

TERMS OF REFERENCE (TOR) FOR CONSULTANCY SERVICES
FOR THE PREPARATION
OF TECHNICAL DOCUMENTATION FOR THE RECONSTRUCTION
AND EXTENSION OF THE NOVA GALOVICA PUMPING STATION
AND
REHABILITATION OF THE GATE ON THE NOVA GALOVICA CANAL

Belgrade, 2024.

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1 BACKGROUND

Hydromelioration system (HMS) Galovica covers an area of 71,600 ha and extends over two land reclamation areas:

- 28,411 ha belong to the land reclamation area "Belgrade Sava 1" (the municipalities of Zemun, Novi Beograd and Surčin) – under the jurisdiction of Public Water Management Company (PWMC) "Srbijavode",
- 43,189 ha belong to the land reclamation area "Srem" (municipalities of Ruma, Stara Pazova and Pećinci) – under the jurisdiction of PWMC "Vode Vojvodine".

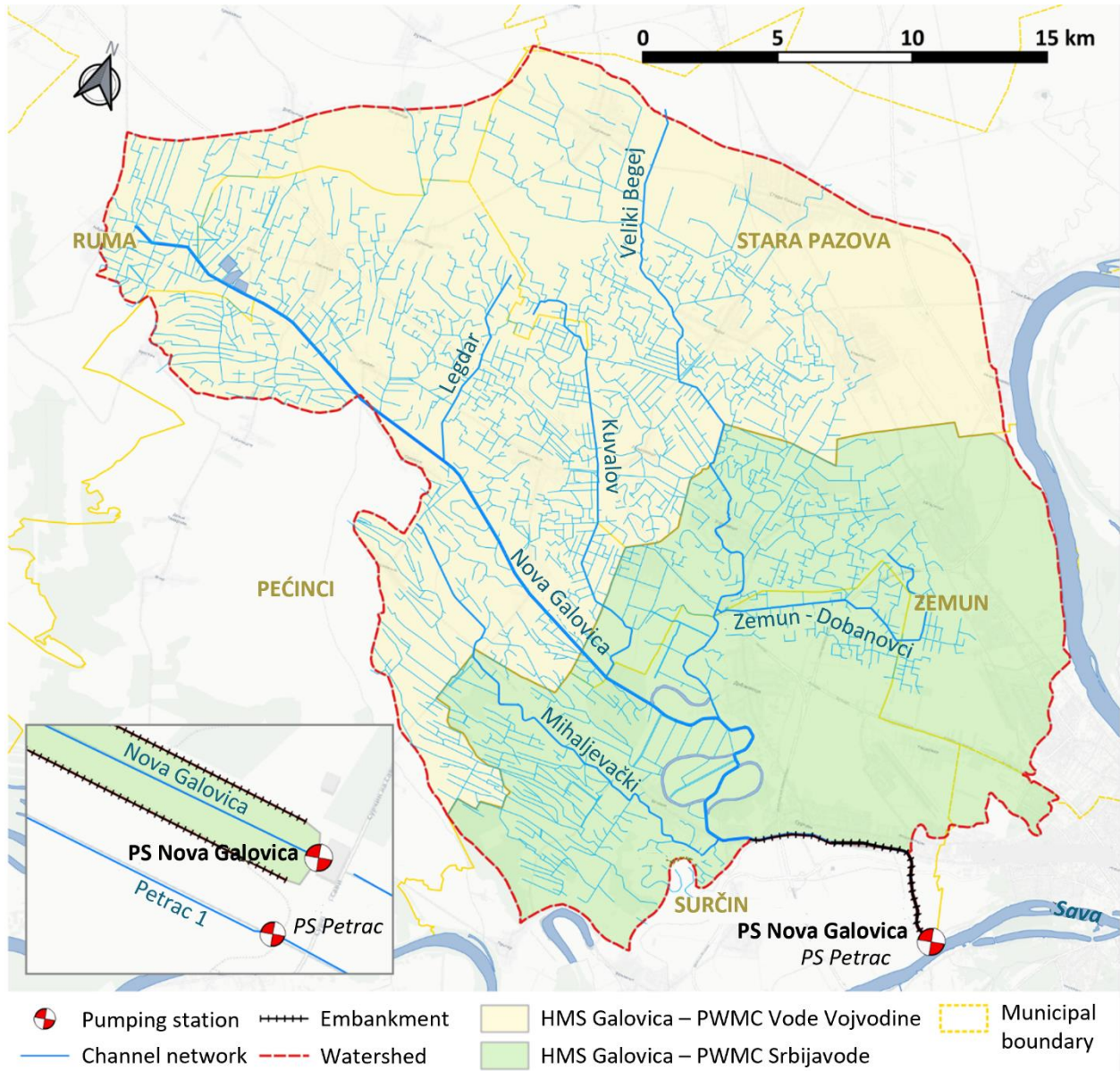


Figure 1. Hydromelioration system Galovica

The area of HMS Galovica is predominantly agricultural, which is why the previous hydrotechnical solutions and built systems and facilities were dedicated to the protection of agricultural land from excess water, and to a lesser extent irrigation, with the aim of establishing stable agriculture.

The concept of water protection in the HMS Galovica basin rests on a dense canal network with a total length of 1,401 km and the main canal Nova Galovica with a length of 46.8 km, which represents the backbone of

the system. All excess precipitation and groundwater from the area eventually ends up in the Nova Galovica canal, which distributes it to the Nova Galovica pumping station, which pumps that water into the recipient, the Sava River.

The name of the basin dates back to 1880, when a canal was dug through the Galovica pond. At that time, the waters of Fruška Gora gravitated into these low areas near the Sava River and covered huge areas, making them unusable for agricultural production. In the beginning, the Galovica canal drained excess water into the Dobanovci pond, and then it was extended to Bežanija. In both cases, the drainage of water into the Sava River was by gravity. Due to the constant expansion of the canal network and the reduced effect of removing excess water at the beginning of the 20th century, the Galovica pumping station was built, the capacity of which increased until 1966, when the Nova Galovica pumping station was built, at the then new location, in the defended zone at the Sava River chainage – km 11+465, where it is still located today.

The Nova Galovica pumping station is located at the end of the Nova Galovica canal at the confluence to the Sava River, in Donje Polje near Novi Beograd, and right next to the Petrac pumping station. It is intended for the evacuation of excess precipitation and groundwater on the territory of the municipalities of Zemun, Novi Beograd, Surčin, Ruma, Stara Pazova and Pećinci. On the right bank of the Nova Galovica canal, there is a smaller part of the watershed, with the Mihaljevački canal as the largest tributary. The northern part of the watershed covers 60% of its territory, where the Veliki Begej canal, which has the largest sub-basin, flows into the Nova Galovica canal on the left bank.

Between the canals Nova Galovica and Petrac 1, a connecting canal with a gate was built, which enabled the gravitational outflow of water from the canal Nova Galovica to the Petrac 1 canal. The position of the Petrac and Nova Galovica pumping stations, as well as the capacity of the installed pumping units, conditions the mutual joint operation of the pumping stations, whereby the smaller flows are pumped over by the Petrac pumping station due to the lower consumption of electricity.

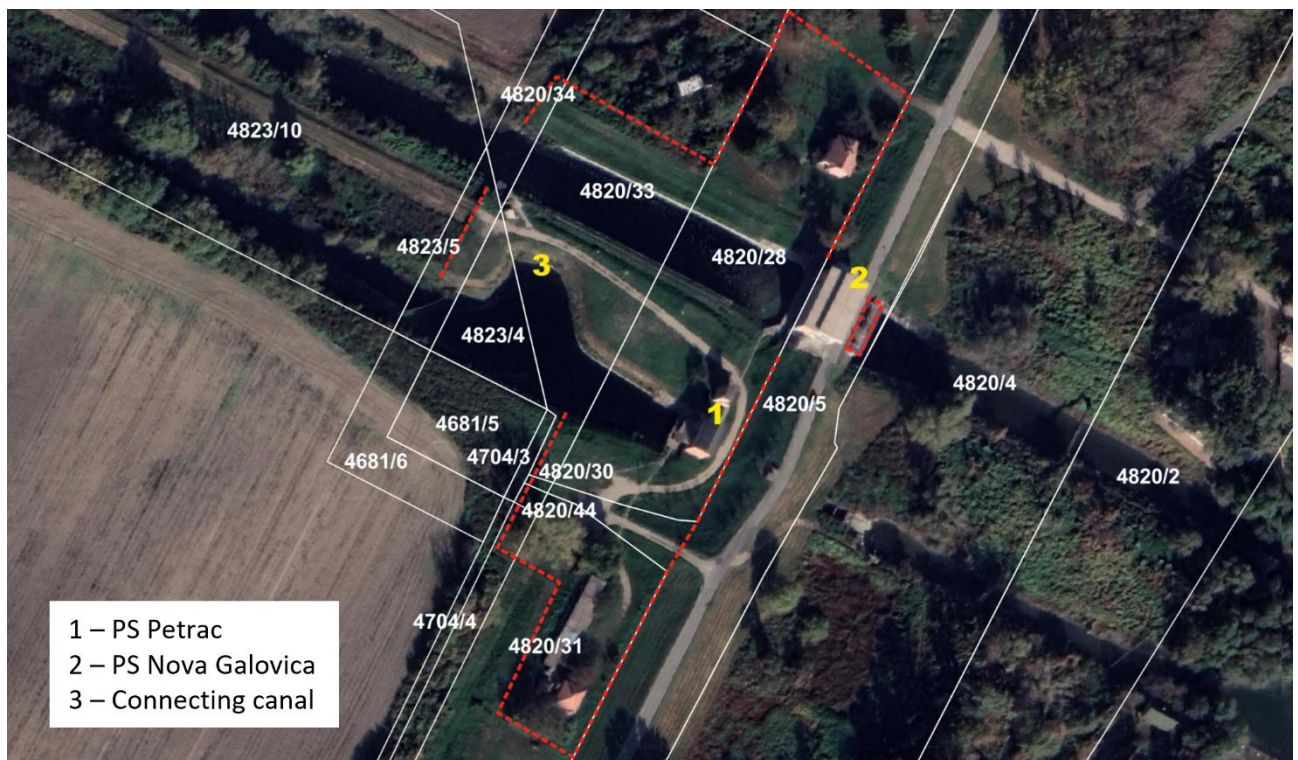


Figure 2. Pumping station Nova Galovica and pumping station Petrac

The gate between the Nova Galovica and Petrac 1 canals is usually closed, and is opened when it is necessary to reduce the water level in the Nova Galovica canal, if the water level of the Sava River is so high that it is not possible to open the gate on the Nova Galovica canal so that the water flows into the Sava River by gravity.

The mode of operation of the pumping station Nova Galovica and the pumping station Petrac depends on the water level in the Petrac 1 and Nova Galovica canals, the water level in the Sava River, rainfall and the need to irrigate agricultural land.

The operating mode that the pumping stations maintain today are:

- The Petrac pumping station starts at an altitude of 70.20 m above sea level, and shuts down at an altitude of 69.90 m above sea level.
- The Nova Galovica pumping station starts at an altitude of 71.20 m above sea level, and shuts down at an altitude of 70.60 m above sea level.

In the Nova Galovica pumping station, three vertical pumping units ($Q = 5,800-8,800$ l/s, $H = 5.5 - 2.5$ m) are installed, which are operated manually.

The pumping units are supplied via the substation in the building of the pumping station, where there are three transformers (630 kVA, 10/3 kV) for powering the pumping station Nova Galovica, one transformer (1000 kVA, 10/6 kV) for powering the units at the pumping station to the Petrac station and two transformers (100 kVA, 10/0.4 kV) for own consumption and supply of auxiliary devices. The total installed capacity of the substation is 2.7 MVA, and it is fed through an underground cable laid under the asphalt road at a depth of about 2.5 m below the crown of the embankment.

Within the pumping station, the replacement of the power supply and control cabinets and the system of starting high-voltage drive motors was done in 2020.

The Nova Galovica pumping station itself is rarely in operation, primarily due to the need to hire a large number of workers and electricity to run it, which is why the water that comes to this pumping station is mostly diverted to the Petrac pumping station.

The Nova Galovica canal was trained in 2020, directly in front of the pumping station facility, by lining the bed by concrete in the first 100 m from the inlet basin. The upstream part of the canal is unmaintained, overgrown with woody and grassy vegetation. The consequence of that is a large amount of floating plant mass that reaches the pumping station and requires the engagement of labor to remove it.

A special problem is represented by the hydrotechnical facilities (gates, culverts, etc.), which play an important role within HMS Galovica. Employees of the water company do not have access to the gates on the Nova Galovica canal (km 20+181), downstream from the military farm Dobanovački Zabran. There are three gates dimension 2x3 m installed, which are managed manually. The gate is significant considering that upstream of it there is a large part of the watershed.

The high degree of urbanization in the basin has led to increased demands for the concentrated release of atmospheric and purified used water into the canal network, including water from already built-up areas of industrial zones and airports. To that balance should be added the planned development in the Surčin municipality and the construction of numerous facilities in that area.

2 OBJECTIVE OF THE ASSIGNMENT

The subject of the preparation of technical documentation within this project assignment is the optimization of the capacity of the existing pumping station Nova Galovica, along with its modernization and automation of work, as well as the modernization and automation of the work of the gate on the Nova Galovica canal (km 20+181). It should be emphasized that the canal network as part of the hydromelioration system, including all hydraulic and other structures outside the scope of the pumping station and outside the scope of the gate, are not subject to technical documentation.

The **general goal** of the preparation of technical documentation – Conceptual Design, Feasibility Study with Preliminary design and Construction Permit Design with accompanying studies and reports is to increase the efficiency and safety of the operation of the pumping station and the gate, bearing in mind their importance for the effective protection of agricultural and urban areas within the framework of hydromelioration system, and especially taking into account the increased urbanization, especially along the downstream part of the stream, including the amount of atmospheric and purified used water that is discharged into the canal network.

The goals of implementing technical solutions that will be defined by technical documentation are:

- Safe and flexible operation of the pumping station and gate by ensuring sufficient capacity and full operational readiness.

With this goal, it is achieved that the pumping station and gate are in a functional state – full operational readiness and that they have the correct equipment with satisfactory characteristics according to their purpose. The benefits of fulfilling this goal are reflected in increased security of the flood protection system, improved protection of agricultural, urban and industrial units, protection of natural and cultural assets within the existing systems.

- Increasing operational readiness and reducing management and maintenance costs, which is achieved by modernizing and automating the pumping station and gate of modern information and telecommunication infrastructure that provides the possibility of remote monitoring and management.

With this aim, it is proposed to install modern equipment and equipment for automatic monitoring of work in order to reduce maintenance costs, electricity consumption costs and implement adequate monitoring of work. By automating and modernizing the equipment at the pumping station and the gate, the operational readiness of the facility to respond to the needs of the system is additionally increased, and the influence of the human factor and the costs of regular maintenance are reduced (cleaning of grates, the number of people required to work in the field, frequent overhauls of outdated equipment, etc.). At any moment, it will be possible to see the current operation of the equipment, the amount of pumped water (at the pumping station) and any problems that require intervention. Fulfilling the goal will provide the possibility of remote control and reduce the risk of the human factor.

- Ensuring the facility's safety conditions.

This aim should reduce the risks of unauthorized intrusions into the facility and equipment damage. Considering that the pumping station and the gate are outside the inhabited area and without a permanent crew, it is necessary to consider adequate protection measures.

3 SCOPE OF SERVICES

Bearing in mind the stated objectives, the general content of the technical documentation for this Terms of Reference is as follows:

- Hydrological-hydraulic study;
- Conceptual Design for the reconstruction and extension of the Nova Galovica pumping station;
- Feasibility study with Preliminary Design for the reconstruction and extension of the Nova Galovica pumping station;
- Construction Permit Design for the reconstruction and extension of the Nova Galovica pumping station;
- Preliminary Design for the rehabilitation of the gate on the Nova Galovica canal, km 20+181.

4 TASKS

Conceptual Design is a set of mutually agreed projects that define the position and capacity of the facility on the site, functionality, spatial design, choice of structural system, choice of building products and required performance in relation to their essential characteristics, installation and choice of equipment, thus ensuring the fulfillment of basic requirements for the facility, etc.

The Conceptual Design is created for the purposes of obtaining location conditions.

The Preliminary Design is created for the purposes of:

- construction of the facility and execution of works for the facilities referred to in Article 133 of the Law on Planning and Construction and is subject to expert control by the audit committee. The Preliminary Design is created for the purposes Feasibility Study;
- or construction of the facility and execution of works from Article 145 of the Law on Planning and Construction for obtaining the Decision on approval for the execution of works.

The Feasibility Study determines, in particular, the spatial, ecological, social, financial, market and economic justification of the investment for the chosen solution, elaborated in the Preliminary Design, on the basis of which a decision is made on the feasibility of the investment and the initiation of the procedure for issuing a construction permit.

The Preliminary Design is a set of mutually agreed projects that determine: the purpose, location, shape, capacity, functional characteristics and appearance of the facility, describe the works and prove the fulfillment of the basic requirements for the facility, depending on the type and class of the facility, i.e. the works that are performed.

The Preliminary Design for the reconstruction and extension of the Nova Galovica pumping station is being prepared according to Article 133 of the Law on Planning and Construction.

The Preliminary Design for the rehabilitation of the gate on the Nova Galovica canal, km 20+181 is being prepared according to Article 145 of the Law on Planning and Construction.

The Construction Permit Design is a set of mutually agreed designs that define the position and capacity of the facility on the site, functionality, spatial design, choice of construction system, dimensioning of the main construction elements, selection of construction products and required performance related to their essential characteristics, installation and selection of equipment, which ensures the fulfillment of location conditions and basic requirements for the facility, etc.

The Construction Permit Design is prepared for the purposes of obtaining the construction permit.

The content and form of the Conceptual Design, Feasibility Study with the Preliminary Design and the Construction Permit Design are prescribed by the Rulebook on the content, method and procedure of preparation and the method of control of technical documentation according to the class and purpose of the facilities ("Official Gazette of the RS", no. 96/23) – hereinafter referred to as the Rulebook.

According to the Rulebook, each part of the Conceptual Design (Volume), Preliminary Design (Volume) and Construction Permit Design (Volume) must contain the following units:

- **General documentation** that includes: basic information about the legal entity that developed the design, the responsible designer, statement on the appointment of the responsible designer, statement of the responsible designer, data on the place and date of the design, the content of the design and other information in accordance with the Rulebook.
- **Textual documentation** that contains a technical description of the designed facility with a specification of the required capacities.
- **Numerical documentation** that contains a representation of the surfaces of facilities with purposes and the number of functional units. Numerical documentation also contains appropriate calculations depending on the type of design.

- **Graphic documentation** containing graphic representations in accordance with the Rulebook.

Task 1: Hydrological-hydraulic study

The hydrological-hydraulic study needs to define the water level and flow regime on the profile of the gate on the Nova Galovica canal at km 20+181 and on the profile of the Nova Galovica pumping station, as well as the water level and flow regime of the Sava River on the profile of the Nova Galovica pumping station.

The water regime on the profiles of the Nova Galovica canal should be defined on the basis of hydrological models of rainfall-runoff and the hydraulic model of flow in the canal network.

The flow and water level regime of the Sava River on the profile of the Nova Galovica pumping station should be defined using the appropriate software package for simulating flow in a complex river system (mouths, branches, etc.) and hydraulic processes in the reservoir with relevant processes at the dam, in order to appropriately take into account the impact of the operation of the Đerdap Hydroelectric Power Plant. Using the developed software package for simulation, and in accordance with the available data, it is necessary to apply a hydraulic model that takes into account the current mode of operation of HPP "Đerdap 1" and the tributaries in the zone of influence of the reservoir.

As part of the hydrological-hydraulic study, it is necessary to:

- perform hydrological modeling on the Nova Galovica canal basin:
 - define the calculated maximum precipitation amounts for rains of different durations (up to three days), occurrence probabilities of 1%, 2%, 5%, 10%, 20% and 50%,
 - define computational hydrographs for a historical period of minimum length of 30 years at the inflows of the lower-order canal into the Nova Galovica canal,
 - analyze the distribution of average daily flows at the annual level and for selected periods (vegetation, non-vegetation or other periods),
 - define the hydrographs of large waters for the calculated maximum amounts of precipitation on characteristic profiles along the canal (inflows, gates, culverts, pumping stations and others) with a probability of occurrence of 1%, 2%, 5%, 10%, 20% and 50%,
- perform hydraulic modeling for the existing dimensions of the bed (assuming that the bed is not loaded with sediment, bearing in mind that the bed cleaning campaign is coming) and existing facilities and define:
 - water levels and discharges of the Nova Galovica canal on the profile of the gate on the Nova Galovica canal at km 20+181 and on the profile of the Nova Galovica pumping station for the historical period,
 - water levels and discharges for computational hydrographs of large waters, for the inflow from all sub-basins, including the inflow from all users for which the PWMC has issued consent to release water into the canal,
- perform a flow simulation in the complex river system of the Danube River and its tributaries upstream of HPP Đerdap 1 and define:
 - water levels and discharges of the Sava River on the profile of the Nova Galovica pumping station for the historical period,
 - water levels and discharges of the Sava River on the profile of the Nova Galovica pumping station for large waters of characteristic return periods in the conditions of coincidence with the levels of large waters of the Danube River of the same return period,
- carry out analyzes of the water level of the Sava River on the profile of the Nova Galovica pumping station and the water level in the Nova Galovica canal on the profile of the Nova Galovica pumping station for the purposes of determining the capacity of the pumping station – curves of the duration of average daily flows for different periods (year, vegetation period, others).

Task 2: Conceptual Design for the reconstruction and extension of the Nova Galovica pumping station

The Conceptual Design for the reconstruction and extension of the Nova Galovica pumping station requires the definition of technical solutions in order to optimize the capacity of the pumping station, increase the efficiency, flexibility and safety of the operation of the pumping station, along with the modernization and automation of hydraulic and electrical equipment.

Using the results of the hydrological-hydraulic study, a hydraulic analysis of the operation of the pumping station should be performed at different water levels in the Nova Galovica canal and the Sava River. On that basis, the mode of operation of the Nova Galovica pumping station and the content and scope of its reconstruction should be defined, which generally refers to:

- capacity revitalization in the existing mechanical building,
- increase in capacity with the extension of a pumping station with accompanying facilities on the supply and pressure taps into the outlet channel and
- automation of pumping station operation.

The revitalization of the capacity of the pumping station in the existing machine building should be considered through the analysis of the following aspects:

- Hydromechanical equipment – perform an analysis of the current condition with reference to the problems in the work so far and, on that basis, make and justify the decision on the replacement or overhaul of certain elements of the existing equipment.
- Electrical equipment – perform an analysis of the medium-voltage plant with power transformers, the cabinet of the electric drive of the pumps and the general electrical installation (take into account the power of the pumps and other equipment specified in the mechanical part of the design).
- Reconstruction of the pumping station building – define the necessary construction works for the reconstruction of the pumping station building.

The expansion of the pumping station with accompanying facilities at the inlet and outlet channel should be considered through the analysis of the following aspects:

- Location and dimensions of the pumping station,
- Capacity and number of pumps,
- Connection of the inlet chamber with the Nova Galovica canal,
- Pressure tap solution with associated reinforcement,
- The connection of the outlet building with the drainage canal.

For the revitalized and extended pumping station, automation of its work should be foreseen, that is, a concept of expansion or installation of measuring, control and telecommunication equipment should be provided.

The Conceptual Design should consist of volumes listed in the following table.

Table 1. Name and numbering of the technical documentation of the Conceptual Design

Ser. No.	No. Volumes	Name
1.	0.	Main Volume
2.	1.	Architecture design
3.	2.1	Construction design
4.	3.	Hydrotechnical installations design
5.	4.	Power installations design
6.	6.	Mechanical installations design
7.	Study	Hydrological-hydraulic study
8.	Report	Current Condition Report

The number of volumes within a certain type of design may be different from the one proposed.

Along with the Conceptual Design, the Contractor will prepare and attach a unique Hydrological-hydraulic study, as defined in the chapter 0.

Along with the Conceptual Design, the Contractor will prepare and attach the pumping station Current Condition Report. The report presents an analysis of the condition of the facility after a detailed reconnaissance of the surrounding terrain and inspection of the facility and equipment, an analysis of the functionality of facilities and equipment, as well as an analysis of observed deficiencies in the operation of hydromechanical and electrical equipment.

Task 3: Feasibility Study with Preliminary Design for the reconstruction and extension of the Nova Galovica pumping station

The Feasibility Study for the design of reconstruction and extension of the Nova Galovica pumping station should be done according to the content and procedure of the preparation of the Feasibility Study are defined by the Rulebook on the content and scope of previous works, Prefeasibility Study and the Feasibility Study ("Official Gazette of the Republic of Serbia" No. 1/2012). The Feasibility Study should contain the following elements:

- Information about the client and the authors of the Feasibility Study,
- Introduction,
- Objectives and purpose of investing,
- Facility description,
- Analysis of investor development opportunities,
- Methodological basis of the preparation of the Study,
- Technical and technological solution in Preliminary Design,
- Market aspects,
- Spatial aspects,
- Ecological aspects,
- Economic costs,
- Profit – benefits,
- Financial efficiency with an assessment of profitability and liquidity,
- Social and economic efficiency
- Analysis of investment sensitivity and risk,
- Analysis of sources of funding of financial obligations and dynamics,
- Analysis of organizational and personnel aspects,
- Conclusion on the feasibility of the investments.

With the technical documentation of the Preliminary Design for the reconstruction and extension of the Nova Galovica pumping station, it is necessary to develop a solution defined by the Conceptual Design and Location Conditions. In this sense, the content and scope of its reconstruction, which generally refers to:

- capacity revitalization in the existing mechanical building while keeping the current labor force
- increase in capacity with the extension of a pumping station with accompanying facilities on the supply and pressure taps into the outlet channel and
- automation of pumping station operation.

The revitalization of the capacity of the pumping station in the existing machine building should be considered through the analysis of the following aspects:

- Hydromechanical equipment – on the basis of the performed analysis of the existing condition given in the Conceptual Design and the decision on the replacement or overhaul of certain elements of the existing equipment, develop dispositional solutions. Give an estimate of the required investments.
- Electrical equipment – based on the requirements from the mechanical part of the design, provide a more detailed analysis of the medium-voltage plant with power transformers, the cabinet of the electric drive of the pumps and the general electrical installation. Give an estimate of the required investments.
- Reconstruction of the pumping station building – Carry out construction work on the reconstruction of the pumping station building. Give an estimate of the required investments, including management options for safe disposal of obsolete and malfunctioning pumps, and spare parts.

The extension of the pumping station with accompanying facilities at the inlet and discharge into the drainage canals includes the definition, elaboration and assessment of the necessary investments:

- Disposition solution of the pumping station,
- Pumps performance analysis,
- Connection of the inlet chamber with the Nova Galovica canal,
- Pressure tap solution with associated reinforcement,
- The solution for the passage of the pressure tap through the embankment,
- The connection of the outlet building with the drainage canal.

For the revitalized and extended pumping station, the concept of work automation should be developed, that is, technical solutions for the installation of measuring, control and telecommunication equipment should be defined.

The Nova Galovica and Petrac pumping stations are supplied with electricity by the same supply cable. Starting from the fact that the rehabilitation of the Petrac pumping station will be done first, the solution to the rehabilitation of the power supply cable will be part of the Petrac pumping station rehabilitation design.

The Feasibility study with Preliminary Design should consist of volumes listed in the following table.

Table 2. Name and numbering of the technical documentation of the Feasibility study with Preliminary Design

Ser. No.	Volume No.	Name
1.	0.	Main Volume
2.	1.	Architecture design
3.	2.1	Construction design
4.	3.	Hydrotechnical installations design
5.	4.	Power installations design
6.	5.	Telecommunications and signal installations design
7.	6.	Mechanical installations design
8.	Study	Feasibility Study
9.	Report	Geodetic works report

The number of volumes within a certain type of design may be different from the one proposed.

Task 4: Construction Permit Design for the reconstruction and extension of the Nova Galovica pumping station

The content and scope of the Nova Galovica pumping station reconstruction, generally refers to:

- capacity revitalization in the existing mechanical building,

- increase in capacity with the extension of a pumping station with accompanying facilities on the supply and pressure taps into the outlet channel and
- automation of pumping station operation.

The revitalization of the capacity of the pumping station in the existing machine building should be designed keeping in mind the following aspects:

- Hydromechanical equipment:
 - overhaul or replacement of pumps depending on the assessment of their condition and the required capacity of the pumping station,
 - installing a front-screen on the supply channel,
 - installation of devices for automatic screen cleaning, and
 - overhaul or replacement of reinforcement (flaps and valves) on the pressure tap,
 - replacing the vacuum installation,
 - crane overhaul in the mechanical building,
 - overhaul of the crane on the outlet structure,
 - overhaul or replacement of panel shutters on gravity outlets,
 - overhaul or replacement of gate at the junction of the outlet structure with the drainage channel.
- Electrical equipment (take into account the power of pumps and other equipment specified in the mechanical part of the design):
 - replacement of the complete medium-voltage plant with energy transformers, including medium-voltage switching cells for starting the motors of the main pumps,
 - replacement of the cabinet of the electric drive of the pumps with a modern solution with frequency converters,
 - creation of a system of automatic control and monitoring of the pumping station both locally and remotely from the command center,
 - replacement of general electrical installations and associated cabinets for lighting, sockets, light switches, crane power supply and other consumers.
- Reconstruction related to:
 - rehabilitation of the lower gallery – grid footing,
 - lighting in the engine room and external lighting,
 - pumping station air conditioning,
 - the fence around the facility.

The pumping station extension design includes:

- Screen with automatic cleaner,
- Inlet structure with inlet chamber,
- The facility of the machine room for the accommodation of pumping units with a crane path,
- Shaft for placing the reinforcement on the pressure tap,
- Pressure tap solution with associated reinforcement,
- The outlet building and the connection of the outlet building with the drainage channel,
- Electrical equipment (transformer station, switchgear and electrical cabinets),
- Power supply solution,
- Control and command center facility.

For the revitalized and extended pumping station, the automation of its work should be designed, i.e. the expansion or installation of measuring, control and telecommunication equipment, which should include:

- Measuring system for monitoring relevant quantities related to the operation of pumping stations (flow, level in the inlet chamber, hours of operation of each unit, electricity consumption),
- Management system (PLC, control panel-HMI, GPRS communication with the Command Center),
- Software platform (system software with licenses for PLC and HMI),
- Application software for managing and monitoring the pumping station and the SCADA system in the Command Center (as executive management components),
- Telecommunication infrastructure for data transmission,
- Video surveillance and burglary protection.

The Construction Permit Design should consist of volumes listed in the following table.

Table 3. Name and numbering of the technical documentation of the Construction Permit Design

Ser. No.	Volume No.	Name
1.	0.	Main Volume
2.	1.	Architecture design
3.	2.1.	Construction design
4.	2.2.	Roads design
5.	3.	Hydrotechnical installations design
6.	4.	Power installations design
7.	5.	Telecommunications and signal installations design
8.	6.1	Mechanical installations design
9.	6.2.	Thermotechnical installations design
10.	Report	Geodetic works report
11.	Report	Energy efficiency report
12.	Report	Geotechnical investigation works
13.	Report	Fire protection study

The number of volumes within a certain type of design may be different from the one proposed.

Along with the Construction Permit Design for the reconstruction and extension of the Nova Galovica pumping station, the following accompanying studies are foreseen:

- Geodetic works report. The report includes the results obtained in the process of geodetic activities, which are given according to the following content: General documentation, Technical report, Numerical attachments and Graphical attachments. The report will provide cadastral topographic plans in the AutoCAD software environment, as well as characteristic points within the object presented in the form of a list of coordinates and elevations with specified descriptions of recorded positions and photo documentation.
- Energy efficiency report, in accordance with the provisions of the Rulebook
- Fire protection report, in accordance with the Rulebook.

Task 5: Preliminary Design for the rehabilitation of the gate on the Nova Galovica canal, km 20+181

The Preliminary Design envisages the rehabilitation of the gate on the Nova Galovica canal (km 20+181) downstream from the military farm Dobanovački Zabran, in order to enable adequate management within HMS Galovica.

In accordance with the results of the hydrological-hydraulic study, it is necessary to prescribe a new regime of management and operation of the gate. Within the framework of the Preliminary Design, foresee the installation of the gate drive (electrical or hydraulic), as well as local and remote control.

The rehabilitation of the gate should be designed taking into account the following aspects:

- Hydromechanical equipment:
 - overhaul or replacement of gate,
 - overhaul or replacement of the existing manual drive and installation of a motor drive.
- Electrical equipment:
 - production of power supply for the gate’s drive and general electrical installation,
 - creation of a system of management and supervision of the gate, locally and remotely from the command center.
- Construction rehabilitation related to:
 - rehabilitation of the concrete structure of the gate,
 - communication paths and approaches,
 - the fence around the facility.

The Preliminary Design should consist of volumes listed in the following table.

Table 5. Name and numbering of the technical documentation of the Preliminary Design

Ser. No.	Volume No.	Name
1.	0.	Main Volume
2.	1.	Engineering Facility Design
3.	Report	Geodetic works report
4.	Report	Current Condition Report

Along with the Preliminary Design for the rehabilitation of the gate on the Nova Galovica canal, the Geodetic works report is attached. The report includes the results obtained in the process of geodetic activities, which are given according to the following content: General documentation, Technical report, Numerical attachments and Graphical attachments. The report will provide cadastral topographic plans in the AutoCAD software environment, as well as characteristic points within the object presented in the form of a list of coordinates and elevations with specified descriptions of recorded positions and photo documentation.

Along with the Preliminary Design, the Contractor will prepare and attach the gate’s Current Condition Report. The report presents an analysis of the state of the facility after a detailed reconnaissance of the surrounding terrain and inspection of the facility and equipment, an analysis of the functionality of the facilities and equipment, as well as an analysis of the observed shortcomings in the work.

5 AVAILABLE REFERENCE DOCUMENTS

5.1 Data provided by the Client

Data provided by the Client:

- Meteorological data from main meteorological stations and rainfall stations in the wider area of the Nova Galovica canal basin;
- Data on the amount of water taken and discharged into the Nova Galovica canal based on the issued consents for the intake and discharge of water,
- Information about the implemented defenses against inland waters on HMS Galovica;
- Relevant spatial (GIS, CAD) data (catchment areas, canal network, pumping stations, culverts, bridges, outlets, water intakes, ponds, irrigation systems, infrastructure, etc.);
- Digital cadastral plan from the competent institution (RGA) – real estate cadastre and underground lines cadastre.

Technical and planning documentation provided by the Client:

- Study of the development of drainage of VRO Galovica, Jaroslav Černi Water Institute, Belgrade, 1986.;
- Available planning documentation on urbanization within the Galovica basin (conversion of agricultural land to urban, industrial and other);
- Galovica drainage system, Main project, Energoprojekt, Belgrade, 1990;
- Available technical documentation in the form of textual, numerical and graphic documentation for the facility and the associated equipment of the pumping station and gate;
- Program II of observation, measurement and analysis of the impact of the regime of stagnation on the banks of the Danube River caused by the construction of HPP "Đerdap 1" – State of drainage systems and operation of pumping stations ending in 2021, Jaroslav Černi Water Institute, Belgrade, 2022;
- Program II of observation, measurement and analysis of the impact of the stagnation regime on the banks of the Danube river caused by the construction of HPP "Đerdap 1" – Observation, processing and analysis of groundwater level measurements in the banks of HPP "Đerdap 1" ending in 2021, Jaroslav Černi Water Institute, Belgrade, 2022.

For the purpose of obtaining and using study and technical documentation, which is the obligation of the Contractor, the Client shall (if necessary) secure the right to use from entities that have the right to the said documentation.

5.2 Data provided by the Contractor

5.2.1 Detailed reconnaissance of the terrain and inspection of facilities and equipment

In order to determine the current situation, carry out a detailed reconnaissance of the terrain and inspection of the facilities and equipment of the pumping station: supply channel, screens, inlet chamber and pumps, lower gallery, machine halls with crane, pressure tap, discharge structure, etc. Professional services of the Client should also participate in these activities, which would point out the situation and possible problems observed in the previous period. The result of the reconnaissance and inspection will be shown in the Report of the existing condition of the pumping station, according to the information from the Task 2.

In order to determine the current condition, carry out a detailed reconnaissance of the terrain and an inspection of the facilities and gate's equipment on the Nova Galovica canal. Professional services of the Client should also participate in these activities, which would point out the situation and possible problems observed in the previous period. The result of the reconnaissance and inspection will be shown in the Report of the existing condition of the gate, according to the information from the Task 5.

5.2.2 Geodetic surveys

For the purposes of designing, it is necessary to provide adequate geodetic data at the level required for the preparation of the relevant technical documentation. Geodetic surveying of the facilities and equipment of the pumping station, that is, the facility and equipment of the gates, to be carried out using the adapted geodetic terrestrial method for the scale 1:100. The horizontal position of auxiliary points of the basic network for recording shall be determined by GNSS technology, with an interval observation of 3 x 30 seconds. Determine the vertical position of the points of the auxiliary network from the existing state leveling network, using the geometric leveling method, with an accuracy of up to 5 mm.

The location of the Nova Galovica pumping station to be surveyed within a radius of about 50 m with a sufficient density of detail points that will clearly represent the external dimensions of all existing facilities and the surrounding terrain and public and private land use in the said area. Survey the actual condition of the canal bed with a minimum of 3 cross-sections in the area of the pumping station on the upstream and downstream sides (total of 6 cross-sections). For the purpose of rehabilitating machine parts, survey the characteristic points of the internal parts of the building (equipment, reinforcement, etc.). All activities and results generated in the process of geodetic works within the Nova Galovica pumping station should be attached in the Geodetic Works Report, in accordance with the information from the Task 3.

Record the location of the gate within a radius of about 20 m with a sufficient density of detail points that will clearly represent the exact dimensions and parts of the gate structure with the surrounding terrain. Record the actual condition of the channel bed with a minimum of 3 cross-sections in the area of the gate from the upstream and downstream sides (total of 6 cross-sections). All activities and results generated in the process of geodetic works within the canal gate should be attached in the Geodetic Works Report, in accordance with the information from the Task 5.

5.2.3 Geotechnical investigation works

For the purposes of designing, it is necessary to provide adequate geotechnical data at the level required for the preparation of the relevant technical documentation.

The planned geological activities include:

(1) At the location of Galovica pumping station:

- Engineering-geological field reconnaissance and mapping
- Investigation drilling – 2 boreholes, 8-12m deep each, with rotation method and continuous coring
- Core logging and sampling
- Standard penetration tests (SPT) in each borehole, 2-4 tests per borehole
- Geophysical investigation works:
 - o Continuous electrical scanning (profiling), 2 profiles, 80-100m' long each
 - o Refractive seismic profiling, 2 profiles, 80-100m' long each
- Laboratory geomechanical testing of soil samples: grain size, unit weight, moisture, plasticity and consistency state, direct shear strength and oedometric compressibility modulus, approximately 10-20 samples

(2) At the location of the gate on the Nova Galovica canal, km 20+181

- Engineering-geological field reconnaissance and mapping
- Investigation drilling – 2 boreholes, 8-12m deep each, with rotation method and continuous coring
- Core logging and sampling
- Standard penetration tests (SPT) in each borehole, 2-4 tests per borehole
- Geophysical investigation works:
 - o Continuous electrical scanning (profiling), 2 profiles, 80-100m' long each
 - o Refractive seismic profiling, 2 profiles, 80-100m' long each
- Laboratory geomechanical testing of soil samples: grain size, unit weight, moisture, plasticity and consistency state, direct shear strength and oedometric compressibility modulus, approximately 10-20 samples

This works will be done according to the Design of engineering-geological investigation works, which will be prepared by the Contractgor before the start of the field works.

The results of the filed works wil be provided in the form of Geotechnical report according to the valid Law on mining and geology (Official Gazzete of Republick of Serbia 101/2015, 95/2018 – etc. law and 40/2021).

6 REPORTING REQUIREMENTS, DELIVERABLES AND TIME SCHEDULE

The Consultant shall prepare and submit the following key deliverables for review and approval:

Inception Report. The Draft and Final Inception Report should outline the work plan, key issues requiring guidance and decisions, and proposed design options to be considered. The Inception Report will include an updated study schedule.

Monthly Progress and Project Trends Reports. A progress and trends report shall be submitted one week after the end of each month. The report shall cover all activities undertaken during the month and indicate any activities that are delayed or likely to be delayed. The Report shall highlight issues that require urgent resolution and shall include updated staffing and study schedules. "Project Trends" will look at the forecast of project completion with a proactive approach; it should define the measures the Consultant has taken or intends to take in order to keep the Tasks on schedule. Based on the "Project Trends", the Consultant shall timely re-schedule its effort so as to ensure the completion of the services on schedule, with the contract ceiling unchanged.

Task Reports. Draft and Final Task Reports shall be submitted on the individual tasks as detailed in the Table hereinbelow:

Report Number	Deadline for deliverable (calendar months after signing the Contract)
1. Inception report	After 1 month
2. Task 1: Hydrological-hydraulic study	After 5 months
3. Task 2: Conceptual Design for the reconstruction and extension of the Nova Galovica pumping station	After 8 months
4. Task 3: Feasibility Study with Preliminary Design for the reconstruction and extension of the Nova Galovica pumping station	After 10 months
5. Task 4: Construction Permit Design for the reconstruction and extension of the Nova Galovica pumping station	After 15 months
6. Task 5: Preliminary Design for the rehabilitation of the gate on the Nova Galovica canal, km 20+181	After 15 months

The Consultant will prepare all reports in Serbian. Inception Report, Monthly Progress and Project Trends Reports shall be submitted in both English and Serbian. The reports will be reviewed by the relevant consultants within the MAFWM PIU in calendar days given in the table after the submission of each deliverable and the World Bank will be supporting the MAFWM on review of these outputs.

7 SERVICES AND FACILITIES TO BE PROVIDED BY THE ADMINISTRATION

PIU will provide the Consultant with all the information and designs and other documents needed by the Consultant for the proper execution and completion of the work.

8 SUPERVISION OF THE WORK BY THE ADMINISTRATION

The reports preparation will be monitored by the PIU staff. Corrective action can be requested whenever necessary.

9 TIME, DURATION AND WORKPLACE

The assignment is expected to be implemented within 15 months from contract signature.

The minimum required input is expected to be:

1. Key staff: 17 man/months.
2. Non-key staff 20 man/months
3. Other staff 12 man/months

Public Participation Meetings will be conducted in Surčin (at least 2 meetings, but continuous engagement is also expected in line with the development of site-specific SEP that would cover for all phases- planning/preparation, construction and operation) and the relevant impacted settlement. The SEP will include stakeholder engagement and public participation meetings that will cover the planning/preparation, construction and operation phases of the center.

10 PROFILE OF THE CONSULTANT

The Consultant will be a company or a Joint Venture of companies with relevant previous project experience in providing similar services related to the tasks specified in these ToR and similar investment Projects using procedures and policies of the International Financial Institutions, notably the World Bank, EBRD, EIB.

The Consultant must provide independent, impartial technical, cost, strategic, management, financial, and legal advice. As such, the Consultant will not be permitted to have a commercial interest in any other contracts or agreements related to the Project.

Qualification requirements of the Consultant:

1. Possession of license P080G3 - for hydrotechnical projects for regulation works to protect urban areas and rural areas larger than 300 ha from floods is mandatory. The license can be provided from one of JV members, but not from the Sub-Contractor.
2. Have extensive experience in the field of services mentioned above. The required experience should be demonstrated by references in last 5 years for each item as follows:
 - At least 1 (one) development of a 1D mathematical model of unsteady river flow for a section of more than 100 km of a model length;
 - At least 1 (one) mathematical model of the regime of surface and underground water under the influence of river flows, the model area of which is greater than 20,000 ha;
 - At least 1 (one) technical documentation of complex hydrotechnical management of terrain and groundwater and surface water regime;
 - At least 3 (three) technical documentations for a pumping station (Preliminary Design or Construction Permit Design of new or rehabilitation of existing one) with at least 300 l/s capacity.

The Consultant shall employ suitably qualified experts and other professionals who will carry out their duties according to responsibilities and/or authorities specified in this TOR. The Consultant will demonstrate equal opportunities in mobilizing and managing human resources. CVs of proposed staff will not be evaluated during the shortlisting phase.

Only Consultants that meet the qualification requirements will be considered for the shortlist. The evaluation criteria to establish the shortlist are:

- Core business and years in business (20 points)
- Past experience in similar assignments (70 points)
- Firms organization and availability of core staffing (10 points)

Consultant team

The Consultant's team available under the assignment has to include minimum the following experts and their qualifications:

Team Leader

- At least 20 years of professional experience in hydromelioration (drainage and irrigation) systems,
- At least master's degree (or equivalent) in a relevant discipline (civil engineering, water and soil management),
- Chartered Engineer – Design License of Serbian Chamber of Engineering type 310, 313, 314 or 376,
- Project and contract management capability, including managing teams of experts,
- Excellent communication skills, presentation skills and ability to manage preparation of high-quality reports, project documentation, and communications materials,

- Experience in working with projects funded by international donors (World Bank, etc.)

Senior Hydrologist

- At least 15 years of relevant experience,
- At least master's degree (or equivalent) in a relevant discipline,
- Chartered Engineer – Design License of Serbian Chamber of Engineering type 313 or 314,
- Experience in hydrological modelling and hydrological analyses within the framework of the preparation of hydrological studies for hydromelioration systems or flood protection systems.

Senior Hydraulic Engineer

- At least 15 years of relevant experience,
- At least master's degree (or equivalent) in a relevant discipline,
- Chartered Engineer – Design License of Serbian Chamber of Engineering type 313 or 314,
- Previous experience in preparing Feasibility studies, Preliminary design, or Final design for hydromelioration systems or flood protection, including hydraulic modelling and the design of hydraulic structures.

Senior Mechanical Engineer

- At least 15 years of relevant experience,
- At least master's degree (or equivalent) in a relevant discipline,
- Chartered Engineer – Design License of Serbian Chamber of Engineering type 332,
- Previous experience in preparing Feasibility studies, Preliminary design, or Final design for pumping stations.

Senior Civil Structural Engineer

- At least 15 years of relevant experience,
- At least master's degree (or equivalent) in a relevant discipline,
- Chartered Engineer – Design License of Serbian Chamber of Engineering type 310,
- Previous experience in preparing Feasibility studies, Preliminary design, or Final design for pumping stations.

Senior Electrical Engineer

- At least 15 years of relevant experience,
- At least master's degree (or equivalent) in a relevant discipline,
- Chartered Engineer – Design License of Serbian Chamber of Engineering type 350,
- Previous experience in preparing Feasibility studies, Preliminary design, or Final design for pumping stations.

11 SELECTION

The consulting firm will be selected under the provisions of the World Bank Procurement Regulations for Borrowers under Investment Project Financing” dated July 1, 2016, revised on November 2017, August 2018, November 2020, in accordance with Quality and Cost Based Selection, Lump - Sum based Contract.

12 OTHER CONDITIONS

The technical documentation in question should be done in a high-quality and professional manner, in accordance with modern professional achievements and positive domestic regulations that regulate this matter.

The technical documentation should be prepared in all respects according to the valid Law on Planning and Construction of the Republic of Serbia, i.e. its by-laws (Regulations on the content, scope and method of preparation of the previous feasibility study and the feasibility study for the construction of facilities), i.e. according to the legal framework in force at the time of submission of contractual products and refers to the subject of the design (Law on Water, Law on Environmental Protection, etc.). Also, the technical documentation should reflect and incorporate environmental and social requirements and mitigation measures that are prescribed within the Project's Environmental and Social Management Plan (ESMP). ESMP document will be developed by PIU, during the design preparation phase. Design Consultant is required to establish and maintain close collaboration with PIU ES Specialists in order to ensure full harmonisation between the final design and project's ES requirements.

The Conceptual Design for the reconstruction and extension of the Nova Galovica pumping station is being developed for the purposes of obtaining the Location Conditions. Along with the Conceptual Design, the Contractor will prepare and attach a unique **hydrological-hydraulic study**, as defined in the chapter 0.

During the preparation of the technical documentation of the Conceptual Design, the Contractor will submit a Request for a decision on the need for an environmental impact assessment. If the competent authority makes a decision that an Environmental Impact Study is necessary, the Contractor will submit a Request for defining the scope and content of the Study and upon receiving the Decision on the scope and content of the Study, the Contractor will prepare an Environmental Impact Study.

The Preliminary Design for the reconstruction and extension of the Nova Galovica pumping station is being prepared according to Article 133 of the Law on Planning and Construction for the needs of the Feasibility Study. The Feasibility Study with Preliminary Design is subject to the Revision (expert control) of the design.

The Construction Permit Design for the reconstruction and extension of the Nova Galovica pumping station with accompanying reports is submitted as a technically complete unit with the aim of issuing the Construction Permit. The Construction Permit Design is subject to technical control.

The technical documentation for the reconstruction and extension of the Nova Galovica pumping station should envisage phased construction (1st phase – reconstruction, 2nd phase – extension of the pumping station with management).

The Preliminary Design for the rehabilitation of the gate on the Nova Galovica canal, km 20+181 is being prepared according to Article 145 of the Law on Planning and Construction for obtaining the Decision on approval for the execution of works.

Technical documentation with accompanying reports are submitted as technically complete units. The deliveries in question are delivered electronically in pdf format.