds	30/10/	12/11/	14/12/	23/01/	08/02/	11/03/	18/04/	17/05/	09/06/	16/07/
Pygmy Cormorant	14/10/	12/11/	14/12/	15/01/	08/02/	11/03/	18/04/	17/05/	09/06/	16/07/
	30/10/	23/11/	26/12/	23/01/	24/02/	27/03/				
Bats								14/05/	18/06/	11/07/

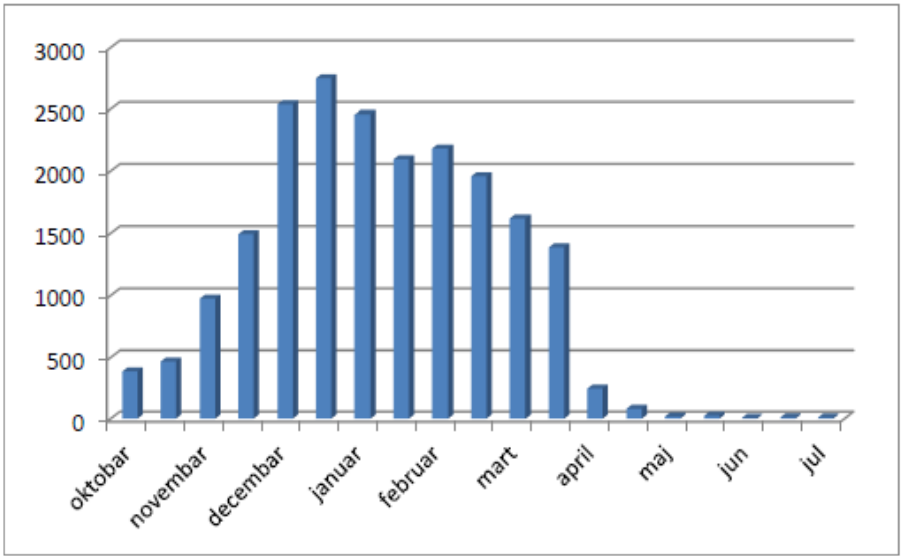
RESULTS

During the monitoring of birds, the presence of 21 species related to aquatic habitats was recorded. The most numerous species recorded during the research period are the mallard duck, pygmy cormorant and black-headed gull. These species were recorded in larger or smaller numbers during all months of monitoring. The greatest attention during the research was paid to the species due to which the area of the confluence of the Sava into the Danube has been declared a habitat important for birds (IBA area), namely for the species such as pygmy cormorants, the black-crowned night heron, and the white-tailed eagle.

The white-tailed eagle was recorded only three times in high flight during the subject monitoring, although it was expected that it would be recorded several times due to the proximity of the nesting territory.

Black-crowned night herons had been present in the study area since the end of March. Mostly single individuals or rarely groups of 2 - 4 birds were recorded. The nearest nesting place of this species is the City Forest near Pančevo, and on the Sava coastal area, certain individual specimens feed during the nesting period.

Pygmy Cormorants were recorded during all months of the study. The numbers increased from October to the end of December when the largest number of individual specimens was recorded (2749), while the number fluctuated during January and February (probably due to weather conditions), and decreased from March to July (Graph 1).



Graph 1. Number of pygmy cormorants on the Sava near the Sava bridge.

Of the other bird species within the explored area, a significant number of mallard ducks (*Anas platyrhynchos)*, Eurasian coots (*Fulica atra*) and black-headed gull (*Larus ridibundus*) were also present. The mallard duck was recorded during the entire research period and had the highest number in January, when 950 individual birds were recorded. Eurasian coot was also recorded during the entire monitoring period, and the highest number of them was recorded in January, i.e. 375 birds. The black-headed gull, like the previous two species, had the highest number in January, when 374 birds were recorded during the monitoring.

The list of other bird species of smaller recorded number is presented in Table 1.

Table 1. List of registered bird species of aquatic habitats on the part of the Sava between Branko's bridge and Gazela bridge.

Species	Serbian name of the species
Podiceps cristatus	ćibasti gnjurac (great crested grebe)
Tachibaptus ruficolis	mali gnjurac (little grebe)
Phalacrocorax carbo	veliki vranac (great cormorant)
Ardea cinerea	siva čaplja (grey heron)
Cosmerodius albus	velika bela čaplja (great white egret)
Egretta garzetta	mala bela čaplja (little egret)
Cygnus olor	labud grbac (mute swan)
Anas crecca	patka krdža (Eurasian teal)
Anas strepera	patka čegrtuša (gadwall)
Anas querquedula	patka grogotovac (garganey)
Aythya ferina	riđoglava patka (common pochard)
Aythya niroca	patka crnka (ferruginous duck)
Aythya fuligula	ćubasta patka (tufted duck)
Mergus serator	mali ronac (red-breasted merganser)
Gallinula chloropus	barska koka (common moorhen)
Larus cachinans	sinji galeb (caspian gull)
Larus canus	sivi galeb (Common gull)
Alcedo atthis	Vodomar (common kingfisher)

During the monitoring of the presence of bats in the area around the Old Sava Bridge, the presence of three species of bats was registered. The presence of the Kuhl's pipistrelle (*Pipistellus kuhli*), common pipistrelle (*Pipistrelluspipistrellus*) and common noctule (Nyctalus noctula) were noted. All three species used the study area as a feeding area. Performing the inventory of the bridge and old trees, the presence of bat shelters was not determined. However, considering that a large number of old dilapidated houses are present in the hinterland of the Staro Sajmište park, the possibility that their shelters are not located in that cannot be ruled out completely.

CONCLUSION

The construction of the bridge over the Sava on the location of the old Sava bridge will not lead to the disturbance of the surrounding natural habitats (tree cutting in the coastal area) or the demolition of old buildings in the vicinity that serve as shelters for bats, therefore, the only negative impact on bat fauna can be caused by collisions with vehicles upon the re-establishment of traffic across the bridge.

The lighting of the traffic infrastructure increases the number of insects along the roads, which attracts their predators (bats). Bat collisions with vehicles in most cases end tragically for bats. To that extent, special care should be taken to choose the lighting for the future bridge in order to reduce the effect of attracting insects and bats to a minimum.

In addition to all the above, in order to record the possible negative impact of the bridge on the birds and bats fauna (primarily in the form of direct damage from collisions with installations, infrastructure elements and vehicles), it is necessary to monitor these groups during construction and in the first year after commissioning, in order to record potential losses and take measures to prevent or reduce them.

LITERATURE:

Public Enterprise “Roads of Serbia” (2012) Priručnik za projektovanje puteva u Republici Srbiji. (Manual for road design in the Republic of Serbia.) Pp. 1-23. Belgrade

Paunović, M., Karapandža, B., Ivanović, S. (2011). Slepi miševi i procena uticaja na životnu sredinu - Metodološke smernice za procenu uticaja na životnu sredinu i strateško procenu uticaja na životnu sredinu. (Bats and environmental impact assessment - Methodological guidelines for environmental impact assessment and strategic environmental assessment.) Wildlife Conservation Society “MUSTELA“, 1-142, Belgrade.

Paunović, M. (1991). Struktura i sezonska dinamika faune ptica beogradskog ušća i njegovih ostrva - Gaviiformes, Podicipediformes, Pelecaniformes, Ciconiformes, Anseriformes i Gruiformes. (Structure and seasonal dynamics of the bird fauna of the Belgrade estuary and its lands - Gaviiformes, Podicipediformes, Pelecaniformes, Ciconiformes, Anseriformes and Gruiformes.) Graduation Thesis, Faculty of Biology: l-44.Belgrade.

Puzović, S., Sekulić, G., Stojnić, N., Tucakov, M. (2009). Značajna područja za ptice u Srbiji. (Important Bird Areas in Serbia). Ministry of Environment and Spatial Planning, Institute for Nature Conservation of Serbia, Provincial Secretariat for Environmental Protection and Sustainable Development.