Water Monitoring Report for the Ada Tepe Prospect of the Khan Krum Deposit 2016

Updated Report 2016

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1. INTRODUCTIONAND DESCRIPTION OF THE MONITORED SITE

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 Auriferous Ores from the 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 Auriferous Ores from the Ada Tepe prospect, Khan Krum Deposit, Krumovgrad. Main objectives of the 2016 monitoring:

- Gather and analyze current data to complement the already existing database on water quality prior to commencing construction works at the minesite;
- Provide a database on water quality in the area, to enable a comparison of results prior to the start of construction works and at all subsequent project implementation stages;

The monitoring was conducted at designated sampling points. Results were then used to identify changes in the status of waters in the Ada Tepe area, Khan Krum deposit. Analyses were conducted by a certified lab.

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, which 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. DESCRIPTION OF THE ECOLOGICAL, CHEMICAL AND QUANTITATIVE CONDITION OF THE WATER BODIES RELEVANT TO THE INVESTMENT PROJECT

In terms of the project area, CoM Resolution № 1106/29.12.2016 endorses the 2016-2021 River Basin Management Plan (RBMP) for the East-Aegean Region. The RBMP, together with the respective National Program for its implementation, is the main applicable water management tool. 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 2016-2021 RBMP.

The Company is the holder of a Permit #31530328/04.03.2013 for groundwater abstraction using new abstraction facilities - 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 Qпр = 2,2 l/sec, Qmax. = 5,0 l/sec, the total allowed annual water volume is 70,000 thousand m3/year, of which - industrial water supply is 63 500 m3/year, and domestic and drinking water supply is 6 500 m3/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 larger tributaries of the Krumovitsa River 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, which springs 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 km2;
- 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 of the torrential type, with characteristic summer dry-ups in some parts, which categorize it as a Sub-Mediterranean river type (intermittent river), Code R14 (as per the RBMP).

General Characterization of the River Flows of Krumovitsa (as per RBMP) - watershed area 497.6 km2; mean flow quantities 7,320 m3/s, maximum flow quantities 15,100 m3/s, and minimum flow quantities 2,827 m3/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 nor areas that are identified as potentially impacted by agricultural sources. The hydromorphological pressure on the BG3AR200R009 surface water body has

been categorizes as "weak" in terms of the dykes; impounded areas - weak pressure; drained areas - n/a; urbanization - n/a; inert materials - weak pressure and migration barriers - insignificant pressure.

According to the 2016-2021 RBMP, the importance of impacts caused by climate changes along the Arda River and its tributaries in terms of the adopted RDC 8.5 working scenario for climate changes featuring a gradual increase of greenhouse gases over the years (i.e. the most pessimistic scenario), trend forecasting for river flow changes shall be most prominent in the long-term, namely in 2071-2100. Surface water bodies along the Arda River fall within several areas affected by climate change, as follows:

9 Upper reaches of the Arda River and its tributaries

10 Lower and middle reaches of the Arda River, and lower and middle reaches of its tributaries

The forecast for the uppermost reaches of the Arda River and its upper tributaries is for "average" intensity of climate changes, and "weak" for its middle and lower reaches (and respective tributaries).

The 2071-2100 forecast for climate change impacts on the Krumovitsa River (BG3AR200R009) is indicated as "weak" (see RBMP Appendix 2, sub-section 21).

Table 3-1 Status of Krumovitsa River and its tributaries as per the 2016-2021 RBMP

River basin	Water body code	Water body name	Type	Category	Strongly Modified /No natural water bodies	Biologic indicators	Physical and chemical indicators	Environmental status/ potential	Chemical indicators
Arda River	BG3AR200R009BG3AR200R009	Krumovitsa River and tributaries	R14	River	-	good	good	good	good

There is a significant change compared to previous RBMP data, where the river's environmental status was indicated as "moderate" and its chemical status as "good", thus arriving at a "poor" (moderate) general state of the river.

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 water

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.km2. 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 is 'good' up to 2011.

Interstitial 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 m2/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.

According to the 2010-2011 RBMP, the chemical state of SWB BG3G000000Q010 "Interstitial groundwaters in the Quaternary deposits - Arda River" was evaluated as 'good', similar to previous years.

In 2016 DPMK had no production operations. Minesite construction works began in November 2016 (earthworks). The Company is undergoing due procedures for obtaining other necessary permits, as required by the provisions of the Spatial Planning Act.

In line with statutory requirements and in compliance with the conditions stipulated in EIA Resolution 18-8,11/2011, the Company has been issued the following permits:

- Groundwater Abstraction Permit № 31530328/04.03.2013;
- Water Use Permit № 33140188/21.08.2015 for discharge of wastewater into surface waters, for project design purposes.

The Company has also submitted a Notification dated 06.02.2017 for using surface waters from the Krumovitsa River during the period of onsite construction works.
In line with the stipulations of the Groundwater Abstraction Permit, DPM Krumovgrad completed the construction of the underground section of the groundwater abstraction from shaft well with an infiltration lateral (November 2013 – January 2014). The construction of the facility's surface section and its proper equipment are now scheduled.

4. LOCATION OF MONITORING POINTS, RESPECTIVELY MONITORING STATIONS, INCLUDING THEIR PURPOSE, LOCATION (INDICATED ON A SUITABLY SCALED MAP), COORDINATES, ALTITUDE, CONSTRUCTION

Water quality assessment in the area of the future minesite shall be done by sampling 22 water points - 9 for surface water and 14 for ground water. Supervision was conducted only at already existing water monitoring points, since not all are set up yet. A map of surface and groundwater monitoring points in 2016 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, as follows - name, altitude, coordinates, point type (surface, ground or waste waters), sampling frequency, sampling points' location, purpose, location (on a suitably scaled map) (Appendix 2).

Table 4-1.1: Water monitoring points							
No.	**Title**	**Suspended Solids (m)**	**coordinates : (WGS84)**	**Type**	**of monitored indicators**	**Sampling frequency**	**Location, Description and Objectives**
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 - 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 of 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	Buyukdere - upstream of confluence with Krumovitsa River Identifies the water quality of Buyukdere upstream of confluence with Krumovitsa River terrace.
5	ESW 06	240	E 386225 N 4588202	SW	as described in Table 4-1-2	Once per month	Kaldzhikdere - upstream of the bridge at Pobeda hamlet, 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	Kaldzhikdere - upstream of confluence with 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	. Krumovitsa river, about 200 m downstream of the north sump of the IMWF.
8	ESW 09	215	E 386952 N 4592512	SW	as described in Table 4-1-2	Once per month	. 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	. 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	GW	Water level	Once per month	Hole ID 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

Table 4-1.1: Water monitoring points							
No.	**Title**	**Suspended Solids (m)**	**coordinates: (WGS84)**	**Type**	**of monitored indicators**	**Sampling frequency**	**Location, Description and Objectives**
			E 388187,46 N 4589517.6		as described in Table 4-1-2	4 times per year	conglomerates. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.
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 hamlet), and represents ground water in Palaeocene breccio-conglomerates and sandstones (Krumovgrad Group), with draining direction E-NE to the Krumovitsa River terrace. 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 N 4586825	GW	Water level	Once per month	Eng. Geology drillhole The monitoring point 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.
					as described in Table 4-1-2	4 times per year	
14	EGW 05	220	E 387957 N 4591016	GW	as described in Table 4-1-2	4 times per year	Shaft well 2 - 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.
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, 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.

Table 4-1.1: Water monitoring points							
No.	**Title**	**Suspended Solids (m)**	**coordinates : (WGS84)**	**Type**	**of monitored indicators**	**Sampling frequency**	**Location, Description and Objectives**
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.
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 (piezometer0, 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 (piezometer0, at the toe of the south part of IMWF, between the South Collection Sump and 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. . 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 the quality of waters used for potable and domestic needs.
22	EWW 01	n/a	Design	WW	quantity as indicated in Table 2-2.1. Section "Waters", EMP	Continuous On a monthly basis	Inlet of household wastewater treatment plant. Water quality and quantity will be monitored, as this is important for the subsequent biological treatment process.
23	EWW 02	n/a	Design	WW	quantity as indicated in Table 2-2.1. Section "Waters", EMP	Continuous On a monthly basis	Discharge, household wastewater treatment plant. Water quantity and quality data will be collected prior to discharge.

Table 4-1.1: Water monitoring points							
No.	**Title**	**Suspended Solids (m)**	**coordinates: (WGS84)**	**Type**	**of monitored indicators**	**Sampling frequency**	**Location, Description and Objectives**
24	EWW 03	n/a	Design	WW	quantity as indicated in Table 2-2.1. Section "Waters", EMP	Continuous Once per week	Runoff Storage Pond - water quality and quantity will be monitored in view of the fact that the process is water-quality sensitive.
25	EWW 04	n/a	Design	WW	quantity as indicated in Table 2-2.1. Section "Waters", EMP	Continuous Once per week	North collecting sump of the IMWF - the water quality and quantity will be monitored for reuse in the process.
26	EWW 05	n/a	Design	WW	quantity as indicated in Table 2-2.1. Section "Waters", EMP	Continuous Once per week	South collecting sump of the IMWF - the quality and quantity of water will be monitored for reuse in the process.
27	EWW 06	n/a	Design	WW	quantity as indicated in Table 2-2.1. Section "Waters", EMP	continuous Once per week	Collection sump at the open pit (mine water) -the quality the water will be monitored for reuse in the process.
28	EWW 07	207	E 386952,99 N 4592540.62	WW	quantity as indicated in Table 2-2.1. Section "Waters", EMP	Continuous Once per week	As per the Water Discharge Permit for design – at the discharge point of the waste water treatment plant for industrial wastewater - monitoring of discharge water quality

* "Seasonal" means:

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

Table 4-1.2: Surface and ground waters chemical analysis (Accredited Laboratory and Internal)		
Point #	Assays	**Frequency**
All surface water points	Cu, As, Fe, Mn, Zn, Al, dissolved oxygen, pH, conductivity, N-NH4, N-NO2, N-NO3, total N, P-ortho-PO4, total P, BOD5, Cr (VI), Cr(III), oil and petroleum products, Ni, SO4, Ca, Mg, Cd, Cl, calcium carbonate hardness, Pb, Co, cyanides (free), cyanides (total), chromium (total)*, COD*.	• Once per month by the Company laboratory; • Four times per year by an accredited laboratory *once every year, by an accredited laboratory
ESW 08, 09, 10 – groundwater	Apart from the envisaged physical and chemical profile listed above, the monitoring should also cover the following the biological elements for quality: Biotic index for macrozoobenthos ("Methods for monitoring of 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)") - Order No RD-412/15.06.2011 of the Minister of Environment and Water.	• Once per annum, in summertime
ground water points except for EGW 05, 06, 07, 11, and 12	petroleum products, F, Hg, Pb, Se, Na, B, Sb, total cyanides, total hardness, permanganate oxidability, conductivity, pH, NH4, NO2, NO3, SO4, Cl, PO4, Cd, Cu, Ni, Cr (VI), Al, Fe, Ca, Mg, Mn, Zn, As, natural U, benzene, benzo[a]pyrene, 1,2-dichloroethane, polycyclic aromatic hydrocarbons, tetrachloroethylene and trichloroethylene, single pesticides, total pesticides, total alpha-activity, total beta-activity, total indicative doze.	• Four times per year by an accredited laboratory • Water levels once a month
EGW 05, EGW 06, EGW 11, EGW 12 Drinking water abstractions of Krumovgrad, Ovchari, Zvanarka, and Guliika.	Under Regulation No. 9 on Drinking Water Quality: 1 Microbiological indicators under Table A.1 on water, under art. 6, par. 1, p. 1, 2, and 4: • E. coli; • enterococci. 2 Table B - chemical indicators: acrylamide, antimony (Sb), arsenic (As), benzene, benzo[a]pyrene, boron (B), bromates, vinyl chloride, 1,2-dichloroethane, epichlorohydrin, mercury (Hg), cadmium (Cd), copper (Cu), nickel (Ni), nitrates (NO3), nitrites (NO2), lead (Pb), pesticides, total pesticides, polycyclic aromatic hydrocarbons, selenium (Se), tetrachloroethylene and trichloroethylene, total trihalomethanes, fluorides (F-), chromium (Cr), cyanides (CN-) 3 Table C - indicators that indicate: Ph, Al, NH4, taste, conductivity, Fe, Ca, Mg, Mn, odor, turbidity, Na, total C, total hardness, residual free chlorine, permanganate oxidisable C, SO4, PO4,	• Four times per year by an accredited laboratory

	chlorides (Cl-), color, Zn, Clostridium perfringens (incl. spores), coliforms, number of colonies (microbe number) at 22 °C. 4 Table D - radiological indicators: tritium, total indicative doze, total alpha-activity, total beta-activity, natural U.	
EGW 7 (Fresh water abstraction well supplying the mine site)	Under Regulation No. 9 on Drinking Water Quality: 1 Microbiological indicators under Table A.1 on water, under art. 6, par. 1, p. 1, 2, and 4: • E. coli; • enterococci. 2 Table B - chemical indicators: acrylamide, Sb, As, benzene, benzo[a]pyrene, B, bromates, vinyl chloride, 1,2-dichloroethane, epichlorohydrin, Hg, Cd, Cu, Ni, NO3, NO2, Pb, pesticides, total pesticides, polycyclic aromatic hydrocarbons, Se, tetrachloroethylene and trichloroethylene, total trihalomethanes, F-, Cr, CN^- 3 Table C - indicators that indicate: Ph, Al, NH4, taste, conductivity, Fe, Ca, Mg, Mn, odor, turbidity, Na, total C, total hardness, residual free chlorine, permanganate oxidisable C, SO4, PO4, Cl, color, Zn, Clostridium perfringens (incl. spores), coliforms, number of colonies (microbe number) at 22 °C. 4 Table D - radiological indicators: tritium, total indicative doze, total alpha-activity, total beta-activity, natutal U.	• Four times per annum under Regulation 9 on Drinking Water Quality by an accredited laboratory. One of the four samplings is between 1.08 - 30.09 under the Water Abstraction Permit . • Weekly in a Company laboratory - pH, conductivity, nitrates, nitrites, sulphates, phosphates, chlorides, Cu, As, Fe, Mn, Zn, Al, Ni, Ca, Mg, Cd, Clm, Hg, Pb, Se, Sb, Cr, CN-; • Volume of exhausted waters.

** - only for points ESW 09 and 10, plus the analysis indicators in column 2*

Surface and groundwater samples for testing were taken in March, June, October and December 2016, in line with the adopted 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 2016. 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 Krumovitsa river and its tributaries adjacent to the Ada Tepe minesite. Assay results are presented in Appendix 3 (digital records). These records feature static water level measurements, from 2010 when they were initiated up to 2016.

Chemical tests are in place for water-soluble forms of the elements, which are provided on the front page of each test certificate by an accredited laboratory.The samples were tested in compliance with the laboratory's accreditation and ISO 11885:2007 was applied for water-soluble forms of water samples.

Water analysis at point EGW 07 (Proprietary abstraction well) has not been conducted. The point was placed under care and maintenance by DPMK and sealed by the Plovdiv Basin Directorate, at the request of the Company, until early 2017.

5. MONITORING DURATION AND FREQUENCY

Water samples were taken four times in 2016 by a certified lab. Water quality results from the monitoring points 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 addition in Appendix 3 (in digital format) for better 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 features results from surface and groundwater monitoring points.

6. DATA SHEET PER POINTS

There is an individual data sheet for each present or future groundwater monitoring point that shall be updated for the whole duration of this Monitoring 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 future operational cycle of the minesite. Operations in the open pit and crushing facility shall be scheduled as two 8-hour shifts a day, 7 days a week. The processing of crushed ore shall be a continuous cycle scheduled as three 8-hour shifts a day, 7 days a week.
Internal monitoring shall be conducted parallel to ongoing minesite operations. It shall cover the period from Plan coordination to finalizing all works related to construction, operation and minesite rehabilitation.

8. ANALYSIS OF MONITORING DATA AND REPORTING

- The Company shall 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 its findings shall be published on the company's website (in Bulgarian and English). A Letter of Notification to indicate the web page where results are published shall be sent to the Basin Directorate, East Aegean Region - Plovdiv, to the MoEW and the Regional Environment and Waters Inspection (REWI) – Haskovo. The Company shall also

notify the Greek Ministry of Environment, Energy and Climate Change about the same.

- Once per annum, by 31st March of each year, the Company shall send a Report (in English) on Water Quality Monitoring Plan results 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.
- The Company shall submit an Annual Internal Water Monitoring Report 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 with DPMK's Environmental Department as records, databases with assay results, and data sheets.
Annual Monitoring Reports shall 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 other requirements except those already outlined.

12. RESULTS FROM THE IMPLEMENTATION OF THE MONITORING PLAN

This year sampling and assay of water samples was conducted four times - in March, June, October and December 2016 - by a certified lab (Eurotest-control EAD, Sofia). Samples were taken from surface waters of tributaries and the Krumovitsa River, as well as from groundwaters, including drinking water abstractions. The continuous gathering of data on water quality and quantity shall enable a more precise impact assessment of minesite operations in the future.
Assay results for all monitoring points (also presented in Table format) are available in Appendix 3.

Surface waters

The water quality of Krumovitsa River and its tributaries was tested at 9 points in 2016. Surface waters were tested 4 times in March, June, October and December, under the indicators set out in Section 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, Code R14.

„The report on the Physical and Chemical Quality Analysis was based on the values provisioned by Regulation N-4 /2012 on Surface Water Characterization, which differentiate between good and moderate condition of the water body. The analyzed surface water quality was compared against the standard applicable to chemical elements and other substances in internal surface waters. The values were compared against the regulated limits under the standard for chemical elements and other substances, which are also regulated by regulation N-4/14.09.2012 on Surface Water Characterization (amended and elaborated in SG 79 / 23.09.2014, effective 23.09.2014).

The analysis also included the reference values provisioned in the Regulation on the Environmental Quality Standards (EQS) for priority substances and other pollutants (amended and elaborated in SG 97 /11.12.2015, effective 11.12.2015). the results were compared against the regulated limits, since a recently published 2016 Report on the water quality of the East-Aegean Region reads that a representative sample requires at least 12 samples to be tested in order to identify the averaged chemical status of the year (Section 3.1.1. Chemical Status Identification Approach, second paragraph on page 11 of the electronic copy of the Report). As part of the implementation of the Monitoring Plan (Water Section), the Company took 4 water samples (seasonal).

It was based on the Report of the Basin Directorate-East-Aegean Region. On the basis of the same comparative principle, the water Monitoring Plan of the Company applied the regulated limits under the EQS. Any priority substance which have no EQS regulated limits,

such as Cu and Ni were compared against the EQS Annual Average Concentration values of Regulation N-4 and the EQS regulation.

The narrative of the Report and the attached tables were elaborated with data on the calcium carbonate hardness and the water quality standard values of the respective element. EQS Annual Average Concentration was applied to cadmium (which is a priority element) for the same reasons, and carbonate hardness was determined and provided in column 6 of Appendix 2 to art.2, par.1 of the EQS Regulation

In addition, all findings presented in the Tables (see Appendices) were also compared to the physical and chemical characteristics of the waters, outlined in the passport of R14 water types (sub-Mediterranean small and medium rivers), with a provision of 25-75 percentile. The data from the passport is presented in Appendix 5 'Passports of Relevant River and Lake Types within the East Aegean Catchment. Information Cards (Passports) of River Types within the East Aegean Catchment (Eco-Region 7 'East Balkans') of River Basin Management Plan (RBMP) for the East-Aegean Region for the period 2016-2021. The variances are not discussed in the report; they have been noted in the attached tables only (Appendix 3 'Tables') for more complete comparison of the data from the assayed points with the data available in the RBMR for River Type R-14 'Sub-Mediterranean Small and Medium Rivers'.
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. Samples were taken on: 14.03.2016, 28.06.2016, 03.10.2016, 06.12.2016 (A Sampling Record is presented in Appendix 3).

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

This point is situated to the East, 600m from the village of 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 2016. There was no inflow at the monitoring point at the time of the 03.10.2016 sampling. Test results show that the concentration of copper ions (Cu) in the sample taken on 15.03.2016 was 0,0048 mg/l, compared to the 0,001 mg/l reference value stipulated in Regulation H-4 (for respective carbonate hardness of the water in the

sample). Next two measurements showed concentrations below the detection limit of the method used for analysis. Samples were taken on: 15.03.2016, 28.06.2016 and 06.12.2016 The Sampling Record is presented in Appendix 3.

- 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.
Four water samples were tested in 2016. Test results show that all four water samples are within a normal range. Samples were taken on: 15.03.2016, 28.06.2016, 03.10.2016 and 06.12.2016.. The Sampling Record is presented in Appendix 3.

- 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 terrace. Only one water sample was tested in 2016, since there was no inflow at this monitoring point when other sampling attempts were made.
Sample test results show that the concentration of water pollutants in 2016 remains below the limits provisioned in Regulation H-4/14.09.2012 on Surface Water Characterization. The water sample from this monitoring point was taken on 15.03.2016 The Sampling Record is presented in Appendix 3.

- ESW 06 Kaldzhikdere - 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.
Three water samples were tested in 2016. No water sample was taken in October due to the lack of water.
Sample test results shows the there is no concentration of metal ions above the limits. Only one sample on 06.12.2016 shows electrical conductivity levels of 919 µS/cm, which are higher than the standard ones of 900 µS/cm, stipulated in the Regulation. Samples were taken on: 15.03.2016, 28.06.2016 and 06.12.2016. The Sampling Record is presented in Appendix 3.

- 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 terrace. The waters in this gully are directly connected to 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.
Two samples were taken from this monitoring point in 2016. proving to be dry, just like in the previous two cases. Analyses show no contamination in terms of the sampled components. Samples were taken on 15.03.2016 and 28.06.2016. The Sampling Record is presented in Appendix 3.

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

Four water samples were tested in 2016. Test results show a one-off elevated concentration of total phosphorus (P_{total}) - 12,3 mg/l, compared to 0,3 mg/l, as stipulated in Regulation H-4. Samples were taken on: 15.03.2016, 28.06.2016, 03.10.2016 and 06.12.2016.. The Sampling Record is presented in Appendix 3.

- 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 Company's wastewater treatment facility.
Four samples were taken at this monitoring point in 2016. Assays show that all results from water samples taken on 15.03 and 28.06. 2016 are within the established norms. The other two samples, however, i.e. from 03.10.2016 and 06.12.2016 show higher concentrations that those permitted in Regulation H-4, as follows:

- On 03.10 ammonia nitrogen (NH_4^+ - N) showed a concentration of 3,2 mg/l, compared to the permitted level of >0,65 mg/l under Regulation H-4; The indicator's status in surface waters is "moderate". It was below detection level during a subsequent sampling in December;
- On 03.10 total nitrogen (N total) showed a concentration of 7,6 mg/l, compared to the permitted level of >2,5 mg/l under Regulation H-4; The indicator's status in surface waters is "moderate". During a subsequent sampling in December, the concentration was already down to 1,2 mg/l;
- On 03.10 phosphates (PO_4^{3-}-P) showed a concentration of 0,67 mg/l, compared to the permitted level of >0,15 mg/l under Regulation H-4; The indicator's status in surface waters is "moderate". During a subsequent sampling in December, the concentration was already down to 0,06 mg/l;
- On 03.10 total phosphorus (P_{total}) showed a concentration of 0,75 mg/l, compared to the permitted level of >0,15 mg/l under Regulation H-4; The indicator's status in surface waters is "moderate". During a subsequent sampling in December, the concentration was already down to 0,14 mg/l;
- On 03.10 manganese ions (Mn) showed a concentration of 0,069 mg/l, compared to the permitted level of 0,05 mg/l under Regulation H-4; During a subsequent sampling in December, the concentration was already down to 0,047 mg/l;
- Biochemical oxygen demand (BOD) was below the 5 mgO2/l threshold during both months of sampling, reaching up to 18,6 mgO2/l in October and then dropping to 5,6 mgO2/l in December, which was still below the norm;
- It was just the opposite with iron ions (Fe), which were within the norm during the October sampling - 0,045 mg/l, then reaching up to 0,11 mg/l in December, compared to the permitted norm of 0,1 mg/l (Regulation H-4);

Pollutant concentrations are directly linked to nearby farmlands and their fertilization, and discharged non-treated wastewaters from the local sewage. Samples were taken on: 15.03.2016, 28.06.2016, 03.10.2016 and 06.12.2016. The Sampling Record is presented in Appendix 3.

- 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 2016 the point was sampled four times. During the second sampling in June (28.06.2016) there was an elevated concentration of zinc ions - 0,013 mg/l compared to the permitted level of 0,008 mg/l (for respective carbonate hardness of the water in the sample), displaying a gradual increase since the previous sampling in March. Subsequent two samplings showed concentrations below detection levels. It should be noted that 2015 concentrations for this indicator were elevated to almost the same threshold levels and slightly higher. Yet, this indicator has in general improved. The second indicator with one-time higher concentrations than permitted ones is nitrite ions. The December sampling shows a concentration of 0,082 mg/l compared to the permitted level of 0,06 mg/l, but this is rather a one-time event.
Samples were taken on: 15.03.2016, 28.06.2016, 03.10.2016 and 06.12.2016. The Sampling Record is presented in Appendix 3.

Groundwater

Ground water samples were taken according to the monitoring schedule, with some exceptions. No samples were taken from monitoring point ESW 07, since it is an underground shaft well (to provide water supplies for the mining operation), which was sealed by the Plovdiv Basin Directorate and placed under care and maintenance by the Company until Jan 2017, at the latter's request. Other monitoring points, namely EGW 01, 08, 09 and 10 are not set up yet. A borehole in close proximity to the future EGW 08 was used to collect data from EGW 08 (which is not set up yet). It is indicated as EGW 08 in Sampling Records, for simplicity. This borehole existed by end 2016.
Data gathering about the static groundwater levels continued in 2016 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 piesometers. 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 2016, 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 terrace. The point monitors the water quality in SWB, code BG3G00PtPg2023 - Fissure-flow groundwaters, Krumovgrad-Kirkovo zone.

Assay results show that all tested water indicators meet the quality standard stipulated in Regulation 1/2010 on Groundwater Exploration, Use and Protection. Samplings were made on 14.03.2016, 28.06.2016, 04.10.2016 and 06.12.2016.

- 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 2016 shows that the water at this point meets the quality standards pursuant to Regulation 1/2010 on Groundwater Exploration, Use and Protection, except those described in the Table.

Table: 12-1 Monitoring point EGW03. Dynamic and amplitude by indicators and dates, and compared to water levels

Indicator	Quality standard as per Regulation № 1/2010	Assay in an Accredited lab conducted on 14.03.2016, groundwater level of 5,55 m.*	Assay in an Accredited lab conducted on 28.06.2016, groundwater level of 5,99 m.*	Assay in an Accredited lab conducted on 04.10.2016, groundwater level of 7,01 m.*	Assay in an Accredited lab conducted on 06.12.2016, groundwater level of 7,58 m.*
Manganese (Mn)	(50 µg/l)	50 µg/l	105 µg/l	200 µg/l	261 µg/l
Iron (Fe)	(200 µg/l)	(4.7 µg/l)	(12 µg/l)	250 µg/l	2050 µg/l
Arsenic (As)	(10 µg/l)	5	5	5	53 µg/l

**water level based on the closest measurement by date*

Most probably the presence of iron, manganese and arsenic ions above the norms permitted by the quality standard is due to the fact that groundwater levels have reached easily soluble fractions of minerals containing these metals. Taking into account that rainfalls and groundwater level measurements are interconnected, we can make the correlation that the lower level of water dilution in the summertime most probably leads to a concentration of these metals in the waters. This is also confirmed by the observed annual trend, i.e. concentrations increase gradually throughout the year, albeit at different rates for different metals. High iron ion concentrations could probably be related to the metal pipes used for setting up the piesometer. The three metals were present in an almost identical ratio in 2015, too.

- 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 Monitoring point EGW04. Dynamic and amplitude by indicators and dates, and compared to water levels

Indicator	Quality standard as per Regulation № 1/2010	Assay in an Accredited lab conducted on 14.03.2016, groundwater level of 1,06 m.*	Assay in an Accredited lab conducted on 28.06.2016, groundwater level of 1,8 m.*	Assay in an Accredited lab conducted on 04.10.2016, groundwater level of 2,62 m.*	Assay in an Accredited lab conducted on 06.12.2016, groundwater level of 2,33 m.*
Manganese (Mn)	(50 µg/l)	(30 µg/l)	97 µg/l	90 µg/l	104 µg/l
Iron (Fe)	(200 µg/l)	(20 µg/l)	23 µg/l	(300 µg/l)	(60 µg/l)

**water level based on the closest measurement by date*

Elevated concentrations of ion are most probably due to corroded pipe casing and the natural decrease of groundwater inflow in the piesometer. Elevated manganese levels are most probably due to ongoing natural processes of oxidation and to groundwaters' hydro-geological dynamics. The two metals were present in an almost identical ratio in 2015, too.

- 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 Monitoring point EGW05. Dynamic and amplitude by indicators and dates

Indicator	REGULATION 9 on Drinking and Household Water Quality.	Assay in an Accredited lab conducted on 14.03.2016	Assay in an Accredited lab conducted on 28.06.2016	Assay in an Accredited lab conducted on 04.10.2016	Assay in an Accredited lab conducted on 06.12.2016
Total alpha activity	0,1 Bq/l	0,21 Bq/l	0,091 Bq/l	0,09 Bq/l	0,106 Bq/l

For this monitoring point, it should be noted that unlike in 2015 when there were several elevated concentrations, incl. nitrates, total alpha activity, E.coli, coliforms, clostridium perfringens, enterococci, in 2016 only the "total alpha activity" indicator is with elevated concentrations compared to potable water norms (Regulation 9). Its measurements were almost identical with 2015 ones. Apparently inflow levels in water abstraction facilities have a direct impact on the concentration of pollutants.

- 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 Monitoring point EGW06. Dynamic and amplitude by indicators and dates

Indicator	REGULATION 9 on Drinking and Household Water Quality.	Regulation №1 on Groundwaters	Assay in an Accredited lab conducted on 14.03.2016	Assay in an Accredited lab conducted on 28.06.2016	Assay in an Accredited lab conducted on 04.10.2016	Assay in an Accredited lab conducted on 06.12.2016
Total alpha activity	0,1 Bq/l	0,5 Bq/l	0,161 Bq/l	0,074 Bq/l	0,052 Bq/l	0,078 Bq/l
Chlorine (free)	(0.3 mg/l)	-	(0.078 mg/l)	(1.25 mg/l)	0,218 mg/l	(0.56 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 March sample shows elevated levels of total alpha activity, which entirely correlates to its elevated values in the nearby EGW potable water monitoring point, too. Unlike 2015, in 2016 bromate concentrations were not elevated.

- EGW 07 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.

No assay was conducted in 2016, since this the water supply source was 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 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.

Samples were taken from a geotechnical borehole in close proximity and west of the future monitoring point EGW 08, with the aim to gather data until a proper piesometer is set up at this specific location. This borehole was demolished during construction works and these were the last samplings taken from it. Assay results show that the water at this point meets the quality standards pursuant to Regulation 1/2010 on Groundwater Exploration, Use and Protection. Only one deviation was registered:

Table: 12-5 Monitoring point EGW08. Dynamic and amplitude by indicators and dates, and compared to water levels

Indicator	Regulation №1 on Groundwaters	Assay in an Accredited lab conducted on 14.03.2016, groundwater level of 15,12 m.*	Assay in an Accredited lab conducted on 28.06.2016, groundwater level of 14,42 m.*	Assay in an Accredited lab conducted on 04.10.2016, groundwater level of 15,47 m.*	Assay in an Accredited lab conducted on 06.12.2016, groundwater level of 16,01 m.*
phosphate ions	(0.5 mg/l)	(0.2 mg/l)	010 mg/l	0,66 mg/l	(0.26 mg/l)

**water level based on the closest measurement by date*

Unlike in 2015, when several samples showed elevated concentrations of total indicative doze, total alpha-activity, permanganate oxidability, manganese, iron, oil products, in 2016 all was within norms. Most probably this is due to the natural variations in the content of minerals and different water levels in terms of metals.

- 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 schists 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 schists 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 EGW11. Dynamic and amplitude by indicators and dates

Indicator	Regulation №9 on Drinking and Household Water Quality	Assay in an Accredited lab conducted on 14.03.2016	Assay in an Accredited lab conducted on 28.06.2016	Assay in an Accredited lab conducted on 04.10.2016	Assay in an Accredited lab conducted on 06.12.2016
Clostridium perfringens	0/100 cfu/100cm³	0/100	0/100	2/100	0/100
E. coli	0/100 cfu/100cm³	3/100	4/100	48/100	15/100
coliforms	0/100 cfu/100cm³	7/100	8/100	88/100	35/100
enterococci	0/100 cfu/100cm³	3/100	4/100	48/100	15/100
Total alpha activity	0,1 Bq/l	0,121 Bq/l	0,078 Bq/l	0,071 Bq/l	0,062 Bq/l

Unlike in 2015, when different samples showed elevated concentrations of aluminum, manganese and iron ions, in 2016 all was within norms. Most probably this is due to the natural variations in the content of minerals and different water levels in terms of metals.
As to micro-organism numbers identified by conducted assays, as per established biologic indicators, it should be noted that they remain very much the same as in 2015. There is, however, an increase in the absolute number of micro-organisms per 100 cm2.
As to total alpha activity, the same concentration is also found in the aquifer sands of Krumovitsa River, as well as

- 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 the EGW 12 water abstraction shows that the water at this point meets the quality standards pursuant to Regulation 9/16.03.12001 on the Drinking Water Quality.

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

Indicator	Regulation №9 on Drinking and Household Water Quality	Assay in an Accredited lab conducted on 14.03.2016	Assay in an Accredited lab conducted on 28.06.2016	Assay in an Accredited lab conducted on 04.10.2016	Assay in an Accredited lab conducted on 06.12.2016
Chlorine (free)	(0.3 mg/l)	(0.299 mg/l)	(0.227 mg/l)	(0.4 mg/l)	(0.18 mg/l)
Total alpha activity	0,1 Bq/l	0,248 Bq/l	0,153 Bq/l	0,053 Bq/l	0,099 Bq/l

It should be noted that total microbial numbers of micro-organisms in 2015 are now within the norm, i.e. they were not present in 2016 samples..

13. ASSESSMENT OF THE EFFICIENCY OF THE MONITORING NETWORK FOR 2016

Effectiveness

The applied on-site monitoring design provides an overview of the state and tendencies for changes in the hydrodynamic and hydro-chemical conditions of surface and groundwaters in the area of the future minesite. The analysis of monitoring data brings to the following conclusions about the efficiency of the monitoring network used in 2016:

- The location of the monitoring points makes it possible to evaluate current 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 hydro-geological and hydro-chemical 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 EGW 01, EGW 08, EGW 09, EGW 10 should be set up upon first convenience during the project's construction phase or immediately after that;
- 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 piesometers until construction works commence, then reduce their number to those that are currently featured in the Monitoring Plan. Monitoring should be conducted on a monthly basis.

14. CONCLUSION

After summarizing the results of tests conducted in 2016 and comparing them with the quality standards provisioned in Regulation № H-4/ 14.09.2012 on Surface Water Characterization (issued by the Minister of Environment and Water, prom. in SG 22/ 5.03.2013, effective 5.03.2013), the following conclusions can be drawn:

1. Surface waters, as follows:

- Krumovitsa River - compliant with Regulation №H-4 stipulations for "good" water status, except results observed at monitoring point ESW 09, i.e. 100 m upstream of the wastewater discharge point, which monitoring point serves as reference for the ESW 10 one, where the values of samples taken on 03.10.2016 for NH_4, N_{total}, PO_4, P_{total}, Mn^+ and BOD_5, and then on 06.12.2016 for Fe^+ and again BOD_5 showed elevations above the permitted levels. However, elevated concentrations from previous samples were below the standard threshold. These findings very much confirm 2015 results, when these contaminants had elevated concentrations, too, except total phosphorus, which is present only in the 2016 reporting period. It should be note that the concentration of copper ions remains within norms in 2016. Unlike in 2015, there are no elevated contaminant concentrations at monitoring point ESW 10, except one sample taken on 06.12.2016 regarding N-NO_2 and the 28.06.2016 sample as to zinc ions (Zn^+). Both times, these were one-off cases that had no re-occurrence, unlike in 2015 when Al and Fe ions demonstrated elevated levels compared to Regulation 4 permitted values for rivers of the Krumovitsa type.
- Egrechka River - meets the requirements of Regulation № H-4;
- . Kessebirdere - meets the requirements of Regulation № H-4, with only one exception during the March sampling, which showed a slightly elevated concentration of copper (Cu) ions;
- . Buyukdere - meets the requirements of Regulation №H-4;
- . Kaldzhikdere - meets the requirements of Regulation №H-4, with two exceptions in the sample taken on 06.12.2016 at EGW 06, where the concentration of sulphate ions (SO_4) was elevated, as well as measured conductivity (in the same sample), which is a clear sign of correlation between the two indicators.

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,

piesometers' 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. It should be noted that total alpha activity measurements again exceed those stipulated in Regulation 9 for potable water.