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This document is translated version of the Updated Environmental Impact Assessment of the “Kalenić” Regional Municipal (Non-Hazardous) Waste Landfill (Ажурирана студија о процени утицаја на животну средину пројекта регионалне депоније комуналног (неопасног) отпада „Каленић“). Official version of the document approved by the Ministry of the Environmental Protection of Republic of Serbia is in Serbian language.

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UPDATED ENVIRONMENTAL IMPACT ASSESSMENT OF THE "KALENIĆ" REGIONAL MUNICIPAL (NON-HAZARDOUS) WASTE LANDFILL,

ON CP NO. 800, CM KALENIĆ, MUNICIPALITY OF UB



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ON CP NO. 800, CM KALENIĆ, MUNICIPALITY OF UB

GENERAL MANAGER

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Belgrade, 2020

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3. Conditions, Valjevo Cultural Monuments Protection Institute, No. 1143 as of 05/12/2018;
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5. Conditions of PE “Elektromreža Srbije”, No. 130-00-UTD-003-1029/2018-003 as of 05/12/2018;
6. Conditions of the Serbian MI, Emergency Management Sector, Valjevo Emergency Management Department, No. 217-16729/18 as of 13/11/2018;
7. Water Conditions, Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate, No. 325-05-1071/2018-07 as of 05/12/2018;
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I GENERAL DOCUMENTATION

Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTUCTURE
No. 351-02-02009/2017-07
Date: July 27, 2017
Belgrade

Ministry of Construction, Transport and Infrastructure pursuant to 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-correction, 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 the FRY" No. 33/1997 and 31/2001 and "Official Gazette of RS" No. 30/2010) and the Rulebook on the manner, procedure and data content for determining the conditions for issuing license for the preparation of technical documentation and a license for construction of facilities for which approval is issued by the Ministry or the Autonomous Province, as well as conditions for revoking those licenses ("Official Gazette of RS" No. 24/15), and deciding at the request of the Institute of Transportation CIP d.o.o. Belgrade, 6/IV Nemanjina St, ID No 07451342, TAX ID 100003172, for the issuance of licenses for the preparation of technical documentation for facilities for which the building permit is issued by the ministry in charge of construction or the competent authority of the autonomous province, and on the basis of authorization number: 031-01-44/2017-02 from July 13, 2017, adopts:

D E C I S I O N

1. It is determined that the Institute of Transportation CIP d.o.o. Belgrade, 6/IV Nemanjina St, ID No 07451342, TAX ID 100003172, **MEETS THE CONDITIONS** for obtaining licenses for the preparation of technical documentation for facilities for which the construction permit is issued by the ministry responsible for construction or the competent authority of the autonomous province, as follows:

   - projects of building constructions of oil and gas processing facilities that are being built outside the exploitation fields, upon previously obtained consent of the ministry responsible for the exploitation of mineral raw materials, production of biofuels and bioliquids in plants with a capacity of over 100 tons per year, oil and product pipelines, gas pipelines of nominal working overpressure over 16 bar if it crosses over the territory of two or more municipalities, oil storages, liquefied petroleum gas and oil derivatives storages, with a capacity of over 500 tons that are built outside the exploitation fields defined by the law governing mining and geological research and main heating pipelines (P030G1);

- electric motor plant management projects - automation, measurements and regulation of oil and gas processing facilities that are built outside the exploitation fields with the previously obtained consent of the ministry responsible for the exploitation of mineral resources, production of biofuels and bioliquids in plants with a capacity of over 100 tons per year, oil and product pipelines, gas pipelines of nominal working overpressure over 16 bar if it crosses over the territory of two or more municipalities, oil storages, liquefied petroleum gas and oil derivatives storages, with a capacity of over 500 tons that are built outside the exploitation fields defined by the law governing mining and geological research and main heating pipelines (P030E4);
- projects of thermo-technical, thermo-energetic, process and gas installations of oil and gas processing facilities that are built outside the exploitation fields with the previously obtained consent of the ministry responsible for the exploitation of mineral resources (P031M1);
- projects of thermo-technical, thermo-energetic, process and gas installations of oil and product pipelines, gas pipelines of nominal working overpressure over 16 bar if it crosses over the territory of two or more municipalities, oil storages, liquefied petroleum gas and oil derivatives storages, with a capacity of over 500 tons that are built outside the exploitation fields defined by the law governing mining and geological research (P032M1);
-projects of thermo-technical, thermo-energetic, process and gas installations of main heating pipelines (P033M1);
- electric motor plant management projects - automation, measurements and regulation for facilities of basic and processing chemical industry, ferrous and non-ferrous metallurgy, facilities for processing leather and fur, facilities for processing Indian rubber, facilities for cellulose and paper production and facilities for processing non-metallic mineral raw materials, which are built outside the exploitation fields defined by the law governing mining and geological research, except for facilities for primary processing of ornamental and other stone (P040E4);
- projects of means of transport, warehouses and machine constructions and technologies for facilities of basic and processing chemical industry, ferrous and non-ferrous metallurgy, facilities for processing leather and fur, facilities for processing Indian rubber, facilities for cellulose and paper production and facilities for processing non-metallic mineral raw materials, which are built outside the exploitation fields defined by the law governing mining and geological research, except for facilities for primary processing of ornamental and other stone (P040M3);
- construction projects for facilities with a structural span over 50m (P202G1);
- building construction projects for buildings over 50 m in height (P203G1);
- building construction projects of multi-family housing complexes when the investor is Republic of Serbia (P093A2);
- projects of building constructions of residential complexes of multi-family housing when the investor is Republic of Serbia (P093G1);
- projects of high and medium voltage electrical installations for thermal power plants with a capacity of 10 MW and more (P052E1);
- electric motor plant management projects - automation, measurements and regulation for thermal power plants with a capacity of 10 MW and more (P052E4);
- projects of high and medium voltage electrical installations for thermal power plants - heating plants with an electric power of 10 MW and more (P053E1);

- electric motor plant management projects - automation, measurements and regulation for thermal power plants - heating plants with an electric power of 10 MW and more (P053E4);
- projects of high and medium voltage power electrical installations of 110 and more kV voltage power lines (P061E1);
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- hydrotechnical projects for interregional and regional water supply and sewerage facilities (P071G3);
- hydrotechnical projects for regulatory works for protection against large waters of urban areas and rural areas larger than 300 ha (P080G3);
- building construction projects of buildings within the boundaries of immovable cultural goods of exceptional importance and cultural goods registered in the List of World Natural and Cultural Heritage and buildings in the protected environment of cultural goods of exceptional importance with defined borders of cadastral parcels and buildings in the protected environment of cultural goods registered in the List of World Natural and Cultural Heritage (P090A1);
- building construction projects of buildings within the boundaries of the national park and buildings within the boundaries of the protection of a protected natural asset of exceptional importance (except for family housing, agricultural and economic buildings and infrastructure facilities needed by them, which are built in villages), in accordance with the law (P091A1);
- building construction projects of buildings in protected areas in accordance with the act on protection of cultural goods (except for the conversion of common areas into an apartment, i.e. business space in a protected environment of cultural goods of exceptional importance and cultural goods registered on the World Cultural Heritage List) – P090A2;
- road projects for passenger terminals and ports (P120G2);
- road projects for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings (P131G2);
- traffic and traffic signaling projects for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings (P131C1);
- projects of building structures for road facilities (bridges) for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings (P132G1);
- projects of building structures for road facilities (tunnels) for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings (P133G1);
- road projects for public railway infrastructure with connections (P141G2);
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- electric motor plant management projects - automation, measurements and regulation for subway (P144E4);
- projects of thermo-technical, thermo-energetic, process and gas installations for subway (P144M1);
- projects of electronic communications facilities, i.e. networks, systems or means that are of international or main importance (P150E3);
- projects of electronic communication facilities, i.e. networks, systems or means that are being built on the territory of two or more local self-government units (P151E3);
- projects of building constructions for regional landfills, i.e. landfills for non-hazardous waste disposal for an area inhabited by over 200,000 inhabitants (P180G1);
- hydrotechnical projects for regional landfills, i.e. landfills for non-hazardous waste disposal for an area inhabited by over 200,000 inhabitants (P180G3);
- technological processes projects for regional landfills, i.e. landfills for non-hazardous waste disposal for an area inhabited by over 200,000 inhabitants (P180T1).

2. With this Decision, the Decision No. 351-02-00140_1/2012-07 ceases to be valid from December 17, 2012.

Explanatory statement

Article 23, paragraph 2 of the Law on State Administration stipulates that the Minister represents the ministry, issues regulations and decisions in administrative and other individual matters and decides on other issues within the scope of the ministry. Article 6 of the Law on Ministries determines the competence of the Ministry of Construction, Transport and Infrastructure.

Article 126, paragraph 1 of the Law on Planning and Construction specifies that the technical documentation for the construction of facilities may be prepared by a company, i.e. another legal entity, i.e. an entrepreneur, which are entered in the appropriate register for the preparation of technical documentation. Paragraph 2 of the same Law stipulates that technical documentation for the construction of facilities for which the Ministry i.e. the Autonomous Province issues a construction permit, may be prepared by a company or other legal entity registered in the appropriate register for the preparation of technical documentation for that type of facilities. The same paragraph stipulates that subject company or other legal entity needs to have employed persons with a competent designer architect license and appropriate professional results in the preparation of technical documentation for that type and purpose of facilities. Paragraph 3 of the subject article specifies that professional results, in the sense of paragraph 2 of this article, achieves a person who prepared or participated in the preparation, i.e. in technical control of technical documentation, according to which facilities of that type and purpose were built.

Paragraph 4 of this Article stipulates that the fulfillment of the conditions referred to in paragraph 2 of this Article shall be determined by a decision of the Minister competent for construction affairs.

Article 126, paragraph 5 of the Law stipulates that the decision referred to in paragraph 4 of this Article is final on the date of delivery.

Article 192, paragraph 1, of the Law on General Administrative Procedure stipulates that on the basis of decisive facts established in the procedure, the body competent for decision making issues a decision on the administrative matter which is the subject of the procedure, and paragraph 2 of the same stipulates that, when a collegial body decides on an administrative matter, it may decide when more than half of its members are present, and the decision is made by a majority vote of the members present, unless a qualified majority is provided by law or other regulations.

Article 7 of the Rulebook stipulates that in the procedure of determining the conditions fulfillment for issuing a license for technical documentation for facilities for which a construction permit is issued by the Ministry, i.e. the Autonomous Province, the Commission determines whether employees with a competent designer's license have appropriate references for technical documentation preparation for objects of a certain type and purpose. Fulfillment of the minimum requirements referred to in paragraph 1 of this Article means: 1) that at least two persons with the appropriate license have developed or participated in the development as responsible designers, or performed technical control of at least two main projects or projects for construction permits, construction projects or 2) that one employee with the appropriate license has developed or participated in the development as a responsible architect, or performed technical control of at least three main projects, construction permit project or construction projects for the appropriate phase of each the type of facility referred to in Article 133, paragraph 2 of the Law for which the license is requested, and that another employee with an appropriate license has developed or participated in the development as a responsible architect, or performed technical control of at least one main project, construction permit project or construction projects for the appropriate phase of each the type of facility referred to in Article 133, paragraph 2 of the Law for which the license is requested.

Article 11 of the same Rulebook stipulates that the license is revoked when the subsequent verification determines that the company or other legal entity has ceased to meet at least one of the conditions under which the license was issued or when the subsequent verification establishes that it was issued on the basis of untrue and incorrect data.

On June 22, 2017, with the request number 351-02-02009/2017-07 and by supplementing the same request from July 26, 2017, the Institute of Transportation CIP d.o.o. Belgrade, 6/IV Nemanjina St, ID No 07451342, TAX ID 100003172, addressed this Ministry, for issuing licenses for the preparation of technical documentation for facilities for which a building permit is issued by the ministry in charge of construction and the competent authority of the Autonomous Province.

Along with the request for issuing licenses, all necessary documentation specified by Article 126 of the Law on Planning and Construction ("Official Gazette of RS" No. 72/2009, 81/2009 - correction, 64/2010 – CC decision, 24/2011, 121/2012, 42/2013 – CC decision, 50/2013 – CC decision and 98/2013 – CC decision) and Article 4 and Article 9 of the Rulebook on the manner, procedure and data content for determining the conditions fulfillment for issuing a license for the preparation of technical documentation and license for the construction of facilities for

which the construction permit is issued by the ministry or the autonomous province, as well as on the conditions for revoking those licenses ("Official Gazette of RS", No. 24/15), was submitted.

At the session of the expert commission formed by the Minister, held on July 27, 2017, it was determined that the applicant meets the conditions for obtaining the said licenses from paragraph 1 in terms of the provisions of Art. 126 of the Law on Planning and Construction and Art.7, Art. 9 and Art. 11 of the of the Rulebook on the manner, procedure and data content for determining the conditions fulfillment for issuing a license for the preparation of technical documentation and license for the construction of facilities for which the construction permit is issued by the ministry or the autonomous province, as well as on the conditions for revoking those licenses.

The conditions are met for the following licenses: projects of building constructions of oil and gas processing facilities that are being built outside the exploitation fields, upon previously obtained consent of the ministry responsible for the exploitation of mineral raw materials, production of biofuels and bioliquids in plants with a capacity of over 100 tons per year, oil and product pipelines, gas pipelines of nominal working overpressure over 16 bar if it crosses over the territory of two or more municipalities, oil storages, liquefied petroleum gas and oil derivatives storages, with a capacity of over 500 tons that are built outside the exploitation fields defined by the law governing mining and geological research and main heating pipelines **(P030G1)**, based on one reference by Mirjana Lazic (310 H754 09), one reference by Rade Bogdanovic (312 0964 03), four references by Vladimir Milicevic (310 A976 05), one reference by Marina Pesic (310 9562 04) and one reference by Biljana (Raseta) Colic (310 9110 04);
- electric motor plant management projects - automation, measurements and regulation of oil and gas processing facilities that are built outside the exploitation fields with the previously obtained consent of the ministry responsible for the exploitation of mineral resources, production of biofuels and bioliquids in plants with a capacity of over 100 tons per year, oil and product pipelines, gas pipelines of nominal working overpressure over 16 bar if it crosses over the territory of two or more municipalities, oil storages, liquefied petroleum gas and oil derivatives storages, with a capacity of over 500 tons that are built outside the exploitation fields defined by the law governing mining and geological research and main heating pipelines **(P030E4)**, based on four references by Slavko Bursac (352 A911 05) and one reference by Nebojsa Stojakovic (352 G573 08);
- projects of thermo-technical, thermo-energetic, process and gas installations of oil and gas processing facilities that are built outside the exploitation fields with the previously obtained consent of the ministry responsible for the exploitation of mineral resources **(P031M1)**, based on four references by Nikola Neskovic (330 7250 04), one reference by Dragan Ilic (330 0842 03) and one reference by Zlatko Stevanovic (330 B870 05);
- projects of thermo-technical, thermo-energetic, process and gas installations of oil and product pipelines, gas pipelines of nominal working overpressure over 16 bar if it crosses over the territory of two or more municipalities, oil storages, liquefied petroleum gas and oil derivatives storages, with a capacity of over 500 tons that are built outside the exploitation fields defined by the law governing mining and geological research **(P032M1),** based on five references by Nikola Neskovic (330 7250 04), one reference by Dragan Ilic (330 0842 03) and one reference by Zlatko Stevanovic (330 B870 05);
- projects of thermo-technical, thermo-energetic, process and gas installations of main heating pipelines **(P033M1)**, based on seven references by Marija Varagic Stanic (330 5903 03) and three references by Dragan Ilic (330 0842 03);

- electric motor plant management projects - automation, measurements and regulation for facilities of basic and processing chemical industry, ferrous and non-ferrous metallurgy, facilities for processing leather and fur, facilities for processing Indian rubber, facilities for cellulose and paper production and facilities for processing non-metallic mineral raw materials, which are built outside the exploitation fields defined by the law governing mining and geological research, except for facilities for primary processing of ornamental and other stone **(P040E4)**, based on four references by Slavko Bursac (352 A911 05) and one reference by Aleksandar Milosevic (351 J129 10);
- projects of means of transport, warehouses and machine constructions and technologies for facilities of basic and processing chemical industry, ferrous and non-ferrous metallurgy, facilities for processing leather and fur, facilities for processing Indian rubber, facilities for cellulose and paper production and facilities for processing non-metallic mineral raw materials, which are built outside the exploitation fields defined by the law governing mining and geological research, except for facilities for primary processing of ornamental and other stone **(P040M3)**, based on two references by Nebojsa Kostic (333 0923 03) and two references by Vladimir Simic (333 0925 03);
- building construction projects for facilities with a structural span over 50m **(P202G1)**, based on two references by Sinisa Mihajlovic (310 4821 03), two references by Aleksandra Naumovic (310 3046 03), one reference by Biljana Raseta (310 9110 04), one reference by Dejan Srejic (310 F110 07) and three references by Nada Pavlovic (310 5632 03);
- building construction projects for facilities over 50 m in height **(P203G1)**, based on two references by Marina Jankovic (310 4148 03), one reference by Olivera Gajovic Gojgic (310 2121 03) and two references by Biljana Raseta (310 9110 04);
- building construction projects of multi-family housing complexes when the investor is Republic of Serbia **(P093A2**), based on one reference by Gordana Vasiljevic Milovanovic (300 7124 04), one reference by Andja Saicic (300 8171 04), three references by Ivan Randjelovic (300 B213 05), one references by Tatjana Pujic Zafirovski (300 0566 03), three references by Vesna Knezevic (300 1184 03), three references by Jelena Krpic (300 D016 06), two references by Natasa Lazarevic (300 C773 06), two references by Gordana Vucic Parezanovic (300 2585 03) and one reference by Tatjana Danilovic (300 B800 05);
- projects of building constructions of residential complexes of multi-family housing when the investor is Republic of Serbia **(P093G1)**, based on two references by Olivera Gajovic Gojgic (310 2121 03), two references by Slobodan Naumovic (310 3056 03) and one reference by Mirjana Lazic (310 H754 09);
- projects of high and medium voltage electrical installations for thermal power plants with a capacity of 10 MW and more **(P052E1)**, based on one reference by Andreja Mijalcic (351 N203 14), four references by Milan Sipetic (351 K881 12) and two references by Slavko Bursac (351 G246 08);
- electric motor plant management projects - automation, measurements and regulation for thermal power plants with a capacity of 10 MW and more **(P052E4)**, based on four references by Aleksandar Zlatanovic (353 0745 03), two references by Nebojsa Stojakovic (352 G573 08) and one reference by Slavko Bursac (352 A911 05);
- projects of high and medium voltage electrical installations for thermal power plants - heating plants with an electric power of 10 MW and more **(P053E1)**, based on two references by Slavko Bursac (351 G246 08), two references by Andreja Mijalcic (351 N203 14) and three references by Milan Sipetic (351 K881 12);
- electric motor plant management projects - automation, measurements and regulation for thermal power plants - heating plants with an electric power of 10 MW and more **(P053E4)**, based on four

references by Aleksandar Zlatanovic (353 0745 03), two references by Nebojsa Stojakovic (352 G573 08) and one reference by Slavko Bursac (352 A911 05);
- projects of high and medium voltage power electrical installations of 110 and more kV voltage power lines **(P061E1)**, based on two references by Slavko Bursac (351 G246 08) and three references by Milan Sipetic (351 K881 12);
- projects of high and medium voltage electrical installations of 110 and more kV voltage transformer stations **(P062E1)**, based on two references by Slavko Bursac (351 G246 08) and two references by Milan Sipetic (351 K881 12);
- hydrotechnical projects for interregional and regional water supply and sewerage facilities **(P071G3)**, based on two references by Marina Bubalo (314 4255 03), two references by Jelena Nikolic (314 3134 03) and two references by Jelelna Suljagic (314 3133 03);
- hydrotechnical projects for regulatory works for protection against large waters of urban areas and rural areas larger than 300 ha **(P080G3)**, based on three references by Mirjana Kristoforovic-Pavic (314 3119 03) and two references by Vojislav Bogdanic (314 D664 06);
- building construction projects of buildings within the boundaries of immovable cultural goods of exceptional importance and cultural goods registered in the List of World Cultural and Natural Heritage and buildings in the protected environment of cultural goods of exceptional importance with defined borders of cadastral parcels and buildings in the protected environment of cultural goods registered in the List of World Cultural and Natural Heritage **(P090A1)**, based on one reference by Branislav Lazovic (300 1205 03), one reference by Svetlana Karanovic (300 1200 03), two references by Branko Grzetic (300 4068 03) and Irena Ilic (300 8811 04), without references;
- building construction projects of buildings within the national park boundaries and buildings within the boundaries of the protection of a protected natural asset of exceptional importance (except for family housing, agricultural and economic buildings and infrastructure facilities needed by them, which are built in villages), in accordance with the law **(P091A1)**, based on one reference by Irena Ilic (300 8811 04), one reference by Julija Nikolic (300 4009 03), one reference by Mirjana Samardzija (300 0801 03), three references by Snezana Soskic (300 1206 03) and one reference by Branko Grzetic (300 4068 03);
- building construction projects of buildings in protected areas in accordance with the act on protection of cultural goods (except for the conversion of common areas into an apartment, i.e. business space in a protected environment of cultural goods of exceptional importance and cultural goods registered in the World Cultural Heritage List) – **P090A2**, based on three references by Branko Grzetic (300 4068 03), Svetlana Karanovic (300 1200 03), without references and one reference by Gordana Vasiljevic (300 7214 04);
- road projects for passenger terminals and ports **(P120G2)**, based on the fulfillment of license conditions, road projects for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings **(P131G2)** and road projects for public railway infrastructure with connections **(P141G2),** in accordance with the Conclusion of the Commission for determining the fulfillment of conditions for the preparation of technical documentation and facilities construction, from April 18, 2016.
- road projects for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings **(P131G2),** based on two references by Mira Gasic Momcilovic (315 1150 03), one reference by Rade Bogdanovic (312 0964 03), one reference by Miodrag Radeka (315 H780 09), one reference by Vidosav Stevanovic (315 G155 08), two references by Dragoslav Dragicevic (315 1151 03), one reference by Miodrag Radeka (315 H780 09), two references by Mira Gasic Momcilovic (315 1150 03), two references by Marko Kovrlija (315 N569

14), two references by Rade Bogdanovic (312 0964 03), one reference by Srdjan Djokic (315 B624 05) and four references by Vladimir Trimcev (315 F827 08);
- traffic and traffic signaling projects for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings **(P131C1)**, based on two references by Petar Djapic (370 G123 08), two references by Sladjana Markovic (370 M354 13), two references by Aleksandra Radosavljevic (370 J967 11) and Nevena Stevic, without references;
- projects of building structures for road facilities (bridges) for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings **(P132G1)**, based on four references by Sinisa Mihajlovic (310 4281 03), two references by Marina Pesic (310 9562 03) and three references by Nada Pavlovic (310 5632 03);
- projects of building structures for road facilities (tunnels) for state roads of the first and second order, road facilities and traffic connections to these roads and border crossings **(P133G1)**, based on two references by Dragana Rupar (310 C622 05) and three references by Jasmina Kostic (310 A144 04);
- road projects for public railway infrastructure with connections **(P141G2)**, based on two references by Radomir Matic (315 5702 03), two references by Milan Jelkic (315 0979 03), two references by Zorana Stanisic (315 3141 03) and two references by Milan Janjic (315 4273 03);
- traffic and traffic signaling projects for public railway infrastructures with connections **(P141C1)**, based on two references by Tomislav Mihajlovic (370 1313 03), two references by Tatjana Mikic (370 9293 03), three references by Dragana Stefanovic (370 9553 04), four references by Danko Trninic (370 4467 03) and three references by Dragan Djordjevic (370 G649 08);
- projects of high and medium voltage electrical installations for public railway infrastructure with connectors **(P141E1)**, based on two references by Slavko Bursac (351 G246 08), two references by Milan Sipetic (351 K881 12) and two references by Andreja Mijalcic (351 N203 14);
- electric motor plant management projects - automation, measurements and regulation for public railway infrastructure with connectors **(P141E4)**, based on five references by Aleksandar Zlatanovic (352 0774 03), and three references by Slavko Bursac (352 A911 05);
- projects of mechanical parts of railroad switches, railway equipment and accessories for public railway infrastructure with connectors **(P141M4)**, based on three references by Mile Nikolic (330 B869 05) and two references by Nenad Djordjevic (333 0924 03);
- projects of building constructions for facilities on public railway infrastructures with connections (bridges) - **P142G1**, based on one reference by Sinisa Mihajlovic (310 4281 03), two references by Nada Pavlovic (310 5632 03), two references by Aleksandra Naumovic (310 3046 03), two references by Marina Jankovic (310 4148 03), two references by Dejan Srejic (310 F110 07), one reference by Slobodan Jacovic (310 J408 10), one reference by Milos Jokic (310 C080 05) and three references by Ljubomir Vlaisavljevic (310 C386 05);
- projects of building constructions for facilities on public railway infrastructures with connections (tunnels) - **P143G1**, based on one reference by Marina Jankovic (310 4148 03), three references by Jasmina Kostic (310 A144 04) and one reference by Dragana Rupar (310 C622 05);
- projects of building constructions for subway **(P144G1)**, based on one reference by Aleksandar Naumovic (310 3046 03), two references by Marina Jankovic (310 4148 03), one reference by Marina Pesic (310 9562 04), three references by Ljubomir Vlaisavljevic (310 C386 05), one reference by Dejan Srejic (310 F110 07), one reference by Slobodan Jacovic (310 J408 10) and one reference by Milos Jokic (310 C080 05);
- road projects for subway **(P144G2)**, based on four references by Milan Jelkic (315 0979 03), two references by Milan Janjic (315 4273 03) and one reference by Novica Gotovina (315 3140 03);

- traffic and traffic signaling projects for subway **(P144C1)**, based on two references by Dragana Stefanovic (370 9553 04), Dragan Djodjevic (370 G649 08), without references, five references by Danko Trninic (370 4467 03) and Aleksandar Radosavljevic (370 J967 11), without references;
- hydrotechnical projects for subway **(P144G3)**, based on seven references by Dragan Milosavljevic (314 9242 04) and one reference by Jelena Nikolic (314 3134 03);
- projects of high and medium voltage electrical installations for subway **(P144E1)**, based on four references by Slavko Bursac (351 G246 08) and three references by Milan Sipetic (351 K881 12);
- electric motor plant management projects - automation, measurements and regulation for subway **(P144E4)**, based on four references by Aleksandar Zlatanovic (352 0774 03) and five references by Slavko Bursac (352 A911 05);
- projects of thermo-technical, thermo-energetic, process and gas installations for subway **(P144M1)**, based on three references by Mile Nikolic (330 B869 05), one reference by Zlatko Stevanovic (330 B870 05) and one reference by Snezana Matic (330 A078 04);
- projects of electronic communications facilities, i.e. networks, systems or means that are of international or main importance **(P150E3)**, based on three references by Perisa Prokopijevic (353 4455 03) and one reference by Tatjana Knezevic (353 A824 04);
- projects of electronic communication facilities, i.e. networks, systems or means that are being built on the territory of two or more local self-government units **(P151E3)**, based on three references by Perisa Prokopijevic (353 4455 03) and one reference by Tatjana Knezevic (353 A824 04);
- projects of building constructions for regional landfills, i.e. landfills for non-hazardous waste disposal for an area inhabited by over 200,000 inhabitants **(P180G1)**, based on two references by Slobodan Naumovic (310 3056 03) and two references by Olivera Gajovic Gojgic (310 2121 03);
- hydrotechnical projects for regional landfills, i.e. landfills for non-hazardous waste disposal for an area inhabited by over 200,000 inhabitants **(P180G3)**, based on one reference by Mirjana Kristiforovic Pavic (314 3119 03), one reference by Dusica Majstorovic (314 3194 03) and one reference by Bratislav Pesterac (314 3132 03);
- technological processes projects for regional landfills, i.e. landfills for non-hazardous waste disposal for an area inhabited by over 200,000 inhabitants **(P180T1)**, based on two references by Ruzica Ilic (371 4487 03) and two references by Jelena Sekulovic (371 4485 03).

Based on the above, at the proposal of the expert commission and Article 192 of the Law on General Administrative Procedure, it was decided as in the dispositive of the Decision.

The fee for this decision was collected in the amount of RSD 22,750.00 (twenty-two thousand seven hundred and fifty dinars).

Instruction on legal remedy: This decision is final in the administrative procedure and no appeal can be filed against it, but an administrative dispute can be initiated with a lawsuit before the Administrative Court of Serbia within 30 days from the day of delivery.

SECRETARY OF STATE

Imre Kern

Deliver:

-to the applicant;
-competent inspection;
-archives.

	EXCERPT ON THE REGISTRATION OF A	Serbian Business
5000159147996	BUSINESS ENTITY	Registers Agency

BASIC IDENTIFICATION DATA

ID / Registration number 07451342

STATUS

Business entity status Active

LEGAL FORM

Legal form A limited liability company

BUSINESS NAME

Business Name INSTITUTE OF TRANSPORTATION CIP ltd, BELGRADE (SAVSKI VENAC)

ADDRESS INFORMATION

Headquarters address

Municipality	Belgrade – Savski Venac
Place	Belgrade – Savski Venac
Street	Nemanjina
Number and letter	6/IV
Floor, apartment number and letter	

BUSINESS DATA

Establishment data

Date of Establishment August 15, 1990

Duration

The duration of the business entity Unlimited

Predominant activity

Activity Code 7112

Name of activity Engineering activities and technical consulting

Other identification data

Tax Identification Number (PIB) 100003172

Data of importance for legal transactions

Current accounts

285-1001209902538-12

205-0070100301189-65
200-2712600101033-65
160-0000000927239-28
295-0000001242946-51
285-1001000000572-49
295-0000000104973-55
200-2712601501033-68
295-0000000000956-57
285-1001209892230-90
190-0000000011520-56
205-0000000002871-11
375-0000000004791-84
200-2712600101003-58

Information on the statute / founding act

There is no obligation to certify amendments to the founding act

Date of valid statute

Date of valid founding act February 02,2015

Legal (statutory) representatives

Individuals

1. Name Milutin Surname Ignjatovic
   ID Number 0104943710139
   Position Managing Director
   Co-signature restriction there is no co-signature restriction

Members / Co-owners

Member information

Business Name Serbian Railways Joint Stock Company, Belgrade

ID / Registration number 20038284

Capital data

Cash amount Date

Listed: RSD 573.094.011,75

Amount	Date
Paid: EUR 2.480.348,30, in the equivalent of RSD 202.575.502,43	June, 08, 2007

Amount	Date
Paid: EUR 1.230.106,41 in the equivalent of RSD 98.834.867,68	June 19, 2008

Amount	Date
Paid: RSD 271.683.641,64	July 09, 2019

Non-monetary

Value	Date	description
Entered: EUR 407.689,48 in the equivalent of RSD 4.784.236.05		

Value	Date	description
Entered: EUR 407.689,48 in the equivalent of RSD 4.784.236.05	December 31, 1999	

amount (%)

Co-ownership share of 100,0000000000

Share capital of the company

Cash amount Date

Entered: RSD 573.094.011,75

Amount Date

Entered: EUR 2.480.348,30 in the equivalent of June 08, 2007

RSD 202.575.502,43

Amount Date

Paid: EUR 1.230.106,41 in the equivalent of June 19, 2008

RSD 98.834.867,68

Amount Date

Paid: RSD 271.683.641,64 July 09, 2019

Non-monetary

value Date description

Entered: EUR 407.689,48 in the equivalent of

RSD 4.784.236.05

value Date description

Entered: EUR 407.689,48 in the equivalent of December 31, 1999

RSD 4.784.236.05

Registrar

Miladin Maglov

LOGO LOGO LOGO LOGO

JUQS - COMPANY FOR QUALITY SYSTEMS CERTIFICATION AND SUPERVISION d.o.o.
3 Crnogorska St, Belgrade, Republic of Serbia

based on the decision from the Minutes of the certification commission session number Z-29-02-19-492

issues

C E R T I F I C A T E

Reg. No. Q-2097-IVR

which confirms that the quality management system established and implemented by the organization

LOGO CIP

6/IV NEMANJINA St • Belgrade 11000 • REPUBLIC OF SERBIA
is in accordance with the standard for quality management systems

SRPS ISO 9001:2015

and refers to
Locations listed in the Decision on certification R-Q-2097-IVR
Scope of certification

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

Belgrade *Director*

Valid from: **December 19, 2019**
Valid until: **December 18, 2022**

Aleksandar Djordjevic

Date of first certification: **December 19, 2007**

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

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JUQS - COMPANY FOR QUALITY SYSTEMS CERTIFICATION AND SUPERVISION d.o.o.
3 Crnogorska St, Belgrade, Republic of Serbia

based on the decision from the Minutes of the certification commission session number Z-29-02-19-493

issues

C E R T I F I C A T E

Reg. No. E-0709-IR

which confirms that the environmental management system established and implemented by the organization

LOGO CIP

6/IV NEMANJINA St • Belgrade 11000 • REPUBLIC OF SERBIA
is in accordance with the standard for environmental management systems

SRPS ISO 14001:2015

and refers to
Locations listed in the Decision on certification R-E-0709-IR
Scope of certification

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

Belgrade *Director*

Valid from: **December 16, 2019**
Valid until: **December 15, 2022**

Aleksandar Djordjevic

Date of first certification: **December 16, 2016**

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

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JUQS - COMPANY FOR QUALITY SYSTEMS CERTIFICATION AND SUPERVISION d.o.o.
3 Crnogorska St, Belgrade, Republic of Serbia

based on the decision from the Minutes of the certification commission session number Z-29-02-19-494

issues

C E R T I F I C A T E

Reg. No. O-0483-IR

which confirms that the occupational safety and health management system established and implemented by the organization

LOGO CIP

6/IV NEMANJINA St • Belgrade 11000 • REPUBLIC OF SERBIA
is in accordance with the standard for occupational safety and health management systems

SRPS ISO 45001:2018

and refers to
Locations listed in the Decision on certification R-O-0483-IR
Scope of certification

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

Belgrade *Director*

Valid from: **December 16, 2019**
Valid until: **December 15, 2022**

Aleksandar Djordjevic

Date of first certification: **December 16, 2016**

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
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INSTITUTE OF TRANSPORTATION CIP d.o.o.

6/IV Nemanjina, 11000 Belgrade

Number: 841-5/19
Date: May 15, 2020

DECISION ON APPOINTMENT OF THE MANAGER OF THE UPDATED STUDY ON ENVIRONMENTAL IMPACT ASSESSMENT

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

M A N A G E R

of an updated study preparation on the environmental impact assessment of the project of the regional landfill for municipal (non-hazardous) waste "Kalenić", at CP no. 800 KO Kalenić, municipality of UB, it is determined:

Master Gorica Aleksic Milosavljevic, graduated chemist _____

Designer: Institute of Transportation CIP, d.o.o. **,** 6/IV Nemanjina

Responsible person / representative Milutin Ignjatovic, Graduate Engineer

Stamp: Signature:

Technical documentation number: 2019-841-LAB
Place and date: Belgrade, 2020

INSTITUTE OF TRANSPORTATION CIP d.o.o.

6/IV Nemanjina, 11000 Belgrade

STATEMENT OF THE MANAGER OF THE UPDATED STUDY ON ENVIRONMENTAL IMPACT ASSESSMENT

Manager of the preparation of the updated Study on Environmental Impact Assessment of the project of the regional landfill for municipal (non-hazardous) waste "Kalenić" at CP no. 800 KO Kalenić, municipality of UB,

Master Gorica Aleksic Milosavljevic, graduated chemist

I DECLARE

1. that the study was prepared in all respects in accordance with the Law on Environmental Protection, the Law on Environmental Impact Assessment, regulations, standards and norms in the field of environmental protection and the rules of the profession;
2. that the Study contains prescribed and established measures and recommendations in order to prevent, reduce and, where possible, eliminate any harmful impact on the environment.

Manager of the Study: Master Gorica Aleksic Milosavljevic, graduated chemist

Signature:

Technical documentation number: 2019-841-LAB
Place and date: Belgrade, 2020

INSTITUTE OF TRANSPORTATION CIP d.o.o.

6/IV Nemanjina, 11000 Belgrade

LIST OF PARTICIPANTS

IN THE PREPARATION:

UPDATED STUDY ON ENVIRONMENTAL IMPACT ASSESSMENT OF THE REGIONAL LANDFILL OF MUNICIPAL (NON-HAZARDOUS) WASTE "KALENIC" PROJECT, ON CP No 800 KO KALENIC, MUNICIPALITY OF UB

Manager of the Study preparation:	**Mrs. Gorica Aleksic Milosavljevic, graduated chemist**
Associates:	Ruzica Ilic, graduate engineer
	Elena Tanjevic, graduated chemist
	MA Dragica Ilic, molecular biologist
	Master Jelena Sekulovic, graduate engineer
	Aleksandar Gajicki, graduate traffic engineer
	Dejan Radulovic, graduate spatial planning eng
	Djordje Stozinic, Bachelor of Economics
	Natasa Rosic, technician

Manager of the LAB Sector

Mrs. Gorica Aleksic Milosavljevic, grad. chemist

II DECISION ON THE SCOPE AND CONTENTS

(Coat of Arms)
The Republic of Serbia
MINISTRY OF THE
ENVIRONMENTAL PROTECTION
Number: 353-02-1927/2019-03
Date: 15/10/2019
Belgrade

In accordance with Article 4, Paragraph 3, Article 16, 17 and 28 of the Law on Evaluation of Impact on the Environment ("The Official Gazette of the RS", number 135/04, 36/09) Article 5a of the Law on Ministries ("The Official Gazette of the RS", no. 44/14, 14/15, 54/15 and 96/15), Article 23, Paragraph 2 of the Law on Public Administration ("The Official Gazette of the RS" no. 79/05, 101/07 and 95/10 and 95/14), Article 136 and 141, Paragraph 7 of the Law on General Administrative Procedure ("The Official Gazette of the RS" number 18/16), and in reference to the Application of the holder of the project Regional center for waste management "Eko-Tamnava" d.o.o. Ub, the Ministry of Environmental Protection, Assistant Minister Aleksandar Vesic, upon Ruling and power of attorney number: 021-01-5/4/2017-01 as of 11/12/2017 passes the following

RULING

1. Scope and updating of the Study on evaluation of impact on the project of regional landfill for utility (non-hazardous) waste Kalenic, Ub Municpality, on cadaster lot no. 800 CM Kalenic, Ub Municipality on the environment are instructed to the project holder Regional center for waste management "Eko-Tamnava" d.o.o. Ub.
2. Obligation of the holder of the project is to make the Study on evaluation of impact of the subject project on the environment in accordance with the Rulebook on contents of the Study on evaluation of impact on the environment "The Official Gazette of the RS, 69/05", Articles 2 to 10.
3. In chapter state of play of the environment at the location and surroundings of the location, it is required to give the existing state of play of environmental facts after finalization of coil exploitation at open pit Tamnava west field and based on results of measuring of noise, air quality, soil quality, surface and underground waters. Project holders obligation is to particularly describe in the Study on evaluation of impact on the environment possible significant impacts of the project on the environmental, then to show possible changes in environment while the project is being carried out, regular operation in case of accident as well, as well as the evaluation whether the changes are of temporary or permanent character.
4. Project holder is obliged, within one year as of the finality date of this Ruling to submit the application for consent on the Study on evaluation of impact on the environment from Item 1 of this Ruling.
5. All terms and consents of other competent authorities should be enclosed with the Study on evaluation of impact, in accordance with special law – location terms, water terms, terms of the Institute for Nature Conservation, terms of the Institute for Protection of Cultural Monuments ets.

6. Study provides data on the project based on which the Study was made, as well as data on legislation that was used while making the Study.

Explanation

Project holder Regional center for waste management "Eko-Tamnava" d.o.o. Ub submitted on 10/09/2018 to the Ministry of environmental protection, the application for determining scope and contents for updating the Study on evaluation of impact on the project of regional landfill for utility (non-hazardous) waste Kalenic, Ub Municpality, on cadaster lot no. 800 CM Kalenic, Ub Municipality, to which the Ministry of agriculture and environmental protection passed a ruling on giving consent number 353-02-806/2015-16 as of 25/08/2016.

The application was submitted in accordance with Article 28 of the Law on Evaluation of Impact on the Environment having in mind that Project holder hasn't started implementation in the period of two years as of the day of entry into force of the Ruling on consent for the Study on evaluation on impact on the environment.

Subject project is on the list of the projects that require mandatory impact List (I)- item 10, which was established in accordance with the Decree on establishing the List of projects which require mandatory impact evaluation and the List of projects for which evaluation of impact on the environment can be asked ("The Official Gazette of the Republic of Serbia" number 114/2008).

The application is accompanied with filled in questionnaires for determining the scope and contents pf the Study on evaluation of impact on the environment (part I and II), as well as the following copies of previously acquired terms and opinions by other competent authorities:

- Location terms from the Ministry of construction, transport and infrastructure, number 350-02-00435/2018-14 as of 13/12/2018;
- Ruling of the Institute for Nature Conservation of Serbia with terms for nature conservation issued for the requirements of the Location terms, 03 number 020-3172/2 as of 03/12/2018;
- Water terms of the Republic Water Directorate of the Ministry of agriculture, forestry and water management, number 325-05-1071/2018-07 as of 05/12/2018;
- Terms of the Institute for Protection of Cultural Monuments, Valjevo, no. 1143 as of 03/06/2019;
- Term regarding fire protection measures Ministry of the Interior, Sector for Emergency Situations. Department for Emergency Situations in Valjevo – Section for preventive protection 09710/2 number 217-16729/18 as of 13/11/2018;
- Graphic documentation.

Acting upon subject request, according to Article 14, Paragraph 1 and Article 29 of the Law on Evaluation of Impact on Environment, interested authorities, organizations and interested public in reference to obtaining opinion on the submitted application are notified – advertisement was published in local paper "Napred", on 26/09/2019, as well as on the website of the Ministry- http://www.ekologija.gov.rs/obavestenja/procena-uricaja-na-zivotnu-sredinu/.

Opinions of interested authorities, organizations and public were not submitted in reference to the submitted application for determining scope and contents of the Study on evaluation of impact on the environment.

In accordance with Article 14, Paragraph 17 and 28 of the Law on Evaluation of Impact on the Environment ("The Official Gazette of the RS", number 135/04, 36/09), as well as in accordance with Articles 1-10 of the Rulebook on contents of the Study on evaluation of impact on the environment ("The Official Gazette of the RS, 69/05), the scope and contents of the subject Study have been determined.

In reference to the aforementioned, it was decided as in the text of this Ruling.

Legal Remedy: A complaint can be filed against this Ruling to the Government of the Republic of Serbia, via this authority, within 15 days as of the date of the Ruling receipt, i.e. as of the day of notifying interested public on the enacted Ruling.

ASSISTANT MINISTER
(Round seal)
(Signature illegible)
(Illegible txt/numbers)
Aleksandar Vesic

Deliver to the following:
- Project holder
- Archives

III TEXTUAL DOCUMENTATION

1. INFORMATION ON THE PROJECT HOLDER

1.	**MAIN CONTRACTOR** **"EKO - TAMNAVA" REGIONAL WASTE MANAGEMENT CENTRE D.O.O. UB** **DIRECTOR:** **(signed and sealed)** **Zoran Petrović**	
2.	Company Adress: **60A/2 Kralja Petra I Str. 14210 Ub**	
3.	Contact Person: **Zoran Petrović**	Phone No. **014/412-415**
4.	Email: **Office@ekotamnava.rs**	Fax: **014/412-415**
5.	Procesor: **Institute of Transportation CIP d.o.o.**	
6.	Company Address: **6/IV Nemanjina Str. Belgrade**	
7.	Contact Person: **Gorica Aleksić Milosavljević, M. Sci. Chem.**	Phone No. **011/324-55-26**

1.1. BASES FOR THE COMPILATION OF THE UPDATED ENVIRONMENTAL IMPACT ASSESSMENT

1.1.1. Purpose of and Methodology of the Preparation of the Updated EIA

Pursuant to Article 28 of the Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04, 36/09), the Environmental Impact Assessment of the "Kalenić" Regional Municipal (Non-Hazardous) Landfill, the Municipality of Ub, on the CP No. 800, CM Kalenić, the Municipality of Ub was updated, which EIA was the subject of the Decision on the EIA Approval No. 353-02-806/2015-16 as of 25/08/2016 issued by the Ministry of Agriculture and Environmental Protection. The reason for the update of the subject EIA is the fact that the Project Holder – "Eko Tamnava" Regional Waste Management Centre d.o.o. Ub - did not start the implementation of the project within two years as of the date when the subject Decision on the Approval of the Environmental Impact Assessment became final.

The Updated Environmental Impact Assessment of the "Kalenić" Regional Municipal (Non-Hazardous) Waste Landfill Project, Municipality of Ub, on CP No. 800, CM Kalenić, the Municipality of Ub, has been compiled in accordance with the Decision on the Scope and Contents of the Updated Environmental Impact Assessment (No. 353-02-1927/2019-03 as of 15/10/2019) adopted by the Ministry of Environmental Protection; the existing legislation, technical documentation and relevant planning documentation. Archival documentation, the results of environmental monitoring in the zone of the future "Kalenić" Regional Sanitary Landfill, conducted by PE "Electric Power Industry of Serbia" Belgrade, MB "Kolubara" Lazarevac Branch, the opinions and requirements of competent institutions and data collected in the field were also used for the EIA update.

Legal Basis

The updated Environmental Impact Assessment Study is based on:
• Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04, 36/09),
• Law on Environmental Protection ("Official Gazette of RS", No. 135/04, 36/09, 72/09, 14/16, 76/18 and 95/18-other law),
• Law on Planning and Construction ("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, 37/19 - other law and 9/20),
• Regulations on determining the List of projects requiring mandatory impact assessment and the List of projects which might require an environmental impact assessment ("Official Gazette of RS", No. 114/08),
• Rules on the Contents of the Environmental Impact Assessment ("Official Gazette of RS", No. 69/05).

The results were interpreted and protection measures were defined in compliance with the following laws and bylaws:
• Law on Environmental Protection ("Official Gazette of RS", No. 135/04, 36/09, 72/09, 14/16, 76/18 and 95/18-other law)
• Law on Environmental Impact Assessment ("Official Gazette of RS", No. 135/04 and 36/09-amendments),
• Law on Waste Management ("Official Gazette of RS", No. 39/09, 88/10, 14/16 and 95/18-other law),
• Law on Packaging and Packaging Waste ("Official Gazette of RS", No. 36/09 and 95/18);
• Law on Utility Services ("Official Gazette of RS", No. 88/11, 104/16 and 95/18);
• Law on Protection of Nature, ("Official Gazette of RS", No. 36/09, 88/10, 91/10-corr., 14/16 and 95/18-other law);
• Law on Waters ("Official Gazette of RS", No. 30/10, 93/12, 101/16 and 95/18-other law);
• Law on Air Protection ("Official Gazette of RS", No. 36/09 and 10/13),
• Law on Environmental Noise Protection ("Official Gazette of RS", No. 36/09 and 88/10),
• Law on Transport of Dangerous Goods ("Official Gazette of RS", No. 88/10, 104/16 and 83/18),

• Law on Chemicals ("Official Gazette of RS", No. 36/09, 88/10, 92/11, 93/12 and 25/15),
• Law on Mining and Geological Research ("Official Gazette of RS", No. 101/15 and 95/18);
• Law on Agricultural Land ("Official Gazette of RS", 62/06, 65/08, 41/09, 112/15,80/17 and 95/18),
• Law on Cultural Heritage ("Official Gazette of the SRS", 71/94, 52/11, 99/11),
• Law on Spatial Plan of the Republic of Serbia from 2010 to 2020 ("Official Gazette of RS", No. 88/10),
• Law on Forests ("Official Gazette of RS", No. 30/10, 93/12, 89/15 and 95/1/),
• Law on Explosive Substances, Flammable Liquids and Gases ("Official Gazette of the SRS", No. 44/77, 45/85, 18/89, "Official Gazette of the RS", No. 53/93, 67/93, 48/94, 101/05 and 54/15),
• Law on Fire Protection ("Official Gazette of RS", No. 111/09, 20/15 and 87/18-other law),
• Law on Safety and Health at Work ("Official Gazette of RS", No. 101/05, 91/15 and 113/17-other law),
• Law on Ionizing Radiation Protection and Nuclear Safety, ("Official Gazette of RS" No. 36/09, 93/12),
• Waste Management Strategy for the period 2010 - 2019 ("Official Gazette of RS", No. 29/10),
• Decree on waste disposal in landfills ("Official Gazette of RS", No. 92/10);
• Decree on systematic monitoring of the condition and quality of land, ("Official Gazette of RS", No. 73/19);
• Decree on limit values of polluting, harmful and dangerous substances in the soil ("Official Gazette of RS", No. 30/18);
• Decree on air quality requirements and monitoring conditions ("Official Gazette of RS" No. 11/10, 75/10, 63/13);
• Decree on Limit Values for Emissions of Pollutants into the Air from Combustion Plants (Official Gazette No. 6/16);
• Decree on limit values for emissions of pollutants into the air from stationary sources of pollution, except for combustion plants (Official Gazette No. 111/15);
• Decree on water classification ("Official Gazette of the SRS", No. 5/68);
• Decree on limit values for emissions of pollutants into water and deadlines for their achievement ("Official Gazette of RS", No. 67/11, 48/12 and 1/16);
• Decree on limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement ("Official Gazette of the SRS", No. 50/12);
• Decree on limit values of high-priority and high-priority hazardous substances that pollute surface waters and deadlines for their achievement ("Official Gazette of RS", No. 24/14),
1. Decree on noise indicators, limit values, methods for assessment of noise indicators, nuisance and harmful effects of noise on the environment ("Official Gazette of RS", No. 75/10),
• Rules on the methodology of and procedure for the implementation of projects of importance for the Republic of Serbia ("Official Gazette of RS" No. 1/12),
• Rules on the contents of the environmental impact assessment ("Official Gazette of RS", No. 69/05),
• Rules on the methodology of collecting data on the structure and quantities of municipal waste on the territory of a local self-government unit, ("Official Gazette of RS", No. 14/20);
• Rules on the manner and procedure of waste tire management ("Official Gazette of RS" No. 104/09 and 81/10);
• Rules on the conditions and manner of collection, transport, storage and treatment of waste used as recycling materials or for energy production ("Official Gazette of RS", No. 98/10);
• Rules on the forms of daily and annual waste reports with instructions for their completion ("Official Gazette of RS", No. 7/20);
• Rules on categories, testing and classification of waste ("Official Gazette of RS" No. 56/10 and 93/19);
• Rules on the storage, packaging and marking of hazardous waste ("Official Gazette of RS", No. 92/10);
• Rules on the manner and procedure of managing spent batteries and accumulators ("Official Gazette of RS", No. 86/10);

• Rules on the contents and appearance of permits for waste storage, treatment and disposal ("Official Gazette of RS", No. 96/09);
• Rules on the manner and conditions for measuring the quantity and testing the quality of wastewater and the contents of the report on the performed measurements (Official Gazette of RS, No. 33/16);
• Rules on conditions, manner and procedure of waste oil management ("Official Gazette of RS" No. 71/10),
• Rules on the application for the issuance of a permit for waste treatment, storage, reuse and disposal ("Official Gazette of RS", No. 38/18),
• Rules on the contents and manner of keeping the register of protected natural resources ("Official Gazette of RS", No. 81/10),
• Ordinance on the 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),
• Rules on evaluation criteria and procedure for categorization of protected areas ("Official Gazette of RS", No. 97/15),
• Rules on the methodology of determining acoustic zones ("Official Gazette of RS", No. 72/10),
• Rules on noise measurement methods, contents and scope of noise measurement reports ("Official Gazette of RS", No. 72/10),
• Rules on safety at work during construction works ("Official Gazette of RS", No. 53/97 and 14/09),
• Rules on preventive measures for safe and healthy work during noise exposure ("Official Gazette of RS", 96/11, 78/15 and 93/19),
• Ordinance on hazardous substances in waters ("Official Gazette of the SRS", No. 31/82),
• Rules on the manner of determining and maintaining sanitary protection zones of water supply sources ("Official Gazette of RS", No. 92/08),
• Rules 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),
• Rules on reference conditions for surface water types ("Official Gazette of RS", No. 67/11),
• Rules on the content of air quality plans ("Official Gazette of RS", No. 21/10),
• Rules on permitted quantities of hazardous and harmful substances in soil and irrigation water and methods for their testing ("Official Gazette of RS", 23/94),
• Rules on the content of the Accident Prevention Policy and the content and methodology of drafting the Safety Report and the Accident Protection Plan ("Official Gazette of RS", No. 41/10),
• Rules on the manner of preparation and content of the Accident Protection Plan ("Official Gazette of RS", No. 41/19);
• Rules on the content of the study on the preparation of the construction site ("Official Gazette of RS", No. 121/12 and 102/15),
• Rules on technical norms for fire and explosion safety of plants and facilities for flammable and combustible liquids and on storage and transfer of flammable and combustible liquids ("Official Gazette of RS", No. 114/17).

Planning documentation

During the preparation of the updated Environmental Impact Assessment of the "Kalenić" Regional Municipal (Non-Hazardous) Waste Landfill Project, Municipality of Ub, on CP No. 800, CM Kalenić, Municipality of Ub, the following existing planning documentation was used as information and documentation basis:
• General regulation plan for the area of TPP "Kolubara B" (with the planned Spatial Unit 4 - Regional Municipal Solid Waste Landfill) ("Official Gazette of the Municipality of Ub", No. 1/07),
• Development project for the construction of the "Kalenić" Regional Municipal Waste Landfill (Approval No. 350-184/14-04 as of 30/04/2014).
• Regional waste management plan for 11 cities and municipalities of the Kolubara region for the 2019-2029 period, Institute of Transportation CIP d.o.o. and "SET" d.o.o. Šabac, Belgrade, 2019
• Strategic Environmental Assessment of the Regional Waste Management Plan for 11 cities and municipalities of the Kolubara region for the 2019-2029 period, Institute of Transportation CIP d.o.o. and "SET" d.o.o. Šabac, Belgrade, 2019

Available technical documentation, studies and surveys

The following technical documentation was used for the compilation of the updated Environmental Impact Assessment:

• Preliminary design of the "Kalenić" Regional Sanitary Municipal Waste Landfill - Phase I, "Kirilo Savić" Institute, Belgrade, 2014

• Preparatory Works Design on CP No. 800, CM Kalenić, Energoprojekt-Hidroinženjering a.d. Belgrade, 2019

- Main Volume;
- 10 - Preparatory Works Design;

• Construction Permit Design for the construction of the "Kalenić" Regional Sanitary Municipal Non-Hazardous Waste Landfill, Energoprojekt-Hidroinženjering a.d. Belgrade, 2019

0 Main volume
1 Architectural Design
2/1.1 Construction Design:
Facilities for controlled implementation of the technological process
2/1.2 Construction Design: Landfill body
2/1.3 Construction Design: Facilities for maintaining groundwater levels
2/1.4 Construction Design: Facilities for the supply of technical and drinking water and water for the fire safety system
2/2 Road Design: Transportation infrastructure facilities within the complex
3/1 Hydraulic Installation Design:
Facilities for controlled implementation of the technological process
3/2 Hydrotechnical Installation Design: Facilities for the drainage of atmospheric, leachate, waste and sanitary-foecal waters
3/3 Hydraulic Installation Design:
Groundwater level maintenance facilities
3/4 Hydraulic Installation Design: Facilities for the supply of technical and drinking water and water for the fire protection system
6/1 Machine Installation Design: Thermal installations
6/2 Mechanical Installation Design: Facilities for drainage of atmospheric, leachate, waste and sanitary-foecal waters
6/3 Mechanical Installation Design: Facilities for maintaining groundwater levels
6/4 Mechanical Installation Design: Facilities for the supply of technical and drinking water and water for fire safety system
7/1 Technological Design:
Facilities for controlled implementation of the technological process
7/2 Technological Design: Landfill Body
9 Exterior design with synchronous plan of installations and connections, landscape architecture and horticulture

Studies and surveys:

• Environmental Impact Assessment of the "Kalenić" Regional Sanitary Municipal Non-Hazardous Waste Landfill Project on CP 800 Kalenić, territory of the Municipality of Ub, Institute of Transportation CIP d.o.o., Belgrade, 2016

• Hydrodynamic study of the impact of groundwater on the body of the regional landfill "Kalenić", Geoing, Belgrade, 2015

• Study of the protection of the "Kalenić" Regional Landfill from large return waters Q1% (T = 100 years) and control water levels Q0.1% (T = 1000 years), Institute of Hydraulic Engineering and Water Environmental Engineering - Faculty of Civil Engineering, University of Belgrade , Belgrade, 2019

• Study of hydrogeological research, analysis of the current state of the groundwater regime with a proposal of hydrogeological measures for maintaining groundwater levels in the conditions of exploitation of the "Kalenić" Regional Landfill, Energoprojekt-Hidroinženjering a.d. Belgrade, 2019;

• Study of the geotechnical conditions for the construction of the "Kalenić" Regional Municipal Non-Hazardous Waste Landfill Project - Phase I, GEOING GROUP, Belgrade 2019;
• Energy efficiency study, Energoprojekt-Hidroinženjering a.d. Belgrade, 2019;
• Fire safety study, "SECURITON" Belgrade, 2019.

Opinions and Requirements of the Competent Institutions

The following conditions, opinions, statements, etc. of the competent institutions were used in the preparation of the EIA:

1. Site conditions for the phased construction of the “Kalenić” Regional Municipal Waste Landfill, Ministry of Construction, Traffic and Infrastructure, No. 350-02-00435/2018-14 as of 13/12/2018
2. Decision on the requirements for the protection of nature, Serbian Institute for the Protection of Nature, 03 No. 020-3172/2/1 as of 03/12/2018;
3. Water-Related Requirements, Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate, No. 325-05-1071/2018-07 dated 5 December 2018;
4. Requirements, Institute for the Protection of Cultural Monuments Valjevo, No. 1143 of 5 December 2018;
5. Technical requirements of PUC "Djunis" Ub, No. 1270 as of 19/11/2018,
6. Requirements, PE "Elektromreža Srbije", No. 130-00-UTD-003-1029/2018-003 as of 05/12/2018;
7. Requirements, Ministry of the Interior of the Republic of Serbia, Emergency Situations Sector, Valjevo Emergency Situations Department, No. 217-16729/18 as of 13 November 2018;
8. Requirements, “Power Distribution Company” Lazarevac, No. 8l.1.00-D-09.13-324782-UPP-18 as of 04/12/2018;
9. Requirements, “Telekom Srbija” a.d., Executive Unit Belgrade, No. 476528/2-2018 as of 9/11/2018
10. Building permit No. ROP-MSGI-19891-CPI-6/2019, Ministry of Construction, Transport and Infrastructure (Execution of preparatory works that include earthworks on the leveling of the existing terrain and works on the drainage and pumping of water from certain zones of earthworks, within the phased construction of the “Kalenić” Regional Sanitary Municipal Non-Hazardous Waste Landfill on CP No. 800, CM Kalenić, on the territory of the Municipality of Ub);
11. Building Permit No. ROP - MSGI - 19891 - CPIH - 9/2020, Ministry of Construction, Transport and Infrastructure (“Kalenić” Regional Sanitary Municipal Non-Hazardous Waste Landfill);
12. Decision on the Approval of Works No. ROP-UB-653-ISAW-2/2020 and Decision on the Approval for the Execution of Works No. ROP-LAZ-39284-ISAW-3/2020 III-03 Number: 351-228/2020, Department for Land Development Affairs, Unified Procedures and Property Legal Affairs, Municipality of Ub (Construction of 4.5 km 10 KW transmission line, building permit for the Municipality of Ub, City Municipality of Lazarevac).

2. DESCRIPTION OF THE PROJECT SITE

2.1. Decription of the Wider Area of the Project Site

The "Kalenić" Regional Landfill is planned as a disposal site for the municipal (non-hazardous) waste from the area of Kolubara waste management region (Kolubara Region). The Kolubara Region includes the area of the Kolubara administrative district, a part of the Mačva administrative district and a part of the city of Belgrade, i.e. the area of eleven cities and municipalities: Valjevo, Lajkovac, Ljig, Mionica, Osečina, Ub, Vladimirci, Koceljeva, Barajevo, Lazarevac and Obrenovac) covering the area of 4,076 km2, with the total of 363,360 inhabitants according to the 2011 census (Figure 2.1-1).

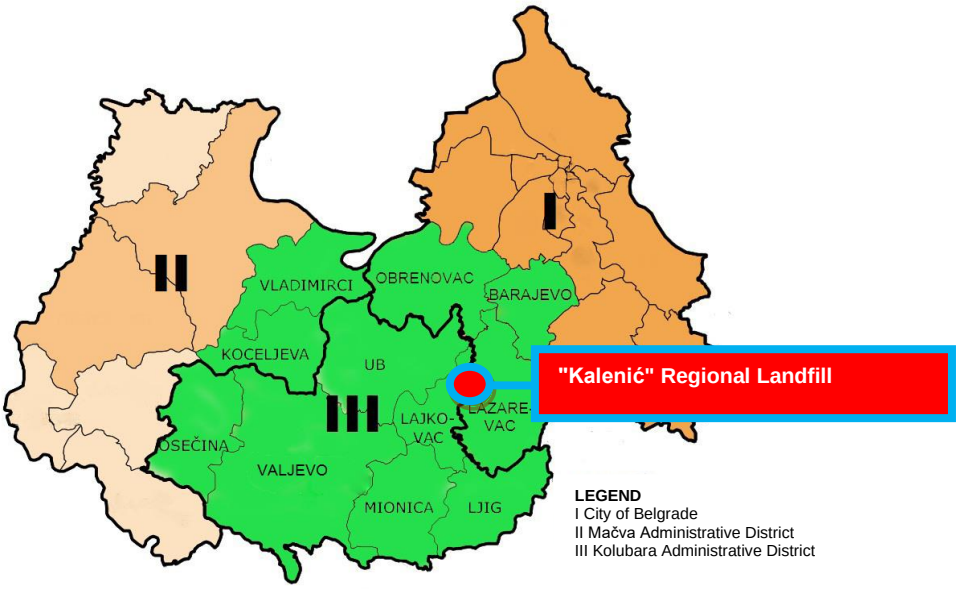


Figure 2.1-1. Spatial distribution of the municipalities of the Kolubara waste management region and the position of the “Kalenić” Regional Municipal Waste Landfill

The distance of the municipalities in the subject region from the site of the sanitary landfill is provided in Table 2.1-1. The complex planned for the construction of the "Kalenić" Regional Landfill has the necessary qualities and advantages for the construction of a landfill, such as: its distance from the nearest settlement of approx. 2 km, and no cultural monuments in the vicinity.

Table 2.1-1. Distance of municipalities from the sanitary landfill site

Municipality	Distance from the Regional Centre, km
Valjevo	43
Mionica	48
Lajkovac	16
Ljig	54
Osečina	63
Ub	14
Vladimirci	64
Koceljeva	40
Lazarevac	17
Obrenovac	21
Barajevo	30

In terms of the area they occupy, the largest municipalities in the Kolubara region are Valjevo and Ub with 905 km² and 456 km², respectively, and the smallest is the municipality of Lajkovac with 186 km² (Table 2.1-2). The municipalities of Valjevo and Lazarevac have the largest number of inhabitants in the municipalities, followed by the municipalities of Ub, Barajevo, Vladimirci, while the municipalities with the smallest number of inhabitants are Ljig and Osečina. Most of the territory of the Kolubara region is a rural area, but the vast majority of the total population lives in the cities - municipal centers.

Table 2.1-2. General Statistical Data for the Kolubara Region (Census 2011)

Municipality	Aera (km²)	No. oh Households in 2011	No. of Households
Valjevo	905	31.401	78
Ub	456	9.176	38
Lajkovac	186	5.113	19
Ljig	279	4.455	27
Mionica	329	4.616	36
Osečina	319	4.212	20
Vladimirci	338	5.835	29
Koceljeva	257	4.522	17
Barajevo	213	8.920	13
Lazarevac	383	18.852	34
Obrenovac	410	23.712	29
REGION	**4.075**	**120.824**	**340**

For the needs of the regional waste management system (11 cities and municipalities of the Kolubara region), in December 2011, the "EKO-TAMNAVA" Regional Waste Management Center (REC) d.o.o. Ub was established as the Regional Landfill and Center. The main activity of "EKO Tamnava" doo Ub is to organize and coordinate the provision of waste management services in the region, manage the construction and operation of the regional landfill, provide transport of municipal, commercial and industrial non-hazardous waste from transfer stations of member municipalities and external users to landfills on a commercial basis. Also, the regional company is engaged in the collection and separation of recyclable waste, composting, as well as the future developments and improvements of the system (use of energy potentials, biogas, etc.).

City of Valjevo

Waste management in the city of Valjevo is performed by PUC "Vidrak". Waste is collected in an organized manner on 95% of the urban part of the municipality, as well as in the settlements of Beloševac, Gorić, Popučke, Jasenica, Lelić, Petnica, Divci, Rađevo Selo, Sedlari, Stave, Veselinovac, Valjevska Loznica, Brankovina and the Divčibare Resort), while other local communities (villages) have no organized collection of municipal waste, and the residents have to take the waste to the surrounding wild landfills. In addition to providing the services of removing waste from households, the company extended such services to private and state-owned companies and public institutions and facilities on the entire territory of the city of Valjevo.

Table 2.1-3. Number of Inhabitants and Households Covered by the Waste Collection Service

No. of Inhabitants	No. of Household	No. of Households Covered by the Waste Managemen Services	Coverage of the Organized Waste Collection %	Quantity (t/year)	Quantity (m^3/year)	Quantity (t/day)	Quantity (m^3/day)
90.312	31.401	25.270	80	37.172	106.204	102	291

The waste is currently disposed of at the city landfill, which has been in use since 1990. The landfill covers an area of 8ha. The height of the deposited waste is up to 20 m in relation to the elevation of the terrain. In addition to the waste that is collected in an organized manner from the municipality of Valjevo, municipal waste that is collected in an organized manner in the municipality of Mionica, approximately 915.06 t/year, is currently disposed of at the city landfill. At the landfill, landfill gas is degassed through installed degassers (4 pieces). In 2018, 9 illegal landfills were discovered on the territory of the city of Valjevo. The estimated total area of the landfill is about 405 m2, and the amount of the waste disposed is about 125 t.

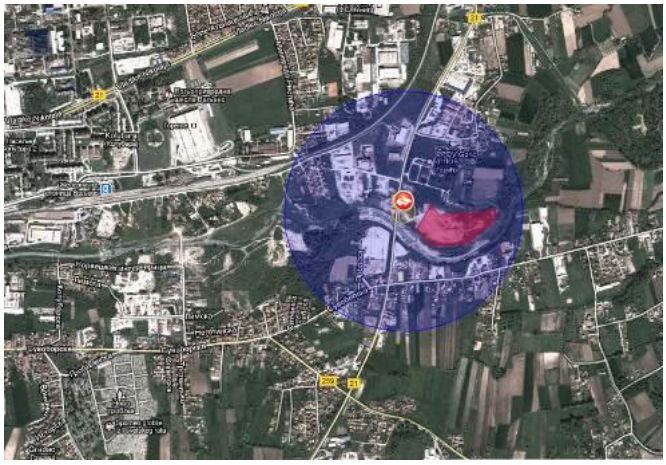



Figure 2.1-2. View of the Site of the City Unsanitary Landfill in Valjevo.

Table 2.1-4. Quantification of Environmental Risks Posed by the Urban Unsanitary Landfill in the City of Valjevo

Quantification of Environmental Risks Posed by the Urban Unsanitary Landfill					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 10^3 m^3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste (m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km)	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water (m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	Daily	Weekly	Monthly	2-4 x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, Disposal Control		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk**	**10-20 Low Risk**	**20-30 Medium Risk**	**30-40 High Risk**	**40-50 Extremely High Risk**
	38				

Municipality of Ub

The collection, transport and disposal of municipal waste on the territory of the municipality of Ub is performed by PUC "Đunis". Waste is collected in the city area by taking over waste from private households and commercial facilities, and there is a long-term program of including the local villages in the municipal hygiene program, which will significantly increase the scope of waste collection. Out of 38 rural settlements on the territory of the municipality of Ub, all settlements are equipped with waste collection containers, with the capacity of 7 m3. Their involvement in the system averages 66%. According to the data submitted for the preparation of the Regional Waste Management Plan (RWMP), approximately 8,605 t or 17,593 m3 are collected, transported and disposed of at the city landfill per annum. A garbage dump is located in Bogdanovica (coordinates: N 4925060; E 427527) on cadastral plots 524/1 and 525/1, CM Ub, covering an area of about 1.7 ha. Waste has been disposed of at this landfill since 1970. The average depth of waste is 7-10 m (Figure 2.1-3).



Figure 2.1-3. Satellite View of the Municipal Unsanitary Landfill in Ub

In 2018, on the territory of the municipality of Ub, 14 wild landfills were discovered. The estimated total area of the landfills is about 320 m2, and the amount of the waste disposed is approx.. 650 t.

Table 2.1-5. Quantification of Environmental Risk Posed by the Municipal Unsanitary Landfill - Municipality of Ub

QUANTIFICATION OF ENVIRONMENTAL RISK POSED BY THE MUNICIPAL UNSANITARY LANDFILL					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 10^3 m^3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste (m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km)	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water(m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	daily	Weekly	Monthly	2-4 x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, Disposal Control		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk**	**10-20 Low Risk**	**20-30 Medium Risk**	**30-40 High Risk**	**40-50 Extremely High Risk**
	42				

Based on the quantification of the environmental risk posed by the main controlled landfill, it has been determined that it belongs in the “Extremely High Risk” category.

Municipality of Lajkovac

Organized waste collection and management on the territory of the municipality of Lajkovac is under the jurisdiction of the PE "Gradska čistoća". According to the data submitted for the preparation of the RWMP, about 9,998 t, i.e. 15,997 m3 of uncompressed non-hazardous waste is collected from citizens and legal entities, and transported and disposed of at the municipal landfill per annum. Non-hazardous waste collected on the territory of the municipality of Lajkovac with villages (18 local communities) is disposed of at the municipal waste landfill at the "Jabučje" site (coordinates: N 44,38399; E 20,20716) on cadastral plot 8770, CM Jabučje, covering an area of approx. 0.3 ha, next to the Kolubara river (Figure 2.1-4.). The average depth of the disposed waste is 3 m. Waste has been disposed of at the

landfill since 2005. Organized waste collection from the inhabitants of the municipality of Lajkovac covers about 32% of the population.



Figure 2.1-4. Satellite View of the Municipal Unsanitary Landfill in Lajkovac.

In the area of the municipality of Lajkovac, 13 illegal landfills were registered, the so-called wild dumps. Although the locations of illegal landfills are regularly cleaned, the locals keep disposing of waste at those sites.

Table 2.1-6. Quantification of Environmental Risk Posed by Unsanitary Landfills - Municipality of Lajkovac

QUANTIFICATION OF ENVIRONMENTAL RISK POSED BY THE MUNICIPAL UNSANITARY LANDFILL					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 103 m3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste (m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km)	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water(m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	daily	Weekly	Monthly	2-4 x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, Disposal Control		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk**	**10-20 Low Risk**	**20-30 Medium Risk**	**30-40 High Risk**	**40-50 Extremely High Risk**
	38				

Municipality of Ljig

Municipal waste management on the territory of the municipality of Ljig is performed by PUC "Komunalac", for the settlements of Ljig, Slavkovica, Rajac and Belanovica. In the previous period, PUC "Komunalac" - Ljig and PUC "Šumadija" - Belanovica merged into one company, that now operates as PUC "Komunalac" - Ljig. Organized waste collection in the municipality of Ljig covers about 44.8% of the population (settlements Ljig and Belanovica and parts of 19 local communities in

the municipality of Ljig). According to the estimates, the annual quantity of the collected, transported and deposited garbage at the municipal landfill is 1,828 t, i.e. 4,062 m3. The waste was previously disposed of at the municipal landfill "Usek", Cvetanovci, which was closed for disposal in 2018. As of 2018, waste is disposed of at the unsanitary landfill - "Osoje" landfill at Kalanjevci, Belanovica (coordinates: N 44º 14' 23,96"; E 20º 24' 01,25") on cadastral plots 2238, 2237/2, 2234/3, CM (Figure 2.1-5) Kalanjevci, covering an area of about 5.48 ha, and being the subject of a rehabilitation, closure and reclamation project which is underway.



Figure 2.1-5. Satellite View of the Municipal Unsanitary Landfill in Ljig.

Based on the quantification of the environmental risk posed by the municipal unsanitary landfill, it has been classified as a medium-risk landfill (Table 2.1-7). In 2018, 7 illegal landfills were registered on the territory of the municipality of Ljig. The estimated total area of the landfill is about 2,750 m2, and the quantity of waste disposed is about 597 t.

Table 2.1-7. Quantification of Environmental Risk Posed by the Municipal Unsanitary Landfill - Municipality of Ljig

QUANTIFICATION OF ENVIRONMENTAL RISK POSED BY THE MUNICIPAL UNSANITARY LANDFILL					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 10^3 m^3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste (m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km)	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water(m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	daily	Weekly	Monthly	2-4x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, Disposal Control		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk**	**10-20 Low Risk**	**20-30 Medium Risk**	**30-40 High Risk**	**40-50 Extremely High Risk**
	29				

Municipality of Mionica

Organized collection of municipal waste on the territory of the municipality of Mionica is under the jurisdiction of PUC "Vodovod Mionica", Mionica. Waste collected on the territory of the municipality of Mionica is currently being transported and disposed of at the unsanitary municipal landfill "Vidrak" in Valjevo. Records are regularly kept on the quantities and types of collected and transported waste for disposal at the "Vidrak" landfill in Valjevo, and the competent institutions are informed about it. Waste is collected in an organized manner only from the following areas in the municipality: Mionica Town, Mionica Village, Vrujci Spa, which includes the territory of three villages - Berkovac, Popadić and Rakari, i.e. approx. 24% of the territory is covered by organized waste collection.

The registered construction waste landfill "Ćosić" has been used for the disposal of construction waste since 2004, but due to the lack of monitoring, biodegradable and bulky waste can be found at the landfill, as well (Figure 2.1-6).



Figure 2.1-6. View of the Construction Waste Landfill "Ćosić".

In 2018, 9 illegal landfills were registered on the territory of the municipality of Mionica. The estimated total area of the landfill is about 450 m2, and the quantity of the waste disposed is about 325 t. The most common locations of wild dumps (landfills) are next to the main roads. Although the sites of illegal landfills are regularly cleaned, waste disposal is repeated at all locations.

Municipality of Osečina

Municipal waste management on the territory of the municipality of Osečina is entrusted to PUC "Osečina" from Osečina. Organized collection of municipal waste on the territory of the municipality of Osečina by PUC "Osečina" covered about 65.5% of the population (2 towns and 18 villages). Since 1970, waste has been disposed of at the municipal landfill "Belotić" in the area of the village of Belotić, about 4.5 km away from Osečina. The space occupied by the existing landfill is 1 ha 54 are 80 m2. There is a solid access road to the landfill. The terrain on which the landfill is located has a slight slope towards the river Jadar, which is located about 170 m away. The average height/depth of the landfill on the entire surface is about 3.0 m. It is estimated that about 47,000 m3 of waste was disposed of at the landfill.



Figure 2.1-6. Satellite Image of the Municipal Unsanitary Landfill in Osečina.

Table 2.1-8. Quantification of Environmental Risk Posed by the Municipal Unsanitary Landfill - Municipality of Osečina

QUANTIFICATION OF ENVIRONMENTAL RISK POSED BY THE MUNICIPAL UNSANITARY LANDFILL					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 10^3 m^3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste (m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km)	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water(m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	daily	Weekly	Monthly	2-4x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, Disposal Control		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk;**	**10-20 Low Risk;**	**20-30 Medium Risk;**	**30-40 High Risk;**	**40-50 Extremely High Risk**
	32				

In the area of the municipality of Osečina, 7 wild dumps were registered, the so-called illegal landfills. The estimated total area of the illegal landfills on the territory of the municipality of Osečina is about 1,370 m2, and the quantity of waste disposed is about 40.5 tons.

Municipality of Vladimirci

Waste collection and transport operations on the territory of the municipality of Vladimirci are performed by PUC "Izvor", Utility Services Organizational Unit. Due to insufficient mechanization, only about 20% of the population from the territory of the municipality is covered by the waste collection system. Communal services are performed on the territory of the town of Vladimirci, in parts of Debrc (the part along the main road) and Provo settlements, as well as parts of the rural local communities Dragojevac, Zvezd, Jalovik, Krnule, Mehovine, Lojanice, Bobovik and Belotić, where municipality waste containers are placed.

Waste collected on the territory of the municipality since 1994 has been taken and disposed of at the unsanitary municipal landfill "Bobovik" in Bobovik, which is located about 1.5 km away from the center of the town (Figure 2.1-7). The municipal landfill does not have the minimum equipment for sanitary protection, it has a guard service, but it is not fenced. It is located in a flooding area. The

average height/depth of the landfill in the entire area is approx. 1.5 m. It is estimated that about 50,000 m3 of compacted waste was disposed of at the landfill.



Figure 2.1-7. Satellite Image of the Municipal Unsanitary Landfill in Vladimirci.

Due to the insufficient coverage by organized waste collection by the PUC on this territory, 13 illegal landfills were registered on the territory of the municipality of Vladimirci. The estimated total amount of waste disposed of at illegal landfills/dumps in the municipality of Vladimirci is about 275 tons.

Table 2.1-9. Quantification of Environmental Risk Posed by the Municipal Unsanitary Landfill – Municipality of Vladimirci

QUANTIFICATION OF ENVIRONMENTAL RISK POSED BY THE MUNICIPAL UNSANITARY LANDFILL					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 10^3 m^3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste (m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km)	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water(m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	daily	Weekly	Monthly	2-4 x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, Disposal Control		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk;**	**10-20 Low Risk;**	**20-30 Medium Risk;**	**30-40 High Risk;**	**40-50 Extremely High Risk**
	43				

Municipality of Koceljeva

Collection, removal and disposal of garbage on the territory of the municipality is performed by PUC "Progres", Koceljeva. Organized collection, transport to the landfill and waste disposal is performed only in the urban part of Koceljeva. The total number of households covered by organized collection by PUC is 1,383, which is about 30.6% of households. Apart from households in the urban part of Koceljeva, municipal waste is also collected from legal entities in the town. According to estimates, about 2,841 t or 8,455 m3 of uncompressed municipal waste is collected, transported and disposed of annually at the city landfill. Waste collected on the territory of the municipality since 1980 has been transported and disposed of at the unsanitary municipal landfill - "Stara ciglana-Ringlov" landfill in Koceljeva, which is located about 1.5 km from the center of the town (Figure 2.1-8).



Figure 2.1-8. Satellite Image of the Municipal Unsanitary Landfill in Koceljeva.

The municipal landfill covers an area of about 2 ha. The average height/depth of the body of the municipal landfill is about 3 m. It is estimated that about 65,000 m3 of compacted waste has been disposed of at the landfill.

Table 2.1-10. Quantification of Environmental Risk Posed by the Municipal Unsanitary Landfill – Municipality of Koceljeva

QUANTIFICATION OF ENVIRONMENTAL RISK POSED BY THE MUNICIPAL UNSANITARY LANDFILL					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 10^3 m^3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste (m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km)	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water (m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	daily	Weekly	Monthly	2-4 x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, конт.одлагања		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk**	**10-20 Low Risk**	**20-30 Medium Risk**	**30-40 High Risk**	**40-50 Extremely High Risk**
	41				

On the territory of the municipality of Koceljeva, 31 illegal landfill sites have been registered.
The estimated total quantity of disposed waste at illegal landfills/dumps in the municipality of Koceljeva is about 497 tons.

Municipality of Barajevo

Collection, transport and disposal of municipal waste on the territory of the municipality of Barajevo is performed by PUC "10. oktobar", "Utility Activities, Mechanization and Transport" Organizational Unit. In addition to the central municipal settlement of Barajevo, all other settlements on the territory of the municipality are included in the scope of waste collection, i.e. Boždarevac, Veliki Borak, Šiljakovac, Vranić, Lisović, Ravni Gaj, Guncati, Ibarska Route, Meljak, Ripanjski Road, Stara Lipovica, Nenadovac, Srednji kraj, Karaula, Stražarija, Glumčevo Brdo, Gaj settlement, Manić Rožanci, Arnajevo, Beljina, Lisović. About 90% of the territory of the municipality is covered by organized waste collection and disposal. Peripheral settlements are not fully covered by organized waste collection. By the decision of the Municipal Assembly of Barajevo as of 31 March 2004, the municipal landfill at the location of Cvetojevci was closed for disposal, and since April 1, 2004, the municipal waste collected in an organized manner has been transported by the vehicles of PUC "10. oktobar" to the City of Belgrade landfill in Vinča. All waste, except hazardous and industrial waste, is collected and transported by the trucks of PUC "10. oktobar" Barajevo, to the city landfill in Vinča. Based on the estimates, about 8,500 tons of municipal waste is collected and transported to the City of Belgrade landfill in Vinča. About 1,800 tons of waste is disposed of at that landfill each day.

On the territory of the municipality of Barajevo, 16 illegal landfill sites have been registered. The estimated total area of the illegal landfills on the territory of the municipality of Barajevo is about 5,920 m2, and the quantity of disposed waste is about 1,275 t.

Municipality of Lazarevac

Organized waste disposal on the territory of the municipality of Lazarevac is under the jurisdiction of PUC "Lazarevac". Waste collected on the territory of the municipality is disposed of at the municipal waste landfill at the location of Field "D" Baroševac, covering the total area of about 25.4 ha. Waste has been disposed of at the landfill since 2011 (Figure 2.1-9).



Figure 2.1-9. Satellite Image of the Municipal Unsanitary Landfill in Lazarevac.

The estimated depth of the waste disposed is about 3.5 m. According to the information the PUC has, 60% of urban settlements is covered by organized waste collection, and waste collection is partially organized in the suburban settlements.

In 2018, 36 illegal landfills were registered on the territory of the municipality of Lazarevac. The estimated total area of the landfill is about 13,600 m2, and the quantity of the waste disposed is about 2,162 t.

Table 2.1-11. Quantification of Environmental Risk Posed by the Municipal Unsanitary Landfill – Municipality of Lazarevac

QUANTIFICATION OF ENVIRONMENTAL RISK POSED BY THE MUNICIPAL UNSANITARY LANDFILL					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 10^3 m^3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste(m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km)	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water(m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	daily	Weekly	Monthly	2-4 x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, Disposal Control		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk;**	**10-20 Low Risk;**	**20-30 Medium Risk;**	**30-40 High Risk;**	**40-50 Extremely High Risk**
	36				

Municipality of Obrenovac

Organized collection and disposal of waste on the territory of the municipality of Obrenovac is performed by PUC "Obrenovac". Annually, about 73,000 tons of municipal waste is collected, transported and disposed of at the city landfill by individuals and legal entities. Approx. 80-85% of the territory is covered by organized waste collection by the local PUC. Waste collected on the territory of the municipality is disposed of at the "Grebača" non-hazardous waste landfill, at Veliko Polje site, covering an area of about 10 ha, with an average depth of 5-15 m of waste. Waste has been disposed of at the landfill since 1985.



Figure 2.1-10. Satellite Image of the Local Municipal Unsanitary Landfill in Obrenovac

In 2018, 10 illegal landfills were registered on the territory of the municipality of Obrenovac. The estimated total area of the landfill is about 835 m2, and the quantity of the waste disposed is about 8,255 t.

Table 2.1-12. Quantification of Environmental Risk Posed by the Municipal Unsanitary Landfill - Municipality of Obrenovac

QUANTIFICATION OF ENVIRONMENTAL RISK POSED BY THE MUNICIPAL UNSANITARY LANDFILL					
Parameter	**Parameter Value**				
	1	**2**	**3**	**4**	**5**
Landfill Volume x 10^3m^3	0 – 5	5 – 25	25 – 100	100 – 500	>500
Height of the Deposited Waste (m)	<1	1 - 3	3 - 5	5 – 10	>10
Distance from a Populated Area (km	>2	1,5 - 2	1 - 1,5	0,5 - 1	0 - 0,5
Distance from a Body of Water(m)	>500	100 – 500	60 - 100	20 – 60	0-20
Distance from Agricultural Land and Pastures (m)	>200	100 – 200	60 - 100	20 – 60	0-20
Frequency of Landfill Covering	daily	Weekly	Monthly	2-4 x per Annum	Annually
No. of Degassers /ha	5	4	3	2	≤1
Underground Water Level (m)	>15	12 - 15	8 - 12	4 - 8	<4
Landfill Fencing%	1	-	-	<100%	0
Landfill Access	Access Limited, Weighbridge, Disposal Control		Access Limited		Free Access
Risk Assessment Grade	**0-10 No Risk;**	**10-20 Low Risk;**	**20-30 Medium Risk;**	**30-40 High Risk;**	**40-50 Extremely High Risk**
	39				

2.2. Description of the Specific Project Site

The site of the future regional landfill for municipal (non-hazardous) waste "Kalenić" is located near the borders of the municipalities of Ub, Lajkovac, Lazarevac, and Obrenovac, in the valley of the Kladnica river and near the Thermal Power Plant "Kolubara B" (under construction). It is about 13 km as the crow flies northeast of the center of Ub, approx. 5.8 km northwest of Veliki Crljeni, and about 45 km away from Belgrade in the southwest direction.

The micro-location is in one of the excavation fields of the Kolubara lignite basin, between the "Tamnava East Field" and "Tamnava West Field" mines on the site of the former open cut mine "Tamnava-West Field" in the Kolubara mining basin, in the southern zone of the General Regulation Plan, i.e. area marked as Section 4 (Appendix 2 - Excerpt from the General Regulation Plan of Kolubara B, purpose of subject areas). The space intended for the future regional landfill for municipal waste has an area of about 70 ha (of which about 50 ha is located in CM Kalenić - Municipality of Ub, and about 20 ha in CM Mali Borak - Municipality of Lajkovac) and it borders the assembly site, the SUP-1 coal transport conveyors and the ash, slag and gypsum landfill. In the northern part of the subject area, there is a section of the existing road Kalenić-Veliki Crljeni, with an access road leading to TPP "Kolubara B" complex, as well as a part of the dry (former) riverbed of the Kladnica river and a bordering channel for the drainage of precipitation from "Tamnava - West Field" mine. Figure 2.2-1 shows the location of the "Kalenić" regional landfill for municipal (non-hazardous) waste.

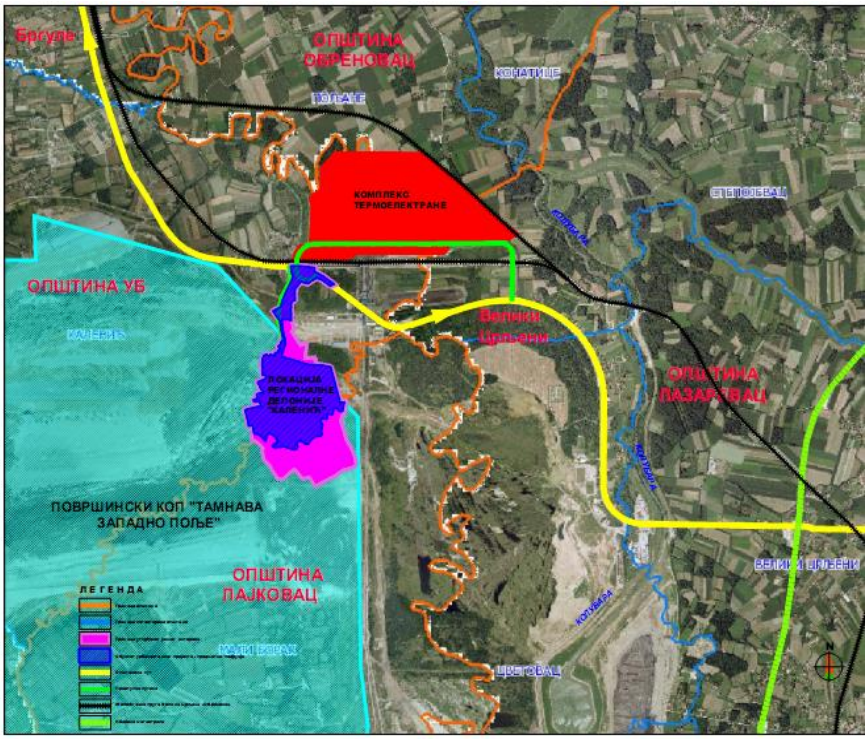


Figure 2.2-1. Site of the Future "Kalenić" Regional Landfill for Municipal (Non-Hazardous) Waste.

The major part of the subject site is currently a degraded area, which used to serve as an internal tailings dump from open-cut mines (Figure 2.2-2). The preparatory works for the construction of the "Kalenić" Regional Municipal Waste Landfill are a measure of rehabilitation and reclamation of the area, i.e. preparing it in accordance with the planned purpose.



Figure 2.2-2. Macrolocation of the Future "Kalenić" Regional Municipal Waste Landfill.

The landfill site did not suffer any direct consequences of the "historic" flood wave which took place in May 2014, both from the Kladnica river basin in the immediate vicinity of the site and the Kolubara riverbed in the wider surroundings, which was determined during the site visit and in the report of the team leader of the Project Supervision Team appointed by the EU Delegation in Belgrade for the monitoring of the activities on the "Kalenić" Regional Municipal Waste Landfill Project on the visit to the "Kalenić" site on 21/05/2014 (Figures 2.2-3).




Figure 2.2-3. Macrolocation of the Future "Kalenić" Regional Landfill for Municipal (Non-Hazardous) Waste after the "historic" flood wave in May 2014 (Source: photographs attached to the report of the Team Leader of the Project Supervision Team appointed by the EU Delegation in Belgrade for monitoring the activities on the "Kalenić" Regional Municipal Waste Landfill Project on the visit to the "Kalenić" site in 21 May 2014).

An on-site inspection revealed a line embankment from the excavation of MB Kolubara - "Tamnava-West Field" open-cut mine, which runs along the southern border of the future landfill and acted as a successful barrier to the flood wave. From the above, it can be concluded that the location of the "Kalenić" landfill was not directly endangered. An indirect consequence of the flood wave is partial penetration of surface waters into the third cassette of the landfill, as well as the need to allow MB "Kolubara", Lazarevac, to excavate a temporary canal along the eastern border of the landfill site for the evacuation of water from the newly formed accumulation in the mining area. The temporary excavation intended as a draining canal for the flooded area of OCM "Tamnava - West Field" was used temporarily and in no way violates the existing project solutions for the "Kalenić" Regional Landfill for Municipal (Non-Hazardous) Waste.

On the northern side of OCM "Tamnava - East Field" and OCM "Tamnava - West Field", the following infrastructural facilities are located: roads, an industrial complex with administrative buildings, TPP "Obrenovac" coal-loading facilities with an industrial railway and other facilities required for water and electricity supply. The nearest settlement is the village of Kalenić about 2 km away from the landfill. Access to the regional center is planned via the regional road R101a, Veliki Crljeni - Stubline and via a local access road, which needs to be reconstructed in order to accommodate heavy-duty trucks. A new two-way asphalt access road will be built, about 400 m long, 6 m wide, with 1-meter wide sidewalks. The site is in a devastated area, with a suitable terrain configuration and sufficient waste disposal capacity. The site where the construction of the Kalenić Regional (Non-Hazardous) Waste Landfill is planned "has the necessary qualities and advantages for the construction of a landfill, such as: its distance from the first settlement is approx. 2 km, there are no cultural monuments, the location is on a devastated terrain, with suitable terrain configuration and there is sufficient capacity for waste disposal.

2.2.1. Information on the Required Land Area

In the area, which was the subject of established public interest and expropriation, through the Project of re-parcelling, the following construction plots were formed:

- on the territory of the Municipality of Ub, CM Kalenić, three construction plots were formed, as follows:
  - construction plot GP 1 (CP No. 746) intended as the infrastructure corridor (road and utilities infrastructure);
  - construction plot GP 2 (CP No. 800), intended for the "Kalenić" Regional Municipal Waste Landfill;
  - construction plot GP 3 (CP No. 770), intended, as a reserve, for related facilities;

• on the territory of the Municipality of Lajkovac, CM Mali Borak - one construction plot (GP 1), intended for the prospective expansion of the “Kalenić” Regional Municipal Waste Landfill.

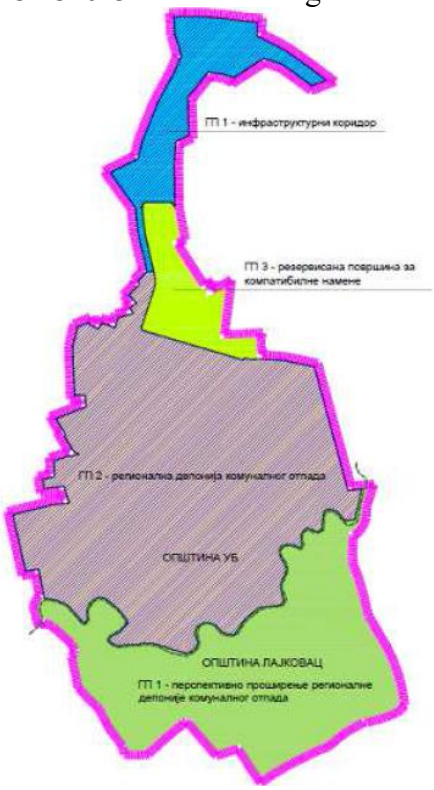


Figure 2.2.1-1. Micro-Location of the Regional Landfill with the Land Purpose Plan
Source: Development Project for the Construction of the “Kalenić” Regional Municipal Waste Landfill)

The scope of the project includes construction plot GP 2. Construction plot (GP 2) – the complex of the "Kalenić" Regional Landfill for Municipal (Non-Hazardous) Waste is located on CP No. 800 CM Kalenić, Municipality of Ub. Table 2-1 provides a summary of the areas within the construction plot (GP 2) - the complex of the "Kalenić" Regional Landfill for Municipal (Non-Hazardous) Waste. The construction plot/complex of the "Kalenić" Regional Landfill for Municipal (Non-Hazardous) Waste includes:

• areas under buildings;
• traffic, handling and parking areas;
• landfill body;
• areas under lagoons;
• space reserved for future expansion of facilities;
• green areas (which include a site intended for construction waste in the future).

Table 2.2.1-1. Summary of Areas within the Construction Plot (GP 2) - Complex of the "Kalenić" Regional Municipal (Non-Hazardous) Waste Landfill.

No.	Land Use		Area (ha)		Share (%)
2	**Construction Plot GP2 “KALENIĆ” REGIONAL MUNICIPAL WASTE LANDFILL COMPLEX**				
	2.1. Areas under Buildings				
		2.1.1 Weighing House	0.0030	0.32	0.80
		2.1.2 Administrative Building	0.0372		
		2.1.3 Power Supply Facilities	0.0085		

No.	Land Use	Area (ha)		Share (%)
	2.1.4 Washing Facility	0.0112		
	2.1.5 Servicing Building	0.0298		
	2.1.6. Garage	0.0240		
	2.1.7. Canopy	0.1133		
	2.1.8. Water Supply Structures (well, water tank)	0.0913		
	2.2. Lagoons	0.39		0.98
	2.3. Landfill Body	24.74		62.0
	2.4. Internal Roads	1.10		2.80
	2.5. Handling areas, parking areas, plateaus, pedestrian paths	0.67		
	2.6. Area reserved for future expansions of the facilities	0.63	3.55	8,90
	2.7. Area intended for the disposal of construction waste in the future	2.25		
	2.8. Landscaped areas	0.09		0.52
	2.9. Protective green belt (not regarded as an area for the disposal of construction waste in the future)	9.69		24.0
Total (2.1. to 2.9.)		**39.88**		**100**

Source: Development Design for the Construction of the "Kalenić" Regional Municipal Waste Landfill

An overview of the purpose of the areas is given in Visual Schedule 2 "Situation of the Complex with the Purpose of the Areas".

2.3. Overview of Pedological, Geomorphological, Geological, Hydrogeological and Seismical Characteristics of the Terrain

2.3.1. Pedological Characteristics of the Terrain

Soil as a partial medium in the area of construction and exploitation of the "Kalenić" Regional Municipal (Non-Hazardous) Waste Landfill consists of: natural, topogenic soils, as well as anthropogenic-technogenic soils.

Natural, topogenic soils

Natural, topogenic soils consist of parapodzol and parapodzolic soils, as well as vertisols in very small proportions, mostly in the northern part of the "Kalenić" RML with significantly pronounced, poor structural and qualitative characteristics.

Anthropogenic-technogenic soils

According to Š k o r i ć/1985/and R e s u l o v i ć/1983 /, the soil on these sites was separated into a special class of technogenic soils - deposol, with the subtype of deposols formed by surface exploitation of lignite coal. The deposols in the subject area are characterized by a wide variability of properties which is correlatively a consequence of different, initial characteristics of the deposited material. According to the textural composition, the following can be distinguished: deposols with lighter mechanical composition and deposols of heavier mechanical composition. The first group is characterized by sandy-loam composition, homogeneous or heterogeneous structure with higher or lower levels of clay components, with good water permeability and aeration. In the structural, lighter aggregates of the second group, smaller or larger "lumps" of highly clayey material are determined in some places, which act as skeletal elements in the soil. Soils with the heavier mechanical composition

are classified as clayey loam or clay with the already mentioned highly clayey "lumps", which classifies them in the so-called "heavier soils" category. The content of humus and organic matter is markedly low, even in the surface layers. The subject deposols "show" a wide variability of the content of individual microelements, without the usual regularity or patterns.

2.3.2. Geomorphological Characteristics of the Terrain

The Kolubara basin is, in the morphological sense, a part of the lower Kolubara basin; it has clear boundaries composed of hills rising from the plains on the west, east and south sides. In the north, it opens towards the Sava River and the Pannonian Plain. It can be classified as an open, ridged pool in the shape of a horseshoe, with a ten-kilometer-wide bottom. The spatially lower valley of the Kolubara river cuts through the middle of the basin, and is intersected by tributaries – the Kladnica and the Tamnava rivers, on the left, as well as the Peštan and the Beljanica rivers on the right. In morphological terms, the basin is mostly composed of flat and hilly terrain, with the average height of 150m. The highest point is Stubički vis on Lazarevac ridge - 393 m above sea level, while the height in the alluvial plains of the Kolubara valley and around the tributaries is less than 90 m above sea level. Only a small part of the terrain is higher than 200 m (about 7% of the basin area). The terrain is sloping from south to north, which is, in general, the direction of valleys, cuts and other geomorphological forms caused by erosion and leaching. The relief was formed by fluvial erosion and the process of stripping. Partially visible characteristics are two groups of fluvial forms - plains and river valleys. The plains are of Pliocene-Pleistocene origin, composed of deposits at the bottom of rivers, with hilly and slightly flattened morphoplastics. The lowest plain is on the west side of the area; its height is 140-170 m. The bottom of the Kolubara basin lies below, in the form of a wide plain at 110-140 m asl. River valleys intersect the plains and, depending on the strength of the river flow, affect the geological composition and slope of the terrain; they are of different dimensions, side slopes and characteristics. The vast alluvial plateaus of Kolubara and its tributaries are built of Quaternary river deposits. Due to the small slope of the terrain, Kolubara meanders, changes direction and leaves the old riverbeds, forming new ones, or branches into canal systems.

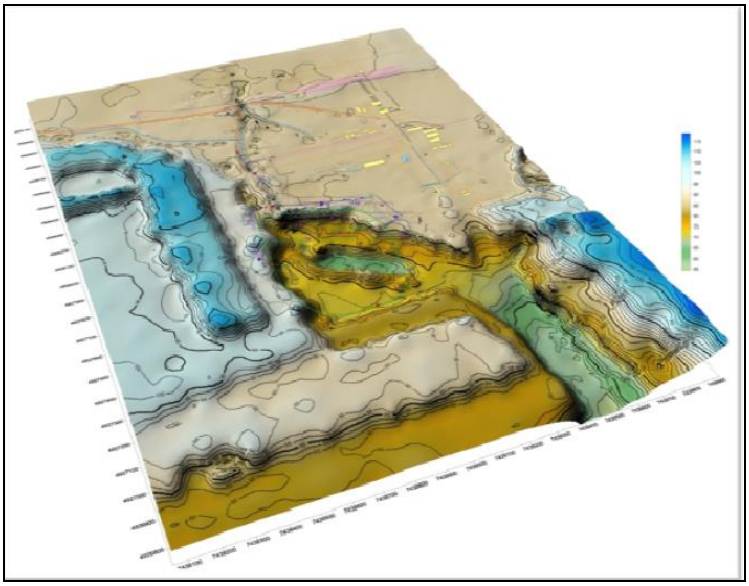


Figure 2.3.2-1. Elevation Model of the "Kalenić" Regional Landfill
(Source: Detailed Geological, Geotechnical and Hydrogeological Study for the Purpose of the Preliminary Design of the "Kalenić" Regional (Non-Hazardous) Municipal Waste Landfill - Construction Phase I)

This is most noticeable in the part of the basin between the rivers of Peštan and Turija (in the vicinity of Medoševac, Sakulja, Baroševac, Junkovac, Mali Crljeni, Rudovci, and Prkosava villages), as well as around the mouth of the Kladnica river where it meets Kolubara (Kalenić, Mali Borak, Cvetkovac). The devastated hilly terrain is sinking on the east side of the basin due to coal mining. Thanks to the deposited substrate, the former cavity is now a flat surface, and the flat terrain is elevated and looks like an elevated flat surface (plateau). From a hypsometric point of view, the northern part of the area

intended for the landfill body is dominated by a hill formed by the deposited materials, with terrain elevations of 100.59 - 94.00 m above sea level. The space provided for purpose-built facilities, service buildings and water management facilities, which are located in the northern and northwestern part of the area, is of uniform altitude (about 89 m above sea level). Along the eastern border, the service road, and on the part of the terrain where the design envisages the construction of an administrative building, the elevation is mostly around 94 m above sea level. The southern border, which extends over the internal landfill, is at an altitude of 80 m above sea level. The lowest part of the terrain is in the area around the accumulation - the lake, where the elevations of the shore are approx. 65 m above sea level.

2.3.3. Geological Structure of the Terrain

The geological structure of the future landfill consists of Paleozoic and Mesozoic sediments (paleorelief), while the site itself is built of Neogene (Pontic), Quaternary sediments and artificial anthropogenic bodies - landfills (Figure 2.3.3-1). The immediate floor of the productive series of deposits "Tamnava-West Field" consists of unbound loose clastic sediments-quartz sands. These sands (thickness from 100 to 120 m) are important as a hydrogeological collector of bottom aquifers. The complex coal series, in addition to coal layers (amorphous, woody, clayey and xylitol), contains layers and interlayers of sand, coal and gray-green clays, of different thicknesses and lateral distribution. The thickness of the productive series is very variable and increases from east to west and from north to south, in accordance with the increase in the number and thickness of the layers of clay and sand. The average thickness of the coal series in the area of the entire deposit is about 33 m, and the thickness of coal with barren interbeds up to 0.5 m thick is 22 m on average. The layer overlying the coal-bearing series is made of upper Pontic and Quaternary sediments. The thickness of the overlying sediments is from 7.5 to 72.3 m, i.e. 35.6 m on average.

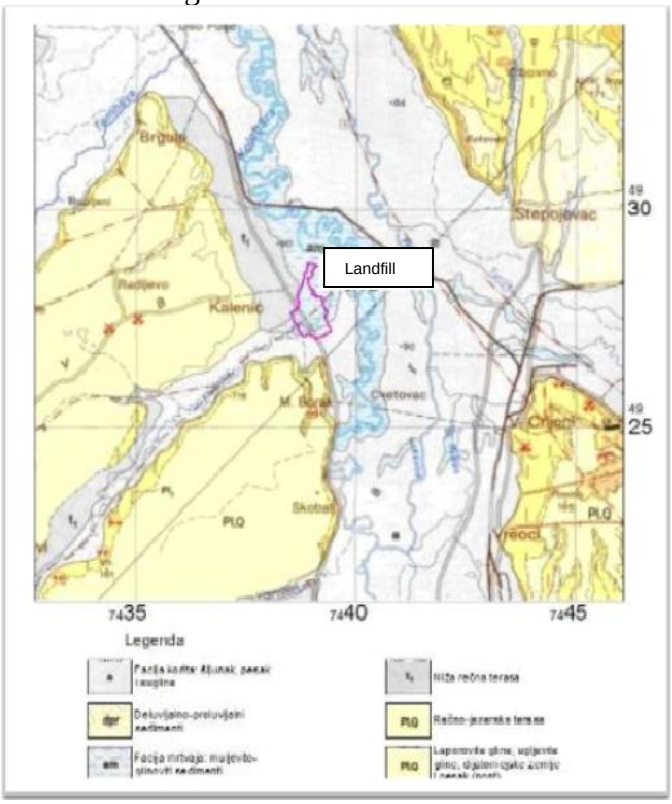


Figure 2.3.3-1. Geological Map of the Kolubara Basin
(Source: GGM, SFRY 1: 100,000 – Obrenovac Sheet).

2.3.2.1. Lithological Composition of the Terrain

The terrain in the western part of the Kolubara coal basin, where the "Kalenić" Regional Landfill will be located, is composed of the following lithofacies, listed from the youngest to the older, as shown in Figure 2.3.3-2.).

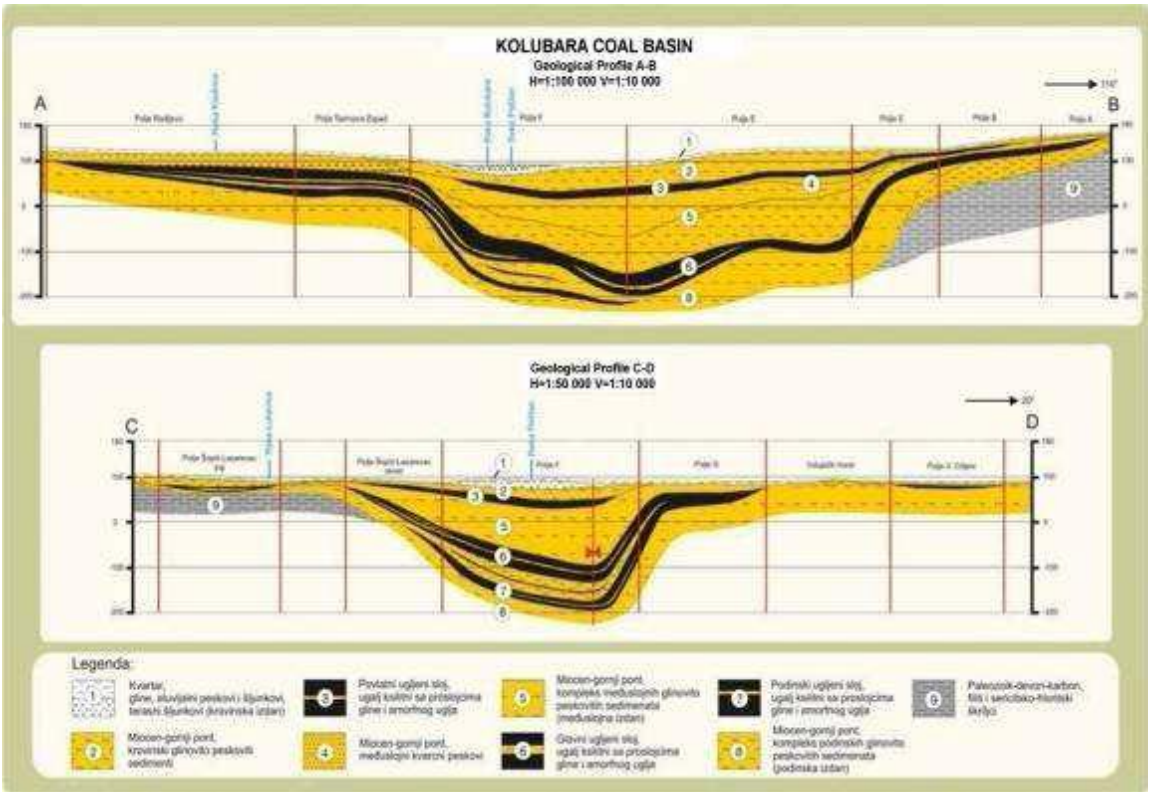


Figure 2.3.3-2. Typical Geological Profile of the Kolubara Coal Basin
(Source: Program for the Elaboration of the Development Plan of the Area of TPP "Kolubara B", Phase I, Analytical and Documentary Basis, PE EPS, TENT, TPP "Kolubara B", Ub, 2006).

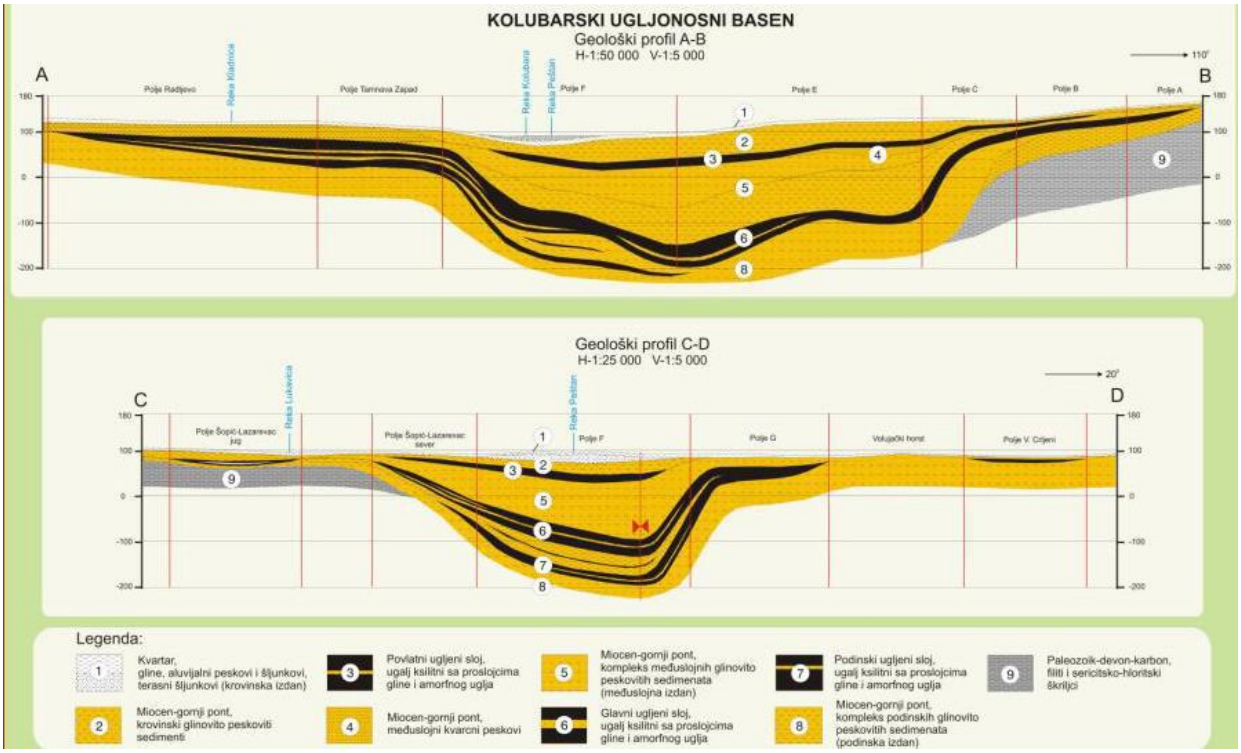


Figure 2.3.3-2. Geological Profiles A-B and C-D (Stojakovic, Petrovic, 2004)

QUATERNARY DEPOSITS (1)

Quaternary deposits near the upper layer of Pontic deposits are represented by river-lake coarse gravel similar to clay, and sand gravel of medium granulation (river-lake terrace), followed by river sand and

gravel layers (river terraces and alluvial plains of the Ub, Tamnava, Kolubara and Kladnica rivers), as well as siltstones and siltstone clays and local marsh clays (alluvial plains).

PONTIC DEPOSITS (2-8)
Pontic deposits have the total thickness of 90 to 300 m. All layers are folded both horizontally and vertically. The megaform is a syncline that extends in the southeast-northwest direction. The layers descend lower and lower to the west and east at a slight slope of 2°, and the angle reaches 6° and more in some parts of the basin. Pontic deposits in the western part of the basin were discovered on the right side of the Ub and Tamnava valleys, on the left side of the natural flow of the Kolubara river from Lajkovac to Brgul, as well as along the upper part of the Kladnica and its tributaries, and along the right side of the Kladnica valley. In lithological terms, Pontic deposits are represented by the following elements:

- Upper-level deposits (2) - gray-blue siltstones which are gradually replaced by a thin layer of clay, several millimeters to several decimeters thick, as well as sandy clays of gray-yellow and gray color, fine grain, to gray-blue quartz-mica sand dust and medium-grained quartz sand, white and light yellow in color;
- Upper layer of coal (3) - xylitol coal with inserted layers of clay and amorphous coal;
- Quartz sand between layers (4) - occasional dusty or clay quartz-mica sand of fine to coarse grain, sand of different colors;
- Clay-sand deposits between layers (5) - extremely plastic clays with occasional coal, gray-green to dark blue;
- Main layer of coal (6) - a layer of coal interspersed with layers of extremely plastic clay mixed with coal in layers whose thickness varies from a few millimeters to several decimeters, dark gray to black in color, as well as highly plastic gray-green clay with occasional thin (mm-cm) dusty and sand inserts of coal and coal concessions, interrupted in the western part by fine-to-medium-grain sand;
- The lowest - underground layer of coal (7);
- A complex of underground clay-sand deposits (8) - quartz-mica sand of fine to medium grain, gray-green color.

PALEOZOIC (9)
Paleozoic deposits have been found in the southeastern part of the Kolubara Basin and are predominantly represented by phyllites and sericite-chlorite shales.

2.3.4. Hydrogeological Characteristics of the Terrain

The regional landfill of (non-hazardous) municipal waste will be formed in the northeastern part of the exploitation field of the OPM “Tamnava-West”, in a depression created by digging up tailings and coal, lying on the bottom sands. The subject area belongs to the alluvial plain of the Kladnica river and is situated at the absolute height of about 102 m above sea level to 90 m above sea level, north and northwest of Mali Borak and Kalenić. All anthropogenic influences on the basic aquifer regime (surface coal exploitation, systems built for the protection of surface mines from groundwater and exploitation of groundwater for water supply) caused a constant decrease in the piezometric level.

Drainage-water intake wells of CE MB "Kolubara" have a significant impact on the water regime of the bottom aquifers. The works on OCM "Tamnava-East Field" and OCM "Tamnava-West Field" changed the groundwater regime, so that, in addition to the natural discharge, aquifers are also artificially drained along a leg of tailings layers, and aquifers are also intensively drained by wells in the area along the western border of the mine (Schedule No. 3). At the beginning of coal exploitation at OCM "Tamnava-East Field", the current was deformed in the direction of a new primary drainage facility – an open cut mine which used a system of drainage trenches, canals, reservoirs and drainage wells to lower the groundwater level to the bottom of the coal series and locally transformed the aquifer from an aquifer under hydrostatic pressure to a free-level aquifer. More intensive pumping of water from all aquifers and changes in the groundwater regime began at the beginning of coal

exploitation at the OCM "Tamnava-West Field". According to the state of mining works in 2013, upon an analysis of the groundwater level isolines, the assumed direction of movement in the area of the regional landfill is northeast-southwest. The distance between the nearest drainage well Bp-4 (Ogr + 172.5) and the location of the regional landfill is about 1,600 m, and the accumulation – lake is about 2,000 m away. The nearest drainage wells of the "Tamnava-East Field" aquifers are located at the distance of about 900 m from the regulation line of the landfill. The mentioned drainage system is also used as a water intake for the needs of the "Vodovod Kalenić" water supply system, with a connection at a distance of about 2,000 meters from the landfill site.

Hydrogeological Function of Rock Masses and Groundwater Regime

Extensive geological, geotechnical and hydrogeological research and tests performed in the previous period indicate the pronounced hydrogeological complexity of the "Tamnava-West Field" basin, a part of which is intended for the construction of the regional landfill. The detected hydrogeological elements have different hydrogeological characteristics that vary from watertight (Kf = 1 x 10-10 m/s) to highly permeable rock masses (Kf = 1 x 10-3 m/s).

Based on the filtration characteristics and spatial position, rocks with the following hydrogeological functions can be distinguished:

- **overlying permeable layers**: - lithofacial units, filtration coefficient ranging from Kf = 1 x 10-8 m/s to Kf = 1 x 10-5 m/s.
  - siltstone (3) and sandy clays (3c) in the overburden of the main coal seam and
  - Quaternary, dusty clays in the river-lake and river aquifer overburden (7a)

- **hydrogeological collector**: - lithofacial units expressed by filtration coefficient higher than Kf = 1 x 10-5 m/s.
  - bottom fine-grained to medium-grained quartz-mica sands (1);
  - interlayer fine-grained and medium-grained, less often coarse-grained, sands in the immediate overburden of the bottom coal seam, i.e. at the bottom of the main coal series (1a);
  - covering - overlying fine-grained and medium-grained sands (3a and 3b);
  - river-lake gravels, occasionally clayey and gravelly sands (4);
  - river gravels, sandy gravels and sands (5,6).

- **semipermeable interlayers** - coal layers up to 10 m thick, filtration coefficient ranging from K = 1 x 10-6 m/s to K = 1 x 10-5 m/s.

- **hydrogeological insulator**: alluvial yellow-brown clays (7b), gray-blue clays (7c), compact coal seam thicker than 10 m (2), coal and dusty Pontic clays (2b) alternating with coal seams (2). Formed landfills within the regulation line (artificial anthropogenic bodies), due to their composition and manner of disposal, are difficult to predict in terms of their permeability properties and cannot be considered as water-retaining environment. The entire Kolubara Neogene basin is a complex of primarily horizontal lithostratigraphic units (Figure 2.3.4-1).

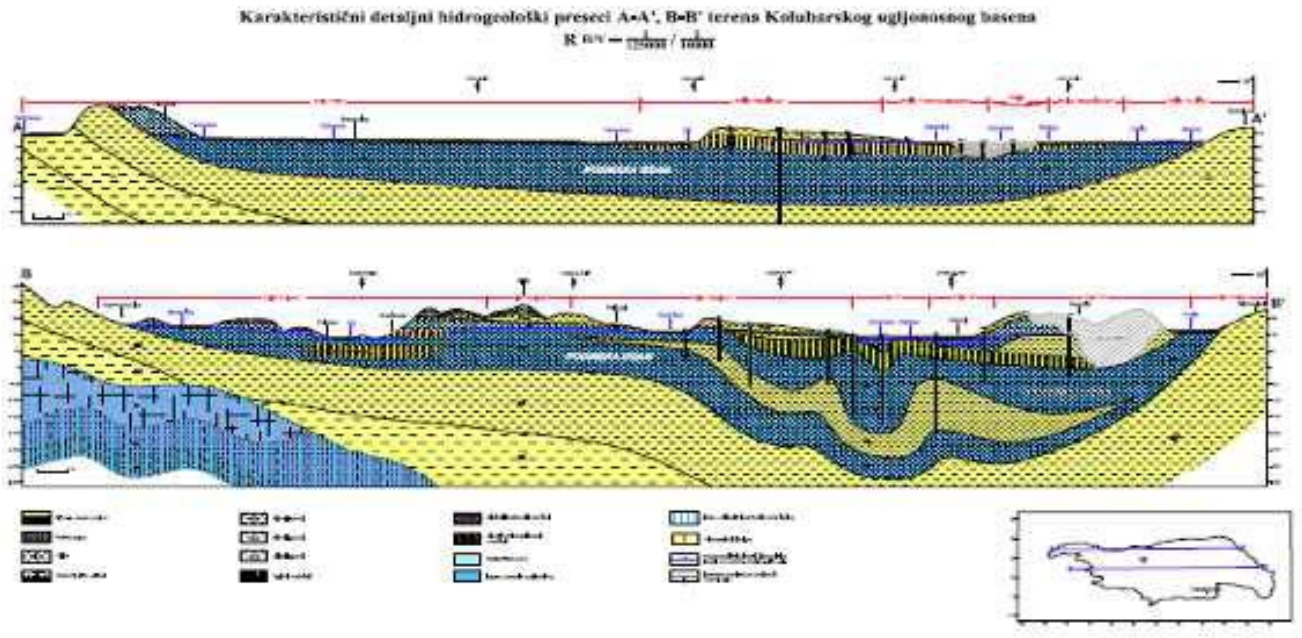


Figure 2.3.4-1. Characteristic Detailed Hydrogeological Sections A-A' and B-B' of the Kolubara Coal Basin.

(Source: Detailed (Hydro)geological Information of CE MB "Kolubara" d.o.o. Lazarevac on the Area Planned for the Construction of the Future "Kalenić" Regional Landfill).

The shift of water-retaining and watertight formations created a complex hydrogeological structure with aquifers formed in the intergranular porous layers, which, according to their hydrodynamic characteristics, belong to aquifers under pressure (at a subartesian level).

The presented water-retaining areas within the TWF reservoir, the following accumulations of free groundwater – aquifers of different size and hydraulic mechanisms were formed: alluvial aquifer - aquifer in alluvial gravels; terrace aquifer - aquifer in terraced gravel; overlying aquifer - aquifer in overlying Pontic sands; interlayer aquifer - aquifer in interlayer sands; and bottom aquifer - aquifer in bottom Pontic sands (at the bottom of the coal seam), which is also the primary water-retaining environment in terms of distribution in the plan and profile. Based on the adopted classification, in relation to the main coal seam in the area of the regional landfill, all aquifers are classified into three groups:

• overlying aquifer (alluvial);
• interlayer aquifer; and
• bottom aquifer.

OVERLYING AQUIFER

- Aquifer in alluvial gravel (5)

This aquifer consists of alluvial deposits of the Kladnica river. The groundwater reservoir consists of sands and gravels, of heterogeneous composition, with clay in certain places. The thickness of this collector is up to 15.0 meters. Quaternary clays (layer 7) lie over the alluvial sands and gravels, which function as the overlying hydrogeological insulator. There is siltstone (layer 3) or coal (layer 2) in the gravel floor, with the function of a hydrogeological floor insulator. The aquifer is primarily replenished by infiltration from precipitation and surface currents. Drainage was primarily performed along the bed of the river Kladnica, which, at the same time, when the water levels were high, fed the aquifer, as well as through evapotranspiration. The works on OCM "Tamnava-East Field" and OCM "Tamnava-West Field" changed the groundwater regime, so in addition to natural discharge, the aquifer was artificially drained along the leg of tailings layers, as well as intensively drained through the wells along the western border of the mine (Bie-K well). The average depth to the underground water level (UWL) registered in piezometers capturing this aquifer in 2010 was about 5 meters, with

maximum oscillations of 2-3 m. Once the Bie-K well was put in operation and with the progress of mining works, the depth to the UWL was changed and averaged at about 15 meters with the maximum depth of up to 20 meters. The average, representative value of the filtration coefficient of this layer is Kf = 1x10-4 m/s, and the effective porosity μ = 0.18. The PB-6hg piezometer was installed in order to monitor this issue in the vicinity of the regional landfill. The measured levels indicate the fact that the groundwater regime in this part of the terrain has changed and that these sediments are free of any water.

INTERLAYER AQUIFER

- Aquifer in Interlayer Sands (1a)

The interlayer sands are located in the larger area of the "Tamnava - West Field" open-cut mine (western part, north of the profile line 140) in the part where the sands are deposited between two layers of coal. The sands extend beyond this mine in the northwest direction, where they merge with the sands of the bottom aquifer. Their thickness is different, from 30 m in the northwestern part of the field to the complete tapering in the northeastern part of the mine. In terms of granulometric composition, interlayer sands make a relatively homogeneous layer in the vertical and horizontal directions, represented by sands of medium and fine grains, whose filtration coefficient is approx. 10-5 m/s (by granulometric composition). The bottom and the overburden of the interlayer aquifer are made of coal seams, except in the northern part of the excavation, where it joins the overlying aquifer in the overburden. The interlayer aquifer represents a confined aquifer under pressure. The aquifer is fed from the mine exterior in the part where erosion stripped away the watertight layers, while the aqufier drains into the open part of the open-cut mine "Tamnava - East Field". Except in the part where the overlying aquifer directly makes up the overburden, the said aquifer is under unequal subartesic pressure (piezometric level from 70 m above sea level to 101 m above sea level).

In the area of the future landfill, the interlayer sands aquifer is located between two coal seams, except for the southeastern part of the deposit, where the sands taper. The interlayer aquifer is of the confined type, and fine-grained to medium-grained quartz-mica sands predominate in terms of lithological elements. The thickness of the interlayer aquifer varies. It is thicker in the NW part of the field, while it decreases to the south (at 3-5 m) and continues to taper away. By observing the groundwater level in the wider zone, it can be concluded that the piezometric pressure is different, with a tendency to decrease towards the north, where the aquifer turns into a free-level aquifer. The mean values of water levels measured during 2011 in piezometers, expressed in absolute height, range from 98.94 m above sea level (OJ-105/m) to 41.94 m above sea level (OP2-m). Feeding and emptying of the aquifer, in natural conditions, took place in the northern part of the basin, and depending on the levels of water in the alluvial quifer, in the area of the river lake terrace, as well. Water replacement takes place in the parts of aquifer with direct or indirect connection with other aquifers – the feeding takes place in the zones where erosion has affected the upper coal seam, the water is drained into the alluvial aquifer, while water replacement is slow in the southwestern part. Today, filtration of groundwater is intensive from the north to the "Tamnava - West Field" open-cut mine.

BOTTOM AQUIFER

- Aquifer in floor sands (1)

The mutual influence of the aquifer and the watertight formations in the feeding and drainage zone influenced the formation of a subartesian level within this aquifer, which before the start of the coal exploitation in the "Tamnava-West Field" area was slightly sloped in the southwest-northeast direction, i.e. in the direction of the Kolubara river valley and the Sava alluvium. At the beginning of coal exploitation in OCM "Tamnava-East Field", the current was deformed in the direction of the new primary drainage element – the open-cut mine, which used a system of drainage trenches, canals, reservoirs and drainage wells to lower the groundwater level to the bottom of the coal seam and locally transformed the aquifer from an aquifer under hydrostatic pressure to a free-level aquifer. More intensive pumping of water from all aquifers and changes in the groundwater regime began at the beginning of the coal exploitation at the OCM "Tamnava-West Field". Based on the state of mining

works, analyzing the groundwater level isolines, the assumed direction of movement in the area of the regional landfill is northeast-southwest.

Fine-grained to medium-grained quartz-mica sands, at the bottom of the coal-bearing seams, extend over the entire area of the Kolubara Neogene basin and represent the basic aquifer. The overburden on the sands consists of the second coal seam, which is also the bottom of the sand facies below the level of the lower Pontic and Pannonian layers. The thickness of the Pontic bottom sands in the profile is up to 100 meters.

Filtration characteristics of bottom sands
- determined on the basis of granulometric analyzes - Kf = 10-3 -10-5m/s.
- determined on the basis of pumping tests at wells OBp-1, OBp-2 and OBp-3:
• Filtration coefficient: Kf = 5.1 x 10-5 m/s
• Transmissibility T = 2x10-3 m2/s
• Specific aquifer yield: μ = 1.2-1.3 * 10-3

Filtration characteristics differ in depth, so two layers with different properties are defined:
- the first layer with the thickness of 40 meters, whose filtration characteristics were determined during the processing of the results of tests of pumping of exploration-exploitation and exploration wells for pre-drainage and water supply, and
- the second layer, 60 meters thick, with the filtration coefficient of Kf = 10-7 m/s.
The bottom aquifer in the northern part of the TWF deposit (north of 4926750) is in a hydraulic connection with the interlayer, directly, or in an indirect hydraulic connection through the bottom coal seam. The aquifer is replenished from the exterior of the mine: by infiltration from precipitation, by overflow from other aquifers (from the aquifers in river-lake sediments) and by direct infiltration from local rivers. In the natural conditions, the aquifer drains in the northern part of the deposit, in the zone where the bottom sands are exposed by erosion, and are covered in Quaternary sands and gravels that drain the bottom aquifer into rivers. The works on the drainage of OCM TWF and the water exploitation from the "Kalenić" spring artificially lowered the groundwater level to 70 m within the boundaries of the open-cut mine. The aquifer groundwater level isolines are shown in the scale of 1: 25000 in Figure 2.3.4-2.

With the advancement of mining activities towards the south of the deposit, in the area of OCM "Tamnava-West Field", the primary drainage facility – the open-cut mine will be moved. With the distancing of the mine, the impact of the "drainage facility" will decrease, so the groundwater level will tend to return to the initial stage, i.e. through the continuous recharge by groundwater, and with reduced drainage, the levels will increase. The newly formed lithological environment will also have a significant impact - the landfill, which is considered primarily watertight, but due to previously unplanned formation and varying degrees of compaction, may act as a water-retaining environment.

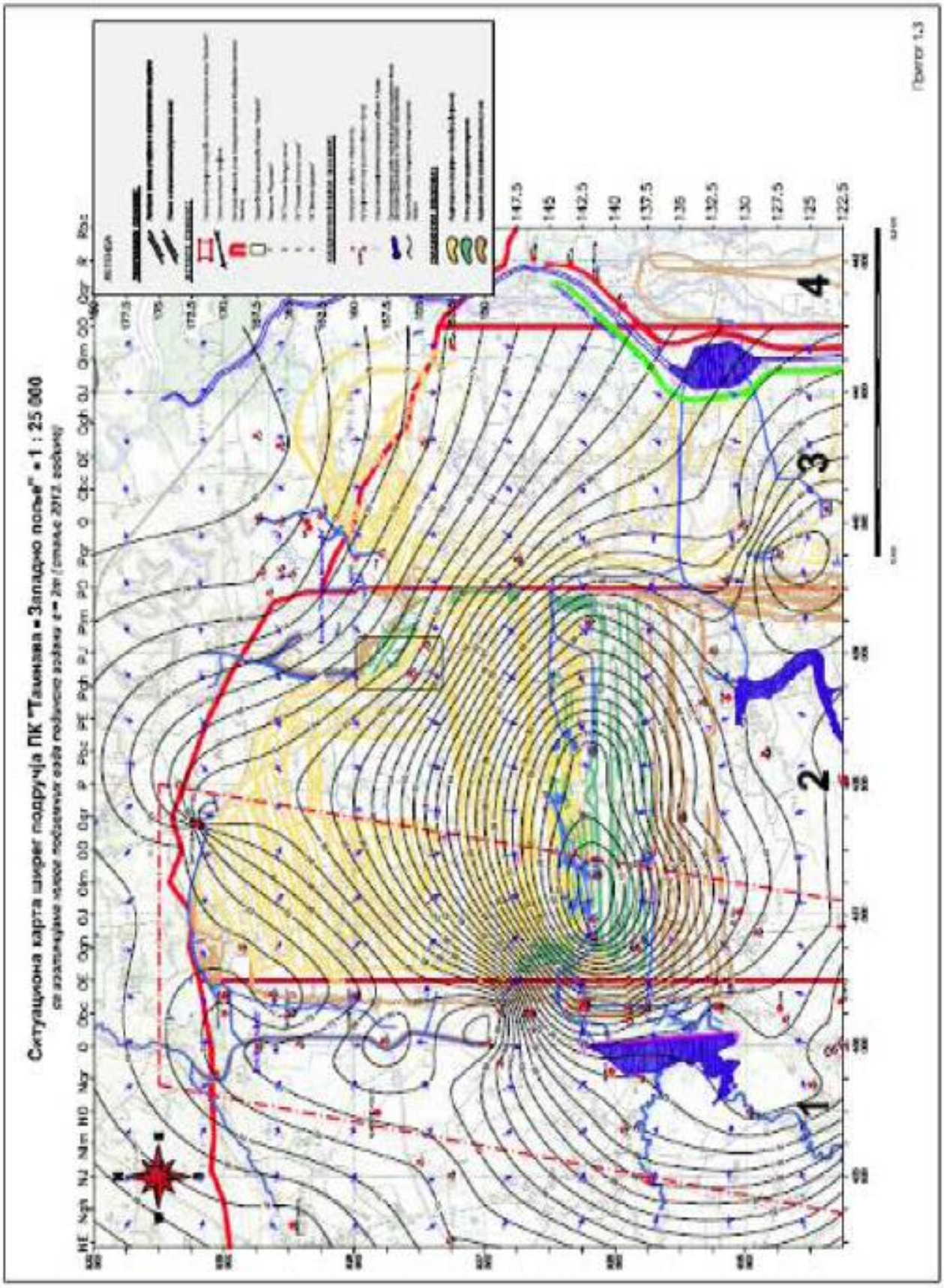


Figure 2.3.4-2. Aquifer Groundwater Level Isolines, e = 2 m
(Source: Detailed (hydro)geological information of CE MB "Kolubara" d.o.o. Lazarevac on the area planned for the construction of the future "Kalenić" Regional Landfill).

From all the above, it can be concluded that the impact of distancing of the boundaries of the active mine from the zone planned for the construction of the landfill and possibly the future cessation of

drainage of aquifer sands will result in an increase in groundwater levels in observation facilities and open parts of the aquifer, i.e. in the entire aquifer in general.

2.3.5. Seismic Properties of the Terrain

Earthquake requirements for the construction of facilities are defined by the Rules on Technical Standards for the Construction of Buildings in Seismic Areas (Official Gazette of the SFRY 31/81), and their subsequent amendments published in the Official Gazettes of the SFRY No. 49/82, 29/83, 21/88 and 52/90, which must be compatible with the European Standard Eurocode 8-1 (SEN, 2003). A seismological map makes an integral part of the above mentioned Rules, according to which the area intended for the construction of the "Kalenić" RM(N)WL lies in the MSK-64 7 ° intensity zone for the return period of 50 years, in the MSK-64 8 ° intensity zone for the return period of 200 years, or the MSK-64 9 ° intensity zone for the return period of 1000 years. The choice of oleate seismological map depends on the objects that will be erected on the subject site. As the seismic resistance of the projected facilities in the landfill area is determined without seismic micro-regionalization of the foundation requirements, the starting point for the seismicity assessment is the oleate of the seismological map for the return period of 500 years. The seismicity coefficient ks = 0.050 - 0.055 corresponds to the earthquake intensity of the eighth degree, as defined in the Rules.

Refractive seismic tests and seismological analysis with seismic hazard and risk assessment in this phase are not foreseen by the Research Project, because the results of the previous research in the wider exploration area for this level of design are sufficient for the selection of seismic engineering parameters (research performed for the needs of the thermal power plant under construction - Kolubara B).

In order to define the seismic parameters at the site, test results were analyzed for the needs of the construction of the TPP Kolubara B facility, which is located within the boundaries of the exploration area. The seismic micro-chartering of TPP Kolubara B was done by the Republic Seismological Institute of Serbia in 2010. Based on the Report - Seismic micro- chartering intended to define project seismic parameters in accordance with the applicable regulations in Serbia and Eurocode 8-1 for the TPP Kolubara B site, it can be concluded that the area corresponds to our medium soil standards and ES-8-1 type B soil. According to ES-8-1, the input parameters for seismic analysis are derived from the requirement that the facility, with an average service life of 50 years, must not collapse, which corresponds to seismic action with the risk of occurrence, i.e. probability of enduring, of 10% in 50 years. The return period of occurrence of these earthquakes is TNRC = 475 years. The second condition is contained in the requirement that limited damage can occur only as a consequence of an earthquake that occurs with the risk of 10% in a period of 10 years or an earthquake that has a return period of 95 years. The seismic action is expressed through the reference maximum horizontal ground acceleration corresponding to the return period of TNRC with the seismic action of 475 years. According to the above Report, the hazard parameters and seismic coefficients shown in Table 2.3.4-1 can be adopted at this location.

Table 2.3.4-1. Seismicity Coefficients for the Subject Areas

	T_{NRC}	PGA(g)	For Frame Structures	For Diaphragms
Z1	100	0.07	**Ks =** 0.02	**Ks =** 0.02
	500	0.16	**Ks =** 0.04	**Ks =** 0.05
Z2	1000	0.23	**Ks =** 0.08	**Ks =** 0.07

Dynamic analyzes were conducted in accordance with the Rules. Time histories were generated for a set of input accelerations for Z1 and Z2 earthquakes for return periods of 100 and 1000 years. Earthquakes that may have a key impact on the subject site:

1. Earthquake of magnitude Mw = 6.0 at a distance of 5 km (earthquake occurred in 1922 near Partizan (Darosava) on a fault that follows the Peštan valley);

2. Earthquake of magnitude Mw = 6.5 at a distance of 5 km (earthquake occurred in 1922 near Partizan on the fault that follows the Peštan valley);
3. Earthquake of maximum magnitude Mw = 7.4 at an epicentral distance of 290 km which corresponds to the maximum earthquake of the Adriatic focal zone;
4. Earthquake of maximum magnitude Mw = 7.8 at an epicentral distance of 450 km which corresponds to the maximum earthquake of the Vrancea focal zone.

2.4. Information on Water Supply Sources (Distance, Capacity, Vulnerability, Sanitary Protection Zones) and General Hydrological Characteristics

2.4.1. Data on Water Supply Sources

In the wider research area around the location of the future regional landfill for municipal (non-hazardous) waste, there are: the "Kalenić" spring and plant and the "Tamnava - East Field" spring. The distance of the nearest well Bp-4 (Ogr + 172.5), from the location of the regional landfill is about 1600 m, and from the accumulation – lake about 2000 m. The nearest wells of the "Tamnava-East Field" spring are located at a distance of about 900 m from the regulation line of the landfill. Visual Schedules No. 2 and 3 show the location of the future regional landfill for municipal (non-hazardous) waste in relation to the position of the drainage wells of CE MB “Kolubara”. The "Kalenić" source consists of wells, used for the drainage of the OCM "Tamnava-West Field". So far, 13 wells have been drilled at the "Kalenić" spring, 6 of which are currently active, and together yield from 34 to 45 l/s. Based on the "Sanitary Protection Zone" study, it can be concluded that the industrial facilities of Kolubara are located in the wider source protection zone. The application of sanitary measures would result in the relocation or difficult operation of the facilities. In practice, these measures have not been implemented because this facility is of a strategic importance for the electricity system of Serbia. Therefore, it is necessary that the supervision measures in this zone are carried out in direct cooperation with the competent services of “Kopovi”. Raw well water is processed at the "Kalenić" water treatment plant. The plant was built in June 1990, but was put into operation at the beginning of 1998 as a part of the investment in the construction of TPP-HP "Kolubara B", and for the needs of drinking water supply to the thermal power plant complex, as well as some industrial facilities located in nearby mines. The total projected processing capacity of the plant is 100 l/s. The drinking water treatment plant includes the following stages of treatment: aeration at atmospheric pressure; water intake pool after aeration; filtration with biological oxidation of ammonia and disinfection with chlorine gas. The envisaged procedures of aeration, retention and filtration with good management of the technological procedure and with the use of adequate mechanical equipment can ensure the quality of drinking water within the MAC.

2.4.2. Information on General Hydrological Characteristics

The area of Tamnava is characterized by a modest relief intersected by meandering watercourses. The Kolubara River is the main watercourse, and its central and lower course with tributaries is important for the project area. The main tributaries in this area are the river Peštan, the river Turija, the river Kladnica, the river Tamnava, the river Vraničina and the river Ub.

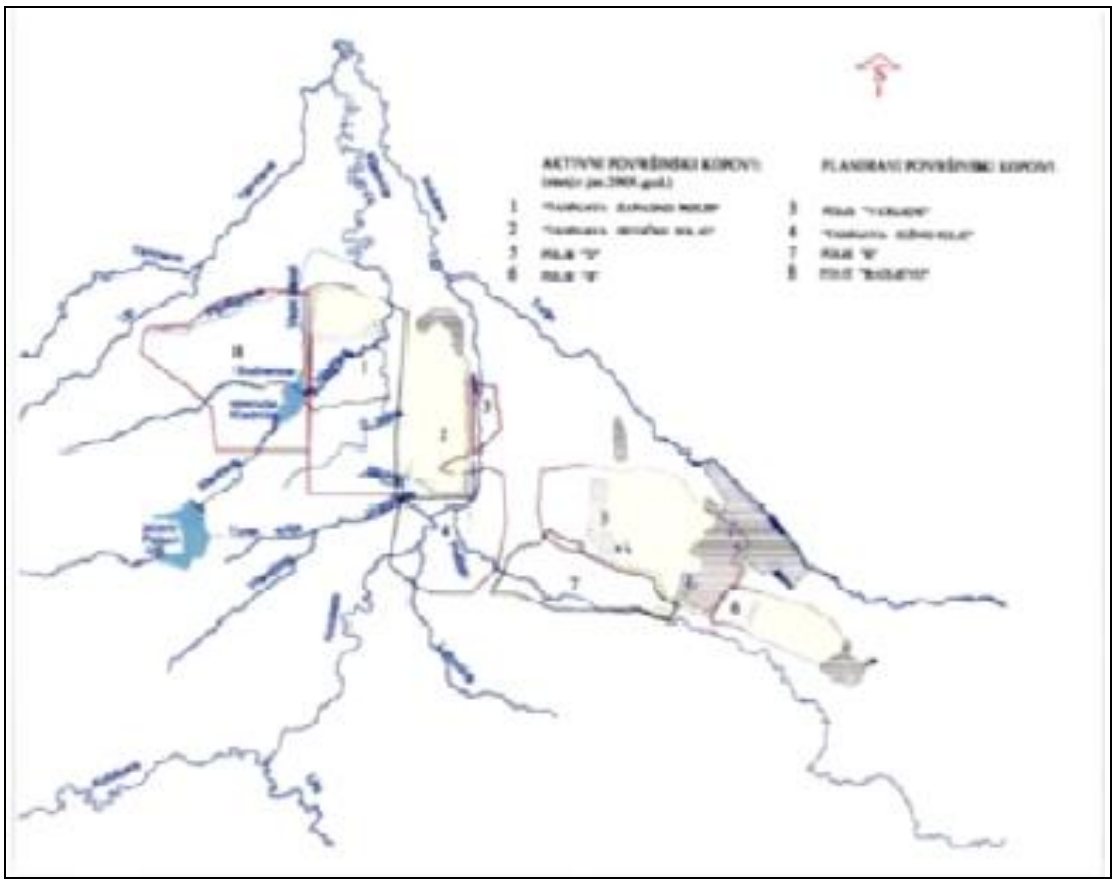


Figure 2.4.1-1. Hydrographic Network
(Source: Program for the Elaboration of the Development Plan for the Area around TPP "Kolubara B", Phase I, Analytical-Documentary Basis, PE EPS, TENT, TPP "Kolubara B", Ub, 2006)

The rivers in the Kolubara basin are mostly of the torrential, with large changes in flow as seasons change. Most of these river systems in the analyzed area have been successively and partially regulated over the past decades, in order to protect the resources along the river banks and the coal exploitation. The Kolubara River was relocated and regulated in 1975, in order to form the open-cut mine "Tamnava-East Field", in accordance with the then needs of open-cut coal exploitation. In the area of Tamnava West, the main watercourse is the river Kladnica. The main tributary of the river Kladnica is Duboki creek, a small stream that flows in the southwest-north-northeast direction, through Tamnava – West Field. In order to protect the Tamnava open-cut mines from high water levels of the Kladnica river, the “Paljuvi-Viš” tank was constructed. From there, the water is conducted through a tunnel into the river Krlja, then flows into the bed of the river Vraničina, and then into Kolubara. The retention area called "Kladnica", wherefrom the water is pumped towards the Pljoštanica river, was built relatively close to the "Tamnava - West Field" open-cut mine. In order to protect the "Tamnava - West Field" open-cut mine from high water levels of the Kladnica’s southern tributaries - Duboki creek and Radavac, five small retentions were built, wherefrom water is directed to neighboring watercourses, i.e. pumped into the river Kolubara, leaving, thus, the lower part of the Kladnica river dry, without tributaries. In the part near TPP "Kolubara B", the river Kladnica has long ago turned into a watercourse with intermittent flow, and has a section of dry and abandoned riverbed along the location of the landfill. Part of the dry (former) bed of the river Kladnica and the peripheral canal for the evacuation of precipitation from the "Tamnava-West Field" mine is about 200 m away from the gate of the landfill complex. The newly formed riverbed of the river Kolubara is more than 3000 m away from the location of the landfill.

The river Kladnica is a left tributary of the river Kolubara. The part of the Kladnica course near the open-cut mine "Tamnava", which borders the projected regional landfill (Figure 2.4.1-2.), is of interest for this study.

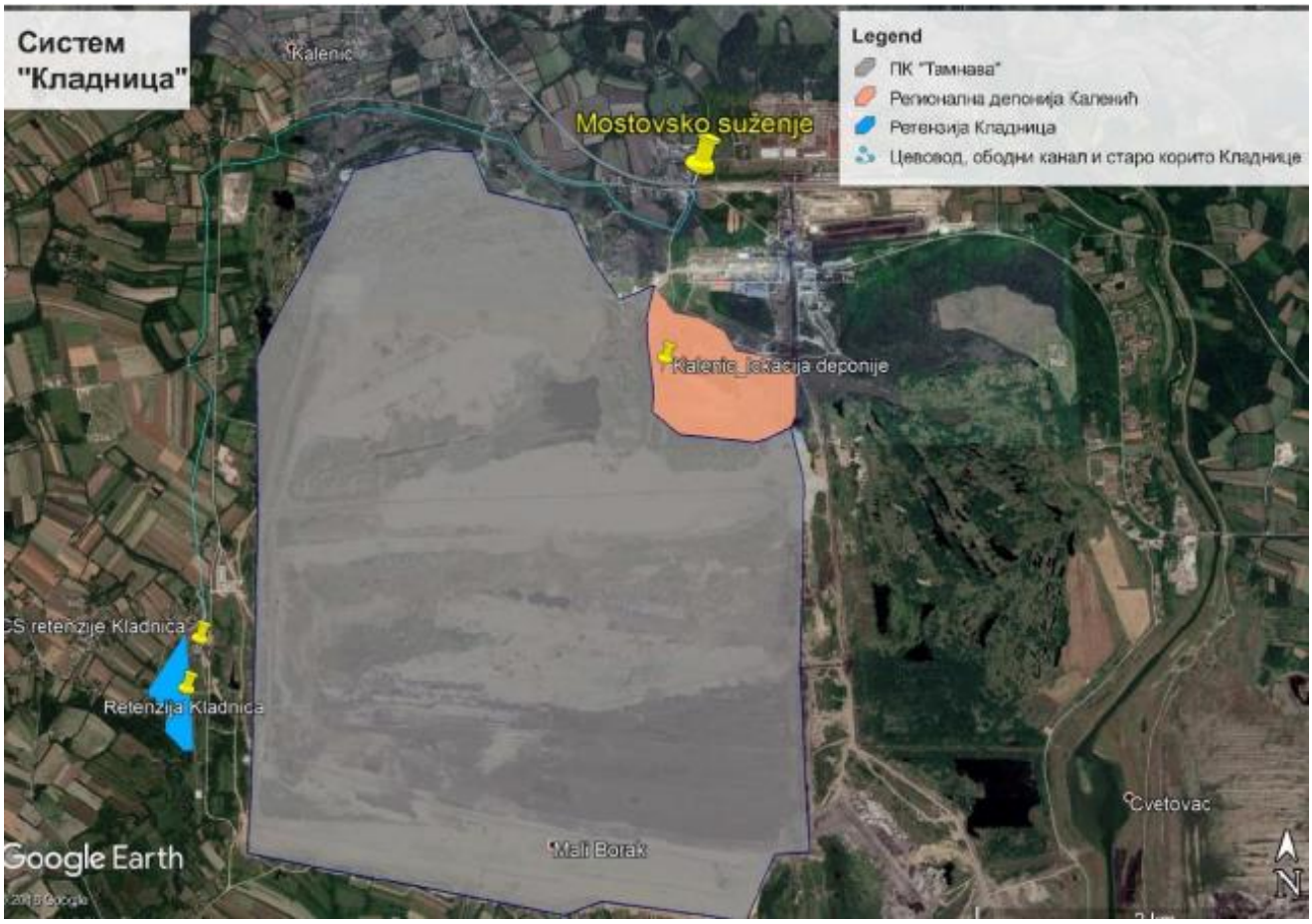


Figure 2.4.1-2. Schematic Presentation of the Kladnica System

In this area, the course of the Kladnica has been redirected due to the expansion of the mine. The natural course of the Kladnica, whose direction went through the area of today's surface mine, was blocked and thus the retention of "Kladnica" was formed. This retention receives the entire volume of the hydrograph of the thousand-year-old high water from the upstream catchment area of the river Kladnica. Downstream, towards the site of the projected landfill, a peripheral canal was built into which the water from the retention is pumped through a natural watershed. The water is pumped from the retention into the circumferential canal through two DN1000 and DN350 pipelines, each 900 m long. The northern peripheral canal flows into the old Kladnica riverbed directly upstream from the bridge narrowing, i.e. near the projected landfill. The capacity of the "Kladnica" pumping station (CS) which pumps water into the circumferential canal is 1800 l/s (three pumps with the capacity of 550 l/s and one pump with the capacity of 150 l/s). For comparison, the peak flow of the inlet hydrogram into the retention, which corresponds to the outflow hydrogram of the return period of 100 years, is 93.4 m3/s. The "Kladnica" retention is designed to accept a flood wave with the volume of 0.5 × 106 m3/s.

The "Kladnica" retention dam has no overflow and the water retained in the retention, due to the breach of the dam, can flow only to the open-cut mine and only to a lesser extent fill the its volume, which is about 50 × 106 m3/s. Based on the above, it can be concluded that the site of the projected landfill is not located in the area to which, in its current state (after the relocation of the Kladnica riverbed), water would flow from the part of the Kladnica course upstream of the retention.

2.5. Overview of Climate Characteristics of the Area

The climate of the Kolubara basin is quite dry, with continuous and steppe features. The winter months are with little precipitation, so the soil is not high in moisture content in the initial phase of vegetation. The second half of spring, as well as the summer months, are characterized by abundant rainfall, but still insufficient to mitigate the effects of high temperatures. There is a lot of precipitation in autumn, but it is at the end of the vegetation period. The average annual temperatures for Zeoke and Tamnava

stations are 11.3ºC, and in Baroševac they are 12.3ºC. Annual temperature amplitudes are not pronounced because summers are moderately warm (average monthly temperatures range between 21-23ºC in the summer) and winters are moderately cold (2.2-3.8ºC). Mean maximum temperatures have the highest value in July (Zeoke 34.7ºC and Baroševac 21.7ºC), and in June (Tamnava 25.8ºC). The highest measured temperatures are in July (around 40ºC at the measuring station Tamnava, 37ºC in Zeoke). The lowest temperature of -28.5ºC was measured at the Tamnava station in January, and at Zeoke -14.5ºC in February. Average annual precipitation levels at the relevant three measuring stations range from 508 mm in Baroševac to 591.6 mm in Tamnava. Compared to the data on the pluviometric regime from the Vreoci and Ub measuring stations (737 mm and 688 mm) from the previous period, these values are significantly lower. The highest precipitation was recorded in June (Zeoke 85.9 mm) and July (Baroševac 86 mm, Tamnava 97 mm).

Eastern, southeastern, western and northwestern winds prevail in this area:
- Baroševac-E, ESE, W and WNW throughout the year;
- Tamnava-ESE and WNW;
- Zeoke-SE and W.

The highest average wind speeds occur in spring from the ESE (5.3 m/s) and SE (6.3 m/s) directions, in the summer from N (4.0 m/s) and NNW (4.1 m/s), in autumn period from E (4.7m/s), ESE (5.6m/s), SE (4.9m/s) and SSE (4.7m/s). During the year, the highest mean wind speeds were recorded from the direction of SE (5.7 m/s), ESE (4.8 m/s), E and SSE (4.5 m/s) and NNW (4.6 m/s).

During the spring, autumn and winter, the prevailing winds from the E, ESE, SE and SSE directions have the highest average speed, while in the summer months, the winds from the NW direction have the highest speed.

2.6. Description of Flora and Fauna, Natural Resources of Special Significance

2.6.1. Vegetation and Flora Segment

The vegetation and flora segment in the area of construction of the future "Kalenić" Regional Landfill in PHASE I includes autochthonous, natural vegetation, as well as a determined, current vegetation and flora segment.

The autochthonous, original vegetation and flora in the subject area consist of:
• Peatland vegetation with rushes and reeds. The peat layer is the substrate in which the largest mass of underground parts of plants with specific morpho-physiological and ecological adaptations of the root system is located. The degree of histosolization/soil structure/and the humidification regime depend primarily on the abundance, direction and speed of water flow. Vegetation of peat bogs with rushes and reeds/phytocenosis *Typhaeto-pragmitetum*/is significant here for the abandoned watercourses of the so-called "dead"/displaced bed of the Kladnica river, for example/and consists of predominantly submerged and floating species such as narrowleaf cattail /*Typha angustifolia*/ and common cattail /*Typha latifolia* /, as well as common reed /*Phragmites communis*/.
• Vegetation of wetlands/wetland meadows/with vegetative flora of river islands. They consist of meadow formations formed after deforestation in positions with high groundwater levels or on pedostructures exposed to prolonged floods.
The vegetation of wetland meadows consists of: primarily fowl bluegrass /*Poa palustris*/, tufted hairgrass /*Deschampia caespitosa*/, true fox sedge /*Carex vulpina, Carex gracilis*/, creeping bent grass /*Agrostis alba*/, as well as buttercup /*Ranunculus flammula, Ranunculus repens*/.
The ground vegetation/flora of river islands is formed by *Salicetum albae* in the lower parts, i.e. areas, which includes mesophytic and hydrophytic species such as wheatgrass /*Agropurum spp*/, true fox sedge /*Carex vulpina, Carex gracilis*/, as well as species of narrowleaf cattail /*Typha angustifolia*/ and common cattail /*Typha latifolia* /.
• Formations of valley, i.e. basin meadows. They are mostly of secondary origin, located near natural waters/Kladnička river and Duboki creek/on wet land. The primary, former production in the

ecosystem was very high. The species are: *Poa pratensis, Poa trivialis, Dactylis glomerata, Agropurum repens, Trifolium repens, Trifolium pratense, Lotus corniculatus*, as well as *Salvia pratensis*.

• Aquatic and coastal vegetation of Kladnička river and Duboko creek. It consists of coastal, woody and shrub vegetation in the phytocenosis of poplar, willow and alder/*Saliceto-populetum-alnetum s. lat.*/. The presence of *Populus albae, Populus nigrae* from the poplar species, *Salix albae, Salix fragilis*, etc. from willow species, as well as alder /*Alnus glutinosa*/ was determined.

Aquatic vegetation consists of floral species: true fox sedge /*Carex vulpina, Carex gracilis*/, agropyron /*Agropurum spp.*/, as well as narrow-leaf cattail /*Typha angustifolia*/ and common cattail /*Typha latifolia* /.

The currently found, i.e. "zero" state indicates that the vegetative-floral segment was significantly destroyed /degraded and devastated/, and the upper layer of pedostructures /mixed with overburden/ lost its structure, mineral components and seed stocks of indigenous plant species. Based on the field visit, the findings and the expert opinion of the court-sworn expert attached in the appendix to the study, the following can be stated:

Presentation of the Current State of the Vegetative and Flora Segment on CP No. 746

The area of CP No. 746 is 5 ha 91 ares and 83 m2, based on the real estate folio No. 52, CM Kalenić, the forested area on this Cadastral Plot totals 1 ha 75 ares and 77 m2. Upon a field inspection, the court expert has stated that the land is devastated almost on the entire cadastral plot – this is, actually, the soil returned after coal exploitation. A part of the plot of about 7 ares is covered in wild shrubbery. An overview of the current state of the vegetative-floral segment on CP No.746 is given in Figure 2.6.1-1.



Figure 2.6.1-1. Current State of the Vegetative-Floral Segment on CP No.746

Overview of the Current State of the Vegetative-Floral Segment on CP No. 770

The area of CP No. 770 is 4 ha 06 ares and 63 m2, according to the Real Estate Folio No. 52 CM Kalenić, the forested area on this cadastral plot totals 99 ares and 10 m2. Upon a field inspection, the court expert has stated that the land is devastated on the entire cadastral plot, referring to the soil returned after the exploitation of coal.

Overview of the Current State of the Vegetative-Floral Segment on CP No. 800

The area of CP No. 800 amounts to 39 ha 87 ares and 58 m2, according to the Real Estate Folio No. 52, CM Kalenić, the forested area on this cadastral plot totals 13 ha 73 ares and 89 m2. Upon a field inspection, the court expert has stated that the land is devastated on the entire cadastral plot, and in one part of this cadastral plot, soil erosion is noticeable. The overview of the current state of the vegetative-floral segment on CP No. 800 is given in Figure 2.6.1-2.



Figure 2.6.1-2. Current State of the Vegetative-Floral Segment on CP No. 800.

2.6.2. Description of Fauna

The fauna in the Kolubara region is relatively rich, both in terms of diversity and its number, despite the small diversity of habitats, changes in landscapes and natural vegetation. The most important group consists of birds, represented by about 130 species, more than half of which (about 70 species) are nesting birds. In addition to the species common to agricultural areas and rural settlements, in the valleys of Kolubara and its tributaries, rare species of birds can be found in small numbers at the time of migration. In numerous forests, especially during the autumn migration, a significant number of forest snipes can be seen, and in smaller ponds along rivers and streams, wild ducks and other species can be found regularly. Surface coal mines represent specific habitats of ornithofauna, where certain species of birds are present, which are not present in the surrounding area. Around the artificial accumulation lake in the village of Paljuvi, a large number of different species of ducks, coots, grebes and other birds gather, and during the spring and autumn migration, some species also nest here. The mammal fauna has more than 35 species, the most numerous of which are rodents, bats, beasts and insectivores. Game species include rabbits, roe deer, foxes, pheasants, quails and partridges. There are two special habitats for deer, rabbits and pheasants. One habitat is located in the municipality of Lazarevac, between Vreoci-Šopić, and the other in the municipality of Ub. The herpetofauna of the area is represented by about 15 species of amphibians and about 10 species of reptiles. The fish stock in the watercourses and stagnant waters includes a carp/cyprinid type of fish that is represented by about 15 fish species. Not counting the Sava River, the Kolubara River has the following fish species: chub, white fish, pike, river carp and a small percentage of catfish. In the municipality of Ub there is organized production of fish (trout).

2.6.3. Natural Resources of Special Significance

The subject area is not a part of the Environmental Network of the Republic of Serbia; there are no identified or recorded significant plant species in it, i.e. individuals or goods that enjoy special protection. According to the Decision of the Serbian Institute for the Protection of Nature 03 No. 020-3172/2 as of 03/12/2018:

1. Within the subject area, there are no protected natural resources, or internationally significant areas (IPA, IBA, PBA, Ramsar), including natural resources planned to be protected (registered or those for which certain activities, such as field research, etc. have been initiated).
2. The subject area is not a part of the unified Environmental Network of the Republic of Serbia;
3. The planned works are not in conflict with the adopted regulations and documents in the area of protection of nature. "

2.7. An Overview of the Basic Features of the Landscape

The subject area intended for the construction of the "Kalenić" Regional Municipal (Non-Hazardous) Waste Landfill is a part of the OCM "Tamnava-West Field" situated in the triangle between the SUP-1 coal transport line, the existing (natural) Kladnica riverbed /which has been redirected/ and the

assembly plot. The site planned for the construction of the regional landfill is one of the excavation fields in the Kolubara lignite basin, which is located within the area of the ongoing/now completed/open-cut exploitation, as a result of which the natural characteristics of the land were devastated, i.e. the existing vegetation, as well as other landscape features were gravely affected. As a result of intensive mining activities and occupation of the subject space, which, above all, has an impact on the physical characteristics of the landscape, causing the loss of fertile land, vegetation, fauna and, of course, the disappearance of settlements. In the zone of open-cut mining/OCM Tamnava-West Field/ this cuased negative changes in the landscape, especially in terms of composition, character and quality, which all had negative visual impact due to devastated basic landscape characteristics; therefore, it can be stated that the landscape is significantly anthropogenically and generally degraded (Figure 2.7-1.).



Figure 2.7-1. Appearance of the OCM "Tamnava - West Field" Area

Open-cut coal mining has completely changed the relief of the area, creating, thus, special geomorphological phenomena - the so-called anthropogenic relief. Hypsometrically speaking, the northern part of the space intended for the landfill body is dominated by a hill of deposited material, where the elevations of the terrain range from 100.59 to 94.00 m above sea level.

In the northern part of the subject area, there is a section of the existing Kalenić - Veliki Crljeni road, with an access road to the TPP "Kolubara B" complex, as well as a part of the watercourse of the river Kladnica.

The space provided for purpose-built facilities, service buildings and water management facilities, which are located in the northern and northwestern part of the terrain, is of uniform altitude (about 89 m above sea level). Along the eastern border, the service road, as well as on the part of the terrain where the administrative building/according to the development solution/ is envisaged, the elevation is mostly approx. 94 m above sea level. The southern border, which extends over the internal landfill, is at an altitude of 80 m above sea level. The lowest part of the terrain is in the area around the accumulation - the lake, where the elevations of the shore are around 65 m above sea level. The erected retention dams in the the river Kladnica basin /a part of the protection system of the open-cut mine "Tamnava - West Field"/ redirected the waters of Kladnica, i.e. the bed of the river Kladnica was destroyed in its middle part of the watercourse, and in the lower part of the watercourse it was retained, as a recipient for the discharge of atmospheric water from the complex of the regional landfill and from TPP "Kolubara".

West of the subject area/on the left bank of the river Kladnica/, an asphalt road was built, which starts from the Kalenić-Veliki Crljeni road, first goes south and then east/passing through the area covered in the Development Design/and ends at the entrance to the "assemply plot" – the industrial complex of

the "Tamnava-West Field". The largest part of the subject site is currently degraded /as already mentioned/, as it served as an internal landfill for the open-cut mine. In the Tamnava West area, the main watercourse is the river Kladnica, whose stretch near TPP "Kolubara B" has long ago turned into a watercourse with intermittent flow. Forest fragments of aquatic, coastal vegetation are present along the Kladnica river, as well as along Duboki creek.

2.8. Overview of Immovable Cultural Monuments

According to the Requirements for undertaking technical protection measures for the construction of the Kalenić Regional Municipal Waste Landfill on Plot No. 800, CM Kalenić, on the territory of the Municipality of Ub, the Valjevo Institute for the Protection of Cultural Monuments (No: 1143 as of 05/12/2018): On the area provided for the construction of the Kalenić Regional Municipal Waste Landfill on Plot No. 800, CM Kalenić, there are no identified or recorded immovable cultural monuments or structures that enjoy prior protection.

2.9. Population, Density and Demographic Characteristics

The subject area, i.e. the Kolubara region covers an area of 4,075 km² and according to the 2011 census has the total population of 363,360. There are 120,824 households in 340 settlements, and the average number of household members is 3.01. In the period between the last two censuses (2002 and 2011), the depopulation trend continued, which means that the population growth rate is negative and amounts to -5.7‰.

The average population density in the Region is 89 inhabitants/km2. The region is characterized by different population densities (from 39.3 inhabitants/km2 in the municipality of Osečina to 176.9 inhabitants/km2 in the municipality of Obrenovac), and therefore the settlements also differ morphologically in a great extent.

For the purpose of waste management, out of the total population of the Kolubara region, 34.4% of the population can be characterized as urban, while the largest part, 65.6% of the population lives in other settlements (331 of them).

Table 2.9-1. Basic Features of the Kolubara Region for the Purpose of Waste Management - Population, Density and Demographic Characteristics

Municipality	Area (km2)	Population (2011 Census)	Growth Ratio – 2002 – 2011 (in ‰)	Population Density (psn/km²)	Number of Settlements	Number of Households	Average No. of Members per Household
Ub	456	29101	-10,9	64	38	9176	3,2
Lajkovac	186	15475	-10,8	83	19	5113	3,0
Ljig	279	12754	-15,2	46	27	4455	2,9
Osečina	319	12536	-20,9	39	20	4212	3,0
Valjevo	905	90312	-7,7	100	78	31401	2,9
Vladimirci	338	17462	-17,1	52	29	5835	3,0
Obrenovac	410	72524	2,4	177	29	23712	3,0
Koceljeva	257	13129	-19,4	51	17	4522	2,9
Lazarevac	383	58622	0,2	153	34	18862	3,1
Mionica	329	14335	-15,7	44	36	4616	3,1
Barajevo	213	27110	10,6	127	13	8920	3,0
REGION	**4075**	**363360**	**-5,7**	**89**	**340**	**120824**	**3,01**

Source: Data by the Statistical Office of the Republic of Serbia

2.10. Information on the existing commercial and residential structures, and infrastructural and suprastructural objects

The position of the existing economic and infrastructural facilities in relation to the location of the future "Kalenić" Regional Landfill is given in the Visual Schedule to the EIA.

2.10.1. Commercial Facilities

The economic-industrial zone of Ub, with an area of about 29 ha, ***as well as the new industrial zone in Ub***, in the northeastern part of the city between the river Ub and the road to Belgrade, are favorable locations for industry and SMEs from various fields of economic activity. About 66.8 ha are used for commercial purposes, and the Ub GDP Program foreseens an increase in the area intended for commercial and industrial purposes by 52.5 ha, i.e. generally for economic activities by about 119 ha and services by about 9.4 ha. In the long-term spatial planning document of the municipality and the Ub GDP, the Municipality of Ub has decided on the following basic directions of economic development: agriculture, food industry, metal processing, production of silo equipment, construction materials, construction, tourism and catering, trade and other services, with the development of coal exploitation and electricity production and a set of various services. The focus of economic development are branches of agriculture, metal processing and service activities. Great importance is given to the establishment of farms, with livestock, field and vegetable production. Favorable position of the Municipality in terms of infrastructural connections and developed transportation infrastructure are important for the distribution of fresh agricultural products to large markets.

In the region directly affected by the previous and planned exploitation of lignite (Baroševac, Vreoci, Zeoke, Junkovac, Mali Crljeni, Medoševac, Prkosava, Sakulje and Cvetovac settlements in the municipality of Lazarevac, and Mali Borak and Skobalj in the municipalities of Lajkovac and Kalenić, Brgulje, Radljevo and Šarb in the municipality of Ub), the provision of conditions for full and economical cultivation of all remaining agricultural areas is mandatory, along with the inclusion of effective measures to protect the pedological layer in the immediate vicinity of the terrain occupied by mines and dumps in the mining design. The total area directly occupied by mining activities is about 16.5 thousand hectares. The planned occupation of about 2,062 ha of agricultural land will reduce the share of agricultural land in the total area from about 59% to 45%. Along with the implementation of reclamation programs (predominantly reforestation, with occasional application of agrobiological measures in the areas of Mali Crljeni and Sakula), which will lead to a gradual revival, and in the future to an increase in the previous biocapacity of the area, support is needed to increase the economic efficiency of the agricultural production, to improve the level of technical equipment and intensify the production of flowers, ornamental plants and other non-edible agricultural products, in accordance with the market demand.

Commercial Facilities near the Site of the Future "Kalenić" Regional Landfill

Near the site of the future "Kalenić" Regional Landfill, there are commercial facilities in the function of mining and energy: OCM "Tamnava-West Field", OCM "Radljevo" (preparations for its opening are underway), coal transport system and coal dump and TPP "Kolubara B" (under construction). OCM "Tamnava-East Field" operated from 1979 to 2008, that is, 2009. In that period, 235.4 million tons of coal was produced and 237.6 million cubic meters of overburden was excavated.
The new zone where energy facilities are concentrated is in CM Kalenić covering an area of about 220 ha (including the following contents of TPP "Kolubara B" under construction: industrial complex, shunting station for processing and loading of coal, accompanying facilities, new site for coal processing, etc.). The construction of the complex is planned to be completed within the TPP "Kolubara B" site, with an area of 105.5 ha. It is possible to expand this site due to the potential dislocation of a part of the mining and industrial zone Vreoci. The existing zone of storage, transport and other facilities in the area of Kalenić (116.5 ha) remains active in the upcoming period.

OCM "Tamnava-West Field"

"Tamnava-West Field" belongs to the western part of the Kolubara coal basin, with an area of about 21 km2. From the west and south, the deposit is contoured by artificial borders and it borders with the "Radljevo" exploration field, with OCM “Tamnava-East Field" in the east, while to the north is the natural boundary of the coal seam. In the north, the field is limited by the Stepojevac-Brgule-Šarbane stretch, which is at the same time the end of the productive part of the coal basin. The contouring of the field in the west and south is not completely geologically defined, but an artificial border has been adopted, determined by the Radljevo-Stublenica stretch. In the SW and south, the field is contoured by the Stublenica-Paljuvi-Skobalj-Vreoci stretch, i.e. by the left side of the river Vranicina valley in the south. In the east, the spread of the field was also artificially determined by the Skobalj-Mali Borak-Stepojevac stretch. The deposit is located in the municipalities of Lajkovac and Ub, in the areas of Kalenić, Mali Borak, Radljevo and Skobalj settlements, i.e. in Folio 7D29 Stepojevac (32; 33; 42, 43; 52; 53; 62; 63; 72, 73; 82, 83).

According to the degree of complexity of the geological material, the "Tamnava-West Field" deposit is classified in group I, subgroup I and III of coal deposits, and based on the degree of exploration, density of exploration works and total geological material, the reserves were classied as "A", "B", and "C1". Total geological reserves of coal according to the Study on Lignite Reserves in the "Tamnava-West Field" Deposit as of 31/12/2004, certified by the competent commission for determining and verifying the reserves of mineral raw materials of the Ministry of Mining and Energy are: 42 538 636 t of "A" category coal; 165 051 487 t of “B” category coal; 292 626 000 t of "C1" category coal. Total geological reserves of coal amount to 500 216 123 t of coal ("A" + "B" + "C1").

For OCM “Tamnava-West Field", 2013 was a record year in coal production with 14,661,219 tons. The record in the production of overburden was achieved in 2013, whose production amounted to 33,119,838 cubic meters of solid mass. In 2014, more than 17 million cubic meters of overburden was excavated and disposed of at the OCM "Tamnava-West Field". Mid-May, for the first time since the beginning of open-cut coal mining, all production systems of the mining giant were stopped and production was completely stopped. Coal production at OCM “Tamnava-West Field" was stopped for seven months.

OCM "Radljevo"

The open-cut mine "Radljevo" is located in the western part of the Kolubara coal basin, right next to the western border of the OCM “Tamnava-West Field". The exploitation of coal in this open-cut mine will take place in a highly stratified working environment, which has not been encountered in our open-cut mines so far. The selective mode of operation with the new equipment will be implemeneted at OCM "Radljevo", and the applied technology will be defined with a view to improving the quality of coal. In the future, OCM "Radljevo" will be a reliable supplier of fuel for both existing and new TPP units. The general information on OCM "Radljevo" is shown in Table 2.10.1-1.

Table 2/10/1-1. General Information on OCM "Radljevo".

Type of Coal	Lignite
Exploitation Reserves	341.4 million tons
Heat Capacity	6.306-7.728 MJ/t
Average Heat Capacity	6.955 MJ/t
Ash Content	16.18%
Moisture	49.50%
Annual Production	13 million tons
Overburden Quotient	2.98
Total Thickness of Coal Seam (6 Layers) with Interlayers	60m
Main Excavation Equipment	Continous
Exploitation period for the capacity of 13 million tons of coal per annum	35 years

From 1962 to 2004, 359 wells were explored in the area of OCM “Radljevo" and a study on the available reserves was written. In 2008, a study on the selection of restrictions and well opening was

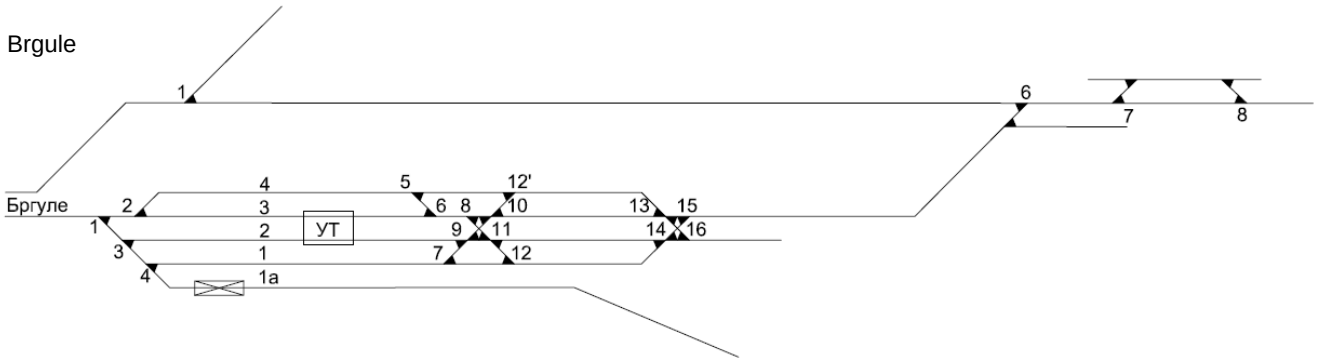
made with a comparative overview of the technological and economic aspects of coal exploitation for the selection of the priority coal supplier of TPP "Kolubara B". In 2010, the Preliminary Design with a Feasibility Study was prepared.

Coal Transport and Landfill System

Railway Transport (RT) is a branch of "Thermal Power Plant Nikola Tesla" in Obrenovac. The main activity of RT is the transport of coal needed for electricity production in TPP "Nikola Tesla A", TPP "Nikola Tesla B" and TPP "Kolubara" In addition to transporting coal for the needs of thermal power plants, Railway Transport transports the equipment, fuel oil, acid, alkali, oil, gravel and other goods for the needs of TENT doo and other users from Obrenovac, but provides road transport of classic cargo and dangerous goods. There are six stations with a strict division of labor on the regular track lines of TENT doo: coal is loaded at Vreoci and Tamnava stations, Stubline and Brgule stations are used to regulate railway traffic, while coal is unloaded at Vorbis and Obrenovac stations.

Tamnava Station is a loading station. The track facilities of this station consist of two consecutive track sets with four tracks each, which are connected by track connections into a single station with four long tracks. In addition, one track connects them to the track facilities of the mine. The station is equipped and secured with SpDrS-64 JZ electro-relay devices manufactured by EI FSU Belgrade. The track plan of the Tamnava station is given in Figure 2.10.1-1.

Tamnava TENT Track Plan



“Kalenić” Regional Landfill. The construction of TPP "Kolubara B" is one of the high-priority tasks of PE "Electric Power Industry of Serbia". The decision to build the then TPP-HP "Kolubara B", with the capacity of two 350 MW Units, was made in 1983. It was designed as a plant for combined production of electricity and heat, in order to deliver heat to the city of Belgrade for the district heating system.

In the Kolubara basin, back in 1988, the construction of two units in the TPP "Kolubara B", located next to "Tamnava - West Field" mine, began. The decision on construction was made in 1984, when the first construction works started. The location of the coal transport and landfill system and TPP "Kolubara B" (under construction) in relation to the site of the future regional landfill are shown in Figure 2.10.1-2.

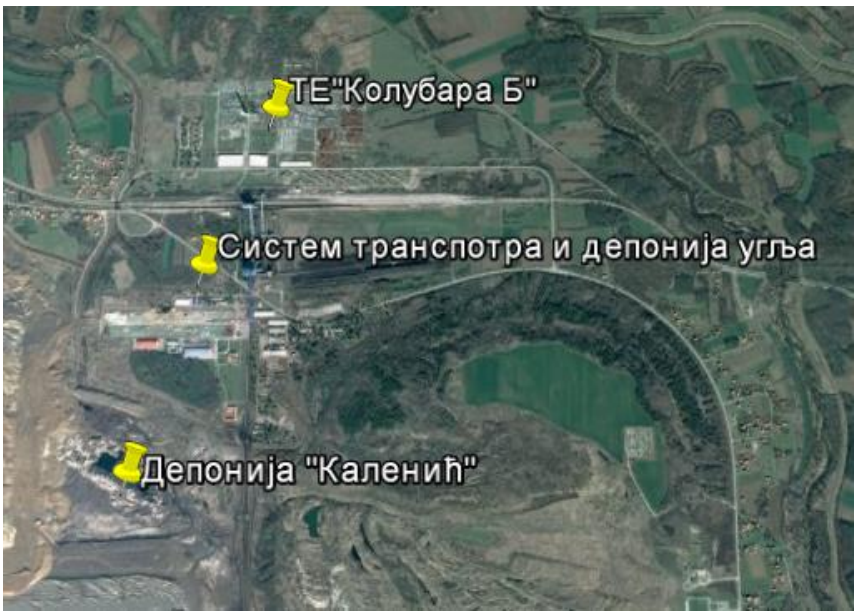


Figure 2.10.1-2. Coal Transport and Landfill System and TPP "Kolubara B" (under construction).

The preparatory works began with the construction works on the preparation and organization of the construction site in 1988, while the construction continued in accordance with the available financial resources. The procurement of the most of the basic equipment was agreed, which was mostly delivered, too. The activities on the implementation of the project and the use of the approved World Bank loan were very slow, and by mid 1992, due to the decision of the Government and the lack of funds, the activities were completely suspended. Until 1992, when the works on the construction site were interrupted due to the sanctions, about 40 percent of the facility was built, and after that only the most necessary activities were performed. Due to the changed concept of Belgrade's supply of thermal energy, the operating mode has been changed, in the sense that the plant operates only in the condensing mode.

In the second half of the 1990s, construction was reactivated, but without significant progress. At the beginning of 2000, the issue of the continuation of construction was brought up again, and a review of the state of previous investments and an assessment of the justification for the continuation of construction were prepared. It was concluded that there are technical and technological solutions that guarantee modern operating parameters on the level of modern thermal units.

Table 2.10.1-2. General Information on TPP "Kolubara B"

Unit Power	350 MW
Number of Units	2
Boiler	Combustion Engineering, rapid heating, with subcritical steam parameters
Turbine	Condensing, three-housing, with steam reheating and regenerative heating of supply water and condensate
Main Fuel	Lignite from Kolubara basin, 6.700 kJ/kg
Unit Exploitation Level (Net)	≥ 37%

A 2004 study determined that more than EUR 300 million had been invested in the construction of TPP "Kolubara B" by then, and it was estimated that about EUR 550 million were still missing for the completion of the construction of the facility. The conducted analyzes of the construction of new production capacities on Kolubara lignite show that the completion of the construction of TPP "Kolubara B" was justified.

2.10.2. Residential Buildings

The distance of the nearest residential houses from the site of the future "Kalenić" Regional Landfill is a little more than 0.6 km (Picture 2.10.2-1.). The nearest settlement is about 2 km away - the village of Kalenić.



Figure 2.10.2-1. Individual Residential House Closest to the Site of the Future "Kalenić" Regional Landfill

The wider area around the landfill is dominated by rural settlements, 86% of which belong to the scattered settlements category. The characteristic of this type of villages is the scattering of households in the area, most often at the level of family or kinship communities, in several settlement groups along local roads. Gross population density ranges from 1-4 inhabitants / ha, while in some, more densely populated groups, the gross population density is 10-35 inhabitants / ha, which corresponds to a sparse - compact to fully compact type of village. Arable land belonging to the households is located mainly in the vicinity of the houses or hamlets. In the past period, there has been a change in the development of the settlement due to the relocation of the population. A total of 1,614 households were relocated from the surface mining development zone. Some settlements have been relocated almost entirely (Sakulja, Cvetovac, Kalenić). Most of the households were moved individually, mostly to the peripheral zones of municipal centers, suburban settlements or by moving within their own areas (Kalenić, Cvetovac, Baroševac). A small part of the households were moved in an organized manner to special settlements (part of Baroševac to the location of Jelav and part of Medoševac to the location of Crna Međa).

2.10.3. Infrastructural Systems

Traffic

From the point of view of spatial development, the traffic infrastructure is important. The most important roads passing through this zone are two Class I state roads, M-4 and M-22, which are located in the municipalities of Lajkovac and Lazarevac, Class II state road between Lazarevac - Arandjelovac, Lazarevac - Stepojevac, Lajkovac - Ub, Ub - Obrenovac, and municipal roads. The Belgrade-Bar railway with several terminals and stations passes through this area. The routes of the main roads go along the valley of the river Kolubara, mostly through agricultural areas, and partly through settlements (railway), in parallel, without railway-road crossings. This area is characterized by a narrow-gauge industrial railway that connects open-cut mines with thermal power complexes and the settlements of Vreoci, Veliki Crljeni and Obrenovac. The corridor for the future Belgrade - South Adriatic highway according to the western variant, as well as the corridor for the relocation of a part of Class I state roads - M22 and M4 - and the railway, are also reserved (next to Ub and Lajkovac).

The Class II state roads network is represented by the following roads:
- on the territory of the municipality of Ub - R-101, R-101a, R-270;
- on the territory of the municipality of Lajkovac - R-101, R-101a, R-271;
- on the territory of the municipality of Lazarevac - R-201, R-201b, R-203, R-205b; and

The local road network is represented by the following roads:
• on the territory of the municipality of Ub - L-1001, L-1002, L-1003, L-1008, L-1009, L-1010, L-1011;
• on the territory of the municipality of Lajkovac - L-4, L-6 (connection to the road L-1003), L-7 (connection to the road L-1011), L-8;
• on the territory of the municipality of Lazarevac - L-1801, L-1802, L-1803, L-1804, L-1805, L-1806, L-1807, L-1808, L-1811, L-1812, L-1813;

Despite the fact that it is located relatively close to the capital, the main direction of the national transport network does not pass through Tamnava - West Field. The nearest route - E-75 highway (which leads from north to south) is located almost 50 km to the east, while its western direction to Valjevo and Tuzla, passes through the southern part of the Kolubara basin. When it comes to the main railway network, the area is very close to the Belgrade - Bar railway, which runs along a part of the Vreoci - Lazarevac road. Both thermal power plants "Nikola Tesla A" and "Nikola Tesla B" are connected to the local railway network, which ensures a constant supply of coal.

Transmission and Distribution Electricity Network

The power system in the area of the Kolubara lignite basin consists of the thermal power plant "Kolubara A" connected to 110 kV voltage level, the transmission network of 400, 220 and 110 kV that crosses the border of the basin and the distribution network of 35, 10 and 0.4 kV. The distribution network is dimensioned only to meet the needs for electricity in the local area. From the significant infrastructural facilities, three routes of 35 kV transmission lines, East I, II and III, pass through the exploitation area of Tamnava West, which serve for power supply to OCM “Tamnava - East Field" and recreational facilities at Cvetovac settlement (lake, playgrounds, restaurant).

Water Management Infrastructure

In the area of the Kolubara basin, i.e. in the REIS area, two systems are being developed: (1) Regional Kolubara system for the provision of water of the highest quality, for the supply of water to settlements and industries using water of drinking water quality; and (2) Kolubara river system, providing water for technological needs and irrigation, as well as for the protection of water system. The key object of both mentioned systems is the multi-purpose accumulation "Stuborovni" on the Jablanica River, which has ensured flow regulation for many years. It provides the so-called average balanced flow of 1,140 l / s, which is used for the regional water supply system of the settlement, as well as for the needs of REIS "Kolubara", both with the constrancy of 97%, while the prescribed guaranteed ecological flow of 130 l / s, which must be discharged from the reservoir, has absolute priority and 100% constancy. In addition to the accumulation Stuborovni on the Jablanica River, "Paljuvi Viš" accumulation on the Kladnica river is used, as well, which currently awaits reconstruction. The largest user of this system is REIS, which requires a regulated flow with a very high constancy of water supply (97%) for the cooling of the thermal power plants.

3.0. PROJECT DESCRIPTION

3.1. Description of Preliminary Project Activities

The Kolubara waste management region is located in Western Serbia. The region includes 11 cities, municipalities and city municipalities in the Kolubara Administrative District, parts of the Mačva Administrative District and parts of the City of Belgrade, which gives it the characteristics of an interregional project. The cities and municipalities participating in the joint project are: Valjevo, Obrenovac, Lazarevac, Ub, Barajevo, Lajkovac, Mionica, Koceljeva, Osečina and Ljig. The project area has 363,360 inhabitants and the average amount of collected municipal solid waste is 486 tons / day.

Cities and municipalities of the Kolubara region are signatories to the Agreement on the Establishment of "EKO - TAMNAVA" d.o.o. Ub Regional Waste Management Center registered on 3 April 2012. The contract defines ownership rights, management bodies and financing of project costs, and the company is entrusted with project management tasks.

The starting points are the harmonized concept of the Kolubara Regional Waste Management System adopted by the representatives of the cities and municipalities participating in the joint project in accordance with the respect for the specifics of the region covered by the plan, differences in the level of economic development of local governments, the developed transportation network, as well as the specific interests of the local communities. They reflect the need to program a sustainable and efficient Regional System, flexible for further upgrades, with clearly defined levels of responsibilities and competencies, in accordance with the standards of the Republic of Serbia and EU Directives.

The general framework is based on the long-term, multi-phase approach in planning and construction, as well as an integrated approach in the organization of the regional waste management system.
- Primary selection of municipal waste is performed at the place of origin in two bins ("wet" and "dry" fractions) and seasonally, on the as-needed basis, in the third bin for inert waste (ash) and bio waste.
- The transfer station network includes Valjevo, Obrenovac (transhipment only), Lazarevac and Koceljeva.
- Plants for secondary separation of recyclable waste (recycling centers) will be organized in Valjevo, Obrenovac, Lazarevac.
- Centers for separate collection of recyclable waste (recycling yards), for bulky waste, household appliances, garden equipment, etc, and other special streams of household waste, will be organized as an integral part of this project in Valjevo, Obrenovac, Lazarevac, Ub, Vladimirci, Lajkovac , Mionica, Koceljeva, Osečina, Ljig.

Division of Competencies and Responsibilities:
- In the hierarchy of municipal waste management, the founding cities and municipalities, together with their respective PUCs, shall be responsible to organize and implement waste prevention and reduction, reuse and recycling measures on their territory.
Cities and municipalities with their local utility companies have absolute ownership and management rights on all facilities of the Regional System built on their territory (transfer stations, recycling centers, recycling yards). They organize and conduct primary waste selection, collection of municipal waste, as well as local transport to the transfer station or the Regional Center.
- In the hierarchy of municipal waste management, "Eko - Tamnava" d.o.o. Regional Waste Management Center Ub is responsible for the treatment, recovery and final disposal of waste and will operate the "Kalenić" Regional Landfill.

The primary activity of the company is the treatment and disposal of non-hazardous waste, and in addition, it organizes and implements education, information and training programs and raises public awareness in the Kolubara region about integrated waste management; coordinates activities on the establishment of a regional system for integrated waste management; performs specialized regional

waste transport (from transfer stations to the "Kalenić" landfill); is the holder of ownership and management rights on facilities, plants, means of transport, equipment and other property of the Regional Center with the landfill "Kalenić"; performs other duties and tasks in accordance with the Establishment Agreement.
- In the official document "Protocol no. 353-01-02028120" as of 22/10/2013, REC "Eko-Tamnava" d.o.o. Ub, the relevant Ministry of Environmental Protection as well as all municipalities participating in the joint project for the construction of the "Kalenić" Regional Municipal (Non-Hazardous) Waste Landfill, agreed **that the waste management option to be developed in the Feasibility Study includes a regional landfill in Kalenić and three decentralized recyclable waste separation facilities (MRF) in Valjevo, Obrenovac and Lazarevac.**

The third point of the Protocol states: "**In the upcoming period, the Municipality of Ub is appointed to make a choice of waste treatment options for the second phase of the development of the center in Kalenić, as well as to implement that project, all with the special consent of the Council of Eko-Tamnava doo**. "

In the Feasibility Study, scenario 1 was selected as the most favorable one, which provides that, in the first phase of the project, only a sanitary landfill will be built (without any treatment facilities). A recommendation was also made to prepare a Feasibility Study for the needs of the second phase of the project and the selection of appropriate technology for the final treatment of waste, which will take into account the need to reduce the share of biodegradable waste on the landfill.

By Conclusion No. 05 352-9288 / 2014 adopted at the 42nd session of the Government of the Republic of Serbia held on 21/08/2014, the project of the "Kalenić" Regional Municipal Waste Landfill was declared a project of special importance for the Republic of Serbia. In accordance with the schedule, technical documentation prepared and building permits obtained, the phased realization of the project of the "Kalenić" Regional Waste Management Center, with the construction of a regional sanitary landfill for non-hazardous waste is planned in the 2020-2022 period.

The project for the construction of the "Kalenić" Regional Sanitary Non-Hazardous Waste Landfill is completely ready for implementation, i.e. all property and legal relations have been resolved, the necessary planning and technical documentation has been prepared, on the basis of which all necessary construction permits have been obtained.

3.2. Waste Quantity and Structure

For the needs of the Design for the Construction Permit for the Construction of the "Kalenic" Regional Sanitary Municipal and Non-Hazardous Waste Landfill, information on the quantity and composition of waste was taken from the Preliminary Design of the regional sanitary landfill at the location "Kalenić", Kirilo Savić Institute, November 2015, and is presented within this chapter. According to the project, the estimated average annual quantity of mixed municipal waste that will be disposed of at the "Kalenić" Regional Landfill is about 120,000 t / year and the average daily amount of compacted waste is 394 m3.

3.2.1. Morphological Composition of Municipal Solid Waste Generated in the Region

Estimates of the quantity of waste generated in the Kolubara region, as well as analyses of the current waste management method were considered in the Report on the Quantities and Morphological Composition of Municipal Waste for 11 Cities and Municipalities of the Kolubara Waste Management Region (FTN Novi Sad / 2013) and in the Feasibility Study for the Kalenić Regional Waste Management Center (CBA, birPRO / 2014). The Technical Faculty in Novi Sad conducted two measurements of the composition and quantity of municipal waste generated in the Kolubara region (the first measurement in the period from 08/04 to 14/04/2013, and the second measurement in the period from 08/07 to 19/07/2013). The measurements were performed based on the Rules on the Methodology for Collecting Information on the Composition and Quantities of Municipal Waste on

the Territory of the Local Government Unit, and these measurements were adopted by the Ministry of Environmental Protection as authoritative. The morphological composition determined on the basis of these measurements is shown in Table 3.2.1-1.

Table 3.2.1-1. Information on the Morphological Composition of Waste (in%) in the Kolubara Region Based on Two 2013 Measurements, Technical Faculty, Novi Sad.

Waste Fractions	April	July	Regional Average
Garden Waste	17.91%	16.22%	17.1%
Other Biodegradable Waste	27.26%	35.94%	31.6%
Paper	4.69%	4.43%	4.6%
Glass	3.00%	2.80%	2.9%
Cardboard	3.62%	3.77%	3.7%
Composite Materials	1.08%	0.91%	1.0%
Metal Packaging and Other Waste	1.09%	0.48%	0.8%
Aluminum Cans	0.49%	0.56%	0.5%
Plastic Packaging	3.92%	4.74%	4.3%
Plastic Bags	7.31%	9.60%	8.5%
HDPE Plastic	1.72%	2.14%	1.9%
Textile	8.16%	6.40%	7.3%
Leather	0.44%	0.54%	0.5%
Diapers	4.37%	3.70%	4.0%
Fine Fractions (<20mm)	14.94%	7.76%	11.4%

The analysis of the morphological composition of the waste showed that biodegradable waste makes up for the highest percentage in the total collected municipal waste:

- Biodegradable waste: 60% (garden waste + kitchen waste + textiles + diapers);
- Packaging waste: 14% (metal packaging + Al cans + plastic packaging + plastic bags);
- Total recyclables: 15% (paper + glass + cardboard + metal packaging + solid plastic);
- Residues: 11% (Fine fractions).

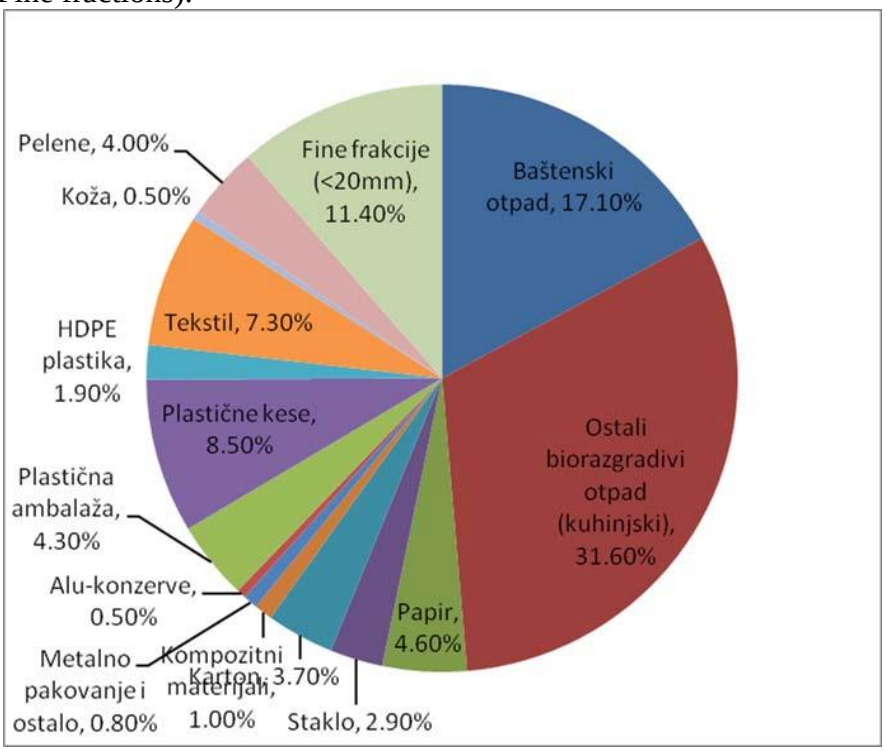


Figure 3.2.1-1. Average Composition of Mixed Waste Generated in the Kolubara Region.

3.2.2. Waste Generation Rates

Waste generation in 11 municipalities in the observed region is shown in the following tables (according to the data obtained from two measurements in 2013):

Table 3.2.2-1. Waste Collection and Generation (April 2013)

MUNICIPALITY	Coverage (%)	Qty Collected by PUC (t/year)	Waste Generation (kg/psn/year)	Waste Generated in the Municipality (t/year)
Barajevo	68.2	7,366	398	12,254
Ваљево	72.0	22,723	349	31,544
Lazarevac	67.6	18,460	466	27,291
Ub	84.6	10,177	413	12,026
Lajkovac	64.9	4,986	496	7,681
Obrenovac	82.7	30,123	502	36,434
Mionica	26.8	1,612	385	6,016
Коцељева	28.9	1,402	369	4,851
Ljig	26.4	1,107	329	4,196
Osečina	39.6	1,318	266	3,329
Vladimirci	18.1	1,182	373	6,516
REGION-total	**65.2**	**100,455**	**424**	**152,138**

Table 3.2.2-2. Waste Collection and Generation (July 2013)

MUNICIPALITY	Coverage (%)	Qty Collected by PUC (t/year)	Waste Generation (kg/psn/year)	Waste Generated in the Municipality (t/year)
Barajevo	68.2	8,424	455	13,803,7
Valjevo	72.0	25,268	388	35,077,7
Lazarevac	67.6	13,398	338	19,807,2
Ub	84.6	4,686	190	5,537,7
Lajkovac	64.9	3,766	375	5,801,9
Obrenovac	82.7	16,761	280	20,272,6
Mionica	26.8	1,075	257	4,013,2
Koceljeva	28.9	1,651	435	5,712,0
Ljig	26.4	1,158	344	4,391,6
Osečina	39.6	1,622	327	4,098,8
Vladimirci	18.1	1,246	393	6,870,2
REGION-total	**65.2**	**79,057**	**334**	**125,386**

The following discrepancy in waste generation was observed between two measurements (424–334) / 424 = 21%. The mean value of the two above-mentioned values of waste generation, i.e. 379 kg / person / year or 1.03 kg / person / day will be taken as reference values for further calculations. This value is slightly higher than the value given in the National Waste Management Strategy, i.e. 318 kg / person / year (2009) or in the Regional Waste Management Plan, i.e. 330 kg / person / year (2010), while it is almost the same as the value taken in the previous feasibility study (366 kg / person / year). For comparison, the average annual value of waste generation per capita in the EU is 502 kg (EUROSTAT 2012).

3.2.3. Waste Generation Forecast

Estimated population trends in the observed region for the 2011-2041 period (Source: Statistical Office of the Republic of Serbia) given in Table 3.2.3-1 is taken as the basis for waste generation forecasts.

Table 3.2.3-1. Population Projection by 2041

Municipality	2011	2016	2021	2026	2031	2036	2041
Barajevo	27,110	28,364	30,051	31,985	34,016	36,129	38,427
Valjevo	90,312	87,655	85,214	83,431	82,248	81,465	81,221
Lazarevac	58,622	59,229	60,000	60,840	61,610	62,351	63,347
Ub	29,101	27,648	26,461	25,648	25,069	25,314	26,208
Lajkovac	15,475	14,638	14,221	14,080	14,006	14,016	14,451
Obrenovac	72,524	73,272	74,077	74,928	75,758	76,683	77,973
Mionica	14,335	13,188	12,601	12,631	12,857	13,217	13,673
Koceljeva	13,129	11,974	11,220	10,744	10,676	10,858	11,203
Ljig	12,754	11,814	11,218	11,029	11,144	11,459	11,870
Osečina	12,536	11,447	10,674	10,145	9,859	9,804	9,909
Vladimirci	17,462	16,203	15,231	14,468	14,112	14,249	14,504
TOTAL REGION	**363,360**	**355,432**	**350,968**	**349,929**	**351,355**	**355,545**	**362,786**
%		**-0.45**	**-0.25**	**-0.06**	**+0.08**	**+0.24**	**+0.40**

*Source: SSO

Initially, a declining population trend of -0.45% was observed in the region at the annual level, but this trend declines over time. After 2027, the population will increase by +0.08% to reach +0.4% at the end of the period (2037-2041). Given that the Kalenić Regional Landfill Project will be operational for a period of 30 years, it is important to estimate future waste generation rates in the region. The waste generation index depends on various factors such as income, consumer habits, gross domestic product, as well as the level of awareness of the population regarding environmental protection.

Regarding waste generation projections, the following three scenarios can be considered:
1. **Rapid growth trend of generated waste at the beginning, with a slower pace later**: this scenario assumes a fast waste generation growth trend of 1.5% in the period 2013-2020, which then slows down to 1% in the remaining period (2021-2026)
2. **Moderate growth trend of generated waste, with a slower pace later**: this scenario assumes a moderate growth trend of 1% in the 2013-2020 period, 0.5% in the 2021-2026 period, and 0.3% in the remaining period
3. **Slow waste growth trend with a stable pace later**: this scenario assumes a slow growth trend of 0.5% in the 2013-2020 period, and a stable rate of 0% in the remaining period.

It is assumed that the moderate growth trend of generated waste of 1.0% per annum (scenario 2) most accurately reflects the real picture of waste generation in recent years in the region. Low growth rate indicated for the period after 2020 is justified by the efforts to break the proportional link between the

dynamics of economic growth and the increase in waste generation, as well as waste generation prevention measures.

Full geographical coverage of waste collection services in the region is the key element in waste management. The region must be very committed to achieving this goal in the long run and must make the necessary efforts, especially after the implementation of the Regional Center Project. Currently, the coverage of organized waste collection services in the region varies from less than 30% to over 75%. The following incremental goals will be adopted:

• For the period 2016 - 2020: 95% coverage of waste collection in the municipalities of Barajevo, Valjevo, Lazarevac, Ub, Lajkovac and Obrenovac; 80% coverage in rural areas - Mionica, Koceljeva, Ljig, Osečina and Vladimirci.

• After 2021: 100% coverage in all areas.

In accordance with the above, projections of the total generated waste, as well as the collected waste in the observed region were made by 2041 (Table 3.2.3-2).

Table 3.2.3-2. Projection of Total Generated Waste by 2041 (tons)

Municipality	2013	2016	2021	2026	2031	2036	2041
kg/psn/year	379	390	408	418	425	431	438
Barajevo	10,429	11,069	12,264	13,383	14,448	15,577	16,818
Valjevo	33,836	34,207	34,777	34,910	34,934	35,123	35,547
Lazarevac	22,287	23,114	24,487	25,457	26,168	26,883	27,724
Ub	10,804	10,789	10,799	10,732	10,648	10,914	11,470
Lajkovac	5,743	5,712	5,804	5,891	5,949	6,043	6,325
Obrenovac	27,574	28,594	30,232	31,352	32,177	33,062	34,125
Mionica	5,253	5,147	5,143	5,285	5,461	5,698	5,984
Koceljeva	4,791	4,673	4,579	4,496	4,535	4,681	4,903
Ljig	4,694	4,610	4,578	4,615	4,733	4,941	5,195
Osečina	4,587	4,467	4,356	4,245	4,188	4,227	4,337
Vladimirci	6,421	6,323	6,216	6,054	5,994	6,143	6,348
TOTAL REGION	136,418	138,705	143,237	146,419	149,234	153,293	158,775

The estimated morphological composition of waste collected from regional centers that will be transported to the "Kalenić" Regional Landfill is shown in the table below.

Table 3.2.3-3. Estimated Morphological Composition of Waste from Regional Centers to be Delivered to the Landfill Expressed in% per Year

Morphological Composition of Waste in %	1 y	2 y	3 y	4 y	5 y	6 y	7 y	8 y	9 y	10 y	11 y	12 y	13 y
Garden Waste	18.5%	18.8%	19.1%	19.1%	19.1%	19.9%	20.0%	20.0%	20.1%	20.3%	20.4%	20.5%	20.6%
Other Biodegradable Waste (Kitchen)	34.3%	34.8%	35.4%	35.4%	35.4%	36.8%	37.0%	37.1%	37.3%	37.5%	37.7%	38.0%	38.2%
Paper	4.2%	4.1%	4.0%	4.0%	4.0%	4.1%	4.0%	3.9%	3.7%	3.6%	3.4%	3.2%	2.9%
Glass	2.2%	2.0%	1.8%	1.8%	1.8%	2.0%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
Cardboard	2.0%	2.9%	2.7%	2.7%	2.7%	2.8%	2.6%	2.5%	2.4%	2.2%	2.0%	1.8%	1.6%
Composite Materials	0.6%	0.5%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
Metal Packaging, Etc	0.6%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Aluminum Cans	0.2%	0.2%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%
Plastic Packaging	2.7%	2.3%	1.8%	1.8%	1.8%	2.1%	2.1%	2.0%	2.0%	2.0%	1.9%	1.9%	1.9%
Plastic Bags	8.3%	8.3%	8.2%	8.2%	8.2%	8.6%	8.6%	8.6%	8.6%	8.6%	8.5%	8.5%	8.5%
HDPE Plastic	1.5%	1.4%	1.3%	1.3%	1.3%	1.4%	1.3%	1.3%	1.3%	1.2%	1.2%	1.2%	1.1%
Textile	7.9%	8.0%	8.2%	8.1%	8.1%	8.5%	8.5%	8.6%	8.6%	8.6%	8.7%	8.7%	8.8%
Leather	0.5%	0.5%	0.6%	0.5%	0.5%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
Diapers	4.4%	4.4%	4.5%	4.5%	4.5%	4.7%	4.7%	4.7%	4.8%	4.8%	4.8%	4.8%	4.9%
Fine Fractions (<20 mm)	11.1%	11.3%	11.5%	11.5%	11.5%	7.5%	7.6%	7.6%	7.7%	7.8%	7.8%	7.9%	8.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Morphological Composition of Waste in %	14 y	15 y	16 y	17 y	18 y	19 y	20 y	21 y	22 y	23 y	24 y	25 y	26 y
Garden Waste	20.8%	20.8%	20.8%	20.9%	20.9%	20.9%	20.9%	20.9%	20.9%	20.9%	21.0%	21.0%	21.0%
Other Biodegradable Waste (Kitchen)	38.5%	38.6%	38.6%	38.6%	38.6%	38.7%	38.7%	38.7%	38.7%	38.8%	38.8%	38.8%	38.9%
Paper	2.6%	2.6%	2.6%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
Glass	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
Cardboard	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%
Composite Materials	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
Metal Packaging, Etc	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Aluminum Cans	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%
Plastic Packaging	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%
Plastic Bags	8.5%	8.4%	8.4%	8.3%	8.2%	8.1%	8.0%	7.9%	7.8%	7.7%	7.6%	7.5%	7.4%
HDPE Plastic	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Textile	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%	9.0%
Leather	0.9%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
Diapers	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	5.0%	5.0%	5.0%
Fine Fractions (<20 mm)	8.1%	8.1%	8.1%	8.1%	8.2%	8.2%	8.2%	8.2%	8.2%	8.3%	8.3%	8.3%	8.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

3.2.4. Structure and Quantities of Waste to be Transported to and Disposed of at the "Kalenić" Regional Landfill

The regional sanitary landfill that will be built on the "Kalenić" site will be in full compliance with Directive 99/31 / EC and national regulations. Waste collection in the Kolubara region is envisaged as a two-bin system: a dry bin for recyclable waste and a wet bin (mixed waste) for the rest. The treatment of the contents of the dry bin will be performed in sorting plants (pure MRF). Pure MRF accepts recyclable waste from households and the commercial sector that is separated through primary selection. Recyclable waste is delivered in mixed streams, i.e. as glass, ferrous metals, aluminum and other non-ferrous metals, PET / HDPE plastic and mixed paper.

In Kolubara region, 3 transfer stations are planned for waste management: in Valjevo, Lazarevac and Koceljeva, and a transshipment point in Obrenovac.

In the region, there is a stationary transfer station (TS) with the capacity of 27,000 t / year, which was built in the city of Valjevo, and will serve Mionica and Osečina for regional waste management purposes.The building of the waste recycling line (MRF) is located next to the TS, which is in the process of being equipped, with the planned capacity of 4,300 t / year.

A recycling line was built in Obrenovac, with the capacity of 17,500 t / year (in one shift), which treats mixed municipal waste from this municipality. The line is classified as a dirty MRF plant and aims to separate recyclables through mostly manual sorting. This line is practically already half of the transfer station to which waste is brought and processed, and in the future, the remains, the so-called residual waste will be sent to the "Kalenić" Regional Waste Management Center instead of the local landfill. The capacity of the MRF line in Obrenovac is 3,400 t / year.

The construction of a substation in Koceljeva (which will also serve Vladimirci), with a capacity of 8,600 t / year, has also been completed.

A substation is planned in Lazarevac, which will also serve Ljig, with the capacity of 24,000 t / year. An MRF line, with the capacity of 7,800 t / year, will be installed in Lazarevac, which will also serve the municipalities of Barajevo and Ljig. The location of the TS and the plan for the transport of mixed waste to the "Kalenić" Regional Municipal (Non-Hazardous) Waste Landfill is shown in Figure 3.2.4-1.

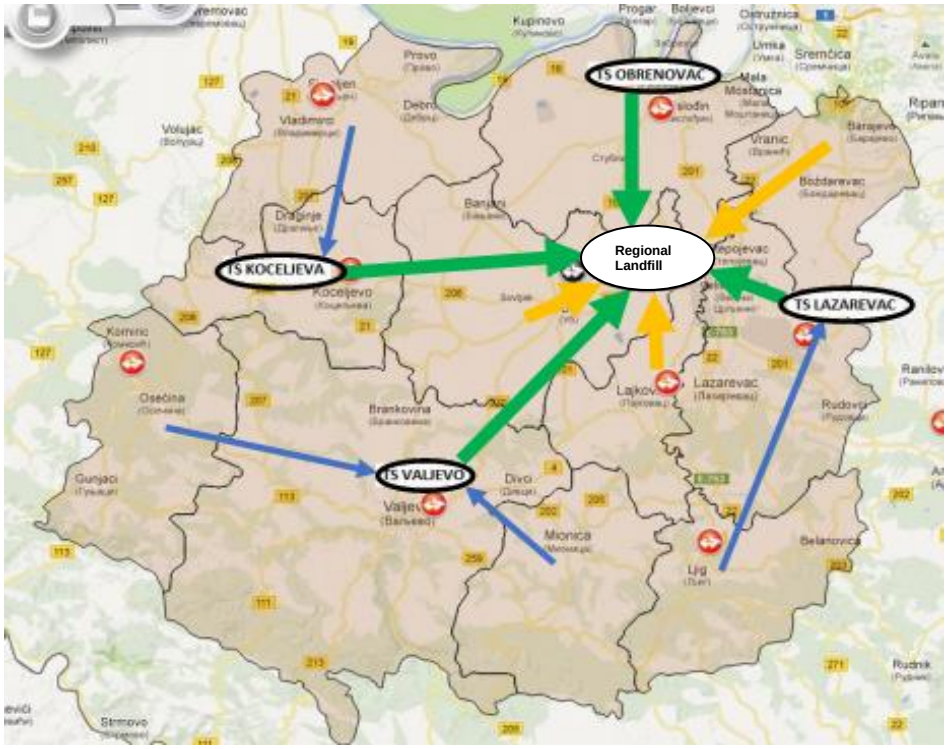


Figure 3.2.4-1. Transfer Station Layout and Transport Plan to the Regional Landfill (blue - transport to the nearest transfer station; green - transport from the transfer station to the landfill; yellow - direct transport to the landfill)

The regional waste management plan for 11 cities and municipalities of the Kolubara waste management region in the 2019-2029 period is to build an MRF plant at the "Kalenić" Regional Sanitary Landfill site. For that purpose, a conceptual design has been prepared, i.e. an MRF plant has been proposed, which includes a line for the separation of mixed waste and a compost line. The line will treat waste with the granulation of less than 500 mm. The delivered waste of higher granulation (for example wood, larger construction waste material, etc.), if it cannot be recycled, is disposed of in a landfill, while usable waste is processed within the center, in order to separate secondary raw materials.

Figure 3.2.4-2 shows a diagram of mixed municipal waste flows from the municipalities of the region - "wet fraction" - for the first year of exploitation of the Kalenić Regional Landfill (2021/22). The projection of the quantity of municipal (non-hazardous) waste that will be disposed of at the regional landfill by municipalities and years is given in Table 3.2.4-1.

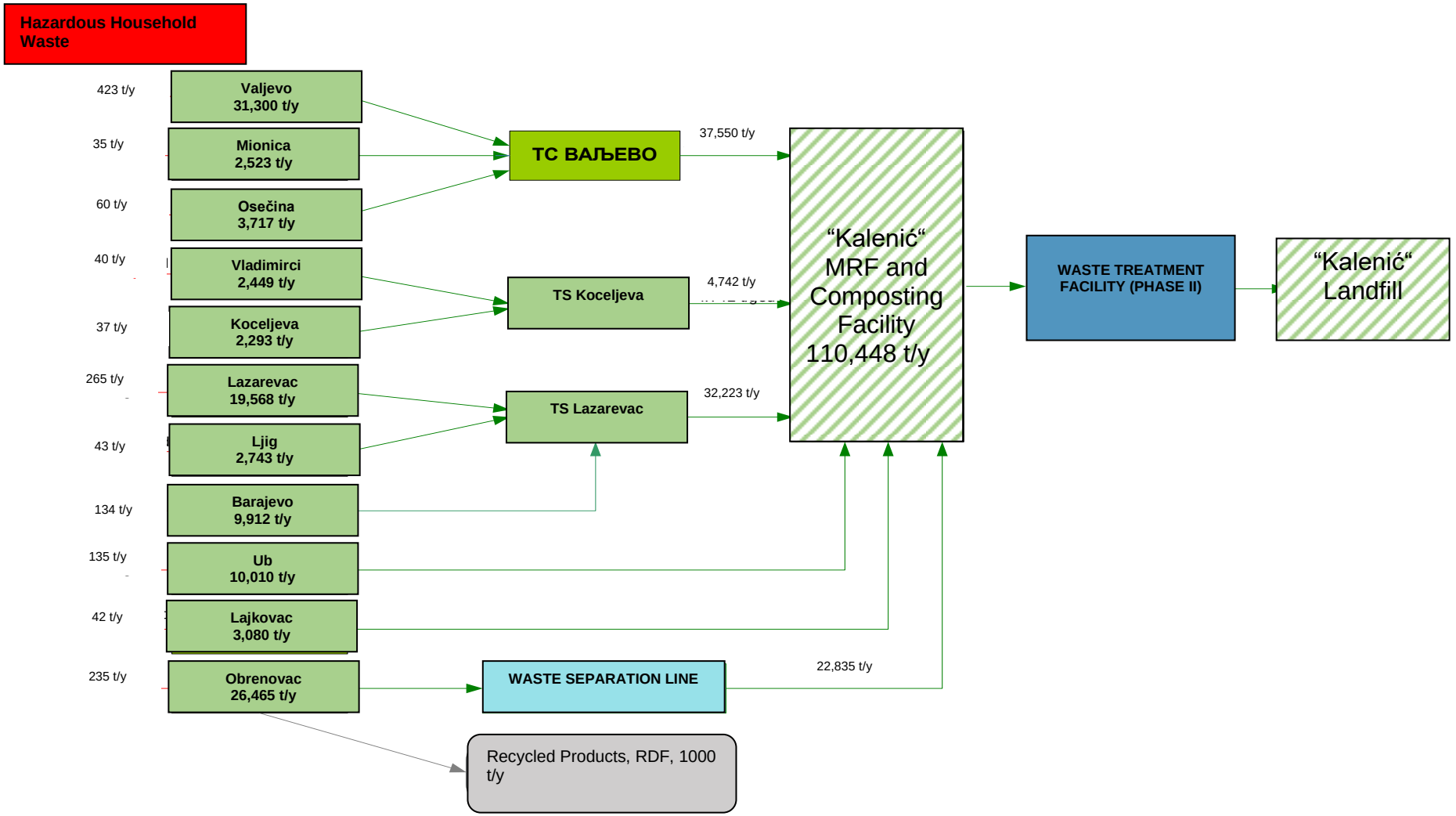


Figure 3.2.4-2. Flows of Mixed Municipal Waste from the Municipalities of the Kolubara Region for 2021/22 - "Wet Bin"
(Source: Regional Waste Management Plan for 11 Cities and Municipalities of the Kolubara Waste Management Region in the 2019-2029 Period)

Table 3.2.4.-1a. Total Estimated Waste Qauntity by Municipality

Municipalities	1 y	2 y	3y	4y	5 y	6 y	7 y	8 y	9 y	10 y	11 y	12 y	13 y	14 y	15 y
	t/year														
Barajevo	7,116	7,255	7,401	10,515	10,736	10,965	11,204	11,453	12,264	12,478	12,697	12,921	13,150	13,383	13,593
Valjevo	24,374	24,465	24,554	32,496	32,639	32,782	32,793	33,063	34,777	34,768	34,777	34,804	34,849	34,910	34,906
Lazarevac	15,075	15,258	15,445	21,958	22,231	22,509	22,793	23,083	24,487	24,678	24,871	25,066	25,261	25,457	25,601
Ub	9,143	9,137	9,133	10,250	10,252	10,258	10,270	10,287	10,799	10,775	10,757	10,744	10,735	10,732	10,711
Lajkovac	3,728	3,722	3,715	5,427	5,448	5,470	5,493	5,517	5,804	5,820	5,837	5,854	5,783	5,891	5,900
Obrenovac	22,797	23,076	23,357	27,164	27,494	27,829	28,168	28,513	30,232	30,452	30,674	30,898	31,125	31,352	31,518
Mionica	1,408	1,398	1,388	4,117	4,118	4,120	4,123	4,128	5,143	5,163	5,188	5,217	5,249	5,285	5,314
Koceljeva	1,385	1,373	1,361	3,738	3,714	3,696	3,685	3,680	4,579	4,560	4,543	4,526	4,510	4,496	4,483
Ljig	1,238	1,231	1,223	3,688	3,685	3,682	3,681	3,680	4,578	4,582	4,587	4,595	4,604	4,615	4,624
Osečina	1,816	1,799	1,783	3,574	3,548	3,528	3,513	3,505	4,356	4,333	4,310	4,287	4,266	4,245	4,221
Vladimirci	1,165	1,158	1,152	5,058	5,039	5,023	5,010	5,002	6,216	6,181	6,148	6,115	6,084	6,054	6,022
Total	89,243	89,872	90,514	127,987	128,904	129,863	130,864	131,911	143,237	143,790	144,388	145,027	145,706	146,419	146,893

Municipalities	16 y	17 y	18 y	19 y	20 y	21 y	22 y	23 y	24 y	25 y	26 y	27 y	28 y
	t/year												
Barajevo	13,804	14,017	14,448	14,667	14,890	15,115	15,344	15,577	15,814	16,057	16,305	16,559	16,818
Valjevo	34,907	34,912	34,934	34,952	34,974	35,003	35,039	35,123	35,180	35,250	35,334	35,433	35,547
Lazarevac	25,745	25,887	26,168	26,308	26,448	26,590	26,734	26,883	27,036	27,196	27,364	27,540	27,724
Ub	10,689	10,668	10,648	10,672	10,719	10,775	10,839	10,914	11,000	11,098	11,208	11,332	11,470
Lajkovac	5,910	5,921	5,949	5,964	5,981	6,000	6,020	6,043	6,076	6,120	6,176	6,244	6,325
Obrenovac	31,683	31,848	32,177	32,345	32,517	32,693	32,874	33,062	33,257	33,460	33673	33894	34,125
Mionica	5,346	5,382	5,461	5,505	5,551	5,598	5,648	5,698	5,751	5,806	5,863	5,922	5,984
Koceljeva	4,481	4,491	4,535	4,559	4,587	4,616	4,647	4,681	4,719	4,759	4,803	4,851	4,903
Ljig	4,640	4,664	4,733	4,773	4,813	4,854	4,897	4,941	4,986	5,034	5,086	5,140	5,195
Osečina	4,204	4,192	4,188	4,190	4,196	4,203	4,214	4,227	4,243	4,262	4,284	4,308	4,337
Vladimirci	6,001	5,991	5,994	6,021	6,049	6,078	6,110	6,143	6,179	6,217	6,258	6,302	6,348
Total	147,411	147,973	149,234	149,956	150,724	151,525	152,366	153,293	154,242	155,259	156,354	157,525	158,775

The estimated average annual quantity of mixed municipal waste that will be disposed of at the landfill is approx. 120,000 t / year.

3.2.5. Landfill Capacity

The required volume for municipal waste disposal is calculated according to the following equation:

$$Vdo = \frac{mot}{\rho ot} + \frac{mpm}{\rho pm}$$

where:
Vdo - required volume for sanitary waste disposal (m3)
mot - mass of municipal waste (t)
mpm - mass of covering material (t)
ρot - average density of compacted waste (t / m3)
ρpm- density of compacted covering material (t / m3).

The use of compactors in the process of sanitary disposal achieves the following densities:
ρot = 0.80 t / m3
ρpm = 1.70 t / m3

The required landfill space for waste disposal for the calculated quantities of municipal waste and inert cover material, at the location of the "Kalenic" Regional Sanitary Municipal and Non-Hazardous Waste Landfill for the projected period is given in Table 3.2.5-1. The required volume of inert covering material of 10% of the volume of compacted disposed municipal waste was adopted for the purpose of this calculation.

Table. 3.2.5-1. Required Waste Disposal and Inert Cover Volume

Year	Total Municipal Waste Mass (t/y)	Total Municipal Waste Volume (m^3/y)	Total Volume of Inert Cover Material (m^3/y)	Total Cumulative Volume of Municipal Waste and Inter Cover Material (m^3/y)
1.	117,972.00	147,465.00	14,746.50	162,211.50
2.	116,976.00	146,220.00	14,622.00	323,053.50
3.	115,991.00	144,988.75	14,498.88	482,541.13
4.	116,896.00	146,120.00	14,612.00	643,273.13
5.	117,843.00	147,303.75	14,730.38	805,307.25
6.	123.001.00	153.751.25	15,375.13	974,433.63
7.	122,965.00	153,706.25	15,370.63	1,143,510.50
8.	122,924.00	153,655.00	15,365.50	1,312,531.00
9.	122,871.00	153,588.75	15,358.88	1,481,478.63
10.	122,798.00	153,497.50	15,349.75	1,650,325.88
11.	122,694.00	153,367.50	15,336.75	1,819,030.13
12.	122,280.00	152,850.00	15,285.00	1,987,165.13
13.	121,832.00	152,290.00	15,229.00	2,154,684.13
14.	121,340.00	151,207.50	15,167.50	2,321,526.63
15.	121,766.00	152,207.50	15,220.75	2,488,954.88
16.	122,230.00	152,787.50	15,278.75	2,657,021.13
17.	122,743.00	153,428.75	15,342.88	2,825,792.75
18.	123.290,00	154.112,50	15.411,25	2.995.316,50
19.	123.860,00	154.825,00	15.482,50	3.165.624,00

Year	Total Municipal Waste Mass (t/y)	Total Municipal Waste Volume (m^3/y)	Total Volume of Inert Cover Material (m^3/y)	Total Cumulative Volume of Municipal Waste and Inter Cover Material (m^3/y)
20.	124.456,00	155.570,00	15.557,00	3.336.751,00
21.	125.118,00	156.397,50	15.639,75	3.508.788,25
22.	125.792,00	157.240,00	15.724,00	3.681.752,25
23.	126.517,00	158.146,25	15.814,63	3.855.713,13
24.	127.299,00	159.123,50	15.912,38	4.030.749,25
25.	128.138,00	160.172,50	16.017,25	4.206.939,00
26.	129.035,00	161.293,75	16.129,38	4.384.362,13

3.3. Description of the Technical and Technological Solutions for the "Kalenić" Regional Municipal (Non-Hazardous) Waste Landfill

Starting from the configuration of the terrain and its geological and hydrogeological characteristics, spatial features of the environment, the quantity of waste that will be disposed of daily at the subject landfill, a landfill body was formed with the accompanying infrastructural elements.

Protection measures and infrastructure necessary for normal and uninterrupted operation dictated the definition of the elements of the complex to be constructed in Phase I. The space intended for the future regional sanitary landfill for municipal and non-hazardous waste covers an area of about 40 ha. Based on the previous technical documentation and the configuration of the terrain and the capacity of the location, it is envisaged that the "Kalenić" Regional Communal Landfill will be executed in three phases:

• In the first phase of construction, the construction of the necessary infrastructure for the operation of the landfill is planned - roads, plateaus, facilities (for servicing and washing vehicles, administrative buildings, substations, etc.), as well as the sanitary equipment of the landfill needed for the first phase of waste disposal.

• In the second and third phase, sanitary disposal of new waste will be performed, as well as the necessary works on the expansion of the landfill body into free areas, using the complete infrastructure built in the first phase.

The project envisages a reserve space for future expansion of the waste treatment at the complex, a plateau for construction waste, as well as space intended for special facilities, the construction of which will take place during the second and third phase of landfill construction, depending on financial possibilities.

The entrance is located in the northern part of the complex, at the place where the construction of a guard's house (weighbridge house), vehicle weighing scales and a disinfection system (tire washing system) is planned.

In the western part of the complex, a site for the administrative building and parking spaces for employees and visitors are planned.

The eastern part of the complex will house the technical facilities, such as: a car wash, a service building with workers' area, a garage for vehicles, a canopy for technical equipment, infrastructural facilities (substation, well, reservoir). Within this zone, space is reserved for perspective expansion of the facilities. Also, in the eastern part of the complex, in accordance with the topographic characteristics of the area, lagoons for the treatment of leachate and technical waters are planned.

The largest, central part of the subject space is intended for the body of the landfill, which is divided into 3 cassettes, because phase construction is planned. The first cassette, which will be realized in the first phase of construction, is additionally divided into three sub-cassettes, in order to reduce the creation of leachate.

The following facilities necessary for the functioning of the landfill complex in the first phase of construction are planned at the complex:
• Guard's and weighbridge house;
• Vehicle weighbridge;
• Disinfection barrier;
• Administrative building with parking for employees;
• Transformer station with space for aggregate storage;
• Car wash;
• Service building with workers's area and access plateau;
• Parking for clean and parking for dirty vehicles;
• Garage for vehicles with a plateau;
• Canopy for technical equipment;
• Technical water tank to be supplied from the well within the complex;
• Phase I lagoons used to receive leachate from the landfill body;
• Phase II lagoon, which will be used to receive precipitation from the landfill body in phase I.

3.3.1. Description of Designed Parts / Buildings

The complex of the regional sanitary landfill at the "Kalenić" site consists of several organizational units (areas), which are shown in detail in Visual Schedule No. 4 - "Layout Plan". Within the entire area, work and protection zones are defined.

The work zone includes:
• Reception area and facilities (gate, guard's house with weighbridge, vehicle weighbridge and disinfection barrier),
• Administrative part (administrative building with parking for employees),
• Technical facilities with accompanying plateaus and parking lots (service workshop, car wash, vehicle garage, canopy for accommodation of technical tools and equipment),
• Sanitary landfill for non-recyclable municipal solid waste - first phase,
• Internal roads,
• Space intended for construction waste,
• Space intended for future waste treatment plant.

Protection Zone

Landscaping of the landfill area is planned within the area of the protection zone around the complex and free areas within the complex. A wire fence, 2.20 m high, is planned around the part of the complex that is being constructed in Phase I. The protection zone is planned along the fence of the Regional Center complex, as a barrier to the outer landscape, and is formed by a combination of tall and low tree species, as well as shrub species. The protection zone is designed with densely placed elements, with sporadic interruptions, avoiding thus air turbulence that would occur in the space behind fully compact wind-breaking zones.

The following infrastructural facilities are also planned for the entire complex:
• Technical water well and high pressure pump to supply water tanks,
• Water tank (for sanitary and fire water supply),
• Transformer station with the necessary power, for power supply of consumers in the complex,

3.3.1.1. Delivery and Dispatch Areas and Facilities

At the entrance to the sanitary landfill complex, there is a 6.2 m wide gate, as well as a 1 m wide pedestrian gate.

In front of the gate, there is a 2x1.5 m board with the following information:
- name of the landfill;
- name and address of the company that manages the landfill;
- working hours;

- prohibited and permitted types of waste, etc.

Control Zone at the Entrance to the Complex
The control zone at the entrance to the complex includes a control area and truck weighbridge. The control area includes a guard's house, administrative building, service building. 40 vehicles are anticipated to enter the complex daily.

Vehicle Weighbridge
At the entrance to the complex, waste trucks are weighed to record waste quantities. Weighbridge with the capacity of 60 t was chosen for the "Kalenić" sanitary landfill. It is located in the road at the entrance to the regional sanitary landfill, at the level of the guard's house. The length of the scale is 18 m and the maximum capacity is 60 tons; the access ramp must have the maximum slope of 5%.

Ionizing Radiation Detector
To control the presence of ionizing radiation in the incoming waste, an ionizing radiation detector with a console is installed at the gate of the complex, which is switched on and monitored via the monitor from the guard's house. This prevents the transport of radioactive waste into the complex. The system will be equipped with several alarm levels, which will be determined for each detector, respectively, according to the radiation level. In case of radioactivity detection, a rotating signal placed next to the weighbridge truck is activated, as well as an audible alarm installed near weighbridge and in the control box.

Disinfection Barrier
On the left part of the road, immediately after the entrance to the complex, a disinfection barrier will be provided for the disinfection of the wheels of vehicles leaving the complex. The barrier is an open, buried structure, rectangular in shape, 6.0 m long and 3.0 m wide. The barrier is filled with a concentrated disinfectant solution, which is diluted in the ratio of 1:20.

Guard's and Weighbridge House
The guard's house (weighbridge house) is located in the northern part of the complex of the "Kalenić" Regional Municipal Waste Landfill, right next to the entrance. The building is located along the internal road, which stretches in the north-south direction.
The guard's and weighbridge house has a guard's room, a weighbridge room, a toilet with an anteroom.

Administrative building
The administrative building is located in the north-western part of the "Kalenić" Regional Municipal Waste Landfill complex. The building is located along the internal road, which stretches in the north-south direction. This buildings is used for complex management, employee offices and visitor reception.

Service Building with Workers' Area
The service building is located in the north-eastern part of the complex of the "Kalenić" Regional Municipal Waste Landfill. The building is located along the internal road, which extends in the east-west direction.

The service building with workers's area consists of the following functional units:
• SERVICING AREA
• WORKERS' ACCOMMODATION AREA
• ACCESS PLATEAU

Garage for Vehicles
The garage is located in the eastern part of the complex of the "Kalenić" Regional Municipal Waste Landfill. The building is located along the internal road, which stretches in the north-south direction.

The garage is located in the immediate vicinity of the service building with the workers's area, a parking lot for clean and dirty vehicles and a car wash. The facility is intended for garaging vehicles serving the complex. It consists of a unique space without partitions, intended as a garage for two vehicles.

Car Wash

The car wash facility is located near the service building with workers' area, a parking lot for clean and dirty vehicles and a garage for vehicles. This facility serves all car washing needs of the landfill complex. It consists of a unique space without partitions with one washing block. Two trucks can be washed at the same time. It has one entrance and one exit.

Vehicles leaving the storage area must pass through the washing area, where their wheels are washed of mud and debris. It is located near the entrance to the landfill body, and the wheels are washed manually, with hoses.

Canopy for Technical Equipment

In case any hazardous waste is discovered in the mixed municipal waste delivered to the Regional Landfill, or secondary raw materials, the workers who monitor the landfill will, after the unloading of the waste, separate it and place it in temporary storage containers under the canopy for technical equipment.

The canopy is located in the eastern part of the complex of the "Kalenić" Regional Municipal Waste Landfill. The facility is located along the internal road, which extends in the north-south direction. All waste, non-hazardous and hazardous, will be placed in containers, on a concrete plateau, under a canopy. The space for temporary storage of hazardous and non-hazardous waste will be separated by a concrete-block wall. The space for non-hazardous waste consists of four segments, while the space for hazardous waste consists of five segments.

Parking Lot for Clean Vehicles

Within the complex, a plateau for clean vehicles is planned, where clean trucks and other washed vehicles required for disposal can be parked.

Parking Lot for Dirty Vehicles

In case of dirty vehicles staying in the complex for a while before leaving it, they need to be parked on the parking lot for dirty vehicles. The purpose of this parking lot is to temporarily park vehicles until the car wash is vacated.

Expansion Areas

The project envisages a space reserved for future expansion of the waste treatment facilities at the complex, a plateau for temporary disposal of construction waste, as well as space intended for a future waste treatment plant.

3.3.1.4. Sanitary Landfill for Non-Recyclable Municipal Solid Waste - First Phase of the Planned Three Phases

The largest part of the landfill complex is occupied by the landfill body. The body of the landfill is made up of a sanitary riverbed, surrounded by a ring road, into the bottom of which two roads descend, which divide the body of the landfill into three parts. In addition to the circular road, a precipitation canal is planned along its entire length, in order to prevent atmospheric waters from penetrating the body of the landfill.

Waste disposal is planned in three phases, based on the configuration of the terrain, which is divided into three parts. The total storage area per stages is:

Phase 1 (which is the subject of the project): total area of about 7.76 ha,

Phase 2: total area of about 8.42 ha

Phase 3: total area of about 5.99 ha.

Bottom and Slope Insulating Layers

For the purpose of controlled collection of leachate from the waste, a waterproof insulating multilayer coating is placed on the body of the landfill (bottom and slopes). The multi-layer waterproof coating consists of the following layers, observed from the bottom to the top (Figure 3.3-1):

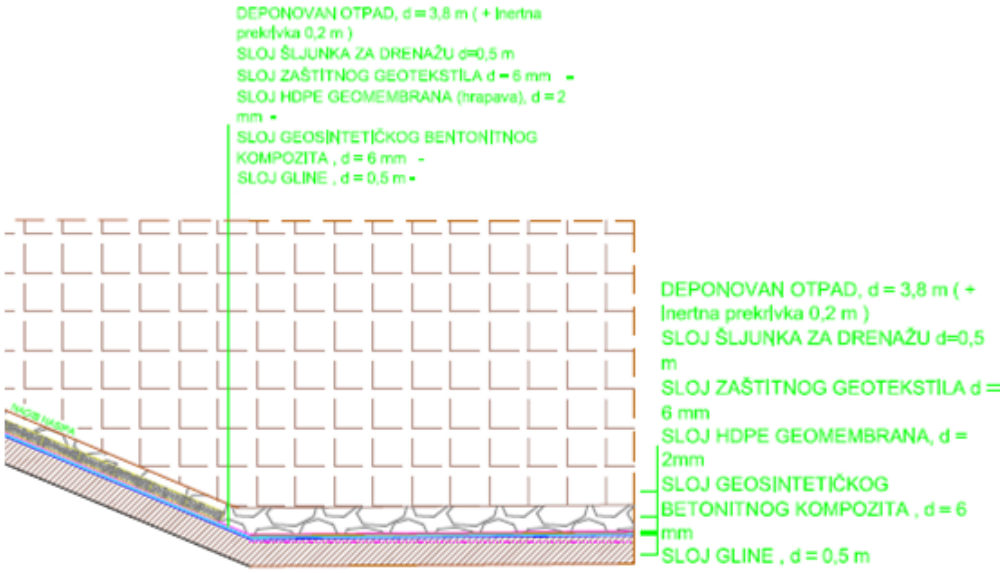


Figure 3.3-1. Demonstration of Bottom and Slope Insulation at the Landfill

• 1) A layer of compacted clay with the permeability coefficient of k = 1x10-9 m / s, and layer thickness of 0.5 m, which is placed on a well-compacted leveled soil prepared during the preparatory works;
• 2) A layer of geosynthetic bentonite composite, with a permeability coefficient of k = 5x10-11 m / s, total thickness d = 6 mm, with pre-defined characteristics, which is laid over the applied and compacted layer of clay;
• 3) HDPE geomembrane layer, d = 2 mm, which is laid over the geosynthetic bentonite composite layer;
• 4) A layer of protective geotextile, d = 6 mm, with pre-defined characteristics, which is laid over the HDPE geomembrane;
• 5) Gravel layer for leachate drainage, fraction Ø16 / 31.5, layer thickness 0.5 m.

The said layers prevent any possibility of contact of the leachate with the soil below, as well as with groundwater and surface water. Above the formed watertight multilayer insulation of the bottom and slopes of the excavation intended for the disposal of municipal solid waste, drainage pipes are placed in the drainage gravel layer (more details are given in the Construction Permit Design 19006-203 – PGD – 3/2, Hydrotechnical Installations Design: facilities for the drainage of precipitation, leachate, waste and sanitary-fecal waters), which serve for the collection and controlled discharge of leachate from the landfill body to the leachate system. The drainage gravel layer (d = 0.5 m) protects the multilayer waterproof insulation from mechanization and other external influences, and at the same time enables the draining of filtrate from waste to drainage pipes.

The clay is laid on the prepared well-compacted subsoil. It is processed by rolling and compaction, in 10-15 cm layers, up to a satisfactory density. The clay must have the water permeability index of less than 1x10-9 m / s.

Laminated Extruded Geosynthetic Bentonite Foil
Laminated extruded geosynthetic bentonite foils are reinforced waterproof geosynthetic materials consisting of two layers of special geotextiles between which natural sodium-bentonite in the form of Extremely fine powder is permanently incorporated-encapsulated by a special needling process.

This natural sodium bentonite in the form of extremely fine powder is a unique and uniform core of this geosynthetic material, with very high swelling properties, which provides a excellent water resistance in combination with polyethylene coating which is inextricably linked to the geotextile carrier layer.

The core of natural sodium bentonite in the form of extremely fine powder, is permanently encapsulated between two layers of special geotextiles (supporting woven - lower layer and cover non-woven - upper layer) which are interconnected by a special needling process, resulting in a unique and independent platform, which, at the same time, ensures an even transfer of shear forces affecting it during exploitation.

In contact with water, natural sodium-bentonite in the form of powder, hydrates and swells, forming a waterproof gel, which also has self-sealing properties.

In addition to the above properties, laminated - extruded geosynthetic bentonite foil has:
- extremely high shear resistance of the layers that make it up,
- very high values of the friction coefficient when in contact with the material which is under or is poured on it,
- shows high robustness and resistance to damage during installation,
- has the same swelling ability and equal watertightness at every point of its surface,
- natural sodium-bentonite in powder form provides instant swelling and sealing,
- an additional layer of sodium bentonite in the form of powder, additionally impregnated in a special process, in the overlap zone provides a permanent strong connection in the overlap zones of two adjacent unwound rolls,

On its lower side, on the supporting - lower layer of geotextile, there is an extruded polyethylene coating, which provides even greater robustness and resistance of the geosynthetic bentonite foil, as well as additionally increased watertightness.

This practically results in an extremely robust and resistant double waterproof barrier in a single geosynthetic material.

This additional polyethylene barrier allows the geosynthetic bentonite foil to show maximum operational effects during exploitation, as it:
- Prevents penetration of root systems from the soil into laminated - extruded geosynthetic bentonite foil,
- Increases resistance to extremely high groundwater pressures,
- Increases resistance to differential subsidence of structures built on poorly bearing soil,
- Further increases the waterproofing and resistance of the complete waterproofing system of which it is a part,
- Drastically reduces the potential for gas transfer.

In accordance with the existing geomechanical and designed technical parameters, laminated - extruded geosynthetic bentonite foil that will be installed in the body of the “Kalenić” Regional Landfill, must meet the following technical requirements:

Laminated-extruded geosynthetic bentonite foil must consist of a continuous, evenly distributed layer of natural sodium bentonite in the form of powder, permanently encapsulated between two layers of geotextile (woven - supporting polypropylene (PP) geotextile and non-woven covering polypropylene (PP) geotextile, which are interconnected by the process of uniform needling over its entire surface).

An additional layer of natural sodium bentonite in the form of powder of identical quality and composition to the one used in the core of the laminated - extruded geosynthetic bentonite foil, must be impregnated during the production process along its edges in the nonwoven PP coating geotextile - in the overlap zone in a 500 mm-wide stretch.

Laminated-extruded geosynthetic bentonite foil must be laminated on its underside - coated with a layer of polyethylene which is evenly extruded over the entire surface of the woven PP geotextile and has rough protrusions, which at the same time creates a double waterproof geosynthetic barrier and provides friction all over its surface. In order to achieve the stated properties, glues, adhesives or other non-

mechanical processes of joining the polyethylene coating to the supporting woven geotextile must not be used, nor may its friction properties be achieved by scratching, scraping, or spraying the foil.
On its underside, on the woven supporting PP geotextile, the laminated-extruded geosynthetic bentonite foil must have a clearly marked - drawn overlapping zone, in order to ensure precise overlapping and to avoid additional unnecessary consumption of laminated - extruded geosynthetic bentonite foil during installation. The minimum fold that needs to be achieved during installation is 30 cm.

The interconnection of unwound rolls of laminated - extruded geosynthetic bentonite foil will be done exclusively by folding in the marked places, without gluing, welding or any addition of bentonite pastes, powders, tapes, glues, ... etc.

Laminated-extruded geosynthetic bentonite foil, in addition to the manufacturer who must test it in its own laboratories, must be controlled by an independent and certified and accredited laboratory in accordance with DIN 18200, and the manufacturer must provide valid evidence of that in the form of certificates issued by such independent certified and accredited laboratories.

Laminated-extruded geosynthetic bentonite foil must have a valid European CE certificate to be submitted.

The manufacturer of laminated-extruded geosynthetic bentonite foil at delivery and before installation, must submit detailed installation instructions to the representatives of the main contractor, the supervisory authority and the designer.

The dimensions of the rolls of laminated-extruded geosynthetic bentonite foil should be as large as possible, in order to reduce overlapping areas and trimming during installation as much as possible.

Each roll of laminated - extruded geosynthetic bentonite foil must be properly marked and contain the following information:
- length and width of the roll;
- total weight of the roll;
- Product Type;
- clear name of the manufacturer;
- production lot number;
- individual roll number.

Each roll must be packed in plastic - nylon packaging resistant to moisture.

The shaft on which each roll is wound, must be such that it is strong enough and resistant to physical influences during transport and handling on the construction site during installation.
When unloading, care should be taken not to damage the rolls.

HDPE Geomembrane for the Bottom of the Landfill
HDPE geomembranes are geosynthetic materials produced from high density polyethylene, with very high resistance to chemicals and hazardous substances, with a smooth surface, used for sealing applications - protection of the landfill body (its bottom) to protect soil and groundwater from potential contaminants originating from the contents of the landfill.

HDPE geomembranes are used for complete sealing and protection from even the most toxic substances.

In addition to resistance to chemicals, their resistance to UV radiation is also very important, bearing in mind that there are cases where HDPE geomembranes are directly exposed to the sun.

HDPE geomembrane should be made of the highest quality high density polyethylene (HDPE), produced by extrusion of flat strips - extrusion of the purest ("virgin") polyethylene hexane comonomers,

completely free of plasticizers or other fillers. The use of HDPE geomembranes produced by the blowing process or any other method of production other than those previously described is not permitted.

The overlaps of adjacent rolls and the weld formation area should be marked with a clear line along the outer longitudinal edge to ensure adequate overlaps and minimize overlap losses.
The rolls should be as wide as possible in order to reduce the number of welds on the structure, which directly leads to the reduction in the number of critical points and increases the safety and impermeability of the entire waterproofing system. The dimensions and shapes of HDPE geomembranes should allow for controlled installation with minimal folds and loads on the HDPE geomembrane itself.

HDPE geomembranes should have a smooth surface on both sides without stains and damage.

HDPE geomembranes must be resistant to UV radiation, and under such radiation, when directly exposed, they need to retain all their properties for at least 20 years.

HDPE geomembrane must have a valid European CE certificate and CE accompanying document, which must be submitted with each delivery and submitted to the supervisory authority and the designer.

The HDPE geomembrane should be controlled by an independent and certified and accredited laboratory in accordance with the DIN 18200 standard and must have a valid certificate of such control.

As proof of compliance with the required technical specifications, the manufacturer needs to submit an official valid report from an independent, certified and accredited laboratory for this type of testing.

HDPE geomembranes should be installed, and the extruder and thermofusion welds must be tested in accordance with the applicable technical standards applicable to this area and the installation instructions of the manufacturer.

HDPE geomembrane must have a valid certificate - European Environmental Product Declaration (EPD) for this group of products.

HDPE Geomembrane for Landfill Slopes
HDPE geomembranes are geosynthetic materials produced from high density polyethylene, with very high resistance to chemicals and hazardous substances, with a rough surface, used for sealing of the landfill body (its slopes) to protect soil and groundwater from potential contaminants originating from the contents of the landfill.

HDPE geomembranes is used for complete sealing and protection from even the most toxic substances.
In addition to chemical- resistance, their resistance to UV radiation is also very important, bearing in mind that there are cases where HDPE geomembranes are directly exposed to the sun.

HDPE geomembrane should be made of the highest quality high density polyethylene (HDPE), produced by the process of extrusion of flat strips - extrusion of the purest ("virgin") polyethylene hexane comonomers, completely free of plasticizers or other fillers. The use of HDPE geomembranes produced by the blowing process or any other method of production other than those previously described is not permitted.

The overlaps of adjacent rolls and the weld formation area should be marked with a clear line along the outer longitudinal edge to ensure adequate overlapping and to minimize overlap losses.

The rolls need to be as wide as possible, in order to reduce the number of welds on the structure, which directly leads to the reduction in the number of critical points and increase the safety and impermeability of the entire waterproofing system.

HDPE Geomembranes should be of such dimensions and shapes as to allow for controlled installation with minimal folds and loads on the HDPE geomembrane itself.

HDPE geomembranes should have a rough surface on both sides without stains and damage.

The rough surface must be extruded in the production process, it must not be subsequently applied by spraying or in any other way.

Rough surface - the protrusions must be in the form of spikes, with a protrusion height of at least 0.9 mm.

HDPE geomembranes must be resistant to UV radiation, and under such radiation, when directly exposed to it, they must retain all their properties for at least 20 years.

HDPE geomembrane must have a valid European CE certificate and CE accompanying document that must be submitted with each delivery and submitted to the supervisory authority and the designer.
The HDPE geomembrane should be controlled by an independent certified and accredited laboratory in accordance with the DIN 18200 standard and must have a valid certificate of such control.

As proof of compliance with the required technical specifications, the manufacturer must submit an official valid report from an independent certified and accredited laboratory for this type of testing.

HDPE geomembranes should be installed, and the extruder and thermofusion welds must be tested in accordance with the applicable technical standards that treat this area and the installation instructions of the manufacturer.

HDPE geomembrane must have a valid certificate - Environmental Product Declaration (EPD) for this product group.

Protective Geotextile
Protective geotextiles are non-woven geosynthetic materials, produced by the needling method, with multiple functions (separation, filtration, drainage, protection), where the protective function is the most important one in their application at municipal waste landfills.

In such facilities, they provide the required degree of safety of all layers of geosynthetic materials installed under them in the body of the landfill.

They have excellent mechanical properties such as elongation, resistance to abrasion and punctures, as well as general durability.

They can safely adapt to heavy dynamic loads and physically aggressive conditions of bulk materials.

Non-woven geotextiles must be produced by the needling method, and be used in the construction of landfills, roads and railways, in accordance with M Geok E 2016

Geotextile 1000 g / m2 must have a valid European CE certificate which must be submitted to the investor, supervisory authority and designer.

Geotextiles 1000 g / m2 should be controlled by an independent certified and accredited laboratory in accordance with DIN 18200 and have a valid certificate of such control.
The results of these tests should be submitted to the customer, the supervisory authority and the designer.

The manufacturer must have a valid ISO 9001 certificate for the geotextile product group.

Geotextile 1000 g / m2 must have a certificate - Environmental Product Declaration (EPD) for this product group.

Geotextile 1000 g / m2 must not change its declared technical characteristics when applied on natural soil whose pH value is between 4 and 9, and where the soil temperature is < 25ºC, for at least 100 years, all in accordance with Annex B of EN 13249: 2016 standard.

Gravel Drainage Layer

This layer is placed over geotextiles and drainage pipes. The drainage layer has a dual role. It serves as a filter layer for leachate and as a protective layer for the pipes and lining, from the pressure caused by the movement of heavy equipment or certain unforeseen loads. The application of this layer requires exceptional control, and the material used must be of appropriate granulometric composition. PGD 19006-203 – PGD – 2 / 1.2 Construction design: Landfill Body provides detailed descriptions of and conditions for drainage layer construction.

Drainage pipes that are placed in the drainage layer should be made of the same material as the lining (HDPE). It is most convenient that the pipes have round openings, and that the diameter of the openings corresponds to the granulometric composition of the material in the layer around the pipe. Waste is disposed of over the substrate thus formed in accordance with the technology presented in the previous chapters.

Landfill Covering Layers

In order to prevent the penetration of precipitation into waste, which would lead to an increase in the quantity of leachate, a covering layer with waterproof protection against atmospheric precipitation is placed over the layers of waste disposed of at the landfill, with the final layer of inert material. The cover layer over the filled landfill consists of the following layers, listed from the bottom to the top:

1) Gravel layer for gas distribution, fraction Ø16 / 31,5, layer thickness 0.3 m;
2) A layer of compacted clay with the permeability coefficient of k = 1x10-9 m / s, and layer thickness of 0.5 m, which is placed over the layer of gravel for gas distribution;
3) Gravel layer for drainage of atmospheric precipitation, fraction Ø16 / 31.5, layer thickness - 0.5 m;
4) A layer of soil, II or III category is placed over the gravel layer for the drainage of atmospheric precipitation, the thickness of this layer is 0.7 m;
5) A layer of humus, 0.3 m thick, is placed over the soil layer.

The following figure shows the landfill closure layers, i.e. a section of the cover layers (Figure 3.3-2).

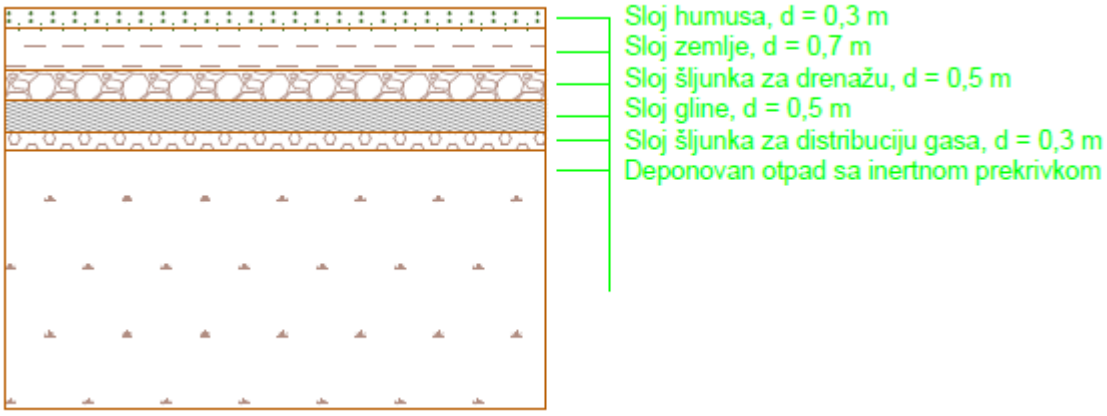


Figure 3.3-2. Final Cover over the Landfill

Bearing in mind that the procedure of covering the landfill body will be implemented only once it is filled, and that in the period until then there may be some changes in the legislation, improvement in the

technology of covering layers and recultivation, this project proposes the above solution. In case of any changes, the Project needs to be updated.

3.4. Complex Infrastructure and Other Infrastructural Works

3.4.1. Roads and Plateaus

Traffic areas are made up by the following roads:

- Road 1, length 0 + 143.95, road width 6.00 m, is a continuation of the access road to the landfill complex. This road is the entrance road to the construction plot of the "Kalenić" Regional Municipal Waste Landfill. On the right side of the road, in the direction of rising survey marks, a 1.20 m wide sidewalk is planned, as well as 1.00 m wide shoulders on both sides of the road. Weighbridge is planned to be installed on the road in a part of the weighbridge house, and the width of the road here is 8.00 m. At the exit from the landfill, a disinfection barrier is installed to wash the wheels of the vehicle, as well as a gate with automatic ramps for the control of the entry and exit of vehicles.
- Road 2, km 0 + 177.34 long and 6.00 m wide, is the road leading to the administrative building of the landfill complex, as well as to the parking area. On the right side of the road, in the direction of rising survey marks, a 1.20 m wide sidewalk is planned, as well as 1.00 m wide shoulders on both sides of the road.
- Road 3, length 0 + 881.69, width of the road from 3.50 m to 6.00 m, is the road leading to the technical group of facilities of the landfill complex. On the left side of the road, in the direction of rising survey marks, a 1.20 m wide sidewalk is planned, as well as 1.00 m wide shoulders on both sides of the road. Considering that within the technical group of facilities there are substations, laundries, canopies, garages and service buildings, plateaus have been formed along this road, which are used for the above mentioned facilities. Also, 4 parking spaces for trucks and utility vehicles are planned here.
- Road 4, km 1 + 204.98 long and 3.50 m wide, represents the ring road around the body of the landfill. On both sides of the road, there are 1.00 m wide shoulders.
- Road 5, length 0 + 177.94 and road width of 3.50 m, is a road that is used for access to the lagoons. On both sides of the road, 1.00 m wide shoulders are planned. At the very end of this road, a turntable for vehicles is planned.
- Roads 6 and 7, length km 0 + 051.41, i.e. km 0 + 039.93, road width - 3.50 m, i.e. 6.00 m are connecting roads that connect other important roads within the complex. On both sides of the roads, 1.00 m wide shoulders are planned.
- Road 8, length km 0 + 036.86, and road width - 6.00 m; this is the access road to parking areas, which are located near the administrative building. A total of 20 2.50x5.00 m parking spaces are planned. A 1.00 m wide shoulder is planned around the parking lot, as well as a 1.00 m wide shoulder on both sides of the road.
- Road 9, length km 0 + 037.68, road width - 4.00 m, is the road leading to the administrative building, which also serves as a turntable for vehicles. 1.00 m wide shoulders are planned on both sides of this road.
- temporary utility path, km 0 + 159.08, road width 3.50 m, is a descending / ascending ramp serving the landfill. This path is used by municipal vehicles to access the garbage disposal area. 2.00 m wide shoulders are planned on both sides of this path. The surface of this path is planned to be made of 20 cm thick reinforced concrete slabs, which are arranged in the defined grid, in order to enable safe and functional traffic, i.e. the passage of vehicles serving the landfill. The slabs are arranged on a prepared buffer base and a previously made embankment made of selected soil. Along both sides of the shoulders, 1.0-1.5 m high embankments are formed in order to increase the safety of vehicle movement.

3.4.2. Water Pipeline

In the area of the Kalenić landfill, it is necessary to provide sufficient quantities of drinking water and technical water for the following needs:

- drinking water and sanitary needs;
- fire protection on the entire surface of the landfill;
- washing waste collection vehicles.

Drinking Water and Sanitary Needs

Water for the needs of employees will be supplied by connecting to the existing DN250mm pipeline along the Veliki Crljeni-TPP "Kolubara" road (covered in the "Construction Permit Design, Volume 3, Hydrotechnical Installation Design - Access Road with Pertaining Infrastructure (infrastructural corridor for the needs of the "Kalenić" Regional Municipal Waste Landfill on CP No. 746, CM Kalenić).

According to the data obtained from the competent services, the required quantity and pressure can be provided by the existing water supply system. The section crosses the Obrenovac-Lazarevac road, where a protective pipe in the length of 11 m is provided.

The drinking water system is intended for the staff working at the landfill, through sanitary devices in the facilities planned at the landfill (weighbridge house, administration building, car wash facilities, service building and garage).

The quantity of drinking water that needs to be provided at the connection point is 1 l / s and the minimum required pressure at the connection point is 3 bar.

The distribution network from Š4 manhole is made of polyethylene, as required by the Terms of Reference.

R3 Reservoir

BDK-1 well is connected to the R3 technical water tank, used for the storage of fire and technical water for the washing of waste transport and handling vehicles in the landfill complex. Groundwater from BDK-1 well will be pushed by a submersible well pump with frequency regulation through a DN 80 pipeline, L = 22.90 m, into a tank with the volume of 100 m3. R3 tank is filled with the water from the well, which is then further distributed for the needs of fire safety and as technical water for the washing of vehicles at the landfill.

The reservoir is partially buried. It consists of two chambers, a tank and an inlet chamber. The tank is made of reinforced waterproof concrete MB30, wall thickness 30 cm. It is protected on the inside with VDP penetrate, and on the outside with one cold and two hot bitulite coatings.

The volume of water in the upper part of the tank of 28 m3 from the level of 90.10 m above sea level to the level of 90.85 m above sea level is intended for washing vehicles. When the water level in the tank drops to 90.10 m above sea level, the pump is switched off via the probe, preventing, thus, the use of water from the fire reserve for the purpose of washing vehicles.
For firefighting needs, water will be pushed into the network from the tank.
The volume in the lower part of the tank of 72m3, from the level of 88.18 asl to the level of 90.10 asl is intended for the fire network.

Fire Safety in the Entire Area of the Landfill

In order to provide pressure to the most distant consumers at the landfill, the installation of an in-line high-pressure pump on the suction line of the DN100 hydrant network pipeline is planned. The hydrant network will be made of HDPE pipes, with the diameters of Ø60mm, Ø 90mm and Ø 110mm, for the working pressure of 10 bar. The total length of the network is 1986.56m. A ring-shaped network has been designed. The available flow in case of a fire of 10 l / s, in the most unfavorable case, when two hydrants are working at the same time, is sufficient for the duration of 2 hours for one fire.

Washing Waste Collection Vehicles

Technical water supply is provided from a local well which pumps water into the tank (R3) V = 100m3. The tank is located near the service building. After unloading the waste, the vehicles come to the parking lot for dirty vehicles or directly to the car wash. The technical water pipeline for vehicle washing is designed from PEHD pipes with the diameter of 40 mm. The length of the pipes from the tank to the car wash is about 50m. The total of 40 washes of vehicles transporting waste to the landfill is planned to be

performed. The average washing time of one vehicle is about 10 minutes, with 0.5 l / s of water per sprayer.

The technical solution for lowering the groundwater level in the first phase of the landfill operation includes the construction of three new drainage wells - BDK-1, BDK-2 and BDK-3, which will capture groundwater from the bottom released in the area of the Kalenić landfill. The wells are designed on the northern, western and southeastern edges of the landfill, with a typical well construction, a filter segment in the bottom sands, the depth of which depends on the occurrence of coal seams in these zones. The estimated capacities of individual wells are 7 l / s.

Groundwater captured by drainage wells can be used as technical water at the landfill, for washing parts of the landfill plant, watering green areas and fire protection of landfill facilities. If necessary, these waters can also be used in the technological process of waste recycling. In this way, the landfill will have its own stable source of technical water, and at the same time, the costs that would be incurred by using water from the public water supply for these needs will be reduced.

3.4.3. Sewage and Wastewater Treatment at the Complex

Collection and drainage of atmospheric water was observed in two ways, i.e. the project defined two solutions:
1) Collection and drainage of atmospheric waters from traffic and handling areas loaded with oils and petroleum products;
2) Collection and drainage of clean water that gravitates towards the body of the landfill.

For the collection and drainage of atmospheric waters from traffic and handling areas, a precipitation sewage network has been designed with the following facilities:
1) 79 drain drums with settling tanks;
2) Drain connections with inspection manholes with the diameter of Ø160 mm, total length l = 302 m.
3) 72 inspection manholes;
4) Sewage collectors with a circular cross-section, with the diameter of Ø315, Ø400 and Ø500 mm, total length l = 1397 m.
5) Two pumping stations with capacities of 60 and 30 l / s;
6) PEHD pressure pipeline Ø200 mm PN10 – connecting pumping station 2 to SA36;
7) A separator for oil and oil derivatives with coalescent filter with the capacity of 60 l / s.

All collected water from the roads and handling areas is discharged into a Ø500 mm sewer collector, designed within the Access Road Project, after purification in the separator.

The body of the landfill is endangered by precipitation gravitating towards it from the higher terrain in the northern and northeastern part in relation to the landfill body. On the other hand, the body of the landfill is raised by circumferential embankments in relation to the surrounding terrain, and thus protected from the possibility of penetration of atmospheric water from the surrounding basin. A solution in the form of a concrete channel has been designed for the collection and drainage of atmospheric water that gravitates towards the body of the landfill. The collected water is clean and is discharged on the surrounding terrain, and a reinforced concrete oulet is designed at the place of discharge.

All sanitary-fecal wastewater generated in the facilities within the complex of the Kalenić Regional Sanitary Municipal and Non-Hazardous Waste Landfill will be collected independently, into separate internal networks and drained from the facilities into special watertight septic tanks of appropriate volumes. The facilities that are included, i.e. where sanitary-fecal wastewater will be produced are:
- guard’s house (weighbridge house)
- administrative building
- car wash
- service building
- garage.

PVC pipes of appropriate diameters and stiffness have been foreseen for the internal and external sewerage network for sanitary-fecal wastewater.

All septic tanks are designed as single-chamber pits made of waterproof concrete (V6), have the appropriate volume in accordance with the planned discharge per facility. As for the discharge, 50 l per employee per day was taken as the norm during the working hours (8 h, one shift), which means that sceptic tank will need to be emptied every 1-1.5 months by the competent utility company (tank trucks).

Technical waters from the washing of vehicles and equipment are drained into leachate lagoons through the system of surface gratings, sewage pipes, and industrial sewage. Before the entering the leachate lagoons, technical water passes through a separator for oil and oil derivatives, and before entering the separator, they go through a settling tank for the mechanical removal of larger materials.

During waste disposal, leachate may form as a consequence of the gravitational penetration of a part of precipitation through the landfill body and of physical, chemical and biological processes of decomposition of the deposited waste.

The development and implementation of the “Kalenic” Regional Sanitary Municipal and Non-Hazardous Waste Landfill is planned as a phased construction of the landfill body. In accordance with the previous project documentation, the body of the Kalenić regional landfill is planned to be developed in three phases.

The impact of leachate on the environment, in the hydrotechnical sense, is prevented by insulating the bottom of the landfill body and installing a system of pipes for the collection of leachate.

A combined insulation of the bottom of the landfill body is installed, which consists of two mineral-sealing layers of clay and a 2 mm thick waterproof HDPE foil. Flat gravel drainage is laid above the insulation layers of the landfill body. The drainage gravel layer is 50 cm thick and leachate is filtered through it, which is then conducted through drainage pipes into the main manholes for leachate collectiong (S1-S12) by individual sectors.

Only the first phase of the landfill body development is processed in this project documentation. In the first phase, the landfill body is divided into three cassettes - cassettes 1, 2 and 3 –from the east side of the landfill body to the west. The cassettes are approximately the same size and capacity. Each cassette is additionally divided into 4 sectors (cells). The landfill sectors are being built gradually, and before the currently active part is used, the next one is being prepared, so that sufficient space is provided for the disposal of municipal waste at all times.

Thus, the body of the landfill in Phase I is divided into 12 sectors, of approximately equal capacity. Each sector has a separate pipe for receiving and evacuating leachate. The pipes are made of HDPE, with Ø225 diameter, and perforated PEHD pipes are planned to be placed over the waterproof PEHD foil, with the perforated side facing upwards. Each individual pipe ends in a circular, collecting, watertight HDPE shaft with the diameter of 1 m.

Drainage pipes from the corresponding sectors penetrate through the shafts of the still unopened sectors in order to evacuate clean atmospheric waters to the lake-accumulation without mixing with leachate from the active sectors of the landfill body. The penetration of the pipe through the manholes is of a temporary character, until the corresponding sector is opened for the disposal of municipal waste. After penetrating the sector shaft, clean atmospheric water flows down the outer side of the embankment towards the existing reservoir lake.

The shafts of the individual sectors are connected by the main pipe for the evacuation of leachate. The main pipe for evacuation of leachate in phase I of the landfill body development ends with a pumping station with the capacity of 40 l / s, equipped with two pumps. One pump pumps the leachate into

leachate lagoons (pools), and the other pump, in the recirculation system, pumps the leachate from the lagoon into the active parts of the landfill body.

The lagoons are open earthen pools, lined with waterproof 2 mm thick HDPE foil, with installed geosensors under the foil to register any possible leakage. The capacities of both lagoons are 3,825m3 each, which means that the total lecheate holding capacity of lagoons is Vuk=7,650m3. The lagoons will be fenced with a 2 m high wire fence.

The volume of leachate lagoons is determined based on the leachate balance in Phase I of the development of the regional landfill body. The calculation of the leachate balance is given in Chapter 3. Numerical documentation (volume 3/2). The capacity of the lagoons is determined so that during phase I it is possible to recirculate leachate to the active parts of the landfill body, without any purification or removal of excess leachate for further treatment by authorized operators.

Recirculation is performed through a handling shaft and lecheate returns to the active parts of the landfill body through a system of pressure pipelines. The water recirculation system and constant soaking of the landfill body prevents the possibility of fire in the landfill body, and also achieves a higher degree of compaction of landfilled municipal and non-hazardous waste and thus a higher degree of utilization of the space reserved for the landfill body, resulting in longer service life of the landfill.

The movement of leachate is limited to the defined closed system of drainage pipes and collecting shafts with a pressure pipeline, and as such it has no impact on the environment.

In the first phase, leachate is pumped into leachate lagoons (pools). The capacity of the lagoons is determined so that in Phase I it is possible to recirculate leachate to the active parts of the landfill body, without any purification or removal of excess leachate for further treatment by authorized operators.

This project documentation does not deal with leachate treatment, but in the next phases of development and construction of the “Kalenic” Regional Sanitary Municipal and Non-Hazardous Waste Landfill, it is recommended to consider the option of purification of these waters, i.e. to design and dimension leachate treatment plants, in accordance with the technologies available in the market, at the given time.

3.4.4. Landfill Gas Collection and Treatment

The installation of degassers for landfill gas collection is not the subject of this project and will be discussed in the subsequent documentation.

3.4.5. Power Supply of Buildings

For the supply of the consumers in the complex (administrative building, guard’s house with the weighbridge house, service workshop, car wash, weighbridge, tank, lighting...), the project forsees the construction of a freestanding transformer station out of prefabricated concrete elements, with the capacity of 1x1000 kVA and a 61 cm wide canal for a high-voltage plant.

A sidewalk is being built around the substation. The area around the substation is usually not fenced.

For the purpose of ensuring uninterrupted power supply of equipment and facilities, a diesel electric generator is provided, with automatic activation in case of power failure.

3.4.6. Control and Monitoring Systems, Automatized Processes at the Regional Waste Management Centre

IP video surveillance is provided. Surveillance of the perimeter of the building and access roads is planned.

The video surveillance system consists of the following units:

- Camera for indoor and outdoor installation
- PTZ camera for outdoor installation

- CCTV switch with PoE functionality (central campus LAN switches)
- NVR (Network Video Recorder) - network video recorder
- PC workstations with installed system monitoring and management software.
- System monitoring and management software

A stable fire detection and alarm system is not provided. Explosive and flammable gases are not used or stored in the building, so the installation for the detection of explosive and flammable gases is not planned.

3.4.7. Telecommunications

An IP telephone system with E1 / T1 / PRI and GSM / CDMA / 3G gateways is planned for all facilities in the "Kalenić" Regional Center with a Regional Landfill. All IP telephones are connected to the central switchboard in the building. IP phones are provided at every workplace. The entire telecommunications network must be wired, up to the telephone outlets.

3.4.8. Landscaping and Space Reclamation

Landscaping of the area of the Regional Center is planned in the protection zone around the complex and free areas within the complex. The formation of a continuous green protective belt around the regional center complex is envisaged. In order for the belt to perform its function throughout the year, a combined, multi-row, multi-storey, planting of primarily autochthonous deciduous and coniferous species is planned for the belt to perform its purpose throughout the year. The belt formed in this way will have a sanitary-decorative function and will reduce gas, dust, light and noise pollution, as well as create a visual barrier, which will reduce the visibility of the landfill in the landscape.

The protection zone is planned to be formed along the fence of the Regional Center complex, as a barrier to the outer landscape, by a combination of tall and low tree species, as well as shrubbery. The protective belt is designed as a densely planted belt, with sporadic interruptions, avoiding, thus, air turbulence that occurs in the space behind fully compact windbreaking protective belts. The specification of planting material for the landscaping is given in Table 3.4.8-1.

Table 3.4.8-1. Specification of Planting Material for Landscaping

Tall Conifers	1. Pinus nigra (black pine)	190 pcs
	2. Pinus silvestris (European red pine)	165 pcs
	3. Pseudotsuga menziesii (Douglas fir)	11 pcs
Tall Deciduous Trees	4. Tilia argentea (linden)	10 pcs
	5. Acer pseudoplatanus (sycamore)	95 pcs
	6. Betula verrucosa (silver birch)	10 pcs
	7. Quercus rubra (red oak)	16 pcs
	8. Juglans regija (walnut)	13 pcs
Low Deciduous Trees	9. Acer campestre (field maple)	8 pcs
	10. Prunus cerasifera v. pissardii (myrobalan plum)	14 pcs
Low Conifers	11. Taxus baccata (yew)	11 pcs
Coniferous Shrubbery	12. Juniperus horizontalis (juniper)	1990 pcs
Evergreen Shrubbery	13. Cotoneaster damerii (bearberry cotoneaster)	30 pcs
	14. Pyracantha coccinea (scarlet firethorn)	320 pcs
Deciduous Shrubbery	15. Tamarix sp. (Salt Cedar)	1440 pcs
	16. Cotinus coggygria "royal purple" (European smoke tree)	720 pcs
Lawn Plants	Lawns will be formed using a mix of the following perennial grasses: 1. Festuca rubra ……40% 2. Poa pratensis ……20% 3. Festuca pratensis ….10% 4. lolium perene ……20% 5. Trifolium repens ……10%	71.268,60 m^2

The participation of autochthonous species is dominant in relation to the introduced ones, with all foreign species being either widely adaptable and widespread or growing naturally in other areas, but in habitats with similar characteristics (geological and pedological background, climatic conditions, etc.). What they have in common is that they are resistant or extremely resistant to adverse natural conditions that can occur (drought, frost, etc.), as well as that they have modest requirements from the soil. The selected species are naturally resistant or extremely resistant to harmful gases and dust.

After the cell filling of the active part of the landfill body, the final layers for the landfill closure are applied: gravel drainage layer for horizontal degassing, d = 0.3 m, clay layer d = 0.5 m and gravel layer for atmospheric precipitation drainage d = 0.5 m. Then, biological reclamation is performed (soil application d = 0.7 m and humus layer d = 0.3 m), which is the final step of the landfill closure. Reclamation of the landfill will be performed successively with the filling of certain parts of the landfill. The landfill is closed at the moment when the planned area is filled and when a layer for protection against atmospheric precipitation, a layer for technical reclamation and biological reclamation is applied to the thus-formed substrate, which is the final step of the landfill closure, i.e. when the projected elevations defined in the Visual Schedules are reached on the entire surface of the landfill body and the leveling plan of exploitation and closure of the landfill is implemented.

3.5. Waste Disposal Technology

At the landfill, waste is disposed of by spreading on the previously prepared substrate. The preparation of the landfill bottom and internal slopes is designed in accordance with the Regulation on Waste Disposal at Landfills ("Official Gazette of RS" No. 92/10) and European Directive no. 1999/31 / CE, dated 26/04/99 and the Project in question.

For the controlled disposal of municipal solid waste, the technology of depositing using the "sandwich" system, i.e. "layer by layer" system has been adopted, which provides the possibility for the final disposal of solid waste, with maximum environmental protection measures. Roughly speaking, the technology of waste disposal at the landfill consists of the following phases: unloading of waste, spreading of waste in a thin layer; compaction of this waste to the minimum possible volume and daily covering of the deposited compacted waste with an inert material about 20 cm thick (Figure 3.5-1).

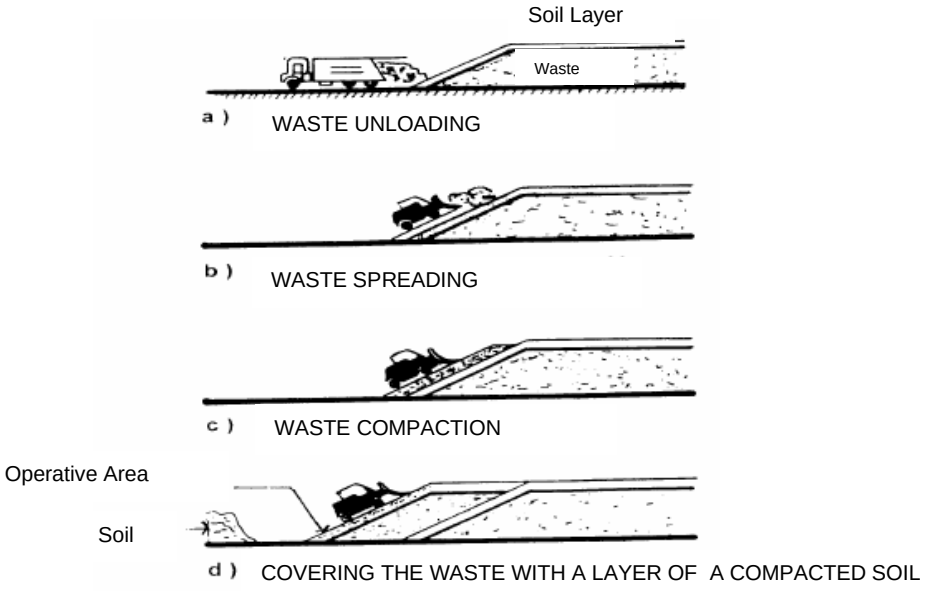


Figure 3.5-1. Schematic Representation of the Surface Waste Disposal Method.

The technological procedure of waste disposal takes place in the following way: a vehicle transporting solid waste enters through the gate, passes the guard and the ionizing radiation detector, and then goes to the weighbridge, where waste is weighed and recorded, and the the guard controller controls the waste composition, all in accordance with the Regulation on Waste Disposal at Landfills ("Official Gazette of

RS" No. 92/10), registers and records the quantity of waste in each vehicle, and then, the said vehicle uses the internal circular and downhill road to access the body of the landfill.

The waste transporting vehicle enters the waste disposal zone, unloads the waste at the place closest to the active cell, turns around and goes to the parking lot for dirty vehicles or directly to the car wash for internal vehicles. After washing, the vehicle, if it does not go immediately outside the complex, is parked in the parking lot for clean vehicles or otherwise leaves the complex. Before leaving the complex, the vehicle crosses the barrier for tire disinfection.

The manner in which waste transporting vehicles enter and exit the complex is completely the same in case of precipitations, as well, with the proviso that the driving must be adjusted to the weather conditions.

Having in mind the defined technological procedure of waste disposal at the “Kalenic” Regional Sanitary Municipal and Non-Hazardous Waste Landfill, the estimated average duration of activities is listed below:
- Entrance to the Landfill complex, weighing and recording: 8 min.
- Descent of the truck into the body of the landfill: 4 min.
- Waste unloading: 12 min.
- Departure of the truck for washing: 3 min.
- Truck wash: 10 min.
- Weighing, disinfection and departure of the truck from the Landfill: 5 min.

It is technically possible to unload waste with the minimum of two trucks at the same time.

On a daily basis, the complex can have about 40 truck entrances and exits delivering municipal solid waste.

The process of sanitary landfilling is performed with the use of mechanical equipment necessary for waste compaction and cell shaping (bulldozers, compactors, loaders - backhoes), in order to control anaerobic fermentation of waste and ensure environmental protection during landfilling.

Each cell formed during the day (regardless of whether it is finished or not), must be covered with the covering material at the end of the day, i.e. the deposited waste must not be left uncovered. Two adjacent sectors, one of which is in operation, and the other passive, are separated by installing waterproof barriers kept in place with tires filled with gravel. In this way, the quantity of leachate is reduced.

In Phase I, waste filling begins at the lowest level of the Phase I landfill, cassette 1, as it is laid over the gravel for leachate drainage (level 77.14 m). Upon completion of Phase I, Phase II is completed. The Phase I landfill is separated from the Phase III landfill by an earthen embankment.

After the filling of cells of the active part of the landfill body, the final layers for closing the landfill are applied: drainage layer made of gravel for horizontal degassing, d = 0.3 m, clay layer d = 0.5 m and gravel layer for drainage of atmospheric precipitation d = 0, 5 m.

Then, biological reclamation is performed (soil application d = 0.7 m and humus layer d = 0.3 m), which is regarded as the final step in the landfill closure process. Reclamation of the landfill will be performed successively with the filling of certain parts of the landfill.

The landfill is closed at the moment when the planned area is filled and when a layer for protection against atmospheric precipitation, a layer for technical reclamation and biological reclamation are applied to the thus formed substrate, which is the final step of landfill closure, i.e. when the projected elevations defined in Visual Schedules are reached on the entire surface of the landfill body and the leveling plan of exploitation and closure of the landfill is implemented.

Special vehicles with a hook for removing roll containers pass through the disinfection barrier before leaving the complex. Since they do not go to the body of the landfill, it is not necessary to wash them when they leave the complex.

At the end of the working day, a loader and a backhoe and a truck for loading and transporting inert material are parked in the complex, under a canopy for technical vehicles and equipment.

The crossing of clean and dirty work streams inside the complex is not allowed.

3.5.1. Waste Unloading

The waste transport vehicle uses the designed transport route and the descending ramp to reach a certain operating zone of cell 1, where waste is unloaded onto the surface of the prepared terrain, i.e. waste is disposed of onto the landfill body (Figure 3.5.1-1).



Figure 3.5.1-1. Unloading of Waste onto the Landfill Body

It is technically possible to unload waste with the minimum of two trucks at the same time. On daily basis, there can be about 40 truck entrances and exits at the complex that deliver solid municipal waste.

3.5.2. Waste Spreading and Compacting

After delivery and unloading, the waste is systematically spread and leveled with a bulldozer, in 0.2–0.3 m layers (Figure 3.5.2-1).



Figure 3.5.2-1. Waste Spreading after Unloading

The next thin layer of waste is spread over each compacted layer, which is also, in turn, compacted with a compactor. This operation is repeated during the entire deposit period. The key parameter in determining the life of a landfill is the degree of waste compaction. In order for the degree of waste compaction to be as high as possible, it is necessary to use a compaction machine (compactor), whose use enables high densities of deposited waste to be achieved, thus saving space. This way of waste compacting ensures sanitary waste disposal.

The degree of compaction is an extremely important parameter that determines the service life of the landfill, so it is necessary to use a compactor that achieves high densities of landfilled waste (over 0.8 t/m3), and thus saves space. Achieving these values depends on the thickness of the layers, the number of transitions of the machine and the direction of movement of the compaction machine, which must move along the operating path, and not the other way around. The best compaction densities are achieved with layers whose thickness does not exceed 0.60 m, so the most efficient compaction is over a larger number of thinner layers. Optimal density is achieved with 3-5 compactor passes. Figure 3.5.2-2. shows a compactor in operation.



Figure 3.5.2-2. Compaction of Waste with a Compactor

Straightening and compaction is better if the waste is wet, but this accelerates the decomposition of organic matter, which leads to increased release of gases. For that reason, wetting should be reduced to the minimum in the summer and, in longer dry periods, with treated water from the lagoon.

It is predicted that the total height of the working layer is 3.80 m of waste, which should be covered with a 0.20 m covering material layer. This forms one working cell, i.e. working layer with the total height of 4.00 m, on which the daily quantity of waste is deposited.

In Phase I, waste depositing starts at the lowest level of the Phase I landfill, Cassette 1, where waste is spread over gravel for drainage of leachate (elevation 77.14 m). The landfill filling plan is given in the visual documentation 19006-203-PGD-07-02-02 - Landfill Filling Plan. Upon the completion of Phase I, Phase II is completed. The Phase I landfill is separated from the Phase III landfill by an earthen embankment. The project in question envisages a storage space for waste disposal with an inert cover with the volume of 1,488,306 m3, which capacity is sufficient for 9 years of operation of the “Kalenic” Regional Sanitary Municipal and Non-Hazardous Waste Landfill.

3.5.3. Covering Waste with a Layer of Inert Material

When covering solid waste with inert material, care should be taken to ensure that it is well leveled and compacted, in order to avoid water retention and thus possible erosion. In Figure 3.5.3-1. an overlay of inert material is shown.



Figure 3.5.3-1. Covering Waste with a Layer of Inert Material

Every cell that is formed during the day (regardless of whether it is finished or not), must be covered with covering material at the end of the day, i.e. the deposited waste must not be left uncovered.

Two adjacent cells, one of which is in operation, and the other passive, are separated by waterproof barriers that are kept in place with tires filled with gravel. In this way, the quantity of leachate is reduced. An overview of cell separation of adjacent sectors by a watertight barrier is given in Figure 3.5.3-2.

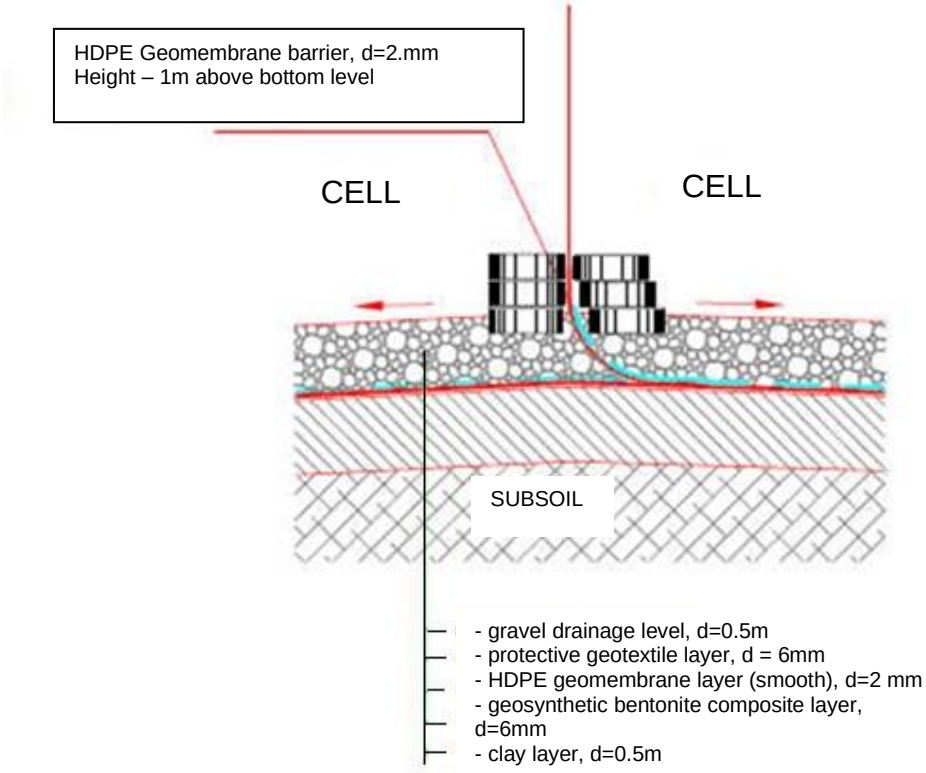


Figure 3.5.3-2. A Cross-Section of the Separation of Landfill Cells by Waterproof Barriers

The characteristics of the inert material that will be used to cover the cells significantly affect the quality implementation and functioning of the projected technological process of disposal.

By surveying the wider area around the site, it has been noticed that there are conditions for the excavation of the required inert material in the immediate vicinity. The following can be used as inert material:
- soil excavated from borrow pits at the landfill site, within the landfill complex and in the surrounding area,
- treated construction debris, i.e. construction waste that is not fit for further use,
- surface sediments represented by loess, lesoid clay or dusty sand, from local and remote borrow pits.

This type of cover prevents the appearance of insects, reduces the penetration of moisture into the landfill, prevents unpleasant effects (odors and sights) and prevents littering, contact of birds and insects with waste, and thus the spread of infection.

3.5.4. Permitted and Prohibited Types of Waste for Disposal

Only waste that does not have any harmful effects on the environment and that does not pose a threat to human health is allowed at the landfill:
- municipal waste,
- inert industrial waste,
- waste from public areas,
- waste from non-industrial companies,
- waste from shops, administrative buildings, etc.,
- ashes.

Table 3.5.4-1. lists decomposition times of certain waste fractions.

Table 3.5.4-1. Decomposition Times of Certain Waste Fractions

Type of Waste	Time of Decomposition
Food, garden and other organic waste	1 to 2 weeks
Paper	10 to 30 days
Cotton Clothes	2 to 5 months
Wool Objects	1 year
Cigarettes with Filters	1 to 2 years
Plastic Glasses	5 to 10 years
Wood	10 to 15 years
Chewing Gum	20 to 25 years
Nylon	40 years
Leather	50 years
Aluminum Can	100 to 500 years
Styrofoam	1.000 years
Plastic Bag	1.000.000 years
Glass	Never

Demolition and construction waste that is not hazardous and not suitable for recycling can be used for daily covering as inert material, while other usable demolition and construction waste should be separated at the place of origin and recycled.

Ash and slag, originating from solid fuels from boiler rooms and households, can be disposed of at the landfill if completely extinguished and if they do not contain any harmful elements. If they are dry, they must be well wetted before disposal and compaction and immediately covered with covering material. This type of waste is more present in the winter and in most cases it is inert and does not pollute the environment, so it can be used to build roads at the landfill.

Industrial waste, which is chemically and biologically neutral, can be disposed of at the landfill. The character of the waste is determined by its analysis by an accredited laboratory. Competent PUCs are required to have reports on waste testing issued by an accredited laboratory, all according to the Regulation on Waste Disposal at Landfills ("Official Gazette of RS" No. 92/2010). Industrial waste, which can be used as secondary raw materials, is not taken to the landfill, but its collection and separation must be organized.

Note:
Special waste streams (waste tires, spent batteries,...) will not be treated in the complex, but only their safe temporary storage will be ensured until they are handed over to authorized organizations for further action, with prior completion of documents on waste movement or documents on hazardous waste movement, depending on the nature of the waste, and the competent ministry will be notified in accordance with the legal procedure.

The "Kalenić" Regional Landfill is planned to operate as the disposal site for the municipal (non-hazardous) waste from the Kolubara region. Pursuant to Article 9 of the Regulation on Waste Disposal, the following types of waste may not be disposed of at the "Kalenić" Regional Landfill:
1) liquid waste;
2) waste that can explode, oxidize in landfill conditions, which is flammable or has other characteristics that make it hazardous in accordance with the special regulation governing waste categories, testing and classification;
3) hazardous medical and veterinary waste generated in medical or veterinary institutions, which has infectious properties in accordance with the special regulation;
4) waste batteries and accumulators;
5) waste oils;
6) waste tires;
7) waste from electrical and electronic products;
8) waste fluorescent tubes containing mercury;
9) waste containing PCBs;
10) waste vehicles;
11) thermally untreated waste generated in institutions where health care is provided;
12) pressure bottles;
13) separately collected waste fractions - secondary raw materials;
14) any other waste whose disposal is not allowed in accordance with the special regulation and which does not meet the criteria for acceptance of waste at the landfill.

Waste mixtures may not be diluted to meet waste disposal requirements.

In addition to the above, the "Kalenić" Regional Landfill prohibits the disposal of industrial waste whose characteristics classify it to the group of harmful and hazardous substances (they must be treated in accordance with the Law on Waste Management, "Official Gazette of RS", No. 36/09, 88/10, 14/16 and 95/18 and the Rulebook on the Manner of Storage, Packaging and Labeling of Hazardous Waste ("Official Gazette of RS" No. 92/10, as well as special regulations defining waste management requirements for special waste streams) .

At the "Kalenić" Regional Sanitary Communal and Non-Hazardous Waste Landfill, in case bulky waste and old car batteries are delivered to the landfill with mixed municipal waste, a covered plateau with containers for secondary raw materials is planned. The worker supervising the unloading of mixed municipal waste will separate easily visible and separable bulky waste and hazardous household waste from the active cell, and deliver it to the container under the canopy for technical vehicles and equipment at the end of work.

3.5.5. Landfill Closure

After all cells are filled in the Phase I of the landfill body, final layers for landfill closure are applied: a gravel drainage layer for horizontal degassing, d = 0.3 m, clay layer d = 0.5 m and gravel layer for drainage of atmospheric precipitation d = 0, 5 m. Then, biological reclamation is performed (soil application d = 0.7 m and humus layer d = 0.3 m), which is the final step of the landfill closure.

3.5.6. General Rules of the Technological Disposal Process

In order for the designed technological process of waste disposal to fully meet the set and desired goal, which is primarily the protection of public health through environmental protection (water, air and land), it is necessary to adhere to the following rules when disposing of waste:

- Start depositing at the lowest level of the landfill;
- Design the cell so that the daily work surface is as small as possible;
- "Cells" and "layers" of waste are formed up to the projected height;
- Each imported batch of waste that is delivered to the body of the landfill, is immediately spread and compacted;
- Provide daily covering of the cell with inert material at the end of the working day;
- In the summer, a layer of compacted waste is sprayed with disinfectant once a day;
- Use only appropriately designed equipment within its capacities;
- Disposal equipment should be kept in the active zone (except on weekends when the equipment is washed and disinfected);
- Ensure the movement of the compactor only along the operating route;
- Always build the internal road in advance in relation to the segment that is being filled, in order to ensure uninterrupted delivery of waste, without delays.

3.5.7. Landfill Equipment

Mobile Equipment (Machines)

The machines used to perform the technological process of landfilling must meet four basic functional requirements: enable the movement and compaction of solid waste, enable the transport and compaction of covering materials, be able to move even at higher inclines, perform supporting functions (preparation of internal roads, pushing materials, etc.). The following table provides data on the planned mobile equipment for landfill operation.

Table 3.5.7-1. Mobile Equipment Required for Landfill Operation

Mobile Equipment	Pcs
Buldozer	1
Compactor	1
Tipping Truck	1
Bucket-Wheel Excavator	1
Off-road Vehicle	1
Telescopic Handler	1
Tractor with a Trailer	1
Grass Trimmer	2

Waste Storage Containers

No waste selection is planned at the landfill. However, certain quantities of bulky and hazardous waste can be found at the landfill. The following containers are provided for the temporary storage of those types of waste.

Bulky Waste Container

They are made of steel sheet S355JP, δ = 2mm roof/3mm sides/4mm floor. The dimensions of the container are 4500x1900x2000 mm. The capacity of the container is 12 m3. The container is used for storage and can be moved with a forklift. The container is designed as a box with a fixed roof. A double-leaf door is installed on the back of the container for easier loading/unloading of bulky EE waste. The

door has a safety locking mechanism. It is protected against corrosion with 2 base coats and 2 final coats in accordance with the RAL card.
Pieces: 6

Container for Used Batteries and Accumulators
This container is made of "first cast" HDPE material - guaranteed and certified, full wall. The dimensions of the container are 1200x1000x760 mm, 3 traverses. The container has a 1200x1000 mm lid. The useful volume of the container is 640 liters. The container can be carried and handled with a forklift and a manual forklift. The container is resistant to all weather conditions and is stable in direct sunlight (infrared and ultraviolet rays). It is resistant to acid and battery liquids.
6 pieces

Container for Electrical and Electronic Waste
This container is made of sheet steel S355JP δ = 2 mm roof/3 mm sides/4 mm floor. The dimensions of the container are 4500x1900x2000 mm. The capacity of the container is 12 m3. The container is used for storage and can be moved with a forklift. The container is designed as a box with a fixed roof. A double-leaf door is installed on the back of the container for easier loading/unloading of bulky EE waste. The door has a safety locking mechanism. It is protected against corrosion with 2 base coats and 2 finishing coats in accordance with the RAL card. 2 pieces

Containers for Fluorescent Tubes
This container is made of sheet metal č 0361 δ = 2 mm with appropriate static reinforcements and is 100% welded. Its dimensions are 1600x500x800 mm + 100 mm legs. The lid (with hinges) made of č 0361 sheet metal, δ = 1.25 mm, is placed on the box. The lid should be sealed and lockable. These containers have legs so that they can be stacked on top of each other. It is protected against corrosion on the outside with 2 base coats and 2 finishing coats in accordance with the RAL card, and with tar epoxy resin on the inside. 4 pieces

IBC Containers - for Waste Oils and Other Liquids
The IBC container is made of HDPE material and is reinforced on the outside with galvanized steel profiles. On top of the IBC container, there is a DN 150 hole with a screw plug, which is also a connection for filling and venting. At the bottom of the tank, a ball valve made of PEDN is installed, enabling the emptying of the container. The IBC container is mounted on a wooden pallet that is integrated as a whole with the IBC container.
8 pieces are planned

IBC Container Storage Tanks
These are made of č 0361 sheet metal, δ = 3 mm, with appropriate static reinforcements and is 100% welded. Dimensions: 3000x1500x500 mm + 200 mm legs. The tanks are protected against corrosion on the outside with 2 base and 2 finishing coats in accordance with the RAL card, and with tar epoxy resin on the inside. The upper side of the tank is made of galvanized lattice that allows the passage of liquid into the interior of the tank, which prevents the leakage of waste oil into the environment.

Manual Oil Transfer Pump
The manual pump is intended for the transfer of waste oil either from standard 200 l metal barrels or from any canisters with the volume of 20 l and more. The pump is equipped with an outlet hose. The pump is made of aluminum and steel. The suction pipe is equipped with a threaded plug for standard connections of 200 liter metal barrels with a vent.
1 piece provided

Containers (Storage) for Paints and Varnishes
They are made of steel sheet S355JP, δ = 2mm roof/3mm sides/4mm floor. The dimensions of the container are 4500x1900x2000 mm. The capacity of the container is 12 m3. The container is used for storage and can be moved with a forklift. The container is designed as a box with a fixed roof. A double-

leaf door is installed on the back of the container for easier loading/unloading of bulky EE waste. The door has a safety locking mechanism. It is protected against corrosion with 2 base and 2 finishing coats in accordance with the RAL card.
Pieces: 4

Container for Sand and Absorbents
This container is made of č 0361 sheet metal, δ = 2 mm, with appropriate static reinforcements and is 100% welded. Dimensions: 1200x1000x1000 mm + 100 mm legs. The č 0361 lid without sheet metal hinges, δ = 1.25 mm, is placed on the box. The cover should have sealing properties and a lifting handle should be mounted in the middle. The container is protected against corrosion by 2 base and 2 finishing coats in accordance with the RAL card.
7 pieces are planned.

Municipal Open Containers for the Collection of Secondary Raw Materials
- Dimensions (length x width x floor width x height x eyelet height): 3470x1600x1500x1250x1000 mm
- Volume: 7 m3
- Net weight: 1850 kg
- Sheet Thickness: 4/4-6, reinforced
- Protected with paint resistant to salts, bases and acids on the inside, and to atmospheric influences on the outside
- Adapted for truck lifting
- Adapted for transport and front shaking with a forklift - with a welded rod for better protection and to avoid the possibility of the container slipping when being shaken with a forklift.

2 containers are provided

Disinfectant Container (Storage)
This container is made of S355JP steel sheet, δ = 2mm roof/3mm sides/4mm floor. The dimensions of the container are 4500x1900x2000 mm. The capacity of the container is 12 m3. The container is used for storage and can be moved with a forklift. The container is designed as a box with a fixed roof. A double-leaf door is installed on the back of the container for easier loading/unloading of bulky EE waste. The door has a safety locking mechanism. It is protected against corrosion with 2 base and 2 finishing coats in accordance with the RAL card.
Pieces: 1

Mobile Pump for Oil Storage with Storage Tank
For the needs of the machines supplying the landfill with diesel fuel, the procurement of a mobile oil pump is planned, with the following characteristics:
- Volume: 2000 l
- Tank Dimensions: Ø1500 x Ø1400 mm
- Net Weight: 250 kg
- Voltage: 12 V, 24 V or 220 V
- Pump Capacity: 60 l/min
- Flow Meter type - K33 with the possibility of measuring individual and total quantity
- Protective Cabinet with equipment storing tank
- Ventilation System
- Fittings for fuel inlet, venting and discharging
- Possibility of transfer by forklift or crane
- Automatic gun with 5 m hose
- Storage tank with lattice, net volume V = 2000 liters
- 1 pump is provided.

3.6. Display of the Type and Quantity of Water and Energy Required

Drinking Water

Water for the needs of employees will be supplied by connecting the complex pipeline to the existing DN250mm pipeline along the Veliki Crljeni-TPP "Kolubara" road (covered in the "Construction Permit Design, Volume 3, Hydrotechnical Installation Project - Access Road with Infrastructure (Infrastructural Corridor for the Needs of the Kalenić Regional Municipal Waste Landfill on CP No. 746, CM Kalenić).

The drinking water system is intended for the personnel working at the landfill, and it will be implemented in the form of sanitary blocks in the facilities planned at the landfill (weighbridge house, administration building, car wash facilities, service building and garage).

The quantity of drinking water that needs to be provided at the connection point is 1 l/s and the minimum required pressure at the connection point is 3 bar.

The quantity of drinking water for the needs of the employees:
The complex is expected to employ 24 workers.
Number of employees: N = 24 employees/day
Specific consumption: qs = 50 l/psn, day (8 h)
Total consumption: Qs = qs · N = 50 l/day · 24 = 1200 l/day

Technical Water

Number of trucks in the complex: N = 40 trucks/day
Specific consumption: qs = 300 l/truck
Total consumption: Qs = qs · N = 300l/day · 40 = 12000 l/day

Chemical Consumption

Concentrated diluent diluted in the 1:20 ratio.
As the dimensions of the part of the disinfection barrier being filled are 20.1x2.6 m, depth 0.45 m, the volume of the barrier is 23.5 m3.

Having that in mind, the required quantity of chemicals for wheel washing is:
23.5m3/20 = **1.75m3**

Electricity Requirements

Electricity in the complex will be used to illuminate the complex and power the following facilities: weighbridge house (guard's house), administrative buildings, service buildings, car wash, wells BDK-1, BDK-2, BDK-3 and pumping stations, technical water tanks, external lighting cabinets of the ROSO-2 complex and power supply of the external lighting cabinets of the ROSO-1 access road.

Diesel Fuel Consumption:

The designed technology of waste disposal in individual cells does not include any equipment supplied with electricity, i.e. there are no electricity consumers on the landfill body.
Having in mind that the project envisages the operation of mobile machines on the body of the landfill, the following is a tabular presentation of operating hours, as well as of the estimated fuel consumption.

Table 3.6-1. Operating Hours and Fuel Consumption on the Landfill Body

Item	Operating Hours h	Consumption l/h	Total l/day
Compactor	2	30	60
Bucket-wheel Excavator	2	10	20
Buldozer	5,5	20	110
Truck	3	22	66
Car	1	10	11
		Total	266

3.7. Technological Process of Sanitary Landfill Operation

The vehicle with solid waste enters through the gate, passes by the guard and ionizing radiation detector, and then goes to the weighbridge where the waste is weighed and recorded (the worker – guard controller - controls the composition of the waste based on the Certified Laboratory Report, all according to the Regulation on Waste Disposal to Landfills ("Official Gazette of RS" No. 92/10), registers and records information on the quantity of waste and each vehicle), then uses the internal circular and downhill roads to access the landfill body. Waste that is not subject to analysis by an accredited laboratory, under a contract, is disposed of at the landfill.

The waste transporting vehicle enters the landfill zone, unloads the waste at the place closest to the active cell, turns around and uses the internal roads to get to the parking lot for dirty vehicles or goes directly to the car wash. After washing, the vehicle, if it does not go out of the complex immediately, is parked at the parking lot for clean vehicles or otherwise leaves the complex. Before leaving the complex, the vehicle crosses the disinfection barrier to disinfect the tires.

The sanitary disposal process is carried out using the mechanical equipment necessary for waste compaction and cell shaping, in order to control the anaerobic fermentation of waste and protect the environment during disposal.

In the previously described manner, landfill cassettes are formed. Each cell that is formed during the day (regardless of whether it is finished or not) must be covered with covering material at the end of the day, i.e. the deposited waste must not be left uncovered. Two adjacent sectors, one of which is in operation, and the other passive, are separated by waterproof barriers that are kept down with tires filled with gravel. In this way, the quantity of leachate is reduced.

In Phase I, landfill filling begins at the lowest level of the landfill Phase I, Cassette 1, by spreading the waste over the gravel for leachate drainage (level 77.14 m).

Upon the completion of Phase I, Phase II is completed. The Phase I landfill is separated from the Phase III landfill by an earthen embankment.

After a cell is filled in the active part of the landfill body, the final landfill closure layers are applied: gravel drainage layer for horizontal degassing, d = 0.3 m, clay layer d = 0.5 m and gravel layer for drainage of atmospheric precipitation d = 0, 5 m.

Then, biological reclamation is performed (soil application d = 0.7 m and humus layer d = 0.3 m), which is the final step of landfill closure. Reclamation of the landfill will be performed successively with the filling of certain parts of the landfill.

The landfill is closed at the moment when the planned area is filled and when a layer for protection against atmospheric precipitation, a layer for technical reclamation and biological reclamation is applied to the thus formed substrate, which is the final step of landfill closure, i.e. when the projected elevations defined in the visual achedules are reached on the entire surface of the landfill body and the leveling plan of exploitation and closure of the landfill is implemented.

Special vehicles with a hook for transporting roller containers with hazardous and bulky waste pass through the barrier before leaving the complex. Since they do not go to the body of the landfill, they do not need to be washed when leaving the complex.

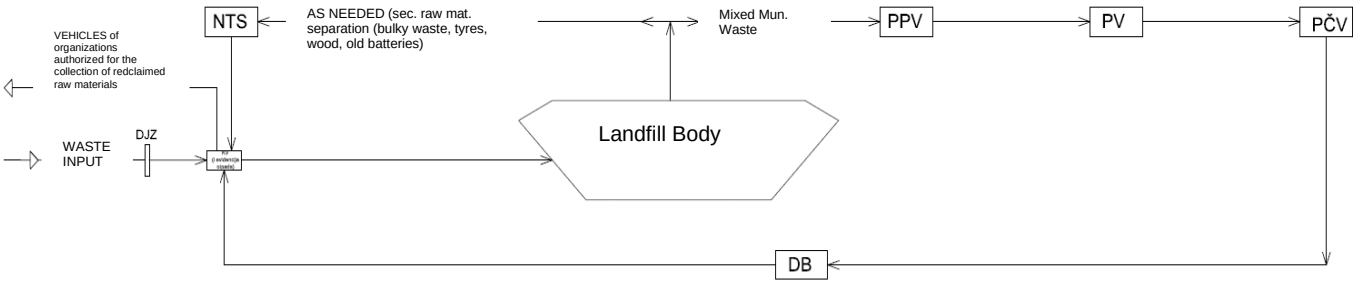
At the end of the working day, the bucket-wheel excavator and the truck for inert material are parked at the complex, under the canopy for technical vehicles and equipment.

The crossing of clean and dirty streams inside the complex is not allowed.

3.8. Sanitary Landfill Exploitation Technology

In Phase I, the landfill filling with waste starts at the lowest level of the landfill Phase I, Cassette 1, by spreading the waste over the gravel for drainage of leachate (elevation 77.14 m). The landfill filling plan is given in the visual documentation 19006-203-PGD-07-02-02 Landfill Filling Plan. Book 7.2 Technology Design/Landfill Body.

Figure 3.8-1. shows the waste disposal process diagram.



Legend:

VW – Vehicle Weighbridge
DJZ – Ionizing Radiation Detector
PPV – Dirty Vehicle Parking Lot
PV – Car Wash
PČV – Clean Vehicle Parking Lot
NTS – Canopy for Technical Equipment and Containers for Bulky and Hazardous Waste
DB – Disinfection Barrier

Figure 3.8-1. Waste Disposal Process Diagram

The subject project envisages that waste disposal storage area, with an inert cover, will have the capacity of 1,488,306 m3, which is a sufficient capacity for 9 years of operation of the “Kalenic” Regional Sanitary Municipal and Non-Hazardous Waste Landfill.

Over the layers of the completely filled landfill, where the final layer is an inert material layer, a covering layer with waterproof protection from atmospheric precipitation is spread.

After the filling of cells in the active part of the landfill body, the final layers for landfill closure are applied: gravel drainage layer for horizontal degassing, d = 0.3 m, clay layer d = 0.5 m and gravel layer for atmospheric precipitation drainage d = 0.5 m. Then, biological reclamation is performed (soil application d = 0.7 m and humus layer d = 0.3 m), which is the final step of the landfill closure.

3.9. Landfill Management and Operation Control

In order for the landfill exploitation process to flow continuously from entrance to exit, and in the manner envisaged by this project, it is necessary to organize the monitoring of operation and evaluate the efficiency of certain technological processes, as well as to monitor and control the relevant environmental protection parameters. Figure 3.9-1. shows a material flow diagram at the landfill, so in accordance with that, the monitoring of parameters should be organized in order to ensure reliable and safe operation both in terms of human health and the environment.

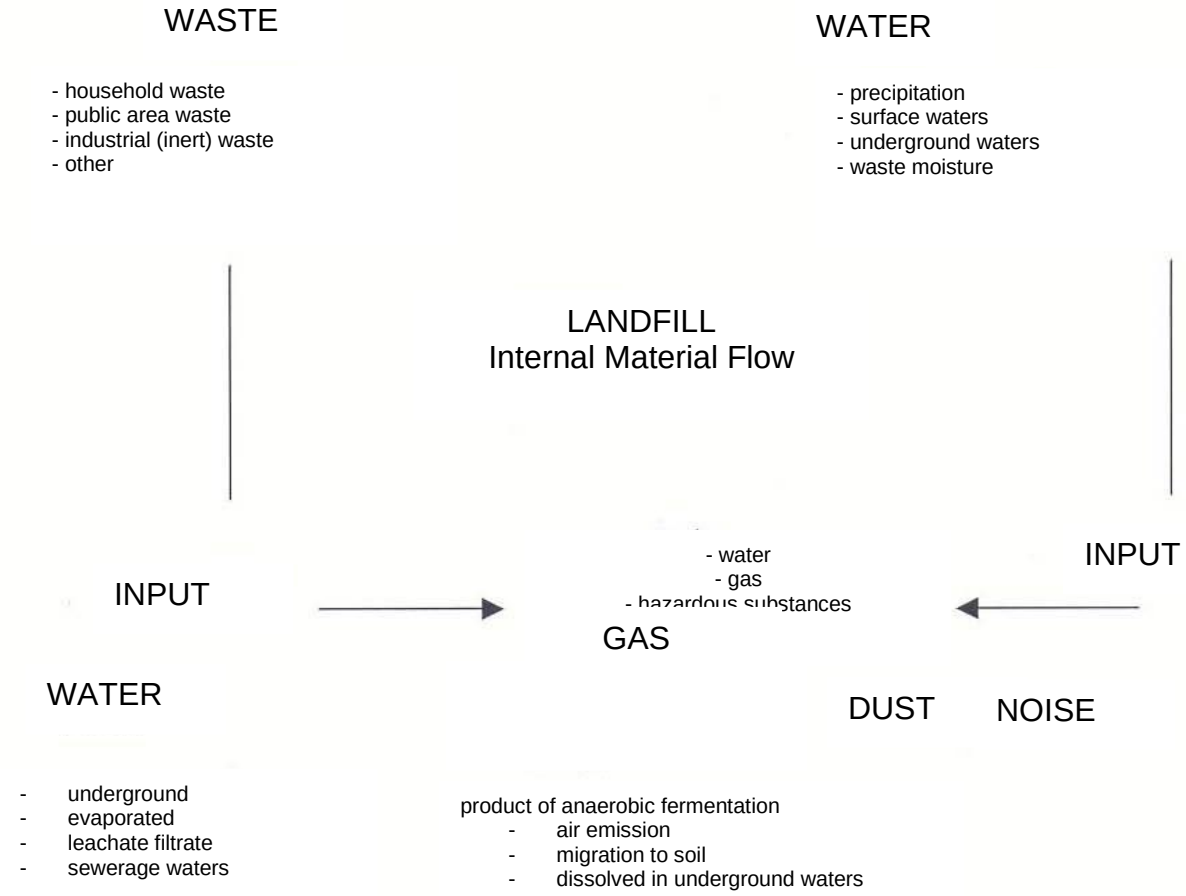


Figure 3.9-1. Material Flow Chart at the Landfill.

Management of the landfill complex includes control and/or records of the following elements:
• Origin, quantity and characteristics of waste entering the landfill,
• Maintenance of the working area of the landfill, collection canals of the leachate collection systems, peripheral canals, systems for degassing and incineration of landfill gas, roads,
• Infection spreading elements,
• Quality control of leachate, surface water and groundwater,
• Recording of groundwater levels in monitored wells,
• Recording of leachate volume in the treatment plant,
• Monitoring of landslides,
• Safety and protection of workers,
• Records and processing of meteorological data.

The control of the type and quantity of waste delivered to the landfill, as well as the keeping of records is performed by an expert who is trained to work at the landfill. Only waste defined in Chapter 3.5.4 of this EIA can be disposed of at the landfill.

In order for the projected process of waste and inert material disposal to be implemented at the landfill, internal roads are built, which enable free flow and access of vehicles, necessary materials and workers employed and engaged in the operation and maintenance of the landfill.

In order to properly conduct the exploitation process, an active working area must be formed as required in the project documentation. The working area at the waste disposal site must be properly maintained, both in terms of observing the designed dimensions and maintaining the designed slope.

Inert material that serves for the coverage and as a technical reclamation layer, must be regularly inspected both in terms of quantity and quality. The landfill must never remain without sufficient material of the required quality to cover the formed layers of waste. Inert material must be stored in the designated place (depending on the phase of exploitation of the landfill) and in an adequate manner. Material must not be distributed and scattered without plan.

Lecheate lagoons need to be monitored on daily basis and discharged if necessary. If needed, peripheral canals should be cleaned of vegetation, collapsed material, etc. Every day, after the end of the work process, the landfill must be cleaned of bulky waste, especially along the wind direction. The landfill fence at that place should also be cleaned of bulky waste.

At the end of each working day, daily remediation process needs to be inspected once again and, if necessary, additional interventions in the form of covering any parts of waste which are uncovered, etc. will be undertaken. The landfill requires the constant presence of an expert who will control the implementation of the prescribed technological process. Also, the internal roads and other facilities of the complex should be kept clean every day. Rodents can appear in the open landfill, but by covering the nutrient waste with inert material, this problem is significantly reduced. If, however, an increased number of rodents is noticed in accident conditions, because rodents (rats) are unwanted companions of food waste, specialized services for disinfection and deratization should be called.

Monitoring groundwater levels is of particular importance. Regular monitoring of groundwater levels is needed, to prevent any jeopardization of the landfill exploitation.

In order to ensure optimal management of the landfill, the following parameters should be controlled and kepte on daily basis:
• Quantity and composition of waste in tons or m3,
• Quantity of available and used covering material in tons or m3,
• Equipment operation times and maintenance statistics,
• Security,
• Quality and quantity of leachate in lagoons,
• Groundwater level in monitored wells and installed piezometers,
• Changes in the surrounding area.

Based on the information on the quantity of incoming waste, as well as on the basis of its characteristics, compliance or deviation from the projected data needs to be controlled in order to ensure the undertaking of timely measures for the increase or decrease in the special equipment or personnel, which means constant compliance with project documentation, and, if needed, its revision, i.e. adjustment to the actual situation at the landfill.

A monitoring system for all important facilities and areas will be installed in order to continuously monitor the operation of the landfill.

4. OVERVIEW OF THE MAIN ALTERNATIVES CONSIDERED BY THE PROJECT HOLDER

The aim of the project is to prepare the technical documentation at the level of the Construction Permit Design (PGD) of facilities and plants of the "Kalenic" Regional Sanitary Municipal and Non-Hazardous Waste Landfill at CP 800, CM Kalenić (Municipality of Ub). The subject of the PGD is Phase 1 of construction of the regional center, which includes buildings and infrastructure, as well as sanitary organization of a part of the landfill body (Phase 1, which consists of three sub-stages - Cassettes 1, 2 and 3), while Phases II and III refer to the sanitary disposal of new waste with the necessary works related to the expansion of the landfill body, using the complete infrastructure built in Phase 1.

No alternative solutions were considered in the PGD development phase, and the following text describes the alternatives analyzed in the earlier phase of EIA and technical documentation development.

4.1 Analysis of Options for the Selection of the Regional Landfill Site

In the earlier stages of preparation of study and technical documentation (Study for the Selection of the Landfill Microlocation (IAUS, 2005)), three alternative sites were considered for their benefits for the construction of a regional landfill:

1. Open-Cut Mine "TAMNAVA - West Field", located on the territory of the municipality of Ub;
2. BOGDANOVICA City Landfill in Ub which is located in the immediate vicinity of the city and is currently used for waste disposal;
3. CARIĆ site, which has already been the subject of certain research, which has indicated certain benefits of this location as the site of the municipal waste landfill. The location is on the territory of the Municipality of Valjevo.

4.1.1. Evaluation of Alternative Sites

Criteria for the selection of the landfill location are defined by the then valid Rules on Criteria for Determining the Location and Arrangement of Landfills and are considered in the environmental protection context. Having in mind these criteria and the data available for all three candidate locations, certain criteria were selected to be evaluated for the selection of the most favorable location. The fact that the subject study deals primarily with the spatial aspect and space reservation for a regional landfill with a recycling center was taken into account, while further elaboration would be done at the level of detailed regulation and conceptual design. In this context, the following relevant criteria were selected:

1. Spatial criteria - refer to the required distances of the landfill from certain elements of the supra- and infrastructure in the surroundings;
2. Protection from elements - the landfill is usually located in bays sheltered by lateral relief, open-cut mines, former borrowing pits, abandoned quarries, etc .;
3. Infrastruxtural connection of the location – proper infrastructural connection of the site with the territory it will serve;
4. Availability of soil for sanitary backfilling of deposited waste - from the economic aspect, it is most rational for the soil source to be located on site;
5. Possibility to use the landfill for a period longer than 20 years;
6. Protection of the environment and health of the population - refers to the assessment of possible impacts in comparison with the current situation on site;
7. Position within the Region - considered for economic reasons;
8. Infrastructural equipment of the site - refers to the infrastructure that is necessary for the normal operation of the landfill and recycling center, which is already available on site and can be used (possibility of connecting future facilities);
9. Landscape characteristics - assessment of the impact the landscape characteristics of the site would suffer because of the implementation of the landfill and recycling center project;
10. Climate characteristics - basic climate parameters that are important for the landfill site in the context of environmental protection;
11. Seismic characteristics;
12. Hydrological conditions;

13. Geological conditions;
14. Available disposal space - available space compared to the calculated requirements (sizing) of the landfill and recycling center.
15. Title and ownership.

Based on the above criteria, a multi-criteria qualitative assessment of individual features will be performed for each of the three candidate locations. The commitment to qualitative assessment is conditional, among other things, upon unsystematized data at the disposal. All the above criteria will be qualitatively evaluated and classified into three categories: favorable (++), conditionally favorable (+) and unfavorable (-). Based on the criteria defined in the Rulebook on Criteria for Determining the Site and Arrangement of Waste Landfills and the qualitative assessment of individual features of each of the three candidate sites, a multi-criteria evaluation and selection of the optimal location for the future regional landfill was performed (Table 4.1-1.).

Table 4.1-1. Criteria for Determining the Site of the Regional Landfill in the Kolubara Region and Qualitative Assessment of the Candidate Locations.

CRITERIA	OCM "TAMNAVA – West Field"	Bogdanovići	Carić
	ASSESSMENT		
Distance from Settlements	++	++	++
Distance from Individual Households outside Settlements	++	-	-
Distance from Rivers	++	-	-
Distance from Medical Facilities	++	++	++
Distance from Gas Pipelines, Oil Pipelines, Overhead Powerlines	++	++	++
Site Protection from Elements	++	-	+
Infrastructural Connection of the Site	++	++	+
Borrowing Pits for Sanitary Backfilling of the Deposited Waste	++	-	-
Possibility of Using the Landfill for more than 20 Years	++	-	-
Environmental and Human Health Protection	++	-	-
Position within the Region	++	++	-
Infrastructural Equipment of the Site	++	+	-
Landscape Characteristics	++	-	-
Climate Characteristics	++	++	++
Seismic Characteristics	+	+	+
Hydrological Conditions	++	-	+
Geological Conditions	++	+	+
Available Disposal Space	++	-	-
Title and Ownership	++	-	-

Legend:
• Favorable (++) - conditions defined by the Rules are met;
• Conditionally favorable (+) - conditions are not fully met, but with certain measures the criteria may meet the conditions defined in the Rules;
• Unfavorable (-) – criterion does not meet the conditions defined in the Rules.

4.1.2. Results of Multicriteria Evaluation

For the multi-criteria evaluation of sites considered for the location of the regional landfill and recycling center, 19 relevant criteria were selected. The selection of criteria is based on the Rules and the available data on potential sites. An overview of the results of site evaluation by categories is given in Table 4.1-2.

Table 4.1-2. Results of Multicriteria Evaluation by Categories.

Site	Favourable	Conditionally Favourable	Unfavourable

OCM "TAMNAVA – West Field"	17	2	/
Bogdanovići	6	3	10
Carić	4	6	9

1. The OCM “Tamnava - West Field" site was assessed as favorable according to 17 criteria, which is far more than any of the other two locations. What is especially important to point out is that this location meets all the key criteria defined by the Rules on Criteria for Selecting Waste Landfill Sites and that it is not unfavorably evaluated according to any of those criteria. It was evaluated as "conditionally favorable" according to 2 criteria (environmental and public health protection and seismic conditions), which means that certain measures must be implemented during the construction of the facility.

2. The OCM “Tamnava - West Field" site, which was assessed as the most favorable of the candidates, has a number of advantages over the locations of Bogdanovica and Carić from the economic aspect, as well. The most significant advantages of the OCM “Tamnava - West Field" site are, as follows:
   • the proposed site meets all important criteria for site selection defined by the Rules on the Criteria for Selecting Waste Landfill Sites;
   • the surroundings have the infrastructure necessary for the normal operation of the landfill, so that with relatively small investments, it is possible to connect the planned facilities to the main roads;
   • there are the necessary quantities of overburden at the site for the formation, closure and reclamation of the landfill;
   • there is mining machinery on the site itself that could be used for relatively quick and easy arrangement of the landfill space;
   • the space intended for the landfill body is located next to the area suitable for the construction of a recycling center and the accompanying facilities of the landfill;
   • in relation to the current state of the environment, this location has the least negative effects on the general state of the environment;
   • since this location offers a greater depth (20 meters) of the landfill body, a smaller area will be occupied by the necessary facilities;
   • there is a possibility of using the landfill for a period longer than 20 years;
   • landscape characteristics of the location are already very poor, so the planned facilities will not have a significant negative impact on the environmental values of the wider surroundings;
   • title and ownership of land is regulated.

3. The macro-location of the regional sanitary landfill is defined in the 2010 Regional Waste Management Plan for the Kolubara Region, and confirmed in the Development Design for the Construction of the "Kalenić" Regional Municipal Landfill (Approval No. 350-184/14-04 as of 30/04/2014) and the Preliminary Design of the "Kalenić" Regional Sanitary Landfill for Municipal Waste - Phase I, Institute "Kirilo Savić", Belgrade, 2014. There are no other alternative locations.

4.2 Analysis of Options for Waste Treatment Technologies

In order to develop a realistic scenario for municipal solid waste management in 11 municipalities of the Kolubara region, the Feasibility Study for the "Kalenić" Regional Waste Management Center (updated by BiPRO GmbH and Particip GmbH, George Tavoularis, Matthias Kutny, Christopher Edge, Alex Panagoulopoulos, February 2014) analyzed 6 (six) scenarios:

1. Sanitary landfill only (no waste treatment). This basic scenario includes a sanitary landfill without waste treatment. The technical conditions for the construction, position, and operation of the landfill itself must be in accordance with the requirements of the Council Directive on Landfills (1991/31/EC), as well as with national legislation, in order to protect human health and the environment. Sanitary landfills have reduced negative environmental impact (minimal odor emissions, reduced risk of animal waste dispersal, or uncontrolled breeding of rodent populations at the landfill, reduced risk of fires), reduce health risks and provide better waste control than is

the case with uncontrolled landfills. The new regional landfill will not accept flammable waste, infectious waste from hospitals, old tires, liquid hazardous waste, as well as other types of hazardous waste.

2. Construction of a simple MBT plant without separation of recyclable materials, with the aim of stabilizing waste before disposal and production of compost-like materials. This scenario takes into account scenario 1 and upgrades it with the integration of a simple mechanical-biological waste treatment plant with the production of compost-like material. The operation is based on the separation of waste into two basic fractions - heavy fraction, containing organic waste, and light fraction, containing recyclables and residues. The light fraction is then immediately sent for disposal with the separation of a certain percentage of metal waste. The heavy fraction is forwarded to composting. The capacity of such an MBT plant would be 120,000 t/year, with two lines, working in two shifts, 310 days a year, and with the operating capacity of 90% or 2x15 tons per hour. Local authorities should decide whether to approve the reception and treatment of sludge from the region's wastewater treatment plant in this facility. However, it is assumed that the obtained compost-like product will not have any market value and will eventually be deposited (except for the minimal benefit in the revitalization of the brownfield site). On the other hand, most of the organic carbon will be mineralized and a large percentage of moisture will evaporate from the waste. In this sense, this technology contributes to the reduction of the share of biodegradable waste in the municipal waste, which reduces greenhouse gas emissions in biogas production, as well as the generation of leachate. The merit of this technology lies in the stabilization, which would result in a 35% waste mass reduction from the moment of its entering into the composting plant, i.e. about 20% of the total quantity of waste transported to the regional center.

3. ***Construction of an MBT Plant with an Indoor Separation of Recyclable Materials and a Composting Center for the Production of Compost-Like Materials***. The difference between this option and the previously described ones lies in the plant for the mechanical and biological treatment of waste, which is technically more advanced and, in addition to the separation of recyclable materials, it also enables the separation of solid fuel from waste (Refuse Derived Fuel - RDF). The capacity and other design parameters of such an MBT are the same as in the previous scenario. The yield that can be achieved largely depends on the efficiency of the sieving drum, magnet and manual sorting line, and is generally low, unless more sophisticated equipment is provided (Table 4.2-1). Like in the previous scenario, there is a waste mass reduction of 35% of the composting plant input or about 20% of the total quantity of waste transported to the regional center.

Table 4.2-1. Light Fraction Utilization

Type of Materials	Utilization %
Mixed Paper	20%
Glass	10%
Cardboard	20%
Composite Materials	50%
Metal Packaging	80%
Aluminium Cans	80%
Plastic Packaging	50%
Plastic Bags	50%
Hard Plastic	50%

The disadvantages of this waste treatment option are high operating costs and poor quality of the separated materials compared to the recyclable materials separated through primary selection. This scenario was proposed in a previous feasibility study and was chosen as the most desirable option, but the costs were underestimated.

4. Construction of MBT plant with a configuration that enables the production of high quality alternative solid fuel from waste (SRF) through biodrying. This waste treatment option involves an MBT plant that operates on the principle of bio-drying and utilization of metals only. The difference between the resulting high quality solid fuel from waste (Solid Recovered Fuel - SRF) and RDF fuel from option 3, is that RDF fuel is pre-sorted and shredded waste with already separated recyclable materials, while in case of SRF, the fuel is produced according to the specification of the plant that will use such fuel. SRF has a higher value and due to its homogeneous composition, it is used more, especially when it is necessary to maintain a constant energy level in a certain system. The MBT design, capacity and other parameters are the same as in the previous options. Upon receipt, the incoming waste goes through a process of comminution, and then of biostabilization or biodrying (i.e. a very rapid process of aerobic digestion). The output dried waste goes through the process of simple mechanical separation, for mechanical refining. SRF fuel and metals are then separated, while the rest goes to landfill. The disadvantages of this process are reflected in the fact that it is incomplete, i.e. it depends on additional plants - incinerators in cement plants or other co-incineration plants. According to the consultant's experience, biodrying plants often cannot find the necessary partners on the market, and therefore disposal becomes the cheaper alternative.

5. Construction of MBT Plant with Anaerobic Fermentation and Energy Production. The difference between this waste treatment option and the previously described scenario is that biological waste treatment includes anaerobic digestion (in the absence of oxygen) instead of composting (in the presence of oxygen). After separation, the light fraction of the waste is sent directly to the landfill and only a certain percentage of the metal is separated. The substrate or heavy fraction is sent for anaerobic digestion, with the production of biogas and energy. The MBT design, capacity and other parameters are the same as in the previous options. Local authorities should decide whether to approve the reception and treatment of sludge from the region's wastewater treatment plant in this facility. This plant consists of a fermentation reactor which is loaded with waste in certain time intervals. The waste is then irrigated with warm water which allows bacteria to penetrate the substrate and use the nutrients and the heat. The decomposition process produces biogas which is piped to the warehouse and then used to produce electricity or a combination of energy and heat. Fermentation residues (digestate) should normally go through the maturation phase for stabilization.

The advantages of this waste treatment option are, as follows:
• Low energy consumption and production of energy that can be fed into the city power grid,
• It is intended for the treatment of municipal waste with a high content of organic components, which is the case with waste generated in the Kolubara region, as confirmed by measurements.

6. ***Thermal waste treatment - waste incineration plant with energy production***. From the technological point of view, this scenario is the most advanced. On the financial side, this is the most expensive waste treatment option. However, it is considered in this chapter since there are several factories with the capacity of 100,000 t/year, which is the lowest limit. This technical concept involves a typical mobile grate plant with the capacity of 120,000 t/year, 365 days a year, and 85% availability, one line and three shifts or 16 t per hour. The waste is transferred from the receiving storage into the incineration chamber where, in the presence of air, CO2 and steam are obtained for energy production. The waste incineration plant complies with the requirements of the Council’s Waste Framework Directive. The ash remaining after the incineration should be disposed of. The flue gases that develop during the combustion process are sent to the treatment unit where fine ash and residues from the cleaning process are generated, both fractions being hazardous waste. The advantages of this option are: high degree of efficiency in energy production; reduction of waste mass and complete reduction of the share of biodegradable waste in the municipal waste; low emissions; flexibility for thermal treatment of RDF from other regions.

The disadvantages of this option are:
• Very high costs compared to other options,

• The authorities are bound by strict "bring or pay" contracts - they must provide the required quantity of waste, if this is not possible, the difference must be paid,
• Authorities must have the appropriately qualified staff to run such a complex project,
• A special cell is required for the disposal of hazardous waste.

And most importantly, the EU is reluctant to provide funding for such projects, because all other waste management objectives are often neglected in such cases (introduction of primary selection, 50% recycling by 2020, etc.), and funding for such projects is only approved under special conditions and after detailed consideration. For example, in Sofia, the EU rejected an application for such a factory.

The following table provides an overview of the qualitative characteristics of each option and their advantages and disadvantages. The six scenarios presented above, including the main assumptions (such as information on the population trends, waste estimates, targets, etc.) were presented to stakeholders during two workshops, on 10/09/2013 and 10/10/2013. For each of the six options, contributions to the achievement of objectives, investment and operating costs, as well as data on net present values were calculated. An interactive discussion was held with the participants of the two workshops regarding the disadvantages and positive aspects of each option. Specifically, the consultant singled out two options, one that represents an advanced scenario for the Kalenić RCUO and the other one that is regarded as the basic concept. Baseline scenario (1) achieves targets related to packaging waste, however, the reduction of the share of biodegradable waste in the landfilled municipal waste is minimal. Scenario 1 is included in the further analysis, because as stated in the presentation, "it meets the necessary needs of the region and enables the construction of the future waste treatment plant in the medium term." The advanced scenario achieves all goals. A previous feasibility study prepared in 2012 identified “the MBT plant with indoor recyclable material recovery and composting and compost-like material production as the chosen option”. The capacity of the plant is not explicitly mentioned, but it can be calculated and it amounts to 90,000 t/year. The required investment for the construction of an MBT with a composting plant was estimated at € 5,199,500, while the total investment for the construction of the regional system was € 14,800,000. The necessary investment for such an MBT has been re-estimated at € 16,400,000 in previous chapters, excluding contingencies. Even if only half of the capacity is taken into account, the amount of such an investment would be € 8,200,000. The simplest type of MBT with biostabilization (operating at full capacity) would still cost € 9,550,000, but this option is not acceptable for the users of the study. Based on the calculation of the investment costs, it becomes obvious that the total budget of € 14,800,000 is not enough to enable the construction of MBT facilities, sanitary landfills and transfer station/MRF in Lazarevac, and that it should either be increased or the construction of waste treatment facilities (MBT) should be postponed as a part of the second tier investment.

Table 4.2-2. Advantages and Disadvantages of Each Analyzed Scenario.

Scenario No.	Advantages	Disadvantages
1	Meets the immediate needs of the region and is a necessary element for the disposal of residual waste, regardless of the future waste treatment options.	It does not contribute to the reduction of the share of biodegradable waste in landfilled municipal waste. Maximum Landfill Volume.
2	Waste weight reduction about 35%; as composting input, meets the minimum requirements of the Landfill Directive, due to lower environmental impact of the compost-like material than in case of the disposal of mixed municipal waste.	Extraction of metal only. Stabilized waste or compost-like material may have minimal benefits in rehabilitating brownfields or old landfills and will generally be disposed of (due to impurity content).
3	Recovery from a range of secondary raw materials via separators and manual sorting. Production of alternative waste fuel (RDF) for industrial use. Production of stabilized reduced mass output, which is then deposited (due to the content of impurities)	High operating costs. The market for solid waste fuel is volatile with often negative costs.
4	High quality solid recovered fuel (SRF) has a	The European Commission requires a special

Scenario No.	Advantages	Disadvantages
	higher value than RDF, when constant quantity of energy is required. SRF has a higher added value.	contract for the use of the SRF to provide co-financing because the end product depends on the private sector. Low recycling rate.
5	Targets waste with large organic contents. It enables the production of biogas as a renewable energy source. Dry anaerobic digestion plants are very common in Europe.	A very expensive investment. Investment depends on the price per kW hour.
6	Incineration plants with the latest energy production generation provide a significant reduction in the mass of waste with minimal emissions. Very low emissions and flexibility of treatment of potential RDF from other regions as well.	High waste input tariff. Very high cost compared to other options. The authorities are bound by strict "bring or pay" contracts - they must provide the required quantity of waste, if this is not possible, the difference must be paid. The local self-government must have technical experts in charge of the management of tender procedures for such a plant. The EU is reluctant to provide funding for such projects, because all other waste management objectives are often neglected in such cases (introduction of primary selection, 50% recycling by 2020, etc.), and funding for this project is granted only under special conditions and after detailed consideration (maximum 40%). The ash that remains after burning and the remains are dangerous. They are deposited at a price of -150 to -200 €/t.

Two options were short-listed:
- The basic scenario (1) includes the construction of the “Kalenić” Regional Landfill and RCUO without waste treatment, which achieves the goals related to packaging waste, however, the reduction of the share of biodegradable waste in the disposed municipal waste is minimal.
- The advanced scenario (3) includes the construction of an MBT plant with indoor separation of recyclable materials and a composting plant, with the production of compost-like material, which achieves all objectives. A previous feasibility study in 2012 also identified an “MBT plant with recycling material recovery and composting in a closed facility and the production of compost-like materials as the selected option”. The investment required to build the MBT was estimated at € 5,199,500. The 2014 Feasibility Study acknowledged that it was the selected waste treatment option, but that the investment value of such a plant under the Preliminary Feasibility Study in 2012 was underestimated and that the necessary investment for such an MBT is € 16,400,000, excluding unforeseen costs.

4.3. Analysis of Leachate Treatment Options

In the modern international practice, the problem of purification and final disposal of landfill leachate is generally resolved in one of the following four ways:
1. Biological or physical and chemical water treatment at the landfill site and discharge of treated wastewater into the watercourse;
2. Treatment at the landfill site and final disposal of treated wastewater by spillage over the surrounding land;
3. Return of collected raw leachate back to the landfill body;
4. Partial purification of leachate at the landfill location and discharge into the city sewerage network.

Due to a number of advantages, the fourth option is applied in most cases. If the location of the landfill is far from the city sewerage network, the choice of this option requires the relatively treated wastewater to be transported in tanks to the discharge point. It is safe to say that other options apply practically only in cases where:

1. Transport of wastewater to the city sewerage network is uneconomical, due to the price, i.e. the sewers network is too distant from the location of the landfill or due to extremely large quantity of wastewater, or
2. When the city utility company refuses to accept this wastewater into its sewer system or
3. When the total quantity of leachate is greater than 5% of the hydraulic capacity of the city wastewater treatment plant, since in that case there may be a serious disruption of its operation.

In case the fourth variant cannot be applied for the above stated or any other reasons, it must be borne in mind that the first two variants require a very high degree of purification, which, on the other hand, requires the application of very complex processing technology, i.e. very high investment and operating costs. On the other hand, opting for the recirculation of raw leachate back to the landfill carries with it a very real danger of "dampening" the landfill, i.e. its gradual transformation into a polluted "shallow lake", which would create an environmentally very unfavorable situation. Taking into account all local conditions, the Feasibility Study for the Kalenić Regional Waste Management Center and the contemporary international practice in the field of collection, treatment and final disposal of leachate from sanitary landfills, the solution with partial, biological leachate treatment at the location of the Regional Center Kalenić was selected, where the quality of lecheate would be brought up to the level of the quality of municipal wastewater. Part of the treated leachate will be recirculated into the landfill body. However, in case of heavy rainfall, and especially in the first months of landfill operation, when there is not enough disposed waste to absorb excess water, there may be a need to remove excess pretreated water off-site to one of the sewerage systems of municipalities within the region which are located in the immediate vicinity of the landfill, or the municipality with which RCUO "Eko-Tamnava" enters into a takeover agreement. The pre-treated water, which would be transported to the selected sewerage system, must be such that it satisfies the conditions of the responsible utility company in terms of quality and quantity.

4.4. Analysis of Gas Exploitation Options

For the controlled degassing of the Regional Sanitary Landfill at Kalenić, according to the technological solution and Terms of Reference, an active method of draining biogas from the landfill body through vertical gas wells (degassers) and a pipeline system that takes the gas to the biogas combustion torch was adopted, as this reduces the harmful effects of methane on the atmosphere. The waste disposal technology requires the system to be passive in the beginning. Gas wells grow in height as the height of the landfill increases, i.e. they are built up together with the formation of the landfill. New ones are added to the existing perforated pipes until the final layer is placed. After the closure of the landfill, the connection of gas wells is gradually started, one by one, to the system for the collection and incineration of biogas. A later connection to the biogas energy utilization system is also possible.

4.5 Analysis of Options for Landfill Bottom and Slope Insulation and Landfill Cover Layer

Within the Preliminary Design, two options for the insulation of the landfill bottom and slopes and the covering layer of the landfill were analyzed.

4.5.1. Analysis of Options for Landfill Bottom and Slope Insulation

The insulation of the bottom and slopes of the landfill bed is performed in order to prevent the penetration of leachate and landfill gases into the land, i.e. the soil and their uncontrolled spillage off-site, which would result in soil, groundwater and surface water pollution, as well as the possible appearance of gases in explosive concentrations and in undefined places.

OPTION 1

Multilayer insulation consists of the following elements:
1. A 50 cm **layer of clay**;
2. **Bentonite composite GCL** (approx. 4,800 g/m2);
3. **Layer of 2.5 mm HDPE foil** (waterproof leachate insulation);
4. **A layer of geotextile**, weighing 1,200 g/m2, approx. 7.5 mm thick, protecting the HDPE foil from gravel penetration.

Above the geotextile layer, a 50 cm thick gravel drainage layer is spread, which serves as a leachate filter layer and has the role of protecting drainage pipes and waterproofing lining from the heavy machinery used as a part of the sanitary disposal technology. Over the gravel layer, waste is disposed of according to the adopted filling plan.

Bottom and Slope Insulation - OPTION 2
Multilayer insulation consists of the following elements:
1. **Trisoplast, mineral barrier, thickness d = 9 cm** and kf≤1x10-12 m/s
2. **A layer of 2.5 mm HDPE foil** (waterproof insulation for leachate);
3. **A geotextile layer**, weight 1,200 g/m2, thickness approx. 8.0 mm, protecting the HDPE foil from gravel penetration.
4. Gravel drainage layer, d = 50 cm
Over the gravel layer, waste is disposed of according to the adopted filling plan.

4.5.2. Analysis of Options for the Final Covering Waterproof Layer
In order to reduce the penetration of precipitation into the body of the landfill, and thus reduce the quantity of leachate, as well as to prevent the diffusion of landfill gas through the inert cover, a multilayer final cover of the landfill is planned, once the planned highest level of waste disposal is reached. The final covering waterproofing layer on the filled landfill is formed in stages in accordance with the phase of exploitation of the landfill. A description of the placement of a waterproof layer over the leveling inert material layer is provided below.

OPTION 1
For the final landfill covering layer, a multi-layer insulation is envisaged, which consists of the following components:
1. A layer of gravel for horizontal gas distribution, 30 cm thick, which is spread over the inert material cover layer. The landfill gas drainage layer consists of 30 cm thick drainage gravel level, in which the landfill gas, which has reached the surface by diffusion through the waste layers, is collected. The gas drainage layer is formed from material whose granulation is approx. 16/31.5 mm. The material should contain less than 30% CaCO3.
2. **A layer of clay**, 50 cm thick and kf≤1x10-9m/s, which is placed over the gas drainage layer. The clay is processed by rolling and compaction, in 15 cm layers, up to the satisfactory density.
3. **Gravel layer for precipitation drainage**. A layer of gravel for precipitation drainage is laid over the clay in a 50 cm-thick layer.
4. A layer of soil for technical reclamation, 100 cm thick, which is placed over the layer of gravel for precipitation drainage. A layer of soil for technical reclamation, 100 cm thick (70 cm of soil of II and III category + 30 cm of humus) is placed over the layer of gravel for precipitation drainage. This layer of soil, together with the biological cover, reduces the penetration of precipitation, while the biological cover makes the cover layer stable and also contributes to the reduction of the permeability of the cover insulation. The method of installation, characteristics, as well as the bill of quantities and the evaluation of the layers for the final cover of the landfill, are given in the Preliminary Civil Engineering Design, 1571.I/04/1.GP.

OPTION 2
For the final covering layer on the landfill, a multi-layer insulation is envisaged, which consists of the following components:
1. **A layer of gravel for horizontal gas distribution**, 30 cm thick, applied over the daily inert material layer (description in item 4.2.1).
2. **Geotextile**, weight 400 g/m2, placed over the layer of gravel for horizontal gas distribution.
3. **Trisoplast**, 7 cm thick kf≤8x10-12m/s
4. **A layer of gravel for precipitation drainage**, 50 cm thick, which is placed over the trisoplast layer.
5. **A layer of soil for technical reclamation,** 50 cm thick, which is placed over the geotextile layer (description as in item 4.2.1.). Upon the completion of technical reclamation works, the works on the landscaping of the landfill body are started, by sowing the appropriate grass mixture. A description of

biological reclamation works, bill of quantities and evaluation is given in the Preliminary Landscaping and Reclamation Design, 1571.I.09.OZ.

4.5.3. Selected Option for Insulation of the Landfill Bottom and Slopes and Landfill Cover Layer

The landfill is designed to meet the necessary conditions for the prevention of the pollution of soil, air, groundwater and surface water and to provide controlled management of leachate and exhaust gases. Soil, groundwater and surface water protection is achieved by combining the geological barrier and the lower impermeable layer during the active phase of the landfill and by combining the geological barrier and the upper impermeable layer during the passive phase after the closure of the landfill. The Regulation on Waste Disposal on Landfills ("Official Gazette of RS", No. 92/10) defines:

• Conditions for the landfill bottom for non-hazardous waste landfills. The bottom and sides of the landfill body should consist of a natural geological barrier that meets the requirements for permeability and thickness, with the combined effect in terms of protection of soil, groundwater and surface water, at least equal to the effect resulting from the following requirements: water permeability coefficient, kf ≤1x10-9m/s, layer thickness ≥ 1 m.

• Leachate conditions - When the geological barrier does not meet the prescribed values, it is insulated by coating the landfill bottom with synthetic materials or natural mineral buffer which must be consolidated so as to obtain an equivalent bottom value in terms of its water permeability properties. Natural mineral tampon should not be thinner than 0.5 m. Additional protection of the landfill bottom is necessary in order to prevent the migration of water into the landfill subsoil by placing an artificial sealing lining – a foil - and spreading a layer of gravel for leachate drainage ≥ 0.5 m. Other methods and techniques can be used to seal the landfill bottom and sides, which ensure the meeting of the above conditions.

• Manner and procedure of landfill closure. After the completed period of exploitation, the non-hazardous waste landfill is closed for further disposal by forming the upper cover layer that meets the following technical requirements:

1) Landfill gas drainage layer ≥ 0.3 m;
2) Impermeable mineral layer ≥ 0.5 m;
3) Reclamation layer ≥ 0.5 m.

Both selected options analyzed in the Preliminary Design meet the requirements defined in the Regulation. In the European practice, both options are common, with OPTION 1 being applied more often, due to lower installation costs, which is also the case for the landfill bottom and slopes and landfill closure in Kalenić. Table 4.5-1. provides comparative prices of insulation of the bottom and slopes of the landfill body and the placement of the cover layer over the Phase I landfill, for OPTION 1, with clay and bentonite and for OPTION 2 with trisoplast as the waterproof layer. The prices are based on the bill of quantities and the estimate given in the Preliminary Civil Engineering Design, 1571.I/04/1.GP.

Table 4.5-1. Comparative Prices of Landfill Bottom and Slope Insulation and Landfill Closure Costs for the Considered Optional Solutions (€)

TYPE OF WORKS	OPTION 1	OPTION 2
Insulation of Landfill Bottom and Slopes, Total	2,676,824.32	2,858,283.30
Placing the Landfill Covering Layer, Total	2,055,318.06	2,278,668.21
TOTAL	**4,732,142.38**	**5,136,951.51**

In accordance with the above information obtained from the Preliminary Design, OPTION 1 has been chosen as the more cost - effective solution.

4.6 Overview of Option Analysis

Table 4.6-1. provides an overview of the analyzed alternative solutions with a description of the selected option.

Table 4.6-1. Overview of the Analyzed Alternative Solutions with a Description of the Selected Option

No.	Criterion	Options Analyzed	Option Selected
0	Waste Management	No options, waste management is defined in the National Strategy and the Regional Waste Management Plan.	**As defined in the Development Project.**
1	Regional Landfill Site Selection	1. Location "TAMNAVA - West Field" ("Kalenić"); 2. Location "BOGDANOVICA" city landfill, the Municipality of Ub; 3. Location "CARIĆ" on the territory of the Municipality of Valjevo.	**"TAMNAVA - West Field" ("Kalenić");**
2	Waste Treatment Options	1. Sanitary landfill only (no waste treatment) 2. Construction of a simple MBT plant without separation of recyclable materials, with the aim of stabilizing waste before disposal and production of compost-like materials. 3. Construction of MBT plant with separation of recyclable materials and indoor composting with the production of compost-like materials. 4. Construction of MBT plant with a configuration that enables the production of high quality alternative solid fuel from waste (SRF) through biodrying. 5. Construction of MBT plant with anaerobic fermentation and energy production. 6. Thermal waste treatment - a plant for incineration of waste with energy production.	**Sanitary landfill only (no waste treatment in Phase 1 of the construction of the Regional Center)**
3	Lecheate Treatment	1. Biological or physical and chemical water treatment at the landfill site and discharge of treated wastewater into the watercourse; 2. Treatment at the landfill site and final disposal of treated wastewater by spillage over the nearby land; 3. Return of the collected raw leachate back to the landfill body; 4. Partial purification of leachate at the landfill location and discharge into the city sewerage network.	**Partial purification of the lecheate on site and recirculation into the landfill body. Excess transported in tanks and released into the city sewerage network, as agreed in an agreement signed between the municipality and RCUO "Tamnava".**
4	Gas Exploitation	1. Incineration in the Incineration Unit; 2. Energy Production.	**Incineration in the Incineration Unit**
5	Landfill Bottom and Slope Insulation and Landfill Cover	1. Option 1- clay and bentonite as the waterproof layer. 2. Option 2- trisoplast as the waterproof layer.	**Option 1- clay and bentonite as the waterproof layer.**

The decision on waste treatment at the landfill, the use of biogas for energy production, reduction of the share of biodegradable waste and compost production must be made in accordance with the applicable legislation, strategic documents of the Republic of Serbia in this area and EU recommendations. It is recommended that this decision is made in the period of 3 years after the construction of Phase 1 of the "Kalenić" Regional Sanitary Municipal (Non-Hazardous) Waste Landfill, i.e. by no later than 2025.

Taking into account the lack of financial resources, 11 cities and municipalities of the Kolubara region and the regional company "Eko-Tamnava" have formally agreed to implement the phased development of RCUO with the construction of the “Kalenić” Regional Landfill:
- The first phase includes the implementation of the basic scenario, i.e. the construction of the “Kalenić” Regional Landfill and RCUO without waste treatment in the short term - 2019-2022. This scenario satisfies the immediate needs of the region and enables the construction of an MBT plant in the future, i.e. in the medium term - 2022-2029 - (II phase of RCUO development).
- Phase II includes the preparation of a Feasibility Study within which waste treatment options would be documented, the preparation of technical documentation for the selected option and construction of a waste treatment plant in the medium term 2022-2029. Activities have begun on the preparation of a Feasibility Study for joining the city of Loznica and the municipalities of Mali Zvornik, Ljubovija and

Krupanj to the Kolubara Waste Management Region. If the results of the study show the efficiency and cost-effectiveness of joint municipal waste management, the Kolubara Waste Management Region would include 15 local governments and would be the largest waste management region with over 500,000 inhabitants, which may affect the choice of technological waste treatment solution.

5. OVERVIEW OF THE ENVIRONMENTAL CONDITIONS ON SITE AND IN THE SURROUNDING AREA

5.1. Demographic Characteristics

Kalenić is a settlement that is closest to the site where the construction of the regional landfill for municipal (non-hazardous) waste is planned, and is about 2 km away from it. According to the 2002 census, there were 888 inhabitants (according to the 1991 census, there were 819 inhabitants) in this village.

Kalenić is a village in Serbia in the municipality of Ub, Kolubara District. According to the 2011 census, there were 759 inhabitants.

There are 675 adults living in the settlement of Kalenić, and the average age of the population is 37.2 years (35.5 for men and 38.9 for women). There are 264 households in the settlement, and the average number of members per household is 3.36. This settlement is largely inhabited by Serbs (according to the 2002 census), and in the last three censuses, an increase in the number of inhabitants has been noticed. Table 5.1-1. provides a comparative overview of the number of inhabitants according to 1948-2002 censuses.

Table 5.1-1. Comparative Overview of the Population in the Settlement of Kalenić according to 1948-2002 Censuses.

Years	No. of Inhabitants
1948	1104
1953	1222
1961	1178
1971	1110
1981	1010
1991	819
2002	888

Table 5.1-2. provides an overview of number of inhabitants by sex and age.

Table 5.1-2. Number of Inhabitants by Sex and Age (Kalenić)

Age	Male	Female
80+	1	7
75-79	11	21
70-74	19	23
65-69	25	28
60-64	21	26
55-59	17	20
50-54	28	19
45-49	39	29
40-44	30	27
35-39	32	26
30-34	32	24
25-29	40	34
20-24	35	38
15-19	25	25
10-14	34	33
5-9	34	22
0-4	35	28
Average	35.5	38.9

Table 5.1-3. provides a comparative overview of the number of households according to 1948-2002 censuses.

Table 5.1-3. Comparative Overview of the Number of Households According to 1948-2002 Censuses

Census Year	1948	1953	1961	1971	1981	1991	2002
No. of Households	212	238	266	273	275	250	264

Table 5.1-4. provides an overview of the number of households by number of Household Members according to the 2002 census.

Table 5.1-4. Number of Households by Number of Household Members According to the 2002 Census (Kalenić)

No. of Members	1	2	3	4	5	6	7	8	9	10 и више	Просечан број чланова
No. of Households	47	58	37	50	41	19	5	5	-	2	3.36

Table 5.1-5. provides an overview of the population over the age of 15 by marital status and sex.

Table 5.1-5. Population over the Age of 15 by Marital Status and Sex (Kalenić)

Sex	Total	Single	Married	Widowed	Divorced	Unknown
Male	355	120	203	19	13	-
Female	347	71	197	71	7	1

Table 5.1-6. (a and b) provides an overview of the population by their commercial activities.

Table 5.1-6. (a) Population by Commercial Activities (Kalenić)

Sex	Total	Agriculture, Hunting and Forestry	Fishing	Mining and Quarries	Processing Industry	Production and Supply	Construction	Trade	HoReCa	Transportation, Storage and Communications
Male	180	47	-	74	8	22	10	1	2	4
Female	73	43	-	10	3	3	1	3	-	-
Both	253	90	-	84	11	25	11	4	2	4

Table 5.1-6 (b) Population by Commercial Activities (Kalenić)

Sex	Financial Mediation	Real Estate	State Administration and Defense	Education	Health and Social Services	Other Services	Private Households	Exterritorial Organizations and Bodies	Unknown
Male	-	2	-	-	2	5	-	-	3
Female	-	1	1	1	4	2	-	-	1
Both	-	3	1	1	6	7	-	-	4

5.2. Flora and Fauna

Information on the flora and fauna in the investigated area is taken from the Report on the Flora and Fauna of OCM “Tamnava West Field" (Company for Coal Production, Processing and Transport RB "Kolubara" d.o.o., Sector for Environmental Protection, Lazarevac 2014).

5.2.1. Vegetation and Flora Segment

Based on the Map of Potential Climatogenic Vegetation of FR Yugoslavia (Stevanović, 1995), the subject area is located in the zone of thermophilic Italian and Turkey oak forests of the *Quercion frainetto* association. The vegetation and flora characteristics of the investigated area before the activities performed by RB Kolubara are practically unknown. The area was once rich in pedunculate oak and ash forests. Today, forest vegetation has been turned into arable land, and it has been completely cleared on the open-cut mine. Natural vegetation remained only along the surrounding rivers and streams in the form of swamps, meadows and smaller forest complexes.

According to the data recorded so far (documentation of RB Kolubara), along the watercourse of the Peštan river there are fragments of forest ecosystems that can be included in the connections *Salicion albae Soo* 1940, *Populion albae* No. B. 1931 and *Alno - Quercion roboris Horv*. 1938 with the greatest dominance of *Salici-Populetum* communities (Tx. 1931) Drees 1936. Fragments of forest ecosystems are followed by ecotonic communities of *Trifolio - Geranietea Muller* 1961. Anthropogenically formed fragments of mesophilic meadow communities are represented by *Molinion coerulae Horv*. 1949, *Calthion Tx* 1937, *Arrhenatherion elatoris Panl.* 1928 and *Agrostion albae (stoloniferae) Soo* (1931) 1971. Meadow fragments belonging to *Festuco - Brometea Br.Bl.etTx* 1943 were recorded in the class of the xero-thermophilic vegetation.

The largest part of the investigated area is extremely anthropogenically conditioned by the works on the open-cut mine. Bare areas and areas in different successive stages of pioneer ruderal vegetation are fragmentarily represented here. Ruderal vegetation of the most recently exposed areas, as well as intensively trampled areas, dry, warm and sunny habitats, local transport infrastructure, etc. it is represented by *Plantaginetea majoris Tx. ex Prsg.* 1950 class and communities of *Polygonetum avicularis Gams* 1927. Ruderal vegetation of the *Agropyretalia repentis Oberd. Mull. et Gors 1967* class is predominantly represented by *Tussilaginetum farfarae Oberd. 1949*. This community is of a typical pioneer character, characteristic of freshly filled or eroded surfaces, tailings of open-cut mines and the like. As for the representatives of the ruderal vegetation of *Artemisietea vulgaris*, fragments of *Agropyrum repens, Tanacetum vulgare, Calamagrostis epigeius* were recorded. Lawn vegetation is represented by the *Festuco - Brometea Br.Bl. et Tx. 1943* class and *Calamagrostetum epigei and Agrostietum* communities.

Trees and shrubbery in the investigated area are represented by secondary vegetation in different successive stages with a significant participation of invasive species. As mostly all habitats in this area are constantly changing, "open" and unstable, foreign, adventitious species (newcomers) and invasive taxa (foreign species that have an exceptional ability to conquer "empty space") are very common. The vegetation of the subject area is shown in the following figures and in Table 5.2.1-1.



Figure 5.2.1-1. Vegetation in the Subject Area

Table 5.2.1-1. Overview of Plant Species Recorded between 17/09 and 31/10/2014 TWF

Family	Species
Apiaceae	*Daucus carota* L.
Asteraceae	**Ambrosia artemisiifolia* L.
Asteraceae	*Arctium* L
Asteraceae	*Artemisia vulgaris* L.
Asteraceae	*Carduus acanthoides* L.
Asteraceae	*Centaurea cyanus* L.
Asteraceae	*Chondrilla juncea* L.
Asteraceae	*Cichorium intybus* L.
Asteraceae	**Erigeron annuus* (L.) Desf.
Asteraceae	**Erigeron canadensis* L.
Asteraceae	*Inula britannica* L.
Asteraceae	**Inula helenium*
Asteraceae	*Lactuca serriola* L.
Asteraceae	*Matricaria inodora* L.
Asteraceae	*Potentilla gracilis* l.
Asteraceae	*Senecio vulgaris*
Asteraceae	Sonchus arvensis L.
Asteraceae	*Tanacetum vulgare* L.
Asteraceae	*Taraxacum* F.H.Wig
Asteraceae	*Tussilago farfara* L.
Asteraceae	*Xanthium* Moretti
Caryophyllaceae	*Silene latifolia* Poiret
Caryophyllaceae	*Stellaria media* (L.) Vill.
Convolvulaceae	*Convolvulus arvensis* L.
Dioscoreaceae	*Tamus communis* L.
Fabaceae	*Lathyrus latifolius* L.
Fabaceae	*Medicago sativa* L.
Fabaceae	**Robinia pseudoacacia* L.
Fabaceae	*Trifolium arvense* L.
Fabaceae	*Trifolium pratense* L.
Fabaceae	*Trifolium repens* L.
Geraniaceae	*Geranium dissectum* L.
Lamiaceae	*Mentha longifilia* (L.) Hudson
Lamiaceae	*Lycopus europaeus* L.
Plantaginaceae	*Plantago lanceolata* L.
Plantaginaceae	*Plantago major* L.
Poaceae	*Agrostis stolonifera* L.
Poaceae	*Bromus ramosus* Hudson
Poaceae	*Calamagrostis epigeios* (L.) Roth
Poaceae	*Festuca rubra* L.
Poaceae	*Holcus lanatus* L.
Poaceae	*Hordeum murinum* L.
Poaceae	*Setaria verticillata* (L.) Beauv.
Poaceae	**Sorghum halepense* (L.) Pers.
Polygonaceae	*Fallopia convolvulus* (L.) A. Love
Polygoniaceae	*Polygonum arenarium* Waldst. & Kit.
Polygonaceae	*Rumex*
Polygonaceae	*Rumex* L
Ranunculaceae	*Ranunculus acris* L.
Rosaceae	*Potentilla reptans* L.
Rosaceae	*Prunus spinosa* L.
Rosaceae	*Rosa canina* L.
Rosaceae	*Rubus* Schot
Rubiaceae	*Galium aparine* L.
Rubiaceae	*Galium verum* L.
Salicaceae	*Populus alba* L.
Salicaceae	*Salix alba* L.
Salicaceae	*Salix cinerea* L.
Scrophulariaceae	*Linaria vulgaris* Miller
Scrophulariaceae	*Veronica persica* Poiret
Simaroubaceae	**Ailanthus altissima* (Miller) Swingle
Typhaceae	*Typha latifolia* L.

*herbs *invasive species


Ambrosia artemisiifolia L.


Erigeron annuus (L.) Desf.


Inula helenium L.


Matricaria inodora L.


Tanacetum vulgare L.

5.2.2. Fauna

Ornithofauna

Table 5.2.2-1 provides information on bird species at OCM „TWF“

Table 5.2.2-1. Bird Species at OCM “TWF“.

Латински назив	Српски назив	Национална заштита	SPEC	Директива о птицама	Бернска Конвенција	Бонска Конвенција
Phalacrocorax carbo	Велики корморан	3			ANEKS III	
Ardea cinerea	Сива чапља	3			ANEKS III	
Egretta garzetta	Мала бела чапља	3	-	-	-	-
Ciconia ciconia	Бела рода	C	SPEC	I	ANEKS II	II
Fulica atra	Лиска	3			ANEKS III	
Larus ridibundus	Речни галеб	3			ANEKS III	
Corvus corone	Црна врана	3				
Corvus corax	Гавран	3			ANEKS III	
Accipiter gentilis	Јастреб	3			ANEKS II	II
Accipiter nisus	Кобац	C			ANEKS II	II
Buteo buteo	Мишар	C			ANEKS II	II
Falco tinnunculus	Ветрушка	C	SPEC		ANEKS II	II
Coturnix coturnix	Препелица	3	SPEC		ANEKS III	II
Phasianus colchicus	Фазан	3			ANEKS III	

National protection - species protected by the Regulation on the Proclamation and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi ("Official Gazette of RS", No. 05/10, 47/11, 32/16 and 98/16). SZ - strictly protected species, Z- protected species.

SPEC – Species of European Concern – According to the European protection requirements (SPEC - Species of European Concern), species are classified into several groups (Birdlife International, 2004). The first group (SPEC 1) includes European species of global importance. The second group (SPEC 2) consists of species whose populations are concentrated in Europe, and which do not have the appropriate protection status in Europe. The third group (SPEC 3) is represented by species whose populations are not concentrated in Europe, and which do not have the appropriate protection status in Europe.

Birds Directive - Member States have to designate special protection areas (SPA) for the species listed in Annex I.

Berne Convention - (Official Gazette of RS - International Agreements, No. 102/07). Species protected by the Convention on the Conservation of European Wildlife and Habitats (enjoying partial protection with the possibility of use under strict control - Annex III to this Convention, strictly protected - Annex II to this Convention)

Bonn Convention - (Official Gazette of RS - International Agreements, No. 102/07). Species protected by the Convention on the Conservation of Migratory Animal Species. Annex II to this Convention means that these are species with an unfavorable conservation status and that their protection needs to be coordinated at the international level.

Bird flocks and individual birds observed at OCM "TWF" are shown in the following pictures.



Figure 5.2.2-1. Flocks and Individual Birds Spotted at OCM “TWF”

Fish, Amphibians and Reptiles

The presence of different life forms in water is evident based on water movement. Measures have been taken by RB "Kolubara" to move a large quantity of fish in the area of the submerged mine to the river Kolubara. The campaign of fish relocation was carried out in cooperation with the Ministry of Agriculture, Fishery Department and will continue until the complete implementation of the pumping project, when all activities in this context will be completed.

In the field, a 7 mm diameter net, 70 m long and 3.5 m wide, was used to catch the fish for relocation. The net was cast 2 times, and the following was caught:

- Carp (*Cyprinus caprio*) age 0+, 320 units,
- Chub (*Leuciscus cephalus*) age 1+, 12 units,
- Nase (*Chondrostoma nasus*) age 1+, 2 units,
- Bleak (*Alburnus alburnus*) age 0+, 1+, 2+, 70 units,
- Goldfish (*Carassius auratus*) age 0+, 1+, 2+, 30 units,
- Barbel (*Barbus*) age 0+, 2 units,
- Pumpkinseed (*Lepomis gibbosus*) age 0+, 7 units,
- European Perch (*Perca fluviatilis*) age 2+, 1 unit

Fishing was continued on 07/10/2014, as well, when 5 nets were cast in the period between 09:00 am and 2:30 pm. The same methodology was used, and the result of the fishing was, as follows:

- Chub (*Leuciscus cephalus*) ages 0+, 1+, 2+, 110 units,
- Carp (*Cyprinus caprio*) age 0+, 550 units,
- Goldfish (*Carassius auratus*) age 0+, 170 units,
- Nase (*Chondrostoma nasus*) age 0+, 5 units,

- European Perch (*Perca fluviatilis*) age 0+, 1+, 9 units,
- Barbel (*Barbus*) age 0+, 12 units,
- Pumpkinseed *(Lepomis gibbosus*) age 0+, 11 units,
- Bleak (*Alburnus alburnus*) age 0+, 1+, 270 units,
- Animals other than fish, age 0+, 11 units.

All fish saved on this occasion was released into the Kolubara river.

The presence of amphibians (frogs) was also noticed, but these were not classified. Also, during the field visit, a grass snake (*Natrix Natrix*) was encountered and photographed in the bed of the Kladnica river.

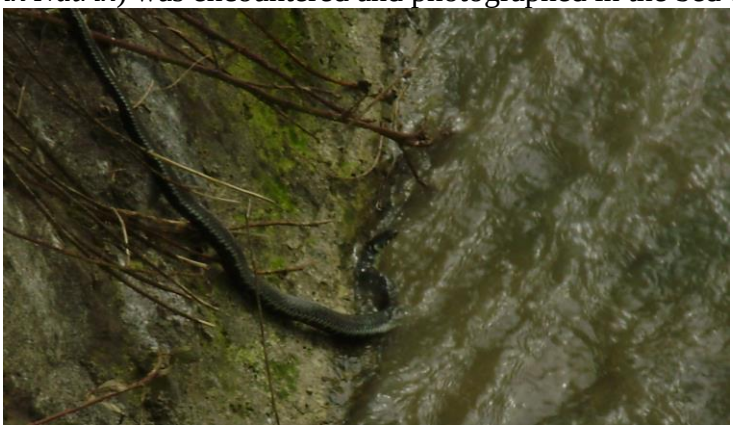


Figure 5.2.2-2. *Natrix natrix*.

5.3. Condition of the Soil, Water, Air

5.3.1. Soil Condition

Several types of soil dominate in the area of OCM “Tamnava-West Field".

Alluvial soil is located along the valley of the Kolubara river and is very fertile despite the hydrogeological conditions of the area, prone to floods, which negatively affect the potential use of that land for agricultural purposes.

Parapodzol and similar soil. This type of soil covers more than 50% of the total area of the Kolubara basin. One of the characteristic features is the formation of an impermeable substrate below the surface, which retains surface waters. Parapodzol is common on the terrain located at an altitude of 100 to 200 m. This soil is of poor composition with relatively high acidity and limited nutrient content. In addition, it’s prone to submersion due to its vertical profile. The humus content varies with depth and on the cross section near Baroševac it ranges from 3.05% in the upper layer of 24 cm below the surface, to 1.11% in the layer of 24 to 46 cm on the soil level. In the lowlands, the humus content is even lower. Drainage and fertilization are necessary for agricultural works on this soil. After treatment, this soil can be used for the cultivation of red clover, alfalfa and other legumes. This type of land is predominant and therefore its agricultural potential is of great importance for the economy of the whole area.

Podzol. This type of soil has a relatively reduced, but still significant yield potential when compared to parapodzol. The level of productivity mainly depends on the basic substrate. In the area of the Kolubara basin, this type of soil is located in regions with increased humidity, therefore, it’s exposed to the risk of increased acidity and leaching of nutrients, as well as to the high probability of erosion.

Soil Quality

Information on soil pollution in the investigated area is taken from the Report on Soil Testing in the Mining Basin (MB) Kolubara prepared by an authorized professional organization (Occupational Safety and Environmental Protection "Belgrade" Ltd., 7 Deskaševa Str) obtained from the competent department of PE "Electric Power Industry of Serbia", Belgrade Branch of MB "Kolubara" Lazarevac.

The basis for the tests of the quality of soil is the Regulation on the Program of Soil Quality Systematic Monitoring, Indicators for Assessing Land Degradation Risk and Methodology for the Development of Remediation Programs ("Official Gazette of RS", No. 88/10) and the Regulation on Limit Values of Polluting, Harmful and Hazardous Substances in Soil ("Official Gazette of RS", No. 30/18), Annex 1, Limit Maximum and Remediation Values of Polluting, Harmful and Hazardous Substances in Soil. Soil testing included sampling and analysis of 22 measuring points at the depth of 0-50 cm.

The coordinates of the places where soil sampling was performed in the MB Kolubara area are given in Table 5.3.1-1.

Table 5.3.1-1. Coordinates of Places Where Soil Sampling was Performed

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No.	Mark	Coordinates		No.	Mark	Coordinates	
		N	E			N	E
1	**Z1**	44º 28' 00.62	20º 16' 28.46	12.	Z12	44º 27' 05.33"	20º 17' 50.62"
2	**Z2**	44º 28' 54.31"	20º 16' 06.31"	13.	Z13	44º 27' 00.91"	20º 19' 14.46"
3	**Z3**	44º 29' 54.08"	20º 15' 21.06"	14.	Z14	44º 26' 50.60"	20º 21' 05.81"
4	Z4	44º 30' 19.07"	20º 12' 39.81"	15.	Z15	44º 26' 23.11"	20º 21' 51.87"
5	Z5	44º 29' 58.85"	20º 11' 25.42"	16.	Z16	44º 25' 08.91"	20º 17' 54.08"
6	Z6	44º 28' 36.75"	20º 11' 21.05"	17.	Z17	44º 24' 17.82"	20º 17' 21.23"
7	Z7	44º 27' 09.80"	20º 12' 31.45"	18.	Z18	44º 24' 11.60"	20º 18' 19.93"
8	Z8	44º 27' 16.02"	20º 13' 41.42"	19.	Z19	44º 23' 47.75"	20º 20' 50.54"
9	Z9	44º 26' 01.09"	20º 13' 53.39"	20.	Z20	44º 23' 25.38"	20º 21' 42.29"
10	Z10	44º 25' 58.44"	20º 15' 09.62"	21.	Z21	44º 23' 04.36"	20º 22' 34.22"
11.	Z11	44º 25' 59.08"	20º 15' 50.77"	22.	Z22	44º 23' 00.75"	20º 24' 01.45"

Figure 5.3.1-1. shows the position of a soil sampling site in relation to the location of the “Kalenić” Regional Landfill.

The soil sampling measuring points nearest to the “Kalenić” Regional Landfill site are Z1 to Z8, whereas other measuring points (Z9 to Z22) are significantly more distant from the location of the future “Kalenić” Regional Landfill. Having that in mind, only the results of the samples taken at Z1 to Z8 measuring points are commented upon in the continuation of this chapter.

Sampling Point: Z1 Veliki Crljeni (pump on M22)
In the examined soil sample, identification number **1909243001**, the analyzed parameters that **exceed limit values** in the soil are **cadmium, chromium, copper, nickel, zinc and arsenic** concentrations.

In the examined soil sample, identification number **1909243001**, the analyzed parameters that **exceed the remediation values** in the soil are the concentration of **chromium and arsenic**



Figure 5.3.1-1. View of the Soil Sampling Site in relation to the Location of the "Kalenić" Regional Landfill.

Sampling Point: Z2 Veliki Crljeni - Water Intake
In the examined soil sample, identification number **1909243002**, the analyzed parameters that **exceed the limit values** in the soil are the concentration of **cadmium, copper, nickel and arsenic.**
In the examined soil sample, identification number **1909243002**, the analyzed parameter that **exceeds the remediation value** in the soil is the concentration of **arsenic**.

Sampling Point: Z3 Stepojevac sumedj
In the examined soil sample, identification number **1909243003**, the analyzed parameters that **exceed the limit values** in the soil are the concentration of **cadmium, chromium, copper, nickel and zinc.**
In the examined soil sample, identification number **1909243003**, the analyzed parameters that **exceed the remediation values** in the soil are the concentration of **chromium and nickel**.

Sampling place: Z4 Kalenić Water Pipeline
In the examined soil sample, identification number **1909243004**, the analyzed parameters that **exceed the limit values** in the soil are the concentration of **cadmium, chromium, copper, nickel and zinc.**
In the examined soil sample, identification number **1909243004**, the analyzed parameters **do not exceed the remediation values**.

Sampling place: Z5 Radljevo – Assembly Plot
In the examined soil sample, identification number **1909243005**, the analyzed parameters that **exceed the limit values** in the soil are the concentration of **cadmium, copper and nickel**.

In the examined soil sample, identification number **19092493005**, the analyzed parameters **do not exceed the remediation values**.

Sampling place: Z6 Kalenić - Retention
In the examined soil sample, identification number **1909243006**, the analyzed parameters that **exceed the limit values** in the soil are the concentration of **cadmium, copper and nickel**.
In the examined soil sample, identification number **1909243006**, the analyzed parameters **do not exceed the remediation values**.

Sampling point: Z7 Skobalj 1
In the examined soil sample, identification number **1909243007**, the analyzed parameters that **exceed the limit values** in the soil are the concentration of **cadmium, copper, nickel and zinc**.
In the examined soil sample, identification number **1909243007**, the analyzed parameters **do not exceed the remediation values**.

Sampling point: Z8 Skobalj 2
In the examined soil sample, identification number **1909243008**, the analyzed parameters that **exceed the limit values** in the soil are the concentration of **cadmium, copper, nickel and zinc.**
In the examined soil sample, identification number **1909243008**, the analyzed parameters **do not exceed the remediation values.**

In three examined samples out of the total of eight, the presence of hazardous and harmful substances above the remediation values was proven, which means that the general functions of the soil are disturbed and that remediation or revitalization measures are necessary.

5.3.2. Condition of Surface Waters and Groundwaters

Surface Waters

In order to analyze the existing surface water quality in the wider area around the future "Kalenić" Regional Landfill, the results of surface water analysis were analyzed as obtained from the Report on Testing the Quality of Wastewater and Surface Water for 2018 and 2019, prepared by the Laboratory for Workplace and Environmental Protection, Occupational Safety and Environmental Protection "Belgrade" Ltd. Belgrade, for the purposes of monitoring conducted by PE "Electric Power Industry of Serbia" Belgrade, MB "Kolubara" Lazarevac Branch.

The basis for the tests of the quality of surface water is the Regulation on Limit Values of Pollutants in Surface and Groundwater in Sediment and Deadlines for their Achievement ("Official Gazette of RS" No. 50/2012) and the Regulation on Limit Values of High-Priority and High-Priority Hazardous Substances Polluting Surface Waters and Deadlines for their Achievement (Official Gazette of RS No. 24/2014).

During 2018 and 2019, surface waters near mines were analyzed. Sampling points, as well as their location are given in Table 5.3.2-1, and Figure 5.3.2-1 shows their position in relation to the future landfill "Kalenić". Based on the obtained results of 2018 analyses, the following conclusion was reached:

Sampling Point: Radljevo Retention
During the month of January, the surface water parameter analyzed, on the basis of which it was concluded that surface water belongs to class II, was the concentration of manganese. The analyzed microbiological parameters (total coliform bacteria and coliform bacteria of fecal origin) in surface waters did not deviate from class II. The analyzed surface water parameters did not exceed the limit values prescribed by the Regulation on Limit Values of High-Priority and High-Priority Hazardous Substances.

Table 5.3.2-1. Surface Water Sampling Points in 2018 and 2019 and Their Coordinates

Sampling Point	Coordinates	Sampling Point Images
Radljevo Retention	N 44º28 '35.43 " E 20º11 '23.85 "	
Kolubara – Pumping Station	N 44º28 '56.3 " E 20º15 '52.6"	
Kolubara after the Influx of Crne Vode	N 44º29 '48.73 " E 20º15 '38.33 "	
Kladnica, Kolubara	N 44º30 '4.05 " E 20º13 '35.99 "	



Figure 5.3.2-1. Position of Surface Water Sampling Points in relation to the Location of the Future "Kalenić" Regional Landfill

During the month of June, the analyzed surface water parameters, on the basis of which surface water was classified as class III, were chloride concentration and iron concentration.

The analyzed microbiological parameters (total coliform bacteria and coliform bacteria of fecal origin) deviate from class III. The analyzed surface water parameters did not exceed the limit values prescribed by the Regulation on Limit Values of High-Priority and High-Priority Hazardous Substances.

Sampling Point: Kolubara - Pumping Station

During the month of July, the analyzed parameter of surface water, on the basis of which surface water was classified as class IV, is the concentration of iron.

The analyzed microbiological parameters (total coliform bacteria and coliform bacteria of fecal origin) of surface water did not deviate from class IV. The analyzed surface water parameters did not exceed the limit values prescribed by the Regulation on Limit Values of High-Priority and High-Priority Hazardous Substances.

Sampling Point: Kolubara after the Influx of Crne Vode

During the month of July, the analyzed surface water parameter, on the basis of which surface water was classified as class B, was the concentration of iron.

The analyzed microbiological parameters (total coliform bacteria and coliform bacteria of fecal origin) of surface water did not deviate from class V. The analyzed surface water parameters did not exceed the limit values prescribed by the Regulation on Limit Values of High-Priority and High-Priority Hazardous Substances..

Sampling Point: Kladnica - Kolubara

During the month of July, the analyzed surface water parameters, on the basis of which the surface water was classified as class B, is the nitrite concentration.

The analyzed microbiological parameters (total coliform bacteria and coliform bacteria of fecal origin) of surface water did not deviate from class V. The analyzed surface water parameters did not exceed the limit values prescribed by the Regulation on Limit Values of High-Priority and High-Priority Hazardous Substances.

Based on the results of analyzes obtained during February and March 2019, the following conclusion was reached:

Sampling Point: Kolubara - Pumping Station

The analyzed surface water parameter, on the basis of which surface water was classified as class III, was chromium concentration.

The analyzed microbiological parameters (total coliform bacteria and coliform bacteria of fecal origin) of surface water did not deviate from class III. The analyzed surface water parameters did not exceed the limit values prescribed by the Regulation on Limit Values of High-Priority and High-Priority Hazardous Substances.

Sampling Point: Kolubara after the Influx of Crne Vode

The analyzed parameter of surface water, on the basis of which surface water was classified as class III, was the concentration of sulfate.

The analyzed microbiological parameters (total coliform bacteria and coliform bacteria of fecal origin) of surface water did not deviate from class III. The analyzed surface water parameters did not exceed the limit values prescribed by the Regulation on Limit Values of High-Priority and High-Priority Hazardous Substances.

Groundwater Quality

For the purpose of preparing the Study of Hydrogeological Research, Analysis of the Current State of the Groundwater Regime with the Proposal of Hydrogeological Measures for Maintaining Groundwater Levels in the Conditions of Exploitation of the “Kalenić” Regional Landfill, information on monitoring the groundwater regime at Open-Cut Mines "Tamnava - West Field" and "Radljevo", at the source of groundwater "Kalenić" and "Tamnava - East Field" and in the area of "Crushing Facility" was obtained for the period 01/01/2017 – 27/02/2019.

Figure 5.3.2-2. shows the locations of piezometers in the overlying, interlayer and bottom aquifers at end of 2018.

In case of overlying aquifer 1, the maximum differences in levels range from 0.01 - 0.28 m, which is a very small difference. In this aquifer, a general trend of level fluctuations cannot be established. In a number of objects, levels decrease during the entire period, in another they increase, while in the third they oscillate around a certain mean value.

The maximum differences in groundwater levels are in the range of 0 - 0.28 m, while the amplitude in the level of 15.6 m was recorded on Piezometer PK5-1, and the amplitude of 1.01 - 1.12 m in the three piezometers. These piezometers are affected by the drainage facilities of the "Tamnava - West Field" mine, but the submitted work schedule of these facilities do not provide more precise conclusions. With all piezometers in this aquifer, the groundwater level rises during the entire observation period, and it is most intense in Piezometer PK5-1.

In the interlayer aquifer, the differences between the maximum and minimum recorded levels range from 0 - 3.44 m, i.e. 0.77 m on average. In most piezometers, a slow trend of rising groundwater levels is noticeable, while in a smaller number, groundwater levels are declining over time.

In the bottom aquifer, in the analyzed period, the average difference between the maximum and minimum groundwater levels is 1.35 m, i.e. the minimum difference is 0.09 m, and the maximum is 9.79 m (Piezometer P-122.5/p). Similar findings in the description of piezometers in the interlayer aquifer can be made here: in most piezometers there is an increase in groundwater levels over time.

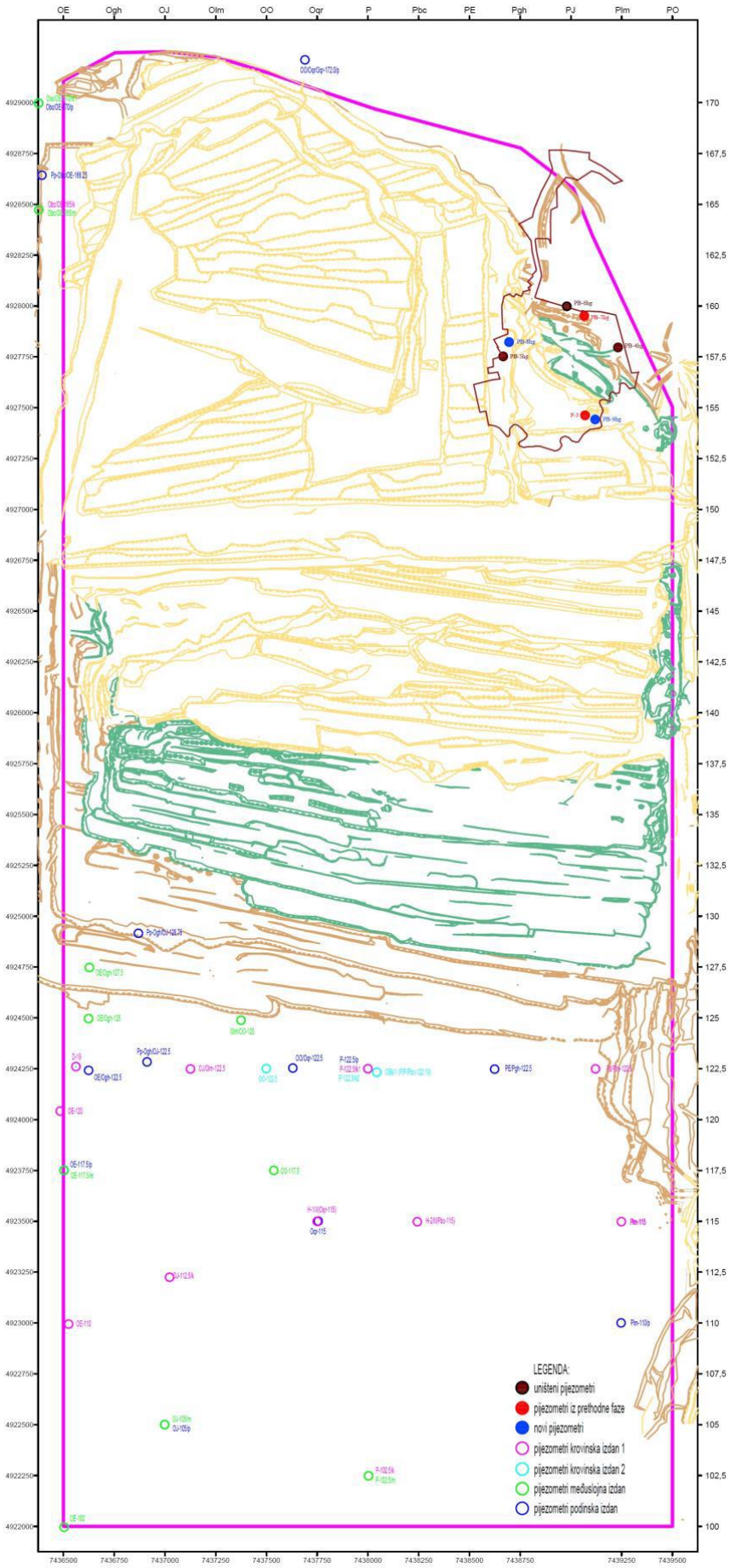


Figure 5.3.2-2. Piezometer Locations in Overlying, Interlayer and Bottom Aquifers

As for the analysis of the spatial distribution of puncturing points for groundwater level monitoring, it can be concluded that piezometers are in a significantly worse position in relation to the location of the "Kalenić" Regional Landfill, compared to the situation in 2013 when the first hydrodynamic model was developed (GeoIng Group, 2015). As a consequence of the May 2014 floods and the advance of the open-cut mine "Tamnava - West Field", a number of piezometers were destroyed. Furthermore, since the piezometers are under the jurisdiction of MB "Kolubara", expert geological services monitor the levels of groundwater in the facilities monitoring the progress of the mine, which is moving away from the location of the landfill. In these conditions, this is certainly an unfavorable circumstance for the provision of data for the location of the landfill. In the area surrounding the location of the "Kalenić" Regional Landfill in 2019, there are practically no piezometers that are in the groundwater monitoring system.

In overlying aquifer 1, the nearest piezometers to the landfill site are those at the site of the Crushing Facility. Out of the eight piezometers at the Crushing Facility site, four were damaged (last level measurement dates ranged from August 2016 to January 2018, depending on the moment of damage. One piezometer (PS-3 (HBS-40/12)) is located outside the area covered by the existing hydrodynamic model. On the remaining three piezometers, the last measurement date is 26/11/2018).

In the period ending in April 2013, observations of groundwater levels in overlying aquifer 1 were carried out on monthly basis, and then there was a trend of rising groundwater levels. Then, there was a series of measurements only in 2015 and in 2016, and one part of piezometers have retained the recorded groundwater levels, while in the other group of structures, the levels have increased by about 0.3 m. In case of time sections in 2017 and January 2018, there was a pronounced trend of declining groundwater levels, and in the last measurement on the remaining piezometers in operation there was an increase (piezometers PD-1 (HBD-1/12) and PS- 1 (HBS-11/12)), i.e. a decrease (piezometer PS-3 (HBS-40/12)) in groundwater levels.

In case of overlying aquifer 2, the nearest piezometer is Obc/OE-165/k located over 2.5 km west of the landfill site.
The situation is similar in the interlayer aquifer. The nearest piezometer is Obc/OE-165/m which is also over 2.5 km west of the landfill site.

In the sub-basin, the nearest piezometer is located northwest of the landfill site (OO/Oqr/Oqr-172.0/p) at the distance of about 1.8 km. The nearest piezometer west of the landfill is Pp-Obc-149 (over 2.5 km) and in the southwest, piezometer Pp-Ogh/OJ-122.5 (over 4 km).

Field exploration works were performed, which included the construction of the total of four wells, three of which are geotechnical wells drilled using the coreing method, piezometric structures were installed in two hydrogeological wells (BD-6gm, BD-7gm, BO-7gm/PB-9hg, PB -8hg) and 4 static penetration experiments were performed in each geomechanical well. Table 5.3.2-2. provides general technical data on exploratory drilling.

Table 5.3.2-2. General Technical Information on Exploratory Drilling.

No.	Mark	Coordinates		Level (asl)	Depth Constructed (m´)	Underground Water Level (m´)	Date of Performance
		Y	X				
1	BD-6gm	7438925.28	4927760.40	74.12	35.0	3.00	23-24/05/2019
2	BD-7 gm	7438820.99	4927808.99	75.34	35.40	4.20	21-22/05/2019
3	BD-7 gm/PB-9hg	74399119.82	4927442.13	71.96	30.70	4.20	23-24/05/2019
4	PB-8 hg	7438695.59	4927822.29	93.56	40.00	23.62	23-26/05/2019

5.3.3. Air Quality

Air quality in the wider area around the future Regional Landfill "Kalenić" was analyzed based on the results of air pollution measurements in the area of RB Kolubara by an authorized professional organization (Occupational Safety and Environmental Protection "Belgrade" Ltd., Deskaševa 7). Two measuring points within the Kolubara Mining Basin were selected. Figure 5.3.3-1 shows the micro-location with measuring points in relation to the location of the future regional landfill "Kalenić".



Figure 5.3.3-1. Image of micro-location with measuring points, relative to location of the future Regional Landfill "Kalenić".

The basis for measuring air quality is the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation Amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) and Regulation Amending the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 63/13), Schedule XV, Section A, Maximum Permitted Concentrations.

Pollutants the concentration of which was measured:
1. Sulfur dioxide
2. Nitrogen dioxide
3. Soot
4. Suspended particles PM10
5. Metal content (As, Cd, Pb, Ni) in PM10
6. Elemental and organic carbon content in PM10
7. Content of RANs in PM10
8. BTEX
9. Sediments (total, soluble, insoluble, ash)
10. Metal content in soluble sediments
11. Anion content in soluble sediments

Measuring point 1 is defined at the location of the Kalenić water supply system, which is at 108 m above sea level.

Sampling was performed in the period from 08 August 2019 to 31 August 2019, and sediments in the period 01 August to 31 August 2019.

Concentrations of **sulfur dioxide** and **nitrogen dioxide** do not exceed the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10). Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as the Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13) Schedule X Section B. Limit value, tolerance value and tolerance limit in the measurement period.

Soot concentrations **do not exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10). Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as the Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13) Schedule XV Section A. Maximum permitted concentrations in the measurement period.

Concentrations of **suspended particles PM10 exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10). Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13) Schedule X Section B. Limit value, tolerance value and tolerance limit **two days** in the measurement period.

Pursuant to the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no.63/13) Schedule X, limit values are defined for **benzene** for the averaging period for the calendar year. Since the obtained results are related to the fifteen-day examination of the stated parameter, they cannot be compared with the limit and target values.

Toluene concentrations do not exceed the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13), Schedule XV, Section A, Maximum permitted concentrations for the protection of human health in the case of dedicated measurements.

Concentrations of **lead in suspended particles (PM 10) do not exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13), Schedule X, Section B, Limit value, tolerance value and tolerance limit.

Pursuant to the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no.63/13) Schedule XV, limit values are defined for arsenic and nickel for the averaging period for the calendar year, as well as Schedule XII defining target values for **arsenic, cadmium, nickel, and benzo(a)pyrene** also for the average annual value of the total content of suspended PM10 particles. Since the obtained results refer to

a fifteen-day examination of the stated parameters, they cannot be compared with the limit and target values.

Concentration of **total sediments exceeds** the value prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no.75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13),Schedule XV, Section A, Maximum Permitted Concentrations.

Measuring point 2 is defined at the location of the Strelište Sumeđ, which is at 82 m above sea level. Sampling was performed in the period from 08 May 2019 to 27 May 2019, and sediment in the period 08 May – 10 June 2019.

Concentrations of **sulfur dioxide do not exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10). Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13) Schedule X Section B. Limit value, tolerance value and tolerance limit in the measurement period.

Concentrations of **nitrogen dioxide do not exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10). Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13) Schedule X Section B. Limit value, tolerance value and tolerance limit in the measurement period.

Concentrations of **soot do not exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10). Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13) Schedule XV Section A. Maximum Permitted Concentrations in the measurement period.

Concentrations of **suspended particles PM10 do not exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10). Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13) Schedule X Section B. Limit value, tolerance value and tolerance limit of two days in the measurement period.

Pursuant to the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no.63/13) Schedule X, limit values for **benzene are defined** for the averaging period for the calendar year. Since the obtained results refer to a fifteen-day examination of the stated parameters, they cannot be compared with the limit and target values.

Concentrations of **toluene do not exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality

requirements (the "RS Official Gazette", no. 63/13), Schedule XV, Section A, Maximum permitted concentrations for the protection of human health in the case of dedicated measurements

Concentrations of **lead in suspended particles (PM10) do not exceed** the values prescribed by the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 63/13), Schedule X, Section B, Limit value, tolerance value and tolerance limit.

Pursuant to the Regulation on monitoring conditions and air quality requirements (the "RS Official Gazette", no. 11/10), Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no. 75/10) as well as Regulation amending the Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no.63/13) Schedule XV, limit values are defined for arsenic and nickel for the averaging period for the calendar year, as well as Schedule XII that defines target values for **arsenic, cadmium, nickel, and benzo(a)pyrene** also for the average annual value of the total content of suspended particles RM10. Since the obtained results refer to a fifteen-day examination of the stated parameters, they cannot be compared with the limit and target values.

5.3.4. Noise, electromagnetic radiation, light radiation, radiation

Data on noise levels in the wider area of the future Regional Landfill "Kalenić" is taken from the Report on noise testing in the open space from the impact of surface mines "Field C" and "Field Radljevo" of the Kolubara Mining Basin. Noise measurement was performed on 11 July 2018, at three measuring points (measuring point 1: settlement of Baroševac, in front of the entrance gate of the household of Radojica Jovićić, measuring point 2: settlement of Baroševac, part of the settlement of Strana and measuring point 3; settlement of Radljevo, in the center of the settlement, near the memorial), during the day, evening and night. Measurement of noise levels in the environment was performed by the Laboratory for Protection of Work and Natural Environment, Department of Acoustic Testing and Pressure Equipment, "Zaštita" Belgrade, in accordance with the Standards SRPS ISO 1996-1:2010, Acoustics-Description, measurement and evaluation of noise in the environment / Part 1: Basic values and assessment procedures, and SRPS ISO 1996-2:2010, Acoustics-Description, measurement and evaluation of environmental noise / Part 2: Determination of environmental noise levels.

Figure 5.3.4-1 shows the position of the measuring points at which the noise level was measured, which are located in the wider zone of the future Regional Landfill "Kalenić":



Figure 5.3.4-1. Position of measuring points in the wider zone of the future Regional Landfill "Kalenić"

Measuring point 1: Settlement of Baroševac, in front of the entrance gate of the household of Radojica Jovićić. Table 5.3.4-1 shows the values of equivalent noise levels (LAeq) obtained on the basis of measurements of communal noise levels at measuring point 1.

Table 5.3.4-1. Value of equivalent noise levels (LAeq) for **Measuring point 1**

Laeq dB(A)		
Day	Evening	Night
48,8	45,6	45,6

Measuring point 2: Settlement of Baroševac, part of the settlement of Strana. Table 5.3.4-2 shows the values of equivalent noise levels (LAeq) obtained on the basis of measurements of communal noise levels at measuring point 2.

Table 5.3.4-2. Value of equivalent noise levels (LAeq) for **Measuring point 2**

Laeq dB(A)		
Day	Evening	Night
44,6	44,9	43,0

Measuring point 3: Settlement of Radljevo, in the center of the settlement, near the memorial. Table 5.3.4-3 shows the values of equivalent noise levels (LAeq) obtained on the basis of measurements of communal noise levels at measuring point 3.

Table 5.3.4-3. Value of equivalent noise levels (LAeq) for **Measuring point 3**

Laeq dB(A)		
Day	Evening	Night
48,5	42,3	40,0

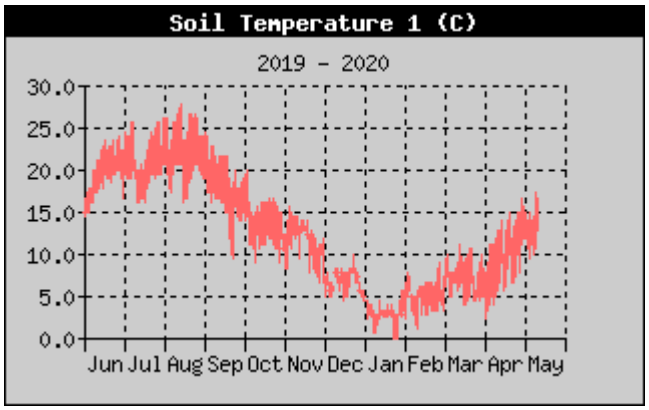
The measuring points are located on the border of the business complex and residential zones and the limit values of noise indicators are determined in Clause 4, Schedule 2 of the Regulation on noise indicators, limit values, methods for assessing noise indicators, disturbance and harmful effects of noise in the environment (the "RS Official Gazette", no. 75/10): 60 dB(A) for day and evening and 50 dB(A) for night.

The measurement determined that the relevant levels do not exceed the limit values of the noise indicator.

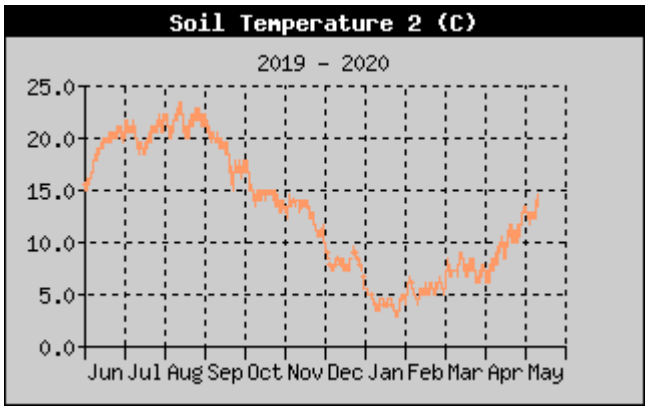
5.4. Climate characteristics

Data on soil temperature, soil moisture and air pressure were taken from the automatic weather station Sovljak, which is located on the territory of the Municipality of Ub, at a distance of about 15 km southwest of the location of the future Regional Landfill. The weather parameters are given for the period June 2019-May 2020.

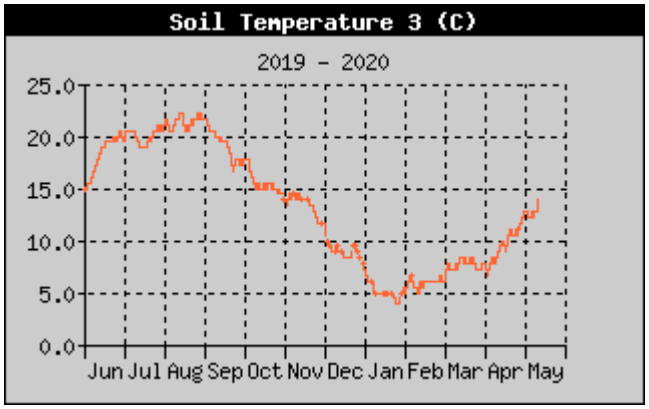
Figure 5.4-1 shows the movement of soil temperature at a depth of 10-50 cm per month for the period June 2019-May 2020.



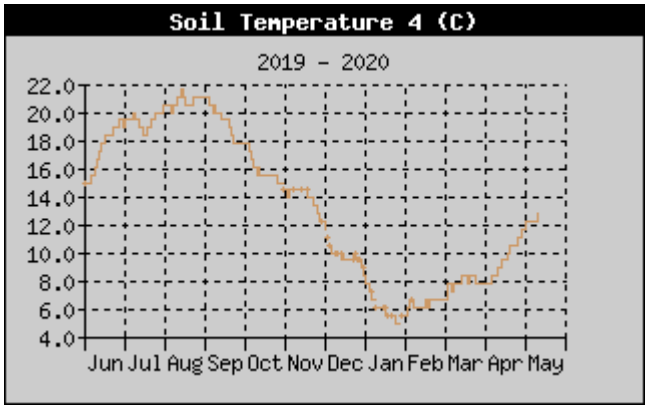
a) soil temperature at 10 cm



b) soil temperature at 20 cm



v) soil temperature at 30 cm

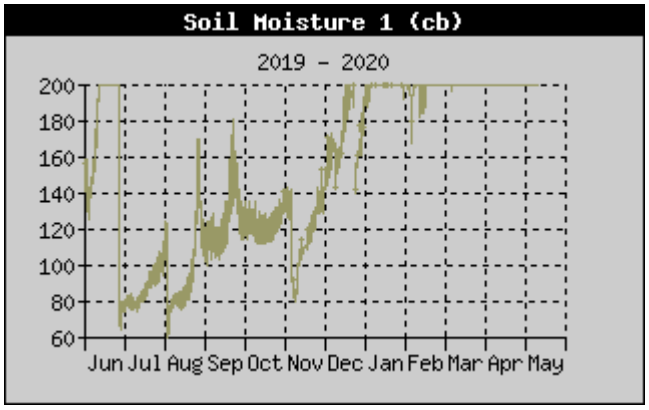


g) soil temperature at 50 cm

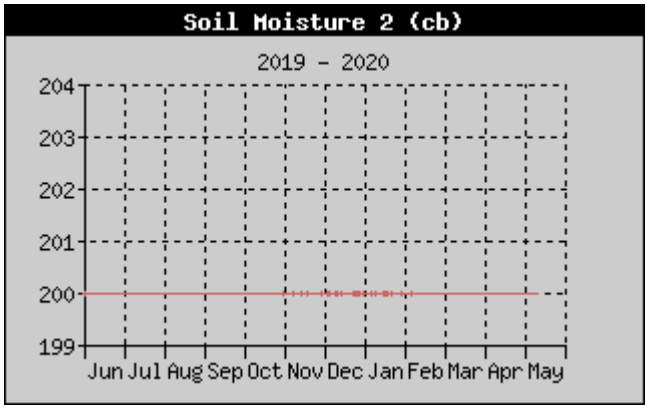
Figure 5.4-1 Movement of soil temperature at 10-50 cm,
for the period June 2019-May 2020

It is evident from the graph that soil temperatures are highest in the summer period (June, July, August), when they exceed 25°C. On the other hand, the lowest temperatures were, as expected, recorded in the winter. In January 2020, the recorded soil temperature ranged from 0-5°C at 10-50 cm.

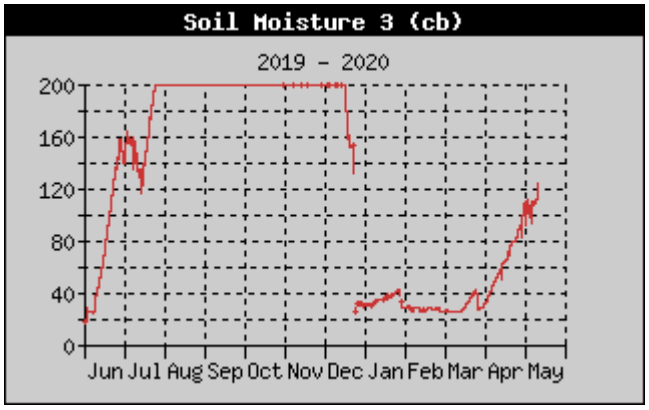
Figure 5.4-2 shows movement of soil moisture at a depth of 10-50 cm by month for the period June 2019-May 2020.



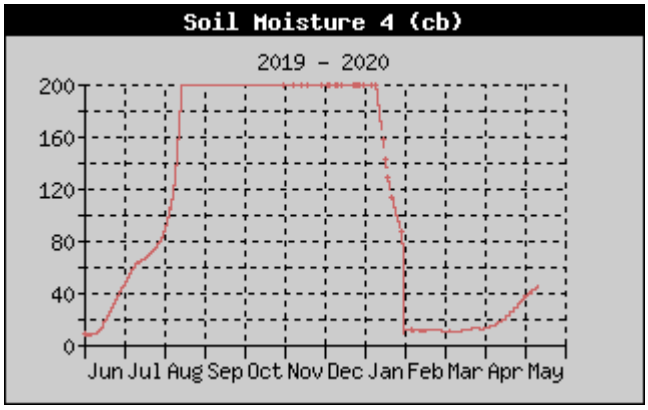
a) soil moisture at 10 cm



b) soil moisture at 20 cm



v) soil moisture at 30 cm



g) soil moisture at 50 cm

Figure 5.4-2 Movement of soil moisture at 10-50 cm,
for the period June 2019-May 2020

Figure 5.4-3 shows movement of air pressure by month for the period June 2019-May 2020.

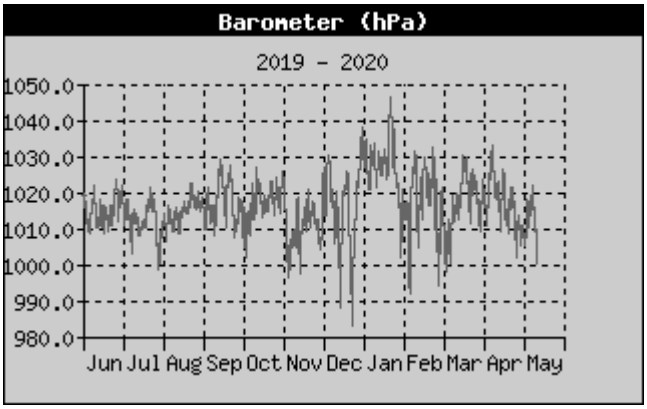


Figure 5.4-4 Movement of air pressure.

It is observed that the highest value was recorded in January 2015, around 1045.0 hPa, and the lowest in December 2019, 983.0 hPa.

Data on other weather parameters from the automatic weather station Sovljak was not available (http://www.meteos.rs/ams/sovljak/data.php?p=8).

5.5. Protected resources (natural resources, immobile cultural and historical monuments)

According to Decision of the Institute for Nature Protection of Serbia 03 no. 020-3172/2 of 03 December 2018: On cadastral plot no. 800, Cadastral Municipality Kalenić, where the construction of the regional landfill for municipal waste "Kalenić" is planned, there are no protected areas for which a protection procedure has been carried out or initiated, environmentally important areas and environmental corridors of international importance of the ecological network of the Republic of Serbia, as well as recorded natural goods.

According to the Conditions for undertaking technical protection measures for the construction of the regional landfill for municipal waste Kalenić on cadastral plot no. 800, Cadastral Municipality Kalenić, on the territory of the municipality of Ub, issued by the Institute for the Protection of Cultural Monuments Valjevo (no. 1143 of 05 December 2018): On the area envisaged for the construction of the regional landfill for municipal waste Kalenić on cadastral plot no. 800, Cadastral Municipality Kalenić, there are no identified or recorded immovable cultural goods, or goods that enjoy prior protection.

5.6. Landscape

The meritorious landscape area for the construction of the Regional Landfill "Kalenić" is a part of PK "Tamnava–West Field", bordered by a triangle between SUP-1 coal export strip, the existing (natural) Kladnica riverbed /which has been relocated/ and the prefabricated plot.

The planned location for the construction of the regional landfill is one of the excavation fields in the Kolubara lignite basin, which is located within the area of ongoing / now completed / surface exploitation, as a result of which the natural characteristics have been disturbed, i.e. the existing vegetation is endangered, as well as other landscape features. As a result of intensive mining activities and occupation of the meritorious space, which, above all, have an impact on the physical characteristics of the landscape, which means the loss of fertile land, vegetation, fauna and, of course, the disappearance of settlements. In the zone of surface mine /PK Tamnava-West Field/ there were negative changes in the landscape, especially in terms of composition, character and quality, and thus negative visual impacts due to disturbed basic landscape features, thus it can be said that the landscape is significantly degraded, anthropogenically and overall. (Figure 5.6-1).

Surface coal mining has completely changed the relief of the area, thus building special geomorphological phenomena - the so-called anthropogenic relief. Hypsometrically speaking, the northern part of the area intended for the landfill body is dominated by a hill of deposited material, where the elevations of the terrain are from 100.59 to 94.00 m above sea level. In the northern part of the subject area, there is a section of the existing road Kalenić - Veliki Crljeni, with an access road turning to the complex of TPP "Kolubara B", as well as part of the watercourse of the Kladnica River. The area envisaged for dedicated facilities, service buildings and water management facilities located in the northern and northwestern part of the terrain, is at even altitude (about 89 m above sea level). Administrative buildings are mostly about 94 m above sea level. Along the eastern border, service road, as well as in the part where Administrative building is envisaged /by the urban planning solution/, are mostly about 94 above sea level. The southern border, which extends over the internal landfill, is at an altitude of 80 m above sea level. The lowest part of the terrain is in the area around the accumulation - lake, where the elevations of the river banks are around 65 m above sea level.



Figure 5.6-1 Part of the PC "Tamnava - West Field" planned for the construction of the Regional Landfill "Kalenić".

With the built retention dams in the basin of the Kladnica River / part of the protective system of the surface mine "Tamnava – West Field"/, the waters of Kladnica were redirected, i.e. the Kladnica riverbed was destroyed in its middle part of the watercourse, and in the lower part of the watercourse it was retained, as a recipient for the discharge of atmospheric water from the Regional Landfill Complex and from the battery limit of TPP "Kolubara".

West of the subject area /on the left bank of the Kladnica River/, an asphalt road was built, which starts from the road Kalenić-Veliki Crljeni, first to the south and then east /passing through the area within the Urban Planning Project/ and ends at the entrance to the complex of "prefabricated plot"- industrial complex "Tamnava-West Field". The largest part of the adopted site is the currently a degraded area /as already mentioned/ which served as an internal landfill of the surface mine. In the area of Tamnava West, the main watercourse is the Kladnica River, which along the stretch near TPP "Kolubara B" has long ago turned into a watercourse with intermittent flow. Forest fragments of aquatic, coastal vegetation are present along the Kladnica River, as well as along Duboki Potok.

5.7. The interplay of the environmental factors

The overall assessment of the state of the environment in the explored area was the result of a comprehensive analysis of the existing results of measuring soil quality, air quality, surface and groundwater and noise levels, which were performed for the purpose of environmental monitoring by accredited laboratories engaged by PE "Electric Power Industry of Serbia" Belgrade Branch RB "Kolubara" Lazarevac. The obtained results indicate that there was degradation in the quality of certain segments of the environment in the analyzed area, mostly as a result of mining activities and operation of thermal power plants. The preparatory works for the construction of the regional landfill for municipal waste "Kalenić" represent a measure of rehabilitation and reclamation, i.e. developing the area in accordance with its planned purpose.

6.0. DESCRIPTION OF THE POSSIBLE SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE PROJECT

The global analysis of the impact of the regional sanitary landfill on the environment shows that negative impacts can be manifested in all phases of the landfill useful life (in the phase of construction, exploitation and its closure).

The impacts that occur as a consequence of the execution of works on the formation of the landfill body, construction of facilities and accompanying infrastructure are mostly temporary in nature. The consequence is the presence of people and machines, as well as technology and organization of works. As a rule, negative impacts on the environment occur as a result of transport and installation of construction materials, and in the case of accidental spillage of oil products from construction machinery.

The impacts on the environment that occur as a consequence of waste disposal over time have a mostly permanent character and as such certainly represent the impacts that are particularly interesting from the point of view of the interplay between sanitary landfill and the environment.

6.1. Description of the significant environmental impacts of the project in the landfill construction phase (temporary impacts)

6.1.1. Air impact

During the construction phase, mechanization and temporary traffic infrastructure are the main causes of air pollution due to the large amount of dust. The entire construction site will not be constantly exposed to intensive work. This means that different amounts of suspended particles (SPM) will be generated on different parts of the construction site. It is to be expected that the suspended particles will be the main air pollutant associated with internal roads, borrow pits and material unloading / loading zones. Construction activities that can lead to formation of dust are as follows:

- Transport of materials on unpaved roads on or off the construction site,
- Excavations, transport of excavated material, funding of buildings and roads, especially during dry periods,
- Transport, use and storage of raw materials and excavated earth.

During these activities, the machinery and equipment that will be used produce large amounts of dust in the construction site and the surrounding area, while trucks for transporting raw materials and soil also emit pollutants such as carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO2) and volatile hydrocarbons. Dust emissions can cause negative effects on flora and fauna by preventing photosynthesis, disturbing the fauna or disturbing the functioning of their respiratory system. The small number of vehicles and machinery, combined with a sufficient distance from the settlement (Kalenić settlement - 1.5 km) and the existing use of local land (zone of surface mines and thermal power facilities), ensures that the impacts on the air are not significant. The excavated material will be temporarily deposited in a suitable part of the site and will be used as a daily cover material during the operational phase of the landfill. The amount of dust emitted from unpaved surfaces varies widely, ranging from 1 to 10 kg per kilometer traveled by vehicles. Since the excavated material will be transported only a short distance within the complex, the emission of dust due to transport will be negligible.

6.1.2. Surface water impact

Activities that can lead to surface water pollution are reduced to physical disturbances, i.e. diversion, diversion, spread and deposition of air pollutants. These activities, which can also cause negative impacts on land and other goods, can result in increased pollution of surface watercourses.

Potential impacts on surface water quality may be:

- Leakage of dirty water from the site leading to pollution of the surrounding land (especially during rainy periods),

- Inadequately resolved issue of fecal water from temporary camps for workers. These wastewaters are characterized by high values and concentrations of parameters such as BOD5, suspended particles, nitrates and a large number of coliform bacteria. If this wastewater is discharged without prior treatment, there can be significant negative impacts on water quality.
- Spillage of fuel or lubricants from vehicles and machinery or waste water caused by washing vehicles, workshops, etc.
- The construction of the landfill complex requires the formation of borrow pits and embankments on site. Linear flows from these formations may contain high concentrations of suspended particles (SS). These negative effects can be significant only during rainy periods.
- Due to the intensive use of machinery and vehicles (loaders, trucks, excavators, etc.), the suspended particles will be mostly composed of various pollutants such as oil, lubricants, heavy metals, etc.

6.1.3. Underground water impact

During the construction phase, activities related to impacts on groundwater relate to works on the construction of the landfill, which includes the removal of the surface layer of soil and the uncovering of layers of soil with lower water permeability. These activities can cause infiltration of contaminants into the soil, leakage of contaminating fluids or leaching of products from unpaved surfaces. Groundwater pollution can also be caused by activities such as maintenance of machinery and vehicles used on site (lubricants, fuels) or by fecal wastewater from temporary camps for workers' accommodation. These impacts, except in the case of major spills, will not be of major importance because, as mentioned earlier, the duration of the construction phase is limited in time, and most of the pollutants will be absorbed in the surface layers of the soil.

6.1.4. Soil impact

Impacts on soil during the construction phase include soil erosion, physicochemical degradation, changes in local topography, and soil pollution. Extensive earthworks on the leveling of the terrain necessary for the realization of the first phase of construction of the landfill body with accompanying facilities and infrastructure are planned. In principle, the division into terrain leveling was made into two zones:

- the zone of buildings, traffic, handling and parking areas and the temporary construction road necessary for the implementation of the planned works,
- landfill body zone.

The estimated amount of excavation is over 420,000 m^3 of material and embankment of over 160,000 m^3. Part of the excavated material in the landfill body area (Phase I), with poor geomechanical properties, will be permanently removed and deposited in areas outside the planned works and in the later stages of development of the regional landfill. Material with good geomechanical characteristics will first be excavated from the mentioned zones,, in order to free up space for depositing inferior material, and in order to use such material with better geomechanical characteristics for backfilling and projected leveling in the works zones for the first phase of the regional landfill, and all in accordance with the results presented in the Study on geotechnical conditions for the construction of the regional landfill for municipal (non-hazardous) waste "Kalenić" (Geoing, July 2019).

Such physical disruptions can lead to changes in soil compaction, its capacity for moisture accumulation, natural drainage, the content of organic matter, as well as organisms that live in the soil.

Soil erosion, removal of surface layers or depth changes can lead to subsidence or landslides.

Soil pollution caused by on-site or off-site work can be caused by intentional or accidental leaks of fuel, hazardous liquids or oil products (from equipment or vehicles) on the construction site.

6.1.5. Noise impact

The construction phase of the landfill includes various activities such as excavations, use of cleaning equipment and site preparation, installation of an impermeable lining on the bottom of the cells as well as

the construction of perimeter embankments. During these activities, mechanization for the execution of works (loaders, excavators, backhoe loaders, trucks), as well as earth removal machines will be actively engaged and will represent generators of significant amounts of noise at the location and in the surroundings. Also, trucks for transporting materials, which will be used for construction, will additionally contribute to the increase of noise levels. In any case, it is to be expected that the construction phase has a limited duration, and the probability that all the equipment operates at the same time is not realistic, that is, it is very unlikely. Therefore, the noise generated in the construction site zone will be comparatively low, while the impacts considered adverse are direct, short-term, reversible and are unlikely to be too significant.

The following text shows the noise levels in decibels dB (A) at a distance of 10 m from different types of machinery and trucks used in construction:

- Large universal loader – 76 dB (A)
- Bulldozer – 69 dB (A)
- Vibration roller – 78 dB (A)
- Tracked excavator – 69 dB (A)
- Truck crane (crane engine only) – 71 dB (A)
- Freight truck – 80-85 dB (A)

The noise impact will be of a local character and the people who will work at the location in question will be exposed to the greatest impact. The impact on the population will not be significant considering that the subject location is more than 600 m away from the nearest individual residential buildings, i.e. more than 1500 m from the nearest populated place.

6.1.6. Human health impact

Workers engaged in the construction of the landfill will be exposed to hygienic, safety and security risks during the following activities:

- Excavations,
- Work with heavy machinery,
- Work in a very noisy environment (e.g. near working machines),
- Lifting and loading heavy loads.
- In addition, dust can cause local discomfort, causing respiratory problems.

Impacts can be assessed as minimal or significant, depending on the situation, especially if the necessary measures are taken into account, i.e. if adequate working conditions are provided that enable a safe atmosphere.

Building construction often involves exposing workers to increased levels of solid particles and gas emissions. Exposure to such substances increases health and safety risks for workers and the surrounding population. These impacts are considered negative, indirect, short-term, reversible and moderately significant.

Also, there are health and safety risks associated with the operation of heavy trucks, e.g. if a worker falls off a truck or is injured by a sharp object such as glass, metal or wood. This can lead to open wounds and lacerations that can become infected and cause serious problems. Due to the short-term and clearly defined nature of the construction phase of the facility, these activities can be controlled and the risks minimized.

Adequate supervision, good work practice as well as implementation of appropriate safety measures will minimize the possibility of occurrence of the described incident situations for workers and the population.

6.1.7. Meteorological parameters and climate characteristics impact

No negative impacts on meteorological parameters and climatic characteristics of the subject area are expected in the work execution phase.

6.1.8. Flora and fauna impact

Potential impacts of the regional landfill on the environment during the construction phase have been identified, and their significance has been assessed on the basis of the following parameters:

- Habitat quality
- Plant and animal species exposed to influences
- Size/extent of exposed habitats/species
- Duration of impact
- Intensity of changes in the environment

The location of the future regional landfill is situated on a terrain that has suffered a significant anthropogenic impact and is not of great importance from the aspect of negative environmental impacts. The existing ground cover and physiognomy of the terrain are characterized by a small diversity of flora and a simple structure. During the construction phase, all plant cover on the site will be removed, and excavation activities can lead to the appearance of dust, which will to some extent cover the surrounding plants and lead to a decrease in their productivity. Removing the surface soil cover will instantly destroy vegetation and organisms living in the near-surface earth layers. Slightly more pronounced disturbances can occur due to noise caused by the movement of vehicles and people on the construction site. Excavations at waste disposal sites can lead to the disappearance of habitats or breeding sites for animals living underground. The main construction activities with potentially negative impacts on biodiversity are earthworks, construction of facilities, disposal of construction waste and discharge of liquid substances. However, the potential impacts from the mentioned sources are considered minimal, and only a small number of animal species can be under a certain influence, that is, their migrations to neighboring areas can occur.

Positive impacts can be expected due to planting greenery and landscaping around the administrative building, i.e. landscaping by planting grass, low and medium shrubs, while respecting the minimum distance from buildings and installations, as well as due to the necessary start of developing the green protective belt. These works will result in beneficial effects on all segments of the environment, and in the final synergy of influences, they will have a beneficial effect on the surrounding vegetation and flora segment, both forest and even more agricultural segment.

6.1.9. Population, concentration and migrations

The proposed project will have a positive impact on the socio-economic environment, because the collection and treatment of municipal waste will be organized, and thus the quality of life of population in the region covered by the project will be improved. In terms of employment opportunities, the local population will have priority in finding employment (skilled / unskilled labor). The possibility of opening construction sites of this type in the region generally has a positive effect on the social and economic life of the population, primarily due to the increase in employment opportunities for the local workforce.

6.1.10. Purpose and exploitation of land

Having in mind that the subject location of the regional landfill is currently a degraded area, which served as an internal dump for tailings from surface mines, no significant negative changes in topographic and geological characteristics are expected during the implementation of the proposed project. These parameters will not be exposed to additional negative influences, while minimal changes can be expected in terms of certain characteristics of the appearance of the environment and micro-location.

6.1.11. Municipal infrastructure impact

During the construction phase of the regional landfill with the accompanying infrastructure and facilities, the traffic activity will be increased, which will have a temporary, but still significant impact. The delivery of raw materials and equipment from smaller or larger distances will affect the development of unusual traffic activity. This impact is considered negative, direct, short-term, reversible and not too significant.

6.1.12. Impact on natural resources of special significance and immobile cultural monuments

Within the planned location and in its surroundings, there are no natural resources, historical or archaeological sites, or monuments intended for protection, so there are no negative impacts of the project on them.

6.1.13. Landscape impact

In the phase of execution of works, the following negative effects of the so-called visual disturbances may occur due to:

- Existence of construction site,
- Storage of construction materials,
- Dust emission,
- Disposal of excavated material.

All the mentioned influences are negative. However, since the projected location is not visible from the surrounding settlements, these impacts can be considered insignificant.

Preparatory works for the construction of the Regional Landfill for Municipal Waste "Kalenić", which are envisaged by the project, represent a measure of rehabilitation and reclamation, i.e. development of the space in accordance with the planned purpose. As part of the construction of the Regional Landfill complex, the development of a green belt around the complete location is also planned. In addition, other measures are planned that will contribute to the improvement of the aesthetic characteristics of the complex.

6.1.14. Waste disposal impact

During the regional landfill construction phase, typical solid waste to be generated includes waste generated by land clearing activities, then waste generated through dispersion of light fractions (e.g. plastic, metal sawdust, etc.) and waste generated during construction activities.

Various activities on the construction and operation of camps for accommodation of workers will cause the creation of a certain amount of solid waste. Bad practices in the management of this waste can cause unpleasant odors and infectious diseases, which can have negative consequences for the environment.

In the area provided for the landfill body (its first phase of construction), piles of deposited material were formed, which were mostly built of coal dust, fine-grained sand and pieces of coal. Due to its heterogeneous lithological and granulometric composition, looseness, high water permeability and high content of organic and combustible substances (18.57%), the material must be removed during construction works, due to poor engineering geological properties. The largest amount of excavated soil, i.e. soil with poor geomechanical characteristics, will be permanently removed and deposited in areas outside the planned works and in later stages of development of the regional landfill.

Practically, the only waste that needs to be taken into consideration is the municipal waste generated in the camp for temporary accommodation of workers. Provided that this waste is properly managed, and taking into account the fact that the works will last relatively short, the impact of waste that will be generated during the construction of the landfill with supporting infrastructure and facilities can be considered relatively insignificant.

6.2. Description of the significant environmental impacts of the project the active phase of the landfill (long-term impact)

6.2.1. Air impact

There are no special emission limit values during the operation of the landfill. However, there are certain standards on human exposure to gases proposed by the World Health Organization (WHO) and the Organization for Health and Safety at Work (OSHA). The main concern during the active phase of the landfill is the emission of harmful gases. Air pollution during the operational phase can be caused by:

- Formation of dust due to the movement of waste trucks, especially during dry periods of the year,
- Formation of dust from the landfill body due to the disposal and compaction of waste and inert material or due to the transport of waste,
- Generation of landfill gas - methane and carbon dioxide are gases that contribute to the greenhouse effect,
- Risk of fire and explosion,
- Release of unpleasant odors,
- Exhaust gases from vehicle engines,
- Scattering of small fragments of waste by wind,
- Occurrence of toxic particles of heavy metals in the atmosphere (lead, cadmium, mercury and others).

A more detailed description of these impacts is given below:

Increasing landfill gas emissions during the operation of waste disposal cells

At the landfill, during the exploitation, waste materials are decomposed, and in that process gases are released. In addition to landfill gas, air pollution can also occur due to the spread of dust and unpleasant odors from the landfill and from the work of mobile machinery that will be engaged at the landfill.

Municipal waste is a very complex and heterogeneous material, which in everyday conditions is mostly in a solid state, and is generated as a result of human life and work. Municipal waste is, for the most part, waste from food processing and consumption (residues of animal and plant origin). The most important characteristic of these wastes is that they rot easily and decompose quickly, especially in summer, at high air temperatures, so although they do not belong to the category of hazardous and harmful substances, they must be regularly removed from the place of collection (due to relatively high content of organic substances that are subject to fermentation). During the disposal of untreated municipal waste, landfill gas is developed.

The formation and spread of unpleasant odors is accompanies the process of waste decay. Microorganisms that decompose waste (bacteria, algae, fungi, molds, etc.) require certain conditions for growth and reproduction, such as certain humidity, temperature, certain proportion of C, O and N, certain pH value… Decomposition of the organic part of waste is accompanied by the formation of gases. The gas present in the aerobic phase (the first phase after waste disposal) contains O_2 and N_2. In this phase (in the presence of oxygen) CO_2, H_2O and nitrates are also formed as products. As oxygen is consumed, anaerobic conditions are increasingly prevalent. When anaerobic conditions prevail, O_2 decreases to almost zero, and N_2 to less than 1%. The main products of anaerobic digestion are CO_2 and CH_4. Anaerobic digestion takes place in two phases. In the first phase, optional microorganisms act (they can live with or without oxygen) that produce simple organic acids, such as e.g. acetic (CH_3COOH), propionic (C_2H_5COOH), pyruvic ($CH_3COCOOH$), etc. and various alcohols. In the second phase, methanogenic bacteria begin to act. They live in conditions without oxygen, so they decompose simple organic acids and alcohols to the final products: CO_2 and CH_4. Gases generated during aerobic and anaerobic decomposition of organic matter in landfills can directly or indirectly affect the environment. CH_4 and CO_2 are present in the largest amount, while H_2S, NH_3, N_2, various aldehydes, mercaptans, etc. are present in a smaller amount. The average composition of landfill gas varies depending on the conditions in which the landfill is located, and the stages of waste decomposition. Namely, per one cubic meter of disposed waste, depending on the composition, about 0.4 m3 to 0.5 m3 of landfill gas is released, in which the concentration of methane and carbon dioxide makes up about 90% of the total volume. A typical landfill gas composition is shown in Table 6.2.1-1.

Table 6.2.1-1 Typical landfill gas composition.

Component	Composition, %
Methane	47,40
Carbon dioxide	47,00
Nitrogen	3,50
Oxygen.	0,80
Paraffin hydrocarbons	0,10

Aromatic hydrocarbons	0,20
Hydrogen	0,10
Hydrogen sulfide	0,01
Carbon monoxide.	0,10
Trace components	0,50

The formation of biogas in a landfill with about 50% methane can have a detrimental effect on the environment for the following reasons:

1. In confined spaces biogas is explosive when the concentration of CH_4 in the air is between 5 and 15% and the mixture with more than 15% is flammable.
2. In confined spaces biogas can cause suffocation of staff.
3. When diffusing through the soil, methane can gradually destroy vegetation.
4. Methane has a great influence in creating the greenhouse effect.

The negative impact of methane formation is its impact on the final vegetative cover. Although methane is not toxic to plants, the production of certain amounts of methane in the root zone leads to a lack of oxygen and wilting of plants. H_2S and CO_2 have a similar effect. Methane is a gas that in a certain ratio with air makes an explosive mixture, so there is a danger of explosion, and the greenhouse effect is affected 11 times more than CO_2. A further problem caused by the formation of gases can be an unpleasant odor caused by traces of H_2S and the formation of organic compounds - such as mercaptans. The odor is removed by collecting and burning gases or covering the waste with a layer of inert material. The impact of CO_2 on the environment is reflected in the fact that it is heavier than air and falls to the bottom of the landfill, where it dissolves in water and increases the corrosiveness and acidity of leachate. During the aerobic phase, the largest amount of CO_2 is generated at the landfill, while the transition to anaerobic conditions significantly reduces its amount. In the event of an environmental accident, unpleasant odors and methane explosions may develop. Protection against air pollution is achieved by applying appropriate disposal technology with control and evacuation of gases created in the landfill body. Evacuation of gases generated in the landfill body is performed through ventilation wells. (biothorns).

The mounting of biothorns for the collection of landfill gas is not the subject of the design for construction permit and will be addressed in some subsequent documentation.

Increased emission of dust and particles from landfills and trucks

Dust and particles that are released during the unloading of solid waste into the cell area are carried by the wind, which results in air pollution in the surrounding area. Everyday work at the landfill will be accompanied by the creation of a certain amount of dust. This impact is considered negative, direct, long-term, reversible and not too significant.

Emissions of unpleasant odors due to the disposal of solid waste on the cells

Air quality is also affected by dust and unpleasant odors. For this reason, care should be taken to regularly cover the disposed waste with inert material. Unpleasant odors at the landfill occur as a result of anaerobic decomposition of organic parts of waste. Sulfur compounds (from the organic component) are converted to sulfides (S^{2-}) which in combination with hydrogen form hydrogen sulfide (H_2S). It is the cause of unpleasant odors (like rotten eggs) and is felt at a distance of 400 m from the landfill. To eradicate the odor, the disposed waste must be covered with an inert material. The green belt around the landfill also reduces unpleasant odors.

Unpleasant odors during leachate management and treatment

Impacts caused by unpleasant leachate odors can be mitigated by optimizing the leachate treatment plant, the operation of which can reduce odor production (e.g. through quality aeration). This impact is considered negative, direct, long-term, reversible and moderately significant.

6.2.2. Surface water impact

During the active phase, impacts on surface waters may occur through the uncontrolled discharge of atmospheric water into which leachate has entered or petroleum products have spilled or leaked from landfill machinery. Therefore, surface water pollution can only occur in the event of an emergency. In addition, the depositing of pollutants from the air can have a negative impact, which again implies non-compliance with the prescribed protection measures.

6.2.3. Underground water impact

Groundwater pollution can occur due to:

- Leakage of leachate through potential damage to the protective impermeable layer at the bottom and/or on the sides of the body of the landfill or lagoon in which its pre-treatment is performed;
- Release of leachate due to uncontrolled drainage;
- Gasoline or oil leaks within the work area or storage areas, as well as from vehicles (also in the event of an accident);
- Migrations of biogas through unprotected parts of the landfill body.

In the case of regular operation, groundwater will not be exposed to the negative effects of the landfill. The greatest negative impact on groundwater (and therefore on soil and, indirectly, on surface water, is the possibility of leakage of leachate.

Leachate

The water contained in the solid waste, as well as the water that infiltrates the landfill, forms a medium in which all soluble substances dissolve and which causes the movement of unreacted material downwards, towards the bottom of the landfill - leachate filtrate. The chemical characteristics of leachate - filtrate are influenced by various physical-chemical processes: oxidation-reduction processes, dissolving of organic and inorganic material in waste, adsorption/desorption, reactions between organic acids and metals, forming the appropriate metal ions, i.e. salts, chemism of CO_2 that reacts with calcium and magnesium salts and causes an increase in the hardness of leachate and others. Microbiological degradation processes of biodegradable organic substances also have a significant influence on the characteristic properties of the filtrate.

The degradation processes of a communal landfill can be generally divided into four phases. The first, initial phase is characterized by aerobic processes in which atmospheric oxygen is intensively consumed for oxidative hydrolysis of carbohydrates, proteins and fats from organic waste. During this phase, the acidity of the environment slowly increases, the pH decreases, which also enables accelerated dissolution of inorganic ingredients. The second phase is a transitional phase in which the degradation of organic substances gradually becomes an anaerobic process in which the primary products of aerobic degradation are further anaerobically degraded. Already during this phase, the acidity of the medium is locally lowered to pH = 5. This process enriches the landfill filtrate with many inorganic ions, such as cations Ca, Mn, Fe, Cu, Zn, Cr and others, i.e. anions, such as sulphate, chloride, nitrate, nitrite, phosphate, etc. Higher fatty acids are broken down by β-oxidation to acetic acid CH_3COOH, and in parallel with this process, significant amounts of CO_2 and H_2 develop, while nitrogen from the air is intensively consumed. In the third acidic and anaerobic phase, CO_2 is still released, acids are intensively formed, and due to the microbiological activity of acetic acid, methane (CH_4) begins to be formed.

The first three phases are relatively short, 180 to 200 days. In the fourth, methane phase, the landfill matures, i.e. there is a balancing of anaerobic processes within which CO_2 and H_2 are released relatively evenly. It is very difficult to predict the actual composition of leachate, because it depends on a number of variable factors such as: waste composition, temperature and moisture content, liquid trajectory, landfill thickness, waste decomposition stages, the possibility of interlayers to adsorb and remove pollution and quality of water that infiltrates the landfill.

Tables 6.2.3-1 and 6.2.3-2, show data on the quality of leachate filtrate from typical sanitary landfills (USA, Russia, Europe), as well as laboratory data obtained by testing waste from the landfill "Vinča". It

can be seen that this last data differs significantly from the data of the USA, Russia, and Europe. The discrepancy of the data is most likely a consequence of the fact that the data from the "Vinča" landfill were obtained in laboratory conditions, while all other data were obtained by direct testing of leachate (filtrate) from the existing sanitary landfills.

Table 6.2.3-1 Data on quality of leachate from sanitary landfills in the USA and Russia, as well as laboratory data from Belgrade waste.

Parameter	Leachate filtrate of a typical sanitary landfill (1)		Typical sanitary landfill in the USA (2)	Sanitary landfill in the USA, Wisconsin (3)	Testing of Belgrade waste (4)		Typical sanitary landfill in Russia (5)
	Range limits	Typical values			Range limits	Typical values	
BPK5	2000-30000	10000	2000-15000	400-40000	25400-32000	28800	7400
Total organic carbon	3000-45000	18000	1000-10000	/	/	/	/
HPK	1500-20000	6000	5000-40000	500-50000	16850-59450	49060	12900
Total solid suspension	200-1000	500	100-400	100-1000	/	/	/
Nitrogen of organic origin	10-600	200	/	/	/	/	/
Nitrogen-ammonia	10-800	200	/	0-350	/	/	/
Nitrates	5-40	25	/	/	0,75-4	2,04	/
Total phosphorus	1-70	30	/	/	/	/	/
Orthophosphorus	1-50	20	/	/	/	/	/
Alkalinity (CaCO3)	1000-10000	3000	/	/	/	/	/
pH	5-8,5	6	4,8-7,5	5,7-7,6	6,46-6,9	6,7	5,3-9,1
Total hardness (CaCO3)	300-10000	3500	1000-10000	500-10000	17100-34680	26290	/
Calcium	200-3000	1000	60-2500	/	2080-9800	6060	/
Magnesium	50-1500	250	100-500	/	2160-2990	2690	/
Potassium	200-2000	300	50-1000	/	443-1580	845	/
Sodium	200-2000	500	10-4000		5050	/	/
Chlorides	100-3000	500	100-2400	100-2500	5250-8050	5830	55000
Sulphates	100-1500	300	25-500	/	2000-3000	2350	/
Total iron	50-600	300	10-100	0-500	218-358	296	/

(1) Mr Branislav S.Tanasić, Comparative analysis of modern procedures for neutralization of household waste, 1982.
(2) Dr Jeffey M.Zauria, Ashifillis and Leachate, Waste age, November 1986.
(3) Phil O'Zeary and Berrin Tansel, Leachate control and treatment, Waste age, May 1986.
(4) Mr Milija Jovičić, Process Development in Municipal Waste Landfills, Conference in Belgrade, December 1991
(5) V.M.Perelegin and V.V.Raznoščik, Gipčena počvi and sanitarija očistka naseljenih mest, Medicina, Moscow, 1977

Table 6.2.3-2. Data on quality of leachate (filtrate) from sanitary landfill and municipal sewerage for Europe (1).

Br.	Parameter	Sewerage water	Sanitary solid waste		
			Min.	Median	Max.
1.	Turbidity	/	Slight	Medium	Exceptional
2.	Color	/	/	Green	Black
3.	Odor	/	Slight	Evident	Strong
4.	Temperature, ºC	/	10	15	30
5.	pH value	/	3,5	7,5	9
6.	Conductivity, µS/cm	200-170	2000	10000	25000
7.	Solid residue after evaporation mg/l	/	300	8000	50000

Table 6.2.3-2. Data on quality of leachate (filtrate) from sanitary landfill and municipal sewerage for Europe (1).

Br.	Parameter	Sewerage water	Sanitary solid waste		
			Min.	Median	Max.
8.	Solid residue after combustion mg/l	/	800	3000	20000
9.	BPK5, mg O2/l	200-400	100	1500	50000
10.	HPK, mg O2/l	400-600	500	60000	/
11.	Oxygen (O2), mg/l	/	0	0	10
12.	Chlorides (Cl-), mg/l	130-200	100	2000	15000
13.	Sulphates (SO42-), mg/l	/	50	300	3000
14.	Nitrates (NO3-), mg/l	Traces	0	3	50
15.	Phosphates (PO43-), mg/l	3-5	0,01	1	10
16.	Fluorides (F-), mg/l	/	/	/	/
17.	Cyanides (NC-), mg/l	/	/	/	/
18.	Ammonium ion (NH4+), mg/l	40-50	/	/	/
19.	Sodium (Na+), mg/l	260-320	/	/	/
20.	Potassium (K+), mg/l	20-15	/	/	/
21.	Calcium (Ca2-), mg/l	65-95	/	/	/
22.	Magnesium (Mg2+), mg/l	6	/	/	/
23.	Aluminium (Al3+ mg/l	Traces	/	/	/
24.	Mineral oils, mg/l	/	0,1	1	3
25.	Chlorinated solvents (KOCl3) mg/l	/	/	0,1	/
26.	Polycyclic aromatic compounds, mg/l	/	0,02	0,1	1
27.	Carboxyl compounds (all), mg/l	/	0,001	0,006	1

(1) Data obtained from the Austrian company AGRU-ALOIS GRUBER GmbH, BAD HALL, Austria

The low pH value of leachate, as mentioned earlier, is a consequence of anaerobic biological activity that stabilizes the landfill material, and most metals are poorly soluble at these pH values. Based on the data from Tables 6.2.5-1 and 6.2.5-2, 10.000 mgO_2/l can be taken as the value for BPK_5 as the average biological pollution of the leachate.

Bacteriological contamination of leachate is also extremely high. 1.5 million bacteria were found in 1 ml of filtrate, of which 34,000 were intestinal (coli-index). The average value of filtrate pollution in terms of the total number of bacteria is at the level of urban fecal water, but it is two to three times higher based on coli-index. The results of bacteriological and epidemiological studies of leachate from the landfill are given in Table 6.2.3-3.

Table 6.2.3-3. Bacteriological composition of leachate filtrate from landfill.

Name of bacteria	Values
1. Escherichia coli in 100 ml of water	1000
2. Enterococcus (streptococ. faecalis)	isolated 6h
3. Proteus (in all measurements)	isolated
4. Clostridium perfringens	isolated
5. Salmonella	not isolated
6. The total number of live germs in 1 ml of the tested sample after 48 h is: $12x10^6$ at 37°C and 271.800 at t=22°C	

Special attention must be paid to wastewater management (leachate, wastewater from vehicle washing and disinfection services, atmospheric water flowing from areas where vehicles will be parked before and after washing, which may be oily or contaminated with waste and sanitary-fecal wastewater) to prevent their leakage into soil and groundwater.

Leakage of leachate can occur for several reasons (Figure 6.2.3-1.):

- Due to unidentified leakage through the insulation,
- Due to mechanical damage to the insulation.
- Pollution of soil and groundwater due to undetected leakage of leachate.

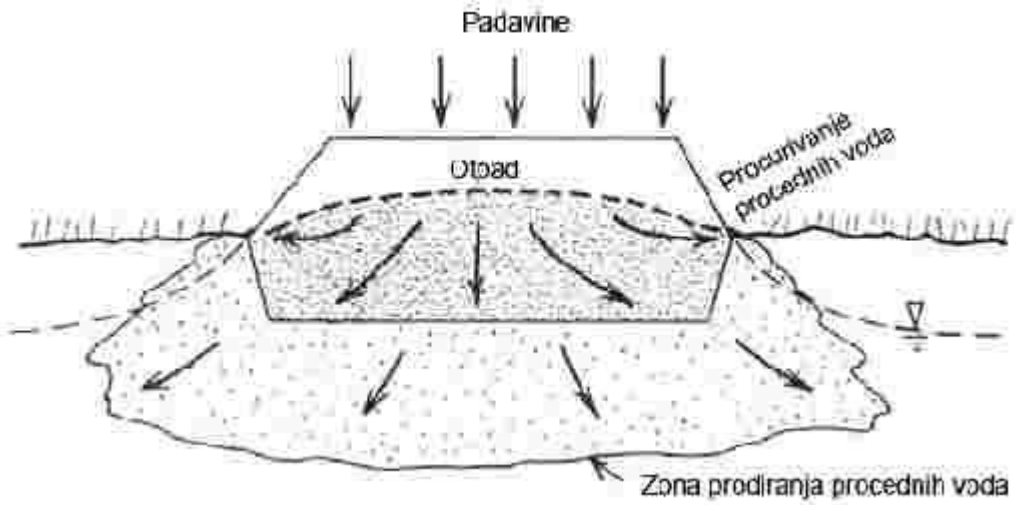


Figure 6.2.3-1. Movement of leachate from landfill (Freeze and Cherry, 1979; reworked with permission from Pearson Education, Inc., Upper Saddle River, NJ).

A poorly chosen cell and lagoon insulation system can lead to a situation where the protective layer does not have sufficient impermeability, which would make it difficult to detect any leaks. As a result, pollution of the surrounding land and groundwater may occur. This impact is negative, direct, long-term, reversible and very significant.

The risk of soil and groundwater contamination due to accumulation of leachate in unprotected areas as a result of possible leakage can be reduced by building an efficient drainage system at the bottom of cells/cassettes, with a pump system that will transport leachate to lagoons where it will be partially treated. This impact is considered positive, direct, long-term, reversible and very significant.

There is also a danger of leakage of wastewater from the vehicle washing and disinfection services and water that drains from the areas where vehicles will be parked before and after washing, which together with leachate are collected and partially treated in aeration and sedimentation lagoons.

When it comes to sanitary wastewater, it is necessary to collect it in a controlled manner in septic tanks and treatment because, regardless of the fact that they are not of the same quality as leachate, they can cause contamination of both groundwater and surface water.

Having in mind the current situation at the location of the future landfill, it can be concluded that the risk of groundwater pollution can be relatively high. This impact is negative, direct, long-term and irreversible. Samples with leachate in surrounding wells are indicators that leachate is spreading uncontrollably. Samples in which leachate occurs are a clear indicator of the problem, so its timely detection is vital for preserving the quality of the environment, as well as the health of the surrounding population. Cracks and fissures in the ground, i.e. damage or holes in the insulation system increase the risk of leachate leakage.

Monitoring groundwater levels is of particular importance. Currently, the groundwater level is maintained and monitored by pumping out from the wells, by the responsible persons of the Kolubara mine, in order to ensure the smooth operation and exploitation of the surface mine. As the work on the exploitation of the surface mine progresses, there is a possibility that the groundwater level will increase and the exploitation of the landfill will be endangered.

For the needs of the Project for the construction permit, the Hydrogeological Research Study was prepared (Energoprojekt - Hidroinženjering a.d., Belgrade, June 2019). Excerpts from the Study are given in the text below.

The aim of the Hydrogeological Research Study is: to predict the type, scope and specification of works on the supplement to the observation network; perform an analysis of water supply possibilities for the needs of the landfill; perform an analysis of the current state of groundwater levels; perform an analysis of the possibility of maintaining the groundwater level in the conditions of exploitation of the facilities of the regional landfill and give a proposal of technical measures which would maintain the groundwater level of the landfill at the permitted levels; define the characteristics of drainage wells, determine potential places for monitoring groundwater and soil.

Technical documentation was requested for the realization of the set goals, and it was submitted by RB "Kolubara". The following data was obtained: current and projected conditions of P.K. "Tamnava – West Field" and P.K. "Radljevo", the current state of the spring "Kalenić" and spring "Tamnava - East Field", as well as the condition of groundwater levels in observation facilities in the wider area of P.K. "Tamnava - West Field" and "Radljevo" for the period 2017-2019.

The obtained data was the basis for reviewing the groundwater regime in all three aquifers in the wider area of the regional landfill "Kalenić": overlying, interlayered and underlying aquifer. Due to its distribution and thickness of aquifer sand, the bottom issue is especially significant. Precisely this aquifer, as the main carrier of groundwater at the location of the landfill, is necessary to drain, i.e. lower the groundwater level to the set elevation below the body of cassette 1 of the landfill..

For the purposes of preparing technical documentation, exploration works were performed in order to obtain the necessary data for the development of technical solutions, development of professional designs and obtaining a building permit. The most important thing for the hydrogeological study is that the observation network was thickened and valid data on groundwater formed in the underlying sands were obtained.

In order to thicken the observation network and obtain valid data on groundwater formed in the underlying sands, piezometer structures were installed in two exploration wells (PB-8 and PB-9hg).

The results of drilling and analysis made it possible to supplement the knowledge about the investigated terrain, which achieved greater reliability in the design of technical solutions.

The contemporary approach in the hydrodynamic analysis of the groundwater regime implies the development of a hydrodynamic model and the implementation of identification calculations and simulation of the regime on it. The first multi-layered hydrodynamic model of the wider area of the regional landfill "Kalenić" was made in 2015 and it covered the entire area of the surface mine "Tamnava - West Field", as there were indications that the projected dynamics of coal exploitation and activities to protect the mine from groundwater would have certain impact on the groundwater regime at the landfill site. Verification of this model was carried out in the same year for the conditions prevailing in the wider area of the regional landfill "Kalenić" and surface mine "Tamnava - West Field" in late May 2014, after the historic floods that caused flooding of the entire surface mine and caused significant rise of groundwater levels.

The main purpose of the hydrodynamic model is to simulate the assumed states of groundwater regime, either as a consequence of a technical solution, or as a consequence of different hydrometeorological and/or hydrological conditions of surface flows that have a hydraulic impact on groundwater.

The concept of conducting a hydrodynamic analysis of the current condition of the groundwater regime at the location of the regional landfill "Kalenić" was conditioned by the fact that in the area near the landfill there are no hydrogeological facilities that are in the system of regular monitoring of professional services RB "Kolubara", which is somewhat expected since, due to the expansion of the surface mine "Tamnava – West Field" to the south, this location is not of interest for monitoring. Also, as a result of the mine flood in May 2014, a significant number of piezometers were destroyed. The analysis of groundwater regime in the wider area of the landfill location concluded that during the period 01 January 2017 – 2 7February

2019 the groundwater level generally did not change, with the exception of a few piezometers. Also, at the location of the landfill, there were only two facilities (piezometers PB-7 and P-3) that were not in the monitoring system of RB "Kolubara". In the second half of May 2019, two new piezometers (PB-8 and PB-9) were mounted, and in the period 27 March – 17 June 2019, short-term monitoring was carried out on all four piezometers at the landfill site, which is not in accordance with the required level of detail of the Study.

The aforementioned caused that the concept of conducting a hydrodynamic analysis of the current state of the groundwater regime in the wider area of the landfill "Kalenić" takes place through several phases on the existing hydrodynamic model of the wider area of the regional landfill, i.e. through:

1) Innovation of the existing (basic) model of the wider area of the regional landfill (thickening of the discretization network in the area of the regional landfill "Kalenić"; entry of current terrain surface elevation; actualization of the geometry of lithological members in the area covered by the model; inspection and actualization of the piezometric network; entry of groundwater level data for the selected time section; inspection and actualization of wells (number of wells in operation and their capacities) at "Kalenić" spring; entry of wells in operation and their capacities at the spring "Tamnava - East Field"; actualization of mining works at the mine "Tamnava – West Field" and system for protection of the mine from groundwater; modification of part of the border conditions in accordance with new knowledge about the terrain and as a consequence of the progress of mining works),

2) Recalibration of the (basic) model of the wider area of the regional landfill in stationary conditions,

3) Separation of the sub-model of the regional landfill "Kalenić" from the existing one and implementation of non-stationary identification calculations, and

4) Implementation of forecast calculations for protection of the regional landfill body (cassette 1) from groundwater.

The existing hydrodynamic model has been retained due to the fact that it has repeatedly achieved very good harmonization of model parameters with the natural regime of groundwater, which allows a higher degree of reliability of forecast calculations, as well as the fact that on the existing model it will be relatively easy to set the front of progress of mining works on the "Tamnava – West Field" mine, the advance of which to the south will negatively affect the increase of groundwater levels at the location of the landfill. It should be emphasized that the mentioned concept of conducting hydrodynamic analysis is largely forced by the short deadline for the realization of the calculation on the one hand, and modest information on the condition of the groundwater regime at the landfill site (which cannot be improved within the given deadlines) on the other hand.

Recalibration of the basic model (wider area of the regional landfill) was performed for stationary conditions of the groundwater regime that prevailed from the end of 2018, which is conditioned by the quality of input data and available condition of mining works at the open pit "Tamnava – West Field" which has a pronounced impact on groundwater.
The recalibration of the model was done manually and automatically with the help of the PEST program, keeping the matrices of the values of the filtration coefficient from the previous model, determined by the PEST program with the regularization option. In order to assess the quality of the recalibration of the hydrodynamic model, a statistical analysis of the results of groundwater regime simulation and analysis of the correlation between the registered and calculated values of levels in 70 piezometers was performed, indicating a generally good congruity between registered and calculated levels in the observation facilities, with six exceptions. The total error in the groundwater balance expressed as the difference between the total groundwater inflow into the model and the total runoff from it is only 0.00011%.

The recalibration of the existing hydrodynamic model of the wider area of the regional landfill "Kalenić" served to identify the hydraulic parameters of the hydrogeological environment and to determine the

groundwater regime overlying, interlayered and underlying aquifer. Given that the location of the regional landfill has a very small amount of groundwater monitoring data, this approach is justified. As in the period from March to June 2019, short-term observations of groundwater levels were performed on newly constructed (PB-8 and PB-9) and existing piezometers (PB-7 and P-3), the identification of parameters of non-stationary groundwater regime was performed. The area of the regional landfill was separated from the basic model with the "Telescopic Mesh Refinement" option, on which non-stationary calibration of the model was performed, and later forecast calculations.

Calibration of the sub-model was performed for the time period from 27 March – 17 June 2019. Regarding the harmonized groundwater levels, it can be concluded that the model is well calibrated to the levels (except for the PB-9 piezometer). On this occasion, it is reminded that neither the number of piezometers, nor their spatial distribution (there are no piezometers in the overlying and interlayered aquifer), nor the number of performed measurements are adequate for the set task. However, these data represent a qualitative shift compared to previous hydrodynamic surveys at the "Kalenić" regional landfill site, conducted in 2015 and 2016. Also, the analysis of the magnitude of the error in the groundwater balance is more than satisfactory - the difference between the total inflow into the model and the total runoff from it for each time step is far below the accepted recommendation of 1%.

Defining the concept of analysis of the possibility of maintaining groundwater levels in the conditions of exploitation of the facility of the regional landfill "Kalenić" through the implementation of forecast calculations followed only after the development and completion of the sub-model calibration. This was due to the following reasons: the existence of short deadlines for the construction of observation facilities at the landfill site and monitoring of groundwater at them, delays in defining the concept of drainage of "aquifer eye" (lake) at the landfill site, and the fact that the laws of groundwater regime the location of the landfill were determined only after calibration of the sub-model and analysis of the obtained results. The forecast calculations take into account and set all the dominant parameters of the groundwater regime in the wider area of the regional landfill "Kalenić" resulting from the model recalibration and sub-model calibration phase, as well as the requirements contained in the terms of reference, namely:

- under the terms of reference for the preparation of the Study, it is necessary to analyze the effects of the operation of drainage wells on the lowering of groundwater levels below the body of the first cassette of the regional landfill. The condition set in the forecast calculations is that the groundwater level at the landfill site should be below 70 m above sea level,
- well flows are set as a constant value for each of the wells in the amount of 7 l/s,
- • values of well capacity at the source "Tamnava – East Field" were kept in the existing values,
- the advance of the surface mine "Tamnava - West Field" to the south is set with a dynamics of 170 meters per year,
- effective infiltration is set at 14% of precipitation value,
- each variant of the calculation was analyzed for the characteristic values of precipitation: the monthly amount of precipitation from May 2019 2019 (132.1 l/m2) and for the maximum monthly amount of precipitation for the period 1960-2010, which is 262.1 l/m2 (July 1999)
- the period of forecast calculations is 7 years, which is the projected exploitation life of the cassette of 1 landfill.

Taking into account that until the moment of setting the concept of forecast variant calculations, the manner and scope of works on drying the "aquifer eye" (lake) at the landfill location have not been precisely defined, different variants of the state of this water phenomenon have been processed by forecast calculations. A total of three variants were defined, and for each of the variants the number and micro-location of drainage wells were determined (working with a constant individual flow of 7 l/s. Forecast calculations determined the number and micro-location of drainage wells considering the effects of their operation for each variant:

Variant 1, "aquifer eye" (lake) at the landfill site remains within the existing boundaries with a water mirror elevation of 71.40 m above sea level, and the decrease in the level in the "aquifer eye" is a consequence of the operation of drainage wells (Figure 6.2.3-2a).

Variant 2 "aquifer eye" (lake) is emptied by surface sludge pumps to a level of 69 m above sea level, while reducing the area occupied by this water phenomenon. This condition lasts during the entire period of operation of cassette 1. The water level in the lake is regulated by the operation of sludge pumps, if necessary. Drainage wells maintain the projected groundwater level below body of landfill cassette 1 (Figure 6.2.3-2 b).

Variant 3 preparatory works lower the level of the "aquifer eye" to the required working elevation, then raise the embankment along the southern slope of cassette 1, and then the location of cassette 1 is arranged. The elevation of the water mirror south of cassette 1 is 71.22 m above sea level and represents the maximum measured value during the wet period in May 2019 (Figure 6.2.3-2 c).

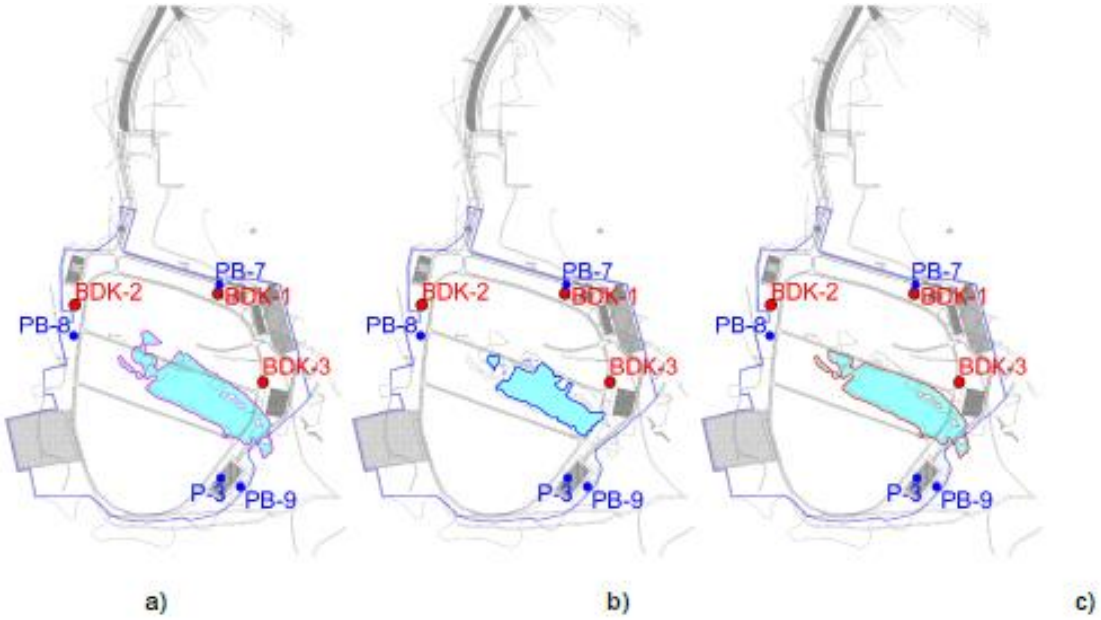


Figure 6.2.3-2. Conditions of the "aquifer eye" (lake) at the location of the regional landfill "Kalenić" which were taken for variant forecast calculations: a) variant 1, b) variant 2 and c) variant 3

The conducted forecast calculations led to the following conclusions:

- Three wells with an individual capacity of 7 l/s each (which are in the same location in each variant) operate to maintain the groundwater level in the underlying aquifer below cassette 1 of the landfill
- Groundwater levels at the landfill site increase over time as a result of the distancing of the surface mine "Tamnava – West Field" and the accompanying system for protection against groundwater
- The most unfavorable variant from the aspect of the condition of the of the "aquifer eye" (lake) is variant 1. According to this variant, wells fail to provide the necessary lowering of levels in the "aquifer eye" (lake) (below 70 m above sea level), or groundwater levels on the southern part of cassette 1.
- The second variant is the most optimistic variant regarding the condition of the lake ("aquifer eye"") at the landfill site. For this variant, it is possible to operate drainage wells with a smaller flow.
- The third variant includes probably the most realistic variant of bringing the "aquifer eye" (lake) into a state (and distribution) that will enable rational exploitation of cassette 1. Even in unfavorable precipitation conditions (maximum monthly amount of precipitation from the period 1960-2010), operation of three drainage wells maintains the level of overlying aquifer, at the location of cassette 1 below the elevation of 70 m above sea level.

The following hydrodynamic analysis included the effects of well shutdown to the groundwater level at the "Kalenić" regional landfill site with the aim of determining the time required for the groundwater level at the landfill site to possibly rise above the set elevation of 70mm. Hydrodynamic analysis, return of groundwater levels at the location of the regional landfill as a consequence of the shutdown of wells, was performed within each variant of forecast calculations, for different values of effective infiltration and condition of groundwater inflow.

The analysis was conducted through a unique hydrogram of operation of drainage wells at the landfill site, where two scenarios of well shutdown were analyzed: after the first and after the fourth year of forecast calculations, in both cases after one year of continuous groundwater extraction by wells. The analysis includes all possible scenarios of shutdown of one and two drainage wells that are in the system of defense of the landfill body (cassette 1) from high groundwater levels.

For groundwater level analysis, control (fictitious) points (MW-1 to MW-5) arranged around, and within the regional landfill cassette were used as shown in Figure 6.2.3-3.

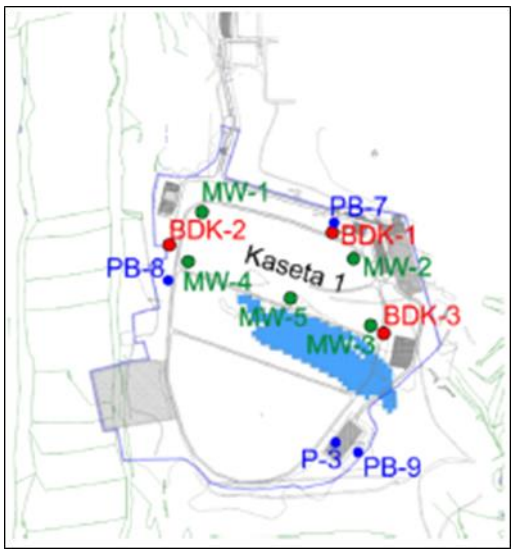


Figure 6.2.3-3. Location of points for analysis of groundwater level rise after shutting down the well

In this analysis, variant 2 is the most favorable, while variant 1 is the most unfavorable. In variant 3 for individual shutdown of well BDK-1 or BDK-2, the most endangered is the location around point MW-5 where the groundwater level exceeds the set elevation of 70 m above sea level during the first month after the shutdown of this well. In case of shutdown of well BDK-2, the level increase above the set elevation also occurs after a few months at the location of point MW-1 and MW-4. When it comes to shutdown of well BDK-3 the most endangered is the location around point MW-3 where already during the first month after the shutdown of this well there is an increase in the level above the set value, and in unfavorable conditions related to the set rainfall regime (July 1969) occurs during the 15th month after the fourth year of exploitation of the cassette (and the operation of the well). For each variant, the shutdown of two wells simultaneously leads to a rapid increase in groundwater levels above 70 m above sea level during the first month after the well was shut down, with a smaller number of locations with elevated levels above the value set in variant 2.

Based on the conducted forecast variant calculations of the operation of drainage wells and the analysis of the increase of groundwater levels as a consequence of the shutdown of wells (emergency, or during the regeneration of the facility), the following conclusions can be made:

- The advance of the surface mine “Tamnava – West Field” and the accompanying drainage system to the south is adversely reflected in the location of the regional landfill “Kalenić” through a continuous increase in groundwater levels, which is a confirmation of indications from 2014 and the results of hydrodynamic calculations from 2015 and 2016

- The "aquifer eye" (lake) of the underlying aquifer at the landfill site has a significant role in the groundwater regime at the site of cassette 1, but also other landfill cassettes,
- Surface sludge pumps must be used to regulate the level of the "aquifer eye" (lake) and its distribution,,
- For regular or intervention works on drainage wells, there is a time of at least one month in the most unfavorable conditions, where only one well can be decommissioned.

These conclusions are derived from the state of precipitation and groundwater regimes, which are less favorable than the real ones and which cannot be expected in a multi-month period, and especially not in a multi-year period as simulated. Therefore, the forecast calculations are based on significantly higher values of precipitation, which are constant values during the calculation, which certainly deviates from the actual situation. This approach, which is often applied in engineering practice, raises the safety coefficient of the offered technical solution for the defense of the location of cassette 1 of the regional landfill "Kalenić" from high groundwater levels of the underlying aquifer. **In practice, it is realistic to expect that at some time of the year it will be necessary to engage a smaller number of wells, or that they operate with reduced flows. At this level of provided data, a more detailed analysis of well flow is not possible.** Certainly, over time, monitoring the operation of drainage wells and groundwater levels in the monitoring network of the regional landfill will provide better input data for conducting more detailed hydrodynamic calculations.

The technical solution for lowering the groundwater level in the first phase of the landfill operation includes the construction of three new drainage wells BDK-1, BDK-2 and BDK-3, which will capture groundwater from the underlying aquifer in the area of the landfill Kalenić. The wells are designed on the northern, western and southeastern perimeters of the landfill, with a typical well construction, with a filter segment in the underlying sands, the depth of which depends on the occurrence of coal seams in these zones. The estimated capacities of individual wells are 7 l/s. Groundwater captured by drainage wells can be used as technical water at the landfill, when washing parts of the landfill plant, watering green areas and fire protection of landfill facilities. When needed, these waters can also be used in the technological process of waste recycling.

6.2.4. Soil impact

During the sanitary disposal of waste at the regional landfill, no significant impacts on the land around the site are expected. Possible causes of soil pollution can be:

- Movement of dirty vehicles inside and outside the landfill during the operational phase,
- Possible damage to the insulation of the bottom of the landfill body and leakage of leachate. These phenomena can be detected by adequate monitoring of the drainage system and groundwater,
- Landslides and shearing of the ground due to inadequate slopes of perimeter embankments,
  Spillage of substances such as fuel, lubricant, motor oils or disinfection agents,
- Terrain surface erosion,
  Spread of light waste fraction caused by wind or animals (birds, pests),
- Soil pollution due to landfill gas intrusion.

Impacts in the operating zone of the landfill body are potentially the most sensitive and delicate segments of negative, direct impact activity "observed through" the time factor and through the space factor, both due to leachate and sediment gas movement through soil layers. These impacts can be significantly reduced, minimized or even completely eliminated if, in all time periods of existence, as well as for the entire spatial and functional whole of the landfill body, all procedural flows for all operations are most strictly continuously and fully applied, with controlled access to the landfill body and with the application of all proposed protection measures (with special emphasis on the correctness and efficiency of the work of landfill gas extraction wells) and with professionally consistent application of all relevant technical instructions and meritorious laws, including the application of integrated monitoring with adequate, timely response.

Impacts in the work zone for the segment of meritorial access, as well as internal roads are directly dependent on: strictly controlled access of only adequate, correct vehicles/with mandatory, prescribed number of washing and cleaning, control of allowed weight when entering, as well as permission to enter only non-dangerous municipal solid waste, as well as strictly controlled access and movement of people (employed staff, as well as visitors), both in the area of the regional landfill complex and in the body of the landfill. Here it is important to underline (in order to reduce or minimize the harmful effects) the need to prior compliance with conditions of high quality and absolutely according to the project constructed internal and access roads in the construction phase, i.e. before the start of the exploitation phase.

Primarily, significant positive effect on the condition of pedostructures can be achieved if all planned works and measures of landscaping and grazing of areas in the zones around the facilities, as well as on all free/designated/areas within the landfill complex, including "a priori" construction works on the green protection belt, are initiated as early as possible in the previous phase of works, so that all integral/already formed/green areas in the exploitation phase are in fully functional, which would have a beneficial, positive effect on soil due to synergistic and mutual effect.

6.2.5. Noise impact

During the active phase of the landfill, the main sources of noise are:

- Movement of vehicles within the landfill complex and on the surrounding roads,
- Operation of compactors for waste compaction and transport of inert material,
- Separation line operation,
- Operation of pumps and aerators at the wastewater treatment plant,
- Bulldozer spreading of inert material and waste.

The list of basic equipment required for the operation of the Landfill with their planned deployment during one working day and individual approximate sound pressure levels that occur during their operational work is shown in Table 6.1.2-1.

Table 6.1.2-1 List of equipment planned for work at the regional landfill and sound pressure level

Description	Deployment during the day (h)	Sound pressure level [dB(A)]
Compactor	2	80
Loader/excavator	2	78
Bulldozer	5,5	81
Truck	3	78
Off-road vehicle	1	80-85

The planned working hours of the landfill will be 8 hours a day, 312 days a year. The total daily delivery of waste to the Landfill during the first phase of exploitation will amount to about 394.0 m^3 and will be carried out with about 40 trucks.

During the analysis of the impact of noise in the exploitation phase, the worst possible case was considered. It is assumed that all equipment shown in Table 6.1.2-1 works simultaneously with the maximum load, as well as that the equipment is located close to each other. As the height of the noise level (sound pressure) is expressed by a logarithmic value, the determination of the total level during the simultaneous operation of the given equipment was done according to the following equation:

$$L = 10 * log\left(10^{\frac{80}{10}} + 10^{\frac{78}{10}} + 10^{\frac{81}{10}} + 10^{\frac{78}{10}}\right) = 85{,}5\ [\mathrm{dB(A)}]$$

During the operation of the regional landfill, there are other sources of noise (truck washing, operation of the transformer station, etc.) that are not dominant and do not significantly affect the overall noise levels. These noise sources were not included in the calculation of the total noise level during the operation of the regional landfill and subsequent analysis. In order to determine the impact of noise, during the

operation of the landfill, the noise propagation was calculated on the nearest residential building according to the standard SRPS ISO 9613-2 (Acoustics - Attenuation of sound during outdoor use, Part 2: General calculation method)).

When calculating the attenuation of sound during its propagation through the air, the influence of attenuation due to distance, the influence of atmospheric attenuation (function of temperature, relative humidity and frequency) and attenuation due to the influence of the substrate were taken into account. The calculation was performed for a center frequency of 1000 Hz under the assumption that the air temperature is 10ºC, relative humidity 70% and that the sound propagates above the relatively porous ground in terms of acoustic reflection described by a coefficient of 0.3. Also, it is assumed that there are no obstacles in the propagation of sound waves between the source and the noise receiver. For the purposes of the calculation, the conversion of the sound pressure level into the sound power level was performed. In order for the sound pressure level to be 90 dB (A) at a distance of one meter, the source must have a sound power of 101 dB (A). During the calculation, the noise source was placed closest to the residential building, which is 600 m away from the Landfill border. It is assumed that the noise source with a total sound power of 101 dB (A) is located at 2.0 m above the ground and that the receiver is at 2.3 m above the ground and 0.5 m in front of the facade of a residential building (no reflection of the sound from the facade was considered during the calculation).

The calculation shows that the noise level on the facade of the residential building due to the operation of the Landfill will not exceed the level of 40 dB (A). The influence of other noise sources that do not originate from the landfill which could affect the overall levels on the facade of the observed residential building was not considered. As we did not have data on acoustic zoning of the space at the Study stage, the most unfavorable variant was assumed to be in Zone 1 or Zone 2. According to the Regulation on Noise Indicators, Limit Values, Methods for Assessing Noise Indicators, Disturbances and Adverse Effects of Noise in the Environment (the “RS Official Gazette”, no.. 75/10) the permissible value of noise levels in the period of the day when the landfill is operating is 50 dB (A). The estimated impact of noise on the residential building, due to the operation of the landfill, is lower by at least 10 dB than the assumed permissible limit value. Based on the obtained results, we can conclude that during the operation of the landfill, it will not endanger the surrounding population in terms of noise, as well as that it will not affect the exceeding of the total noise levels at the nearest residential building.

6.2.6. Human health impact

The expected impacts on human health during the operational phase are mostly related to air pollution and noise that affect the employees at the landfill. Since the necessary protection measures are envisaged within the project, no significant impact on the health of the population in the vicinity of the complex is expected.

The existing bad practice in waste management has a very negative impact on human health and the state of the environment. Current and previous waste disposal practices, especially in open landfills, directly affect environmental pollution. Such landfills represent a suitable soil for the development of rodents and insects and a source of infectious diseases. Such negative impacts can be reduced by applying adequate practices in solid waste management, i.e. the construction of a regional landfill.

The work of the Regional Sanitary Landfill will have a positive impact on the health of the population of all eleven municipalities in the Kolubara region, because an adequate system of municipal (non-hazardous) waste will be established and thus minimize the existence of new illegal dumps and create conditions for remediation of existing illegal dumps.

6.2.7. Meteorological parameters and climate characteristics impact

The impact of the regional landfill on the microclimate characteristics of the area will most likely be felt only in the area immediately above the landfill body and more in the part where new waste will be disposed, and will be manifested through rising air temperature as a result of elevated temperatures in the landfill body.

The consequences of these microclimatic changes will be manifested in somewhat more intensive processes of evaporation and evapotranspiration, as well as in a somewhat faster process of snow melting in the landfill area.

6.2.8. Flora and fauna impact

In this phase, additional negative (potential) effects on health status and benefits can be expected through changes in the structure and reduction of the composition of woody and phytocenological species, natural and artificial genesis, of forest and non-forest type, primarily in a wider area of influence. Due to the specific procedure of landfill exploitation, negative effects are possible due to the occurrence of the so-called landfill gas and descending diffusion of biogas (composed primarily of CH_4 and CO) through pedostructures and water, and thus to the gradual destruction of vegetation in the wider area. The size (scope), as well as the intensity of this action will be directly proportional to the consistency and synchronized application of all envisaged protection measures for different segments (environmental media), including certainly the most urgent development and functional-operational start of multi-layered protective green belt, which will in parallel have multiple beneficial effects against the harmful effects of the landfill and at the same time exhibit beneficial effects on the biological capacity of the vegetative-floral segment in the wider area.

The potential impact of landfill on fauna includes the impact of noise, as well as disturbances due to the so-called light pollution and traffic. Based on the limited development of fauna on the site and in the impact zone, as well as on the basis of the existing occupation of areas, potential impacts on fauna are considered minimal.

6.2.9. Population, concentration and migrations

The construction of the landfill does not require the displacement of the population or the relocation of commercial facilities.

During the operational phase of the landfill, new jobs will be created, which will provide an opportunity for employment of the local population. According to the quantities of waste that are brought to the landfill and the organization of collection in the region, work is planned in one shift of 8 hours, 5 days a week, and if necessary on Saturdays, i.e. 260-312 days a year. During the operational phase, 24 workers will be hired to work on the regional landfill complex for 24 hours, of which 22 in the first shift.

6.2.10. Purpose and exploitation of land

The spatial aspect, which considers the impact on spatial and urban development, is covered through planning solutions of already adopted planning and urban documents:

1. Spatial Plan of the Republic of Serbia 2010-2014-2020
2. Regional Spatial Plan of the Kolubara District affected by the earthquake (the “RS Official Gazette”, no. 70/02)
3. Regional spatial plan of the administrative area of Belgrade (the “Official Gazette of the City of Belgrade”, no. 27/03)
4. Spatial plan of the area of exploitation of the Kolubara lignite basin (the “RS Official Gazette”, no. 122 /08)
5. General regulation plan for the area of TPP “Kolubara B” (the “Official Gazette” of Ub Municipality, no. 1/07)
6. Spatial Plan of the Municipality of Ub (the “RS Official Gazette of Ub Municipality”, no.13/12)
7. Spatial Plan of the Municipality of Lajkovac (the “RS Official Gazette of Lajkovac Municipality”, no. 1/11)
8. Urban project for the construction of a regional landfill for municipal waste “Kalenić”
9. Regional spatial plan for the area of Kolubara and Mačva administrative districts (under development, draft plan phase).

For the needs of the construction of the Regional landfill for municipal (non-hazardous) waste "Kalenić", the competent Ministry of Construction, Transport and Infrastructure has issued the Location Conditions for cadastral parcel no. 800, cadastral municipality Kalenić, municipality of Ub, no. 350-02-00435/2018-14 dated 13 December 2018).

According to the Location Conditions, the General Regulation Plan for the area of TPP "Kolubara B" - the first phase, determined Spatial Unit 4 - Regional landfill for municipal solid waste, as having public purpose. The plan of general regulation of "Kolubara B" stipulates that the development of the Urban Project for the complex of the regional landfill for municipal waste "Kalenić" is obligatory.

Within the scope of the approved Urban Project (certificate no. 350-184/14-04, 30 April 2014, Municipal Administration of the Municipality of Ub) there are: construction plot GP 1, which is intended for the infrastructure corridor (road and communal infrastructure), area of 5.92 ha; construction plot GP 2, which is intended for the regional landfill for municipal waste "Kalenić", area of 39.88 ha.

Location conditions issued for the subject cadastral parcel no. 800, cadastral municipality Kalenić (GP 2), which is intended for the regional landfill for municipal waste "Kalenić" (number: 350-02-00435/2018-14) contain the rules of arrangement and construction, traffic access, regulation, typology and relationship to other plots , urban indicators, and their integral part is a graphic attachment to the confirmed urban project.

6.2.11. Municipal infrastructure and traffic impact

The intensity of local traffic and over longer distances will be increased, the traffic of trucks will usually take place at least 5-6 days a week and will be mainly related to the delivery of waste to the landfill. Dust, noise and air pollution, as described earlier, will be increased due to higher freight traffic. In addition, turning of vehicles on the access road may cause changes in the speed of vehicles on the state road II A no.145 (section Kalenić-Veliki Crljani).

Vibration effects due to vehicle movement often cause structural damage to the pavement structure.

All in all, the realization of the project will result in an increased frequency of traffic on all roads used for waste transportation. This increase will cause certain negative impacts on the environment, e.g. increase in noise, dust and exhaust fumes. This impact is not too significant due to the fact that the belt around the access road is not inhabited.

The impact of transport on soil, surface and groundwater, surface occupation, flora, fauna and landscape characteristics is not considered material.

6.2.12. Impact on natural resources of special significance and immobile cultural monuments

Within the planned location and in its surroundings, there are no natural assets of special values or archeological sites, or cultural assets intended for protection, so there are no negative impacts during the active phase of the "Kalenić" regional landfill.

6.2.13. Landscape characteristics impact

Due to the daily delivery of new quantities of solid municipal non-hazardous waste in the form of decades-long disposal (a period of 20 (30) years is predicted) in appropriate cassettes (cassette 1, cassette 2 and cassette 3), there will be strong, conditionally undesirable actions impacts (taking into account the ultimate goal compared with the already existing degradation), on the characteristics of the landscape segment in the form of:

- daily changes through the modification of morphological characteristics of the subject body of the landfill, then in the form of
- physical increase of space and areas, as well as in the form of
- permanently dynamic (daily) changes in the landscape-visual impression, all "observed" through the factor of time, target exploitation life of 20 (30) years, including actions in the form of changes

in the level of spatial-visual pollution caused by possible emission of harmful landfills gases (primarily methane and carbon dioxide).

Positive effects on landscape determinants can be achieved (it is realistic to expect them) due to the selection of the most favorable location for the regional landfill with the least harmful effects, primarily in terms of physical occupation of space, as well as parallel, minimal (only realistically necessary) wearing of already endangered natural resources, including consistent and professional application of all proposed protection measures for water, pedostructures, as well as for the vegetative-floral segment, as well as operational warning and alarm systems for critical conditions related to alarm and control systems with the possibility of remote control.

Intensive actions with a positive sign can certainly be achieved by a raised and already formed protective green belt, as well as all grassy and free green areas within the regional landfill complex, including green areas around buildings (e.g. administrative building), which is why the erection thereof should begin as soon as possible.

7. ENVIRONMENTAL IMPACT ASSESSMENT IN CASE OF ACCIDENT

The extent of each accident can be observed from several aspects: according to the endangerment of the environment, as well as according to the duration of harmful effects and the scope of remedial measures. The classification of accidents according to the scope depending on the estimated level of the accident, the place of the accident and the method of management is accepted here.

Possible accident levels are:
I - level (plant level) - The negative consequences of the accident are limited to the plant and can be controlled by process personnel. The company funds are sufficient for organizing measures and containing harmful and dangerous influences, because no consequences for the community are expected.
II - level (company level) - The negative consequences of the accident affected the entire plant, or the entire production complex of the plant. Environmental consequences can be expected. In addition to the company's resources, community assistance is needed to respond to this level of accident.
III - level (communal level) - Refers to accidents with negative consequences transferred to the public sector - the community and the funds of the wider community (municipality or city) are required to respond to the accident.
IV- level (regional level) - This is a wider and more serious accident that has a regional significance, because the negative consequences of the accident can spread to the territory of several municipalities. Forces and resources at the regional or national level must be used in response to the accident.

The possibility of an accident exists during the operation of the regional landfill for municipal (non-hazardous) waste “Kalenić” and it is possible due to floods, fires, inadequate management of biogas and leachate, leakage of oil products from machinery, etc. In the case of a future regional landfill, the level of the accident is also possible.

7.1. Impact of surface and groundwater on the designed facilities and infrastructure of the “Kalenić” Regional Landfill

The analysis of the impact of surface and groundwater on the designed facilities and infrastructure of the Regional Center “Kalenić” was covered through the latest hydrological research: “Study of the protection of regional landfill “Kalenić” from ingress of large body of water of the return period Q1% (T=100 years) and control calculation water Q0,1% (T=1000 years) (Faculty of Civil Engineering and Enviro System doo, July 2019) and hydrogeological research: “Study of hydrogeological research analysis of the current state of groundwater regime with a proposal of hydrogeological measures to maintain groundwater levels in conditions of operation of the Regional Landfill “Kalenić” (Energoprojekt-Hidroinženjering, July 2019). The text that follows is taken from the aforementioned Studies.

7.1.1. Protection of the regional landfill “Kalenić” from the occurrence of large waters of the return period Q1% (T=100 years) and control water levels Q0.1% (T=1000 years)

The aim of the hydrological-hydraulic study is to check the level of protection of the projected regional landfill for municipal waste “Kalenić” from large waters (characteristic return periods) of the Kladnica river and assess the impact of construction of the regional landfill on the transport capacity of Kladnica river for water and sediment.

The hydrological-hydraulic study covers the area upstream of the bridge narrowing, which has been identified as critical from the aspect of endangering the regional landfill from high waters. The bridge narrowing is located downstream from the mouth of the northern peripheral canal into the old Kladnica riverbed at a distance of about 1 km from the designed landfill. The potential danger of landfill flooding may occur due to insufficient permeability of the narrowing at high waters. In this case, flooding can occur due to the slowdown created by the narrowing under the bridge (Figure 7.1.1-1. Narrowing under the bridge near the junction of the peripheral channel with the old bed of the Kladnica river). Therefore, special attention was paid to this site in the hydraulic study. Thus, in a separate part of the study, the sensitivity of the calculation results to the change in the permeability of the bridge narrowing was analyzed and the case of congestion at the narrowing site was simulated.



Figure 7.1.1-1 Figure 7.1.1-1 Narrowing under the bridge near the junction of the peripheral canal with the old Kladnica riverbed

The study of protection of the regional landfill "Kalenić" from the occurrence of large waters of the return period Q1% (T = 100 years) and control calculation water Q0.1% (T = 1000 years) consists of two parts, hydrological and hydraulic study. The task of the hydrological study is to estimate the relevant high waters, which are the input data for the hydraulic study. In the hydraulic study, the depths and velocities of the Kladnica river in the area of the designed landfill were estimated. The spatial arrangement of the values of these quantities served as an indicator of the degree of protection of the regional landfill from high waters, i.e. its impact on the transport capacity for water and sediment.

Based on the said Study, the following conclusions were drawn:
For the purpose of checking the level of protection of the designed regional landfill for municipal waste "Kalenić" from high waters, it is necessary to estimate the flow of typical return periods on the bridge profile over the old Kladnica riverbed (Figure 7.1.1-2) which was identified as critical for slowing and possible flooding of the landfill site.

The flow on the bridge profile is the sum of the flow that is pumped by pipelines from the "Kladnica" retention into the northern peripheral channel (SOK) and the inflow from the SOK catchment area.
The capacity of CS "Kladnica" is 1800 l/s. The inflow from the SOK basin, which is hydrologically unexplored, was modeled using a synthetic unit hydrogram (SJH) and computational rain.

Several SJH models were considered, and SCS SJH was selected since it gave the largest ordinates of the (unit) hydrogram. Two variants were considered: computational rain of uniform intensity (block rain) and high soil moisture (ARC III), and computational rain of uneven intensity (alternating block method) and average conditions for absorption in the basin (ARC II). Hydrograms due to rain of uneven intensity were obtained using the HEC - HMS program. Both approaches give similar estimates of large waters (Tables 7.1.1-1 and 7.1.1-2).



Figure 7.1.1-2. Kladnica system illustration

Table 7.1.1-1 Maximum ordinates of runoff hydrograms for different block computational rain durations. Hydrograms were obtained using SCS synthetic unit hydrogram and with the assumed high initial soil moisture.

Трајање кише	Q_{max} (m^3/s)				
(min)	50 година	100 година	200 година	500 година	1000 година
10	2.74	3.40	4.13	5.24	6.18
15	4.59	5.72	6.99	8.82	10.41
20	5.44	6.56	7.79	9.60	11.13
30	7.20	8.59	10.11	12.35	14.22
45	9.01	10.78	12.73	15.56	17.97
60	9.81	11.58	13.50	16.32	18.67
75	10.47	12.40	14.51	17.58	20.19
90	10.84	12.81	14.96	18.08	20.71
120	11.12	13.05	15.14	18.19	20.73
180	11.09	12.98	15.03	18.02	20.50
240	10.72	12.55	14.54	17.44	19.86
300	10.24	11.97	13.85	16.58	18.86
360	9.74	11.36	13.13	15.69	17.82
420	9.27	10.82	12.51	14.95	16.99
480	8.83	10.31	11.91	14.24	16.18
540	8.42	9.82	11.35	13.56	15.40
600	8.04	9.38	10.82	12.93	14.68
720	7.37	8.58	9.89	11.80	13.38
1440	4.91	5.71	6.58	7.83	8.88

Table 7.1.1-2 Maximum ordinates of runoff hydrographs for 24-hour rain determined by the alternating block method. Hydrograms were obtained using SCS curvilinear synthetic unit hydrograph and with the assumed average initial soil moisture.

Повратни период (године)	50	100	200	500	1000
Q_{max} (m^3/s)	10.83	12.96	15.28	18.68	21.53

A comparison of specific runoff with adjacent profiles indicates that the evaluated quantiles are on the safety side. An overview of the relevant flows, obtained as the sum of inflows from the Kladnica retention, which is equal to the capacity of CS "Kladnica", and the maximum inflow from the SOK basin, which was adopted as a higher value than the results of the two considered approaches, is given in Table 7.1.1-3.

Table 7.1.1-3. Overview of the relevant flows of different return periods in the bridge profile.

Повратни период (године)	50	100	200	500	1000
Доток са слива СОК (m^3/s)	11.12	13.05	15.28	18.68	21.53
Доток из ретензије Кладница (m^3/s)	1.8				
УКУПАН ПРОТОК НА ПРОФИЛУ МОСТА (m^3/s)	12.92	14.85	17.08	20.48	23.33

The hydraulic study analyzes the plane flow in the Kladnica riverbed downstream from the "Kladnica" retention to a cross section of approximately 250 m downstream from the bridge narrowing located near the area of the designed "Kalenić" Regional Landfill. The zone upstream from the "Kladnica" retention towards the lake "Paljuvi Viš" was not analyzed in the study because the retention receives the total volume of runoff hydrographs of the return period of 1000 years for the part of the basin upstream from the retention and water from the retention, due to possible breaking of the retention dam, can flow only to the lower surface mine of significantly larger volume than the "Kladnica" retention.

Despite the fact that the hydraulic study analyzed the steady flow with flows obtained by "reading" the largest flows on the flow hydrographs for the part of the basin between the "Kladnica" retention and the section near the designed "Kalenić" landfill, the results of hydraulic calculations show that there is a significant reserve to the large water overflow with a return period of 1000 years to the area of the designed landfill.. Even in the scenario of partially reduced permeability of the bridge narrowing, the landfill is not endangered by the large waters of the Kladnica River. It should also be emphasized here that the flow hydrographs taken from the hydrological study were obtained by applying the method by which the highest flows were calculated i.

Considering that in the domain of analyzed flows, the access road and landfill embankment lines are not located on floodplains (i.e. in the flowing part of floodplains), it can be concluded that the designed "Kalenić" landfill (in the domain of analyzed flows) does not affect the transport capacity of the Kladnica River for water and sediment.

7.1.2. Analysis of the return of the underground water levels on the regional landfill site after the failure of water wells

Within the Study of hydrogeological research, prepared by Energoprojekt - Hidroinženjering a.d., the hydrodynamic analysis included the effects of well shutdown on the groundwater level at the location of the "Kalenić" Regional Landfill with the aim of determining the time required to possibly raise the groundwater level at the landfill site above the set elevation of 70 meters above sea level.

The analysis was conducted through a unique hydrogram of drainage wells at the landfill site, where two scenarios of well shutdown were analyzed: after the first and after the fourth year of forecast calculations, in both cases after one year of continuous groundwater abstraction by wells. The analysis includes all possible scenarios of shutdown of one and two drainage wells that are in the system of defense of the landfill body (cassette 1) from high groundwater levels.

For groundwater level analysis, control (fictitious) points (MW-1 to MW-5) were used, arranged around and within the regional landfill cassette, as shown in Figure 7.1.2-1.

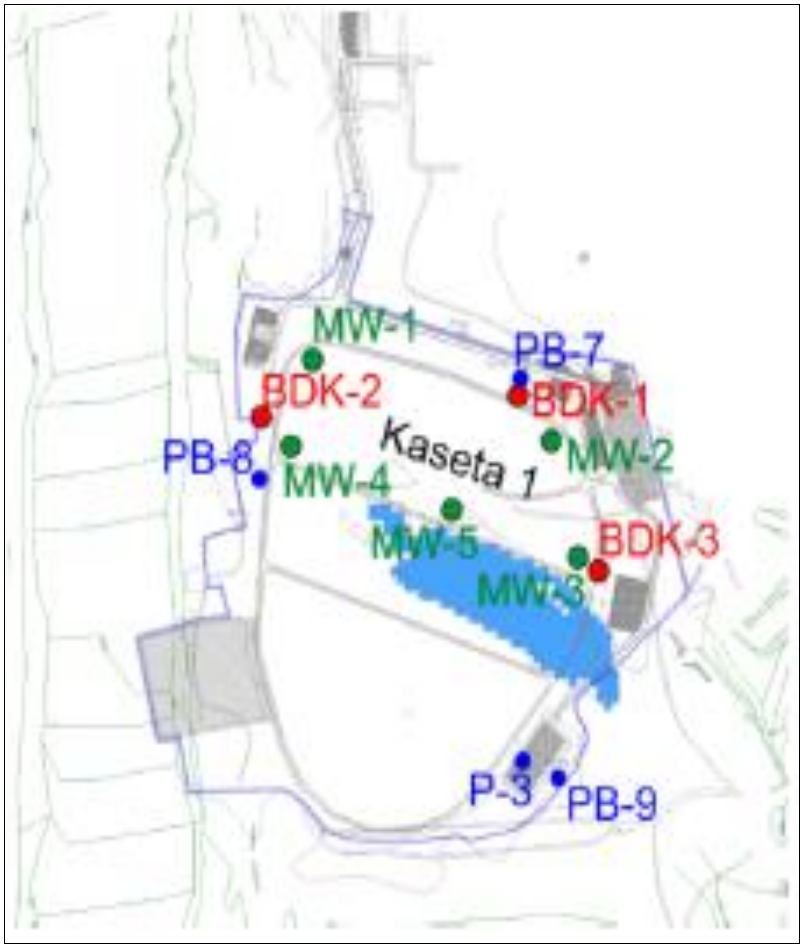


Figure 7.1.2-1. Location of points for analysis of groundwater level rise after shutting down the well

In this analysis, variant 2 is the most favorable, while variant 1 is the most unfavorable. In case of variant 3 for individual shutdown of well BDK-1 or BDK-2 the location around the point MW-5 where the underground water level exceeds the set elevation of 70 meters above the sea level during the first month of shutdown of this well is the most endangered. In the case of shutdown of BDK-2 well, the increase of the level above the set value occurs even after a few months at the location of point MW-1 and MW-4. When it comes to the shutdown of the BDK-3 well, the most endangered location is around the point MW-3, where during the first month after the shutdown of this well there is an increase in the level below the set value, and in unfavorable conditions related to the set rainfall regime (July 1969) occurs during the 15th month after the fourth year of operation of the cassette (and the operation of the well). For each variant, the shutdown of two wells simultaneously leads to a rapid increase in groundwater levels above 70 m above sea level during the first month after the well is shut down, with a smaller number of sites with elevated levels above the set value in variant 2.

Based on the conducted forecast variant calculations of the operation of drainage wells and the analysis of the increase of groundwater levels as a consequence of the shutdown of wells (emergency, or during the regeneration of the facility), the following conclusions can be made:

- The progress of the “Tamnava - West Field” surface mine and the accompanying drainage system to the south is adversely reflected in the location of the “Kalenić” regional landfill through a continuous increase in groundwater levels, which confirms the indications from 2014 and the results of hydrodynamic calculations from 2015 and 2016
- “Aquifer eye“ (lake) of the underlying aquifer at the landfill site has a significant role in the groundwater regime at the site of cassette 1, but also other landfill cassettes

- Surface sludge pumps must also be used to regulate the level of the "aquifer eye"" (lake) and its distribution,
- For regular or intervention works on drainage wells, there is a time of at least one month in the most unfavorable conditions, where only one well can be non-operational.

These conclusions are derived from the state of precipitation and groundwater regimes, which are less favorable than the actual ones and which cannot be expected in a multi-month period, and especially not in a multi-year period as simulated. Therefore, the forecast calculations are based on significantly higher values of precipitation, which are constant values during the calculation, which certainly deviates from the actual situation. This approach, which is often applied in engineering practice, raises the safety factor of the offered technical solution for the defense of the location of cassette 1 of the "Kalenić" regional landfill from high groundwater levels. **In practice, it is realistic to expect that at some time of the year it will be necessary to engage fewer wells, or to work with reduced flows. At this level of data availability, a more detailed analysis of well flow is not possible.** Certainly, over time, monitoring the operation of drainage wells and groundwater levels in the monitoring network of the regional landfill will provide better input data for conducting more detailed hydrodynamic calculations.

The technical solution for lowering the groundwater level in the first phase of the landfill operation includes the construction of three new drainage wells BDK-1, BDK-2 and BDK-3, which will capture groundwater from the underlying aquifer in the Kalenić landfill area. The wells are designed on the northern, western and southeastern perimeter of the landfill, with a typical well construction, with a filter segment in the underlying sands, the depth of which depends on the depositing of coal layers in these zones. The estimated capacities of individual wells are 7 l/s.

In addition to drainage wells - the primary system of landfill protection against groundwater, a secondary drainage system should be provided as additional insurance if the groundwater level in some situations reaches the geomembrane. The proposal is a drainage geocomposite - a secondary groundwater drainage system that would be installed under the HDPE geomembrane.

7.2. Fire

Fire Combustible substances at the complex of the future "Kalenić" Regional Landfill constitute a group of substances that can burn in the air of normal composition. Only mixed municipal waste comes to the landfill, as well as residues from MRF plants, where secondary raw materials are separated.

At the "Kalenić" regional sanitary landfill for communal and non-hazardous waste, in case bulky waste and old car batteries are delivered to the landfill with mixed municipal waste, a covered plateau with containers for secondary raw materials is planned. The worker supervising the unloading of mixed municipal waste will separate easily visible and separable bulky waste and hazardous household waste from the side of the active cell manually or with the help of appropriate working machines and tools, depending on the size of the deposited material, which will be brought to the container under the awning for technical devices and equipment at the end of the work.

Classification of materials according to fire behavior

Standard SRPS Z.CO.005 determines the classification of substances and goods according to their behavior at high temperatures caused by fire. Dominant substances from the point of view of sources of danger and fire are classified according to SRPS Z.CO.005 as:

- Tire FxIIICFu
- Wooden furniture FxIVC
- DxV batteries
- FxIIIC cable
- FxIIIC textile waste.

Label explanation:

- Hazard class I: extremely flammable and combustible substances

- Hazard class II: highly flammable and combustible substances
- Hazard class III: flammable substances
- Hazard class IV: combustible substances
- Hazard class V: non-combustible substances
- - S- solid matter
- - V- liquid matter
- - E- self-igniting substances
- Fu- substances and goods of all categories that develop smoke in the fire to a large extent, which makes rescue and firefighting actions more difficult
- Fx - substances and goods that can directly or indirectly participate in the combustion process by releasing the heat of combustion and releasing flammable decomposition products
- Dx - substances and goods that that are not easily flammable, but which still can be relatively quickly and easily damaged under the influence of fire (fire, smoke or water for extinguishing) (destruction of materials).

Waste pneumatic tires

Waste tires that are separated at the landfill and will be temporarily stored in the complex come from motor vehicles (trucks, cars, etc.), agricultural and construction machinery and other similar products, which the owner discards due to damage, wear or other reasons, after the end of their useful life.

Physical properties of waste: Tire belongs to the group of solid combustible materials.

Fire characteristics: Tire is obtained by processing rubber to which sulfur, soot, zinc oxide are added, as well as plasticizers, fillers, paints, etc. The basic raw materials for tire production are flammable (rubber, sulfur, soot...,). The tire itself is difficult to ignite, but it is very difficult to extinguish when ignited, with the release of very toxic products. Self-ignition can occur with finely chopped, heated, vulcanized rubber. These particles can also form explosive mixtures with air.

Waste lead-acid batteries

They occur when replacing batteries in vehicles. The battery case is made of plastic, and the battery contains lead grilles with a solution of sulfuric acid that is not flammable.

Properties: Sulfuric acid as a component in the waste battery is a highly corrosive, liquid substance that releases toxic sulfur oxides and carbon dioxide in a fire. Use self-contained breathing apparatus and suitable protective equipment (goggles, protective clothing, footwear, mask ...) when extinguishing.

In case of acid spillage from the battery, soak the spill site with inert absorbent material. Sawdust or other flammable material must not be used to collect spilled acid. It must not be diluted with water. Sulfuric acid reacts violently with water and most metals, with organic matter, reducing agents and flammable substances. It is incompatible with strong bases and oxidizing agents. Strong oxidizing agents, contact with alkali and alkaline earth metals can lead to fire or explosion. Sulfuric acid in a fire releases toxic sulfur oxides. The plastic material of the battery housing also releases toxic substances dangerous to the human body during combustion. In case of fire, use foam, dry matter or carbon dioxide.

Waste wood

The waste wood that will be temporarily stored at the complex mostly comes from old furniture. The flammability of wood depends on a number of factors that affect the course of combustion. The most important combustion factors are the type of wood, the size of the piece, the surface treatment, the chemical treatment and the moisture content. Hard and voluminous wood will catch fire harder than soft and light wood. Smaller pieces of wood are easier to burn than larger pieces, and pieces of wood with coarse surface are easier to burn than pieces with a polished surface. Wet wood burns harder than dried wood.

Wood combustion occurs in several stages. The wood ignites at a temperature of 250-300°C. Under the influence of the ignition source, the wood is charred in some parts with the release of heat. In this first

phase, to a lesser extent, flammable gases are released, which results in the ignition of other parts of the wood.

In the second phase of wood burning, heat is transferred from the surface of a piece of wood to its internal parts. The gaseous substances that have developed inside the wood mass pass through the formed pores and cracks and break out on the surface of the wood, where they burn in a mixture with oxygen from the air. In the third phase of combustion, carbon is released on the surface of a burning piece of wood. This slows down the process of heat transfer to the interior of the wood mass. The intensity of combustion weakens for a short time, and then there is an increase in the flame that accompanies the combustion process with ignition, as a consequence of the decomposition of the carbon layer. Afterburning is a process that is not accompanied by the appearance of flames. When wood burns, the composition of the decomposition product changes with increasing temperature. At lower temperatures, CO and SO and SO_2 predominate. At higher temperatures SN_4, N_2 and other hydrocarbons appear with a decrease in heavier decomposition products.

Table 7.2-1 Composition of decomposition products caused by combustion of wood at different temperatures

T°	Gas volume at $m^3/100m^3$ wood	SO_2	SO	SN_4	S_2N_4	N_2
200	0,4	75,0	25,0	-	-	-
300	0,4	5,6	40,0	3,8	-	-
400	0,4	9,5	43,0	14,3	0,85	1,45
500	0,4	12,8	28,4	21,7	3,68	2,34
600	0,4	14,3	27,2	23,4	5,74	2,66
700	0,4	16,0	25,2	24,9	8,50	2,80

In the temperature range of 150-180°S, 51.9% of gaseous matter per unit of dry matter is released. When wood decomposes at 150°S, the carbon content is 52%, water 6% and about 43% bound oxygen, while at 450°C the carbon content is 84.9%, hydrogen 3.1% and 12% oxygen. Wood is a solid combustible matter. In case of fire, use water for extinguishing.

Mixed municipal waste

Mixed municipal waste may contain flammable components such as paper and cardboard, textiles, organic matter, plastic matter, etc. As the mixed municipal waste is wet due to the presence of organic components, there is no great danger of the occurrence and spread of fire. A hydrant network is installed at the complex as a protection measure. Due to the possible presence of plastic substances in the mixed municipal waste, when extinguishing the initial fire, it is necessary to use protective equipment: suit, mask for the protection of the respiratory organs, etc.

Note: Special waste flows, which include waste tires and used batteries, are not treated in the complex, but only their safe storage, and upon reaching a certain amount these are handed over to authorized organizations for their further treatment, with the filling in of documents on waste movement or documents on movement of hazardous waste (depending on the nature of the waste) and notifying the competent ministry in accordance with the legal procedure.

Bulky waste and home appliances (except refrigerators and freezers with freon) can be disassembled on site and the separated components can be stored in the intended packaging (containers) until handed over to authorized organizations.

By analyzing the amount of flammable materials in the premises, the most probable fire we can expect is: class A fire (burning of solids-paper, textiles, food items and wood), class B fire (flammable liquids that burn superficially without foci), class fire C (fires of flammable gases burning completely) and fire on electrical installations and devices.

In accordance with the Study of Fire Protection, and based on the parameters of fire risk assessment arising from the technological process and substances used in it or storage, the facilities belong to the K5 category of technological process of fire risk (Categorization of technological process according to fire risk is performed on the basis of the Rulebook on technical standards for installations of hydrant fire extinguishing network (the "RS Official Gazette", no. 3/18)). For extinguishing the fire of a facility classified in the category of technological process according to fire risk (K5), a total amount of water 10 l/s must be provided for extinguishing the fire in a period of at least 120 minutes using the public water supply network.

The supply of the hydrant network of the complex is from the technical water tank R3, which is connected to well BDK-1. Technical water tank R3 serves for storage of fire extinguishing water and technical water for the needs of washing vehicles for transport and waste handling in the landfill complex. Groundwater from well BDK-1 will be pushed by a submersible well pump with frequency regulation through pipeline DN 80, length L = 22.90 m into a tank with a volume of 100 m^3.

Tank R3 has the role of accepting water from the well and further distributing it for the needs of fire protection and technical water for washing vehicles at the landfill.
The control of the pumps is provided according to the water level in the tank.

From the tank R3, V=100 m^3 water is supplied into the hydrant network. The volume of the tank that is planned for extinguishing the fire at the landfill complex is 72 m^3, from the water level in the tank 88.18 m above sea level to the level 90.10 m above sea level.
In order to provide pressure to the most distant consumers at the landfill, the installation of a high-pressure pump in line on the suction line of the DN100 hydrant network pipeline is planned.

The landfill body will be protected in case of fire by filling it with earth.

Based on the assessment of possible fire classes and the selection of appropriate means for extinguishing these classes of fires, it can be concluded that manual portable and transportable fire extinguishers of the appropriate type will be installed in the facilities, as follows:

- dry powder extinguishers, marked "S"
- carbon dioxide fire extinguishers, marked "CO_2".

Firefighting equipment consists of dry powder extinguishers, S-9 (9kg) and carbon dioxide CO_2 (5kg and 10 kg) (Table 7.2-2).

Table 7.2-2. Firefighting equipment

Facility	Device S–9 (pc.)	Device CO_2–5 (pc.)	Device CO_2-10 (pc.)
Porter's lodge	1		
Administrative building	2	1	
Service building	4	1	
Car wash	1		
Canopy	2		
Transformer stations	3		1
TOTAL	14	2	1

The total amount of extinguishing agents satisfies the needs of the facility.

Firefighters from the area of Obrenovac will respond for extinguishing the fire, as well as rescuing people and property endangered by fire or other natural disasters. The arrival time of the nearest Professional Fire and Rescue Unit from Obrenovac to this location is estimated at about 25 minutes. In order for everything to function, it is necessary to maintain all equipment dedicated to fire protection in proper

condition during the operation of the facility, to train persons to handle the equipment, and to train all employees to use hydrant kits and mobile fire protection equipment.

7.3. Biogas management risks

Uncontrolled release of biogas, i.e. accidents can occur due to: damage to biogas extraction and/or collection systems or due to damage to the incineration flare. In all three cases, depending on the type or duration of damage, the negative effects can be of lesser or greater intensity. The presence of methane in a critical concentration, from 5 to 15%, represents the danger of its explosion, which regularly causes great material destruction, and also human casualties in the case of the presence of people.

7.4. Lecheate management risks

Accidents related to leachate management can occur due to:

- Failure of the leachate collection system,
- Failure of the leachate pumping system,
- Damage to the protective foil.

Due to the inadequate functioning of the drainage system, there is an increased amount of leachate inside the landfill body, which results in a disturbance of the stability of the landfill body, increased humidity, clogging, etc.).

Leakage of leachate into the recipient or failure of the collection and drainage system in any part of it that requires pumping can cause material adverse effects.

Damage to the insulating foil leads to the leakage of leachate into the insulating layer of clay, which has exceptional filtration capabilities. The design envisages the installation of a geosensor (electromagnetic system sensor) for monitoring the water tightness of HDPE foil at the bottom and internal slopes of the leachate basin and at the bottom of the landfill.

7.5. Power outage

In the event of a power outage, all systems at the landfill would be disrupted. Therefore, it is necessary to provide alternative energy sources.

For the needs of uninterrupted supply of equipment and facilities with electricity, the design envisages a diesel electric generator, with automatic starting in case of loss of mains supply. The design envisages that the wells and part of the lighting in the Administrative and Service Building will be supplied with DEA.

Anti-panic lighting is provided. In all communications, anti-panic lamps are provided and installed, which provide the necessary illumination of the evacuation routes and exits in the event of a power outage.

7.6. Leakage of hazardous substances

Given the limited amount of gasoline/oil in trucks and machinery, as well as the technical characteristics of modern engines, no significant risk of gasoline/oil leakage is expected. As a consequence, no significant impacts on the environment (land, groundwater) are expected.

Possible leaks of gasoline or oil from trucks or machinery on the ground should be repaired as soon as possible. Contaminated soil should be sampled by an accredited laboratory, excavated, loaded into airtight containers and handed over to a specialized institution that will perform biodegradation and disposal at a hazardous waste landfill and/or incinerate at a hazardous waste incineration plant, depending on pollution levels.

7.7. Other possible incidents

Other possible incidents may occur due to:

- Damage to the insulation layers,

- Damage to the protective layers,
- Instability of the landfill body structure,
- Instability of waste at the landfill,
- Accident with equipment at the landfill,
- Accident with equipment/vehicles within the work zone,
- Accident with vehicles during waste transport,
- Infiltration of leachate into the soil,
- Landfill equipment failure,
- Failure of equipment/vehicles within the work zone,
- Insufficient entry control and the possibility of hazardous waste disposal.

8. DESCRIPTION OF THE MEASURES INTENDED TO PREVENT, MITIGATE OR RECTIFY ANY SIGNIFICANT HAZARDOUS IMPACT ON THE ENVIRONMENT

This chapter describes the measures for prevention, reduction and elimination of any material adverse impact of the project of construction of the "Kalenić" regional landfill of municipal (non-hazardous) waste, on cadastral plot 800, Cadastral Municipality Kalenić, territory of the municipality of Ub. Environmental protection measures provided by law and other regulations (regulatory measures), protection measures in case of accidents, plans and technical solutions for environmental protection and other environmental protection measures are included.

8.1. Measures required by laws, and other regulations, norms and standards

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

Measures required by law

Measures provided by law are measures covered by:

- Law on Environmental Protection (the "RS Official Gazette", no. 135/04, 36/09, 72/09, 14/16, 76/18 and 95/18 - other law)
- Law on Environmental Impact Assessment (the "RS Official Gazette", no. 135/04 and 36/09-amendments),
- Law on Waste Management (the "RS Official Gazette", no. 39/09, 88/10, 14/16 and 95/18- other law),
- Law on Packaging and Packaging Waste (the "RS Official Gazette", no.. 36/09 and 95/18);
- Law on Communal Activities (the "RS Official Gazette", no. 88/11, 104/16 and 95/18);
- Law on Nature Protection, (the "RS Official Gazette", no. 36/09, 88/10, 91/10-ispr., 14/16 and 95/18 - other law);
- Law on Waters (the "RS Official Gazette", no.. 30/10, 93/12, 101/16 and 95/18-other law);
- Law on Air Protection (the "RS Official Gazette", no.. 36/09 and 10/13),
- Law on Environmental Noise Protection (the "RS Official Gazette", no. 36/09 and 88/10),
- Law on Transport of Dangerous Goods (the "RS Official Gazette", no. 88/10, 104/16 and 83/18),
- Law on Chemicals (the "RS Official Gazette", no. 36/09, 88/10, 92/11, 93/12 and 25/15),
- Law on Mining and Geological Research (the "RS Official Gazette", no. 101/15 and 95/18);
- Law on Agricultural Land (the "RS Official Gazette", no. 62/06, 65/08, 41/09, 112/15,80/17 and 95/18),
- Law on Cultural Heritage (the "SRS Official Gazette", no. 71/94, 52/11, 99/11),
- on Spatial Plan of the Republic of Serbia from 2010 to 2020 (the "RS Official Gazette", no. 88/10),
- Law on Forests (the "RS Official Gazette", no. 30/10, 93/12, 89/15 and 95/1/),
- Law on Explosive Substances, Flammable Liquids and Gases (the "SRS Official Gazette", no. 44/77, 45/85, 18/89, the "RS Official Gazette", no. 53/93, 67/93, 48/94, 101/05 and 54/15),
- Law on Fire Protection (the "RS Official Gazette", no. 111/09, 20/15 and 87/18 - other law),
- Law on Safety and Health at Work (the "RS Official Gazette", no.. 101/05, 91/15 and 113/17-other law),
- Law on Ionizing Radiation Protection and Nuclear Safety (the "RS Official Gazette", no. 36/09, 93/12),
- Waste Management Strategy for the period 2010 - 2019 (the "RS Official Gazette", no. 29/10),
- Regulation on waste disposal in landfills (the "RS Official Gazette", no. 92/10);
- Regulation on systematic monitoring of the condition and quality of land (the "RS Official Gazette", no. 73/19);
- Regulation on limit values of polluting, harmful and dangerous substances in the soil (the "RS Official Gazette", no. 30/18);
- Regulation on air quality monitoring conditions and requirements (the "RS Official Gazette", no. 11/10, 75/10, 63/13);

- Regulation on limit values for emissions of pollutants into the air from combustion plants (the "RS Official Gazette", no. 6/16);
- Regulation on limit values for emissions of pollutants into the air from stationary sources of pollution, except for combustion plants (the "RS Official Gazette", no. 111/15);
- Regulation on water classification (the "SRS Official Gazette", no. 5/68);
- Regulation on limit values for emissions of pollutants into water and deadlines for their achievement (the "RS Official Gazette", no. 67/11, 48/12 and 1/16);
- Regulation on limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement (the "SRS Official Gazette", no. 50/12);
- Regulation on limit values of priority and priority hazardous substances that pollute surface waters and deadlines for their achievement (the "RS Official Gazette", no.. 24/14),

1. Regulation on noise indicators, limit values, methods for assessment of noise indicators, disturbance and harmful effects of noise in the environment (the "RS Official Gazette", no. 75/10),

- Rulebook on methodology and procedure for implementation of projects of importance for the Republic of Serbia (the "RS Official Gazette", no. 1/12),
- Rulebook on the content of the study on environmental impact assessment (the "RS Official Gazette", no.. 69/05),
- Rulebook on the methodology for collecting data on the composition and quantities of municipal waste on the territory of the local self-government unit (the "RS Official Gazette", no.. 14/20);
- Rulebook on the manner and procedure of waste tire management (the "RS Official Gazette", no. 104/09 and 81/10);
- Rulebook on conditions and manner of collection, transport, storage and treatment of waste used as a secondary raw material or for energy production (the "RS Official Gazette", no. 98/10);
- Rulebook on the form of daily records and annual report on waste with instructions for its completion (the "RS Official Gazette", no. 7/20);
- Rulebook on categories, testing and classification of waste (the "RS Official Gazette", no. 56/10 and 93/19);
- Rulebook on the manner of storage, packaging and marking of hazardous waste (the "RS Official Gazette", no. 92/10);
- Rulebook on the manner and procedure of managing used batteries and accumulators (the "RS Official Gazette", no. 86/10);
- Rulebook on the content and appearance of the permit for storage, treatment and disposal of waste (the "RS Official Gazette", no. 96/09);
- 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 (the "RS Official Gazette", no. 33/16);
- Rulebook on conditions, manner and procedure of waste oil management (the "RS Official Gazette", no. 71/10),
- Rulebook on the application form for the issuance of a permit for treatment, i.e. storage, reuse and disposal of waste (the "RS Official Gazette", no.. 38/18),
- Rulebook on the content and manner of keeping the register of protected natural monuments (the "RS Official Gazette", no. 81/10),
- Rulebook on the proclamation and protection of strictly protected and protected wild species of plants, animals and fungi (the "RS Official Gazette", no.5/10, 47/11, 32/16 and 98/16),
- Rulebook on evaluation criteria and procedure for categorization of protected areas (the "RS Official Gazette", no. 97/15),
- Rulebook on the methodology for determining acoustic zones (the "RS Official Gazette", no. 72/10),
- Rulebook on noise measurement methods, content and scope of noise measurement reports (the "RS Official Gazette", no. 72/10),
- Rulebook on safety at work during construction works (the "RS Official Gazette", no.. 53/97 and 14/09),
- Rulebook on preventive measures for safe and healthy work during noise exposure (the "RS Official Gazette", no.96/11, 78/15 and 93/19),

- Rulebook on hazardous substances in waters (the "SRS Official Gazette", no. 31/82),
- Rulebook on the manner of determining and maintaining sanitary protection zones of water catchment areas (the "RS Official Gazette", no. 92/08),
- Rulebook on parameters of ecological and chemical status of surface waters and parameters of chemical and quantitative status of groundwater (the "RS Official Gazette", no. 74/11),
- Rulebook on reference conditions for surface water types (the "RS Official Gazette", no.. 67/11),
- Rulebook on the content of air quality plans (the "RS Official Gazette", no. 21/10),
- Rulebook on permitted quantities of hazardous and harmful substances in soil and water for irrigation and methods for their testing (the "RS Official Gazette", no. 23/94),
- Rulebook on the content of the Accident Prevention Policy and the content and methodology of drafting the Safety Report and the Accident Protection Plan (the "RS Official Gazette", no.. 41/10),
- Rulebook on the manner of preparation and content of the Accident Protection Plan (the "RS Official Gazette", no. 41/19);
- Rulebook on the content of the study on the arrangement of the construction site (the "RS Official Gazette", no. 121/12 and 102/15),
- Rulebook o on technical norms for fire and explosion safety of plants and facilities for flammable and combustible liquids and on storage and transfer of flammable and combustible liquids (the "RS Official Gazette", no. 114/17).

The project owner (Investor) is obliged to comply with all environmental protection measures prescribed in the conditions and opinions of competent authorities and organizations, both in the phase of preparation of technical documentation, also in the phase of construction and use of the "Kalenić" regional landfill for municipal (non-hazardous) waste, cadastral plot 800, cadastral municipality Kalenić, territory of the Municipality of Ub. Special attention should be paid to protection measures from the conditions of the Institute for Nature Protection of Serbia (no. 03 no. 020-3172/2/1 dated 3 December 2018) and Water Conditions, Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate, no. 325-05-1071/2018-07 dated 05 December 2018.

8.2. Protective measures in case of accidents

Prevention of accidents is achieved through good design, careful operation, maintenance, inspection and adherence to all prescribed protection measures. These factors also reduce the probability of occurrence and consequences of accidents. However, unforeseen situations caused by sudden equipment failures or caused by human factors cannot be completely prevented. For that reason, the most important form of control of the causes of dangerous situations is to determine measures to mitigate the negative consequences of such circumstances and to create conditions for continuation of operation as soon as possible.

Measures to eliminate the consequences of the accident consist, above all: a well-organized work of emergency response teams in the field; good equipment with the necessary means to operate in the circumstances of the accident; the team being equipped with special suits and other protective equipment that enables work in such situations; prompt decision-making and emergency intervention at the scene of the accident.

8.2.1. Protective measures in case of emergency in the phase of construction of the regional landfill

- The contractor is obliged to educate employees on the construction site,
- If, due to an accident on the construction machinery, an accidental release of fuel, oil and other dangerous and harmful substances occurs, the Contractor is obliged to eliminate the consequences of the accident as soon as possible and perform urgent and complete remediation of the location.
- Contaminated land must be sampled and removed as soon as possible, in accordance with the obtained report of the accredited laboratory and under the conditions of the competent inspection authority.
- When building a regional landfill, it is mandatory to implement all measures for fire protection of people and equipment on the construction site.

8.2.2. Protection measures in case of emergency in the active phase of the landfill

As a basic measure of preparedness for responding to an accident, the Regional Center for Waste Management "Eko-Tamnava" d.o.o." as the operator is obliged to prepare an Accident Protection Plan. The Plan is prepared by companies, i.e. other legal entities that have the authority to prepare the Plan.

The accident protection plan is prepared in accordance with the Rulebook on the manner of preparation and content of the accident protection plan (the "RS Official Gazette", no.. 41/19). This plan defines the organization of work and elaborates the tasks of the company, i.e. other legal entity in the implementation of measures to prevent accidents and limit the consequences of accidents on human life and health, economy, social stability and the environment, in accordance with the law.

The plan is prepared on the basis of technical documentation (technological, mechanical design, etc.), documentation governing the field of fire protection accepted by the competent authority, work instructions for production and other activities of the company, or other legal entity instructions for work on plants, machines, devices and equipment prescribed by the manufacturer, etc. In addition to the above, standards and legal regulations shall be used that regulate the activity or dangerous substance in question, existing instructions for safety and health at work, etc.

The plan contains:

1) Introduction;
2) Hazard assessment;
3) Action in case of an accident;
4) Informing the public;
5) Attachments to the Plan (graphic part, accompanying documents and accident records).

The introduction contains general data and description of the complex of the company and other legal entity The hazard assessment is made in order to consider the assessment of the threat to life, human health, economy and environment and social stability, from the consequences of accidents caused by activities with hazardous substances and contains:

1) Hazard identification;
2) Prevention measures;
3) Forces and means for protection, rescue, mitigation and elimination of consequences of accidents.

Hazard identification includes the identification of critical points, i.e. places in the process or at the plant (where hazardous substances are produced, used, stored or handled in any way), which are the weakest points or possible sources of danger from the aspect of accidents, with special reference on the analysis of the human factor as a possible cause of the accident.

Prevention measures are implemented to prevent or reduce the likelihood of an accident as well as to reduce its consequences.

Prevention measures include:

1) Measures envisaged and/or implemented through spatial planning, design and construction of the plant – complex
2) Measures that are envisaged and/or implemented through the choice of production technology, technological equipment, process management equipment and other technical equipment, and which provide a higher degree of environmental protection and lower risk of accidents;
3) Measures envisaged through the selection of technical-technological solutions that contribute to the safe transport of dangerous goods;
4) Measures that ensure quality and timely maintenance of the technical and technological level of the facility - plant;
5) Measures envisaged for achieving the required level of knowledge and levels of work and technological discipline and training and equipping of human capacities for emergency response (types of training, exercises and testing of knowledge in the field of accident response, as well as specifics envisaged by the Plan);

6) Measures envisaged in the security system: supervision, management of technical security and protection systems, detection and identification of hazards and maintenance of communication routes and passages in facilities and plants.

Overview of forces and means for protection and rescue, mitigation and elimination of consequences from accidents includes:

1) Available human resources (evaluate and present the existing and define the necessary human structure, their training and equipment for the implementation of protection and rescue measures, elimination of consequences of accidents and organization of continuation of operation and recovery);
2) Available material means and equipment for protection and rescue (evaluate and present the existing condition of available and necessary material means and equipment for protection and rescue - quantity, type and correct functioning);
3) The need to engage intervention services outside the plant/complex;
4) The need for assistance from the local community in responding to an accident within the facility;
5) Organization and manner of continuation of operation and recovery from accidents.

Measures to eliminate the consequences are aimed at remedying the consequences of the accident, organizing post-accident monitoring, recovery and creating conditions for normalization of work and life at the location - the area affected by the accident, monitoring the post-accident situation and taking preventive measures, eliminating the risk of recurrence.

Measures to eliminate the consequences of the accident are:

1) Objectives and scope of remediation (priorities, method, collection, disposal, decontamination of bulk hazardous substances - waste);
2) Forces and resources for remediation (teams and tasks, required time - deadline, required resources);
3) Forces and means for conducting remediation;
4) Post-accident environmental monitoring program (biomonitoring of air, water and soil), includes the impact on human and animal health, and is implemented by defining the owner, content, reporting and time periods;
5) Organization of continuation of operation and recovery from accidents (tasks, owners, teams, necessary material resources and planned time);
6) Planned financial resources;
7) Review of legal entities authorized for rehabilitation, remediation and environmental monitoring.

For each scenario from the Accident Protection Plan, it is necessary to provide for action in case of an accident, with data on: “Who is doing the work?” And “What do they do?” In case of an accident, from the moment the accident is identified to the end of the accident, the manner of communication and alarming, as well as the method and means of communication.

Informing the public includes the manner and procedures of informing the public about the type and nature of the danger, the measures taken to prevent the spread of accidents, measures to protect and rescue from the consequences of accidents and measures to eliminate the consequences of accidents.

8.3. Protection measures during the works

Prior to the beginning of construction of the regional landfill for municipal (non-hazardous) waste, within the Preparatory Works Project, it is necessary to envisage all measures to protect soil, surface and groundwater and air that will prevent or reduce dust and noise, environmental hazards, health and safety. employees, as well as the negative consequences of generation of construction waste. The contractor should define these basic control measures as a condition that must be met during the execution of works.

8.3.1. Air protection measures

The protection measures proposed for the construction phase should include preventing the formation of dust, i.e. spreading dust from piles made of earth or some other material during earthworks and excavations. Dust distribution is controlled by wetting the appropriate surfaces, using modern windshields

and covering the trucks with cloth. The contractor must not leave piles of earth after the construction phase is completed. In addition, all excavations must be covered with suitable solid material and covered with green vegetation, and no earth surface must be left bare and thus prone to erosion.

Mitigation measures related to dust and exhaust gases from vehicles and machinery are reflected in regular monitoring of air quality, vehicle noise, exhaust gas testing, vehicle speed limitation (slow and reasonable driving) and dewing. Dust emission control is a simple method the success of which mostly depends on the applied control measures at the source. Operation of machinery in the construction phase creates a large amount of dust, and control measures to reduce it include:

- Spraying roads with water;
- Determining the maximum allowed speed on all unpaved roads;
- Keeping traffic areas clean;
- Covering of all trucks carrying loose material;
- Washing the wheels of the vehicles leaving the work area.

Proper maintenance of machinery and equipment used for construction, in order to reduce gas emissions, all in accordance with the manufacturer's instructions.

8.3.2. Land, surface and groundwater protection measures

- Construction works can cause soil erosion, slope instability as well as local morphological changes, but with proper shaping of exposed areas and landscaping, soil erosion can be minimized.
- All excavations, pits or openings that are over two meters deep should be covered and properly protected when not in use.
- All trench walls that are over 1.2 meters deep should be reinforced with wooden formwork to prevent collapse.
- Careful placement and management of excess soil material.
- Proper maintenance - checking the correct functioning of vehicles and equipment. Cleaning and washing of equipment should be performed only in defined places with proper protection in order to prevent soil pollution.
- Regular field inspections to check for possible oil, fuel and chemical leaks. The control of these works is performed in cooperation with the persons responsible for safety at work.
- Wastewater generated during the construction phase from the activities of on-site workers should be disposed of in an environmentally sound manner. It can be collected in containers that are emptied as needed by an authorized organization;
- Oil from machinery and vehicles must not be spilled on the site.
- Discharge of wastewater into the ground or groundwater is not permitted.
- It is mandatory to use mobile toilets with temporary septic tanks during the landfill construction phase, in order to prevent the inflow of sanitary wastewater into groundwater or surrounding water bodies.
- Protection of surface and groundwater from pollution by oil and oil derivatives is achieved by impermeable containers in which oil/grease will be stored and transported. Floors of areas where oil/grease are used should be watertight. Container loading and stacking areas must be watertight with drains having jet diffusers/deflectors to prevent the outflow of wastewater from the landfill site and pollution of surface and groundwater. The use of mobile tanks is mandatory.
- Maintaining the correct condition of transport vehicles and construction equipment, as well as performing their servicing off the site.
- Use of mud barriers to prevent soil and mud from being transferred from the site.
- Regular inspection and cleaning of storm water drains.
- Auxiliary embankments in fuel/oil storage facilities to prevent spills.
- Performing routine cleanliness inspections. Preparation of a plan of action in case of leakage of oil products, which especially refers to fuel and oil storage facilities.
- Good maintenance of working parts of the landfill.

Measures to protect soil, water, flora, etc. from liquid waste that may endanger surface and groundwater in the construction phase of the landfill, are conducted by persons responsible for protection. The measures must prevent oil or fuel from leaking into the ground by organizing a system for their collection. Waste oils from construction machinery should be collected at a predetermined location and disposed of in recycling units. In the event of a fuel leak, absorbent materials (sorbents) should be used immediately. There is a wide range of sorbents and biological and/or chemical agents on the market for the removal of residues of oil products (e.g. Road Bio, Forecourt Bio, Simple Green, etc.). Of the sorbents and means for removing the residues of petroleum products, those that have already proven application should always be used. Each material used or each piece of equipment must be certified by an independent company for use in that area.

8.3.3. Noise control measures

Temporary noise produced by machinery during construction works is controlled by proper maintenance of equipment and vehicles (periodic inspection of engines). Noisy fixed plants or equipment may be fenced off or covered, if necessary and practical. Construction works should be performed exclusively during the day. The person responsible for technical supervision controls the implementation of noise protection measures. In case the noise level exceeds the allowed level, employees must have adequate ear protection.

The contractor is obliged to make a work plan which will minimize the negative impact of noise on workers on the construction site, the environment, inhabited buildings and the wider area covered by the project.

8.3.4. Contruction waste management guidelines

It is necessary to consider the possibilities of reducing the amount of solid waste and plan an appropriate method of waste disposal/recycling that will be in line with environmental protection and that will contribute to the conservation of natural resources. There must be a Waste Management and Disposal Plan for temporary facilities built during the landfill construction phase.

- Construction waste may be reused and recycled, except in the case of hazardous waste generation, while the collection and disposal of solid waste will be the responsibility of the Contractor.
- Uncontrolled dumping of garbage inside the site and on the surrounding areas should be prohibited.
- Some types of waste, such as stones or excavated earth, can be used for construction purposes. For example, stones can be used as a base for a fence around a building, while excess soil can find its application when landscaping, as well as for backfilling when regulating levels on the landfill.
- During the landfill construction phase, solid waste (debris, etc.) should be regularly collected in containers that are properly arranged at the locations of activities and disposed of from the construction site (responsibility of the Contractor).

8.4. Environmental protection plans and technical solutions

8.4.1. Air protection measures

At the “Kalenić” landfill, measures are planned to protect the air from pollution, which include regular covering of the disposed waste with inert material and controlled discharge of the landfill gas through the degassing system and then burning it on a torch.

Regular daily compaction and sanitary covering with inert material, then sprinkling with water, if necessary, as well as the existence of a high belt of natural greenery around the landfill prevent the spread of unpleasant odors and dust outside the landfill, as well as fires that can be sources of harmful gases.

The technology of waste disposal on the landfill body is such that it is covered daily with a layer of inert material. In this way, the distribution of deposited waste is prevented, and the suppression of unpleasant odors is provided. Covering is done with the help of compactors or bulldozers that allow the soil to be scattered. During the summer period, once a day, a layer of compacted waste is sprayed with disinfectant.

Mounting a degassing system by building degassing wells - biothorns and by disposing of landfill gas on the incineration flare were not further elaborated within the Design for the building permit. The conceptual design for the controlled degassing of the Regional Sanitary Landfill at the Kalenić site according to the technological solution envisages an active way of draining biogas from the landfill body through vertical gas wells (biothorns) and a pipeline system that takes gas to the biogas combustion flare, which reduces the harmful effects of methane on the atmosphere.

Waste disposal technology requires the system to be passive at the beginning. Gas wells grow in height as the height of the landfill increases, i.e. they are built together with the development of the landfill. New perforated pipes are added to the existing ones until the final layer is placed. After the closure of the landfill, the connection of gas wells to the system for collection and incineration of biogas is gradually begun, part by part.

The construction of the active system will begin after the completion of the filling of the landfill, in the following way: a ring collector is mounted along the perimeter of the landfill to the gas combustion plant. It is connected by local transverse collectors. After filling the last layer of phase I on top of the biothorns, caps are mounted and wells are connected to local transverse collectors or directly to the ring collector which leads the landfill gas to the combustion system (i.e. the use of landfill gas). Condensate separators with drainage are provided at the lowest points of certain parts of the collector network. All separators and drains are located in the landfill body. The remaining condensate separated in the incineration plant itself is returned to the landfill.

A total of 97 gas wells are planned to be installed in the first phase. Landfill gas storage is not envisaged.

The gas incineration plant was selected on the basis of the maximum expected hourly production, i.e. the collected amount of landfill gas during the useful life of the landfill. When dimensioning the pipeline, the maximum recommended flow rates were taken into account, especially at the places of opposite flows of gas and condensate.

Checking the composition of the gas, as well as the intensity of gas extraction must be performed both during the disposal of waste in the landfill and after the closure of the landfill for the first 10 years every six months, and then every two years until the landfill dies out. Checking the composition of landfill gases is done by taking gas samples from biothorns by placing special sampling probes in degassing pipes to the appropriate depth, and then analyzing samples using appropriate gas analyzers, performed by specialized institutions, which are registered for this type of activity.

A flare with a closed flame is envisaged due to easier control of the combustion temperature, which is one of the key factors in reducing the emission of harmful substances. Too high combustion temperatures increase the emission of NOx compounds, while too low combustion temperatures increase the production of carbon monoxide and unburned hydrocarbons. Automatic regulation of the combustion temperature is achieved by connecting the thermocouple and the air supply valve through the control unit. Also, with the favorable construction of the torch, it is necessary to guarantee the minimum required reaction time, which enables complete combustion of hydrocarbons. The flare is started on the control panel by releasing gas towards the burners and switching on the electric ignition device. The UV flame detector enables immediate registration of the disappearance of the flame, closing of the basic biogas flow via the servo control valve, reactivation of the ignition device, re-release of the basic biogas flow (only after confirmed presence of spark) or shutdown of the entire system.

The maximum expected gas production (according to the LandGEM model) is: Q = 580 m^3/h
Selected radius of influence of gas wells: R = 18 m
Gas well opening radius: r = 0,3 m
A gas combustion plant with the following characteristics is required:
Maximum gas flow: **Qmax = 600 m^3/h**,
Vacuum required: **$\Delta pmax_{ulaz}$ = -100 mbar**

8.4.2. Land, surface and groundwater protection measures

In order to effectively protect groundwater, as well as to protect the landfill from the impact of groundwater, technical measures have been designed to create conditions for preventing its negative impact.

- In the first phase, the protection of the Kalenić landfill from **groundwater** (in the period of 7 years as the estimated operating time of cassette 1) will be provided by the construction of drainage wells located along the perimeter of the landfill. Lowering the groundwater level in the first phase of the landfill operation requires the construction of three new drainage wells BDK-1, BDK-2 and BDK-3, which will capture the groundwater from the underlying aquifer in the area of the Kalenić landfill. Wells are designed on the northern, western and southeastern edges of the landfill. The estimated capacities of individual wells are 7 l/s.
- Groundwater that is captured by drainage wells around the landfill, and based on the results of previous chemical analyzes, can be used without special treatment. They can be used as technical water at the landfill, when washing parts of the landfill plant, watering green areas and fire protection of landfill facilities. If necessary, these waters can also be used in the technological process of waste recycling. This will enable own stable source of technical water, and at the same time, the possible costs that would be incurred by using water from the public water supply for these needs will be reduced.
- In addition to drainage wells - the primary system of landfill protection from groundwater, a secondary drainage system should be provided as additional insurance if the groundwater level in some situations reaches the geomembrane. The proposal is a drainage geocomposite - a secondary groundwater drainage system that would be installed under the HDPE geomembrane. The geocomposite drainage layer should consist of a single HDPE drainage core inserted between two geotextile layers. The drainage core should be able to accept water from only one side. The side leaning on the geomembrane should be flat and impermeable. Drainage cores that are permeable on both sides are not allowed. Geotextiles on the waterproof side should be UV stable to sun exposure for a minimum of 12 months.
- The landfill body is endangered by **Precipitation** that gravitate towards it from an absolutely higher terrain in the northern and northeastern part in relation to the landfill body. On the other hand, the landfill body is elevated by circumferential embankments in relation to the surrounding terrain, and thus protected from the possibility of penetration of atmospheric water from the surrounding basin. A solution in the form of a concrete channel has been designed for the collection and drainage of atmospheric water that gravitates towards the landfill body. The collected water is clean and is discharged on the surrounding terrain, and a reinforced concrete structure is designed at the place of discharge.
- **Atmospheric water** from roads and handling surfaces collected by drains is drained by a system of sewer pipes (collectors), pumping stations and pressure pipelines from the subject location to the oily water separator and thus purified it is drained to the recipient, the Kladnica river.
- The adopted mineral oil separators meet the required parameters with their propeerties, water sampling is enabled due to the quality control of the effluent before discharge into the recipient. The position of the separator is in the shoulder in the embankment or after the recipient structures at the ends of the concrete channels, in the immediate vicinity of the edge traffic lane, so that access to the vehicle for cleaning and maintenance is enabled. At the discharges into the recipients, it is planned to make concrete discharge heads that provide the place of the discharge, as well as mica flaps (water return is prevented).
- Regularly performed maintenance of atmospheric wastewater drainage and treatment systems. In order to effectively maintain the drainage system, it is very important to monitor the condition of the plant in the operation phase. Waste material should be handled in accordance with legal regulations. Handle oil and sediment from the separator in accordance with the Law on Waste Management (the “RS Official Gazette”, no.. 36/09, 88/10, 14/16 and 95/18 - other law),

Rulebook on the method of storage, packaging and marking of hazardous waste (the "RS Official Gazette", no. 92/10) and Rulebook on conditions, manner and procedure of waste oil management (the "RS Official Gazette", no.. 71/10).

- The frequency of separator cleaning, 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 company. Oil and sediment from the separator should be collected and stored in special containers within the mobile storage of hazardous waste, according to the Law on Waste Management (the "RS Official Gazette", no.. 36/09, 88/10, 14/16 and 95/18 - other law), Rulebook on the manner of storage, packaging and marking of hazardous waste (the "RS Official Gazette", no.. 92/10) and Rulebook on the conditions, manner and procedure of waste oil management (the "RS Official Gazette", no. 71/10), until the takeover by the authorized company that will transport the waste from the perimeter of the facility for further treatment prescribed by law. It is forbidden to dispose of the removed waste in the natural environment, to release it into water recipients, sewage or to deposit it in drying fields.
- All **sanitary-fecal** wastewater generated in the facilities within the complex of the Kalenić regional sanitary landfill of municipal and non-hazardous waste will be collected independently, by separate networks of internal installations and drained from the facilities into special watertight septic tanks of appropriate volume. Septic tanks are located in green areas behind the porter's lodge, administrative and service buildings, in positions that are accessible from the roads, for easier emptying of tank trucks by the local PUEs.
- **Technical waters** from the washing of mechanization are drained to the lagoons for leachate through the system of surface gratings, sewage pipes, technological sewage. Before the leachate lagoons, technical water passes through a separator of oil and oil derivatives, and before entering the separator there is a precipitator for mechanical removal of larger material.
- In the first phase, **leachate** is pumped into lagoons (pools) for receiving leachate. The lagoon capacity is dimensioned so that during phase I it is possible to recirculate leachate to the active parts of the landfill body, without treatment or removal of excess leachate for further treatment by authorized operators.
- Water recirculation system and constant soaking of the landfill body prevents the possibility of fire in the landfill body, and also achieves a higher degree of compaction of disposed municipal and non-hazardous waste, and thus a higher degree of utilization of reserved space for the landfill body, resulting in extended useful life of the landfill. Also, a higher degree of compaction and decomposition of the deposited waste achieves a higher degree of utilization of landfill gas in the later stages of development of the landfill body, i.e. the entire complex of the regional sanitary landfill.
- Prevention of the impact of leachate on the environment, in the hydrotechnical sense, is solved by isolating the bottom of the landfill body and installing a system of pipes that collect leachate. Combined insulation of the bottom of the landfill body is performed, which consists of a layer of clay, geosynthetic bentonite composite, HDPE geomembrane, protective geotextile and a layer of gravel for drainage. The drainage layer of gravel is 50 cm thick, and leachate is filtered through it, and then run through the drainage pipes to the main manholes for collecting leachate by individual sectors.

  The sectors are physically separated from each other by a waterproof foil, raised to a height of about 1-1.5 m, temporarily secured with three rows of truck tires filled with sand, to prevent mixing of leachate formed in the active parts of the landfill body with clean atmospheric water from unopened parts, i.e. in order to reduce the production of leachate due to atmospheric precipitation. At the same time, conditions are being created for the collection and processing of landfill gas and the phased realization of the landfill in accordance with future needs.

  The landfill body in Phase I is divided into 12 sectors, of approximately equal capacity. Each sector has a separate pipe for receiving and evacuating leachate. Each individual pipe ends with a circular, collecting, watertight HDPE shaft with a diameter of 1 m. Drainage pipes of the

corresponding sectors penetrate through the shafts of the still unopened sectors in order to evacuate clean Precipitation to the lake-accumulation without mixing with leachate from the active sectors of the landfill body. The penetration of the pipe through the manholes is of a temporary nature, until the corresponding sector is opened for the disposal of municipal waste. After penetrating the sector shaft, clean atmospheric water flows down the outer side of the embankment towards the existing reservoir lake.

After the opening of the waste disposal sector, a part of the pipe that penetrates through the outer wall of the shaft is dismantled, and a fitting piece - "pipe" is installed. In this way, after activating the associated sector, the produced leachate of that sector is connected to the collection pipe for leachate and evacuated further to the pumping station and lagoons for leachate. The role of the "pipe" is to prevent the spread of unpleasant odors from the deposited waste through the leachate system (the passage of gases is prevented by water that is constantly in the siphon - "pipe").

The shafts of individual sectors are connected by a main pipe for evacuation of leachate. The main pipe for evacuation of leachate of the first phase of the landfill body ends with a pumping station with a capacity of 40 l/s, equipped with two pumps. With one pump, the leachate is pumped into lagoons (pools) for receiving leachate, and with another pump, in the recirculation system, the leachate from the lagoon is pumped to the active parts of the landfill body. Lagoons are open earthen pools, lined with waterproof HDPE foil 2mm thick, with the placement of geosensors under the foil, to register any leaks. The capacities of both lagoons are 3,825 m^3 each, which in total gives the total capacity of the lagoons for receiving leachate of Vuk=7,650 m^3. It is planned to fence the lagoon with a 2 m high wire fence. The volume of lagoons for receiving leachate is dimensioned based on the leachate balance for phase I of the regional landfill body. The capacity of the lagoons is dimensioned so that during phase I it is possible to recirculate leachate to the active parts of the landfill body, without treatment or removal of excess leachate for further treatment by authorized operators.

In the previously described manner, the movement of leachate is limited to a defined closed system of drainage pipes and collecting shafts with a signature pipeline, and as such has no impact on the environment.

- The Construction Permit Design does not address leachate treatment, but in the next phases of development and construction of the "Kalenić" regional sanitary landfill for municipal and non-hazardous waste it is recommended to consider the option of its treatment, i.e. design and dimensioning of leachate treatment plants in accordance with available treatment technologies on the market, at a given time.
- **Disinfection barrier** - The disinfection barrier is emptied using sludge pumps into IBC containers. Such material is then sent for analysis to an accredited laboratory, and then to authorized operators for further action.
- Procurement and installation of a geosensor (sensor electromagnetic system) for monitoring the water tightness of HDPE foil at the bottom and internal slopes of the leachate basin and at the bottom of the landfill is planned.
- For the needs of diesel fuel supply, it is planned to purchase a mobile oil storage pump with a tank with a volume of 2000 l. The tank has a protective role to receive the contents from the tank in case of emergency.
- A dry transformer is envisaged, with natural circulation of cooling air, thus eliminating the potential possibility of soil and groundwater pollution with cooling oil.

When managing the work of the "Kalenić" Regional Sanitary Landfill for Municipal and Non-Hazardous Waste, it is necessary to adhere to the following principles:

- Start depositing at the lowest level of the landfill;
- Design the cell so that the daily work surface is as small as possible;
- Cells and layers of waste are formed up to the designed height;
- Each batch of waste delivered to the landfill body is immediately spread and compacted;
- Provide daily covering of the cell, at the end of the working day, with inert material;
- During the summer period, once a day, a layer of compacted waste is sprayed with disinfectant;

- Use only appropriate equipment and within its capabilities;
- Locate the disposal equipment in the active zone (except during the weekend when the equipment is washed and disinfected),
- Ensure the compactor moves only along the excavation face,
- Always build the internal road in advance in relation to the segment to be filled, in order to ensure the unobstructed delivery of waste, without delays.

Protection measures in the reclamation phase include the following measures and works:

- After the completed cell filling of the active part of the landfill body, the final layers for closing the landfill are applied: gravel drainage layer for horizontal degassing, d = 0.3 m, clay layer d = 0.5 m and gravel layer for atmospheric precipitation drainage d = 0, 5m.
- Then biological reclamation is performed (soil application d = 0.7 m and topsoil layer d = 0.3 m), which is the act of final closure of the landfill.
- Reclamation of the landfill will be performed successively with the filling of certain parts of the landfill.
- The landfill is closed at the moment when the planned area is filled and when a layer for protection against atmospheric precipitation, a layer for technical reclamation and biological reclamation is applied to the thus formed substrate, which is the act of final closure of the landfill, i.e. when the designed elevations defined by graphic attachments are reached on the entire surface of the landfill body and the leveling plan of exploitation and closure of the landfill is implemented.

8.4.3. Temporary waste storage

For temporary disposal of hazardous waste and secondary raw materials, the facility OB 14 Canopy will be used at the landfill (The location of the canopy (OB 14) is shown in graphic attachment No. 1: "Layout of the "Kalenić" Regional Sanitary Landfill for Municipal and Non-Hazardous Waste)

All waste, non-hazardous (secondary raw materials) and hazardous, will be placed in appropriate containers, on a concrete plateau, under a canopy. The space for temporary storage of hazardous and non-hazardous waste will be separated by a wall made of concrete blocks.

The space for non-hazardous waste consists of four segments, while the space for hazardous waste consists of five segments.

Within the space for temporary storage of hazardous waste, there are two segments, which are fenced with a steel fence, in order to provide additional security and prevent access to unauthorized persons, since there will be non-lockable containers in these segments. Segments for temporary storage of hazardous waste, of open type, are intended for storage of locked containers.

The storage of hazardous waste is done in accordance with the Rulebook on the manner of storage, packaging and marking of hazardous waste (the "RS Official Gazette", No. 92/10).

The temporary storage must meet the regulations on sanitary and health protection, as well as technical and other conditions that provide protection from harmful effects on human health and the environment.

The temporary waste storage must be provided with appropriate access roads and suitable for waste handling (loading/unloading). Access to the temporary storage facility must be free and passable. Access should be allowed only to employees and authorized persons.

Liquid waste is stored in a storage container with an impermeable tank, which can receive the entire amount of waste in the event of an accident (leak).

Temporary storage of non-hazardous waste - secondary raw materials

Secondary raw materials must be temporarily stored at a specially designated location for this type of waste. Temporary storage of non-hazardous waste, which is used as a secondary raw material must:

- have access for loading and unloading,
- be fenced with a metal fence over 2 m high, with a stable and impermeable base with adequate protection from atmospheric influences,
- have a system for complete controlled reception of atmospheric water from all handling surfaces, with leveled terrain and receiving channels and shafts,
- have a fire protection system, and
- comply with special regulations.

Temporary storage of hazardous waste

Temporary storage of hazardous waste is regulated by legislation in the field of environmental protection and is performed in a way that ensures the lowest risk of endangering human life and health, as well as reducing the risk of environmental pollution.

The warehouse must meet the following criteria:

- The warehouse must meet the following criteria,
- It is locked, physically secured and supervised, and
- Allows easy and free access to stored waste.

Hazardous waste is stored in temporary storage in special containers, tanks and other storage containers, which must be closed and made of a material that provides impermeability and protection from atmospheric influences. Hazardous waste storage containers should be resistant to the waste stored in them.

Hazardous waste can be temporarily stored at the location of the producer or owner of the waste, for a maximum of 12 months. Joint disposal of hazardous waste with other types of waste at the same location is not allowed.

8.4.4. Noise control measures

During operation, the regional landfill complex will not endanger the surrounding population in terms of noise and it is not necessary to plan special protection measures. The green belt around the landfill, which is primarily planned as an air protection measure, can also serve as a noise protection measure. The extent to which noise levels will be reduced will depend on the characteristics of the green belt (belt width, height and vegetation density), but in principle no large reductions are expected.

8.4.5. Flora and fauna protection measures

Vegetation protection measures during operation:

- Mounting of waterproof layers at the bottom of the landfill body, in order to minimize the harmful effects of leachate on the surrounding area and surface,
- Daily and regular coverage of landfilled municipal waste with adequate coverage,
- Maximum respect for the procedural flow for all working phases of the landfill,
- Greening of the space of the regional landfill within the area of the protection zone around the complex, as well as free areas within the complex,
- For the functioning of the protection zone throughout the year, a combined, multi-row, multi-story planting of autochthonous deciduous and coniferous species is planned The protective belt is in a dense, with sporadic interruptions, thus avoiding air turbulence that occurs in the space behind the compact windshields,
- The participation of indigenous species is dominant in relation to the introduced ones, with all foreign species being either widely adaptable and widespread or growing by nature in other areas, but in habitats with similar characteristics (geological and pedological background, climatic conditions, etc.),
- Selected species are resistant or extremely resistant to harmful gases and dust.
- After the cell filling of the active part of the landfill body is completed, the final layers for closing the landfill are applied: gravel drainage layer for horizontal degassing, d = 0.3 m, clay layer d = 0.5 m and gravel layer for atmospheric precipitation drainage d = 0, 5m.

- Then biological reclamation is performed (soil filling d = 0.7 m and topsoil layer d = 0.3 m), which is the act of final closure of the landfill. Reclamation of the landfill will be performed successively with the filling of certain parts of the landfill.
- The landfill is closed at the moment when the planned area is filled and when a layer for protection against atmospheric precipitation, a layer for technical reclamation and biological reclamation is applied to the thus formed substrate, which is the act of final closure of the landfill, i.e. when the designed elevations defined by graphic attachments are reached on the entire surface of the landfill body and the leveling plan of exploitation and closure of the landfill is implemented.

The adopted concept of landfill exploitation will not lead to disruption of the natural biodynamic cycle of fauna at this site, which is otherwise devastated by mine excavations and tailings disposal, thus no special measures of fauna protection are needed.

8.4.6. Radiation control measures

There is no risk or possibility of ionizing and non-ionizing radiation, since depositing radioactive waste is prohibited at the landfill, and before the vehicle enters the landfill, the control of ionizing radiation is mandatory, through a device for detecting ionizing radiation.

8.4.7. Health protection measures

Daily covering of waste with inert material will prevent the possibility of spreading the infection by spreading waste by birds, rodents and insects, while installing a fence will prevent the spread of garbage by wind, as well as uncontrolled access of people and animals.

8.4.8. Fire control measures

"Kalenić" regional sanitary landfill for municipal and non-hazardous waste is entirely designed as fire-safe and with the use of materials that are in accordance with applicable standards and regulations. The landfill is located at a safe fire distance from neighboring facilities that do not belong to the landfill.

Access roads to firefighting facilities are at least 3.5 m wide for one-way and 6 m two-way traffic. As there are no conditions for the supply of technical water from the "Kalenić" drinking water treatment plant which is located in the immediate vicinity, an alternative solution was selected - making a well on the plot, with the accompanying infrastructure (tank, pumping station, etc.), which will provide the missing quantities of water for technical needs - fire water and water for washing vehicles, without special processing. The estimated fire-fighting water needs are 72 m^3 (one fire for 2 hours, extinguishing water flow 10 l/s) and this volume must be stored permanently in the tank.

8.4.9. Vibration control measures

During the exploitation of the landfill, as well as until its closure, there will be no vibrations that would have a harmful effect on the environment.

8.4.10. Material and cultural monuments protection measures

On the area planned for the construction of the "Kalenić" regional landfill for municipal waste on plot no. 800, Cadastral Municipality Kalenić, there are no identified or recorded immovable cultural monuments, or assets that enjoy prior protection, which would be endangered by the operation of the landfill.

If archeological objects are found during the earthworks, the contractor is obliged to immediately, without delay, stop the works and inform the Institute for the Protection of Cultural Monuments "Valjevo", and take measures not to destroy or damage the find, and to preserve it in the place and position in which it was discovered.

In case of imminent danger of damage to the archeological site or object, the Institute for the Protection of Cultural Monuments "Valjevo" will temporarily suspend all works and take measures to determine whether the property or object is a cultural good or not.

In case of permanent destruction or disturbance of the archeological site due to investment works, protective excavation will be carried out at the expense of the investor.

8.4.11. Landfill operator obligations

The operator is obliged to manage the landfill in accordance with the Law on Waste Management and other laws and secondary legislation in the subject area, as well as examples of good practice.
The operator is obliged to:

1. Prepare a work plan and ensure its implementation and updating. The work plan must contain the following elements:
   1) Description of location and identification of risk sources (waste management operations, permitted types of waste, working hours);
   2) Equipping the plant for the prevention and control of environmental pollution and endangering human health (receiving and drainage system for wastewater, wastewater treatment system, system for purification of gases from the plant);
   3) Site infrastructure (site security, fencing, collector control);
   4) Work in the plant (control of sludge and residues, potential leakage and environmental pollution, fire protection, waste reception and procedures for control, sampling and testing of waste, systems for measuring the amount of waste, storage of hazardous waste, hazardous waste treatment process - plant , equipment and procedures, including waste unloading and spreading systems, daily and on-site coverage as required);
   5) Pollution control, monitoring and reporting (monitoring and reporting on: waste composition, gas emissions, wastewater quality, i.e. leachate composition, groundwater quality, surface water quality, soil quality, weather conditions);
   6) Management and monitoring of conditions in the plant, i.e. at the landfill (control, monitoring and reporting of suspended particles, control of unpleasant odors, control and monitoring of noise, control of pests and birds, control of garbage distribution);
   7) Site documentation (availability of documents, hazardous waste records).
   The work plan for landfills, in addition to the above, contains elements related to equipping the site to prevent and control pollution, namely: receiving system for wastewater, receiving system for leachate, leachate treatment system, landfill gas control system, system for collecting atmospheric water, establishing, maintaining and protecting the final cover. The work plan of the waste management facility is attached to the application for the issuance of an integrated permit or waste management permit, updated regularly every three years, as well as in case of significant changes in the operation of the facility.
2. Prepare Accident Protection Plan, in accordance with the law;
3. Obtain a permit for waste disposal and dispose of waste in accordance with that permit;
4. Implement measures to ensure the protection of the environment, in accordance with regulations;
5. Charge for landfill waste disposal services;
6. Ensure reclamation of the landfill after its closure and perform professional supervision over the landfill, i.e. site for a period of at least 30 years, in order to reduce the risk to human health and the environment;
7. In case of an accident, inform the competent authority without delay, in accordance with the law;
8. Keep records on waste, in accordance with the Law on Waste Management;
9. Designate a qualified person responsible for professional work at the landfill;
10. Allow the competent inspector to control the locations, facilities and documentation.
11. Before disposal, the operator at the landfill shall ensure the verification of the delivered waste, i.e. its identification according to the type, quantity and properties, through the determination of the volume of waste and the control of the accompanying documentation before takeover.

12. accordance with the Law on Waste Management, the landfill operator is obliged to refuse to accept waste that does not meet the conditions for waste disposal from the permit or to refuse to accept waste when mixed with other waste, i.e. poses a risk to human health or the environment.
13. The operator is obliged to inform the body responsible for issuing the permit about the refusal to accept waste.
14. The landfill manager is required to keep a work log including the following information:
    - Weight, quantity and type of waste accepted for disposal, seat (permanent residence) of the waste supplier or his authorized representative
    - Waste analysis results
    - Technical data on the work of the landfill
    - Problems and accidents in operation
    - Opening hours of the facility
    - Conducted maintenance works
    - Conducted inspections and audits
    - Results of monitoring the impact of the landfill on the environment – monitoring

The manager of the complex manages and supervises the work of the Regional Landfill complex. It shall take all necessary measures to minimize the potential negative effects of the landfill on the environment.

The manager constantly monitors the impact of the landfill on the environment. In the event that any irregularity is noticed, the manager must be prepared to take the necessary measures to eliminate the negative impacts.

9. ENVIRONMENTAL IMPACT MONITORING PROGRAM

In order to control the impact of the "Kalenić" regional landfill and the undertaken environmental protection measures, it is necessary to monitor all parameters on the basis of which possible harmful impacts on the environment can be determined and, if necessary, take effective measures to eliminate them.

Monitoring of the state of the environment in the zone of influence of "Kalenić" regional landfill for non-hazardous waste should be performed in accordance with the Regulation on waste disposal in landfills (the "RS Official Gazette", no.. 92/10), which prescribes in more detail the types of waste the disposal of which at a landfill is prohibited, quantities of biodegradable waste that can be disposed of, manner and procedures of operation and closure of the landfill, content and manner of monitoring the operation of the landfill, as well as subsequent maintenance after closure of the landfill and other laws and secondary legislation:

- Law on Environmental Protection (the "RS Official Gazette", no. 135/04, 36/09, 72/09, 14/16, 76/18 and 95/18 - other law);
- Law on Waste Management (the "RS Official Gazette", no. 39/09, 88/10, 14/16 and 95/18-other law);
- Rulebook on conditions and manner of collection, transport, storage and treatment of waste used as a secondary raw material or for energy production (the "RS Official Gazette", no. 98/10);
- Rulebook on categories, testing and classification of waste (the "RS Official Gazette", no. 56/10 and 93/19)
- Rulebook on the manner of storage, packaging and marking of hazardous waste (the "RS Official Gazette", no. 92/10);
- Law on Air Protection (the "RS Official Gazette", no.. 36/09,10/13);
- Regulation on conditions for monitoring and air quality requirements (the "RS Official Gazette", no., 11/10 and 75/10, 63/13);
- Regulation on Limit Values for Emissions of Pollutants into the Air from Combustion Plants (the "Official Gazette", no. 6/16);
- Regulation on limit values for emissions of pollutants into the air from stationary sources of pollution, except for combustion plants (the "Official Gazette", no. 111/15);
- Law on Environmental Noise Protection (the "RS Official Gazette", no.. 36/09 and 88/10);
- Regulation on noise indicators, limit values, methods for assessment of noise indicators, disturbance and harmful effects of noise in the environment (the "RS Official Gazette", no. 75/10),
- Rulebook on noise measurement methods, content and scope of the noise measurement report (the "RS Official Gazette", no. 72/10);
- Law on Meteorological and Hydrological Activity (the "RS Official Gazette", no.. 88/10);
- Law on Waters (the "RS Official Gazette", no.. 30/10, 93/12, 101/16 and 95/18-other law);
- Regulation on limit values of priority and priority hazardous substances that pollute surface waters and deadlines for their achievement (the "RS Official Gazette", no. 24/14);
- Regulation on limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement (the "RS Official Gazette", no.. 50/12);
- Rulebook on hazardous substances in waters (the "SRS Official Gazette", no. 31/82);
- Rulebook on the manner and conditions for measuring the quantity and testing of wastewater quality and the content of the report on performed measurements (the "RS Official Gazette", no. 33/16)
- Regulation on water classification (the "SRS Official Gazette", no. 5/68);
- Rulebook on permitted quantities of hazardous and harmful substances in soil and irrigation water and methods of their testing (the "SRS Official Gazette", no. 23/94);
- Regulation on emission limit values for pollutants in water and deadlines for their achievement (the "RS Official Gazette", no.. 67/11, 48/12 and 1/16);
- Rulebook on parameters of environmental and chemical status of surface waters and parameters of chemical and quantitative status of groundwater (the "RS Official Gazette", no.. 74/11);
- Rulebook on reference conditions for surface water types (the "RS Official Gazette", no.. 67/11);

- Regulation on limit values of pollutants, harmful and dangerous substances in soil (the "RS Official Gazette", no. 30/18 and 64/19);
- Regulation on systematic monitoring of the condition and quality of soil, (the "RS Official Gazette", no. 73/19);
- Regulation on determining the criteria for determining the status of endangered environment and priorities for remediation (the "RS Official Gazette", no.. 22/10);
- Law on Protection against Non-Ionizing Radiation (the "RS Official Gazette", no.. 36/09);
- Law on Mining and Geological Research (the "RS Official Gazette", no.. 101/15 and 95/18);
- Rulebook on the methodology for the development of the national and local register of pollution sources, as well as the methodology for the types, methods and deadlines of data collection (the "RS Official Gazette", no.. 91/10, 10/13 and 98/16);
- Rulebook on the form of the Document on waste movement and instructions for its completion (the "RS Official Gazette", no. 114/13);
- Rulebook on the form Document on the movement of hazardous waste, the form of prior notification, the manner of its delivery and instructions for their completion (the "RS Official Gazette", no. 17/17);
- Rulebook on the form of daily records and annual report on waste with instructions for its completion (the "RS Official Gazette", no.. 7/20);
- Rulebook on forms of reports on packaging and packaging waste management (the "RS Official Gazette", no.. 21/10, 10/13 and 44/18);
- Regulation on products that after use become special waste flows, form of daily records on the quantity and type of produced and imported products and annual report, manner and deadlines for submission of annual report, entities subject to payment of fees, calculation criteria, amount and manner of calculation and payment of the fees (the "RS Official Gazette", no.. 54/10, 86/11, 15/12, 3/14 and 95/18)
- Law on Official Statistics (the "RS Official Gazette", no.. 104/09).

Landfill operation monitoring is carried out during the active and passive phase of the landfill, and regardless of the phase in which the landfill is, through the following activities:

- monitoring of meteorological parameters,
- surface water monitoring,
- leachate monitoring,
- groundwater monitoring,
- monitoring of gas emissions,
- monitoring the amount of rainwater
- monitoring the landfill body stability,
- monitoring of pedological and geological properties.

. The program of monitoring the impact of the landfill on the quality of the environment (monitoring) consists of two types of controls:

Regular, daily control - the environmental quality monitoring program consists of daily visual control of the following:

- Unloaded quantities and types of waste,
- Quality implementation of the designed technological process of landfill exploitation,
- Maintenance of landfills and roads,
- Quality of washing and disinfection of transport vehicles,
- Presence of infectious agents.

The landfill manager shall keep a work log that includes the following information:

– Weight, quantity and type of waste accepted for disposal, seat (permanent residence) of the waste supplier or his authorized representative
– Waste analysis results
– Technical data on the operation of the landfill
– Problems and accidents during operation

- Opening hours of the facility
- Conducted maintenance works
- Conducted inspections and audits
- Results of monitoring the impact of the landfill on the environment – monitoring

Controls through measurement and analysis of samples on the basis of which the following are registered:

- Quantity and quality of leachate filtrate,
- Groundwater quality,
- Composition and quantity of extracted gas,
- Weather characteristics
- Noise levels
- Soil quality
- Quantities of generated waste
- Quantities of waste received for disposal

Sampling and measurement defined by monitoring is performed by:

- Landfill laboratory where certain tests are performed daily (monitoring of weather parameters, monitoring of leachate);
- Accredited laboratory at certain intervals prescribed by the Regulation on disposal of waste at landfills.

The measuring equipment must be calibrated in accordance with the standards governing these areas.

The regional company must submit reports on monitoring and any irregularities during the operational phase to the competent licensing authorities. On the other hand, the competent authorities have the right to control the site and request the implementation of appropriate measures. Adequate landfill management is achieved through the responsible work of institutions in charge of monitoring the Regional Landfill and which may require operators to apply certain environmental protection measures.

9.1. Monitoring and reporting on weather conditions

The program of measuring weather parameters in the active phase and after the closure of the regional landfill is shown in Table 9.1-1.

Table 9.1-1. Program for measuring weather parameters.

Sampling location	Parameter	Method of determination[1]	Sampling frequency	
			Active phase	Passive faze
Weather station	Precipitation amount		Daily	Daily
	Temperature		Min; Max; 14:00 h	Monthly average
	Speed and direction of air flow	Lysimeter*	Daily	Not necessary
	Evaporation		Daily	Daily
	Atmospheric humidity (at 14:00)		Daily; 14:00 h	Monthly average

* or other appropriate method

Measurement of temperature and precipitation is performed at the location of the landfill, while the parameters related to wind speed, evaporation and atmospheric humidity are taken from the nearest weather station.

9.2. Surface water monitoring

Surface water monitoring is performed in accordance with the Regulation on disposal of waste at landfills (the "RS Official Gazette", no. 92/10), Law on Waters (the "RS Official Gazette", no.. 30/10, 93/12, 101/16 and 95/18-other law); Regulation on limit values of pollutants in surface and groundwater and

[1] In addition to recommended methods set out in the Table, standard or documented accredited methods can also be used .

sediment and deadlines for their achievement (the "RS Official Gazette", no. 50/12); Rulebook on hazardous substances in waters (the "SRS Official Gazette", no. 31/82); 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 (the "RS Official Gazette", no. 33/16); Regulation on water classification (the "SRS Official Gazette", no. 5/68); Rulebook on permitted quantities of hazardous and harmful substances in soil and irrigation water and methods of their testing (the "SRS Official Gazette", no. 23/94); Regulation on limit values of priority and priority hazardous substances that contaminate surface waters and deadlines for their achievement (the "RS Official Gazette", no. 24/14); Rulebook on parameters of ecological and chemical status of surface waters and parameters of chemical and quantitative status of groundwater (the "RS Official Gazette", no. 74/11); Rulebook on reference conditions for types of surface waters (the "RS Official Gazette", no. 67/11).

Sampling and testing of surface waters, in the Kladnica river, is performed in the prescribed time intervals, by institutions accredited for this type of testing, with accredited methods of sampling and analysis. Sampling is performed on at least two points, upstream and downstream of the landfill, by an accredited laboratory:

1) Before commissioning the landfill, by taking surface water samples, i.e. by determining the "baseline state".
2) During operation for the purpose of comparison with the "baseline state", namely at the beginning of landfill operation (first year) every month, complete analysis with all defined parameters (chemical and bacteriological analysis), and later every three months,
3) After the closure of the operation of the landfill, for the first five years every six months, and later once a year, until the decay of the landfill, if the monitoring results show that no accident has occurred.

Continuous monitoring of surface water during the operation of the landfill with abbreviated chemical and bacteriological analyzes is performed every 15 days in the landfill laboratory.

The parameters to be analyzed in the complete analysis are defined by the Regulation on limit values of contaminants in surface and groundwater and sediment and deadlines for their achievement (the "RS Official Gazette", no. 50/12). An overview of the parameters monitored in the active and passive phases, frequency and sampling sites are shown in Tables 9.2-1a and 9.2-1b.

Table 9.2-1a. Surface water monitoring plan.

Sample	Sampling location	Parameter	Sampling frequency	
			Active phase	Passive phase
Surface water	The Kladnica river upstream and downstream from the landfill	pH	The first 12 months of each month, and then quarterly	The first five years every six months. After that, once a year, until the landfill decays if the measurement results show that no accident situation has occurred
		Oxygen regime		
		Dissolved oxygen		
		O_2 saturation		
		BPK_5		
		Bichromatic HPH method		
		Permanganate HPK method		
		Total organic carbon (TOS)		
		Total nitrogen		
		Nitrates		
		Nitrates		
		Ammonium ion		
		Non-ionized ammonium		
		Non-ionized ammonium		
		Total phosphorus		
		Orthophosphates		
		Chlorides		

		Total residual chlorine		
		Sulfates		
		Total mineralization		
		Electrical conductivity at 200ºC		
		Arsenic		
		Boron		
		Copper		
		Zinc		
		Chrome (total)		
		Iron (total)		
		Manganese (total)		
		Phenolic compounds (as C_2H_5OH)		
		Surfactants (such as lauryl sulfate)		
		AOH (adsorbing organic halogen)		
		Fecal coliforms		
		Total coliforms		
		Intestinal enterococci		
		Number of aerobic heterotrophs (Kohl method)		

Table 9.2-1b. Surface water monitoring plan.

Sample	Sampling location	Parameter	Sampling frequency	
			Active phase	Active phase
Surface water-abbreviated analysis	The Kladnica river upstream and downstream from the landfill	pH	Fifteen days	Not applicable
		Hardness		
		BPK_5		
		Total organic carbon (TOS)		
		Total nitrogen		
		Nitrates		
		Nitrates		
		Ammonium ion		
		Phenolic compounds (as C_2H_5OH)		
		Total coliforms		

9.3. Leachate and industrial waste water monitoring

Leachate monitoring involves monitoring the volume of leachate and the composition/quality of leachate. In that way, disruptions in the process of collecting and pre-treatment of leachate are detected in a timely manner, which enables the undertaking of certain actions in order to take protection measures.

In the first phase, leachate is pumped into lagoons (pools) for receiving leachate. The capacity of the lagoons is dimensioned so that during phase I it is possible to recirculate leachate to the active parts of the landfill body, without treatment or removal of excess leachate for further treatment by authorized operators.

The water recirculation system and constant soaking of the landfill body prevents the possibility of fire in the landfill body, and also achieves a higher degree of compaction of landfilled municipal and non-hazardous waste, and thus a higher degree of utilization of reserved space for the landfill body, resulting in longer useful life of the landfill.

This project documentation does not address leachate treatment, but in the next stages of development and construction of the “Kalenić” regional sanitary landfill for municipal and non-hazardous waste it is

recommended to address the option of treatment of leachate, i.e. design and dimensioning of leachate treatment plants, in accordance with treatment technologies available on the market at a given time.

The plan for monitoring leachate is shown in Table 9.3-1.

Table 9.3-1. Leachate monitoring plan.

Sample	Sampling location	Parameter	Sampling frequency	
			Active phase	Passive phase
Leachate	Entrance to the aeration lagoon	Volume m^3	once a month	Not applicable
		Temperature ^0S	daily	
		pH value	daily	
		Biochemical oxygen consumption (BPK_5) (lagoon in/out)	daily	
		Chemical oxygen consumption (HPK)	daily	

Regular monitoring of the formation and quality of leachate at the landfill is performed by the laboratory within the complex by controlling the following parameters:

1) Leachate temperature of the sample taken from the waste water collection shaft and ambient air temperature;
2) pH value from the sample taken from the wastewater collection shaft, aeration lagoon and precipitation lagoon;
3) Consumption of permanganate from the sample taken from the wastewater collection shaft, aeration lagoon and precipitation lagoon,
4) BPK (biological oxygen consumption) from the sample taken from the wastewater collection shaft, aeration lagoon and precipitation lagoon.

The quantity of generated leachate is to be estimated by multiplying the operating hours of the leachate pump stations and their capacity.

Also, it is necessary to take samples of leachate for testing in an authorized laboratory. Leachate monitoring is performed on a representative number of samples at each point where the liquid is drained from the site in a controlled manner. Measurement of volume and composition, i.e. qualitative and quantitative parameters of leachate is performed once a month during the operation of the landfill. These measurements are performed after the cessation of landfill operation every six months for the first five years, and then once a year until the landfill decays.

9.4. Precipitation and sanitary waste water monitoring

9.4.1. Precipitation

Atmospheric water from roads and handling surfaces collected by drains is drained from the subject location to the oily water separator by a system of sewage pipes (collectors), pumping stations and pressure pipelines, and so treated the water is drained to the recipient, the Kladnica river.

In accordance with the Law on Environmental Protection (the “RS Official Gazette”, no.. 135/04 and 36/09, 36/09 - other law, 72/09 - other law, 43/11- Decision of the US, 14/16, 76/18, 95/18 - other law and 95/18 - other law), Law on Waters (the “RS Official Gazette”, no.. 30/10, 93/12, 101/16 and 95/18 other law) and Rulebook on the manner and conditions for measuring the quantity and testing the quality of wastewater and the content of the report on performed measurements (the “RS Official Gazette”, no. 33/16), during the use of the separator it is necessary to perform systematic monitoring of wastewater and wastewater quality and the report on the performed measurements shall be submitted to the public water

management 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 recipient 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 performed measurements (the "RS Official Gazette", no. 33/16), through a legal entity authorized to test wastewater or independently if it meets the conditions in accordance with the law governing water and in accordance with: Law on Waters, Rulebook on the manner and conditions for measuring quantity and testing the quality of wastewater and the content of the report on the performed measurements (the "RS Official Gazette", no. 33/16) and Regulation on the limit values of emissions of contaminants into water and deadlines for their achievement (the "RS Official Gazette", no.. 67/11, 48/12 and 1/16).

Selection of parameters to be monitored
The following parameters need to be specified:

- air temperature, water temperature,
- barometric pressure, color,
- odor,
- visible substances,
- sedimentary substances (after 2 hours),
- HPK,
- $BPK_{5,}$
- pH value,
- oxygen content,
- dry residue,
- annealed residue,
- loss by annealing,
- suspended matter,
- electric conductivity
- heavy metal content
- hydrocarbon index (mineral oils from C_{10}-C_{40}).

Locations, manner and frequency of measuring the determined parameters
The location for wastewater sampling is determined in accordance with the Rulebook on the manner and conditions for measuring the quantity and testing of wastewater quality and the content of the report on performed measurements (the "RS Official Gazette", no. 33/16), taking into account changes in wastewater composition in time and space. The sampling point must be integrated in the separator or outside the separator and in both cases directly downstream of the separator. The minimum number of sampling is determined in accordance with the above-mentioned Rulebook, and in accordance with the flow of wastewater at the individual discharge from the separator. Given the capacities of the separators provided by the project, sampling should be performed 4 times a year, i.e. once every three months.

9.4.2. Sanitary and fecal water

Sanitary-fecal water from the facility will be collected independently from each facility separately, in special septic tanks of appropriate volume, built of impermeable reinforced concrete, which will be periodically, if necessary, emptied by tank trucks and transferred for further treatment in some of the city's sewer systems in the area.

Wastewater and its limit values before entering the public sewer are defined by the Rulebook on technical and sanitary conditions for discharging wastewater into the city sewer (some of the city sewage systems in the area under the jurisdiction of the PUC with which the contract will be concluded). If this Rulebook does not comply with the regulations, the values of parameters defined by the Regulation on emission limit values for contaminants in water and deadlines for their achievement (the "RS Official Gazette",

no.. 67/2011, 48/12 and 1/16) shall apply. The monitored parameters and sampling locations are shown in Tables 9.4.2-1a and 9.4.2-1b.

Table 9.4-1a. Sanitary wastewater monitoring plan.

Sample	Sampling location	Parameter	Sampling frequency	
			Active phase	Passive phase
Sanitary wastewater discharged in the public sewer	Septic tanks	Volume	Monthly	Not applicable
		pH		
		Temperature		
		Suspended matter		
		BPK_5		
		HPK		
		Toxicity		

Table 9.4-1b. Sanitary wastewater monitoring plan.

Sample	Sampling location	Parameter	Sampling frequency	
			Active phase	Passive phase
Sanitary wastewater discharged in the public sewer	Septic tanks	Total inorganic nitrogen (NH_4-N, NO_3-N, NO_2-N)	Monthly	Not applicable
		Total phosphorus		
		Total nitrogen		
		Ammonia, expressed via nitrogen (NH_4)		
		Deposits		
		Ekst.or.ras. (oils, fats)		
		Mineral oils		
		Phenols (phenolic index)		
		Tar		
		Total iron		
		Total manganese		
		Sulfides		
		Sulfates		
		Active chlorine		
		Total salts		
		Fluorides		
		Total arsenic		
		Total barium		
		Cyanide (easily volatile)		
		Total cyanides		
		Total silver		
		Total mercury		
		Total zinc		
		Total cadmium		
		Total cobalt		
		Chrome 6+		
		Total chrome		
		Total lead		
		Total tin		
		Total copper		
		Total nickel		
		Total molybdenum		
		BTEX (benzene, toluene, thiobenzene, xylene)		
		Organic solvents		
		Asbestos		

9.5. Groundwater monitoring

Groundwater monitoring is performed in three stages: sampling; monitoring and determining critical values. Samples are taken as reference values for groundwater monitoring before the landfill is commissioned and marked as “baseline state”.

Monitoring of groundwater below the landfill body and in the immediate area of impact of the landfill must be such as to provide information on groundwater that may be contaminated as a result of the operation of the landfill.

Groundwater quality control, and thus the impact of the landfill on them, will be performed through installed piezometers.

At the location of the future Kalenić landfill, there are currently 4 piezometers - previously drilled P-3 and PB-7, as well as two new piezometers PB-8 and PB-9, which monitor the groundwater levels of the underlying aquifer. The observation network will be supplemented with 5 new piezometers, where 3 piezometers will be installed in the backfill of exploitation wells BDK-1, BDK-2 and BDK-3. The remaining two piezometers will have filter structures in the interlayered aquifer.

Piezometers play a multiple role in well fill. In addition to monitoring groundwater levels and quality, these piezometers also provide significant data on the aging process of wells. If significant differences in depth to the groundwater level in the well and the accompanying piezometer are observed, it can be concluded that the filter structure of the well has become clogged and that it is necessary to carry out regeneration of the well.

The two piezometers that will have filter structures in the interlayered aquifer will serve as a significant source of information for the development of the next hydrodynamic model, given the modest data base on this aquifer. It primarily refers to filtration properties of the porous medium in the piezometer zone, as well as the groundwater levels.

The newly formed observation network will consist of 9 piezometers that evenly cover the area of the Kalenić landfill. In order for the process of monitoring groundwater levels and chemical composition to enable the drawing of certain conclusions, in addition to the number and arrangement of piezometers, it is necessary to correctly define the appropriate dynamics of monitoring the regime parameters.

From these piezometers, before the beginning of works, during operation and after closing and reclaiming of the landfill, sampling of groundwater content will be performed, in accordance with legal requirements, in order to monitor their presence and quality (physical-chemical and bacteriological analyzes) and register possible penetration of contaminated water from the landfill body to the surrounding terrain).

In the first six months from the beginning of exploitation, measurement and testing (abbreviated chemical and biological analysis) of groundwater is performed every 15 days, and after this period according to frequencies depending on the specifics of the terrain [if a critical level is reached, the frequency must be based on the possibility of taking corrective measures between two samplings, i.e. the frequency must be determined on the basis of knowledge and assessment of the groundwater flow rate, and when a critical level is reached it is necessary to carry out control by repeated sampling; when the level is confirmed, a contingency plan (specified in the permit) must be implemented], all in accordance with Clause 5, Annex 6, of the Regulation on disposal of waste at landfills (the “RS Official Gazette”, no.. 92/10).

Groundwater samples, which are taken at the prescribed time intervals, after the expiration of 6 months of landfill operation, are subject to complete chemical and bacteriological analyzes in accredited institutions for this type of testing.

In addition to monitoring the composition of groundwater, a permanent measurement of groundwater levels is performed (every 6 months in both the active and passive phase of the landfill). The Regulation on limit values of contaminants in surface and groundwater and sediment and deadlines for their achievement (the "RS Official Gazette", no. 50/12) defines the parameters of groundwater monitoring at the landfill. The groundwater monitoring program is shown in Table 9.5-1.

Table 9.5.1. Groundwater monitoring program.

Sample	Sampling location	Parameter	Sampling frequency	
			Active phase	Passive phase
Groundwater	Piezometers	Water level	Every six months	Every six months
		Nitrates		
		Active substances in pesticides		
		Arsenic		
		Cadmium		
		Lead		
		Mercury		
		Ammonium ion		
		Chlorides		
		Sulfates		
		Trichlorethylene		
		Tetrachloro-ethylene		
		Vinyl chloride		
		Electric conductivity		

9.6. Gas emission monitoring

At the degassing system checkpoints, during the operation of the landfill, gas sampling and control is performed by an authorized institution, on a representative number of samples prescribed by permits.

Periodic measurements include measurement of static, differential and barometric pressure and the amount of concentration (% by volume) of methane, carbon dioxide and oxygen, as well as gas volume once a month in the active phase of landfill operation and twice a year in the passive phase. Measurement of temperature and concentration of other landfill gases (such as hydrogen, hydrogen sulfide, nitrites) depends on the composition of the disposed waste and is performed in accordance with the waste disposal permit.

The monitoring system, in addition to the above, should also detect the potential spread of gas outside the landfill body and the high, explosive concentration in the facilities of the landfill complex and its surroundings as well as in the soil. The maximum permitted concentration of methane in the air should not exceed the limit of 25% of the lower explosive level (LEL) in buildings and 100% of LEL in the environment. The LEL for methane is 5% (methane concentration in air). Monitoring of possible spread of gas outside the landfill body into the atmosphere can be done by measuring the concentration of methane in the facilities, which ensures highly safe operation of the landfill.

Facilities at the landfill site and other enclosed structures must be regularly inspected to determine possible landfill gas leaks and to avoid the risk of explosions. This means that monitoring must be directed towards checking the vegetation, unpleasant odors, surface conditions and measuring landfill gas in monitoring wells and parts of the landfill where gas can accumulate and cause danger.

Checking the composition of landfill gases is done by taking gas samples from biothorns by placing special probes for sampling in degassing pipes to the appropriate depth, and then analyzing samples using appropriate gas analyzers. This is performed by specialized institutions, which are registered for this type of activity. The gas emission monitoring program is shown in Table 9.6-1.

Table 9.6-1. Gas emission monitoring program.

Sampling location	Parameter	Sampling frequency	
		Active phase	Passive phase
Biodegassers	Atmospheric pressure	Monthly	After the closure of landfill operation for the first ten years, every six months, and then every two years until the landfill decays
	Methane		
	Carbon dioxide		
	Oxygen		
	Hydrogen		
	Hydrogen sulfide		

9.7. Precipitation level monitoring

Precipitation level monitoring in the area of the landfill, its accompanying facilities and in the wider protection zone is performed in accordance with the regulations governing water, i.e. in accordance with the water permit. This part of the monitoring should be specified after the water permit is issued.

9.8. Monitoring the stability of the landfill body and protective layers

Stability of the landfill body is determined by monitoring the structure and composition of the landfill body, once a year in the active phase, and the properties of subsidence of the landfill body in the active phase and reading annually in the passive phase in accordance with Clause 7 of Annex 6 to the Regulation on disposal of waste at landfills (the "RS Official Gazette", no. 92/10.).

The correctness of the waterproofing and water tightness of the landfill body is monitored by a system that operates on the principle of electromagnetic waves and their return signals. In that way, places are found where, during construction, but also later during operation (after 2 m of landfill height), the insulation is damaged. The metal strips of the monitoring system are placed under the waterproofing foil, and over the mineral sealing layer. The waterproofing foil is made of high density polyethylene (PEHD).

The protective layers of the landfill are monitored continuously by sensors built into the artificial waterproof lining, and the data is monitored at the landfill laboratory. Monitoring of the protective layers of the landfill is performed continuously during the operation of the landfill, and after the closure of operation, monitoring and data processing is performed at intervals prescribed in the landfill operating permit. The program for monitoring the stability of the landfill body and protective layers is shown in Table 9.8-1.

Table 9.8-1. Landfill body stability and protective layers monitoring program.

Sample	Sampling location	Parameter	Sampling frequency	
			Active phase	Passive phase
Stability of the landfill body		Structure and composition of the landfill body	Annually	Not applicable
		• area occupied by waste		
		• volume of waste		
		• waste composition		
		• method of disposal		
		• time of disposal		
		• duration of disposal		
		• remaining capacity		
	Senzori	Landfill body subsidence property		Annually

Table 9.8-1. Landfill body stability and protective layers monitoring program.

Sample	Sampling location	Parameter	Sampling frequency	
			Active phase	Passive phase
Protective layers	Senzori	Not applicable	Continuously	In accordance with the permit

9.9. Monitoring of pedological and geological characteristics

Monitoring of pedological soil characteristics and geological soil characteristics in the immediate zone of the landfill for "baseline state" is performed by periodic sampling of the geological environment from shallow and deep drilling pits and wells, once a year during the operation of the landfill, and after the cessation of the landfill, once in five years, until the decay of the landfill. Testing of samples is performed by accredited institutions, which compare the results with the limit values determined by the landfill operating permit. The person responsible for monitoring the operation of the landfill shall keep records of the test results and submit them to the competent institution for environmental protection in accordance with the applicable legislation.

In order to control the applied soil protection measures, it is necessary to take and analyze soil samples in the vicinity of the site, within a radius of 1 km, before the beginning of works, and then monitoring at defined measuring points during and after exploitation, in accordance with legal regulations (once a year during the period of operation of the landfill and for 5 years after the cessation of operation, in accordance with Clause 9, Annex 6, to the Regulation on disposal of waste at landfills (the "RS Official Gazette", no.. 92/10), by an accredited institution.

9.10. Monitoring and reporting on the waste composition

Waste management is accompanied by documentation determined by the applicable legislation. During the operation of the landfill, the company that manages the landfill should keep daily records of the composition and amount of incoming waste with the help of weighing system software. This is done in order to prevent the disposal of illicit waste, but also to obtain statistical data on the amount and composition of waste and its variability over the years.

The environmental quality monitoring program also includes the mandatory determination of the waste structure, i.e. its morphological composition and the amount of individual components, seasonally four times a year.

Determining the morphological composition of waste will be done in accordance with the Rulebook on methodology for collecting data on the composition and quantities of municipal waste on the territory of the local self-government unit (the "RS Official Gazette", no. 61/10), and data will be entered in the tables of the Rulebook.

Data on the quantities of landfilled waste are kept on a daily and annual basis. The Daily Record on Waste Management of the Waste Disposal Plant Operator is kept on the prescribed form DEO2 (Appendix 5), maintained by the operator on the landfill weighbridge on the basis of internal instructions for keeping daily records of deposited waste (Appendix 6). The manner of reporting is prescribed by the Rulebook on the form of daily records and annual report on waste with instructions for its completion (the "RS Official Gazette", no. 7/20).

Data on the quantities of generated waste is kept on a daily and annual basis. Based on the collected data, the person responsible for working with the agency is obliged to enter data into the information system of the National Register of Pollution Sources (NRIZ) and provide completed and certified forms in paper form: GIO2 (Annual Waste Management Report of the Waste Disposal Plant Operator, Annual Waste Report), KOM1 (Annual Report on Municipal Waste Management) and GIO1 (Annual Report on Waste of Producers) to the Environmental Protection Agency by March 31 of the current year for the previous year.

9.11. Daily visual monitoring

Daily visual monitoring should be provided, inter alia, in the following areas:

- Application of prescribed and designed technological processes for landfill exploitation.
- Maintenance of landfill and internal roads - quality and quantity of inert material, washing, daily cleaning of bulky waste, supervision of daily activities and corrections if necessary.
- Quality of washing and disinfection of vehicles (entry/exit control).
- Health and safety measures for protection of workers - regulations for work and inspection of equipment, machines and vehicles before the start of work, speed limit, inspection of waste disposal zone, lighting, parking.
- Presence of pests - insects and rats, covering the waste with inert material, disinfection at least once a year by the company for disinfection and deratization.

9.12. Biomonitoring

It is extremely good to include biomonitoring in the Monitoring Plan, which includes regular visual observation of the condition of plant community in the protection zone around the landfill, and if necessary on the surrounding land, because living organisms react most quickly to adverse effects and give an excellent picture of the surrounding biocenosis. The advantage of biological indication in relation to physical-chemical methods of monitoring environmental pollution lies in the fact that living organisms can show the effect of accumulation of pollutants over a longer period of time. On the other hand, physical-chemical methods give more exact data, but they are available only at a specific point in time. A bioindicator is an organism or biological change that reveals the presence of pollution by the appearance of typical symptoms and is therefore more qualitative. Changes in these organisms (or communities of organisms) can be: physiological, chemical or behavioral changes and can be observed by monitoring:

- quantities of elements or compounds contained in organisms;
- their morphological or cellular structures;
- metabolic-biochemical processes;
- behaviors;
- population structure.

Community assessment (so-called biomonitoring), i.e. biological monitors or biomonitors are defined as organisms that provide quantitative information about the quality of the environment in which they are located. The whole community is sampled to determine which taxonomic type survives.
The use of biomonitors is called biological monitoring (biomonitoring), and involves the use of organisms to obtain information on certain aspects of the biosphere.

For methodological reasons, biological monitoring is divided, in relation to which of the forms of the environment the changes are monitored, into:

Biological monitoring of air pollution (bioindicators are most often lichens and moss);
- Biological monitoring of water pollution (bioindicators are most often fish, frogs, water fleas, freshwater zooplankton);
- Biological monitoring of soil pollution (bioindicators are higher plants, i.e. vegetation).

Pollution biomonitoring can be:

- Passive (organisms that live naturally in the environment are observed);
- Active (test organisms, of known genotype and reactions to the pollutant, are placed in the environment subject to the study).

There are several types of bioindicators:

- Lichens - indicate changes in forests caused by climate change, air quality (sulfur dioxide, nitrogen oxides …);
- Algae - indicate the amount of nutrients (nitrogen, phosphorus) in water systems;
- Genetically modified organisms, e.g. grass that has a different color if toxins are present in the soil;
- Animals - increasing or decreasing their number, monitoring the concentration of toxins in the tissue, monitoring the frequency of deformities in the population;

- Microorganisms - in the presence of cadmium and benzene, some microorganisms produce new proteins, the so-called stress proteins.

The type and extent of biomonitoring that will be applied at the landfill needs to be precisely defined by the Monitoring Plan for which guidelines are given here, and in accordance with the specifics of the location.

9.13. Other controls

- Security facilities (fences, gates, locks, etc.) will be inspected periodically for possible damage and maintenance.
- Access roads, direction signs and facility names will be checked regularly for damage and maintenance. Signs must be legible and repairs will be performed as needed.
- Control of garbage, health and safety measures at work is carried out weekly by visual inspection and recording of accidents.
- Noise level monitoring is performed upon receipt of complaints by measuring in the facility.

10. NON-TECHNICAL SUMMARY

Pursuant to Article 28 of the Law on Environmental Impact Assessment (the "Official Gazette of RS", no. 135/04, 36/09), updates are made to the Studies on Environmental Impact Assessment of the project of "Kalenić" regional landfill for municipal (non-hazardous) waste, municipality of Ub, on the cadastral parcel 800, cadastral municipality Kalenić, municipality of Ub, to which the Ministry of Agriculture and Environmental Protection issued a decision on giving consent no. 353-02-806/2015-16 from 25 August 2016. The reason for updating the Study in question is that the project holder Regional Waste Management Center "Eko Tamnava" d.o.o. Ub did not start the implementation of the project in the period of two years from the day when the decision on giving consent to the Environmental Impact Assessment Studies became final.

Updated Study on Environmental Impact Assessment of the project of regional landfill for municipal (non-hazardous) waste "Kalenić", Municipality of Ub, on cadastral parcel number 800 cadastral municipality Kalenić, Municipality of Ub was prepared in accordance with: Decision on determining the scope and content for updating the Study on Environmental Impact Assessment (no. 353-02-1927/2019-03 dated 15 October 2019) adopted by the Ministry of Environmental Protection, existing legislation, technical documentation and relevant planning documentation. Archival documentation was also used, the results of environmental monitoring in the zone of the future regional sanitary landfill "Kalenić", conducted by PE "Electric Power Industry of Serbia" Belgrade, branch of RB "Kolubara" Lazarevac, opinions and conditions of competent institutions and data collected in the field.

The macro-location of the future regional landfill for municipal (non-hazardous) waste "Kalenić" is located in the immediate vicinity of the four borders of the municipalities of Lazarevac, Lajkovac, Obrenovac and Ub and in the immediate vicinity of the location of the thermal power plant "Kolubara B" (under construction). It is about 13 km as the crow flies northeast of the center of Ub and about 5.8 km northwest of Veliki Crljani, and about 45 km from Belgrade to the southwest.

The micro-location of the regional landfill for municipal (non-hazardous) waste "Kalenić" is located in the mining basin of Kolubara, on the site of the former surface mine "Tamnava-West Field" (between PK Tamnava East and West). Part of the dry (former) riverbed of the Kladnica River and the peripheral channel for evacuation of Precipitation from the mine "Tamnava-West Field" is about 100 m away from the gate of the landfill complex. The newly formed Kolubara riverbed is more than 3000 m away from the location. The distance of the nearest drainage well Bp-4 (Ogr+172.5), from the location of the regional landfill is about 1,600 m, and from the reservoir - lake about 2,000 m. The nearest drainage well of the spring "Tamnava-East Field" are at a distance of about 900 m from the landfill regulation line. The said drainage system is also used as water catchment for the demands of "Kalenić Waterworks" system, with connection at a distance of about 2.000 meters from the landfill site. On the northern side of PK "Tamnava – East Field" and PK "Tamnava – West Field" there are infrastructure facilities: roads, industrial complex with administrative buildings, coal loading facilities for TPP "Obrenovac" with industrial railway and other facilities used for water supply and electricity supply. Access to the regional landfill is planned through the regional road R 101a, Veliki Crljeni - Stubline and through the dirt road, which needs to be reconstructed in order to be able to receive large capacity trucks. In the earlier stages of preparation of study and technical documentation, the subject location was chosen as the final solution for the location of the regional landfill for municipal waste, which was also confirmed in valid planning documents (Spatial Plan of the Republic of Serbia, Spatial Plan of Kolubara District, Spatial Plan of Ub Municipality, Kolubara B, RS Waste Management Strategy and Regional Waste Management Plan of 11 cities and municipalities of Kolubara region with Strategic Environmental Impact Assessment).
Based on the previous technical documentation and the configuration of the terrain and the capacity of the location, it is envisaged that the Regional Communal landfill "Kalenić" will be realized in three phases:

- In the first phase, the construction of the necessary infrastructure for the operation of the landfill is planned - roads, plateaus, facilities (for servicing and washing vehicles, administrative buildings, substations, etc.), as well as sanitary development of the landfill for the first phase of waste disposal.

- In the second and third phase, sanitary disposal of new waste will be performed with the necessary works related to the expansion of the landfill body to free areas, using the complete infrastructure built in the first phase.

The project envisages a backup space for future expansion of the content of waste treatment at the complex, a plateau for construction waste, as well as space intended for special facilities, the realization of which will, depending on financial possibilities, take place during the second and third phase of landfill construction.

The entrance zone is located in the northern part of the complex, on the place where the construction of a porter's lodge (weighbridge), weighbridge and disinfection system (tire washing) is planned

In the western part of the complex, a zone is planned that includes the location of the administrative building and parking spaces for employees and visitors.

In the eastern part of the complex there is a technical group of facilities which includes: car wash, service building with area for workers, garage for vehicles, canopy for technical equipment, infrastructure facilities (substation, well, tank). Within this zone, space is reserved for prospective expansion of facilities. Also, in the eastern part of the complex, in accordance with the topographic characteristics of the area, the planned lagoons for the treatment of leachate and technical waters are located.

The largest, central part of the subject area is intended for the landfill body, which is divided into 3 cassettes, since phase construction is planned. The first cassette, which will be realized in the first phase of construction, is additionally divided into three sub-cassettes, in order to reduce the creation of leachate.

The following facilities necessary for the functioning of the landfill complex in the first phase of construction are planned at the complex:

- Porter's lodge and weigher’s lodge;
- Weighbridge;
- Disinfection barrier;
- Administrative building with parking for employees;
- Transformer station with space for storing of aggregate;
- Car wash;
- Service building with space for workers and a access plateau;
- Parking for clean and parking for dirty vehicles;
- Garage for vehicles with a handling plateau;
- Canopy for accommodation of technical devices;
- Technical water tank to be supplied from the well from the complex;
- Phase I lagoons that serve to receive leachate from the landfill body;
- Phase II lagoon, which will be used in phase I to receive atmospheric water from the landfill body.

The work zone includes:

- Receipt and dispatch area and facilities (gate, porter's lodge with weigher, weighbridge and disinfection barrier),
- Administrative part (administrative building with parking for employees),
- Technical group of facilities with accompanying plateaus and parking lots (service workshop, car wash, vehicle garage, canopy for accommodation of technical devices and equipment),
- Sanitary landfill for non-recyclable municipal solid waste - first phase,
- Internal roads,
- Space intended for construction waste,
- Space intended for future waste treatment plant.

Protection zone
Landscaping of the landfill area is planned within the area of the protection zone around the complex and free areas within the complex. A 2.20 m high wire fence is planned around the part of the complex that is being built in phase I. The protection zone is planned along the fence of the Regional Landfill complex, as a barrier to the outer landscape, and is formed by a combination of tall and low tree species as well as shrub species. The protective belt is designed in a dense assembly, with sporadic interruptions, thus avoiding air turbulence that occurs in the space behind fully compact windshields.

The following infrastructure facilities are also planned for the entire complex:

- Technical water well and high pressure pump to supply water tanks,
- Water tank (for sanitary and fire water supply),
- Transformer station of the required power, to supply the consumers of the complex.

At the regional landfill "Kalenić" it is planned to dispose of municipal (non-hazardous) waste of eleven cities and municipalities, which together make up the Kolubara region for waste management: from the Kolubara administrative district (Valjevo, Lajkovac, Ljig, Mionica, Osecina and Ub), part of the Mačva administrative district (Vladimirci and Koceljev). For the needs of the functioning of the regional waste management system, in December 2011, a company was established, the Regional Center for Waste Management "EKO-TAMNAVA" Ltd. - Ub, whose main activity is to organize and coordinate the provision of waste management services in the region, as well as to manage the regional landfill for municipal (non-hazardous) waste, on commercial basis. All 11 cities and municipalities, through an inter-municipal agreement, undertook to dispose of municipal waste at the regional landfill for municipal (non-hazardous) waste, immediately after its development. Local PUCs will continue to provide waste collection services on the territory of their self-government units. Collection and transport of recyclable materials is the responsibility of local PUCs. Municipalities may collect recyclable waste independently or, in the case of smaller municipalities, they may entrust the separate collection of recyclables to the municipality responsible for the operation of the nearest or selected MRF.

In the area of Kolubara region, 3 transfer stations (TS), one transshipment point and three waste recycling lines (MRF) are planned for waste management. There is a stationary substation in the region, which was built in the city of Valjevo, which will serve Mionica and Osečina for the needs of regional waste management. Next to the TS there is an MRF with a waste separation line. A recycling line of the dirty MRF plant was built in Obrenovac and it aims to separate recyclables, mainly by manual sorting. This line is practically already half of the transfer station to which waste is brought and processed, and the remains, the so-called residual waste, will be sent in the future, instead of to the local landfill, to the regional waste management center "Kalenić". The TS in Koceljeva, which will also serve Vladimirci, was built, and the construction of the TS in Lazarevac, which will also serve Ljig, is planned. An MRF line will be installed in Lazarevac, which will also serve the municipalities of Barajevo and Ljig. The following waste fractions will be brought to the "Kalenić" landfill: mixed waste from a wet bin and residues from three separation plants (MRF plants). The estimated average annual amount of mixed municipal waste that will be disposed of at the landfill is on average about 120,000 t/p.a.

In the earlier stages of preparation of study and technical documentation, the subject location was chosen as the final solution for the location of the regional landfill for municipal waste, which was confirmed in valid planning documents (Spatial Plan of the Republic of Serbia, Spatial Plan of Kolubara District, Spatial Plan of Ub Municipality, Urban Plan of Kolubara B, RS Waste Management Strategy and Regional Waste Management Plan of 11 cities and municipalities of Kolubara region with Strategic Environmental Impact Assessment).

The largest part of the considered site is the currently degraded area, which served as an internal tailings dump from surface mines. There are no recorded cultural or natural goods or habitats of plant or animal species at the site in question. The results of the examination of the quality of soil, air, surface and

groundwater indicate that there has been degradation of the environment, despite the efforts of the competent commercial and state entities to preserve and improve the environment in the Kolubara basin.

The global analysis of the impact of the regional landfill of municipal (non-hazardous) waste on the environment shows that negative impacts can be manifested in all phases of the useful life of the landfill (in the phase of construction, exploitation and its closure). The impacts that occur as a consequence of the works on the formation of the landfill body, construction of the facility and the accompanying infrastructure are by nature mostly temporary. They are a consequence of the presence of people and machines, as well as technology and organization of works. As a rule, negative impacts on the environment occur as a result of transport and installation of construction materials, and in the case of accidental spillage of oil products from construction machinery. In the phase of construction of the regional sanitary landfill "Kalenić", noise and air pollutant emissions are expected, as well as the creation of construction and communal waste.

The impacts on the environment that occur as a consequence of waste disposal over time are mostly permanent in nature and as such certainly represent the impacts that are particularly interesting from the point of view of the relationship sanitary landfill - environment. The negative impacts of the decomposition of landfilled waste on the environment can be:

- pollution of land, surface and groundwater due to uncontrolled discharge of wastewater from the landfill (leachate, technical water, sanitary wastewater);
- air pollution and endangerment of other segments of the environment due to uncontrolled movement of landfill gas and the spread of unpleasant odors;
- aesthetic disruption of the area.

The third type of possible impact on the environment is manifested at the end of the period of use of the sanitary landfill, i.e. in the phase of its closure. Reclamation is a complex measure of environmental protection that is taken in order to prevent surface erosion, uncontrolled waste distribution, disturbances in waste decomposition and gas separation, as well as uneven subsidence of the terrain. Reclamation is directed toward achieving optimal biological production, in order to better achieve the protective function and to secure that the landscape will functionally and visually fit into the surroundings.

The concept of solution and organization of the complex of regional landfill for municipal (non-hazardous) waste "Kalenić" is based on the implementation of technical, technological and organizational measures that provide maximum protection of the environment and health of the population, with maximum rational use of space and rational investment of financial resources, and in compliance with technical standards as well as the objectives of the Waste Management Strategy.

As part of the Hydrodynamic Study of the Impact of Groundwater on the Body of the Regional Landfill "Kalenić" (Geoing, Belgrade, May 2015), the state of groundwater levels at the location of the Regional Landfill "Kalenić" in the next at least 20 years was reviewed in reference to the designed mining activities and expansion of the capacity of "Kalenić" waterworks system, measures are proposed to maintain the designed groundwater level at the landfill site, which include the construction of drainage wells. For the needs of the Building Permit Design, additional research was carried out, which was presented within the Study of Hydrogeological Research (Energoprojekt - Hidroinženjering a.d., Belgrade, June 2019). In order to thicken the observation network and obtain valid data on groundwater formed in the underlying sands, piezometer structures were installed in two exploration wells (PB-8 and PB-9hg). The results of drilling and analysis made it possible to supplement the knowledge about the investigated terrain, which achieved greater reliability in the design of technical solutions. Based on the conducted forecast variant calculations of the operation of drainage wells and the analysis of the increase of groundwater levels as a consequence of the shutdown of wells (emergency, or during the regeneration of the facility), the following conclusions can be made:

- The advance of the surface mine "Tamnava - West Field" and the accompanying drainage system to the south is adversely reflected in the location of the Regional Landfill "Kalenić" through a continuous

increase in groundwater levels, which confirmed the indications from 2014 and the results of hydrodynamic calculations from 2015 and 2016,

- "aquifer eye" (lake) of the underlying aquifer at the landfill site has a significant role in the groundwater regime at the site of cassette 1, but also other landfill cassettes,
- surface sludge pumps must be used to regulate the level of the "aquifer eye" (lake) and its distribution,
- for regular or intervention works on drainage wells, there is a time of at least one month in the most unfavorable conditions, where only one well can be shut down.

These conclusions are derived from the state of precipitation and groundwater regimes, which are less favorable than the actual ones and which cannot be expected in a multi-month period, and especially not in a multi-year period as simulated. Therefore, the forecast calculations are based on significantly higher values of precipitation, which are constant values during the calculation, which certainly deviates from the actual situation. This approach, which is often applied in engineering practice, raises the safety factor of the offered technical solution for the defense of the location of cassette 1 of the Regional Landfill "Kalenić" from high groundwater levels. In practice, it is realistic to expect that at some time of the year it will be necessary to fewer wells, or to work with reduced flows. At this level of data availability, a more detailed analysis of well flow is not possible. Certainly, over time, monitoring the operation of drainage wells and groundwater levels in the monitoring network of the regional landfill will provide better input data for conducting more detailed hydrodynamic calculations.
The technical solution for lowering the groundwater level in the first phase of the landfill operation includes the construction of three new drainage wells BDK-1, BDK-2 and BDK-3, which will capture groundwater from the bottom released in the area of the landfill Kalenić. The wells are designed on the northern, western and southeastern perimeters of the landfill, have a typical well construction, with a filter segment in the underlying sands, the depth of which depends on the occurrence of settling of coal layers in these zones. The estimated capacities of individual wells are 7 l/s. Groundwater captured by drainage wells can be used as technical water at the landfill, when washing parts of the landfill plant, watering green areas and fire protection of landfill facilities. If necessary, these waters can also be used in the technological process of waste recycling.

In order to prevent, reduce and eliminate any significant harmful impact of the project of construction of the regional landfill of municipal (non-hazardous) waste "Kalenić", on cadastral plot 800, Cadastral Municipality Kalenić, territory of the Municipality of Ub, environmental protection measures are envisaged: protection measures provided by law and other regulations (statutory measures), protection measures in accident situations, plans and technical solutions for environmental protection and other environmental protection measures.

In order to control the impact of the Regional Landfill "Kalenić" and the measures taken to protect the environment, the study provides a program for monitoring the state of the environment in accordance with the Regulation on disposal of waste at landfills (the "RS Official Gazette", no.. 92/10), which in more detail also the types of waste the disposal of which at the landfill is prohibited, the quantities of biodegradable waste that can be disposed of, the manner and procedures of operation and closure of the landfill, the content and manner of monitoring the landfill, as well as subsequent maintenance after landfill closure and other laws and secondary legislation. Monitoring includes the frequency, scope, quality assessment procedures, documentation and recommendations of adequate measures, as well as regular record keeping and reporting. Monitoring of landfill operation is carried out during the active and passive phase of the landfill, and regardless of the phase of the landfill, through the following activities: monitoring of weather parameters, surface water monitoring, leachate monitoring, monitoring treated water monitoring, groundwater monitoring, gas emissions monitoring , monitoring the amount of precipitation, monitoring the landfill body stability, monitoring pedological and geological characteristics. Sampling and measurement defined by monitoring is performed by:

- Landfill laboratory where certain tests are performed daily (monitoring of weather parameters, leachate monitoring);

- Accredited laboratory at certain intervals prescribed by the Regulation on disposal of waste at landfills.

The measuring equipment must be calibrated in accordance with the standards governing these areas.

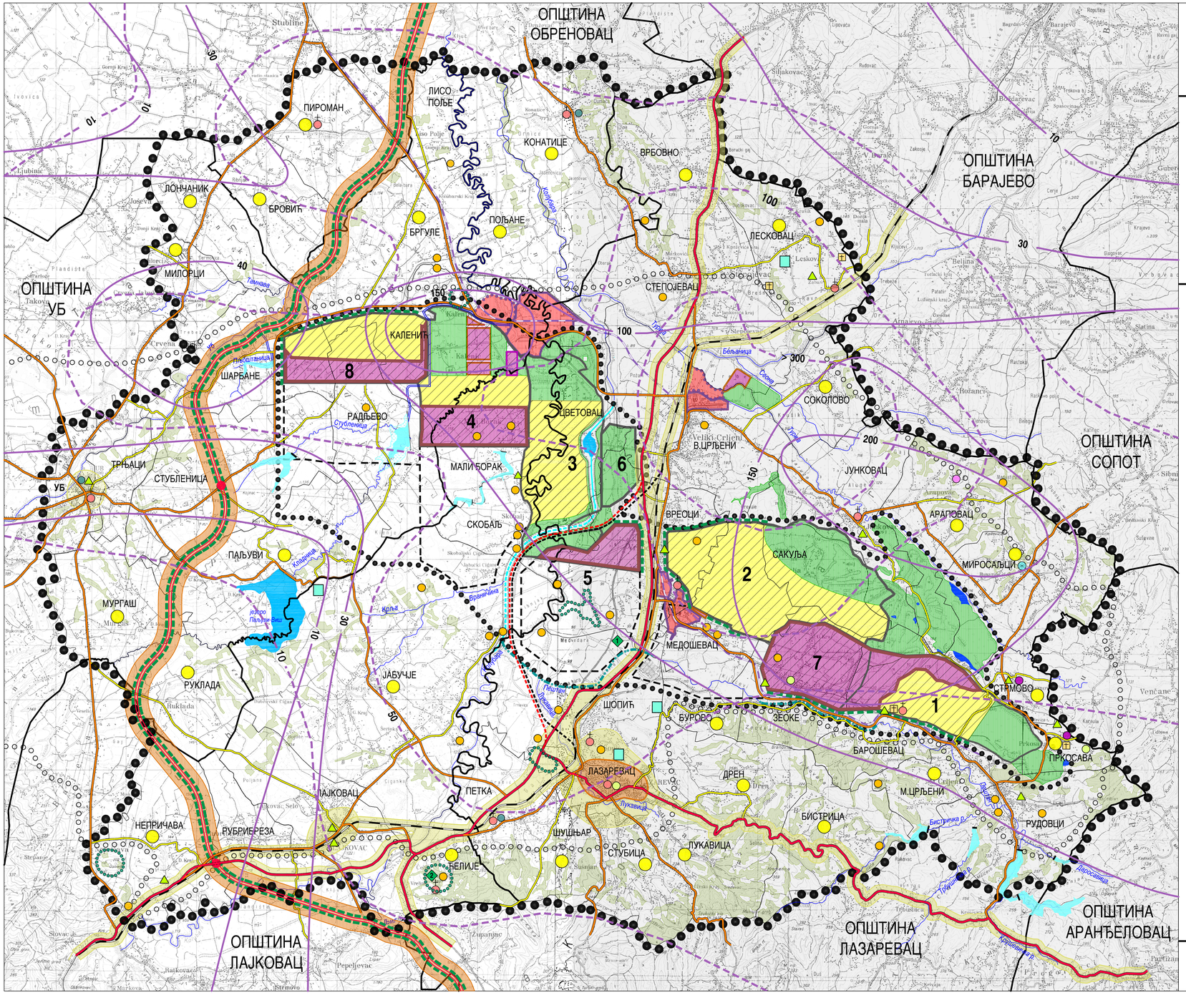
The regional enterprise must submit reports on monitoring and any irregularities during the operational phase to the competent licensing authorities. On the other hand, the competent authorities have the right to control the location and request the implementation of appropriate measures. Adequate landfill management is achieved through the responsible work of institutions in charge of monitoring the Regional Landfill and which may require operators to apply certain environmental protection measures

The design of construction of the Regional landfill for municipal (non-hazardous) waste "Kalenić", on cadastral plot No. 800 in Cadastral Municipality Kalenić (Municipality of Ub), **according to the previously mentioned conditions and the results of the performed hydrodynamic analysis, is sustainable and its realization recommended**.

11. INFORMATION ON EIA LIMITATIONS

During the preparation of the updated Environmental Impact Assessment Study, the multidisciplinary team of the CIP Traffic Institute that participated in the preparation did not encounter any special obstacles and difficulties.

IV GRAPHICS/DRAWINGS



РЕПУБЛИКА СРБИЈА
В Л А Д А

ПРОСТОРНИ ПЛАН ПОДРУЧЈА ЕКСПЛОАТАЦИЈЕ КОЛУБАРСКОГ ЛИГНИТСКОГ БАСЕНА

РЕФЕРАЛНА КАРТА БР. **3**

ЗАШТИТА ЖИВОТНЕ СРЕДИНЕ, ПРИОРДНИХ И КУЛТУРНИХ ДОБАРА

Р = 1 : 50 000

ЛЕГЕНДА:

- ГРАНИЦА ПРОСТОРНОГ ПЛАНА
- ГРАНИЦА ОПШТИНЕ
- ГРАНИЦА КАТАСТАРСКЕ ОПШТИНЕ
- ГЕОЛОШКА КОНТУРА "ПРОДУКТИВНОГ" ДЕЛА ЛИГНИТСКОГ БАСЕНА
- ОРЈЕНТАЦИОНА ГРАНИЦА ЕКСПЛОАТАЦИОНОГ ПОДРУЧЈА

ПОВРШИНЕ ЗАУЗЕТЕ РУДАРСТВОМ

- КОНТУРА КОПА
- АКТИВНИ ДЕО КОПА
- ОТКОПАВАЊЕ ОТКРИВКЕ И ЕКСПЛОАТАЦИЈА УГЉА
- ОДЛАГАЊЕ ОТКРИВКЕ
- ЗАВРШНА КОНТУРА КОПА

ОЗНАКЕ КОПОВА

1 ПОЉЕ "Б и Ц" · 2 ПОЉЕ "Д" · 3 "ТАМНАВА - ИСТОЧНО ПОЉЕ" · 4 "ТАМНАВА - ЗАПАДНО ПОЉЕ" · 5 "ЈУЖНО ПОЉЕ" · 6 ПОЉЕ "ВЕЛИКИ ЦРЉЕНИ" · 7 ПОЉЕ "Е" · 8 ПОЉЕ "РАДЉЕВО"

ЕНЕРГЕТСКИ И ИНДУСТРИЈСКИ КОМПЛЕКСИ

- ЕНЕРГЕТСКО-ИНДУСТРИЈСКИ КОМПЛЕКС
- ПОТЕНЦИЈАЛНО ПРОШИРЕЊЕ ЕНЕРГЕТСКО-ИНДУСТРИЈСКОГ КОМПЛЕКСА
- ДЕПОНИЈЕ ПЕПЕЛА И ШЉАКЕ
- РЕКУЛТИВИСАНЕ ПОВРШИНЕ

ВОДОТОЦИ, ЈЕЗЕРА, БАРЕ И РЕТЕНЗИЈЕ

- ВОДОТОК
- ИЗМЕШТЕНИ ВОДОТОЦИ
- ЈЕЗЕРО/БАРА
- РЕТЕНЗИЈА

САОБРАЋАЈНИЦЕ

- АУТОПУТ БЕОГРАД-ЈУЖНИ ЈАДРАН
- ДРЖАВНИ ПУТ I РЕДА
- ДРЖАВНИ ПУТ II РЕДА
- ЛОКАЛНИ ПУТ
- ПРИСТУПНА САОБРАЋАЈНИЦА
- ЖЕЛЕЗНИЧКА ПРУГА БЕОГРАД-БАР
- ИНДУСТРИЈСКИ КОЛОСЕК
- КОРИДОР ЗА ТРАЈНО ИЗМЕШТАЊЕ МАГИСТРАЛНИХ ИНФРАСТРУКТУРНИХ СИСТЕМА ПОСЛЕ 2020.ГОДИНЕ
- РЕГИОНАЛНА САНИТАРНА ДЕПОНИЈА

ЗАШТИТА ЖИВОТНЕ СРЕДИНЕ

- ЗАШТИТНО ЗЕЛЕНИЛО-ШУМСКИ ПОЈАС
- ЗАШТИТА ИЗВОРИШТА И ПОСТРОЈЕЊА ЗА ПРЕЧИШЋАВАЊЕ ВОДЕ

КАТЕГОРИЗАЦИЈА ЗАГАЂЕНОСТИ

I КАТЕГОРИЈА · II КАТЕГОРИЈА · III КАТЕГОРИЈА · IV КАТЕГОРИЈА · V КАТЕГОРИЈА · VI КАТЕГОРИЈА · VII КАТЕГОРИЈА

- 150 МОДЕЛ РАСПОДЕЛЕ СРЕДЊЕДНЕВНИХ КОНЦЕНТРАЦИЈА SO2 ТЕ "КОЛУБАРА Б" И ТЕ "КОЛУБАРА А" - ЛЕТО (mg/m3)
- 100 МОДЕЛ РАСПОДЕЛЕ ДНЕВНОГ ТАЛОЖЕЊА ПЕПЕЛА, ТЕ "КОЛУБАРА Б" И ТЕ "КОЛУБАРА А" - ЛЕТО (mg/m2)

СПОМЕНИЦИ КУЛТУРЕ

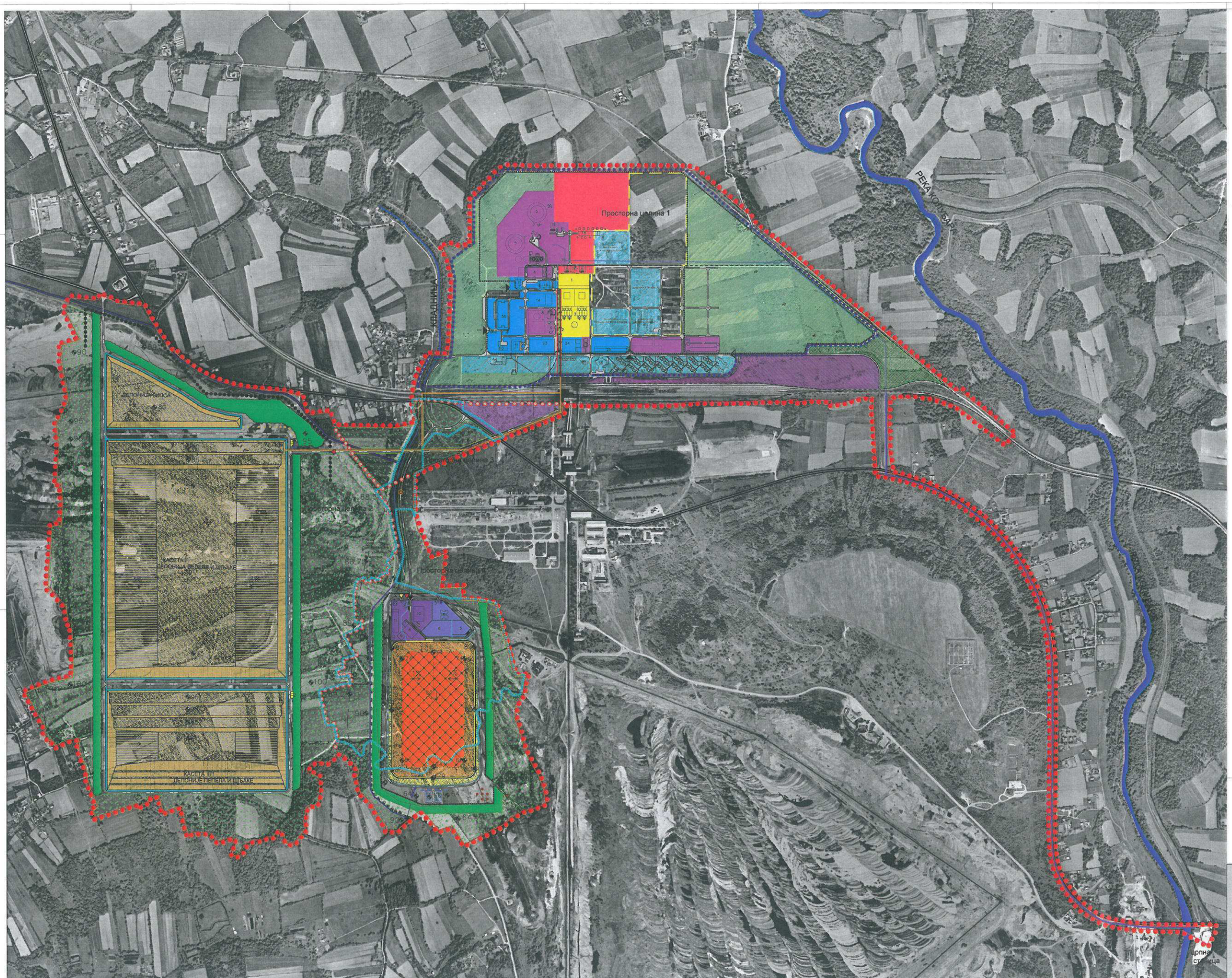
АРХЕОЛОШКИ ЛОКАЛИТЕТИ · СПОМЕНИК · ЦРКВА · ГРОБЉЕ · КУЋА · ШКОЛА · КАЧАРА · ВАЈАТ · МЛЕКАРА

- ЕТНО СЕЛО

СПОМЕНИЦИ ПРИРОДЕ

ЗАШТИЋЕНО ПРИРОДНО ДОБРО
1 ШОПИЋАНСКИ ЛУГ · 2 ВРАПЧЕ БРДО

Службени гласник Републике Србије, број 122/2008



ЛЕГЕНДА

граница планског подручја
граница просторне целине
граница урбанистичког пројекта
јавна путна саобраћајница

Просторна целина 1
ТЕ "Колубара Б"

граница појединих целина (комплекс термоелектране)
ограда комплекса ТЕ
улаз у комплекс са подизном рампом
зона главног погонског објекта
зона примарних садржаја
зона пратећих техничких објеката
зона пратећих објеката
развођно постројење и енергетски коридор
зона привремених садржаја у функцији изградње електране
зона зелених и рекреативних површина
резервисан простор за II фазу изградње
појединица II - интерна пруга са зеленим појасом
појединица III - продаја и утовар угља са паркингом за теретна возила
појединица IV - железничка станица Тамнава
појединица V - коридор цевовода сирове воде
трасе цевовода сирове воде
интерне саобраћајнице и саобраћајне површине
железничка пруга (интерна)
коридор техничке инфраструктуре (коси мост)

Просторна целина 2
Депонија пепела, шљаке и гипса

ограда око дела комплекса
улаз у комплекс са капијом
улаз са подизном рампом
сервисна саобраћајница
инфраструктурни коридор (цевовод за испаљене, цевовод за повратну воду, канал за атмосферску воду за будућу фазу надградње депоније)
канал (за пријем воде из бране на Кладници и са ПК Тамнава-западно поље)
депонија
ветрозаштитни појас
слободне и зелене површине
пумпна станица
трафостаница

Просторна целина 3
Везни инфраструктурни коридор

приступни пут
коридор система за транспорт пепела, шљаке и гипса
површина у функцији дробилане Тамнава

Просторна целина 4
Регионална депонија комуналног чврстог отпада

сигурносна ограда око комплекса
унутрашња ограда са клизним капијама
заштитна ограда на круни насипа
главни улаз
службени улази
трговачки улаз
помоћни улаз
подизна рампа уз таблу са натписом упозорења
сервисна саобраћајница
ободна-пожарна саобраћајница
интерне саобраћајнице и саобраћајне површине
канал за прикупљање атмосферских вода
новопројектовани атмосферски канал
депонија
биотрнови за вентилацију депоније
лагуна
депо инертног материјала
заштитни појас зеленила
слободне и зелене површине
простор за изградњу рециклажног центра
простор за изградњу пратећих објеката депоније
линија раздвајања чистих и прљавих површина
резервоар за пожарну воду
станица за пречишћавање отпадних вода

Извод из Плана генералне регулације "Колубара Б" - Намена површина
Цртеж број: 1571.I.02.1.TP.01

OB 5 - PARKING ZA ZAPOSLENE

OB 6 - UPRAVNA ZGRADA

OGRADA

BDK-2

OB 7 - PROSTOR ZA SMEŠTAJ GENERATORA

OB 8 - TRAFO STANICA

OB 12 - PARKING ZA PRIJAVA VOZILA

OB 11 - PARKING ZA ČISTA VOZILA

OB 9 - PERIONICA

OB 13 - GARAŽA

OB 20 - OGRADA

OB 16 - BUNAR ZA TEHNIČKU VODU

BDK-1

R3

OB 18 - REZERVOAR ZA TEHNIČKU VODU

S3

OB 10 - SERVISNA ZGRADA

OB 14 - NADSTREŠNICA

OB 19 - LEC DEPONIJE GASA

REZERVISAN PROSTOR ZA BUDUĆE PROŠIRENJE DEPONIJE

Postojeća AB građevina kanala atmosferske vode

PRIVREMENA OGRADA

340 m

250 m

SEPARATOR SEP2

REZERVISAN PROSTOR ZA BUDUĆE PROŠIRENJE DEPONIJE PRIVREMENI PARKING ZA MAŠINE I VOZILA

Postojeća AB građevina kanala atmosferske vode

PRIVREMENA OGRADA

PERSPEKTIVNA LOKACIJA NAMENJENA ZA GRAĐEVINSKI OTPAD

PRIVREMENA OGRADA

N

W

E

S

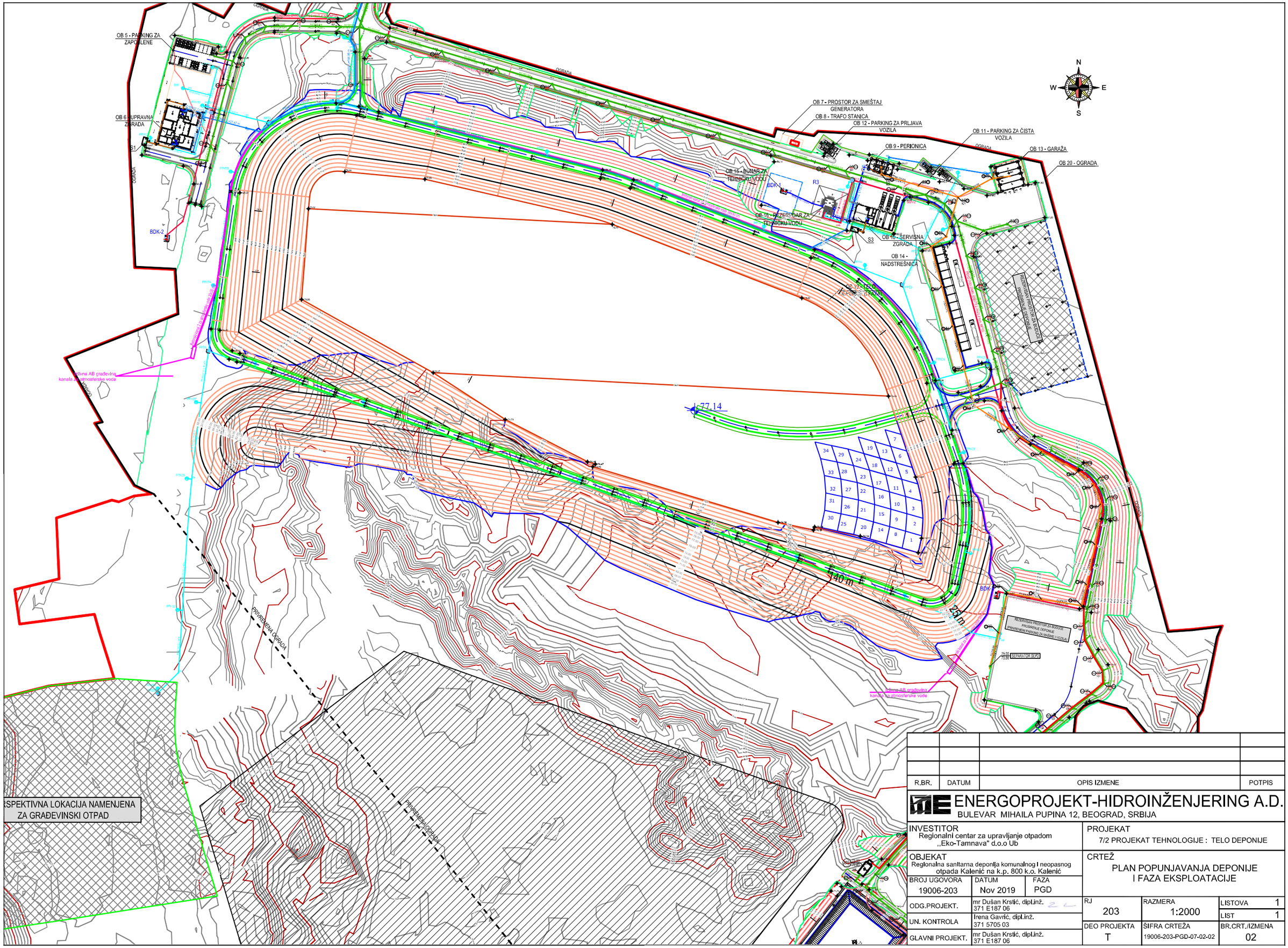
R.BR.	DATUM	OPIS IZMENE	POTPIS

ENERGOPROJEKT-HIDROINŽENJERING A.D.
BULEVAR MIHAILA PUPINA 12, BEOGRAD, SRBIJA

INVESTITOR Regionalni centar za upravljanje otpadom ,,Eko-Tamnava" d.o.o Ub	PROJEKAT 7/2 PROJEKAT TEHNOLOGIJE : TELO DEPONIJE
OBJEKAT Regionalna sanitarna deponija komunalnog i neopasnog otpada Kalenić na k.p. 800 k.o. Kalenić	CRTEŽ Situacioni plan regionalne sanitarne deponije komunalnog i neopasnog otpada ''Kalenić''

BROJ UGOVORA	DATUM	FAZA
19006-203	Nov 2019	PGD

ODG.PROJEKT.	mr Dušan Krstić, dipl.inž. 371 E187 06	RJ	RAZMERA	LISTOVA	1
UN. KONTROLA	Irena Gavrić, dipl.inž. 371 5705 03	203	1:2000	LIST	1
GLAVNI PROJEKT.	mr Dušan Krstić, dipl.inž. 371 E187 06	DEO PROJEKTA T	ŠIFRA CRTEŽA 19006-203-PGD-07-02-01	BR.CRT./IZMENA 01	



R.BR.	DATUM	OPIS IZMENE	POTPIS

ENERGOPROJEKT-HIDROINŽENJERING A.D.
BULEVAR MIHAILA PUPINA 12, BEOGRAD, SRBIJA

INVESTITOR Regionalni centar za upravljanje otpadom „Eko-Tamnava" d.o.o Ub	PROJEKAT 7/2 PROJEKAT TEHNOLOGIJE : TELO DEPONIJE
OBJEKAT Regionalna sanitarna deponija komunalnog i neopasnog otpada Kalenić na k.p. 800 k.o. Kalenić	CRTEŽ PLAN POPUNJAVANJA DEPONIJE I FAZA EKSPLOATACIJE

BROJ UGOVORA	DATUM	FAZA	RJ	RAZMERA	LISTOVA 1
19006-203	Nov 2019	PGD	203	1:2000	LIST 1
ODG.PROJEKT.	mr Dušan Krstić, dipl.inž. 371 E187 06		DEO PROJEKTA	ŠIFRA CRTEŽA	BR.CRT./IZMENA
UN. KONTROLA	Irena Gavrić, dipl.inž. 371 5705 03		T	19006-203-PGD-07-02-02	02
GLAVNI PROJEKT.	mr Dušan Krstić, dipl.inž. 371 E187 06				

Plan zelenila
R 1:1000



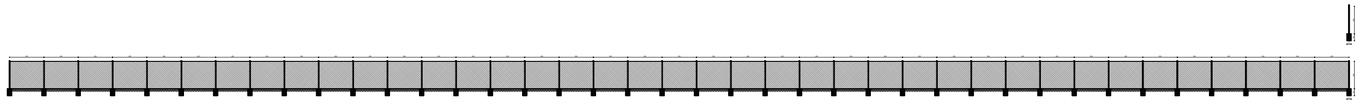
LEGENDA	
	Travnjak T1 -T17
	Visoki četinari
1.	Pinus nigra (crni bor)
2.	Pinus silvestris (beli bor)
3.	Pseudotsuga menziesii (duglazija)
	Visoki lišćari
4.	Tillja argentea (lipa)
5.	Acer pseudoplatanus (javor)
6.	Betula verrucosa (breza)
7.	Quercus robur (hrast lužnjak)
8.	Juglans regija (orah)
	Niski četinari
9.	Taxus baccata (tisa)
	Niski lišćari
10.	Acer campestre (klen)
11.	Prunus cerasifera v. pissardii (crvena šljiva)
	Četinarsko žbunje
12.	Juniperus horizontalis (kleka)
	Zimzeleno žbunje
13.	Cotoneaster damerii (dunjarica)
14.	Pyracantha coccinea (vatreni grm)
	Listopadno žbunje
15.	Tamarix sp. (tamariš)
16.	Cotinus coggygria 'royal purple' (pamukovac)

R.BR.	DATUM	OPIS IZMENE	POTPIS

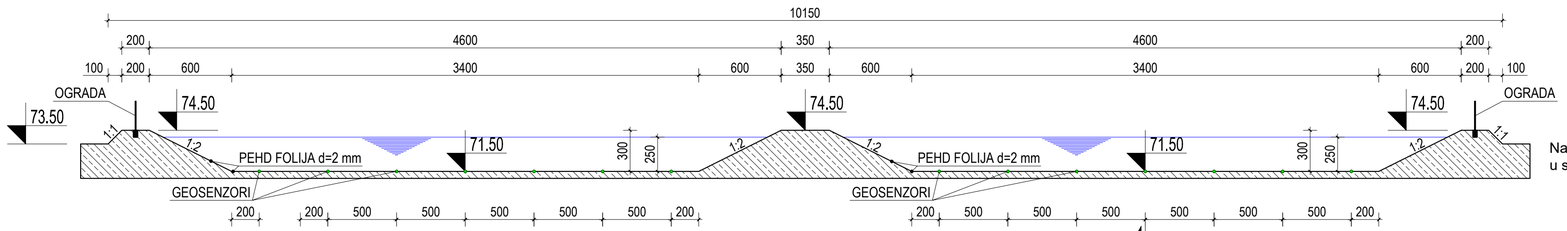
ENERGOPROJEKT-HIDROINŽENJERING A.D.
BULEVAR MIHAILA PUPINA 12, BEOGRAD, SRBIJA

INVESTITOR: Regionalni centar za upravljanje otpadom "Jadar-Cer-Kamenica" d.o.o. Ub	PROJEKAT: Projekat za građevinsku dozvolu 03 Projekat spoljnog uređenja Sanitarna deponija komunalnog i neopasnog otpada Kalenić
OBJEKAT: Sanitarna deponija komunalnog i neopasnog otpada Kalenić, na k.p. 600 k.o. Kalenić	CRTEŽ: SITUACIONI PRIKAZ PROJEKTOVANOG STANJA ZELENILA
BROJ DOKUMENTA: 19008-203	DATUM: novembar 2019
FAZA: POD	
ODG.PROJEKTI:	Ana Mrđenović, dipl.inž.arh. 311-3168-13
GLAVNI PROJEKAT:	Ivo Đukan Kraljić, dipl.inž.arh. 311-5197-16
ODG. PROJEKTANT:	Ana Mrđenović, dipl.inž.arh. 314-3264-13
SARADNIK:	Ivo Đukan Kraljić, dipl.inž.arh. 311-5197-16
R.	203
RAZMERA:	1:1000
LISTOVA:	1
LIST:	1
BR.CRT./IZMENA:	3

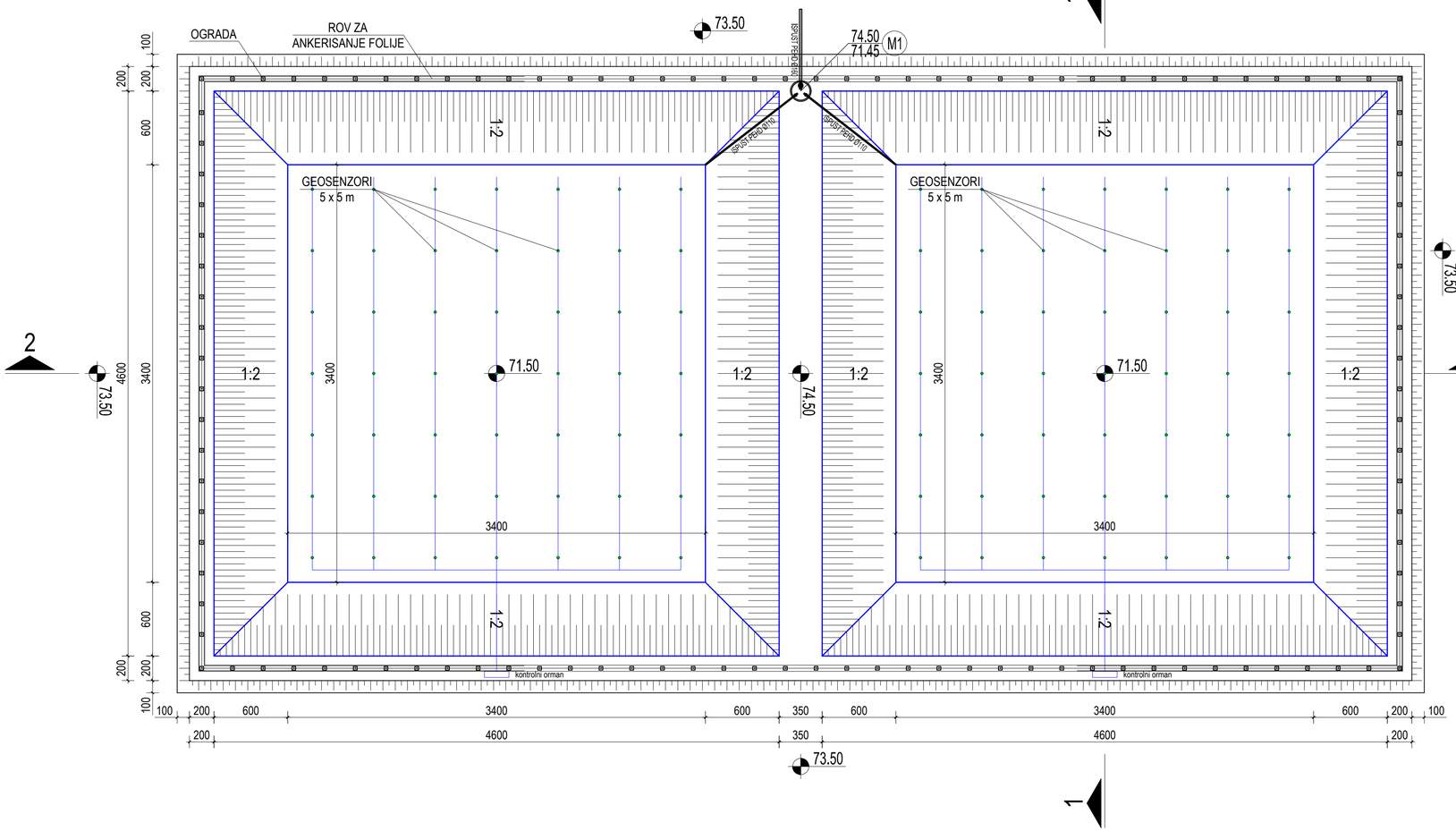
# LAGUNE ZA PROCEDNU VODU
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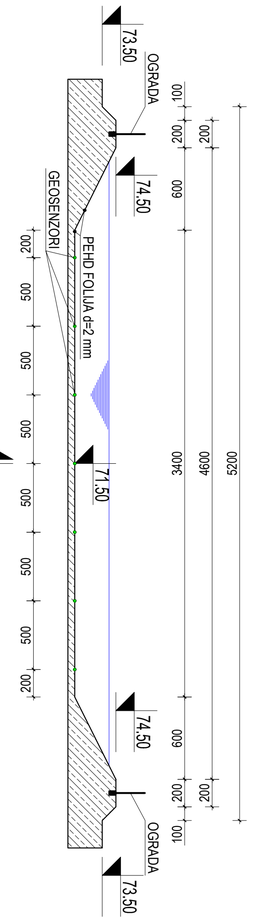


PRESEK 2-2



Napomena: donja granica spoljašnje kosine u skladu sa usvojenom nivelacijom





PRESEK 1-1

R.BR.	DATUM	OPIS IZMENE	POTPIS

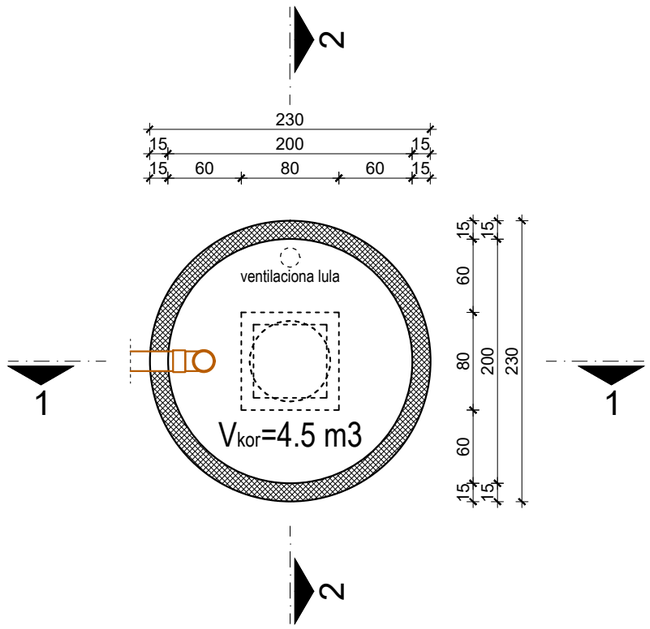
ENERGOPROJEKT-HIDROINŽENJERING A.D.
BULEVAR MIHAILA PUPINA 12, BEOGRAD, SRBIJA

INVESTITOR: Regionalni centar za upravljanje otpadom "EKO-Tamnava" d.o.o. Ub	PROJEKAT: Projekat za građevinsku dozvolu 3/2 Hidrotehničke instalacije: Objekti za odvođenje atmosferskih, procednih, otpadnih i sanitarno-fekalnih voda
OBJEKAT: Regionalna sanitarna deponija komunalnog i neopasnog otpada "Kalenić", KP 800 KO Kalenić	CRTEŽ: LAGUNE ZA PROCEDNU VODU

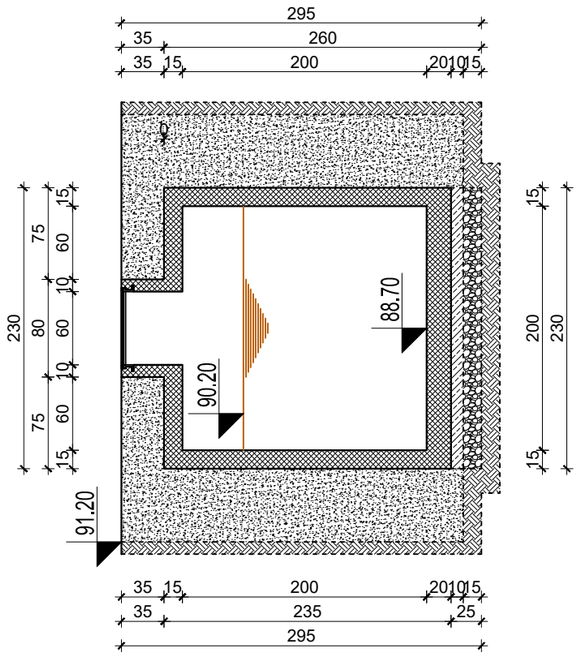
BROJ UGOVORA: 19006-203	DATUM: novembar 2019.	FAZA: PGD	
ODG. PROJEKT:	Petar Isaković, dipl.inž.grad., 314 D663 06	RJ: 204	RAZMERA: 1:250
UN. KONTROLA:	Zoran Marinković, dipl.inž.grad., 314 5264 03		LISTOVA: 1 / LIST: 1
ŠEF PROJEKTA:	Dušan Krstić, dipl.inž.tehn., 372 E187 06	DEO PROJEKTA: H	ŠIFRA CRTEŽA: 19006-203-PGD-3/2
			BR.CRTEŽA/IZMENA: 4.19

SEPTIČKA JAMA S2 (PORTIRNICA)

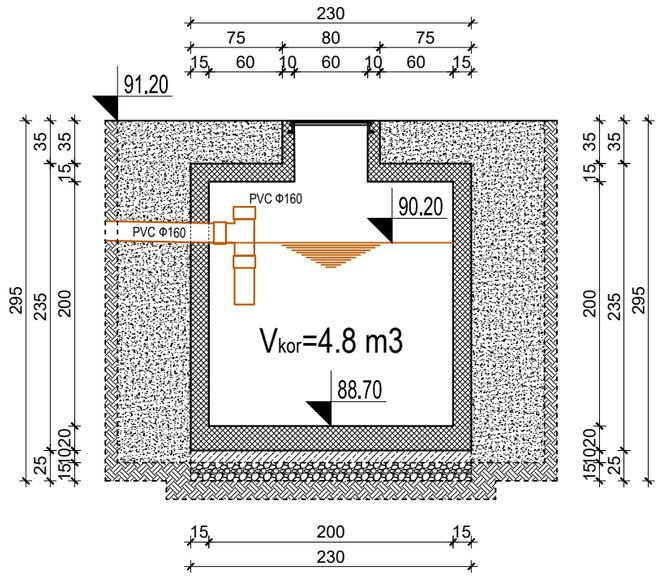
OSNOVA



PRESEK 2-2



PRESEK 1-1



LEGENDA	
	armirani beton
	mršavi beton
	zemlja
	pesak
	LG poklopac

R.BR.	DATUM	OPIS IZMENE	POTPIS

ENERGOPROJEKT-HIDROINŽENJERING A.D.
BULEVAR MIHAILA PUPINA 12, BEOGRAD, SRBIJA

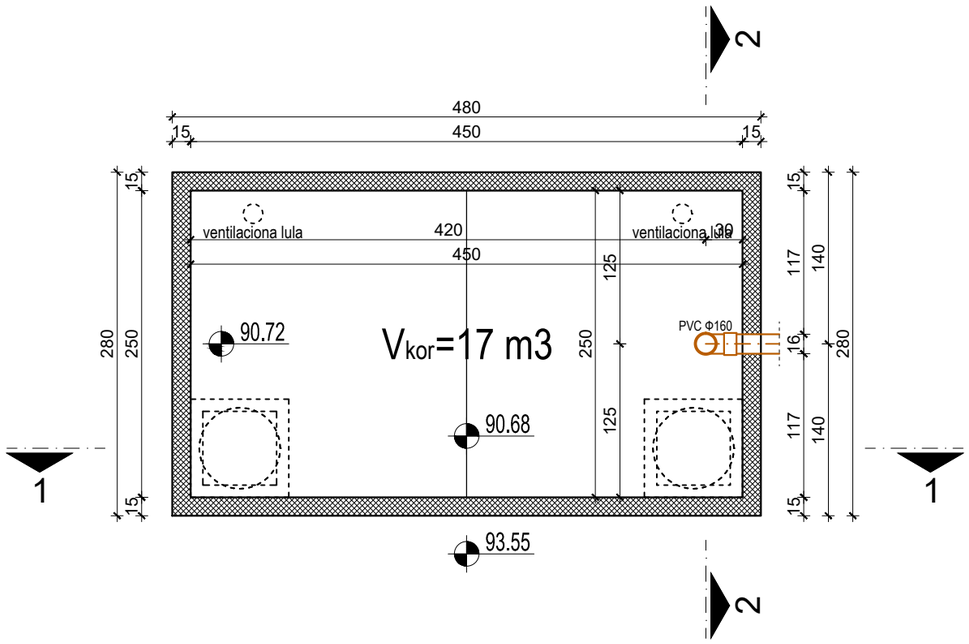
INVESTITOR Regionalni centar za upravljanje otpadom "Eko-Tamnava" d.o.o. Ub	PROJEKAT PGD Projekat za građevinsku dozvolu 03/01 - Hidrotehničke instalacije
OBJEKAT Regionalna sanitarna deponija komunalnog i neopasnog otpada Kalenić, KP 800 KO Kalenić	CRTEŽ Kućica vage (portirnica) Septička jama S2 - osnova i preseci

BROJ UGOVORA	DATUM	FAZA
19006-203	Novembar 2019.	PGD

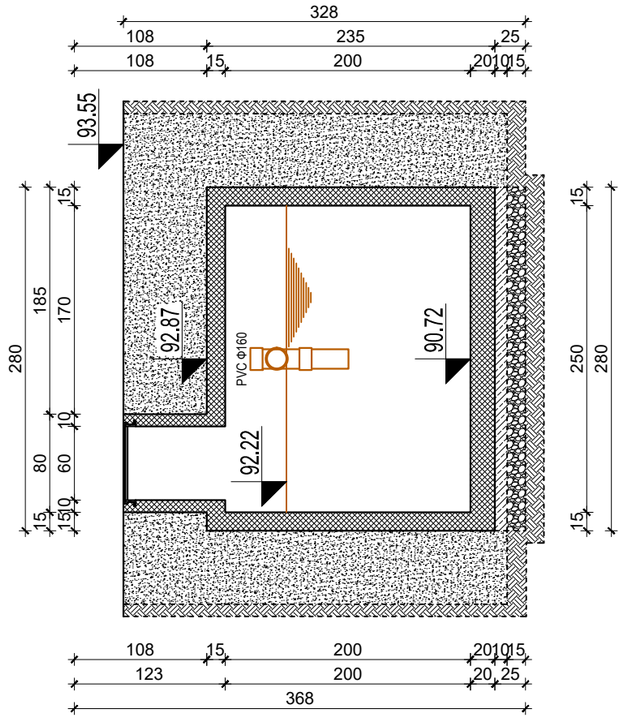
ODG.PROJEKT.	Petar Isaković, dipl.inž.građ.	314 D663 06	RJ	RAZMERA	LISTOVA 1
UN. KONTROLA	Zoran Marinković, dipl.inž.građ.	314 5264 03	204	1:50	LIST 1
ŠEF PROJEKTA	mr Dušan Krstić, dipl.inž.tehn.	371 E187 06	DEO PROJEKTA	ŠIFRA CRTEŽA	BR.CRT./IZMENA
			H	19006-203-PGD-03-01	4.2.3

SEPTIČKA JAMA S1 (UPRAVNA ZGRADA)

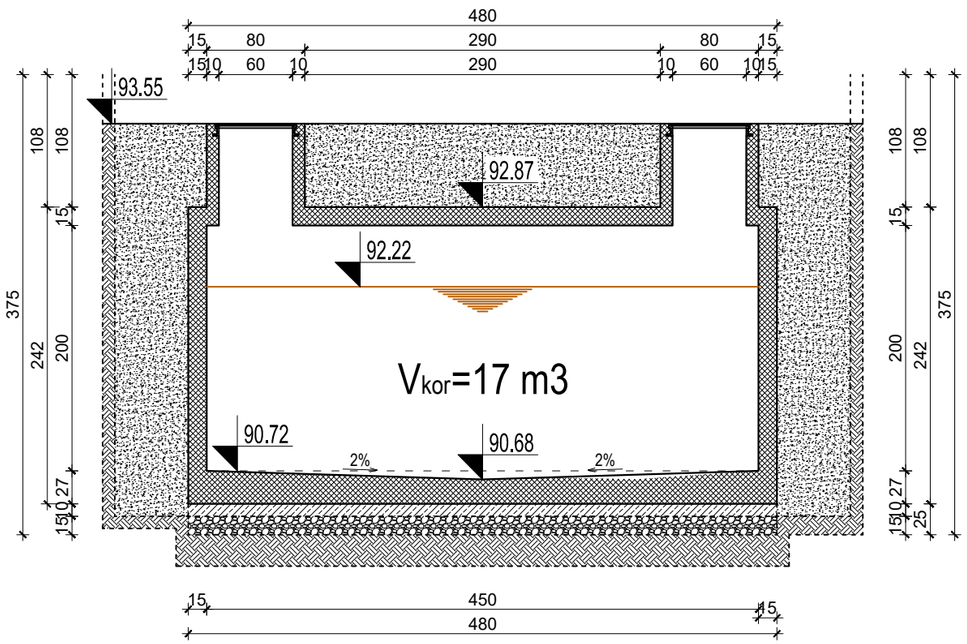
OSNOVA



PRESEK 2-2



PRESEK 1-1



LEGENDA	
	armirani beton
	mršavi beton
	zemlja
	pesak
	LG poklopac

R.BR.	DATUM	OPIS IZMENE	POTPIS

ENERGOPROJEKT-HIDROINŽENJERING A.D.
BULEVAR MIHAILA PUPINA 12, BEOGRAD, SRBIJA

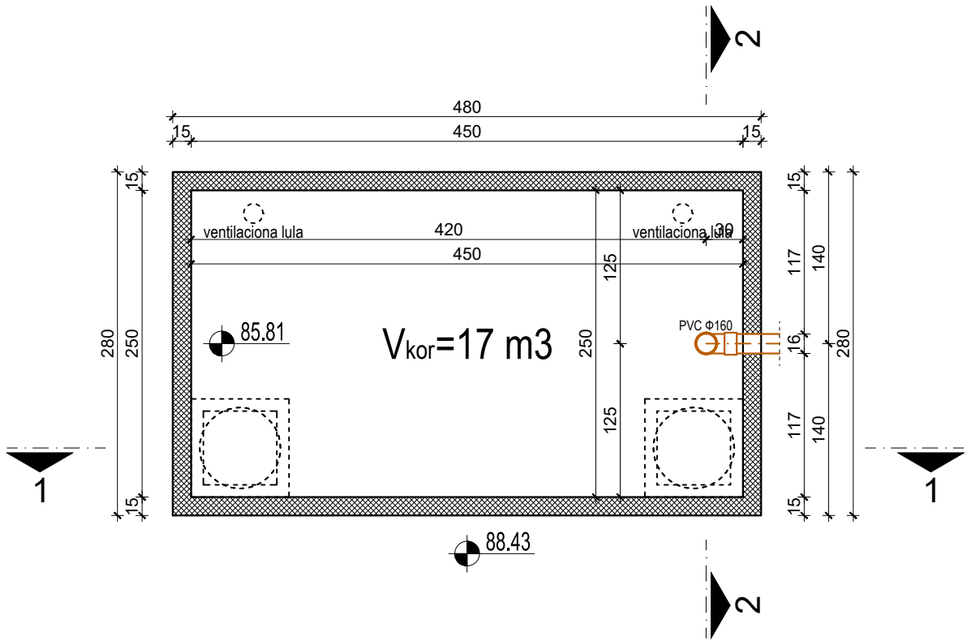
INVESTITOR Regionalni centar za upravljanje otpadom "Eko-Tamnava" d.o.o. Ub	PROJEKAT PGD Projekat za građevinsku dozvolu 03/01 - Hidrotehničke instalacije
OBJEKAT Regionalna sanitarna deponija komunalnog i neopasnog otpada Kalenić, KP 800 KO Kalenić	CRTEŽ Upravna zgrada Septička jama S1 - osnova i preseci

BROJ UGOVORA	DATUM	FAZA
19006-203	Novembar 2019.	PGD

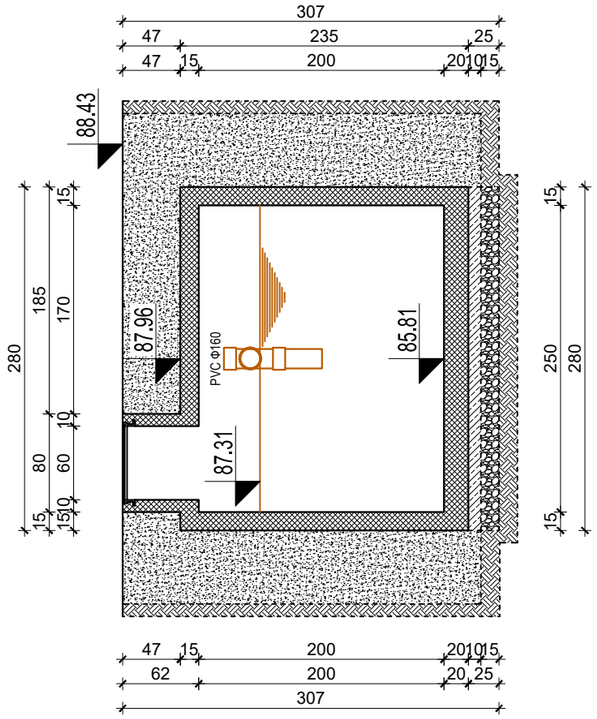
ODG.PROJEKT.	Petar Isaković, dipl.inž.građ.	314 D663 06	RJ	RAZMERA	LISTOVA 1
UN. KONTROLA	Zoran Marinković, dipl.inž.građ.	314 5264 03	204	1:50	LIST 1
ŠEF PROJEKTA	mr Dušan Krstić, dipl.inž.tehn.	371 E187 06	DEO PROJEKTA: H	ŠIFRA CRTEŽA: 19006-203-PGD-03-01	BR.CRT./IZMENA: 4.2.7

SEPTIČKA JAMA S3 (SERVISNA ZGRADA)

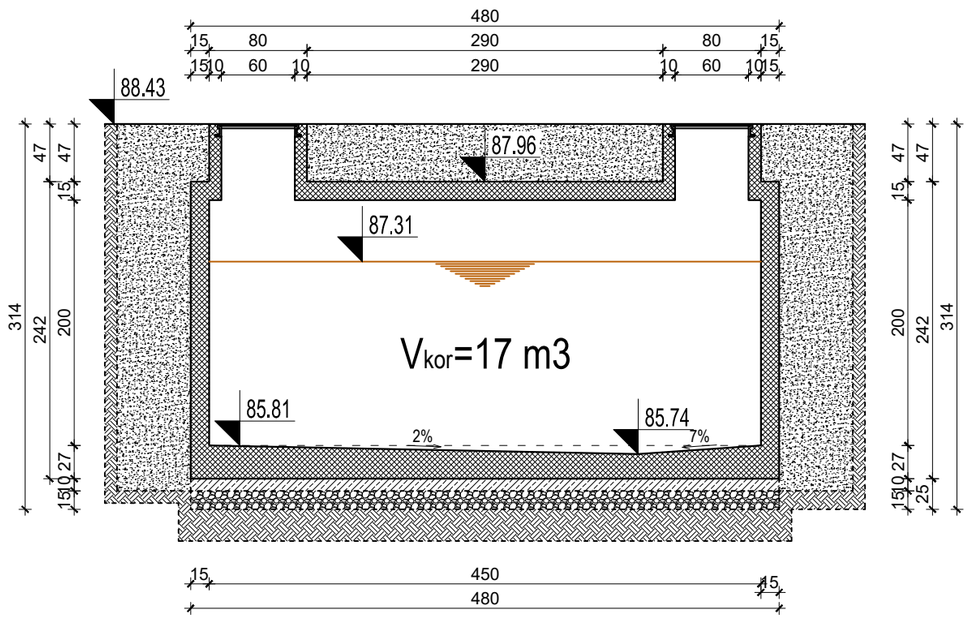
OSNOVA



PRESEK 2-2



PRESEK 1-1



LEGENDA

	armirani beton
	mršavi beton
	zemlja
	pesak
	LG poklopac

R.BR.	DATUM	OPIS IZMENE	POTPIS

ENERGOPROJEKT-HIDROINŽENJERING A.D.
BULEVAR MIHAILA PUPINA 12, BEOGRAD, SRBIJA

INVESTITOR: Regionalni centar za upravljanje otpadom "Eko-Tamnava" d.o.o. Ub			PROJEKAT: PGD Projekat za građevinsku dozvolu 03/01 - Hidrotehničke instalacije		
OBJEKAT: Regionalna sanitarna deponija komunalnog i neopasnog otpada Kalenić, KP 800 KO Kalenić			CRTEŽ: Servisna zgrada Septička jama S3 - osnova i preseci		
BROJ UGOVORA: 19006-203	DATUM: Novembar 2019.	FAZA: PGD			
ODG.PROJEKT.	Petar Isaković, dipl.inž.građ.	314 D663 06	RJ: 204	RAZMERA: 1:50	LISTOVA: 1 / LIST: 1
UN. KONTROLA	Zoran Marinković, dipl.inž.građ.	314 5264 03	DEO PROJEKTA: H	ŠIFRA CRTEŽA: 19006-203-PGD-03-01	BR.CRT./IZMENA: 4.2.11
ŠEF PROJEKTA	mr Dušan Krstić, dipl.inž.tehn.	371 E187 06			

roto®

voda

Oil Separators







Slovenian manufacturer, tradition and expertise

ROTO companies and Kovinoplastika Pavlinjek Slovenian manufacturer of plastic products with 35 year-long tradition. These products are fruit of knowledge of our engineers as we;; as permanent cooperation with Institutes and accurate work with more than 200 employees. ROTO is private company with head office in Murska Sobota that also has its branch of manufacturing company in Croatia, Serbia, B&H and Macedonia. These products are designed in accordance with EU standards ISO 9001 AND 14000.

ROTO has its manufacturing, development center (from idea to execution), sales in commercial network in the country and abroad, transportation and services. ROTO is winner of numerous international awards: Award for exceptional business results at GZS, Eco-Partnership award, winner of the Hospitality Sign. Quality sign in construction etc.

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About oil separators

Material

Oil separators are made of polyethylene which is suitable for clean water and fecal chemicals.

Use:

According to the EU Directives, oil separators should be mounted on all:

-parking surfaces

-open and close parking lots

They are meant for leaching of light liquids in accordance with the European standard SIS EN 858-1 and prEN 858-2. In part of Annex A.

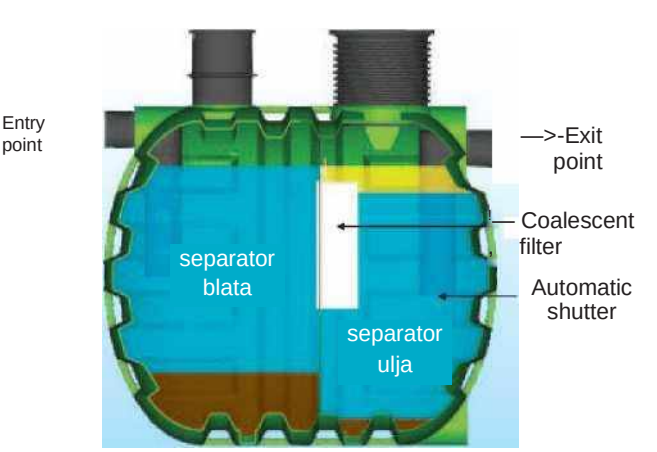
Operation of Roto oil separator

Rainwater mixed with oil and mud flows from the road surface into sewer system or directly into wilderness. This mud is often mixed with oil. Roto oil separators are designed to clean the water from mud and oil. Two-chamber reservoir is most often used for optimal effect. The first part of reservoir separates mud from water, and then the second one separates oil from water.

Reservoir interior

Interior of mud separator is separated in the following manner: Dirty water enters into reservoir with oil and mud. With the help of specially patented Roto system for water distribution, water is equally divided in reservoir. Mud falls to the bottom of the reservoir and when water from the first chamber of the reservoir moves to the second one, it is already cleaned from mud.
In the second part of the reservoir, oil is removed from water. Dirty water comes to separator. With the help of Roto patented distribution system for waters , water and oil are equally places. Bigger oil drops raise to water surface, due to their low density. Smaller drops join and increase in scope in filter and go to the surface. In such a way, companies that deal with cleaning of hazardous waste can clean oil separator. After that, water that leaves the separator is oil free.

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Oil separator:

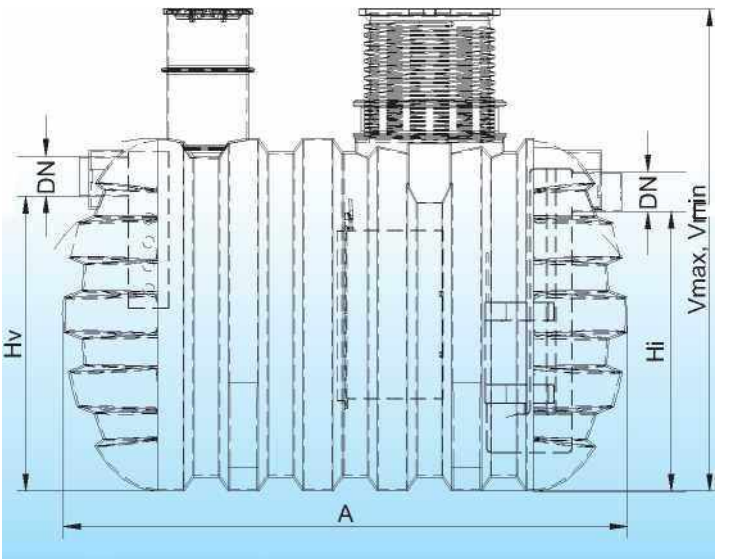
I. class

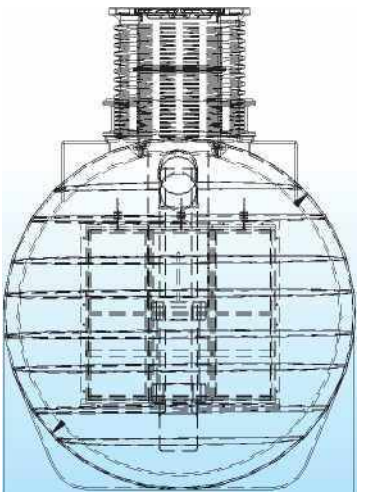
(with coalescent filter)



Oil separator sizes

Model	Code	Flow Q lit/s (NS)	Volume (L)	Separator dimensions in mm A (d)	B (š)	C (v-min)	C (v-max)	Pipe connection DN (mm)	Entrance exit height H, / H, (mm)
NS 3 SIP	7595	3	3500	1987	1800	2050	2500	DN 160	1550/1470
NS 6 SIP	7597	6	3500	1987	1800	2050	2500	DN 160	1550/1470
NS 10 SIP	7275	10	5000	2480	1800	2050	2500	DN 200	1510/1430
NS 15 SIP	7599	15	6000	2880	1800	2050	2500	DN 200	1510/1430
NS 20 SIP	7588	20	6000	2880	1800	2050	2500	DN 200	1510/1430
NS 30 SIP	7273	30	8000	2680	2310	2350	2830	DN 300	1990/1840
NS 40 SIP	7278	40	12000	3760	2310	2350	2830	DN 300	1990/1840
NS 50 SIP	7276	50	20000	6280	2310	2350	2830	DN 300	1990/1840
NS 75 SIP	7289	75	20000	6280	2310	2350	2830	DN 300	1990/1840
NS 100 SIP	7421	100	30000	8800	2310	2350	2830	DN 300	1990/1840
NS 150 SIP	7592	150	40000	11320	2310	2350	2830	DN 400	1890/1690
NS 200 SIP	7598	200	50000	13840	2310	2350	2830	DN 400	1890/1690
NS 250 SIP	7600	250	2 x 30000	17600	2310	2350	2830	DN 400	1890/1690





Oil Separator

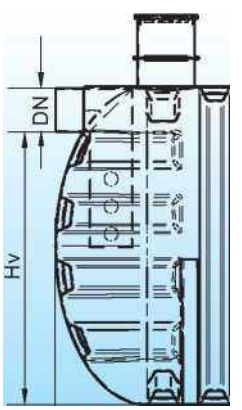
II Class

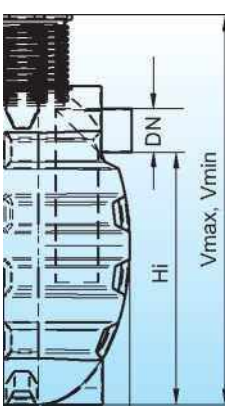
(without coalescent filter)

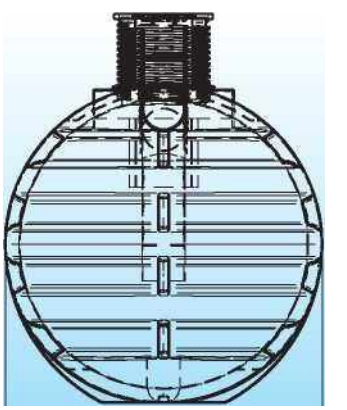


Size of oil separator

Model	Code	Flow Q lit/s (NS)	Volume (L)	Separator dimensions in mm A (d)	B (š)	C (v-min)	C (v-max)	Pipe connection DN (mm)	Entrance exit height H, / H, (mm)
NS 3 SIIP	7590	3	3500	1987	1800	2050	2500	DN 160	1550/1470
NS 6 SIIP	7591	6	3500	1987	1800	2050	2500	DN 160	1550/1470
NS 10 SIIP	7288	10	5000	2480	1800	2050	2500	DN 200	1510/1430
NS 15 SIIP	7593	15	6000	2880	1800	2050	2500	DN 200	1510/1430
NS 20 SIIP	7271	20	6000	2880	1800	2050	2500	DN 200	1510/1430
NS 30 SIIP	7272	30	8000	2680	2310	2350	2830	DN 300	1990/1840
NS 40 SIIP	7274	40	12000	3760	2310	2350	2830	DN 300	1990/1840
NS 50 SIIP	7277	50	20000	6280	2310	2350	2830	DN 300	1990/1840
NS 75 SIIP	7294	75	20000	6280	2310	2350	2830	DN 300	1990/1840
NS 100 SIIP	7422	100	30000	8800	2310	2350	2830	DN 300	1990/1840
NS 150 SIIP	7285	150	40000	11320	2310	2350	2830	DN 400	1890/1690
NS 200 SIIP	7286	200	50000	13840	2310	2350	2830	DN 400	1890/1690
NS 250 SIIP	7287	250	2 x 30000	17600	2310	2350	2830	DN 400	1890/1690





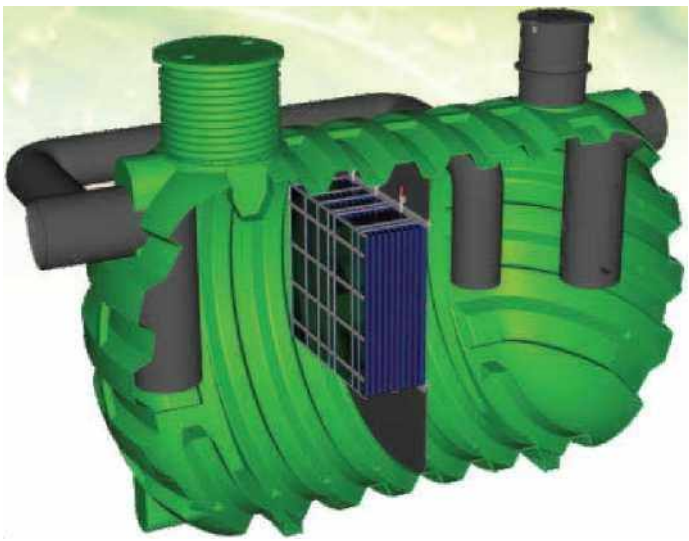


B

Oil separator:

By Pass 20%

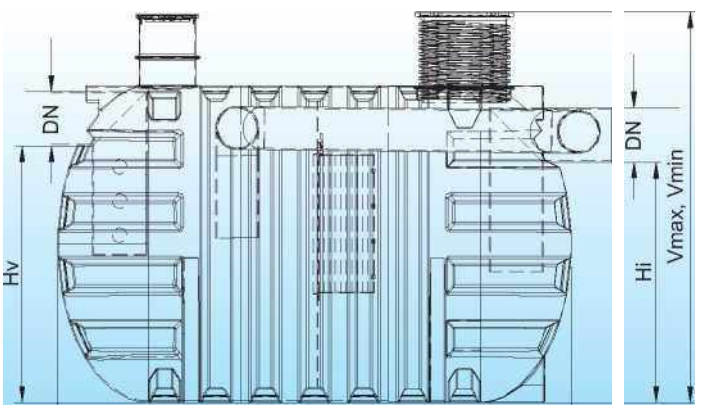
By Pass 10%

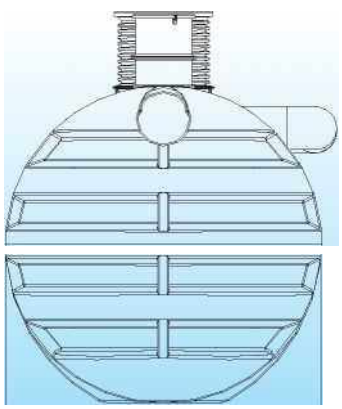


Oil separator size

					Separator dimensions u mm					Entrance exit height
		Max. total	Max. flow through	Volume	A (d)	B (š)	C (v-min)	C (v-max)	Pipe connection	
ROTO 3/15 SIP	6880	15	3	3500	1987	1800	2050	2500	DN 200	1560/1460
ROTO 6/30 SIP	6881	30	6	3500	1987	1800	2050	2500	DN 300	1460/1310
ROTO 10/50 SIP	6882	50	10	5000	2480	1800	2050	2500	DN 300	1460/1310
ROTO 15/75 SIP	6883	75	15	6000	2880	1800	2050	2500	DN 300	1460/1310
ROTO 20/100 SIP	6884	100	20	6000	2880	1800	2050	2500	DN 300	1460/1310
ROTO 30/150 SIP	6885	150	30	8000	2680	2310	2350	2830	DN 400	1890/1690
ROTO 40/200 SIP	6886	200	40	12000	3760	2310	2350	2830	DN 400	1890/1690
ROTO 50/250 SIP	6887	250	50	20000	6280	2310	2350	2830	DN 400	1890/1690
ROTO 75/375 SIP	6888	375	75	20000	6280	2310	2350	2830	DN 500	1790/1540
ROTO 100/500 SIP	6889	500	100	30000	8800	2310	2350	2830	DN 600	1680/1380

Model	Code	Max. total flow Q (lit/s)	Max. flow through separator Q (lit/s)	Volume (L)	Separator dimensions u mm A (d)	B (š)	C (v-min)	C (v-max)	Pipe connection DN (mm)	Entrance exit height HV / H, (mm)
ROTO 30/3 SIP	6890	30	3	3500	1987	1800	2050	2500	DN 300	1460/1310
ROTO 60/6 SIP	6891	60	6	3500	1987	1800	2050	2500	DN 300	1460/1310
ROTO 100/10 SIP	6892	100	10	8000	2680	2310	2350	2830	DN 400	1890/1690
ROTO 150/15 SIP	6893	150	15	8000	2680	2310	2350	2830	DN 400	1890/1690
ROTO 200/20 SIP	6894	200	20	12000	3760	2310	2350	2830	DN 400	1890/1690
ROTO 300/30 SIP	6895	300	30	20000	6280	2310	2350	2830	DN 500	1790/1540
ROTO 400/40 SIP	6896	400	40	20000	6280	2310	2350	2830	DN 500	1790/1540
ROTO 500/50 SIP	6897	500	50	30000	8800	2310	2350	2830	DN 600	1680/1380





Oil separator:

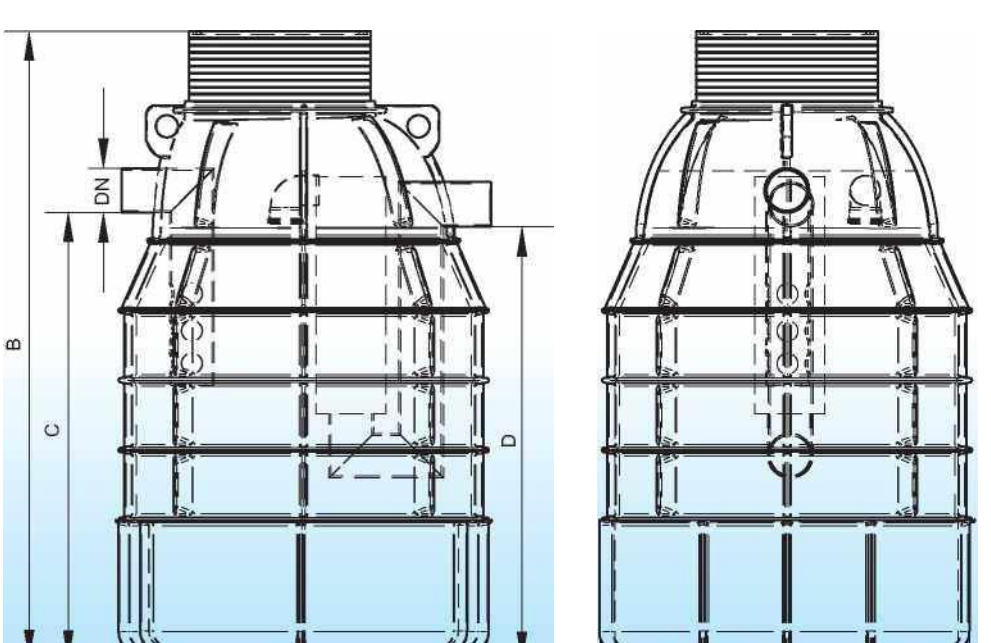
I. class

(manhole shape)



Oil separator size

Code	Oil separator	Manhole	Flow though separator Q lit/s (NS)	Separator dimensions in mm A	B	C	D	Pipe connection (DN)
7426	tip A - 10 l/s	01200	10	1324	1750	1350	1300	160/160
7427	tip A -15 l/s	01200	15	1324	2000	1600	1550	160/160
7428	tip B - 30 l/s	2X01200	30	3150	1750	1350	1300	200/200
7429	tip B - 50 l/s	2X01200	50	3150	2000	1600	1550	250/250



Roto oil separator is located in one reservoir, with two chambers and filter. Oiled water with mud enters into first chamber, where mud and sand are deposited. Oiled water goes to the second chamber through oil filter where oil is separated from water. Purified water goes from reservoir into control shaft.

$$Ns = (Qr + fx * Qs) * fd$$

NS = nominal circumference v L/s
Qr = maximum flow of rain water v L/s
Qs = maximum flow of wastewater v L/s
fx = restraining factor, depending on nature of release (table I)
Fd = density factor for appropriate light liquid (table I)

Selection of separation system

Table I

Method of use	fx
Industrial wastewaters, car-wash, gas stations, cleaning of oiled surfaces.	
Oiled rain water from impermeable places: parking lots roads, factories, gardens etc.	
Hold all the liquids that pollute – protect the environment.	

Table II

, Density (g/cm^3)	to 0.85	from 0.85 to 0.90	from 0.90 to 0.95
Method of use			
	Density factor **fd**		
Class II	1	2	3
Class I	1	1,5	2
Combination of class I and II	1	1	1

Installment

At installment of oil separators, the following rules should be observed:

The dig should be about 50cm wider than the separator. In this way layer of sand can be filled next to reservoir. Check if the terrain bellow separator is fastened well. Standard maximal depth for the dig is 2,5m. In case that the separator is placed at the lower level, It must be protected with reinforced structure. Additionally, make sure that there are no sharp objects which would damage the reservoir.

Instructions for mounting the reservoir on the ground with underground waters

Due to underground waters, the separator must be fastened, i.e. anchored so that the water does not lift it. Concrete plate is to be placed at the bottom of the pit, with visible anchoring bolts. Reservoir can be connected-anchored though them by polyester ribbons.

At least three anchoring ribbons are necessary with at least 2500 kg load capacity.

Fill the entire system with water due to:

- Perfect operation of the separator
- High underground water that might lift the reservoir
- Securing clean sensors in electronic alarm device.

Additional equipment

Sensors

- Oil level measuring device with alarm
- Oil and mud level measuring device with alarm
- Device for notification of operation on cellular phone



Automatic shutter



Sampling manhole



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distributor:

V ANNEXES

(Coat of Arms)
The Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
File number: ROP-MSGI-19891-LOC-4/2018
Number: 350-02-00435/2018-14
Date: 13/12/2018
Nemanjina 22-26, Belgrade

The Ministry of Construction, transport and infrastructure, acting upon request of the company Regional center for waste management "Eko-Tamnava" d.o.o. Ub, Kralja Petra I Oslobodioca no. 60A/2 from Ub, for issuing location terms, based on Article 6 and 37, Paragraphs 8.9 and 10 of the Law on Ministries ("The Official Gazette of the RS" number 44/2014), Article 23 of the Law on Public Administration ("The Official Gazette of the RS" , number 79/05, 101/07 and 95/10), Article 52a and 133, Paragraph 2, Item 19 of the Law on Planning and Construction ("The Official Gazette of the RS", number 72/09, 81/09-correction, 64/10- Decision of the Constitutional Court, 24/11, 121/12, 42/13-decision of the Constitutional Court, 50/13-decisioin of the Constitutional Court, 98-12- decision of the CC, 132/14, 145/15 and 83/18) of the Decree on location terms ("The Official Gazette of the RS" number 35/15, 114/15 and 117/2017) and Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" 113/115, 96/16 and 120/2017), and in accordance with the General Regulation Plan of the Thermal Power Plant "Kolubara B" ("The Official Gazette of the Ub Municipality", no. 1/07), Urbanistic design for constructing regional landfill for utility waste "KALENIC" (approval no. 350-184/14-04 as of 30/04/2014) and authorization contained in the Minister's Ruling number 031-01-17/2018-02-1 as of 15/11/2018 issues the following:

LOCATION TERMS

I For phase construction of regional landfill for utility waste Kalenic, on the cadaster lot no. 800 CM Kalenic, in the territory of UB municipality, required for construction of preliminary design, the design for construction permit and main design, in accordance with the General regulation plan for the region of Thermal Power Plant "Kolubara B" ("The Official Gazette of the Ub Municipality", no. 1/07), Urbanistic design for constructing regional landfill for utility waste "KALENIC" (approval no. 350-184/14-04 as of 30/04/2014).

Dominant category of the facility: G
B facility category, classification number: 122011, 127420, 121201.
V facility category, classification number: 122012, 124210.
G facility category, classification number: 222410, 211201, 222330, 242003, 222220.

II PLANNED PURPOSE

Cadaster lot no. 800 CM Kalenic is located within the scope of the General Regulation Plan for the region of Thermal Power Plant "Kolubara B" ("The Official Gazette of the Ub Municipality", no. 1/07), Urbanistic design for constructing regional landfill for utility waste "KALENIC" (approval no. 350-184/14-04 as of 30/04/2014).

Within the scope of Urbanistic design, there is a construction lot GP2, which is intended for regional landfill for utility waste “KALENIC” with the surface 39,88 ha.

On the cadaster lot GP2/complex of the regional landfill for utility waste “Kalenic” there are: surfaces under high rise facilities; traffic, manipulative and parking surfaces; landfill body; surfaces under lagoons; reserved space for future facility extension; green spaces (within which a perspective location intended for construction waste is located).

III RULES FOR DEVELOPMENT AND CONSTRUCTION

Traffic access to the construction lot is envisaged with the use of the existing road (length of ca.400m), constructed on the left bank of the river Kladnica, to which a new section of access road on ca.260m is attached, to the entrance of the cadaster lot of the regional landfill for utility waste “Kalenic”, with construction of new connecting section between the new section of access road and entrance in the complex of the “assembly yard” – industrial facility “Tamnava- West Field.”

Entry zone is located in the north part of the complex, at the place where construction of the gatekeeper’s lodge (weighing house), weighbridge and disinfection system (tires washing).

A zone that encompasses the location of management building and parking space for employees and visitors (20 parking spaces) is envisaged in the west part of the complex.

Technical group of facilities is located in the east part of the complex and it comprises the following: vehicle wash, service building with the space for workers’ accommodation, vehicle garage, canopy for storing technical means, infrastructure facilities (power line, well, reservoir). Within this zone there is a space reserved for perspective extension of the facility.

The biggest, central part of the subject space is meant for the landfill body, which is divided into 3 cassettes, because phase construction is envisaged. The first cassette, which will be realized in the phase I of construction, is additionally divided into three sub-cassettes, in order to reduce creation of drain waters.

In the east part of the complex, in accordance with topographic features of the space, planned lagoons for treatment of drain and technical waters are located.

In the west part of the complex, there is a potential location for construction waste storage.

Regulation line is defined and it corresponds to the border of the construction lot of the regional landfill for utility waste “Kalenic”.

High rise facilities are freestanding, so that they do not touch any border of the construction lot, they are within the space defined by construction lines and construction borders, i.e. distances from neighboring lot borders.

Regarding the height regulation, construction of the facility with floors to ground floor +1 of the height to 8,0m is envisaged.

- Ground floor level of the facility cannot be lower than the gradient of access road;
- Ground floor level can be maximally 0,20m higher than sidewalk level.

Landfill body is made of sanitary vessel, which is divided with to lowering roads in three parts. That space is bordered with ring road into whose bottom two lowering roads are lowering. Slopes of the landfill body are processed with slope inclinations of 1:3.

Exploitation of the landfill is planned to take place in three phases, and the construction of the landfill body is harmonized with the respective.

Fencing of the complex of regional landfill for utility waste "Kalenic" is envisaged with the wire fence, which is fastened to steel poles with foundations.
Landscaping of the space of regional landfill for utility waste "Kalenic" is envisaged within the surface of protective belt and space for management building.
Preliminary design for hydro technical installation of the complex comprises a solution for: atmospheric waters, drain waters, technical wastewaters, waters for landfill watering, technical waters, drinking waters and fecal waters.

In order to create technical conditions for connecting the facility of the regional landfill for utility waste "Kalenic" (with energy terms Pi=400 kVA, Pj=195 kVA), it is required to build the following electrical-energy facilities:

- Power line of 10kV, length from 2,8 to 3,5 km, which will depend on choice of the subject power line route;
- Distributive type prefabricated power transformer station (MBTS) 630/250 Kva

IV PLAN IMPLEMENTATION

Urbanistic design for construction of the regional landfill for utility waste "KALENIC" (together with General Regulation Plan "Kolubara B") is a basis for issuance of Location terms.

V SUBJECT OF THE REQUEST

Subject of the request is construction of regional landfill for utility waste Kalenic, on the cadaster lot no. 800 CM Kalenic, in the territory of Ub municipality.

The following surfaces are planned in the complex of the regional landfill for utility waste "Kalenic":

- Surfaces under high rise buildings;
- Traffic, manipulative and parking surfaces,
- Landfill body,
- Surfaces under lagoons for drain waters and wastewaters treatment;

- Reserved space for future facility extension;
- Green spaces (within which there is a perspective location intended for construction waste).

Preliminary design planned the construction of the following high rise facilities:
- Management building,
- Weighing house,
- Vehicle wash,
- Facility for vehicle servicing with rest area for workers,
- Vehicles garage,
- Canopy for storage of technical means.

It is required to equip the location with electrical installations, telecommunication and signal installations, water installations, sewerage and passive system for gas evacuation.

Technology for final utility waste disposal at "Kalenic" landfill will be carried out in three phases, in accordance with the "sandwich" system, i.e. "layer by layer", based on field configuration and location capacity. It is planned to build in phase I the entire infrastructure and sanitary development of the part of the landfill body, envisaged for the first phase of waste disposal (which consists of three sub-phases), while the second phase will consist of sanitary disposal of new waste with necessary works in relation to extension of the landfill body, while using the entire infrastructure from the first phase.

VI INFRASTRUCTURE CONNECTIONS

Electrical-energy infrastructure

For the facilities for which construction permit is issued by the ministry in charge of construction issues, designing terms and connection sin regard of connecting to distributive, i.e. power transmission system are not acquired by the competent authority within the unified procedure, but the Investor in in accordance with the law applicable on energy, and in accordance with Article 14, Paragraph 4 of the Decree on location terms.

Duty of the responsible designer is to make the preliminary design, design for construction permit and main design in accordance with designing terms as well as connecting, regarding connecting to distributive i.e. power transmission system , acquired out of unified procedure.

For the needs of issuance of construction permit, it is required to deliver the contact concluded with the holder of public authorizations, if by terms acquired out of the unified procedure it was concluded that it is required to build the missing infrastructures:

- While making technical documentation observe in all terms for designing and connecting, issued by the EPS, Distribution, Branch "Elekotrdistribucija Lazarevac", number 8I.1.0.0.D-09.13-324782-UPP-18, as of 04/12/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-10/2018 as of 05/12/2018.

- While designing observe in all terms for crossing and parallel conduct issued by "Elektromree Srbije" a.d. Belgrade, number 130-00-UTD-003-1029/2018-003 as of 05/12/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-8/2018 as of 05/12/2018.

Water supply and sewer:

While designing observe in all technical terms of Utility public enterprise "Djunis" Ub, number 1270 as of 19/11/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-9/2018 as of 20/112/2018.

Telecommunication infrastructure:
While designing and connecting, observe in all terms of "Telekom Srbija", Direction for techniques, Service for planning and construction of network Belgrade, number 476528/2-2018 as of 09/11/2018, number in system ROP-MSGI-19891-LOC-4-HPAP-7/2018 as of 09/11/2018.

VII SPECIAL TERMS:

Water terms:

While making project documentation it is required to observe in all water terms of the Ministry of agriculture, forestry and water management, the Republic water directorate, number 325-05-1971/2018/07 as of 05/12/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-3/2018 as of 06/12/2018.

Terms of Institute for Nature Conservation:

While designing observe in all terms of the Institute for Nature Conservation of Serbia, given by ruling 03 number 020-3172/2 as of 03/12/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-4/2018 as of 03/12/2018.

Terms regarding measures for fire and explosion protection:

While designing observe in all terms of the Institute for Protection of Cultural Monuments in Valjevo, number 1143, number in the system ROP-MSGI-19891-LOC-4-HPAP-6/2018 as of 05/12/2018.

VIII TERMS ACQUIRED FOR THE NEEDS OF LOCATION TERMS CREATION:

For the need of issuing location terms for phase construction of regional landfill for utility waste Kalenic, on cadaster lot no. 800 Kalenic, in the territory of Ub municipality, in accordance with the service duty the Ministry acquired the following terms:

- Terms for designing and connecting issued by EPS Distribution, Branch "Elktrodistribucija Lazarevac" 8I.1.0.0.D-09.13-324782-UPP-18, as of 04/12/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-10/2018 as of 05/12/2018.

- Terms for crossing and parallel conduct issued by “Elektromreze Srbije” a.d. Belgrade, number 130-00-UTD-003-1029/2018-003 as of 05/12/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-8/2018 as of 05/12/2018.
- Technical terms of Utility public enterprise “Djunis” Ub, number 1270 as of 19/11/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-9/2018 as of 20/112/2018.
- Terms of “Telekom Srbija”, Direction for techniques, Service for planning and construction of network Belgrade, number 476528/2-2018 as of 09/11/2018, number in system ROP-MSGI-19891-LOC-4-HPAP-7/2018 as of 09/11/2018.
- Water terms of the Ministry of agriculture, forestry and water management, the Republic water directorate, number 325-05-1971/2018/07 as of 05/12/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-3/2018 as of 06/12/2018.
- Terms of the Institute for Nature Conservation of Serbia, given by ruling 03 number 020-3172/2 as of 03/12/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-4/2018 as of 03/12/2018.
- Terms of the Ministry of the Interior, Sector for Emergency Situations, Department for Emergency Situations in Valjevo, 09/10/2 number 217/16729/18 as of 13/11/2018, number in the system ROP-MSGI-19891-LOC-4-HPAP-5/2018 as of 15/11/2018.
- Terms of the Institute for Protection of Cultural Monuments in Valjevo, number 1143, number in the system ROP-MSGI-19891-LOC-4-HPAP-6/2018 as of 05/12/2018.

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Constituent part of these location terms is the Preliminary design for phase construction of the regional landfill for utility waste Kalenic, on the cadaster lot no.800 CM Kalenic, in the territory of Ub municipality, constructed by the “Institute Walter Koch” d.o.o. from Belgrade.

IX Previous term for issuing construction permit for concluding contract on construction of missing infrastructure with suitable holders of public authorizations.

X The Investor is obliged – with the request for issuance of construction permit- to submit Design for construction permit with technical control made in accordance with Article 118a and 129 of the Law, a proof of appropriate right on the land of facility in accordance with Article 135 of the Law and the Report of the Audit Committee, in accordance with Article 131 and 135, Paragraph 13 of this Law.

XI The Responsible designer is obliged to create preliminary design, design for construction permit and main design in accordance with the construction rules and all other terms contained in location terms.

XII Prior to submitting application for work registration, it is required to acquire from the ministry in charge of the issues of environmental protection the consents for the study of estimation of impact on the environment, if the obligation of its creation is determined by the regulation arranging the evaluation of impact on the environment, i.e. decision that creation of the study is not necessary.

XIII Location terms are valid for 12 months as of the day of their issuance.

Legal Remedy: An objection can be filed on Location terms to the Government of the Republic of Serbia, through this Ministry, within three days as of the delivery date.

ASSISTANT MINISTER
(Digital signature)
Jovanka Atanackovic

THE REPUBLIC OF SERBIA
THE INSTITUTE FOR NATURE CONSERVATION OF SERBIA
NEW BELGRADE, Dr. Ivana Ribara No. 91
Tel: +381 11/2093-802; 2093-803;
Fax: +381 11/2093-867

The Institute for Nature Conservation of Serbia, Belgrade, Dr. Ivana Ribara Street No. 81 (authorized officer Goran Drmanovic, Decision 04 No. 035-784/1 as of 29/03/2017), in accordance with Article 9 of the Law on Nature Conservation ("The Official Gazette of the RS" no. 36/2009, 88/2010, 91/2010- correction and 14/2016), and in reference to Article 8b of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009, 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018), by the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS", no.130/2015, 96/2016 and 120/2017), the Decree on Location Terms ("The Official Gazette of the RS", no. 35/2015, 114/2015 and 117/2017) and Article 136 of the Law on General Administrative Procedure ("The Official Gazette of the RS", no. 18/2016), acting upon the application no. ROP-MSGI-19891.LOC.4/2018, registration no. 350-02-00435/2018 as of 30/10/2018 of the Ministry of construction, transportation and infrastructure, Nemanjina Street 22-26, Belgrade, for issuance of terms for nature conservation for the needs of creating location terms for the construction of the regional landfill for the utility waste Kalenic, on the cadaster lot no. 800, CM Kalenic, in the territory of Ub municipality, on 03/12/2018 under 03 no. 020-3172/2 passes the following

RULING

1. On the cadaster lot no. 800 CM Kalenic , where construction for the regional landfill for utility waste Kalenic, there are no protected areas for which protection procedure was carried out or initiated, there are no ecologically significant areas and ecological corridors of international importance of ecological network of the Republic of Serbia, and there are neither noted natural goods. The following nature conservation terms are being issued for the construction of the regional landfill for utility waste:

1) Regional landfill for utility waste Kalenic is to be built on the cadaster lot no. 800 CM Kalenic, in accordance with the plan documentation for construction of the subject facility.
2) Envisage sanitary vessel for the landfill body, divided into cassettes and sub-cassettes. Plan, at the bottom of the landfill body, setting of water impermeable layer of clay with minimal thickness o,5m, and thereafter insulation layers (bentonite, HDP foil, geotextile) and protective layer of gravel of minimal thickness 0,5m.
3) Landfill body should be designed in a way that the minimal possible water amount from the surrounding zone gets into it, as well as to prevent pollution of superficial and underground waters around landfill. Enable draining of the atmosphere and draining of drain waters to lagoons for biological purification by perimeter canals around landfill

body, as well as by the system of rain sewer alongside the roads. Biological purification is to be enabled by airing, layering and mud stabilization.

4) Sanitary disposal of waste is to be done by waste dissemination in thin layer, by compressing the respective waste to minimal possible volume with daily covering of deposited compressed waste by internal material of thickness from 10 to 30cm.
5) Plan application of the following layers for closing the landfill body: internal material (dirt) of the proposed minimal thickness of 0,2m, gravel for gas distribution of proposed minimal thickness of 0,3m, clay of proposed minimal thickness of 0,5m, gravel for drainage of proposed minimal thickness of 0,5m, layer for technical re-cultivation (dirt) of proposed minimal thickness of 0,7m, layer for biological re-cultivation (hummus) of proposed minimal thickness of 0,3m.
6) Connect all traffic surfaces in planed area into a unique system, and conduct infrastructure network within the regulation width of roads and in green surfaces,
7) Greening is to be planned within the surface of protective belt around the landfill body and space next to the management building. Protective plants are to be arranged as a unique and dense linear massive in floors, with optimal width of 10m. Selectin of species will be harmonized with terms of habitat and primarily oriented to autochthone species. Selected species should be resistant and adaptable, fast growing with visible features of natural renewal, with big leaf mass and dense crown and features of early leafing and late leaf falling off. Free surface next to the complex of the management building is to be decorated with grass and by planting low and medium growing bushes.
8) High-rise facilities meant for regular operation of regional landfill are to be designed, built and installed in accordance with all applicable regulations and standards.
9) If during works one gets to geological-paleontological documents or mineral-petrological facilities, which are deemed to have the features of natural goods, the Contractor is obliged to notify the Ministry for Environmental Protection within 8 days, as well as to take all protective measures form destruction, damage or theft until authorized person arrives.

2. This Ruling does not set the Applicant free of requirement to acquire other terms, licenses and consents envisaged by positive regulations.
3. If the Applicant does not start the works and activities for which this Ruling was issued, within two years as of the delivery date of this Ruling, he is obliged to submit the application for new ruling.
4. While changing location terms, one should acquire new terms for nature conservation.
5. Fee for this Ruling, in the amount of 25.000,00 dinars is determined in accordance with Article 2, Paragraph 4, Item 4 of the Rulebook on the amount and method for calculating and collecting fees for issuance of document on protection terms (“The Official Gazette of the RS”, no. 73/2011, 106/2013).

Explanation

The competent authority – Ministry of construction, traffic and infrastructure addresses to the Institute for nature conservation of Serbia with the application filed under no. 020-3172/1 as of 6/11/2018 for issuing terms for nature conservation for the requirements for creation of location

terms for construction of the regional landfill for utility waste Kalenic on the cadaster lot no. 800, CM Kalenic. The application for issuing location terms for subject construction was submitted to the Ministry of construction, traffic and infrastructure by the enterprise Regional center for waste management "Eko-Tamnava" d.o.o. Ub, from Ub, Kralja Petra I Oslobodioca Street, no. 60 A/2.

Planned location for regional landfill for utility waste Kalenic is located in the territory of municipalities Ub and Lajkovac, and it is defined within the spatial entity 4 in the General regulation plan "Kolubara B" ("The Official Gazette of Ub Municipality", number 1/2007- for the territory of Ub Municipality; "The Official Gazette of Lajkovac Municipality", number 6/2006 – for the territory of Lajkovac Municipality; "The Official Gazette of the City of Belgrade", no. 29/2006 and 1/2007- for the territories of the city municipalities Lazarevac and Obrenovac).

Regional landfill Kalenic is meant for disposal of utility waste form the territories of eleven cities and municipalities from the area of Kolubara administrative county (Valjevo, Lajkovac, Ljig, Mionica, Osecian and Ub), part of Macva administrative county (Vladimirci and Koceljeva) and part of the City of Belgrade (Barajevo, Lazarevac and Obrenovac).

The following surfaces are planned within the complex of regional landfill: landfill body, surfaces under lagoons for treating drain and technical waters; reserved space for future facility extension; surfaces under high-rise facilities (management building, technical group of facilities, infrastructure facilities, weighing house, weighbridge and disinfection systems); traffic, manipulative and parking surfaces; green surfaces (within perspective location meant for construction waste). The biggest, central part of the subject space is meant for landfill body, which will be divided into 3 cassettes, because phase construction is envisaged. The first cassette, which will be realized in the first construction phase, is additionally divided into three sub-cassettes, in order to reduce creation of drain waters.

On cadaster lot nu. 800 CM Kalenic, there are no protected areas for which there was carried out or there has been initiated protection procedure, established ecologically significant areas and ecological corridors of international importance of the ecological network of the Republic of Serbia, determined by the Decree on ecological network ("The Official gazette of the RS", no. 102/2010), neither registered natural goods.

Terms from the text of this Ruling are determined in accordance with regulations regulating the area of nature conservation.

Legal basis for enacting a Ruling: The Law on Nature Conservation; The Law on Environmental Protection ("The Official Gazette of the RS", no. 135/2004, 36/2009, 72/2009, 43/2011-correction and 14/2016); the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009-correction, 64/2010- decision of the Constitutional Court, 98/2013-Decision of the Constitutional Court, 132/2014, 145/2014 and 83/2018); Decree on Location Terms ("The Official Gazette of the RS", no. 35/2015, 114/2015 and 117/2017); the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" 113/115, 96/16 and 120/2017).

Based on all the aforementioned, it was decided as in the text of this Ruling.

Legal Remedy: Complaint can be filed against this Ruling to the Ministry of Environmental Protection within 15 days as of the receipt of this Ruling. Complaint is to be submitted in written form or declared orally to the records to the Institute for Nature Conservation of Serbia.

HEAD OF THE DEPARTMENT
Goran Drmanovic, MA in Law
(Digital signature)

Upon the Director's decision
04 no. 035-784/1 as of 29/03/2017

(Logo)
THE INSTITUTE FOR PROTECTION
OF CULTURAL MONUMENTS
VALJEVO

Milovana Glisica 2
14000 Valjevo
Serbia
Tel/Fax: 014/3522-689, 3519-656
Account no. 840-227664-16
e-mail: *office@vaza.co.rs*

**MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
Nemanjina 22-26
Belgrade**

File number:
ROP-MSGI-19891-LOC-4/2018
Sub-number:
350-02-00435/2018-14
Registration no. 1143

Based on Article 99, Paragraph 2, Item 1) and 100, Paragraph 1 of the Law on Cultural Property ("The Official Gazette of the RS" no. 71/94, 52/11 and other Law and 99/11 – and other Law_ and in reference to Article 54, Paragraph 1 of the Law on Planning and Construction ("The Official Gazette of the RS: no. 72/2009, 81/2009, 64/2010 – Decision of the CC of the RS, 24/2011 (Article 88nand 89 are not it cleared text), 121/2012, 42/2013- Decision of the CC of the RS, 50/2013- - Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014 and 145/2014), the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" 113/115) and Decree on Location Terms ("The Official Gazette of the RS", no. 35/15, 114/15) the Institute for Protection of Cultural Monuments "Valjevo" determines:

Terms for taking measures of technical protection for construction of the regional landfill for utility waste Kalenic in the cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality

On the surface envisaged for construction of the regional landfill for utility waste Kalenic, on the cadaster lot no.800 CM Kalenic, there are no establishes nor registered immovable cultural properties, nor properties requiring previous protection.
If during excavation works one would come to archeological items, the Contractor is obliged to notify immediately, without delay end the works and notify the Institute for Protection of Cultural Monuments "Valjevo" and take measures to protect and save findings from destruction and to preserve it in the place and position in which it was discovered.
In case of new immediate danger from damaging archeological finding or item, the Institute for Protection of Cultural Monuments "Valjevo: will temporarily stop all works and take measures for determining whether the immovable property or the item are cultural property or not.
In case of permanent destruction or endangering of archeological site, due to investment works, a protection excavation at the Investor's cost, will be carried out.

Director of the Institute for Protection of Cultural Monuments “Valjevo”
Ksenija Stevanovic, phd

(Digital signature)

UTILITY PUBLIC ENTERPRISE "DJUNIS" UB
Veljka Vlahovica Street, no.6
Date: 19/11/2018

The Republic of Serbia
Municipal directorate of Ub Municipality
Department for matters of urbanism, unified procedure and property-legal affairs
ROP-MSGIS-19891-LOCH-4/2018

Subject: Issuance of location terms for construction of regional landfill for utility waste on cadaster lot no.800 CM Kalenic in the territory of Ub Municipality, in accordance with the preliminary design which was delivered

TECHNICAL TERMS

Data on facility from the delivered preliminary design:

- Type of the facility: freestanding facilities/utility infrastructure
- Facility category: G-242003- waste disposal – landfills
- Cadaster lot no.800 CM Kalenic
- Total lot surface: 39,88ha
- Gross surface of the facility: 0,32ha

1) WATER SUPPLY

In the vicinity of cadaster lot o.800 CM Kalenic where regional landfill is built there is no public water supply network managed by the UPE Djunis from Ub.

2) FECAL SEWER

In the vicinity of cadaster lot o.800 CM Kalenic where regional landfill is built there is no public fecal sewer network managed by the UPE Djunis from Ub.

3) RAIN SEWER

In the vicinity of cadaster lot o.800 CM Kalenic where regional landfill is built there is no public rain sewer network managed by the UPE Djunis from Ub.

UPE "DJUNIS" UB
Service war maintenance of water supply and sewer
Slavica Tesic, mechanical engineer
(Digital signature)

(Logo) EMS

SHAREHOLDER COMPANY
"ELEKTROMREZA SRBIJE" BELGRADE

The Republic of Serbia
MINISTRY OF CONSTRUCTION, TRANSPORT AND INFRASTRUCTURE
Nemanjina 22-26
11000 Belgrade

Number: 130-00-utd-003-1029/2018-003
Date: 05/12/2018

File no. in communication of the applicant and NO: ROP-MSGI-19891-LOC-4/2018
File no. in communication between NO and IJO: ROP-MSGI-19891-LOC-4-HPAP-8/2018

Subject: Issuing technical terms for the requirements of creation of technical terms for construction of the regional landfill for utility waste Kalenic, on the cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality

In reference to your request number 350-02-00435/2018-14 as of 30/1-/2018, which we filed on 06/11/2018 under number DTEH-46898, and delivered documentation (preliminary design (volume 0,1 and 7), Terms EPS Distribution for designing and connecting, excerpt from cadaster of lines and copy of plan for the cadaster lot in digital form), we notify you of the following:

1. In accordance with the documentation that was sent, it is visible that within the scope of the subject facility, as well as in direct vicinity of the scope of the subject facility, there are no facilities that are owned by "Elektromreza Srbija" A.D.
2. In accordance with the Development plan of the transmission system for the period 2018-2027 and Investment plan of the scope of the subject facility, construction of electrical-energy infrastructure that would be owned by "Elektromreza Srbije" A.S. is not planned.
3. In accordance with the aforementioned items "Elektromreza Srbije" A.D., there are no special terms for the requirement of creation of location terms for construction of the regional landfill for utility waste Kalenic, on the cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality.

Validity of subject terms is two years as of the date of issuance or less if change of legal regulations takes place. Upon expiration of this deadline, the Applicant is obliged to ask for renewal of validity of the respective.

For all additional explanations, you can address the Sector for high-voltage lines, Directorate for technical support in transmission system, Vojvode Stepe Street 412, 11000 Belgrade and to Gordana Lukovic, tel: 011/3957-223.

Respectfully,

Executive director for power transmission
(Digital signature)
Ilija Cvetic, electrical engineer

Copies are to be delivered to the following:

- Regional maintenance center Belgrade- PPS Valjevo
- Regional maintenance center Belgrade- PPS Belgrade
- Directorate for technical support for transmission system – Sector for high-voltage lines

Second original:

- Archives

SHAREHOLDER COMPANU
"ELEKTROMREZA SRBIJE" BELGRADE
Kneza Milosa 11
11000 Belgrade

ID no.: 20054182
TIN: 103921661
www.ems.rs

THE REPUBLIC OF SERBIA
MINISTRY OF THE INTERIOR
Sector for Emergency Situations
Department for Emergency Situations in Valjevo
Section for Preventive Protection
09/10/2/ number 217-16729/18
Date: 12/11/2018
ROP-MSGI-19891-LOC-4/2018
Uyun Mirkova Street 1a
Valjevo
G.S.

Ministry of the Interior of the Republic of Serbia, Sector for Emergency Situations, Directorate for Preventive Protection, in accordance with Article 54 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/09, 81/09, 24/11, 121/12, 42/13, 50/13, 98/13, 132/14 and 145/14), Article 16, Paragraph 2 of the Decree on location terms ("The Official Gazette of the RS", no. 113/15 and 96/16), resolving upon the request of the Ministry of construction, transport and infrastructure no. 350-02-00435/2018-14 as of 30/10/2018, delivered on behalf of "EKO-TAMNAVA" d.o.o. Ub, Kralja Petra I Oslobodioca Street, no. 60A/2, from Ub, in procedure of issuing location terms within the unified procedure electronically via **ROP-MSGI-19891-LOC-4/2018** issues the following:

TERMS IN REFERENCE TO FIRE PROTECTION MEASURES

For construction of the regional landfill for utility waste Kalenic, on cadaster lot number 800, CM Kalenic, in accordance to the delivered preliminary design, made by the "Institute Walter Koch" d.o.o. Belgrade, Zarija Vujosevica 8, 11070 Belgrade.

In reference to issuance of these terms, we notify you that this authority **HAS NO** specific terms regarding fire protection measures, as well as that in the phase of designing and construction of the subject facility, with all accompanying installations, equipment and devices, it is necessary to implement fire protection measures **envisaged by applicable laws, technical regulations, standards and other documents that arrange fire protection field.**

Issued terms in reference to fire protection measures are constituent part of the location terms, based on which the ruling on construction permit is being issued, which is necessary to deliver to this Department in accordance with Article 138 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/09, 81/09, 24/11, 121/12, 42/13, 50/13, 98/13, 132/14 and 145/14).

In accordance with Article 123 of the Law in Planning and construction, and in accordance with the Provisions of the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" 113/115, 96/16) and Article 34 of the Law on Fire Protection ("The Official Gazette of the RS" no. 11/09 and 20/15) it is required, prior to procedure for establishing suitability of the facility for use, to deliver for consent the designs for constructing the facility, whose constituent part is also the Final fire protection design.

Fee in the amount of **16.750,00** dinars **is collected** in accordance with the tariff no. 46a of the Law on the Republic Administrative Fees ("The Official Gazette of the RS", no. 43/03, 51/03, 53/04, 42/05, 61/05, 101/05, 42/06, 47/07, 54/08, 5/09, 35/10, 50/11, 70/11, 55/12, 93/12, 47/13, 65/13, 57/14, 45/15. 83/15, 112/15, 50/16, 3/18 and 50/18).

TERMS ARE TO BE DELIVERED TO THE FOLLOWING:

1. The Ministry of construction, transport and infrastructure
2. Section for Preventive Protection
3. Archives

HEAD OF THE DEPARTMENT
Policy Advisor
Milan Mihailovic
(Digital signature by Slobodan Kolarevic)

(Coat of Arms)
The Republic of Serbia
MINISTRY OF AGRICULTURE,
FORESTRY AND WATER MANAGEMENT
Republic Water Directorate
Number: 325-05-1071/2018/07
05/12/2018
Belgrade, Nemanjina 22/26

In accordance with Article 113, 115 and 117 of the Law on Waters ("The Official Gazette of the RS" no. 30/2010, 93/2012, 101/2016), Article 30, Paragraph 2 of the Law on Public Administration ("The Official Gazette of the RS" no. 79/2005 and 101/2007), Article 5 of the Law on Ministries ("The Official Gazette of the RS" no.44/2014, 14/2015/54/2015, 96/2015/, 60/2017), the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/09, 81/09, 24/11, 121/12, 42/13, 50/13, 98/13, 132/14 and 145/14), the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" 113/2015, 96/2016 and 120/2017) and Instructions on method of acting of public authorities and holders of public authorizations implementing the unified procedure in regard of water documents in procedures of accomplishing the right to construction (number: 110-00-163/2015-07, as of 19/05/2015), resolving upon the request of the Ministry of construction, transport and infrastructure on behalf of the investor, Regional center for waste management "Eko-Tamnava" d.o.o. Ub, the Ministry of agriculture, forestry and water management, Republic Water Directorate, acting Director Natasa Milic, in accordance with the Government Ruling 24 number: 119-7558/2018 as of 28 August 2018, enacts the following:

WATER TERMS

1. Water term are being issued in procedure of preparation of technical documentation for construction of the regional landfill for utility waste Kalenic, on the cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality.
2. This Document is registered into the Register of water terms for water area Sava, under number 75, as of 05/12/2018.
3. Water terms determine technical and other terms that must be met while planning, designing, constructing the facility and performing the works that can permanently, occasionally and temporarily impact the changes in water regime, for the purpose of harmonization with the Provisions of the Law on Waters and regulations passed in accordance with the respective.
4. Technical documentation for construction of regional landfill for utility waste should meet the following water terms:
   4.1. Technical documentation is to be made in accordance with applicable legal regulations, opinions and norms for this type of works. It is needed to provide technical solution that will not, regardless of the possible work in phases and construction dynamics, impact negatively on water regime. Technical documentation should be controlled, in accordance with applicable legal regulations;
   4.2. It is necessary to previously carry out detailed geodetic recording of the field levels, based on which one should process and update cadaster-topographic plan, optimal

proportions as foundation for future designing. While making technical documentation, one should provide all necessary foundations and documents from competent authorities (urbanistic, geological, geodetic, geo-mechanical, hydrological, hydro-geological etc.) and carry out appropriate analysis in scope envisaged for this type of works. Based on carried out research, one should define hydro-geological terms (dissemination of the filtration coefficient, water level depth, underground waters regime…) on the landfill location;

4.3. While making plan and technical documentation, one should take care of direct or indirect impact to water flows, to planned and already built water facilities on the subject location of Kladnica River etc., in a way that will provide protection of their stability and protection from harmful water effect, as well as on current regime of surface and underground waters;

4.4. The Applicant is obliged to resolved potentially unresolved property-legal relations on cadaster lots and water land with competent public water management enterprise in the construction zone and zone of direct dissemination of impact of the facility construction. Required protection level, criteria, works and measures are to be harmonized with the Water management basis of Serbia and Water Management Strategy in the territory of Serbia;

4.5. Landfill design should provide Program with the network of piezometers for permanent quality control and monitoring of underground waters regime in the landfill zone, both during the exploitation and upon termination of waste disposal, whereby so-called "O" condition is mandatory to be registered, with mandatory provision of proposals for appropriate measured for protection of underground waters from contamination by harmful and hazardous materials;

4.6. One should give such technical solutions not to endanger water regime (quantitative and in terms of quality) of surface and underground waters. Technical solution should provide maximum prevention of waste water infiltration underground, as well as underground waters penetration into landfill body by choosing water impermeable foundation in the bottom and on landfill sides, by drainage system etc.;

4.7. For adopted characteristic calculation values of water flow of Kladnica River in previous regime, on the subject section, appropriate hydraulic calculations are to be carried out:

- Hundred-year big water Q1%=93,4m3/s
- Fifty-year big water Q2%=74,1m3/s
- Medium waters Qsr=0,42m3/2
- Minimal medium monthly flow with secured 95% Q95%=0.042m3/2
- Flow surface Fsl=105km2

4.8. Hydrological-hydraulic calculation of big waters is to be done and one should take into account that relevant calculated big water is Q1%(T=100 years) and controlled calculated big water is Q0,1% (T=1000years). Protection of the subject landfill is to be done by superelevation of 30cm above the level of controlled calculated bog water;

4.9. Method for depositing utility and neutral industrial waste (compact and non-compact) in layers with dissemination is to be envisaged, by covering with inert material and recultivation of impacted surfaces;

4.10. Drainage system should be given for collection of drain waters occurred within the landfill and appropriate solutions should be provided for evacuation and treatment of these waters with the possibility of recirculation of purified drain water for the purpose of utility waste fogging;

4.11. Supplying of the complex with sanitary approved drinking water is to be resolved with connecting to public water supply, according to the terms of competent public utility company;

4.12. For using underground waters, it is required to provide technical solution with intake of underground waters for supplying the complex with technical water for hydrant needs. For use of underground waters, it is required to establish reserves of underground waters and acquire ruling from the ministry in charge for issues of geological researches. Additionally, it is necessary to envisage all required hydro-mechanical equipment for rational intake of underground waters, in order to prevent endangering of other facilities (underground springs) in the surrounding area, if any, and install devices for registering of taken in underground water which will be used for the requirements of the system;

4.13. Provide detailed description of the working process for planned activity and identify all wastewaters and materials that can occur within the subject complex, in accordance with expected quantities and quality;

4.14. Envisage separate system of sewer for sanitary-fecal, technological, drainage, allegedly clean and potentially polluted atmospheric water;

4.15. Sanitary-fecal wastewaters are to be collected in properly constructed water impermeable septic tank. Locations of the respective are to be determined so that they are in the zone of access road for the subject facility, due to maintenance and necessary periodical emptying by the competent public utility enterprise;

4.16. All collected wastewaters from the landfill complex must be purified on the devices for waste waters purification. Technical-technological solution that will ensure and guarantee that quality of waste waters is in accordance with the valid regulations is necessary, i.e. that it meets conditions for threshold values of emission, i.e. that quality of released water does not endanger standards of environmental quality. It is forbidden to release unpurified waste waters into surface and underground waters;

4.17. Drain waters that are being drained in working cassettes through waste, are to be conducted by the system of drain waters to biological system for waste water purification;

4.18. Oiled atmospheric waters from the surface, traffic and parking surfaces as well as technological waste waters from washing and maintenance of the respective surfaces and vehicles, waste waters from temporary storages etc., must be collected with special system of sewerage and conducted through settlers for removal of mechanical impurities and separator for removal of oil and its derivatives to biological system for purification of waste waters or to recipients – Kladnica River;

4.19. Technical documentation is meant for processing the solution for collecting and conduct of all allegedly clean surface waters from the landfill via canal, which should be deep enough to prevent raising of underground waters level;

4.20. Atmospheric waters from conditionally unpolluted, roof and non-communication surfaces are to be collected and evacuated into surrounding green surfaces or recipient. Dimensioning of the facility for evacuation of atmospheric waters from drainage area is to be done based on characteristic values for rainfall intensity;

4.21. Technical documentation should envisage method for cleaning and maintenance of all devices for purification, deposit and mud treatment, as well as a place for depositing and method for mud disposal, under condition that they do nor pollute neither surface nor underground waters;

4.22. For water supply facilities, facilities for sewer and purification of waste waters required hydraulic calculations are to be done and they should be duly dimensioned;

4.23. Technical documentation should envisage installment of devices for measuring and registration of quantities of released purified waste waters as well as spots for sampling for quality inspection of taken waters and quality of purified waste waters;

4.24. Outlet structure should be fitted into profile of riverbed of Kladnica River so that it is solid and functional in all conditions. Secure bank slope from erosion. Technical documentation should envisage a free space of appropriate width, whereby free space is reserved for access of mechanization and interventions on water facilities;

4.25. If subject location of the landfill envisages storage of wastewaters, oil and its derivatives etc., design documentation should envisage solution for reservoir for storage of appropriate equipment and operational space, which will enable protection of surface and underground waters, with continuous control of surveillance system for monitoring possible water pollution. All reservoirs and equipment for storing oil and its derivatives etc., must be in water impermeable storage tank plants of appropriate volume for intake of maximally stored quantities from the reservoir;

4.26. While planning and constructing all facilities, one should take into account possible terms of high levels of underground waters and impact of big waters of surrounding water flows. In case of danger, one should envisage additional facilities and measures for protecting the facility from big waters and flows and protection of water flows from pollution in case of flooding;

4.27. One should envisage such solutions that will enable required permeability of the riverbed, both upstream and downstream from observed section, to the place where the impact of change of regime of waters is felt caused by regulation, based on adopted relevant values from Item 4.7;

4.28. At the beginning and at the end of the rout of regulated section there should be inflow structures that will be shaped in such a way so that they do not cause harmful consequences on unregulated sections, upstream and downstream, as well as on regulation structures;

4.29. Longitudinal regulation disposition (slopes of the bottom of regulated riverbed) and lateral riverbed profile should be designed in such a way that the water regime and deposit should be stationed in a way that there is no erosion of the bottom and banks, i.e. filling of the riverbed;

4.30. Technical documentation should envisage appropriate technology of construction works, in order to eliminate the possibility of damage of constructed protective water

facilities. Possible damages that occur while constructing, must be removed at the Investor's cost;

4.31. There should be an appropriate technical solution for all other activities that might be carried our within the entire complex, aimed at preventing water regime change;

4.32. Technical documentation should be made in accordance with issued water terms, technical inspection of the respective should be carried out and an application must be filed to this Ministry for issuance of water consent for technical documentation, and after the facility is being constructed, file for issuance of water permit is to be submitted.

Explanation

The Ministry of construction, transport and infrastructure on behalf of the Investor, Regional Center for Waste Management "Eko-Tamnava" d.o.o. Ub, Kralja Petra I Oslobodioca Street, no. 60A/2, Ub (reg.no. 20816309), submitted he application in procedure of preparation and creation of technical documentation for construction of the regional landfill for utility waste Kalenic, on cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality.

The following documentation was enclosed with the application:

- Information on location issued by the Ministry of construction, transport and infrastructure, no. 350-02-00435/2018-14, as of 30/11/2018;
- Notification by the designer, the Institute Walter Koch, Association for quality control, consulting and designing, doo, Belgrade, number 196/18/I, as of 24/10/2018;
- Copy of the plan R1:3500, CM Kalenic, issued by the Real Estate Cadaster, Ub, no. 953/2/2018-86, as of 5/11/2018;
- Location terms for construction of the regional landfill for utility waste Kalenic, by the Ministry of construction, transport and infrastructure, number: 350-02-00333/2017-14, as of 20/10/2017;
- Opinion in procedure for issuance of water terms, number 10130/1 as of 15/11/2018, issued by PWE :Srbijavode" VPC "Sava= Dunav", New Belgrade;
- Opinion in procedure of creation of technical documentation for construction of regional landfill for utility waste Kalenic, by the Republic Hydro-Meteorological Institute, number: 922-1-157/2-17 as of 9 October 2017;
- Return of technical documentation by the Republic Hydro-Meteorological Institute, number: 922-1-254/2-18 as of 9 November 2018;
- Opinion for issuance of water term for construction of the "Regional landfill for utility waste Kalenic" on the cadaster lot no.800 CM Kalenic, number 011-00-001/270/2018-02 as of 08/11/2018, issued by the Environmental Protection Agency;
- Preliminary design for construction of regional landfill for utility waste Kalenic, on cadaster lot no.800 CM Kalenic, in the territory of Ub Municipality, done by the company "Institute Walter Koch" d.o.o. Belgrade, Zarija Vujosevica 8, Belgrade, number of the part of the project: 64/IDR/7, as of Ocotober 2018;
- Hydrological study for sanitary landfill Kalenic, done by the company Lakomica d.o.o., Prokuplje, number of the part of the project: EKOT-3.1/2017, as of Septemebr 2017;

The Ministry of agriculture, forestry and water management – Republic Water Direcotrate, within its competencies, provided terms in the text of the Ruling, in accordance with Provisions of Article 113-118 of the Law on Waters. According to Article 14 in reference to its purpose, the

water facility is listed under 5- collection, conduct and purification of waste waters and water protection. The facility is listed under 9) industrial and utility landfill, in accordance with Article 117. Based on Article 43, in reference to water activity, it is about water protection from pollution. The closest water flow to the subject location is Kladnica River, sub-flow of Kolubara River, water area Sava, in accordance with Article 27 of the Law on Waters and Decision on establishing boundaries of water areas ("The Official Gazette of the RS" no. 75/2010) and Article 1 and f of the Rulebook on establishing sub-flows ("The Official Gazette of the RS" No. 54/11). According to the Decision on establishing Listing of I level waters, the I level water ("The Official Gazette of the RS" no. 83/10) is listed under 2- other water flows, 1) natural water flows. Subject facility is located in the area of water unit number 4 "Kolubara-Lazarevac", according to the Rulebook on determination of water units and their boundaries ("The Official Gazette of the RS", no. 8/2018).

Based on the Decree on water flows categorization ("The Official Gazette of the SRS" number 5/68), river categorization was given and maximum amounts of dangerous materials in waters are given by the Rulebook on hazardous materials in waters ("The Official Gazette of the SRS" no. 31/82) and they cannot be violated. Polluting substances that are released by wastewaters into recipient, must meet criteria of the Decree of threshold values of emission of polluting materials into waters and deadlines for their achievement ("The Official Gazette of the RS" no. 67/11, 48/13 and 1/16). The Decree on threshold values in surface and underground waters and sediments and deadline for their achievement ("The Official Gazette of the RS" NO. 50/2012) and the Decree on threshold values of priority and priority hazardous substances polluting surface waters and deadlines for their achieving ("The Official Gazette of the RS", no. 24/2014) establish threshold values of polluting substances in surface and underground waters and sediments, as well as deadlines for their achievement. Measuring of quantities and testing of waste waters are to be done in accordance with the Rulebook on method and terms for measuring quantities and testing wastewaters and contents of report on carried out measures ("The Official Gazette of the RS", no.33/2016). Quality control and surveillance of regime of underground water and piezometers, are to be done in accordance with the Decree on program of system monitoring of soil quality, indicators for evaluating risk from degrading of soil and methodology for creating remediation programs, Annex 2 Remediation values for concentration of hazardous and harmful materials and values that can point to significant contamination of underground waters ("The Official Gazette of the RS", no. 88/2010).

The Ministry of construction, transport and infrastructure issued the Information on location (no. 359-02-00435/2018-14 as of 30/10/2018) for subject location, in accordance with General Regulation Plan for the area of Thermal Power Plant "Kolubara B" ("The Official Gazette of Ub, Municipality", no. 1/07) and Urbanistic design for construction of the regional landfill for utility waste "KALENIC" (authorization no. 350-184/14-04 as of 30/04/2014).

The opinion of the PWE :Srbijavode" WPC "Sava-Dunav", Belgrade, is enclosed to the document giving general data, hydrographic and hydrological data, other data, data of importance for issuance of water term. Location of the subject landfill is planned in used part of the superficial opt cut mining Tamnava West. Its position is on the downstream part of the flow of Kladnica River, at confluence with Kolubara River. In current terms, until the coal excavation is finalized in Tamnava, sanitary landfill is entirely protected from big waters by excavation pit protection system, so as long as the works are in progress in Tmanava, there is no need for any protection of the landfill space from the impact of Kladnica River. Kalenic landfill is not exposed to impact of big waters from Kolubara River. Upon termination of works at open cut Radaljevo

and Tamnava West Field, in 2040, recultivation and creation of artificial lake is planned, according to the General Regulation Plan for the impact zone of Radaljevo, as of 2012. It means that the body of the sanitary landfill will not be endangered by big waters from the flow of Kladnica River even upon shutting down of the named mines in 2040. Therefore, the protection from surface waters from inter-flow will be made only at the southern part of Kalenic landfill, from Paljuvi Vis accumulation to Kladnica retention.

The Opinion of the Republic Hydro-Meteorological Institute gives characteristic calculations for flows of big waters of Kladnica River The opinion is given by the Environmental Protection Agency, with data for water quality in Kladnica River for downstream profile Kalenic.

Within the complex of the regional landfill for utility waste "Kalenic", according to the preliminary design, the following surfaces are planned: surfaces under high-rise facilities, roads, manipulative and parking surfaces; landfill body; surfaces under lagoons; reserved space for future extension of the facility; green surfaces (within which there is a perspective location meant for construction waste). The biggest, central part of the subject space is meant for landfill body, which will be divided into three cassettes, because phase construction is envisaged. The first cassette, which will be realized in the first construction phase, is additionally divided into three sub-cassettes, in order to reduce creation of drain waters. In the eastern part of the complex, in accordance with topographic features of the space, lagoons are planned for treatment of drain and technical waters. Technology of final disposal of utility waste on "Kalenic" landfill will be done in three phases, according to the "sandwich" system, i.e. "layer by layer".

It is envisaged that purified waters from the Lagoon I, with special system of pumps, fixed and mobile pipes and equipment, are reused for the requirements of landfill fogging, for the purpose of improvement of process of waste disintegration, prevention of possible ignition, better layer compression, prevention of dust. At certain period of exploitation, tis water will constantly recirculate through the system of Lagoon I. All technical waters for vehicle washing process, for transport and waste manipulation, waters for fire protection and requirements of water spots in facilities will be provided from the wells and reservoirs for technical water. Special supply line is envisaged from the main pipeline for drinking water in gatekeeper's lodge , management building and service facilities, next to the road Ub-Veliki Crljeni ("Kalenic" spring). Alternatively, drinking water can be provided from the reservoir installed at the location.

For the needs of collecting atmospheric waters from asphalt roads and plateaus system of classic rain sewer is envisaged, in a way that atmosphere waters will be collected and conducted to the recipient- riverbed of Kladnica River. Rain water will be conducted in the following manner:

- In western part of the manipulative space A24 manhole is envisaged, the rain water will be gravitationally conducted to the R1 reservoir, wherefrom it will be conducted under pressure to manhole K10 and further gravitationally to Kladnica riverbed;
- Atmospheric waters from the management building plateau will be gravitationally conducted to K9 manhole. Prior to rainwater conduct to the named manhole, its treatment in oil separator is planned.

From the secondary flow in the north-west of the lot, atmospheric water which will gravitate towards access road shall be taken in several places alongside the road and flown into the manholes K9, K5 and K1. Atmospheric waters that will fall directly on "inactive" cassettes 2 and 3, will be collected with the system of drainage pipes and conducted to the junction manhole and from there they will be directed towards the Lagoon 2. All rain waters from Lagoon 2, if necessary, shall be re-pumped to manhole PS4, which will be located in direct vicinity of Lagoon 1. From PS4 manhole, they will be re-pumped to rain water manhole, wherefrom they will be

conducted to Kladnica riverbed or they will be gravitationally taken into Lagoon 1 and in dry period, they will be used for landfill fogging. Concrete pipeline for gravitational conducting extra water, in case of a need, from Lagoon 1 to Lagoon 2 is planned.
It is envisaged that all waters that are drained in working cassettes through waste are collected with the system of drainage pipes and conducted to further processing into Lagoon 1. Drainage pipes, with diameter DN 100mm and DN 300mm will be located into filter layer (in the bottom of the landfill body). Waters from Lagoon 1 (drain and technical wastewaters that will also be conducted to Lagoon 1) will be used for landfill watering.
Technical wastewaters in the landfill complex comprise wastewaters from the facility for vehicle washing, potentially oiled wastewaters from parking space, wastewaters from temporary storages (under the canopy). Conduct of all drain waters is planned to be gravitational to Lagoon 1, after passing through oil separator.
It is planned that that all fecal waters are collected independently, with system of separate skeptical tanks, with appropriate volume. Septic tanks will be emptied periodically and taken for further treatment.
System for wastewaters purification: It is planned that biological purification takes place in system of two lagoons- aired and deposit. Drain waters from landfill body and technical waters from vehicle washing will be conducted to lagoon for purification. Separation of deposit organic materials is carried out in the second deposit lagoon, in which wastewater from the aired lagoon will be taken by re-pumping through pump station. Mud stabilization process will take place in deposit lagoon. Cleared water from deposit lagoon will be re-pumped with the system of pumps and conducted to landfill fogging. Possible extra of drain waters in rain period will be taken to the closest facility for waste water purification in the region.
According to the terms from the text of the document, no.4.1-4.4 technical documentation should be at the level of design in accordance with the Provisions of the Law on Waters, guidelines from Water management basis of the RS ("The Official Gazette of the RS" number 11/02), Strategy for water management in the territory of the Republic of Serbia ("The Official Gazette of the RS"), number 3/2017), the Law on Planning and Construction with mandatory annexes:

- Evidence that company, enterprise or other legal entity registered into register for creation of technical documentation with enclosed applicable and appropriate licenses of responsible designers;
- Technical report, calculations (hydrological, hydraulic, dimensioning of facilities, etc.), graphic enclosures;
- Technical solution for facilities and activities from water intake to water release into final recipient, impact on water regime due to water intake and release, method of water purification, defining place for measuring quantities of taken and released waters as well as place for water sampling etc.;

Water term from Item 1 of the text of this document, is given based on Provisions of Article 114, Article 115, Article 117, Paragraph 1, Item 9 and Article 118, Paragraph 1 of the Law on Waters (LoW). Water term under Item 2, of the text of this document is given based on Provision of Article 130, Paragraph 7 of the LoW, i.e. Rulebook on contents and method of water book and form keeping ("The Official Gazette of the RS", no. 86/10). Term 4.12 in the text of the wording, is given in accordance with Article 71 and 74 of the Law on Waters. Terms from the text of the Ruling, number 4.6, 4.10, 4.13-4.23 are given in accordance with Article 92. Article 93 and Article 97- Article 100 of the Law on Waters, which comprise water protection from pollution. Terms no.4.25 and 4.30-4.21, provide obligation of taking

measures in case of immediate danger from pollution, according to Article 101 and Article 103 of the Law on Waters. Term number 4.23 in the text of the Ruling is given in accordance with Article no.99 of the Law on Waters. Term no. 4.5 is given in accordance with Article 20 of the Law on Waters. Terms no. 4.7, 4.8, 4.24 and 4.26-4.29 are given in accordance with Article 8, Article 11, Article 13, Article 16, Article 44, Article 65 and Article 133 of the Law on Waters which comprises organization of water flows and protection from harmful effect of waters.

Upon termination of technical documentation and technical inspection and meeting requirements from the Rulebook on contents and form of application for issuance of water documents, contents of the opinion in procedure of issuance of water terms and contents of the report in the procedure of issuance of water terms and contents of the report in procedure for issuance of water permit ("The Official Gazette of the RS", number 72/2017), it is required to submit the application to this Ministry for issuance of water consent for technical documentation and after construction of the facility it is required to submit the application for issuance of water permit, in accordance with Article 119 of the Law on Waters, so the term 4.32 of the text of the document is given.

By overview of the enclosed documentation, expert of this Ministry proposed issuance of water terms under terms named in the text of the document.

Based on the Rulebook on contents and method of water book and form keeping ("The Official Gazette of the RS", no. 86/10), this document is registered into the Register of water terms for water area Sava, by term 2 of the text of the document.

The Republic administrative fee for the document upon application for issuance of water documents is free of charge, in accordance with the Law on Republic Administrative Fees ("The Official Gazette of the RS" number 93/2012) and Law on Republic Administrative Fees ("The Official Gazette of the RS" no. 43/03…..50/11, 70/11 and 55/2012).

DELIVER TO THE FOLLOWING:

- Ministry of construction, transport and infrastructure
- PWE "Srbijavode" WPC "Sava-Dunav", New Belgrade
- Water inspection
- Water book
- Archives

ACTING DIRECTOR

Natasa Milic

(Digital signature)

(Coat of Arms)
The Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
ROP-MSGI-19891-CPI-6/2019
Number: 351-02-00266/2019-07
Date: 27/09/2019
Belgrade, Nemanjina 22-26

The Ministry of Construction, Transport and Infrastructure, resolving upon request of the Regional Center for Waste Management "Eko-Tamnava" d.o.o. Ub, Kralja Petra I Oslobodioca no 60A/2, Ub, for issuance of construction permit for carrying out preparatory works that encompass earth works at the leveling of the existing field and works on draining and re-pumping of waters from some zones of earth works, within the phase construction of the regional sanitary landfill for utility and non-hazardous waste Kalenic, on the cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality, and in the I phase of construction of the regional center, which comprises high-rise facilities and infrastructure, as well as sanitary organization for the part of the landfill body (I phase that consists of three sub-phases – cassette 1, 2 and 3), in accordance with Article 6 of the Law on Ministries ("The Official Gazette of the RS", no. 44/2014, 14/2015, 54/2015, 96/2015 – other law and 62/2017), Article 136 of the Law on General Administrative Procedure ("The Official Gazette of the RS", no. 18/16), Article 135 and Article 137 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009 – correction, 64/2010- Decision of the CC, 24/2011, 121/2012, 42/2013 – decision of the CC, 50/2013 – decision of the CC, 98/2013 – decision of the CC, 132/2014, 145/2014 and 83/2018_ and authorization contained in the Ministry's Ruling number: 031-01-17/2018-02-2 as of 26/11/2018) passes the following:

RULING ON
CONSTRUCTION PERMIT

I IT IS ALLOWED to the Investor "Eko-Tamnava" d.o.o. Ub, Kralja Petra I Oslobodioca no 60A/2, Ub, to carry out preparatory works that encompass earth works at the leveling of the existing field and works on draining and re-pumping of waters from some zones of earth works, within the phase construction of the regional sanitary landfill for utility and non-hazardous waste Kalenic, on the cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality, namely phase I of construction of the regional center, which comprises high-rise facilities and infrastructure, as well as sanitary organization for the part of the landfill body (I phase that consists of three sub-phases – cassette 1, 2 and 3).

II Pre-calculation value of the works is: 375.375.816,00 dinars.

III The Investor IS OBLIGED, prior to begging of works, to report beginning of construction of the facility to the Ministry of construction, transport and infrastructure.

IV The Investor IS OBLIGED to provide professional supervision during facility construction, i.e. performance of works for which the construction permit was issued.

V Constituent part of this Ruling is the following: Location terms of the Ministry of construction and infrastructure number ROP-MSGI-19891-LOC-4/2018; 350-02-00435/2018-14 as of 13/12/2018; Excerpt from the design; 0 Main volume; 10 Design of preparatory works made by "Energoprojekt-hidroinzenjering" a.d. Bulevar Mihaila Pupina no. 12, Belgrade; Elaborate on geotechnical terms of construction which was made by "GEOING GROUP" d.o.o. Kraljice Marije Street, no.25, Belgrade.

VI Construction permits ceases to be valid if works are not reported within three years as of the day of this Ruling's entry into force.

Explanation

The Investor "Eko-Tamnava" d.o.o. Ub, Kralja Petra I Oslobodioca Street, 60A/2, Ub, submitted to the Ministry of construction, transport and infrastructure, through empowered Dusan Krstic, Dr. Ivana Ribara Street, No 160 Belgrade-New Belgrade, an application for issuance of construction permit for preparatory works comprising earth works on leveling of the existing field and works on drainage and re-pumping of waters from certain zones of earth works within phase construction of the regional sanitary landfill of the utility and non-hazardous waste Kalenic on cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipaliry, and the I phase of construction of the regional center, comprising high-rise facilities and infrastructure, as well as sanitary organization for the part of the landfill body (I phase that consists of three sub-phases- cassette 1, 2 and 3).

By the insight into delivered application and annexes, it was established that all enclosed all required documentation, i.e. that formal terms for acting upon request envisaged by Article 16 and 17 of the Rulebook on the procedure for conducting the unified procedure electronically are met. Article 19, Paragraph 1 of the Rulebook envisages that, if formal terms for acting upon request are met, the competent authority, according to service duty, without delay, acquires from the authority in charge of issues of state measuring and cadaster the excerpt from the real estate folio, which is the subject of the request.

Issued location terms of the Ministry of construction, transport and infrastructure no. ROP-MSGI-19891-LOC-4/2018; 350-02-00435/2018-14 as of 13/12/2018 establishes terms for phase construction of the regional landfill for utility waste Kalenic, on cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality, required for construction of preliminary design, design for construction permit and final design, in accordance with the General Regulation Plan for area of Thermal Power Plant "Kolubara B" ("The Official Gazette of Ub Municipality, no. 1/07), Urbanistic design for construction of the regional landfill for utility waste "KALENIC" (authorization no. 350-184/14-04 as of 30/04/2014).

By the insight into acquired transcript of the excerpt from the real estate folio from Real Estate Cadaster Service Ub, no. 358 CM Kalenic, it was established that cadaster lot no. 100, registered in CM Kalenic, in the territory of Ub Municipality is in private property of "Eko-Tamanva" d.o.o. Ub, Kralja Petra, with 1/1 share scope. It results from the aforementioned that the Investor provided evidence on right on the property, in accordance with Article 135, Paragraph 2 of the Law on Planning and Construction.

By the insight into enclosed Main volume, made by "Energoprojekt-hidroinzenjering" a.d. Bulevar Mihaila Pupina Street no.12, it was established that preparatory works are done for

facilities of G category, classification number:, and that Dusan Krstic, tech. eng., license number 371 E187 06, was appointed for main designer.
Report and summary of the report on technical inspection for construction permit no. 12311/19/I as of 03/09/2019, made by "SET" d.o.o. Brace Nedica street, no.1, 15000 Sabac (who owns appropriate license in accordance with the ruling no. 351-03-04592/2018-07 as of 27/11/2018), confirmed that the design was harmonized with technical terms, that technical documentation is technically correct and that some parts of the design are mutually harmonized, and that the respective can be accepted.
It was established that in accordance with Article 97, Paragraph 8 of the Law on Planning and Construction contribution for developing construction land is not calculated for facilities of utility and other infrastructure.
By insight into invoices, it was established that compensation for CEOP was paid, as well as the Republic administrative fee for filing application and republic administrative fee for passing the ruling.
Based on the aforementioned state of play, concluding that the Investor submitted the design for preparatory works, that he has appropriate right on the land and that he delivered evidence envisaged by the Rulebook on the procedure for conducting the unified procedure electronically, it was established that terms from Article 137, Paragraphs 3 and 4 and in reference to Article 135, Paragraph 1 of the Law on Planning and Construction were met for issuance of construction permit, and it was decided as in Paragraph 1 of the text of the document.
Since estimated value of works in the amount of 375.375.816.00 was established in the Main volume, the decision as in Paragraph II of the text of this Ruling was made.
Decisions from Paragraphs III, IV, V and VI was made in accordance with Article 135, Article 97 and 148, Paragraph 1 and 2, i.e. Article 153,131,136 and Article 140 of the Law on Planning and Construction.

Resolved at the Ministry of construction, transport and infrastructure, under number 351-02-00266/2019-07, on 27/09/2019.

Legal remedy: This Ruling is final in administrative procedure and complaint cannot be filed, but administrative procedure can be initiated by filing complaint to the Administrative Court of Serbia within 30 days as of the day of receipt of the Ruling.

Assistant minister
(Digital signature)
Jovanka Atanackovic

(Coat of Arms)
The Republic of Serbia
MINISTRY OF CONSTRUCTION,
TRANSPORT AND INFRASTRUCTURE
Number: 351-02-00364/2019-07
ROP-MSGI-19891-CPIH-9/2020
Date: 25/02/2020
Nemanjina 22-26, Belgrade

The Ministry of Construction, transport and infrastructure, resolving upon request of the company Regional center for waste management "Eko-Tamnava" d.o.o. Ub, Kralja Petra I Oslobodioca no. 60A/2 from Ub, for issuing construction permit for the construction of the first phase of regional landfill for utility waste Kalenic, on cadaster lot no.800 CM Kalenic, in the territory of Ub Municipality, based on Article 6 of the Law on Ministries ("The Official Gazette of the RS" number 44/2014, 14/2015, 54/2018, 96/2015- other law and 62/2017), Article 136 of the Law on Genera Administrative Procedure ("The Official Gazette of the RS" , no. 18/16), Article 135 of the Law on Planning and Construction (("The Official Gazette of the RS", number 72/09, 81/09-correction, 64/10- Decision of the Constitutional Court, 24/11, 121/12, 42/13-decision of the Constitutional Court, 50/13-decisioin of the Constitutional Court, 98/2013-decision of the CC, 132/14, 145/15, 83/18, 31/19 and 37/19), Article 16-23 of the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS", no. 68/2019) and power of attorney contained in the Minister's Ruing number: 119-01-31/2020-02-2 as of 14/02/2020), enacts the following:

RULING
ON CONSTRUCTION PERMIT

I It is allowed to the Investor Regional center for waste management "Eko-Tamnava" d.o.o. Ub, Kralja Petra I Oslobodioca no. 60A/2 from Ub, to carry out works on construction of the first phase of regional landfill for utility waste Kalenic, which comprises landfill body-cassette 1, gatekeeper's lodge, weighing bridge, outline 6mx5m, GFA 30m2, management building with outline 22,20m x 19,80m, GFA 446,94m2. Vehicle wash, outline 14,75mx6,90m, GFA 101.77m2, facility for vehicle servicing with workers' rest area, outline 25,00x9,90m GFA 247,10m2, vehicle garage outline about 16,00m x 15,00m, GFA 242,85 m2, canopy for storing technical means outline 65,2mx5,40m S 353,38m2, transformer substation 10/0,4 kV, internal road in length of L=2.910,86m, manipulative and parking surfaces (20PP), pumping station APS1 outline 10,60 x 5,60m+2,0x3,9m, capacity 60+60 1/s, pumping station APS2 outline: 8,60 x 4,60m +2,0x2,6m, capacity 30+30 l/s, pumping station PVCS1, dimensions D=2,4m; H=3,45m, capacity 10+10 l/s, oil derivatives separator SEP1, capacity Q=60 l/s and SEP2 capacity Q= 5 l/s and Septic tank S1 and S3, dimensions 4,80x2,80m, depth 2,35m and Septic tank S2 diameter 2,3m, depth 2,35m all in cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality,

II Estimated value of the works is: 1.190.473.564,57 dinars

III It is being CONCLUDED that contribution for development of construction land is not calculated.

IV The Investor IS OBLIGED, prior to begging of works, to report beginning of construction of the facility to the Ministry of construction, transport and infrastructure.

V The Investor IS OBLIGED to provide professional supervision during facility construction, ,i.e. performance of works for which the construction permit was issued.

VI Constituent part of this Ruling is the following: Location terms of the Ministry of construction and infrastructure number ROP-MSGI-19891-LOC-4/2018; 350-02-00435/2018-14 as of 13/12/2018; Excerpt from the design; 0 Main volume, 1 Architecture design, 2/1.1, Structure design: Landfill body, 2/1.3 Construction design: Facilities for controlled carrying out of technological process, 2/1.. Construction design: Landfill body, 2/1.3 Construction design: Facilities for maintenance of underground water levels, 2/1.4 Construction design: Facilities for conducting technical and drinking water and water for fire protection system, 2/2 Road design: Infrastructure facilities within the complex, 3/1 Hydro-technical installations design: Facilities for controlled conduct of technological processes, 3/2 Hydro-technical installations design: Facilities for conduct of atmospheric, drain, waste and sanitary-fecal waters, 3/3 Hydro-technical installations design: Facilities for maintenance of underground water levels, 3/4 Hydro-technical installations design: Facilities for conducting technical and drinking water and water for fire protection system, 4/1 Electrical-energy installations design: Power transformer station, electrical-energy distribution and external lighting, 4/2 Electrical-energy installations design: General electrical-energy installations, 4/3 Electrical-energy installations design: Electromotive drive and control, 5 Telecommunication and signal installations design, 6/1 Mechanical installations design: Thermal-technical installations, 6/2 Mechanical installations design: Facilities for conduct of atmospheric, drain, waste and sanitary-fecal waters, 6/3 Mechanical installations design: Facilities for maintenance of underground water levels, 6/4 Mechanical installations design: Facilities for conducting technical and drinking water and water for fire protection system, 7/1 Technology design: Facilities for controlled carrying out of technological process, 7/2 Technology design: Landfill body, 9 Exterior decoration design with synchro installation and connections plan, landscape architecture and horticulture, Energy efficiency elaborate, Hydro-geological study of research of analysis of the existing underground waters regime with proposed hydro-geological measures for maintenance of underground waters level in terms of exploitation of the Regional landfill "Kalenic", made by: "Energorpojekt-Hidroinzenjering" a.d. Bulevar Mihaila Pupina 12; Elaborate on geotechnical terms of construction of the regional landfill for utility (non-hazardous) waste "Kalenic" –I phase, made by "GEOING GROUP" d.o.o. Kraljice Marije Street, no.25, Belgrade, Study for protection of regional landfill "Kalenic" from big waters of reversible period Q1% (T-100 years) and controlled calculated water Q0,1% (T-1000 years) made by the Institute for hydro-technics and water ecological engineering –The Faculty for Civil Engineering of the University in Belgrade, Ruzveltova 1a, Belgrade; Elaborate for fire protection made by "SECURITON" d.o.o., Danila Lekica Spanca 31, NEW Belgrade; Study on evaluation of impact of design for construction of the regional landfill for utility (non-hazardous) waste "Kalenic" on cadaster lot 800 CM Kalenic, territory of UB Municipality on the environment , made by the Institute of transportation CIP d.o.o. Nemanjina 6/IV, Belgrade; Technical inspection report no. 17954/19/1 as of 11/12/2019,

made by “SET” d.o.o. Sabac, Brace Nedica Street no.1,; Report on expert inspection of Preliminary design, Republic Audit Commission no. 350-02-01399/2019-14 as of 26/11/2019.

VIII Construction permits ceases to be valid if works are not reported within three years as of the day of this Ruling’s entry into force

Explanation

The Investor “Eko-Tamnava” d.o.o. Ub, Kralja Petra I Oslobodioca Street, 60A/2, Ub, submitted to the Ministry of construction, transport and infrastructure, through empowered Dusan Krstic, from Belgrade, through CIS, an application for issuance of construction permit for construction of the facility like in Paragraph I of the text of this Ruling. Construction of the facility comprises landfill body-cassette 1, gatekeeper’s lodge, weighing bridge, outline 6mx5m, GFA 30m2, management building with outline 22,20m x 19,80m, GFA 446,94m2. Vehicle wash, outline 14,75mx6,90m, GFA 101.77m2, facility for vehicle servicing with workers’ rest area, outline 25,00x9,90m GFA 247,10m2, vehicle garage outline about 16,00m x 15,00m, GFA 242,85 m2, canopy for storing technical means outline 65,2mx5,40m S 353,38m2, transformer substation 10/0,4 kV, internal road in length of L=2.910,86m, manipulative and parking surfaces (20PP), pumping station APS1 outline 10,60 x 5,60m+2,0x3,9m, capacity 60+60 1/s, pumping station APS2 outline: 8,60 x 4,60m +2,0x2,6m, capacity 30+30 l/s, pumping station PVCS1, dimensions D=2,4m; H=3,45m, capacity 10+10 l/s, oil derivatives separator SEP1, capacity Q=60 l/s and SEP2 capacity Q= 5 l/s and Septic tank S1 and S3, dimensions 4,80x2,80m, depth 2,35m and Septic tank S2 diameter 2,3m, depth 2,35m.
By insight into delivered application and annexes, it was established that formal terms were not met for acting, so the respective was rejected as incomplete with ruling no. 351-02-00284/2019-07; ROP-MSGI-12438-CPI-3/2019 as of 17/12/2019, having in mind that the following formal terms were not met for acting: it is required to deliver contract on construction of missing infrastructure, concluded with “EPS Distribucija” Branch “Elektrodistribucija Lazarevac; it is defined in terms that there is no water supply network, so it is not clear to which existing water installation the subject facility will be connected, technical description reads that it will be to the existing pipeline DH250mm next to the Veliki Crljeni-TPP “Kolubara” road, in that case it is required to obtain terms of TPP “Kolubara” for connection, upon which the investor submitted harmonized application within deadline envisaged by the law.
Upon submitting harmonized application, it was established that all necessary documentation envisaged by Article 16 of the Rulebook on the procedure for conducting the unified procedure electronically, i.e. that formal terms for acting upon application are met.
By insight into Location terms of the Ministry of construction, transport and infrastructure number ROP-MSGI-19891-LOC-4/2018; 350-02-00435/2018-14 as of 13/12/2018 (published on 14/12/2018) terms for phase construction of the regional landfill for utility waste Kalenic on cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality were established, required for creation of Preliminary desgn and Design for construction permit and Main design, in accordance with General Regulation Plan of the area TPP “Kolubara B” (“The Official Gazette of Ub Municipality”, no. 1/07), Urbanistic design for construction of the regional landfill for utility waste “KALENIC” (authorization no. 350-184/14-04 as of 30/04/2014).

Upon service duty, this Ministry acquired excerpt from the real estate folio in accordance with Article 17, Paragraph 4 of the Rulebook on the procedure for conducting the unified procedure electronically.

By insight into transcript from the real estate folio no. 358 KO Kalenic, issued by the RGI RES Ub as of 03/02/2020, which the Ministry of construction, transport and infrastructure acquired upon service duty, it was established that cadaster lot no. 800 CM Kalenic is in private ownership of company "Eko-Tamnava", d.o.o. Ubm Kralja Petra Prvog Street, no 60, with share scope 1/1. Having in mind the aforementioned, the Investor provided evidence on appropriate right on land in sense of Article 135 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009- correction, , 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018, 31/2019 and 37/2019).

By insight into Contract on construction of missing electrical-energy facilities as of 04/02/2020, it was established that Contacting Parties ODS EPS Distribucija d.o.o. Belgrade, Branc ED Lazarevac and PD "Eko-Tamnava" d.o.o. Ub, entered into contract for construction of connecting SN 10 kV line from TS 10/0,4 kV "Sumedj" to newly planned MBTS 10/0,4kV "Regional landfill" Kalenic that arranges mutual rights and obligations.

Bu insight into enclosed Main volume, made by "Energoprojekt Hidroinzenjering" a.d. Bulevar Mihaila Pupina no.12, licensed for creation of technical documentation for which construction permit is issued by the ministry in charge of issues of construction, no. 351-02-08826/2016-07 as of 29/09/2016 it was established that works are carried out for the facilities of B, V and G category, classification numbers: 122011, 127420, 122012, 124210, 222410, 211201, 222330, 242003 and 222220, and that Dusan Krstic tech.eng., license number 371E187 06, was appointed for the main designer.

By insight into technical inspection of technical documentation no. 17954/19/I as of 11/12/2019, made by "SET" d.o.o. Sabac Brace Nedica Street no.1, licensed for making technical documentation for which construction permit is issued by the ministry in charge of issues of construction, no. 351-03-04592/2018-07 as of 27/11/2018, it was established that persons that carried out technical inspection determined that it was acted in accordance with location terms, with measures from report on professional inspection and that the design was in all made in accordance with due diligence.

From the Report of the Republic Audit commission no. 350-02-01399/2019-14 as of 26/11/2019 on professional inspection of the Preliminary design for construction of the regional landfill for utility waste Kalenic, on cadaster lot no. 800 CM Kalenic, in the territory of Ub Municipality, this Ministry established that the Republic Audit Commission decided that technical documentation was to be accepted and that creation of the design for the construction permit/with implementation of audit commission measures can be approached to.

By insight into invoices, it was established that compensation for CEOP, republic administrative fee for application submission and republic administrative fee for passing the ruling were paid.

It was established that based on Article 97, Paragraph 8 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009- correction, , 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018, 31/2019 and 37/2019), as well as based on the Certificate of Municipal Administration d.o.o. Ub, Department for urbanism, unified procedures and property-legal relations ROP-MSGI-19891-

CPIH-9-LDACP-1/2020, 418-3-11/20-04 as of 24/02/2020, that calculation of contributions for developing construction land for facilities of utility infrastructure is not calculated.
In reference to the aforementioned state of play, finding that the Investor delivered design for construction permit, that he is entitled to certain rights on the land and that he delivered evidence envisaged by the Rulebook on the procedure for conducting the unified procedure electronically, it was established that terms from Article 135 of the Law on Planning and Construction for issuance of construction permit, so it was decided as in Paragraph I of the Ruling.
Since estimated bill of quantities established estimated value of the works in the amount of 1.190.473.564, 57 dinars, decision as in Paragraph II of the text of this Ruling was made.
Decisions from Paragraph IV, V, VI and VII were made in accordance with Article 8dj, 148, i.e. Article 153, 136 and 140 OF THE law on Planning and Construction and Article 21 of the Rulebook on the procedure for conducting the unified procedure electronically.

Resolved in the Ministry of construction, transport and infrastructure under number 351-02-00364/2019-07 as of 25/02/2020.

Legal Remedy: This Ruling is final in administrative procedure and complaint cannot be filed, but administrative procedure can be initiated by filing complaint to the Administrative Court of Serbia within 30 days as of the day of receipt of the Ruling.

Assistant minister
(Digital signature)
Jovanka Atanackovic

REPUBLIC OF SERBIA
THE CITY OF BELGRADE
CITY MUNICIPALITY OF LAZAREVAC
ADMINISTRATION OF THE CITY MUNICIPALITY
Department for urbanism and
construction affairs
Section for unified procedure
ROP-LAZ-39284-IASW-3/2020
23/03/2020
LAZAREVAC

Section for unified procedure of the Department for urbanism and construction affairs of the Administration of CM Lazarevac upon application ODS "EPS Distribcija" Belgrade, Branch Elektrodistribucija Lazarevac, Janka Stajcica street no.2, TIN 100001378, submitted electronically, though authorized person Biljana Dimitrijevic from Lazarevac, 1300 kaplara street, no.126, for issuing ruling that authorizes construction works on electrical-energy medium voltage grid of 10kV, on cadaster lots in CM Cvetovac and CM Stepojevac, in accordance with Article 145 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/09, 81/09, 24/11, 121/12, 42/13, 50/13, 98/13, 132/14, 145/14, 83/2018, 31/19, 37/19, 9/20), Article 28 of the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" no. 68/19), Article 3, Paragraph 2, Item 23 of the Rulebook on special type of facilities and special type of works that do not require obtaining of the document from the competent authority, as well as type of the facilities that are being built, i.e. type of works that are being carried out, based on the ruling and authorization for works, as well as scope and contents and technical documentation inspection enclosed to the application and procedure that competent authority is carrying out ("The Official Gazette of the RS", no. 2/19), Article 32 of the Decision on Administration of Lazarevac Municipality "(The Official Gazette of the City of Belgrade" number 120/2016, 5/2017, 30/2018, 20/2019 and 122/2019), Article 136 of the Law on General Administrative Procedure ("The Official Gazette of the RS", no. 18/16, 98/18-authentic interpretation)m upon power of attorney III-01 number 031-16/2019 as of 24/04/2019, passes the following

RULING

IT IS APPROVED to ODS "EPS Distribucija" Belgrade, Branch Elektrodistribucija Lazarevac, Janka Stajcica street no.2, TIN 100001378, carrying out of construction works on construction works on electrical-energy medium voltage grid of 10kV, on cadaster lots 115/2, 114/3, 114/4, 101/4, 212, 99/8, 98/4, 86/1, 88/1, 89/1, 90/1, 93/9, 93/1, 93/4 all in CM Cvetovac and for cadaster lots number 2503/2, 2507/1, 2507/3, 2507/4, 2506/2, 2342/4, 2536/4, 2526/3, 2512/2, 2513/2, 2516/6, 2516/3 2516/7, 2517/2, 2520/3, 2418/5, 2449/2, 2417/24, 2537/6, 2461/3, 2460/2, 2462/2, 2459/2, 2457/2, 2493/4, 2492/2, 2487/3, 2490/3, 2489/4, 2662/1 all in CM Stepojevac, G category (engineering facilities) with classification number 222410.

Electrical-energy medium voltage grid from the first paragraph of this ruling is surface-underground connecting 10 kV medium-voltage line of TS 10/0,4kV "Sumedj" Cvetovac to

“manhole 0” of total length of 2400,7m, which is installed-laid down within lots in public property, as follows:

- Underground line type and crosscutting: HNE 49-A, 4x (1x150), voltage level of 10 kV, cable line depth minimally 0,80mm, route length 317,6m;
- Surface line type and crosscutting: HNE 48/0-A, 3x (1x50) +50, voltage level of 10 kV, instalment method – reinforced concrete pole, route length 2.083,1m.

Connecting medium-voltage line is built for the requirements of power supply improvement for the part of the territories of Cvetovac and Stepojevac, and creation of technical possibilities for power supply for regional sanitary landfill for utility and non-hazardous waste Kalenic. Connection to existing grid is a surface one – to existing steel-grid pole TS 10/0,4kV “Sumedj” Cvetovac that is located on cadaster lot number 115/2 CM Cvetovac.

The Ruling is issued based on location terms ROP-LAZ-39284-LOCH-2/2020 (internal III-03 number: 350-376/2019), as of 03/02/2020, issued by this Department,

Constituent part of this Ruling is Preliminary design (technical documentation number IDP- JB-20-001) made in March 2020, by “Energotehnika Juzna Backa” doo, Novi Sad, Put Novosadskog partizanskog odreda 1, Novi Sad, main designer Nikola Mucalica, electrical engineer, license number 350 0925 15.

Estimated value of the works is 13.909.899,00 dinars, without VAR.

The Investor is obliged to report beginning of works to the authority that issued the Ruling approving works, in accordance with Article 148 of the Law on Planning and Construction. Additionally, he submits evidence on paid administrative fee and reimbursement.

Upon finalization of works from Paragraph 1 of this Ruling, the Investor can submit the application for issuance of exploitation permit in accordance with the Law.

The Investor is obliged to reimburse the damage occurred by transit and transport to the owners or holders of neighboring or surrounding land, and to bring the land back into previous condition.

The authority competent for issuance of this Ruling is not entering into evaluation of technical documentation which is its constituent part, so in case of damage occurred as a consequence of implementation of the respective, the designer who made and signed technical documentation and the Investor are solidary liable for the damage.

Explanation

ODS “EPS Distribucija” Belgrade, Branch Elektrodistribucija Lazarevac, Janka Stajcica Street No.2, TIN 100001378, ddressed, via authorized person Biljana Dimitrijevic from Lazarevac, 1300 kaplara street, no. 126, on 16/03/2020, with electronic application ROP-LAZ-39284-ISAW-3/2020 (internal number 351-228/2020) for issuance of Ruling approving works on construction of electrical power medium-voltage 10kV grid on cadaster lots in CM Cvetojevac and CM Stepojevac.

Beside the application for issuance of the Ruling approving works, the following documentation was enclosed;

- Preliminary design (technical documentation number IDP- JB-20-001) made in March 2020, by “Energotehnika Juzna Backa” doo, Novi Sad, Put Novosadskog partizanskog odreda 1, Novi Sad, main designer Nikola Mucalica, electrical engineer, license number 350 0925 15.
- Cadaster-topographic plan made by “GODEA COMPANY” 15/10/2019;

- Consent of PE EPS Branch RB "Kolubara; number E.04-02-137101/2-20, as of 04/03/2020;
- Power of attorney 8I.1.0.0.-D.09.13-20843/1-2018 as of 17/01/2018
- Evidence on payment of administrative fee and reimbursement.

In the procedure of unified procedure, this Department did not address RGI for delivery of real estate lists for subject cadaster lots, because, according to public records of the RGI, all cadaster lots through which surface-underground system cable line is going though are public property (apart from cadaster lot number 115/2 CM Cvetovac), and in major part, the line is setting in regulation of existing roads. There is already existing freestanding electric power pole on cadaster lot 115/2 CM Cvetovac, which is the only one in private property, and the connecting line is setting on surface, so, in accordance with the Law on Planning and Construction, consent of the owner of the subject lot for aforementioned works was not obtained.

According to Provisions of Article 69, Paragraph 17, the Investor is obliged to reimburse the damage occurred due to transit and transport to the owners and holders of the neighboring or surrounding land, and to return the land in previous condition.

In reference to Provisions of Article 97, Paragraph 8 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/09, 81/09, 24/11, 121/12, 42/13, 50/13, 98/13, 132/14, 145/14, 83/2018, 31/19, 37/19, 9/20), contribution for developing construction land is not calculated for public purposes in public property, facilities of utility and other infrastructure.

In the procedure upon submitted application, this Department established that the Investor enclosed required documentation in accordance with Article 145 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/09, 81/09, 24/11, 121/12, 42/13, 50/13, 98/13, 132/14, 145/14, 83/2018, 31/19, 37/19, 9/20) and Article 28 of the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" no. 68/19), for issuance of the Ruling approving works on construction of electrical power medium-voltage 10kV grid, G category (engineering facilities) classification number 222410 on cadaster lots no. 115/2, 114/3, 114/4, 101/4, 212, 99/8, 98/4, 86/1, 88/1, 89/1, 90/1, 93/9, 93/1, 93/4 all in CM Cvetovac and for cadaster lots number 2503/2, 2507/1, 2507/3, 2507/4, 2506/2, 2342/4, 2536/4, 2526/3, 2512/2, 2513/2, 2516/6, 2516/3 2516/7, 2517/2, 2520/3, 2418/5, 2449/2, 2417/24, 2537/6, 2461/3, 2460/2, 2462/2, 2459/2, 2457/2, 2493/4, 2492/2, 2487/3, 2490/3, 2489/4, 2662/1 all CM Stepojevac, so it was decided as in the text of this Ruling.

LEGAL REMEDY:

Complaint is allowed against this Ruling to the City Administration Belgrade – Secretariat for inspection affairs, within 8 days as of the Ruling delivery date.

Complaint is to be submitted via this Department and the fee to be charged is 480,00 finals of the republic administrative fees.

The Ruling is to be delivered to the Applicant, Construction Inspection and Archives.

File processed by:
Dragana Jecmenica, architect

HEAD OF THE DEPARTMENT
Dusan Nenadic, lawyer
(Digital signature)

THE REPUBLIC OF SERBIA
MUNICIPAL ADMINISTRATION UB
Department for urbanism, unified procedures and
property-legal affairs
ROP-UB-653-ISAW-2/2020
Date: 05/05/2020
Ub, Vojvode Misica Street, number 20B
Tel: 014-411-622
M.DJ.

Municipal administration Ub, Department for urbanism, unified procedures and property-legal affairs, upon request from the Operator of the distributive system "EPS Distribucija: d.o.o. Belgrade, Belgrade-Lazarevac, Janka Stajcica 2, for issuance of the Ruling approving works on construction of Connecting MV 10kV line from "manhole 0" to newly planned MBTS 10/0,4Kv "Regional landfill" Kalenic on cadaster lots 37/12, 610/2, 608, 609, 611, 605/4, 605/3, 605/2, 605/1, 606, 607/1, 584/6, 755/1, 584/7, 566/2, 754/3, 582/8, 562/3, 562/68, 561/3, 559/6, 746, 538/3, 538/1, 770 and 800 all CM Kalenic, in accordance with Article 8d, 8dj and Article 145 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009-correction, , 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018, 31/2019 and 9/2020), Article 27 and 28 of the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" 68/2019), Rulebook on contents, method and procedure for making and controlling technical documentation according to the class and purpose of the facility ("The Official Gazette of the RS" number 73/2019), Article 3 of the Rulebook on special type of facilities and special type of works….("The Official Gazette of the RS" no. 2/2019)and Article 136 of the Law on General Administrative Procedure ("The Official Gazette of the RS" no. 18/16), independent advisor Milena Djokic, spatial planner, upon the Ruling of the Head of Municipal Administration Ub, number 112-17-44/2017-01 as of 28/02/2017, passed the following:

RULING

1. **IT IS APPROVED** to the Operator of the distributive system "EPS Distribucija: d.o.o. Belgrade, Belgrade-Lazarevac, Janka Stajcica 2 (IDNo: 07005466 and TIN: 100001378) from Lazarevac, to carry out construction works of the Connecting MV 10kV line from "manhole 0" to newly planned MBTS 10/0,4Kv "Regional landfill" Kalenic on cadaster lots 37/12, 610/2, 608, 609, 611, 605/4, 605/3, 605/2, 605/1, 606, 607/1, 584/6, 755/1, 584/7, 566/2, 754/3, 582/8, 562/3, 562/68, 561/3, 559/6, 746, 538/3, 538/1, 770 and 800 all CM Kalenic.

The facility belongs to G category (classification mark 222410).
Total length of the surface-underground line is 1653m.
Type of the underground line, type and cross section HNE 49-A, 4X (1x150), voltage level 10kV, depth of cable line laying is min. 0,80m, and rout length is 536 m + 28,5m.
Type of surface line, type and cross section Al-C 3x50(8), voltage level 10kV, installed on reinforced concrete poles, route length 1008,5m.
Estimated value of the facility is 11.090.070,00 dinars, without VAT.

2. Constituent parts of this Ruling are the following:

- Location terms issued by the Municipal Administration Ub, Department for urbanism, unified procedures and property-legal affairs under ROP-UB-653-LOC-1/2019 as of 05/02/2020.
- 0.1 Front page of the main volume of technical documentation, 0- Main volume, Preliminary design for construction of the Connecting MV 10kV line from "manhole 0" to newly planned MBTS 10/0,4Kv "Regional landfill" Kalenic on cadaster lots 37/12, 610/2, 608, 609, 611, 605/4, 605/3, 605/2, 605/1, 606, 607/1, 584/6, 755/1, 584/7, 566/2, 754/3, 582/8, 562/3, 562/68, 561/3, 559/6, 746, 538/3, 538/1, 770 and 800 all CM Kalenic, technical documentation number JB-20-001 as of March 2020, made by the designer "Energotehnika Juzna Backa" doo, Novi Sad, Put Novosadskog partizanskog odreda 1, Novi Sad, main designer Nikola Mucenica, electrical engineer, license number 350 0925 15.
- Cadaster-topographic plan –Transmission line route 10kV;
- Consent number 60402-137076/2-20 as of 04/03/2020, given by the Public Enterprise ELEKTROPRIVREDA SRBIJE, Branch RB Kolubara, Svetog Save street 1, Lazarevacm to the Investor Operator of the distributive system "EPS Distribucija: d.o.o. Belgrade, Belgrade-Lazarevac, Janka Stajcica 2, to install newly planned reinforced concrete poles and necessary equipment for construction of the subject facility on cadaster lots 566/2, 562/68, 538/3, all CM Kalenic, registered as the right of use of the Public Enterprise "Elektroprivreda Srbije" Belgrade, in accordance with location terms ROP-UB-653-LOC-1/2019 and layout drawing;
- Ruling number 418-25/20-4 as of 11/03/2020, issued by the Department for urbanism, unified procedures and property-legal affairs allowing the Operator of the distributive system "EPS Distribucija: d.o.o. Belgrade, Belgrade-Lazarevac, Janka Stajcica 2, surface installment of the connecting line through cadaster lot 746 and 770 CM Kalenic in total length of 577 m.

Construction of the facility, i.e. work performance, from Item 1 of the text of this Ruling can be approached based on this legally valid Ruling and report of works.
Prior to beginning of the works, the Investor is obliged to report the respective to the authority in charge of issuance of construction permit with date of beginning and deadline for termination of construction, i.e. works, in accordance with Article 31 of the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" no. 68/2019).

3. **In case of damage occurred as a consequence of implementation of technical documentation based on which the Ruling –for which it is later established that it is not in accordance with due diligence- is issued, designer, person who performs technical control and the Investor are solidary liable in accordance with Article 8dj , Paragraph 5, of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009- correction, , 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018, 31/2019 and 9/2020),**
4. Works must be carried out in accordance with the applicable legal regulations, norms and standards whose implementation is mandatory while carrying out this kind of works.

5. In accordance with Article 145 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009- correction, , 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018, 31/2019 and 9/2020), it is envisaged that exploitation permit can be issued upon termination of works at the Investor's request.

Explanation

Operator of the distributive system "EPS Distribucija: d.o.o. Belgrade, Belgrade-Lazarevac, Janka Stajcica 2 submitted the application to this Department for authorization of construction works of the Connecting MV 10kV line from "manhole 0" to newly planned MBTS 10/0,4Kv "Regional landfill" Kalenic on cadaster lots 37/12, 610/2, 608, 609, 611, 605/4, 605/3, 605/2, 605/1, 606, 607/1, 584/6, 755/1, 584/7, 566/2, 754/3, 582/8, 562/3, 562/68, 561/3, 559/6, 746, 538/3, 538/1, 770 and 800 all CM Kalenic.

For the needs of power supply for the regional sanitary landfill for utility and non-hazardous waste Kalenic on cadaster lot no.800 Kalenic, it is required to build Connecting MV 10kV line. Newly designed MV 10kV line is connected underground in cable manhole – "manhole 0" on cadaster lot 37/12 CM Kalenic, branch Sumedj, wherefrom line route is planned on the left side of "Obrenovac-Veliki Crljeni" road to cadaster lot 566/2 CM Kalenic, where MV route moves to surface section. Surface section is likewise on the left side of "Obrenovac-Veliki Crljeni" road to turning for newly planned landfill access road. The route is on the left side alongside newly planned road in the area where filed development is envisaged from pole 73 to pole 81. From pole81 to newly planned MBTS 10/04,kV "Regional landfill" Kalenic, surface cable is envisaged, in all in accordance to enclosed chart. Planned underdround line is HNE-49-A 4x (1x150)mm2, and surface one on armed concrete poles, 12 meters with conductor AI-C-3x50/8mm2.

The Investor enclosed the following to the application for issuance of authorization for construction:

- 0.1 Front page of the main volume of technical documentation, 0- Main volume, Preliminary design for construction of the Connecting MV 10kV line from "manhole 0" to newly planned MBTS 10/0,4Kv "Regional landfill" Kalenic on cadaster lots 37/12, 610/2, 608, 609, 611, 605/4, 605/3, 605/2, 605/1, 606, 607/1, 584/6, 755/1, 584/7, 566/2, 754/3, 582/8, 562/3, 562/68, 561/3, 559/6, 746, 538/3, 538/1, 770 and 800 all CM Kalenic, technical documentation number JB-20-001 as of March 2020, made by the designer "Energotehnika Juzna Backa" doo, Novi Sad, Put Novosadskog partizanskog odreda 1, Novi Sad, main designer Nikola Mucenica, electrical engineer, license number 350 0925 15, delivered electronically in pdf and dwg formats, verified with qualified electronic signature;
- Cadaster-topographic plan – 10 kV line route , delivered electronically in pdf and dwg formats, verified with qualified electronic signature;
- Consent number 60402-137076/2-20 as of 04/03/2020, given by the Public Enterprise ELEKTROPRIVREDA SRBIJE, Branch RB Kolubara, Svetog Save street 1, Lazarevacm to the Investor Operator of the distributive system "EPS Distribucija: d.o.o. Belgrade,

Belgrade-Lazarevac, Janka Stajcica 2, to install newly planned reinforced concrete poles and necessary equipment for construction of the subject facility on cadaster lots 566/2, 562/68, 538/3, all CM Kalenic, registered as the right of use of the Public Enterprise "Elektroprivreda Srbije" Belgrade, in accordance with location terms ROP-UB-653-LOC-1/2019 and layout drawing, delivered electronically in pdf and format, verified with qualified electronic signature;

- Ruling number 418-25/20-4 as of 11/03/2020, issued by the Department for urbanism, unified procedures and property-legal affairs allowing the Operator of the distributive system "EPS Distribucija: d.o.o. Belgrade, Belgrade-Lazarevac, Janka Stajcica 2, surface installment of the connecting line through cadaster lot 746 and 770 CM Kalenic in total length of 577 m.
- Consent given by the ED Lazarevac Branch Director, Biljana Dimitrijevic, under number 8N,1.9.9.-D.09.13-2084311 on 17/01/2018 for submitting application in unified procedure;
- Evidence on payment of the fees for application and ruling, in the amount of 5.950,00 dinars, as well as reimbursement for central registration services in the amount of 2.000,00, delivered electronically in pdf and format, verified with qualified electronic signature.

As the evidence on property life on the land, this Department acquired the following in accordance with service duty:

Excerpt from the real estate folio number 353 C.M Kalenic, the Real Estate Cadaster Service Ub, under number 952-5/2020-47 as of 04/05/2020, for cadaster lots number 746 and 770 CM Kalenic, based on which it was established that Ub Municipality from Ub holds property right, which issued the Ruling number 418-25/20-04 as of 11/03/2020 to the Investor, which is the evidence on appropriate right on the land and the facility, in the sense of Article 145, and in reference to Article 135, Paragraph 2 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009- correction, , 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018, 31/2019 and 9/2020).

Excerpt from the real estate folio number 186 C.M Kalenic, the Real Estate Cadaster Service Ub, under number 952-5/2020-47 as of 04/05/2020, for cadaster lots number 566/2, 562/68, 561/3 and 538/3 CM Kalenic, based on which it was established that the Republic of Serbia, PE Elektroprivreda Srbije, Belgrade, Belgrade, Balkanska street 13, which provide the Consent number 60402-137076/2-20 as of 04/03/2020 to the Investor, which is holder of the property right, which is the evidence on appropriate right on the land and the facility, in the sense of Article 145, and in reference to Article 135, Paragraph 2 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009- correction, , 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018, 31/2019 and 9/2020).

Excerpt from the real estate folios number 56 and 189 C.M Kalenic, the Real Estate Cadaster Service Ub, under number 952-5/2020-47 as of 04/05/2020, for cadaster lots number 37/12 and 584/6 C.M. Kalenic, based on which it was established that the Republic of Serbia Belgrade,

Nemanjina 26 is the holder of property right, and Excerpt from the real estate folio number 358 C.M Kalenic, the Real Estate Cadaster Service Ub, under number 952-5/2020-47 as of 04/05/2020, for cadaster lot number 800 C.M. Kalenic, based on which it was established that PC "EKO-TAMNAVA" D.O.O. Ub, Ub, Kralja Petra I is the holder of property right, which is the evidence on appropriate right on the land and the facility, in the sense of Article 145, and in reference to Article 135, Paragraph 2 of the Law on Planning and Construction ("The Official Gazette of the RS", no. 72/2009, 81/2009- correction, , 64/2010 – Decision of the CC of the RS, 24/2011, 121/2012, 42/2013- Decision of the CC of the RS, 50/2013 – Decision of the CC of the RS, 98/2013 – Decision of the CC of the RS, 132/2014, 145/2014 and 83/2018, 31/2019 and 9/2020).

This Department established that formal terms for issuance of authorization have been met and that the Investor filed all necessary documentation from Article 145 of the Law on Planning and Construction and Article 27 of the Rulebook on the procedure for conducting the unified procedure electronically ("The Official Gazette of the RS" no. 68/2019) and Article 136 of the Law on General Administrative Procedure ("The Official Gazette of the RS" no. 18/19) for issuance of authorization for construction, so it was decided as in the text of the Ruling.

LEGAL REMEDY: A complaint can be filed against this Ruling to the Ministry of construction, transport and infrastructure, Kolubara county in Valjevo, Karadjordjeva street no.13, within 8 days electronically via BRA, with 480,00 administrative fee on the account number 840-742221843-58 with reference number 74-105.

Case processed by: Milica Rankovic

HEAD OF THE DEPARTMENT
(Digital signature)
Milena Djokic, spatial planner