



PRESENTATION OF WORKS NECESSARY FOR THE PREPARATION OF TECHNICAL DOCUMENTATION FOR THE PURPOSE OF REHABILITATION AND REMEDIATION OF THE ABANDONED LANDFILL "DONJE VRANJE"

Review
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Abstract: *Inadequate waste management is one of the biggest environmental problems. This conclusion is derived from numerous analyses of the environmental situation in the territory of the Republic of Serbia that have been done in recent years. One of the responses of the state of Serbia to such a situation is the adoption of the Law on Waste Management and other "environmental" laws and bylaws. Waste management is an environmental problem that requires priority resolution and is considered one of the most demanding areas in terms of compliance with EU standards. On the territory of the City of Vranje, a major ecological problem is represented by the complex of the abandoned landfill "Donje Vranje", where industrial and municipal waste was disposed of in the period from 1962 to 2002. The complex of the abandoned landfill is located 3 km from the center of Vranje and directly in the aluvion of the City River. In order to strategically and timely integration and harmonization with the Action Plan for the implementation of the Regional Waste Management Plan and the construction of the Regional Non-Hazardous Waste Management Center "METERIS VRANJE", the preparation of project and technical documentation is required. The purpose of all these activities is the rehabilitation and remediation of the complex of the abandoned landfill "Donje Vranje" with the consideration of the possibility of relocation of all waste after partial separation to the Regional Center.*

Key words: LANDFILL, WASTE, ENVIRONMENTAL PROTECTION

INTRODUCTON

With the construction of the first sanitary landfill "Meteris" in Serbia, in Suv Dol in 2002, according to all European standards, the establishment of a waste management system was initiated with all measurements and control.

However, since waste that has been disposed of for 40 years has remained in the same location, it is still a major environmental problem and one of the main sources of environmental pollution, including air pollution, land, surface water and groundwater.

The abandoned landfill has caused pollution of the City River for years, because in this area the riverbed passes along the east slope of the landfill, causing its flooding and falling (Figure 1).

The greatest pollution of surface and groundwater comes from leachate from garbage dumps and waters resulting from biochemical and chemical reactions.

Waste in the Pčinja District (seven municipalities of Vranje, Vladičin Han, Surdulica, Bosilegrad, Presevo, Bujanovac and Trgovište, which makes a total of 7 urban settlements and 356 villages) is disposed of at temporary and permanent garbage dumps, which do not have a work permit and are significantly below EU standards.

All these garbage dumps need to be closed, remediated, and recultivated. Vranje is the only municipality that has a "Meteris" landfill that approximately meets EU standards.

Considering the overall situation, in accordance with the current legislation related to the management of solid waste, it was necessary to take all necessary measures in order to rehabilitate and remediate the abandoned landfill "Donje Vranje" with the consideration of the possibility of relocation of the entire waste and prevention of further pollution and degradation of the living environment [1].



Figure 1, East slope of the landfill and the City River [1]

ACTIVITIES, DEVELOPMENT OF TECHNICAL DOCUMENTATION

Work on the preparation of project-technical documentation for the rehabilitation and remediation of the abandoned landfill complex "Donje Vranje" should be organized in such a way that the requirements stated in the terms of reference are fully met.

All activities must comply with laws and regulations.

It was necessary to systematize, analyze and incorporate all domestic and foreign experiences related to waste management in a professional and creative way in the subject Feasibility Study with the Preliminary Design for rehabilitation and remediation of the abandoned landfill complex "Donje Vranje".

Purpose research have been done on terrain and laboratories and that were necessary for the purpose of identifying the contaminated area, reviewing natural and anthropogenic factors, detailed research and analysis of all data in order to assess the degree of pollution, qualification and categorization of waste and establish monitoring until the completion of remediation.

The preparation of project-technical documentation for the rehabilitation and remediation of the abandoned landfill "Donje Vranje" requires good organization, professional and creative approach, systematization and analysis of previous domestic and foreign experiences in solving such problems.

Given the specifics of the Feasibility Study with the Preliminary Design for the rehabilitation and remediation of the abandoned landfill complex "Donje Vranje", all activities on their development will take place through parallel engagement of a multidisciplinary team of experts of different profiles and specialties, which in itself guarantees a professional relationship and high quality.

This team of experts will be coordinated with each other by the team leader.

By initiating the necessary activities on the development of the grounds necessary for the preparation of technical documentation, while considering the possibility of relocating the entire landfill, strategic steps have been taken towards establishing a complete municipal waste management system.

An important goal is to prevent negative impacts on human health as well as all users of space, landscape values and all watercourses in the territory of the city of Vranje, while preventing bad impacts on microclimate and environmental conditions.

The preparation of project documentation for the rehabilitation and remediation of the abandoned landfill complex includes the following activities:

1. Geographical and hydrogeological reconnaissance of the area
2. Geodetic recording for the purpose of preparation of technical documentation
3. Hydrogeological exploration works
4. Preparation of hydrogeological project documentation
5. Detailed analysis of samples of waste, land and leachate water
6. Preparation of a Study on types and quantities of waste with comparison of variant solutions in terms of remediation process
7. Preparation of a study on the methodology of waste treatment (processing, recycling) from the remediation process
8. Preparation of a study on the methodology of disposal of types of waste from the remediation process

9. Preparation of a study on the needs of energy sources, water and raw materials for the realization of the project
10. Preparation of the Environmental Impact Assessment Study
11. Feasibility study with conceptual design
12. Development of the Project for building permit and Extract from the same project [1].

CONCEPT AND METHODOLOGY OF RESEARCH

This chapter presents the activities for which the employees of the Mining Institute were in charge during 2021.

1. *Geographical and hydrogeological reconnaissance* of the area includes the consideration of conditions and determination of the most favorable microlocation for exploration works with the preparation of the space, given that the landfill area is extremely devastated.
2. *Geodetic surveying* for the purpose of preparation of technical documentation includes the development of a Cadastral and Topographic Plan (KTP) of the abandoned landfill "Donje Vranje" with associated locations in order to obtain precise measures and data for the construction (KTP) of the landfill.
3. *Preparation of hydrogeological project documentation* - Realization of feasibility study begins with the development of the Hydrogeological Research Project for the purpose of rehabilitation and remediation of the abandoned landfill "Donje Vranje" in Vranje, 2021, Mining Institute Ltd. Belgrade.

This Project defines all the necessary exploration works for determining the geological, engineering-geological and hydrogeological structure of the terrain with field and laboratory tests, with the aim of providing relevant bases for further design at that site.

The tasks of research, types and scope of research, pre-measure, pro-calculation and dynamics of the execution of these works are defined.

The scope and type of newly designed exploration works are aligned with the requirements of the Project assignment.

4. *Hydrogeological exploration* works - are carried out in order to determine the condition and degree of soil and water pollution on the site.

Four exploratory boreholes with core were drilled in order to take samples of waste, soil and water in order to obtain precise information on the degree of environmental degradation at the mentioned location.

Piezometric structures were installed in the boreholes to monitor groundwater level fluctuations.

5. *Elaborate on the results of the conducted research with recommendations*- The types, scope, conditions of execution as well as the results of the conducted exploration works are presented in detail in the Study on the results of

hydrogeological investigations for the purpose of remediation and remediation of the abandoned landfill "Donje Vranje" in Vranje, 2021, Mining Institute Ltd. Belgrade.

The concept of the exploration was defined by the investor, with the envisaged scope of research, in accordance with the goal of hydrogeological examination of the terrain for the purpose of obtaining geological bases:

- Collecting, analyzing, synthesizing and reinterpreting the results of previous research
- Definition of engineering-geological and geotechnical properties of the terrain, within which the following tasks should be solved:
 - a) Determine the morphological properties of the terrain;
 - b) Give an overview of the regional geological structure;
 - c) Determine by laboratory tests the parametric values of those identification-classification and physico-mechanical properties of rock masses that are necessary for their identification and classification, as well as for construction calculations;
 - d) Define hydrogeological properties of rock masses and groundwater level in the field;

According to the established research tasks, the following methodological approach is foreseen:

- Previous works:
 - a) Review and analysis of the existing fund and project documentation;
 - b) Creation of the Hydrogeological Research Project;
- Give an interpretation of the geotechnical properties of the terrain in relation to the protection of the natural geological environment and the preservation of the geological heritage.

According to the established research tasks, the project envisages the following methodological approach:

- Previous works:
 - a) Review and analysis of the existing fund of geological - geotechnical and project documentation;
- Land works:
 - a) Geodetic marking and recording of elevations and coordinates (x;y;z) of investigation sites;
 - b) Drilling of exploratory wells;
 - c) Taking samples for laboratory tests;
 - d) Installation of piezometer constructions;
 - e) Observation of NPV oscillations;

- Laboratory tests of soil samples:
 - a) Tests of laboratory identification and classification of materials with determination of water permeability coefficient;
- Technical documentation:
 - a) Elaboration of the Elaboration on the hydrogeological results of research and land testing [2];

CONCLUSION

By creating project-technical documentation for the rehabilitation and remediation of the complex of the abandoned landfill "Donje Vranje", while considering the possibility of moving all the waste after partial separation to the premises of the Regional Waste Management Center "METERIS VRANJE", strategic and timely steps are being taken towards the establishment of a complete municipal waste management system in accordance with the guidelines and recommendations of the National Waste Management Plan. Also, the goals are to prevent negative impacts on people's health, as well as all users of space, landscape values and all watercourses on the territory of the City of Vranje, while preventing impacts on microclimatic and ecological conditions.

In order to provide the necessary foundations for the realization of rehabilitation and remediation of the Donje Vranje landfill complex, it is necessary to carry out investigative geological works, defined by the project documentation.

After the tour of the field and the geodetic survey of the location, a situational map was made as a basis for designing. The project envisages the execution of four exploratory multi-purpose wells. During drilling, geological mapping of the extracted core will be done, samples will be taken for laboratory tests in the geomechanical laboratory, and piezometer structures will be installed.

Piezometers will be used to monitor groundwater level oscillations as well as to take samples of groundwater for chemical analysis in order to monitor changes in its chemical composition. The quality of underground and surface water is important in order to define and monitor the impact of the landfill on the environment.

The realization of the rehabilitation and remediation project of the abandoned landfill complex "Donje Vranje" will determine the composition and quantity of disposed material, partial separation enables the "processing" of waste material, i.e. the utilization of secondary raw materials contained in it, the degraded area will be rehabilitated so that it can be used for its intended purpose as a business / economic zone.

LITERATURE

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