

# **Environmental Water Monitoring Report for the Ada Tepe Prospect of the Khan Krum Deposit, 2015 Year**



**May, 2016**

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## 1. INTRODUCTION

This report has been prepared on the basis of an approved Environmental Monitoring Plan of Dundee Precious Metals Krumovgrad EAD and in compliance with Condition No III.20 of EIA Resolution 18-8,11/2011 issued by the Minister of Environment and Water, which grants an approval of the proposed investment project titled Mining and Processing of Gold Ore from Ada Tepe Prospect, Khan Krum Deposit, Krumovgrad Municipality.

The purpose of this document is to report the analyzed results of the environmental monitoring work completed at the local monitoring network, including sampling points for surface and ground water in the Ada Tepe area, Khan Krum deposit.

This document reports the completed monitoring activities related to the implementation of DPMK's project for the Mining and Processing of Gold Ore from the Ada Tepe prospect, Khan Krum Deposit, Krumovgrad. The main objectives of the monitoring during 2015 are:

- Gathering and analysis of actual data to complement the already existing database for water quality prior to commencing construction works of the future minesite;
- Collect minesite design data;
- Providing a database for water in the region, which will be used to compare current results on local environmental status with future ones, i.e. once construction works begin and then throughout the next stages of project implementation;

The monitoring efforts involve sampling from designated sampling points and subsequent testing. The test results were used to identify any changes to the monitored environmental components in the in the Ada Tepe area, Khan Krum deposit. Analyses have been conducted by a certified lab, as well as by using Company equipment and appliances.

## 2. GENERAL

**The Water Monitoring Report (the Report) of Dundee Precious Metals Krumovgrad ("DPMK" or "the Company")** has been drafted in connection with environmental monitoring conducted in the area of the future minesite under the project for Mining and Processing of Auriferous Ores from the Ada Tepe Prospect, Khan Krum Deposit, Krumovgrad Municipality, and in execution of the Company's obligations provisioned in the 2014 Environmental Monitoring Plan, endorsed by the respective environmental authorities.

According to the provisions of the Design Phase, item 3 of the EIA Resolution (Appendix 1), the Company has drafted an environmental monitoring plan. The plan is coordinated with REWI-Haskovo, the EEA and Krumovgrad Municipality, and the "Waters" Component is also agreed with the Basin Directorate for Water Management - East Aegean Region - Plovdiv.

### **3. LOCATION AND DESCRIPTION OF THE ECOLOGICAL, CHEMICAL AND QUANTITATIVE CONDITION OF THE WATER BODIES RELEVANT TO THE IP'S IMPLEMENTATION**

The Minister of Environment and Waters has approved a River Basin Management Plan (RBMP) for the East-Aegean Region, which is the main water management tool thereof. The characterization of both surface water and groundwater bodies that may be affected by the gold ores mining and processing project development or are located in the project area takes into account the data and requirements set out in the RBMP: Volume 1 - General and Volume 2 - Arda River - water management information and requirements.

The Company is the holder of a Permit No.31530328/04.03.2013 for groundwater abstraction through new abstraction facility - tube well with infiltration lateral, issued by the Director of Basin Directorate for Water Management - East Aegean Region - Plovdiv with a 10-year validity term. The purpose of abstraction is industrial and independent drinking water supply. Water will be abstracted from a Quaternary aquifer titled BG3G000000Q010 Interstitial groundwaters in the Quaternary deposits - Arda River". Permitted daily average water abstraction rate is  $Q_{np} = 2,2$  l/sec,  $Q_{max.} = 5,0$  l/sec, the total allowed annual water volume is 70,000 thousand  $m^3$ /year, of which - industrial water supply is 63 500  $m^3$ /year, and domestic and drinking water supply is 6 500  $m^3$ /year.

#### **Surface Water Characterisation**

The site whereon gold ore mining and processing will take place is situated in the left portion of the mid-stream watershed portion of Krumovitsa River, which is a right-hand tributary of Arda River between the Studen Kladenets and Ivailovgrad water reservoirs.

The river typology of the Arda River basin indicates that the entire watershed of Krumovitsa River - the main watercourse and its tributaries, belongs to a uniform water body.

The more important tributaries are the Virovitsa (Kessebir) River, the Vetritsa (Elbassandere) River and the Kaldzhikdere River.

The main surface water body receiving the treated waste water generated by mining and processing of ore will be Krumovitsa River issues from the southern border ridge (Maglenik) of the Eastern Rhodopes and flows northwards and north. Its total length is 58.5 km, and its watershed area is 670.8  $km^2$ . At the Krumovgrad gauge station (HMS 61550, which is the only one in the river watershed), the river has

- length of 37.3 km;
- watershed area of 497.6  $km^2$ ;
- average gradient of 19‰;
- average altitude above sea level - 494 m;
- river network density of 1÷1.5  $km/km^2$ ;
- average vegetation cover in the watershed of 35% reaching up to 90-100% in the upper parts and down to zero around Krumovgrad.

The soils, which are mainly cinnamon low saline and sandy and clayey-sandy, stony in composition, have eroded severely in the conditions of deforestation, and their water regulation capacity is very poor. This causes rapid runoff from precipitation, which is predominantly rain in this climatic area of Southern Bulgaria.

The river is the torrential type, with characteristic summer dry-ups in some parts, which categorize it as an intermittent river (as per the RBMP).

General Characterization of the River Flows of Krumovitsa (as per RBMP) - watershed area 497.6 km<sup>2</sup>; mean flow quantities 7,320 m<sup>3</sup>/s, maximum flow quantities 15,100 m<sup>3</sup>/s, and minimum flow quantities 2,827 m<sup>3</sup>/s.

There are domestic waste water treatment plants downstream of Krumovitsa River. Sediment materials are being extracted downstream from the river bed. There are no sources of industrial wastewaters or areas that are identified as potentially impacted by agricultural sources. The environmental status of the river as per the RBMP is being categorized as moderate. The evaluation of the state of watershed water amounts in Krumovitsa river and its tributary BG3AR200R009 the type has a TP 011011 code (type BG TP24), R14 - intermittent river, 'moderate'; environmental state and 'good' chemical state, state summarized as "poor" (moderate).

### **Groundwater Characterization**

Predominant in the ore mining and processing area are the porous and fissure-flow groundwaters. Fissure-flow groundwaters are characteristic for the district of the future open pit, and porous waters are defined along the stream of Krumovitsa River and some of its tributaries.

#### ***Fissure-flow groundwaters***

The project footprint partly overlaps the aquifer identified as BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone. It is evident from data presented in Table IV.2.1-8 that this aquifer has the lowest water potential - its modulus is 0.5 L/s.km<sup>2</sup>. Fissure-flow groundwaters are fed by the surface flow, and they flow predominantly along the crack in metamorphic rocks sideways from Ata Tepe to Krumovitsa River and Kaldzhik gully, which are their main drainage arteries. Sourcing water from this aquifer is limited and usually used to serve local demands only. There are no resources in this aquifer to be used.

The chemical state for 2010 and 2010 of SWB BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone was evaluated as 'poor' for 2010 and 'good' for 2010 as per the Report on the water volumes state on the territory of the Basin Directorate for water management - East Aegean Region 2010-2011" This Report states that the quantitative state of all groundwater on the territory of this Basin Directorate - Plovdiv is 'good' for 2011.

#### ***Porous water***

Of particular interest are the waters accumulated in the Quaternary deposits (aquifer code BG3G000000Q010) of Arda River, where in this body pertain also the terrace of Krumovitsa river from Ovchari Village to the Arda River. Water in the alluvial aquifers is recharged by precipitation, by inflowing tributary or fissure flow water along the river valleys, by river water penetrating into the floodplains and by high water along the rivers. An unconfined groundwater flow has been formed in the alluvials, which generally flows in the direction of the hydraulic gradient of the river watershed.

Several water abstraction facilities are available in the terrace of Krumovitsa, which supply Krumovgrad and some other settlements.

The natural (dynamic) resources in the alluvial deposits in the Krumovitsa watershed are relatively low. Given an average transmissivity of 1500 m<sup>2</sup>/d, average hydraulic gradient of 0.002 and average floodplain width of 750 m, the dynamic groundwater draw is 26 L/s. Between 60 and 80% of the local abstraction resource comes from the river recharge. Therefore, in the EIA Resolution approving the ore mining and processing from Ada Tepe prospect on Khan Krum Deposit, there is a condition for the chemical treatment of discharged wastewater to potable water quality.

The chemical state for 2010 and 2011 of SWB BG3G000000Q010 - "Interstitial groundwaters in the Quaternary deposits - Arda river" was evaluated as 'good' as per the Report on the water volumes state on the territory of the Basin Directorate for water management - East Aegean Region 2010-2011" This Report states that the quantitative state of all groundwater on the territory of this Basin Directorate is 'good' for 2011.

According to legislation requirements and EIA Decision 18-8.11/2011 conditions, the Company received next listed permits:

- Permit # 31530328/04.03.2013 for abstraction of groundwater resources through construction of new water abstraction facility;
- Water Use Permit # 33140188/21.08.2015 - Krumovitsa river and Arda River, part of water body BG3AR200R009 – Krumovitsa and tributaries, for discharge of wastewater into surface waters, for the design of site.

According to permit for abstraction of groundwater resources I the period November 2013 – January 2014 DPM Krumovgrad has completed the construction of the underground section of the facility for ground water abstraction from shaft well with an infiltration lateral. The water abstraction well (underground part) was placed under care and maintenance by DPMK and sealed by the Plovdiv Basin Directorate, at the request of the Company.

#### **4. MONITORING POINTS DETAILS, SAMPLING POINTS DISTRIBUTION, PURPOSE, LOCATIONS ETC**

Water quality assessment in the area of the future minesite shall be done by sampling 22 water points - 8 for surface and 14 for ground water. Only existing points are being monitored, since some points do not been set up as monitoring points (e.g. old exploration boreholes) yet. A map of surface and ground water monitoring points in 2015 is presented in Appendix 2. Details of the selected locations are provided in Table 4-1.1. The table provides description of each individual point.

**Table 4-1.1: Water monitoring points**

<b>№</b>	<b>Title</b>	<b>Suspended Solids (m)</b>	<b>coordinates: (WGS84)</b>	<b>Type</b>	<b>of monitored indicators</b>	<b>Sampling frequency</b>	<b>Location, Description and Objectives</b>
1	ESW 01	236	E 387727 N 45. 86,770	SW	as described in Table 4-1.2	Once per month	Krumovitsa River – the source point (at confluence of Egrechka River and Kessebirdere) Identifies surface water quality south from the minesite
2	ESW 03	233	E 38 69 38 N 45 86 342	SW	as described in Table 4-1.2	Once per month	Kessebirdere River - upstream of confluence with the Egrechka River. Identifies the water quality upstream of confluence point. Egrechka River
3	ESW 04	235	E 38 76 08 N 45 86 646	SW	as described in Table 4-1.2	Once per month	Egrechka River – upstream the confluence with Kessebirdere Identifies the water quality upstream of confluence point.
4	ESW 05	222	E 39 03 67 N 45 88 680	SW	as described in Table 4-1.2	Once per month	Buyuk dere River - upstream of confluence with the Krumovitsa River Identifies the water quality of Buyukdere upstream of confluence with Krumovitsa River.
5	ESW 06	240	E 386225 N 4588202	SW	as described in Table 4-1.2	Once per month	Kaldzhik dere River - upstream of the bridge at Pobeda hamlet of Ovchari village. Identifies the water quality in the gully upstream of the intersection with the access road to the minesite and the section of the gully passing by the minesite.
6	ESW 07	220	E 38 77 91 N 45 89 777	SW	as described in Table 4-1.2	Once per month	Kaldzhik dere River - upstream of confluence with the Krumovitsa River Identifies the quality of the stream flowing west of the minesite
7	ESW 08	231	E 388364 N 4587708	SW	as described in Table 4-1.2	Once per month	River Krumovitsa river, about 200 m downstream of the north sump of the IMWF.

**Table 4-1.1: Water monitoring points**

<b>№</b>	<b>Title</b>	<b>Suspended Solids (m)</b>	<b>coordinates: (WGS84)</b>	<b>Type</b>	<b>of monitored indicators</b>	<b>Sampling frequency</b>	<b>Location, Description and Objectives</b>
8	ESW 09	215	E 386952 N 4592512	SW	as described in Table 4-1.2	Once per month	River Krumovitsa River, approximately 100m upstream of the discharge point Reference to point ESW 10. Indicates water quality before discharge
9	ESW 10	215	E 386822 N 4592681	SW	as described in Table 4-1.2	Once per month	River Krumovitsa River, approximately 100m downstream of the discharge point Its purpose is to assess the impact on the surface water quality after the discharge of water.
10	EGW 01	N/A	Design E 388187,46 N 4589517.6	GW	Water level	Once per month	Drillhole. The monitoring point is located NE from the site, and covers groundwater running towards the Krumovitsa River from the entire SW sector of Ada Tepe. It is situated in Eocene sandstones and conglomerates. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.
					as described in Table 4-1.2	4 times per year	
11	EGW 02	312	E 388103 N 4588506	GW	Water level	Once per month	Public irrigation well. The point is a well set up E-NE of the open pit at the foot of the slope (in Chobanka), and represents ground water in Palaeocene breccio-conglomerates and sandstones (Krumovgrad Group), with draining direction E-NE to the Krumovitsa River. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.
					as described in Table 4-1.2	4 times per year	
12	EGW 03	312	E 386986 N 4588201	GW	Water level	Once per month	Eng. Geology drillhole. The monitoring point is situated in the metamorphic complex (metagranites and granite-gneiss) on the west slope of Ada Tepe and its purpose is to monitor groundwater flowing towards Kardzhikdere from the drainage on the west slope of the deposit. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.
					as described in Table 4-1.2	4 times per year	
13	EGW 04	229	E 387596	GW	Water level	Once per month	Eng. Geology drillhole. The monitoring point is set up in the metamorphic rocks on the slope descending to

**Table 4-1.1: Water monitoring points**

№	Title	Suspended Solids (m)	coordinates: (WGS84)	Type	of monitored indicators	Sampling frequency	Location, Description and Objectives
			N 4586825		as described in Table 4-1.2	4 times per year	the Krumovitsa River terrace and covers groundwater flowing south downstream of the mining waste facility. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.
14	EGW 05	220	E 387957 N 4591016	GW	as described in Table 4-1.2	4 times per year	Shaft well 2 of Krumovgrad drinking water abstraction, located in the in the alluvials of the Krumovitsa River. Identifies any negative changes in the quality of the groundwater abstracted for drinking. The point monitors the water quality in the quaternary aquifer of the water body named BG3G000000Q010 Interstitial groundwaters in the Quaternary deposits.
15	EGW 06	218	E 387590 N 4590649	GW	as described in Table 4-1.2	4 times per year	Shaft well 1 of Ovchari-Krumovgrad – II drinking water abstraction, located in the alluvials of the Krumovitsa River. Identifies any negative changes in the quality of the groundwater abstracted for drinking. The point monitors the water quality in the quaternary aquifer of the water body named BG3G000000Q010 Interstitial groundwaters in the Quaternary deposits.
16	EGW 07	230	E 387521 N 4586750	GW	as described in Table 4-1.2	under discharge permit (but minimum four times a year)	Shaft-tube well with drainage collector. Proprietary abstraction well, located in the alluvials of the Krumovitsa River. Identifies any negative changes in the quality of the groundwater abstracted for drinking. The point monitors the water quality in the quaternary aquifer of the water body named BG3G000000Q010 Interstitial groundwaters in the Quaternary deposits. When the construction of the Tube Well is completed, a conceptual design of the facility will be attached to the Monitoring plan in order to provide clarity on the contact point of the infiltration lateral in the tube well and the lithology structure.
17	EGW 08	N/A	Design E 387367 N 4587549	GW	Water level as described in Table 4-1.2	Once per month 4 times per year	Monitoring drill hole (piezometer), at high elevation of Ada Tepe, a reference point over the IMWF. Set in a metamorphic complex - metagranites and gneisses, with some schists layers. The groundwater source is porous, with draining direction to the Krumovitsa River. The point provides the background characteristics of groundwater running towards IMWF.

**Table 4-1.1: Water monitoring points**

№	Title	Suspended Solids (m)	coordinates: (WGS84)	Type	of monitored indicators	Sampling frequency	Location, Description and Objectives
18	EGW 09	N/A	Design E 388302 N 4587478	GW	Water level as described in Table 4-1.2	Once per month 4 times per year	Monitoring drill hole (piezometer), at the toe of the north part of IMWF, between the North Collection Sump and the Krumovitsa River. Set in a metamorphic complex - metagranites and gneisses, with some schists layers. The groundwater source is porous, with draining direction to the Krumovitsa River. The point monitors the groundwater quality running to IMWF.
19	EGW 10	N/A	Design E 388392 N 4587262	GW	Water level as described in Table 4-1.2	Once per month 4 times per year	Monitoring drill hole (piezometer), at the toe of the south part of IMWF, between the South Collection Sump and the Krumovitsa River. Set in a metamorphic complex - metagranites and gneisses, with some schists layers. The groundwater source is porous, with draining direction to the Krumovitsa River. The point monitors the groundwater quality running to IMWF.
20	EGW 11	325	E 385053 N 4589103	GW	as described in Table 4-1.2	4 times per year	Water collection system for pump station of Zvanarka village. The captured springs are water bodies not pertaining to the Krumovitsa River terrace. Krumovitsa River. They drain waters in the Paleogene sediments. The point monitors household and potable water supply quality.
21	EGW 12	220	E 389417 N 4589599	GW	as described in Table 4-1.2	4 times per year	Shaft well of pump station at Guliika village. Located in the alluvial deposits of the Krumovitsa river. The point monitors household and potable water supply quality.
22	EWW 01	N/A	Design	WW	quantity	Continuous	Inlet of household wastewater treatment plant - inlet. Water quality and quantity will be monitored, as this is important for the subsequent biological treatment process.
					as described in Table 2-2-2 from part "Water" of EMP	On a monthly basis	
23	EWW 02	N/A	Design	WW	quantity	Continuous	Outlet of household wastewater treatment plant - discharge. Water quantity and quality data will be

**Table 4-1.1: Water monitoring points**

<b>№</b>	<b>Title</b>	<b>Suspended Solids (m)</b>	<b>coordinates: (WGS84)</b>	<b>Type</b>	<b>of monitored indicators</b>	<b>Sampling frequency</b>	<b>Location, Description and Objectives</b>
					as described in Table 2-2-2 from part "Water" of EMP	On a monthly basis	collected prior to discharge.
24	EWW 03	N/A	Design	WW	quantity	Continuous	Runoff Storage Pond - water quality and quantity will be monitored in view of the fact that the process is water-quality sensitive.
					as described in Table 2-2-2 from part "Water" of EMP	Once per week	
25	EWW 04	N/A	Design	WW	quantity	Continuous	North collecting sump of the IMWF - the water quality and quantity will be monitored for reuse in the process.
					as described in Table 2-2-2 from part "Water" of EMP	Once per week	
26	EWW 05	N/A	Design	WW	quantity	Continuous	South collecting sump of the IMWF - the quality and quantity of water will be monitored for reuse in the process.
					as described in Table 2-2-2 from part "Water" of EMP	Once per week	
27	EWW 06	N/A	Design	WW	quantity	continuous	Collection sump at the open pit (mine water) -the quality the water will be monitored for reuse in the

Table 4-1.1: Water monitoring points							
№	Title	Suspended Solids (m)	coordinates: (WGS84)	Type	of monitored indicators	Sampling frequency	Location, Description and Objectives
					as described in Table 2-2-2 from part "Water" of EMP	Once per week	process.
28	EWW 07	207	E 386952,99 N 4592540.62	WW	quantity	Continuous	According to Water Discharge Permit for design. – monitoring of discharge water quality.
					as described in Table 2-2-2 from part "Water" of EMP	Once per week	

\* "Seasonal" means:

- Spring – May through June;
- Summer – July through September;
- Fall – October through November;
- Winter – January through February.

**Table 2-2.1: Assays of waste waters (performed by the Company, and by an accredited laboratory)**

Point No	Assays	Frequency
EWW 01 and 02 Household wastewater treatment plant - input and discharge	pH, temperature, conductivity, BOD5, COD, solids, SS, total P, total N	Once per week by the Company laboratory; once per month by an accredited laboratory
EWW 03, 04, 05, 06 water reservoir and water from the collection sumps of the IMWF	pH, conductivity, dissolved O <sub>2</sub> , COD, suspended solids, dissolved solid, Cu, As, Fe, Mn, Zn, Al, Ni, NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> , N (total), SO <sub>4</sub> , PO <sub>4</sub> , Ca, Mg, Cd, Cl, Cr (VI).	Once per week by the Company laboratory; once per month by an accredited laboratory
EWW 06 – water from open pit	K, Na, Cr <sub>total</sub> , Pb, Se, Sb, β-BHC, α-BHC, U <sub>nat.</sub> .	once per month by an accredited laboratory, excluded β-BHC, α-BHC, U <sub>nat.</sub> which will be analyzed once per year. Quantity – permanent
EWW 07	pH, Cd, As, Fe, Cu, Zn, Pb, Ni, Cr, Mn, Co, suspended solids, BOD5, COD, petroleum products.	Once per week by the Company laboratory; once per month by an accredited laboratory; permanent quantity of discharged water.

Surface and groundwater samples for testing were taken in May, July and December 2015, according to approved Monitoring Plan.

Samples were taken from current monitoring points, provided the presence of water therein. Appendix 2 presents maps of surface and groundwater monitoring points that were sampled for quality analysis in 2015. These points were selected in a manner, which enables sufficient data collection for the proper monitoring of the background water status in the area around and downstream river beds and gullies adjacent to the future Ada Tepe minesite. Appendix 3 also features all records with results, including an individual analysis of static water level measurements (from their initiation in 2010 up to 2015).

## 5. MONITORING TYPE AND FREQUENCY

Water samples were taken three times in 2015 by a certified lab in the developed points. Water quality results are shown in Table 4-1.2. Groundwater static water levels were measured on a weekly basis. All current test results on water quality were reviewed against the regulated limits and are provided in Appendix 3 for higher clarity.

Surface water analysis results are compared to the metric values provisioned in Regulation № H-4/ 14.09.2012 for Surface Water Characterization (issued by the Minister of Environment and Water, prom. in SG issue 22/5.03.2013, effective 05.03.2013).

Results from groundwater tests are reviewed against the groundwater quality standards set out in Regulation № 1/10.10.2007 on Groundwater Exploration, Use and Protection. Appendix 3 presents surface and ground water monitoring results in 2015 and prior to that year, compared to the metric values stipulated by current legal standards.

## 6. DATA SHEET PER POINTS

There is an individual data sheet for each point that shall be updated for the whole duration of this Plan. Data sheets are shown in the Appendix 4.

## **7. MONITORING SYSTEM - TERMS OF USE**

The monitoring system's terms of use are related to the minesite's operational cycle. Operations in the open pit and crushing facility will be scheduled as two 8-hour shifts a day, 7 days a week. The processing of crushed ore shall be a continuous process scheduled as three 8-hour shifts a day, 7 days a week.

The Internal Monitoring Plan shall be implemented parallel to minesite operations. It shall cover the period from coordinating the Plan and to finalizing all works related to construction, operation and minesite rehabilitation.

## **8. ANALYSIS OF MONITORING DATA AND RESULTS SUBMISSION**

- The Company will be submit internal monitoring results as per the provisions of art 174 of the Waters Act to the Director of the Basin Directorate, East Aegean Region, within the deadlines specified in the respective permits, issued under the Waters Act;
- Internal monitoring data, including description of the Internal Monitoring Plan (locations, parameters and frequency of measurements) and the findings will be posted on the company website (in Bulgarian and English) and letter of Notification for web page where will be published data will be sent to the Basin Directorate, East Aegean Region - Plovdiv, to the MoEW and the Regional Environment and Waters Inspection (REWI) – Haskovo. Company will also notify the Greek Ministry of Environment, Energy and Climate Change about the same web page.
- Once per annum, by 31st March of each year after the first project year, the Company will send a report with the results of the Water Quality Monitoring Plan in English to the Greek Ministry of Environment, Energy and Climate Change. The report will include a full description of the points from which samples are taken (location, etc.), analyzed parameters, analytical methods and comparison of these data against the limit values of these emissions. This report, both in English and Bulgarian, will be submitted to the EABD.
- Annual Water Monitoring Report with results shall be submitted to the Krumovgrad municipality..

The analysis of water monitoring data includes a comparison between obtained results from the analysis of water samples and the applicable standards for surface, waste and groundwater quality, specified in the by-laws to the Waters Act.

## **9. CRITERIA FOR DUE NOTIFICATION**

The criteria for due notification are:

- upon scheduled suspension of the work of the wastewater treatment facility;
- upon emergency suspension of the work of the wastewater treatment facility;
- when there is an unavoidable need for an emergency discharge of non-treated wastewater;
- upon emergency regarding inevitable surface and groundwater pollution.

In the event of one or more of the above mentioned emergencies endangering surface and groundwater quality, information about the undertaken measures shall be duly sent to:

- Basin Directorate, East Aegean Region;
- REWI - Haskovo;
- Kardzhali Regional Health Inspectorate;
- Krumovgrad Municipality;
- Kardzhali District Governor;
- other authorities defined in the minesite's Emergency response plans.

## **10. FUNCTIONAL LINES FOR PROVISION OF MONITORING INFORMATION**

All water monitoring data and records are kept in the Environmental Department of DPMK in the form of protocols, database including results of chemical analysis and data sheets. Annual monitoring reports will be prepared every year. Electronic copies of the annual monitoring reports will be available in Bulgarian and in English on the corporate website at <http://dundeeprecious.com/>.

## **11. OTHER REQUIREMENTS REGARDING THE PLAN'S CONTENTS**

Currently there are no requirements regarding the Plan's contents other than those already outlined.

## **12. RESULTS FROM THE IMPLEMENTATION OF THE MONITORING PLAN**

In 2015 testing and assay of water samples was conducted by a certified lab (Eurotest-control EAD, Sofia) three times, respectively in May, August and December 2015. Samples were taken from surface waters of tributaries and the Krumovitsa River, as well as from groundwaters, including drinking water abstractions. The gathering of baseline data on the status of waters and the dynamics of their quantitative and qualitative parameters shall continue until the start of minesite construction works. As we gather baseline data about the water, we would be able to more accurately assess the impact of the future mining and processing operations. Assay results for all monitoring points are provided in Appendix 3.

### Surface Water

The water quality of Krumovitsa River and its tributaries was tested at 9 points in 2015. Surface waters were tested three times in May, August and December under the parameters set out in item 4.1 of this Report.

According to Regulation № H-4, the status of waters in rivers falls within four river categories - mountain rivers (R1, R2, R3), semi-mountain rivers (R4, R5) + conditional spring-type rivers (R15), plain rivers (R7, R8, R12, R13), intermittent and Black sea type of rivers (R9, R10, R11, R14). The Krumovitsa River and its tributaries belong to the intermittent type.

The comparison between surface water status and test results can be made according to the three states defined in Regulation № H-4 - "very good", "good" and "moderate". For the purposes of this Report, the physical and chemical elements for "good" surface water quality were chosen for comparison of monitoring results. Other indicators for surface water quality are the quality standards for chemical elements and other substances applicable to internal surface waters, i.e. the regulated limits for quality standards of chemical elements and other substances that are also

provisioned in Regulation № H-4/ 14.09.2012 on Surface Water Characterization. The reference values provisioned in the Regulation on the Environmental Quality Standards (EQS) for priority substances and other pollutants have also been added to this analysis.

The following elevated concentrations have been established at different surface water monitoring points:

- ESW 01 – Krumovitsa River, first section (the confluence point of Krumovitsa, Egrechka and Kessebirdere). This point is situated 200m south from the future minesite and indicates background levels. It presents the state of those waters that run close to the southern part of the future mining operation and yet remain off-site and downstream the Krumovitsa River.

No elevated concentrations have been observed, as per the physical and chemical indicators for "good" quality of intermittent type of rivers (such as Krumovitsa) and the quality standards for chemical elements and other substances for surface waters produced internally (regulated limits - environmental quality standards), provisioned in Regulation № H-4/ 14.09.2012 on Surface Water Characterization.

As to the chemical indicators provisioned in the Regulation on the Environmental Quality Standards (EQS) for priority substances and other pollutants, all measurements are below indicated threshold levels. Water sampling conducted on the following dates: 18/05/2015, 18/08/2015, 09/12/2015 (Appendix 3 shows the sampling protocol).

- ESW 03 – Kessebir River downstream of Sinap, upstream the confluence with Egrechka River

This point is situated 600m N-NW Sinap. Its purpose is to gather data about any pollution generated in the water catchment area of Kessebir gully.

Three water samples were tested in 2015. Test results show that the concentration of aluminum ions (Al) in the sample taken on 18.05.2015 was 0,026 mg/l, compared to the 0,025 mg/l reference value stipulated in Regulation H-4. Next two measurements showed a drop in concentration - first to 0,024 mg/l (in August) and then below set detection limits (in December). Water sampling conducted on the following dates: 18/05/2015, 18/08/2015, 09/12/2015 (Appendix 3 shows the sampling protocol).

- ESW 04 – Egrechka River – upstream the confluence with Kessebirdere

This point is situated 500m south from the future process plant. Its purpose is to gather data about any pollution of Egrechka generated in the water catchment area. This is a background monitoring point, since it is located above the minesite.

Three water samples were tested in 2015. Three water samples were tested in 2015. Test results show that two samples were within limits. The sample taken on 18.08.2015 showed lead ion concentration of 0,021 mg/l, i.e. above the set limit of 0,014 mg/l, as per the EQS Regulation. Water sampling conducted on the following dates: 18/05/2015, 18/08/2015, 09/12/2015 (Appendix 3 shows the sampling protocol).

- ESW 05 Buyukdere - upstream the confluence point Krumovitsa River.

The purpose of this point is to gather information about any Krumovitsa pollution generated by the populated areas situated in the water catchment area of the gully. The Buyukdere River is a

right-hand tributary of Krumovitsa River. Two water samples were tested in 2015. The second sampling scheduled for September 2015 did not take place due to lack of water.

Sample test results show that the concentration of water pollutants in 2015 remains below the limits provisioned in Regulation H-4/14.09.2012 on Surface Water Characterization. Water sampling conducted on the following dates: 18/05/2015 and 09/12/2015 (Appendix 3 shows the sampling protocol).

- ESW 06 Kaldzhikdere - upstream of the bridge at Pobeda hamlet of Ovchari village.

Identifies water quality in the gully upstream of the intersection with the access road to the minesite and the section of the gully passing by the minesite.

Two water samples were tested in 2013. No water samples were taken in September due to the lack of water.

Sample test results show that all samples were within limits, except for the elevated concentration of iron ions in one sample taken on 09.12.2015, showing 0,14 mg/l compared to the annual average value for established quality standard of 0,1 mg/l, as per the EQS Regulation. Water sampling conducted on the following dates: 18/05/2015 and 09/12/2015 (Appendix 3 shows the sampling protocol).

- ESW 07 Kaldzhikdere - upstream the confluence point with Krumovitsa

This point is situated N-NW, at 300m from the confluence point of Kaldzhikdere and Krumovitsa River. The waters in this gully are directly connected the flow generated by precipitations in the Ada Tepe area. The purpose of this point is to gather data on Krumovitsa River pollution generated by populated areas situated within the gully's water catchment area and the future minesite.

The point was sampled once throughout the reported period, proving to be dry, just like in the previous two cases. Analyses show no contamination in terms of the sampled components. Water sampling conducted on the 09/12/2015 (Appendix 3 shows the sampling protocol).

- ESW 08 Krumovitsa river, downstream of the north sump of the IMWF.

Three water samples were tested in 2015. Results show no contamination throughout the reported period. Water sampling conducted on the following dates: 19/05/2015, 18/08/2015, 09/12/2015 (Appendix 3 shows the sampling protocol).

- ESW 09 Krumovitsa River.

The point is approximately 100m upstream of the discharge point. ESW 09 is a reference point for ESW 10. It indicates Krumovitsa River water quality before discharge downstream of the water treatment facility.

Water samples taken from this point were tested three times in 2015. Results show that the sample taken on 18.08.2015 displays higher concentrations than the permitted ones, as per Regulation H-4, namely:

- Ammonia nitrogen ( $\text{NH}_4^+ - \text{N}$ ) - concentration of 1,93 mg/l, compared to the quality standard  $>0,65$  mg/l under Regulation H-4. The status of surface water is “moderate”;

- Total nitrogen ( $N_{total}$ ) - concentration of 3,6 mg/l, compared to the quality standard  $>2,5$  mg/l under Regulation H-4. The status of surface water is “moderate”;
- Phosphates ( $PO_4^{3-}$ -P) - concentration of 0,21 mg/l, compared to the quality standard  $>0,15$  mg/l under Regulation H-4. The status of surface water is “moderate”;
- Manganese ions (Mn) - concentration of 0,15 mg/l, compared to the annual average value 0,05 mg/l under Regulation H-4;
- Iron ions (Fe) - concentration of 1,13 mg/l, compared to the annual average value 0,1 mg/l under Regulation H-4;
- Copper ions (Cu) - concentration of 0,031 mg/l, compared to the annual average value 0,022 mg/l under Regulation H-4;

It appears that there is an almost complete correlation between elevated concentrations in reference point ESW 09 and ESW 10, except for copper ions concentration which is within permitted limits at ESW 10.

Pollutant concentrations are directly linked to nearby farmlands and their fertilization, and discharged non-treated waste waters from the local sewage. Water sampling conducted on the following dates: 19/05/2015, 18/08/2015, 09/12/2015 (Appendix 3 shows the sampling protocol).

- ESW 10 Krumovitsa River, downstream of the discharge point of mine waste waters.

This point is located along the Krumovitsa River, approximately 100m downstream of the discharge point. The aim is to facilitate the assessment of discharged treated waters' impact on the river's water quality. Until 2014 this point was indicated as 02.

In 2015 the point was sampled three times. The first sampling on 19.05.2015 displayed two components with elevated concentrations:

- Aluminum ions (Al) - concentration of 0,35 mg/l, compared to the maximum threshold concentration 0,025 mg/l under Regulation H-4;
- Iron ions (Fe) - concentration of 0,48 mg/l, compared to the annual average value of the standard 0,1 mg/l under Regulation H-4;

The second sampling on 18.08.2015 showed the following elevated values:

- Ammonia nitrogen ( $NH_4^+$  - N) - concentration of 2,81 mg/l, compared to the quality standard  $>0,65$  mg/l under Regulation H-4. The status of surface water is “moderate”;
- Total nitrogen ( $N_{total}$ ) - concentration of 5 mg/l, compared to the quality standard  $>2,5$  mg/l under Regulation H-4. The status of surface water is “moderate”;
- Phosphates ( $PO_4^{3-}$ -P) - concentration of 0,3 mg/l, compared to the quality standard  $>0,15$  mg/l under Regulation H-4. The status of surface water is “moderate”;
- Manganese ions (Mn) - concentration of 0,14 mg/l, compared to the annual average value of the standard 0,05 mg/l under Regulation H-4;
- Iron ions (Fe) - concentration of 0,16 mg/l, compared to the annual average value of the standard 0,1 mg/l under Regulation H-4;

The direct correlation between the two points, i.e. ESW 09 and ESW 10 is apparent. The only difference is in the concentration of copper ions which are also present at ESW 10 but in slightly lower concentrations. It also appears that the concentration of ammonium and phosphate ions, as well as that of total nitrogen, increase from ESW 09 to ESW 10, while metal ions' correlation between the two points is inversely proportional, i.e. decreases downstream. This is most probably due to the slightly higher presence of hydrogen cations in this environment, proven by the nearly neutral pH values at both points. Most probably, free hydrogen ions quickly form hydrocarbons and then bind metal ions, which also explains the drop in their concentration.

Contamination with the above mentioned pollutants is probably due to the several urban sewage pipes which discharge non-treated waste waters into the river or its riverbed sands, depending on the season. Another additional explanation are all arable lands along the Krumovitsa River, upstream these two points. This results in a direct correlation of the volume of surface runoff that passes through the riverbed and affects the dilution of present pollutants. Water sampling conducted on the following dates: 19/05/2015, 18/08/2015, 09/12/2015 (Appendix 3 shows the sampling protocol).

### Ground water

Ground water samples were taken according to the monitoring schedule, with some exceptions. No samples were taken from ESW 07 monitoring point, since it is an underground shaft well (designed to meet the fresh water demands of a future mining operation), which is currently placed under care and maintenance and sealed by the Plovdiv Basin Directorate, at the request of the Company. Other monitoring points, namely EGW 01, 09 and 10 are not set up yet. Data gathering about the static groundwater levels continued in 2015 and the data is provided in Appendix 3, together with a brief analysis on their dynamics. The regular monitoring activities at these stations enable tracking of the dynamics of the groundwater flow and chemical composition. The data will be later used for comparison with the future data as part of the future assessment of any indirect future impact of the mining operations on the local ground water. Variances in the static water levels of these waters are dictated by the recharge conditions and seasonal climatic conditions. Our analysis shows that there is no direct link between water levels measured in various piezometers. However, all of them are directly affected/ recharged by precipitation.

Points and analyzed ground water points are as follows:

- Design borehole EGW 01. It is located NE from the minesite and covers fissured groundwaters running towards the Krumovitsa River from the entire NE sector of Ada Tepe. It is situated in Eocene sandstones and conglomerates. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.

No analysis was conducted in 2015, since this is a design borehole.

- Point EGW 02 is a well set up E-NE of the open pit at the foot of the slope (in Chobanka hamlet), and represents ground water in Palaeocene breccio-conglomerates and sandstones (Krumovgrad Group), with draining direction E-NE to the Krumovitsa River. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.

The chemical test of the sample shows that the water at this point meets the quality standards pursuant to Regulation 1/2010 on Groundwater Exploration, Use and Protection, except for the arsenic (As) content in a sample taken on 18.08.2015, showing 11 µg/l, compared to a quality standard of 10 µg/l.

- Borehole EGW 03 is situated in the metamorphic complex (metagranites and granite-gneiss) on the west slope of Ada Tepe and its purpose is to monitor groundwater flowing

towards Kardzhikdere from the drainage on the west slope of the deposit. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.

The chemical test of the samples taken in 2015 shows that the water at this point meets the quality standards provisioned in Regulation 1/2010 on Groundwater Exploration, Use and Protection, except those described in the Table below.

Table: 12-1 Point EGW 03. Dynamic and amplitude by components and dates

Indicator	Quality standard as per Regulation № 1/2010	Assay in an Accredited lab conducted on 19.05.2015	Assay in an Accredited lab conducted on 18.08.2015	Assay in an Accredited lab conducted on 09.12.2015
Manganese (Mn)	(50 µg/l)	230 µg/l	510 µg/l	101 µg/l
Iron (Fe)	(200 µg/l)	(51 µg/l)	3320 µg/l	(150 µg/l)
Arsenic (As)	(10 µg/l)	<5	41 µg/l	(8.5 µg/l)

The presence of iron and arsenic ions that fails to meet set quality standards is most probably due to the lower level of water dilution in summer months caused by less precipitation.

- Borehole EGW 04 is set up in the metamorphic rocks on the slope descending to the Krumovitsa River terrace and covers groundwater flowing south downstream of the mining waste facility. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.

The chemical test shows that the water at this point meets the quality standards pursuant to Regulation 1/2010 on Groundwater Exploration, Use and Protection. The following deviations were identified:

Table: 12-2 Point EGW 04. Dynamic and amplitude by components and dates

Indicator	Quality standard as per Regulation № 1/2010	Assay in an Accredited lab conducted on 19.05.2015	Assay in an Accredited lab conducted on 18.08.2015	Assay in an Accredited lab conducted on 09.12.2015
Manganese (Mn)	(50 µg/l)	120 µg/l	105 µg/l	50 µg/l
Iron (Fe)	(200 µg/l)	(47 µg/l)	210 µg/l	(170 µg/l)

\*elevated levels (see Regulation №1)

Elevated iron levels are most probably due to corroded pipe casing. Elevated manganese levels are most probably due to ongoing natural processes of oxidation and to groundwaters' hydro-geological dynamics.

- EGW 05 - Krumovgrad drinking water abstraction, located in the in the alluvials of the Krumovitsa River. Identifies any negative changes in the quality of groundwater abstracted for domestic and potable needs. The point monitors the water quality in the quaternary aquifer of the water body named BG3G000000Q010 Interstitial groundwaters in the Quaternary deposits.

Tests show that the assayed indicators meet the requirements of Regulation 9 on Drinking and Household Water Quality. The following deviations were identified:

Table: 12-3 Point EGW 05. Dynamic and amplitude by components and dates

Indicator	REGULATION 9 on Drinking and Household Water Quality.	Assay in an Accredited lab conducted on 20.05.2015	Assay in an Accredited lab conducted on 18.08.2015	Assay in an Accredited lab conducted on 09.12.2015
Nitrates (NO <sub>3</sub> )	(50 µg/l)	50 mg/l	(2.9 mg/l)	(4 mg/l)
Total alfa activity	0,1 Bq/l	0,099 Bq/l	0,117 Bq/l	0,048 Bq/l
E. coli	0/100 cfu/100cm <sup>3</sup>	1/100	1/100	1/100
coliforms	0/100 cfu/100cm <sup>3</sup>	22/100	7/100	43/100
enterococci	0/100 cfu/100cm <sup>3</sup>	0/100	2/100	5/100
Clostridium perfringens	0/100 cfu/100cm <sup>3</sup>	0/100	2/100	0/100

\*elevated levels, as per Regulation №1

A specific feature of this point is the repeated presence of microorganisms that are hazardous to human health. Nitrate concentration in the month of May is another specific feature and is most likely due to the fertilization of nearby arable lands in the Krumovitsa terrace. Another point to mention is the slightly elevated alpha radiation in the July water sample.

- EGW 06 Ovchari-Krumovgrad II drinking water abstraction, located in the alluvials of the Krumovitsa River. Identifies any negative changes in the quality of the groundwater abstracted for drinking. The point monitors the water quality in the quaternary aquifer of the water body named BG3G000000Q010 Interstitial groundwaters in the Quaternary deposits.

Tests show that the assayed indicators meet the requirements of Regulation 9 on Drinking and Household Water Quality. The following deviations were identified:

Table: 12-4 Point EGW 06. Dynamic and amplitude by components and dates

Indicator	REGULATION 9 on Drinking and Household Water Quality.	Regulation №1 on Groundwaters	Assay in an Accredited lab conducted on 20.05.2015	Assay in an Accredited lab conducted on 18.08.2015	Assay in an Accredited lab conducted on 09.12.2015
coliforms	0/100 cfu/100cm <sup>3</sup>	-	10/100	0/100	0/100
E. coli	0/100 cfu/100cm <sup>3</sup>	-	1/100	0/100	0/100
bromates	10 µg/l	-	26	<10	<10
Chlorine (free)	0.3 mg/l	-	0.111 mg/l	0.392 mg/l	1.52 mg/l

\*elevated levels, as per Regulation №1

The high concentration of free chlorine is probably due to the heavy chlorination of potable water. The May sample displays elevated content of microorganisms that are hazardous to human health. In the subsequent samples their presence is brought down to 0. The one-time elevated value of bromates is interesting to note and should be followed-up on in the future.

- EGW 07 Proprietary abstractions well, located in the alluvials of the Krumovitsa River. Identifies any negative changes in the quality of the groundwater abstracted for drinking.

The point monitors the water quality in the quaternary aquifer of the water body named BG3G000000Q010 Interstitial groundwaters in the Quaternary deposits. When the construction of the Tube Well is completed, a conceptual design of the facility will be attached to the Monitoring plan in order to provide clarity on the contact point of the infiltration lateral in the tube well and the lithology structure.

No analysis was conducted in 2015, since this the water supply source is sealed.

- EGW 08 design borehole in the Ada Tepe area - it is located at high elevation on Ada Tepe and is a reference point above the IMWF. Set in a metamorphic complex - metagranites and gneisses, with some schist layers. The groundwater source is porous, with draining direction to the Krumovitsa River. The point provides the background characteristics of groundwater running towards IMWF.

Samples were taken from a geotechnical borehole some 200m west of the future monitoring point EGW 08, with the aim to gather data until a proper piezometer is set up at this specific location. The chemical test of the samples shows that waters at this point meet the quality standards provisioned in Regulation 1/2010 on Groundwater Exploration, Use and Protection. The following deviations were, however, identified:

Table: 12-5 Point EGW 08. Dynamic and amplitude by components and dates

Indicator	Regulation №1 on Groundwaters	Assay in an Accredited lab conducted on 19.05.2015	Assay in an Accredited lab conducted on 18.08.2015	Assay in an Accredited lab conducted on 09.12.2015
Total indicative dose	0,1 mSv/per annum	0,021 mSv/per annum	<b>0,113</b> mSv/per annum	0,085 mSv/per annum
Total alpha activity	0,1 Bq/l	0,113 Bq/l	<b>0,67</b> Bq/l	<b>0,517</b> Bq/l
permanganate oxidisable C	5 mg O2/l	1,86 mg O2/l	2,61 mg O2/l	<b>6,4</b> mg O2/l
Manganese	50 µg/l	14 µg/l	14,4 µg/l	<b>160</b> µg/l
Iron	200 µg/l	43 µg/l	2 µg/l	<b>350</b> µg/l
Petroleum products	50 µg/l	<20 µg/l	<20 µg/l	<b>58</b> µg/l

\*elevated levels, as per Regulation №1

High iron (Fe) concentrations in the last sample are probably due to the highly corroded pipe case of this particular borehole.

Without any long-term observation, it would be hard to identify the source of elevated alpha activity in the last two samples, as well as the one-time elevated total indicative dose in the July sample.

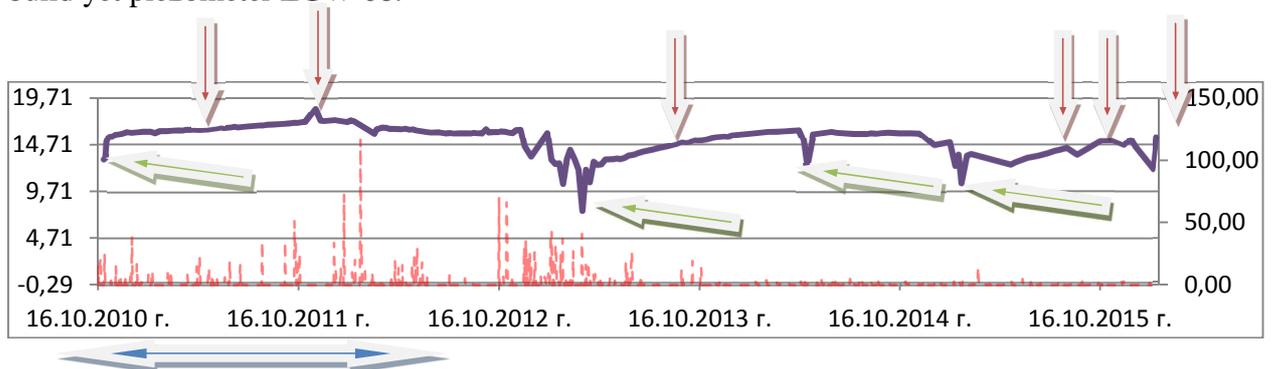
The elevated concentration of manganese is probably due to lower static water levels, i.e. less water to leach the metals. The same applies to petroleum products. This hypothesis is confirmed by analyses of static water levels measured within the boreholes, displaying the following variations:

- On 20.05.15 – 12,98 m;
- 14.08.15 – 14,35 m;
- 10.12.15 – 15,18 m.

Groundwater level variations are presented in the below chart (the dark line). Precipitation and respective precipitation volumes are marked in red. There is an apparent link between

precipitation volumes and recharged groundwaters. However, this is observed with a corresponding delay in time at the different boreholes. Groundwater recharging is also strongly dependent on precipitation intensity. The chart shows groundwater recharges as spikes marked with green arrows, caused by precipitation (red bars), while the smooth progression of the curve displays those areas with decreasing water levels (marked with red arrows). The blue arrow shows a water saturated area, immediately followed by a very pronounced spike in groundwater levels. We are witnessing a longterm correlation between fissure saturation (after a long period of low-volume precipitation) and a subsequent period, after pores get water saturated (green arrow spike).

Figure: 12-1 Ground water levels dynamics according to precipitation – 200 m west from not build yet piezometer EGW 08.



Elevated permanganate oxidation reveals a likely process of fermentation. However, the water sample bears no visible evidence of this.

- Design borehole EGW 09. At the toe of the north part of IMWF, between the North Collection Sump and the Krumovitsa River. Set in a metamorphic complex - metagranites and gneisses, with some schist layers. The groundwater source is porous, with draining direction to the Krumovitsa River. The point monitors the groundwater quality running to IMWF.

The point was not analyzed, as it is still not set up.

- Design borehole EGW 10. At the toe of the south part of IMWF, between the South Collection Sump and the Krumovitsa River. Set in a metamorphic complex - metagranites and gneisses, with some schist layers. The groundwater source is porous, with draining direction to the Krumovitsa River. The point monitors the groundwater quality running to IMWF.

The point was not analyzed, as it is still not set up.

- EGW 11 - Zvanarka drinking water abstraction. Captured springs are water sources that do not pertain to the Krumovitsa River terrace. They drain waters in the Paleogene sediments. The point monitors the quality of waters used for potable and domestic needs.

EGW 11 water sample tests show that ion concentrations meet the quality standards provisioned in Regulation 9/16.03.12001 on Drinking and Household Water Quality, except on the following dates with certain elevated concentrations, as indicated below:

Table: 12-6 Point EGW 11. Dynamic and amplitude by components and dates

Indicator	Regulation №9 on Drinking and Household Water Quality	Assay in an Accredited lab conducted on 20.05.2015	Assay in an Accredited lab conducted on 18.08.2015	Assay in an Accredited lab conducted on 09.12.2015
Aluminum	200 µg/l	1300 µg/l	15 µg/l	<8.0 µg/l
Manganese	50 µg/l	100 µg/l	4.4 µg/l	4 µg/l
Iron	200 µg/l	1300 µg/l	140 µg/l	19 µg/l
E. coli	0/100 cfu/100cm <sup>3</sup>	1/100	2/100	2/100
coliforms	0/100 cfu/100cm <sup>3</sup>	16/100	42/100	18/100
enterococci	0/100 cfu/100cm <sup>3</sup>	0/100	2/100	1/100
Total alpha activity	0,1 Bq/l	0,049 Bq/l	0,094 Bq/l	0,119 Bq/l

\*elevated levels, as per Regulation №1

The high concentration of aluminum, manganese and iron is probably due to low volumes of water at the source, which is located in limestone. Water drainage at this monitoring point cannot be compared to other potable water monitoring points, since they are located in the alluvial Krumovitsa River terrace. There is no available data on water levels and volumes at the source, which means that above mentioned likelihood is based on assumptions only.

Perhaps the same reasons could also explain the presence of microorganisms in these waters.

This water sample also features chromium and nickel, which are not found in other sampled points. Their concentration is, however, below the threshold for potable water.

- EGW 12 - abstraction facility at Guliika pump station. Located in the alluvial deposits of the Krumovitsa River. The point monitors the quality of waters used for potable and domestic needs.

The chemical test of the samples taken from EGW 12 shows that waters at this point meet the quality standards provisioned in Regulation 9/16.03.12001 on the Drinking Water Quality.

Table: 12-7 Point EGW12. Dynamic and amplitude by components and dates

Indicator	Regulation №9 on Drinking and Household Water Quality	Assay in an Accredited lab conducted on 20.05.2015	Assay in an Accredited lab conducted on 18.08.2015	Assay in an Accredited lab conducted on 09.12.2015
E. coli	0/100 cfu/100cm <sup>3</sup>	1/100	0/100	0/100
coliforms	0/100 cfu/100cm <sup>3</sup>	18/100	0/100	0/100
Chlorine (free)	0.3 mg/l	0.153 mg/l	0.488 mg/l	0.39 mg/l
Total alpha activity	0,1 Bq/l	0,024 Bq/l	0,084 Bq/l	0,141 Bq/l

\*elevated levels, as per Regulation №1

The reasons for the appearance of microorganisms are probably the same as with monitoring point EGW 11.

### **13. ASSESSMENT OF THE EFFICIENCY OF THE MONITORING NETWORK FOR 2015**

#### Efficiency

The applied on-site monitoring design provides an overview of the state and tendencies for changes in the hydrodynamic and hydrochemical conditions of surface and groundwaters in the area of the future minesite. Monitoring data analysis leads to the following conclusions about the efficiency of the 2015 monitoring network:

- The location of the monitoring points makes it possible to evaluate the general picture of the water status by providing the option for comparison with an eventual future contamination of surface and groundwaters as a result of Dundee Precious Metals Krumovgrad EAD's operations on the basis of hydrogeological and hydrochemical conditions close to the footprint of the future mine that represent the various types of groundwaters, which by one way or another are geologically connected to the ore body of Ada Tepe and the layers beneath it;

#### Proposals for improving efficiency

- Scheduled points indicated as EGW 01, EGW 08, EGW 09, EGW 10 are included in the Company's 2014 Monitoring Plan to be constructed;
- Potassium should be added as a tested element in all groundwater monitoring points except EGW 05, 06, 07, 11 and 12, since it is among the key ions and influences ion balance.
- In addition to the physical and chemical surface water indicators, the following biological elements for quality shall also be monitored at ESW 08, ESW 09 and ESW 10: Biotic index for macrozoobenthos ("Methods for monitoring the biological element macrozoobenthos in rivers (biotic and trophic index)", and IPS index for phytobenthos - flint (diatom) algae ("Methods for monitoring the biological element phytobenthos in rivers (IPS index)").
- Continue collecting data on static water levels in piezometers until construction works commence, then reduce their number to those that are currently featured in the Monitoring Plan.

### **14. CONCLUSION**

After summarizing the results of tests conducted in 2015 and comparing them with the quality standards provisioned in Regulation № H-4/ 14.09.2012 for Surface Water Characterization (issued by the Minister of Environment and Water, prom. in SG 22/ 5.03.2013, effective 5.03.2013), we can make the following conclusions:

#### 1. Surface waters, as follows:

- Krumovitsa River - meets the requirements for "good" status written in Regulation № H-4, except measurements at ESW 10, some 100 m downstream of the discharge point, where aluminum (Al) and iron (Fe) ions tested on 20.05.2015 exceeded the water quality in rivers of the Krumovitsa type (R9), as per Regulation № H-4. On 18.08.2015 tests conducted at points ESW10 and ESW09 (100 m upstream of the discharge point) showed

- elevated levels of ammonium ( $(\text{NH}_4)$ ), total nitrogen ( $\text{N}_{\text{total}}$ ), phosphates ( $\text{PO}_4$ ), manganese (Mn) and iron (Fe) ions, as well as copper (Cu) ions at monitoring point 9. Subsequent measurements showed no elevated values;
- Egrechka River - meets the requirements of Regulation № H-4. Elevated concentration of lead (Pb) ions was measured only once (small volumes of surface run-off in the summer months);
  - Kessebirdere - meets the requirements of Regulation № H-4, with only one exception on 29.05.2015 with elevated concentration of aluminum (Al) ions;
  - Buyukdere - meets the requirements of Regulation №H-4;
  - Kaldzhikdere - meets the requirements of Regulation № H-4, with only one exception on 09.12.2015 with elevated concentration of iron (Fe) ions.
2. Groundwaters – Groundwaters' quality in the monitoring points is related to the mineralogy of the specific earth layers through which the drillhole passes, as well as the layers through which waters run prior to reporting to the monitoring point. As evident from the information presented in the report, there are elevated concentrations of certain metals, which could be a combined consequence of the mineralogical structure of the layers, piezometers' corroded pipe casing or polluted drillholes from drills. Most common elevated concentrations of ions were those of iron (Fe), aluminum (Al), manganese (Mn) and rarely arsenic (As).
3. Different numbers and types of microorganisms that shouldn't be present in potable water have been detected at monitoring points for groundwaters, used for domestic and drinking purposes. This was most probably due to the fact that sampled water was not chlorinated.