

LABORATORY ANALYSIS REPORT

No. 11040505-1

ABOUT QUALITY OF SURFACE WATER

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INTRODUCTORY NOTES:

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- The test results refer only to the submitted sample, except when Anahem doo Belgrade performs sampling.
- Anahem doo Belgrade is responsible for all data stated in the test report except for those obtained from the test user.
- Anahem doo Belgrade disclaims responsibility for the validity of the results for the presentation of which the data obtained from the user were used.

1 INTRODUCTION, OBJECTIVE AND PURPOSE OF THE REPORT

Introduction:

Based on Offer no. 71040501 dated 04/06/2021, ANAHEM d.o.o. performed sampling on 05/27/2021, and then the physical-chemical and microbiological analysis of surface water at the location: The area of the municipality of Zrenjanin, the surroundings of the future wastewater treatment plant.

Test objective:

Surface waters were sampled as part of the monitoring of certain environmental parameters for the project of construction of a wastewater treatment plant. Water testing was performed by comparing the measured values with the prescribed limit values (GV).

User information:

DVOPER d.o.o. is a company for environmental protection and sustainable development that provides consulting and engineering services in the field of environmental protection and management of its resources. Prepares expert studies of a wide range of activities as well as project-technical and other documentation: Environmental impact assessment studies of certain projects, Strategic environmental assessment studies of certain plans and programs, Waste management plans (local, regional, national, as well as plans for economic entities), Reports on environmental assessment and safety at work.

2 SAMPLING MARKINGS AND SAMPLING LOCATIONS

Water sampling was performed at the location of the municipality of Zrenjanin, surface water of the river Begej was sampled, at the following points according to the request of the client:

No.	Sample label	GPS coordinates	
1.	1104050501 – Begej River 150 m upstream from the outflow channel	N 45°20'46.00"	E 20°25'5.59"
2.	1104050502 - Begej River 250 m upstream from the outflow channel	N 45°20'42,70"	E 20°25'7,93"
3.	1104050503 – Begej River 25 m downstream from the outflow channel	N 45°20'40,54"	E 20°25'9,09"
4.	1104050504 - Begej River 75 m downstream from the outflow channel	N 45°20'38,80"	E 20°25'10,11"
5.	1104050505 – Begej River 125 m downstream from the outflow channel	N 45°20'37,26"	E 20°25'11,56"
6.	1104050506 - Begej River 175 m downstream from the outflow channel	N 45°20'35,13"	E 20°25'13,74"
7.	1104050507 – Begej River 225 m downstream from the outflow channel	N 45°20'33,74"	E 20°25'15,90"
8.	1104050508 - Begej River 275 m downstream from the outflow channel	N 45°20'32,16"	E 20°25'18,03"

SURFACE WATER SAMPLING SITE Macrolocation:



The test sites are located on the eastern edge of the settlement of Mužlja as well as on the western border of the industrial zone "Ečka-Jugoistok" located on the right side of the main road Belgrade-Zrenjanin. Measuring points are defined by the request of the client and based on the project EISA ZRENJANIN.

3 LABEL AND DESCRIPTION OF THE SAMPLE

Sampling was performed on 05/27/2021, Sampling was performed in accordance with the standards SRPS EN ISO 5667 - 1, 3, 4, 6 and SRPS EN ISO 19458: 2009. A detail description of the measuring points and samples is given in the section with pictures of the samples and the sampling points.

The following figures show the sampling locations.

Sample marked 1104050501, river Begej 150 m upstream from the outflow channel



Sample marked 1104050502 - Begej river 250 m upstream from the outflow channel



Sample marked 1104050503 - Begej river 25 m downstream of the outflow channel



Sample marked 1104050504 - Begej river 75 m downstream of the outflow channel



Sample marked 1104050505 - Begej river 125 m downstream from the outflow



Sample marked 1104050506- Begej river 175 m downstream of the outflow channel



Sample marked 1104050507 - Begej river 225 m downstream of the outflow channel



Sample marked 1104050508 - Begej river 275 m downstream of the outflow channel



4 MEASURING PROCEDURE AND TYPE OF MEASURING DEVICES

ATOMIC EMISSION SPECTROMETER (ICP-OES)

Manufacturer	THERMO SCIENTIFIC - USA
Model:	iCAP 6500 Duo
Serial number:	IC5D20125009
inventory number:	3022211



Flame atomic absorption spectrophotometer (metals)

Manufacturer	Perkin Elmer USA	Karakteristike
Model:	AAAnalyst 100	Opseg: As: 0.5-10 µg/l Hg: 0.5-10 µg/l Talasna duzina: As: $\lambda = 193.7 \text{ nm}$ Hg: $\lambda = 253.7 \text{ nm}$
Serial number:	04059100103	
inventory number:	3103002	



UV-VIS SPECTROPHOTOMETRE

Manufacturer	Perkin Elmer USA
Model:	Lambda 40
Serial number:	101N0032402
inventory number:	7080831



BOD OXITOP

Manufacturer	WTW GERMANY
Model:	Oxitop 18 BOD
Serial number:	/
inventory number:	4012903-27



ION CHROMATOGRAPH	
Manufacturer	DIONEX USA
Model:	DX-500
Serial number:	932011
inventory number:	7080810



TOC Zellweger labTOC 2100	
Manufacturer	Z Zellweger UK
Model:	LabTOC2100
Serial number:	000101
inventory number:	7080812



COD	
Manufacturer	HACH USA
Model:	Hach Cod
Serial number:	/
inventory number:	7080820



GC-MS/MS	
Manufacture	Thermo Fisher Scientific USA
Model:	TSQ 8000 TripleQuad. GC-MS/MS
Serial number:	713201275
inventory number:	4032311



5 REPORTS ON RESULTS OF SURFACE WATER TESTING

5.1 Table 1.

No ..	Test method	Test parameter	1104050501	1104050502	1104050503	1104050504	GV ¹ / GV ²				
							I class	II class	III class	IV class	V class
1.	EPA 150.1:2001	pH value	7,02	7,01	6,97	6,81	6,5 - 8,5	6,5 - 8,5	6,5 - 8,5	6,5 - 8,5	<6,5->8,5
2.	EPA 120.1:1982	Electrical conductivity, µS/cm	418	411	406	435	<1000	1000	1500	3000	>3000
3.	SRPS ISO 7150-1:1992	Ammonium ion, expressed as N (NH ₄ -N) mgN/l	4,2	2,6	2,5	3,8	0,1	0,30	0,6	1,5	>1,5
4.	EN 1484:1997	Total organic carbon (TOC) mg/l	3,4	3,2	3,1	3,3	2,0	5,0	15	50	>50
5.	SM 2540D	Suspended solids, mg/l	14	16	12	22	25	25	/	/	/
6.	ISO 10304-1:2007	Nitrates mgN/l	0,27	0,44	0,4	<0,01	0,01	0,03	0,12	0,3	>0,3
7.	ISO 10304-1:2007	Nitrites mgN/l	0,42	0,43	0,16	<0,05	1,0	3,0	6,0	15	>15
8.	ISO 10304-1:2007	Chlorides, mg/l	26	29	27	28	50	100	150	250	>250
9.	EPA 410.4:1993	Chemical oxygen consumption (COD) mg/l	21	22	21	23	10	15	30	125	>125
10.	SRPS EN 1899.2:2009	Biochemical oxygen consumption (BOD) mg/l	6,0	5,0	5,0	6,0	2,0	5,0	7	25	>25
11.	BS ISO 17378-2:2014	Arsenic, µg/l	5,4	4,7	4,0	6,6	<5	10	50	100	>100

¹GV, Decree on limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement (Official Gazette of RS, No. 50/2012, Annex 1, Tables 1, 2 and 3).

² Rulebook on parameters of ecological and chemical status of surface waters and parameters of chemical and quantitative status of groundwater (Official Gazette of RS, 74/2011) and Rulebook on determination of water bodies of surface and groundwater ("Official Gazette of RS", No. 96/10) Type 1 - large lowland rivers, dominance of fine sediment

12.	SM 3111b	Copper µg/l	<1	<1	<1	<1	40	40	500	1000	>1000
13.	SM 3111b	Zinc µg/l	<5	<5	<5	<5	300	1000	2000	5000	>5000
14.	SM 3111b	Total iron, µg/l	<200	<200	<200	<200	200	500	1000	2000	>2000
15.	SRPS EN ISO 11885:2011	Total phosphorus, mg P/l	0,64	0,64	1,3	0,53	0,05	0,20	0,4	1	>1
16.	EPA 360.1:2002	Oxygen saturation, %	61,6	54,8	91,8	34,9	90-110	70-90	50-70	30-50	>30
17.	EPA 360.1:2002	Disolved oxygen mg/l	5,3	4,6	7,8	3,0	8,5	7,0	5,0	4,0	<4,0
Bacteriological analysis											
18.	DML 2.9:2016	Total coliform bacteria in 100 ml	24000	24000	110 000	110 000	500	10000	100000	1000000	>1000000

5.2 Table 1.

N o.	Test method	Test parameter	1104050505	1104050506	1104050507	1104050508	GV ¹ / GV ²				
							I class	II class	III class	IV class	V class
1.	EPA 150.1:2001	pH value	6,86	6,88	6,89	6,93	6,5 - 8,5	6,5 - 8,5	6,5 - 8,5	6,5 - 8,5	<6,5->8,5
2.	EPA 120.1:1982	Electrical conductivity, µS/cm	424	409	403	406	<1000	1000	1500	3000	>3000
3.	SRPS ISO 7150-1:1992	Ammonium ion, expressed as N (NH ₄ -N) mgN/l	3,2	3,9	3,1	3,1	0,1	0,30	0,6	1,5	>1,5
4.	EN 1484:1997	Total organic carbon (TOC) mg/l	3,6	3,7	3,1	3,2	2,0	5,0	15	50	>50

¹GV, Decree on limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement (Official Gazette of RS, No. 50/2012, Annex 1, Tables 1, 2 and 3).

² Rulebook on parameters of ecological and chemical status of surface waters and parameters of chemical and quantitative status of groundwater (Official Gazette of RS, 74/2011) and Rulebook on determination of water bodies of surface and groundwater ("Official Gazette of RS", No. 96/10) Type 1 - large lowland rivers, dominance of fine sediment

5.	SM 2540D	Suspended solids, mg/l	16	12	12	16	25	25	/	/	/
6.	ISO 10304-1:2007	Nitrates mgN/l	<0,01	<0,01	<0,01	0,42	0,01	0,03	0,12	0,3	>0,3
7.	ISO 10304-1:2007	Nitrites mgN/l	<0,05	<0,05	<0,05	<0,05	1,0	3,0	6,0	15	>15
8.	ISO 10304-1:2007	Chlorides, mg/l	26	28	26	27	50	100	150	250	>250
9.	EPA 410.4:1993	Chemical oxygen consumption (COD) mg/l	22	25	22	22	10	15	30	125	>125
10.	SRPS EN 1899.2:2009	Biochemical oxygen consumption (BOD) mg/l	7,0	7,0	5,0	5,0	2,0	5,0	7	25	>25
11.	BS ISO 17378-2:2014	Arsenic, µg/l	5,6	5,2	4,9	4,7	<5	10	50	100	>100
12.	SM 3111b	Copper µg/l	<1	<1	<1	<1	40	40	500	1000	>1000
13.	SM 3111b	Zinc µg/l	<5	<5	<5	<5	300	1000	2000	5000	>5000
14.	SM 3111b	Total iron, µg/l	<200	<200	<200	<200	200	500	1000	2000	>2000
15.	SRPS EN ISO 11885:2011	Total phosphorus, mg P/l	0,83	0,63	0,67	0,49	0,05	0,20	0,4	1	>1
16.	EPA 360.1:2002	Oxygen saturation, %	30,2	40,1	50	65,9	90-110	70-90	50-70	30-50	>30
17.	EPA 360.1:2002	Disolved oxygen mg/l	2,6	3,5	4,3	5,6	8,5	7,0	5,0	4,0	<4,0
	Bacteriological analysis										
18.	DML 2.9:2016	Total coliform bacteria in 100 ml	46000	46000	24000	24000	500	10000	100000	1000000	>1000000

6 STATEMENT OF CONFORMITY⁵

Comparing the physico-chemical test results of surface water samples with the maximum permitted LIMIT VALUES (GV) prescribed by the Rulebook on parameters of ecological and chemical status of surface waters and parameters of chemical and quantitative status of groundwater (Official Gazette of RS, 74/2011) and maximum permitted values according to Regulation on the limit values of pollutants in surface and groundwater and sediment and deadlines for their achievement (Official Gazette of RS 50/2012), the following can be concluded:

- The results of physico-chemical and microbiological analyzes show that the surface water quality (sample 1104050501) predominantly corresponds to the class I water quality, except for the TOC and arsenic parameter corresponding to the class II water quality. COD, BOD, total phosphorus, dissolved oxygen, oxygen saturation and total coliforms belong to class III, the nitrite parameter belongs to class IV surface waters. The value of ammonium ion classifies water as Class V surface water. Regarding the microbiological classification of the quality of this sample, it can be concluded that the Danube waters at the location Belegiš-preliv belong to the total coliform bacteria class II surface water for coliform bacteria and aerobic heterotrophs correspond to class III water, while for intestinal enterococci correspond to class IV water.
- The results of physico-chemical and microbiological analyzes show that the surface water quality (sample 1104050502) predominantly corresponds to the class I water quality, except for the TOC and BOD parameter which correspond to the class II water quality. COD, total phosphorus, oxygen saturation and total coliforms belong to class III; the dissolved oxygen parameter belongs to class IV surface water. The value of ammonium ion and nitrites classifies water in the V class of surface waters.
- The results of physico-chemical and microbiological analyzes show that the surface water quality (sample 1104050503) predominantly corresponds to the class I water quality, except for the parameters TOC, BOD and dissolved oxygen which correspond to the class II water quality. The COD parameter belongs to class III; the total coliform parameter belongs to class IV surface waters. The values of ammonium ion, nitrites and total phosphorus classify water in class V of surface waters.
- The results of physico-chemical and microbiological analyzes show that the surface water quality (sample 1104050504) predominantly corresponds to the class I water quality, except for the TOC and arsenic parameters that correspond to the class II water quality. COD, BOD and total phosphorus belong to class III, the parameter oxygen saturation and total coliforms belong to class IV surface waters. Values of ammonium ion and dissolved oxygen, classifies water in class V surface water.
- The results of physico-chemical and microbiological analyzes show that the surface water quality (sample 1104050505) predominantly corresponds to the class I water quality, except for the TOC and arsenic parameters that correspond to the class II water quality. COD, BOD and total coliforms belong to class III, the parameter oxygen saturation and total phosphorus belong to class IV surface waters. Values of ammonium ion and dissolved oxygen, classifies water in class V surface water.
- The results of physico-chemical and microbiological analyzes show that the surface water quality (sample 1104050506) predominantly corresponds to the class I water quality, except for the

⁵ Applied decision rule: binary system of simple decision-making, ie “shared risk” defined on the anahem.org website.

TOC and arsenic parameters that correspond to the class II water quality. COD, BOD and total coliforms belong to class III, the parameter oxygen saturation and total phosphorus belong to class IV surface waters. Values of ammonium ion and dissolved oxygen, classifies water in class V surface water.

- The results of physico-chemical and microbiological analyzes show that the surface water quality (sample 1104050507) predominantly corresponds to the class I water quality, except for the TOC parameter which belongs to class II; COD, BOD and total coliforms belonging to class III, parameters dissolved oxygen, oxygen saturation and total phosphorus belong to class IV surface waters. The value of ammonium ion classifies water as Class V surface water.
- The results of physico-chemical and microbiological analyzes show that the surface water quality (sample 1104050508) predominantly corresponds to the class I water quality, except for the TOC parameter, which belongs to class II; nitrites, COD, BOD, oxygen saturation, dissolved oxygen and total coliforms belong to class III, the parameter total phosphorus belongs to class IV surface waters. The value of ammonium ion classifies water as Class V surface water.

Sampling, laboratory testing and the data evaluation were done by the following personnel:

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Date

**Controlled and approved by:
Head of laboratory for water analysis**

Belgrade, June 3, 2021

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