LYDIAN ARMENIA

About the mine

Amulsar gold-bearing quartzite deposit (the Project) is located on the borderline of RA Vayots Dzor and Syunik Regions, within the ridge area of north, north-western branching of Zangezur Range, at the elevation of 2500-2988m.

Reserves of Amulsar gold-bearing quartzite deposit were explored, estimated and given a commercial value as a result of large-scale geological exploration activities at Mountain Amulsar undertaken by Lydian Armenia.

Structurally, the Project is located on the north-eastern edge of the Zangezur ore zone and hosted by two large ore-bearing and non-metallic sequences.

1. Ore-bearing, upper volcanic sequence comprises andesitic volcaniclastic rocks, breccias and tuff ("andesitic coat"), which strikes meridionally about 5,000m, and the thickness is up to 350-400m.

2. Non-metallic, lower volcanic sequence comprises argillically altered homogeneous and non-clastic andesitic rocks. The sequence thickness ranges 100-300m (Middle Eocene).

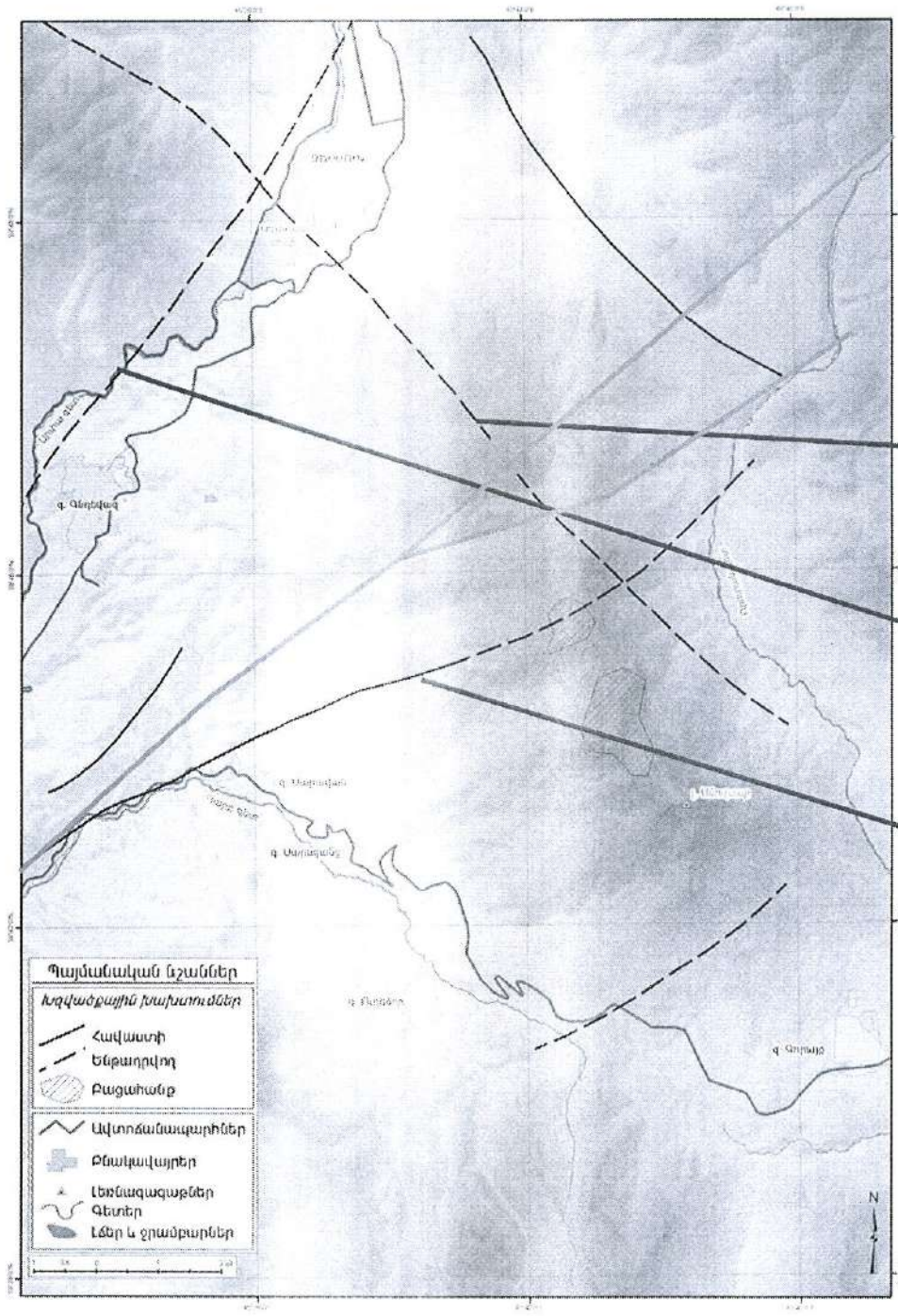
From all the sides the Amulsar tectonic block is confined to major faults, out of which Kechut-Zirak cross fault striking along the northern boundary is noteworthy. From the village of Kechut this fault stretches over the Volcano Zirak to the Vorotan riverheads and it is characterized by the outcrops of minor intrusions and hydrothermally altered rocks, and the mineralization is localized in its upthrown side.

The Amulsar deposit has independent hydrogeological conditions favorable for the mine operation, mining and drilling activities. Hydrogeology of the deposit is distinguished with its independent conditions and in no way it has any connection to mineral and freshwater basins, springs, especially to Jermuk mineral water deposit, which is fed from another tectonic block. From Amulsar it is straddled by deep major Kechut-Zirak fault, located in low 1,000m hypsometric area and is fed from deep layers.

Exploration activities in the Amulsar ore zone identified combined Tigran-Artavazdes, Erato, Arshak and Orontes sites with their own internal structures.

Reserves of Tigranes-Artavazdes, Erato sites have been approved in accordance with RA legislation, and the right for their operation belongs to Lydian Armenia. Lydian Armenia owns all the approved reserves of the deposit, amounting to 89,376.3 Kt of ore; 73,733 kg of gold (average grade of 0.78 g/t) and 294,367 t of silver (average grade of 9,29 g/t).

The deposit is to be developed by combined Tigranes-Artavazdes and Erato open pits, with the annual mining output capacity of 10 Mt of ore.



Metals from the deposit are to be extracted by heap leaching method, which is common international, and will be used in Armenia for the first time.

alternate interpreta or splays

Zirak`

Kechut

Agarakadzor

Home

About Us

Company Overview (index.php?m=pages&p=67)

Lydian Armenia Board of Directors (index.php?m=pages&p=68)

Amulsar Gold Project

About the mine (index.php?m=pages&p=70)

Amulsar Information Center (index.php?m=pages&p=71)

Corporate Governance

Corporate Policies (index.php?m=pages&p=79)

Environmental Policy (index.php?m=pages&p=80)

Media

News (index.php?m=news&p=85)

Community Newsletters (index.php?m=newsletters&p=86)

Videos (index.php?

Economy

Financial Reports (index.php?m=pages&p=91)

Economic Impact (index.php?m=pages&p=92)

Careers

Social Policy (index.php?m=pages&p=81)

Health and Safety Policy (index.php?m=pages&p=82)

Human Resources (index.php?m=pages&p=83)

Procurement Policy (index.php?m=pages&p=97)

m=videos&p=87)

Photo Gallery (index.php?m=photo&p=88)

Presentations (index.php?m=pages&p=89)

Amulsar Project Jobs (index.php?m=pages&p=94)

Vacancies (index.php?m=list&p=95)

Our Employees (index.php?m=pages&p=96)

We Are Social

(https://www.youtube.com/channel/UC3FdEw6IQj16k3JSb5-beta/132026B4)

Subscribe

to our newsletter

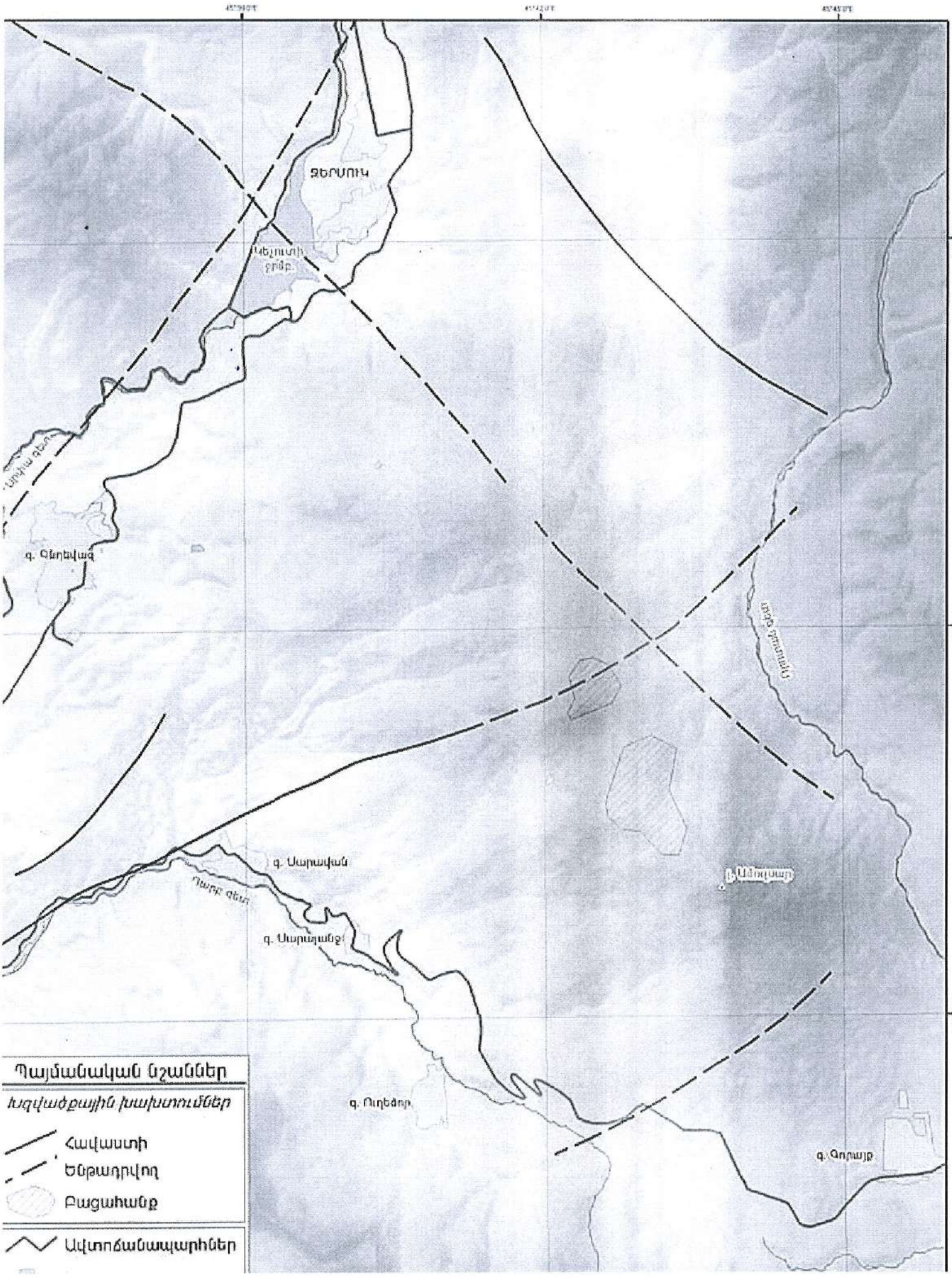
Enter your E-mail Address

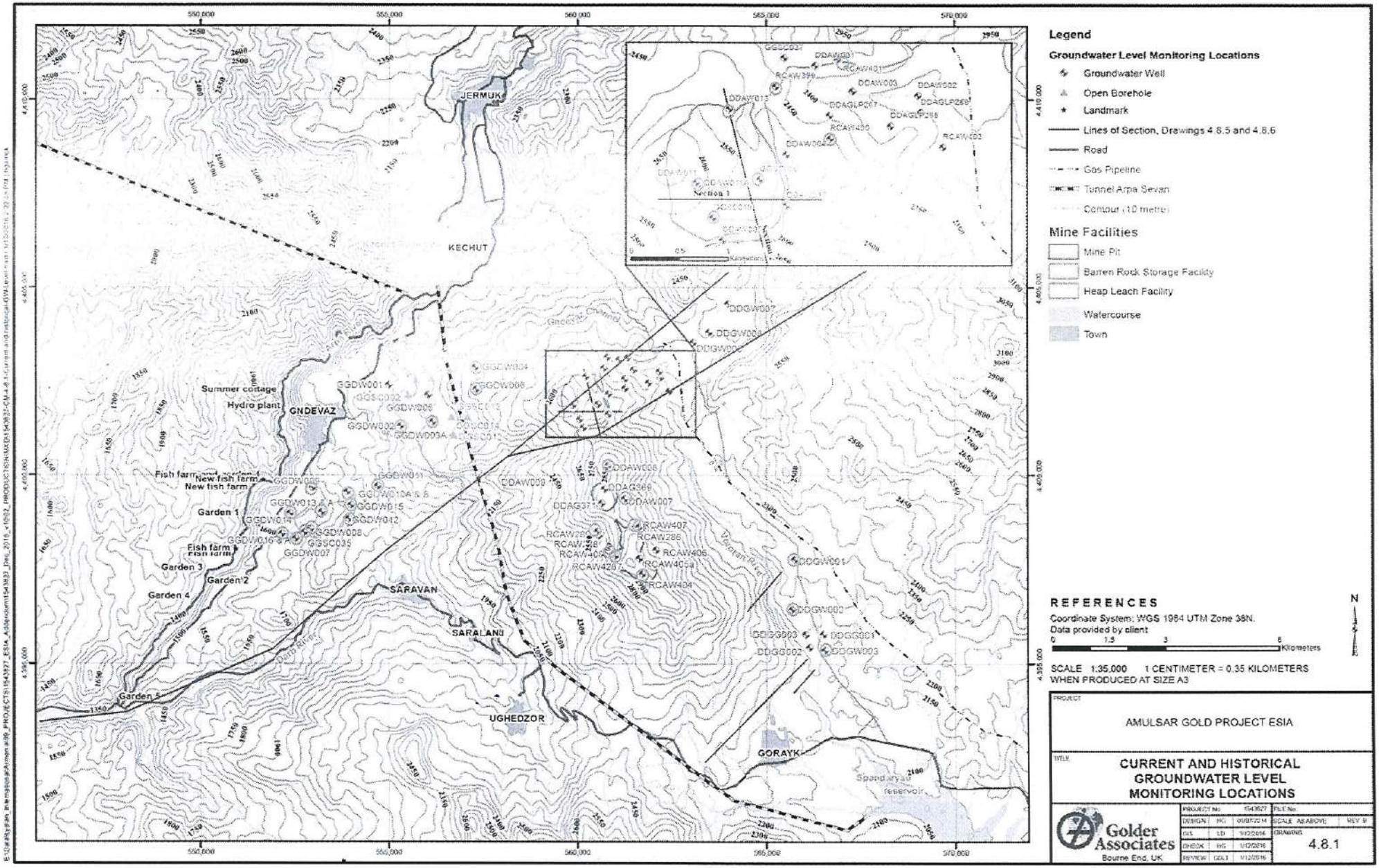
Subscribe

© 2019 Lydian Armenia
All rights reserved.

LYDIAN ARMENIA

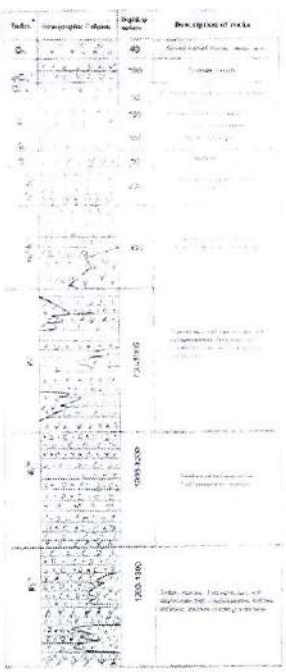
Developed by
ITSecurity LLC
(http://www.itsec.am/)

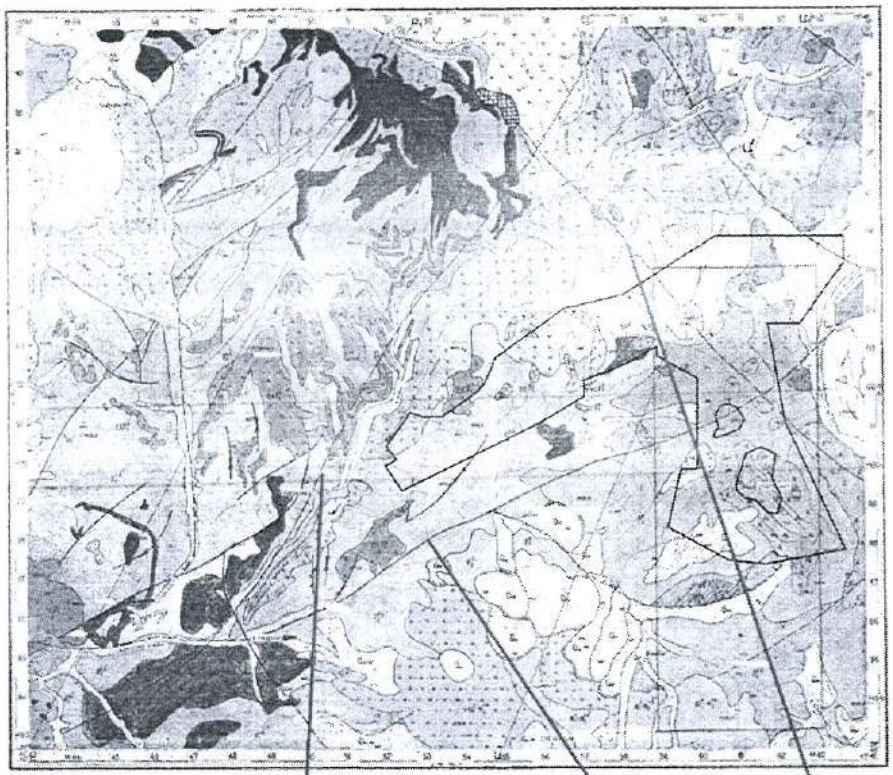

ՋԵՐՄՈՒԿ
գ. Ջեղեվազ
գ. Սարավան
գ. Սարալանջ
գ. Ուղեձոր
գ. Գորայք
Պայմանական նշաններ
Հավաստի
Ենթադրվող
Բացահանք
Ավտոճանապարհներ

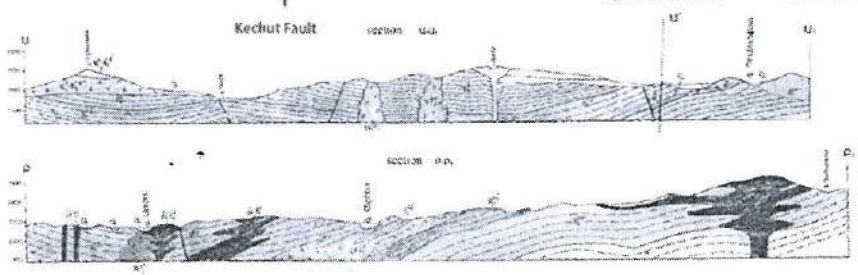

Legend
Groundwater Level Monitoring Locations
Groundwater Well
Open Borehole
Landmark
Lines of Section, Drawings 4.8.5 and 4.8.6
Road
Gas Pipeline
Tunnel Arpa Sevan
Contour (10 metre)
Mine Facilities
Mine Pit
Barren Rock Storage Facility
Heap Leach Facility
Watercourse
Town
JERMUK
KECHUT
GNDEVAZ
SARAVAN
SARALANJ
UGHEDZOR
GORAYK
Summer cottage
Hydro plant
Fish farm
New fish farm
Garden 1
Garden 2
Garden 3
Garden 4
Garden 5
Vedi River
Spandaryan reservoir
REFERENCES
Coordinate System: WGS 1984 UTM Zone 38N.
Data provided by client
0 1.5 3 6 Kilometers
N
SCALE 1:35,000 1 CENTIMETER = 0.35 KILOMETERS
WHEN PRODUCED AT SIZE A3
PROJECT
AMULSAR GOLD PROJECT ESIA
TITLE
CURRENT AND HISTORICAL GROUNDWATER LEVEL MONITORING LOCATIONS
Golder Associates
Bourne End, UK
PROJECT No 1543927
TILE No
DESIGN MG 09/07/2014
SCALE AS ABOVE
REV 0
GIS LD 1/12/2016
DRAWING
CHECK HS 1/12/2016
REVIEW GDLT 1/12/2016
4.8.1

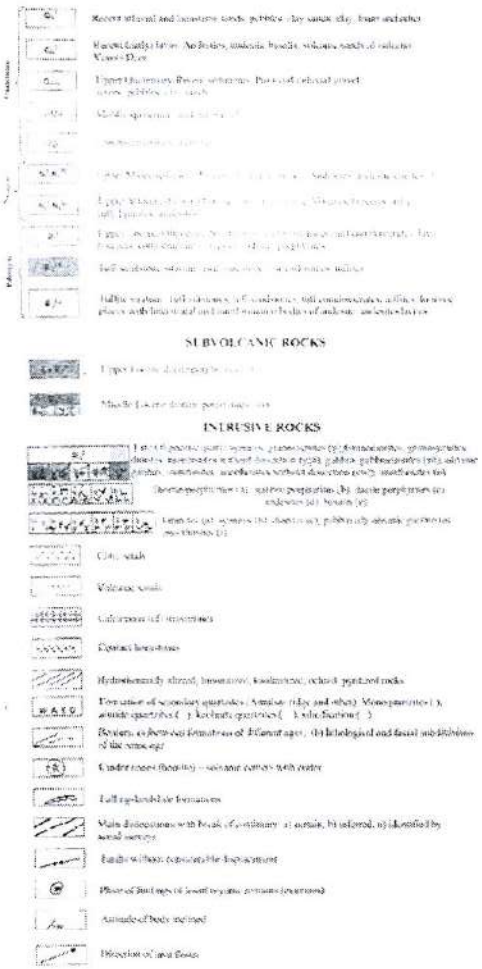
GEOLOGICAL MAP OF VAYOTS DZOR, ARMENIA

Scale 1: 50 000









The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

REPUBLIC OF ARMENIA

GEOTEAM

CLOSED JOINT STOCK COMPANY

WORKING DESIGN

Company: **GEOTEAM CJSC**

Project: **Amulsar gold-bearing quartzite deposit, RA Vayots Dzor Region**

Sections: **Geology**

GEOTEAM CJSC

General Manager **Hayk Aloyan**

Yerevan – 2014

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

TABLE OF CONTENTS

1. GEOLOGY

1.1. Geographical and economic description of the area

Amulsar gold-bearing quartzite deposit is on the borderline of Armenia's Vayots Dzor and Syunik Regions, in the ridge part of north-northwest branching of the Zangezour Range, at the altitude of 2500-2988 m. The mineralization area is located 12 km NW from Gorayk village of Syunik Region, and 10 km south from Kechut village of Vayots Dzor Region. The villages Saravan and Ughedzor are the adjacent settlements.

The Amulsar Mountain of the Zangezour Range is the dividing line between the Rivers Arpa and Vorotan, maximum elevation of which is 2,987.8 m (Amulsar).

In the recent erosion cross section, the Mount Amulsar rises up as a meridional major four-headed oval-ellipsoidal cone step-like cut morphological structure, the peaks of which relatively differ from each other by approximately 20-25 m, maximum up to 110 m. The area of the cone base with the radius of 2 km, edging with the outcrops of unaltered rocks and secondary quartzites, is 12 km^2. The ridge-top part with oblique section and 1 km radius has an area of 3.5 km^2.

The area is woodless. The vegetation cover is represented by shrubs and alpine meadows.

The main rivers are Arpa and Vorotan with their numerous streams. The River Darb, tributary of the River Arpa, flows through the license area.

Three climatic zones have been identified, such as lowlands with dry continental climate, and plateaus with steppe climate for the highlands, and the alpine climate predominates in the ridges. The average yearly amount of rainfalls in the lowlands of the area reaches 300 mm, on the foothills – 400-500 mm, and in the ridges – 500 mm. 20-30 cm topsoil freezes in winter. The snow remains here for about 6 months. The prevailing winds direction is north-eastwards. The eastern winds are dry, and the western ones are wet.

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

The area has a well-occurring infrastructure. Iran-Armenia gas pipeline and high-voltage power transmission lines pass south the Project area. It is planned to lay a railway line and a trunk highway to Kapan and Meghri (North-South Project) along the ravine south the Project area.

Ore and nonmetallic mineral resources have been prospected and explored in the region. Azatek gold-polymetal and Kaqavasar polymetal deposits are the projects prospected in more details.

The area is rich in building materials, out of which andesitic basalts, volcanic tuffs and slags, limestones, sands and other sand detrital formations used in local construction have widespread occurrence in the area.

The population is mainly engaged in farming. Animal husbandry is well-developed.

It will be possible to provide the proposed mining enterprise with work force through hiring people from the villages Saravan, Gndevaz, Gorayk, Kechut, etc.

1.2. Geological structure of Amulsar deposit

Structurally, Amulsar deposit is located on the north-eastern edge of Zangezour ore megazone, which is the boundary of Armenian-Iranian post-Baykal plate, where Mesozoic and Caenozoic tectonic-magmatic formations occur intensively.

The structure of the Amulsar deposit is comprised of two major sequences (from up to down)

1. Ore bearing, upper volcano-sedimentary sequence consisted of andesitic volcanic debris, breccias and tuff (andesitic "cloak"), which are strongly broken in the oxidation and hypergenesis zone, washed and represented by various sedimentary formations: kaolinisation, silification, alunitization, migmatization. The thickness of the sequence reaches up to350-400m. It is of Upper Eocene-Lower Oligocene age. It is overlaying various layers of Eocene.

2. Non-metallic, lower volcanoclastic sequence, consisted of argillitized andesitic rocks, which are homogenous and not broken. The thickness of the sequence is 100-300m. It is of Middle Eocene age.

The andesitic "cloak" of Amulsar deposit stretches meridionally about 5,000m, and the rocks are fractured along its boundaries, mostly in the extrusions of andesitic breccias and brecciated volcanic rocks, which has created favorable conditions for vein and disseminated, i.e. gold-bearing stockwork mineralization and further recent infiltration processes.

Basically the Amulsar deposit borders with the above sequences and is comprised of discrete mineralization centers, which occurrence regularity is due to major ore control structure. Tigranes-Artavazdes, Erato, Arshak and Orontes sites are identified with their particular internal structures.

The ore control structure is represented by:

1. Amulsar ore control north-northwest striking faulting zone dipping south-westwards, and the mineralization is localized in its hanging wing. This is the first category fault.
2. Tigranes-Artavazdes joint ore zone, striking north-eastwards and bordering with Tigranes and Orontes faults. This joint ore zone has occurred in the center of northeastern (Tigranes Site) and southeastern (Artavazdes Site) fracturing. Tigranes-Artavazdes zone is younger, than the

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

Amulsar ore control zone. The thickness of the ore zone is 600-1200 m. From the south the ore zone is confined to the northwest striking Arshak fault. The faults of Tigranes-Artavazdes ore zone are second category faults.

3. Tigranes-Artavazdes ore zone in the central part of the Site Tigranes crosses with the northwest striking Southern Erato fault, and from the north-east the mineralization borders with the Northern Erato fault. The internal structure of the Erato site is due to the center of northwestern and southeastern faults. Northwestern faults of Amulsar deposit area are third category faults, and all intrastructure faults (fractures) – fourth category.

The mineralization of the Amulsar deposit is mostly localized in altered and silicified breccias, which have been subject to oxidation and hypergene alterations. On the surface the Tigranes-Artavazdes ore zone has isometric-oval contour with the length of 800-1,500 m, and the width – 600-800 m. The ore body is traced by drill-holes to 120-250 m depth. Deeper parts are observed in the near root of the extrusion of breccias, where the inclination of the ore body (angle of dip) changes from horizontal to 20-25^0. The lower limit of mineralization is undulating, caused by the contact of the altered and silicified breccias and underlying solid andesit and the boundary of oxidation zone. In fact, currently contoured commercial ore body is located within the boundaries of the strongly oxidized breccias.

Geotechnical surveys proved the high grades of gold to be accompanied by slight mineralization of silver with the grade of 1-4 g/t, which is typical to similar structures and is considered one of the hypogene features. This ore contains no lead, zinc and other metals.

Site Erato is located to north-west (500-750 m) from Tigranes-Artavazdes, where detailed prospecting and exploration activities were undertaken. Geoteam has carried out large-scale core and RC drilling with depth of up to 404m, sampling of surface volcanoclastic rocks, mechanical trench sampling of rocks, geochemical and geophysical complex surveys (magnetic survey, induced polarization, electric prospecting) and hydrogeological activities.

Erato Site is at the elevation of 2,900 m. The oxidation processes occur intensively, and they have traced to 404 m depth by drill-holes. The intensively altered rocks, such as iron oxides and hydroxides, copper secondary sulfides are striking deeper horizons as compared with Tigranes-Artavazdes site.

The oxidation and alteration of rocks, as well as lenticular-dissemination occurrence of leached metals prove the concentration of metals in deep horizons, this means a secondary mineralization zone has been identified with typical chalcosine, covelline and bornite. In this site gold mineralization also occurs in the secondary quartzes rich in iron oxides and hydroxides. These quartzites have been generated in andesitic brecciated inclusions, mostly localizing in intensively fractured bodies forming vein and disseminated concentrations. Here the limonitization and ochring occur relatively slightly.

In Erato Site the ore zone has a rounded morphology (650x650 m) and is traced at about 350 m depth. The ore zone is controlled by Northern and Southern Erato faults, which strike in near-latitudinal (northeastern) direction.

Two large sites have been explored in the area of Amulsar deposit so far. They are discrete centers of mineralization of the combined structure. This combined mineralization centers probably merge at the depth creating a whole porphyric complex, the upper stage is represented by gold-silver mineralization of secondary quartzites.

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

The hydrogeology of the Amulsar deposit is favorable for further development, exploration, mining and drilling activities. The geological structure of the Project area, as well as the morphology of Amulsar deposit located 800-1000m upstream the catchment basins of the rivers Arpa and Vorotan, ensures hydrogeological independent (autonomic) conditions. There is no common water-bearing layer in the Project area. Water chemistry is hydrocarbonate-chlorite-calcium and hydrocarbonate-calcium. The hydrogeology of Amulsar deposit has an independent regime and by no means they have any relation to mineral and freshwater springs of adjacent areas, particularly with Jermuk mineral waters, which are feed from other tectonic block, bordering with Kechut major deep fault and located at hypsometric low level and fed from deep layers.

Amulsar deposit has been formed at shallow depth, at low temperature environment. Gold is represented in finely dispersed form. The mineralization is controlled by faults and concentrates in altered silicified brecciated formations.

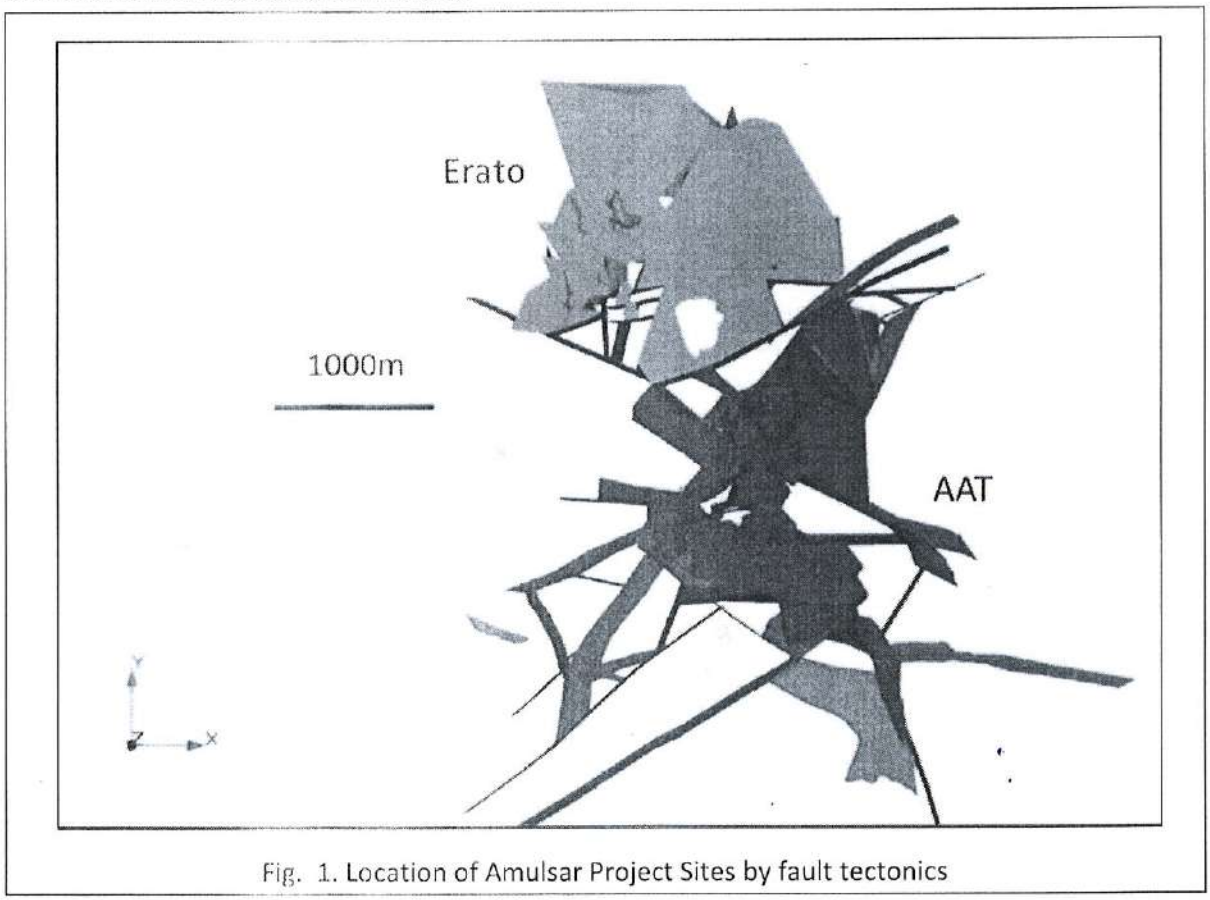


Fig. 1. Location of Amulsar Project Sites by fault tectonics

All the features of high-sulphide epithermal-infiltration gold-bearing system occur in the Amulsar Project area. Thick volcanic dome consists of the pre-ore sequences of lower volcanoclastic rocks and upper andesitic tuffs and ignimbrites. These sequences are gently dipping north-eastwards and they are broken by andesitic brecciated multi-stage extrusions. The latter have occurred in two stages, which caused to occurrence of two phases of hydrothermal alterations. The solid quartzites (monoquartzites), which are the outcome of pre-ore alterations, supported localization of the low-grade disseminated gold mineralization. The second-phase quartz-alunitic alterations occurring later were more favorable in terms of gold-bearing, especially in clastic rocks associated with dome-like extrusions and hydrothermally altered breccias. Gold was separated and localized primarily at the second phase, with brecciated extrusions and their adjacent structures.

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

Almost everywhere in higher parts, rocks are altered up to homogenous quartzites (pre-ore "monoquartzites"), and in lower parts spotted quartzite to quartz-alunitic and clay facies are observed.

It should be noted that the oxidation zone (up to 100-150m deep and more) occur in Amulsar deposit, which is proved by the wide-spread occurrence of iron hydroxides and commercial grades of mineralization at these depths, as well as the infiltration mechanism of formation, which is the result of the occurrence of gold on secondary limonite.

The base of Amulsar volcanic system consists of underlying sequences of volcanoclastic and brecciated flows. The dome flow complex is broken by andesitic second-phase brecciated extrusions, where the mineralization is distributed.

In the central part of the deposit the alteration of rocks is so much intensive that it is not possible to determine the primary structure and mineral composition of igneous rocks. In the parts where the alterations are slight, one can see a homogenous structure of andesitic rocks, where plagioclase fine prevail. Also smaller augite impregnations and fine grains of feldspar are observed.

Hydrothermal (secondary) breccias: Their components have been cemented under the influence of hydrothermal solutions. The hydrothermal breccias occurred at the late stage of gold mineralization. The clastic material consists of both homogenous and heterogeneous separations. Breccias often have not typical fracturing. Sometimes the fragments are ground, in other cases they are not ground and they are broken.

Dykes: Dykes have various composition, a part of which is related to dome extrusions, and some parts are not classified. The edges of calcination are apparent in the contact of dykes, which can be seen from the layering of altered rocks and residues of volcanic structures. Barite dykes are encountered as well. Sometimes they are represented by mass barite covered by the film of coarse-crystalline limonite. Sometimes barite contains powdery formation partly represented by yellowish antimony hydroxide (stibiconite), which has occurred due to the antimonite crystallines.

The other part of powdery formations is represented by bismuthite (bismuth carbonate oxide). The barite dyke also accompanies the ore body of Artavazdes Site. Some increase in the gold grade is seen in barite dykes.

The shallow faults in the sites of the Project are well-defined and their occurrence is based on the formation of clay material in the contacts of altering rocks. Dykes and hydrothermal breccias often concur with faults. Some of them are argillitized, the others contain abundant granular quartz.

Volcanoclastic and volcano-breccia formations are well-defined in the deposit. They are broken by Lower Oligocene (Upper Eocene-Lower Oligocene) intrusive rocks.

The Amulsar Project area has a block structure and from the north it borders with Zirak deep fault, which is clearly seen on the surface with outcrops of gabbroidic, granite-syenitic and granitoidic minor intrusive rocks, along the northern flank of the synclinorium.

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

Three intrusive formations are identified in the Zirak faulting zone: gabbroids, syenites and granite-diorites.

1. The outcrops of *Jermuk* intrusions are exposed in the area between the town of Jermuk, Kechut village and the ruins of the village Zirak.
2. Separate outcrops of *Kechut* intrusions are exposed NE Kechut village, from under the Quaternary lava covers.
3. *Upper Vorotan* intrusions outcrop upstream Vorotan River, spread on two banks of the river,

The Eocene volcanic and volcanoclastic rocks of Amulsar Project area are divided into three groups:

1. Gold-mineralized secondary quartzites altered by iron oxides and hydroxides. They are represented by variety of hematite, geotite, magnetite, limonite, also their intermediate varieties.
2. Primary non-mineralized andesites and plagioandesites and sericitic, rutile-alunitic secondary quartzites.
3. Monoquartzites, rutile and rutile-alunitic secondary quartzites with fine-grained sulphide and overlying superegene ferric mineralization.

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

GEOLOGICAL MAP OF VAYOTS DZOR, ARMENIA

Scale 1: 50 000

STRATIGRAPHIC COLUMN

Index	Stratigraphic Column	Depth in meters	Description of rocks
Q_4		40	
αQN_2^2		100	Andesite-basalt
Q_{III}		50	Pedimental-deluvial, fluvial-lacustrine
Q		100	Andesite-basalt and basalt flows
Q_{II}		100	Andesite-basalt
Q		50	Andesite
$N_2^3 N_2^{sv}$		200	Andesite, andesite-basalt (upper unit)
$N_2^3 N_2^{sv}$		300	Volcanic breccias, tuffs, tuff, lavas of andesites (lower unit)
P_3^3		700-1000	Siltstones, tuff sandstones, tuff conglomerates, lava breccias, conglobreccias, lavas of andesite porphyrites
P_3^{2b}		1000-1200	Stratum of tuff sandstones. Tuff sandstones, tuffites
P_3^{2a}		1200-1300	Tuffite stratum. Tuff siltstones, tuff sandstones, tuff conglomerates, tuffites, andesite, andesite-dacite porphyrites

1.3. Mineral composition and qualitative properties

Amulsar deposit ore is represented by mineralized secondary quartzites, and gold and silver grades are the main indicators of their quality. The grades of gold and silver have been tested in several thousand samples. Based on the assay results gold mineralization in the range of occurrence of secondary quartzites is variable and discrete.

It should be noted that any regularity of distribution of poor, medium and relatively rich varieties of ores is not seen within the area of the deposit, which made impossible to present these varieties of ore in separate estimation blocks when contouring the resources.

Besides the metal contents, the feasibility of the specific weight of ore is also important for unbiased qualitative and quantitative assessment of reserves.

During the exploration activities this index has been determined by Geoid LLC.

The specific weight value of 2.37 t/m^3 has been taken as a basis when estimating the reserves of Erato. By the way, the same value was used also for estimating the reserves of Tigranes and Artavazdes/

1.4. Mineral processing description and flowsheet

The scoping for processing the ore of Amulsar deposit has been carried out in several stages by the companies SGS, WAI and KSA.

The tests at KSA proved the identity of technological characteristic of the ores of Erato, Tigranes and Artavazdes and the feasibility of recovery of gold from the ore of Erato by using the heap leach method.

The feasibility of the process flowsheet (heap leaching, Dore) and the following technological parameters have been proved based on the tests at the American KSA:

- Optimum size of ore crushing – 12 mm;
- Cyanide solution concentration – 0.05%;
- Specific consumption of cyanide solution – 0.13 to 0.44 kg/t
- Specific consumption of lime – 0.73 kg/t
- Heap leaching process duration – 40 days;
- Gold recovery from heap leaching of ore – 88.3%;
- Gold grade in heap leach tails – 0.03-0.09 g/t;
- Gold recovery while getting Dore bar from the ore;
- Silver recovery while getting Dore bar from the ore.

1.5. Amulsar ore reserve estimation

1.5.1. Cutoff parameters

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document

The following parameters have been used for contouring the in-balance reserves of both Tigranes and Artavazes and Erato sites:

- cutoff grade of gold in the ore – 0.20 g/t;
- Minimum allowable contour sizes of the mineralized intervals included in reserve estimation, as well as maximum allowable size of off-grade ore and barren rocks is 5.0m.

1.5.2. Results of Amulsar reserve estimation

The resources of Amulsar Gold Deposit have been estimated and approved by sites.

Site Tigranes was the main prospecting project before 2008. C1 + C2 reserves of Tigranes (about 17.4 Mt ore, approximately 16.4 t gold) were approved by decision №211 dated 23.09.2009 of the Agency for Mineral Resources of RA Ministry of Energy and Natural Resources.

Detailed exploration of Site Artavazdes was completed in 2009-2011. Together with Tigranes the Site Artavazdes has been considered as a joint mineralization zone which reserves were approved by the Agency's decision №309 dated 19.09.2011.

Table 1.1 Ore and gold reserves of Amulsar Deposit, Sites Tigranes and Artavazdes

Indices		Unit	Reserve category		
			C_1	C_2	C_1+C_2
Reserves	Ore	t	**27138760**	**29295718**	**56434478**
	Gold	kg	**27078.5**	**25585.5**	**52664.0**
	Silver	kg	**105137.9**	**105369.3**	**210507.2**
Grade	Gold	g/t	**0.998**	**0.873**	**0.933**
	Silver	g/t	**3.87**	**3.60**	**3.73**

Out of the approved reserves the following commercial reserves of C1+C2 categories of ore, gold and silver were contained within the boundaries of the open pit.

Table 1.2

Level	Ore reserves, t	Average grade, g/t		Reserves, kg	
		Au	Ag	Au	Ag
1	2	3	4	5	6
2960	142127	0,688	3,34	97,8	474,2
2950	336341	0,966	7,47	325,0	2513,2
2940	532496	0,702	3,80	373,9	2022,4
1	2	3	4	5	6
2930	887892	0,676	8,13	600,3	7222,7
2920	1129497	1,081	7,92	1221,0	8945,7
2910	1783224	0,798	3,51	1423,3	6265,6
2900	2345413	0,848	3,07	1989,9	7203,1
2890	2478174	1,033	3,23	2560,8	8011,9
2880	2445970	1,020	2,80	2496,2	6839,9
2870	2535734	0,801	3,77	2031,4	9567,5

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

2860		2771459	1,058	3,57	2931,4	9884,7
2850		2802506	0,909	3,13	2547,2	8768,3
2840		2805369	1,108	3,42	3109,4	9583,0
2830		2762576	0,863	3,79	2383,0	10476,0
2820		2240060	1,044	3,84	2338,1	8603,7
2810		1748136	0,963	4,51	1683,4	7879,3
2800		1527650	1,017	4,70	1553,5	7179,7
2790		1139342	0,961	4,08	1075,7	4565,3
2780		1116934	1,040	4,22	1161,2	4711,5
2770		1124541	1,472	3,18	1655,6	3581,5
2760		660552	0,613	3,22	404,8	2127,9
2750		345389	0,821	3,24	283,5	1120,5
2740		131829	1,258	2,86	165,9	377,3
Total						
C_1+C_2		35776924	0,961	**3,85**	**34394,92**	**137862,6**
Including	C_1	25629479	0,998	**3,88**	**25571,29**	**99535,5**
	C_2	10147445	0,870	**3,78**	**8823,64**	**38327,1**

The estimation block areas on horizontal sections have been measured using AutoCad.

In 2012 the Company VHH LLC completed the working design of the Amulsar gold-bearing quartzite deposit. According to the design, the capacity of the open pit by commercial ore is taken:

1-3 years of operation (I phase) – 2.6Mt;

4-6 years of operation (II phase) – 4.0Mt;

Starting from the 7th year of operation (III phase) – 5.5Mt.

Out of the approved reserves totaling 56438478 t only 55644803 t (98.6% of the approved reserves) were included in the final contours of the open pit.

As of 12.09.2013, the reserves of Erato Site of Amulsar gold-bearing quartzite deposit within the limits proved by the authors of the geological report have been approved by Decision №360 dated 11.12.2013 of the Agency for Mineral Resources. They are tabulated below.

Table 1.3 Explored ore and gold reserves of Amulsar deposit, Site Erato

Reserve category	Reserves			Average grades, g/t	
	Ore, thsd. t	Gold, kg	Silver, t	Gold	Silver
C_1	17824.7	11862.5	45.89	0.666	2.57
C_2	15117.1	9206.5	37.97	0.609	2.51
$C_1 + C_2$	32941.8	21069.0	83.86	0.640	2.55

Total reserves of ore and metals by geological blocks are summarized in Table 1.4. The specific weight value of 2.37 t/m3 has been taken as a basis when estimating the reserves.

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

Table 1.4. Calculation of ore and metal reserves

Reserve block	Block volume, m^3	Ore-bearing factor	Ore volume, m^3	Ore reserves, t	Grade, g/t		Metal reserves, kg	
					Au	Ag	Au	Ag
1	2	3	4	5	6	7	8	9
Level 2900								
Block 1 – C_1	19524	0.83	16129	38225	1.818	3.49	69.5	133.4
Level 2890								
Block 2 – C_1	67738	0.89	60608	143640	0.922	2.67	132.4	383.5
Level 2880								
Block 3 – C_1	94401	0.88	83073	196883	0.437	2.57	86.0	506.0
Level 2870								
Block 4 – C_1	117012	0.97	113502	268999	0.336	2.39	90.4	642.9
Level 2860								
Block 5 – C_1	129853	1.00	129853	307752	0.541	2.03	166.5	624.7
Level 2850								
Block 6 – C_1	137012	0.90	123311	292247	0.451	2.01	131.8	587.4
Level 2840								
Block 7 – C_1	228526	0.93	212529	503694	0.402	1.85	202.5	931.8
Level 2830								
Block 8 – C_1	344202	0.90	309782	734183	0.752	2.06	552.1	1512.4
Level 2820								
Block 9 – C_1	418770	0.88	368518	873387	0.665	2.33	580.8	2035.0
Level 2810								
Block 10 – C_1	484322	0.84	406830	964188	0.559	2.11	539.0	2034.4
Block 10 – C_2	35175	*0.84*	*29547*	*70026*	*0.559*	*2.11*	*39.1*	*147.8*
Total C_1+C_2	519497	0.84	436377	1034215	0.559	2.11	578.1	2182.2
Level 2800								
Block 11 – C_1	524557	0.93	487838	1156176	0.472	2.12	545.7	2451.1
Block 11 – C_2	123519	*0.72*	*88950*	*210811*	*0.667*	*3.35*	*140.5*	*706.6*
Total C_1+C_2	648076	0.89	576788	1366987	0.502	2.31	686.2	3157.7
Level 2790								
Block 12 – C_1	456072	0.95	433268	1026846	0.704	2.37	722.9	2433.6
Block 12 – C_2	125054	*0.95*	*118800*	*281557*	*0.648*	*2.42*	*182.5*	*680.4*
Total C_1+C_2	581126	0.95	552069	1308403	0.692	2.38	905.4	3114.0
Level 2780								
Block 13 – C_1	423303	0.92	389439	922970	0.558	2.27	515.0	2095.1
Block 13 – C_2	63325	*0.92*	*58259*	*138074*	*0.558*	*2.27*	*77.0*	*313.4*
Total C_1+C_2	486628	0.92	447698	1061044	0.558	2.27	592.1	2408.6
Level 2770								
Block 14 – C_1	487534	0.92	448531	1063019	0.640	2.44	680.3	2593.8
Block 14 – C_2	134758	*0.92*	*123977*	*293826*	*0.585*	*1.89*	*171.8*	*554.1*
Total C_1+C_2	622292	0.92	572509	1356845	0.628	2.32	852.1	3147.9
Level 2760								
Block 15 – C_1	468533	0.98	459162	1088215	0.751	3.32	817.2	3612.9
Block 15 – C_2	260464	*0.95*	*247966*	*587679*	*0.879*	*3.69*	*516.8*	*2169.0*
Total C_1+C_2	728997	0.97	707128	1675894	0.796	3.45	1334.0	5781.8

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

Reserve block	Block volume, m^3	Ore-bearing factor	Ore volume, m^3	Ore reserves, t	Grade, g/t		Metal reserves, kg	
					Au	Ag	Au	Ag
1	2	3	4	5	6	7	8	9
Level 2750								
Block 16 – C_1	343738	0.97	333426	790219	1.103	3.84	871.6	3034.4
Block 16 – C_2	332189	0.95	315464	747650	1.089	3.65	813.9	2732.6
Total C_1+C_2	675927	0.96	648890	1537869	1.096	3.75	1685.5	5767.0
Level 2740								
Block 17 – C_1	363221	0.97	352324	835009	0.934	3.44	779.9	2872.4
Block 17 – C_2	309106	0.97	299833	710604	1.014	3.37	720.9	2398.1
Total C_1+C_2	672327	0.97	652157	1545613	0.971	3.41	1500.8	5270.5
Level 2730								
Block 18 – C_1	501903	0.91	456732	1082454	0.643	2.91	696.0	3149.9
Block 18 – C_2	388116	0.84	326485	773769	0.573	3.56	443.7	2752.8
Total C_1+C_2	890019	0.88	783217	1856224	0.614	3.18	1139.7	5902.8
Level 2720								
Block 19 – C_1	526923	0.95	500577	1186367	0.478	2.76	567.1	3274.4
Block 19 – C_2	463790	0.93	430693	1020743	0.443	2.48	452.6	2530.3
Total C_1+C_2	990713	0.94	931270	2207110	0.462	2.63	1019.7	5804.7
Level 2710								
Block 20 – C_1	427947	0.98	419388	993950	0.462	2.32	459.2	2306.0
Block 20 – C_2	373273	0.92	341711	809997	0.384	2.28	311.1	1843.1
Total C_1+C_2	801220	0.95	761159	1803947	0.427	2.30	770.3	4149.1
Level 2700								
Block 21 – C_1	381552	0.98	373921	886193	0.916	2.44	811.8	2162.3
Block 21 – C_2	413164	0.96	396954	940780	0.697	2.23	655.3	2094.5
Total C_1+C_2	794716	0.97	770875	1826973	0.803	2.33	1467.1	4256.8
Level 2690								
Block 22 – C_1	348248	0.86	299493	709799	1.182	2.55	839.0	1810.0
Block 22 – C_2	530517	0.91	482608	1143780	0.738	2.23	844.1	2545.9
Total C_1+C_2	878765	0.89	782101	1853579	0.908	2.35	1683.0	4355.9
Level 2680								
Block 23 – C_1	267408	0.90	240667	570381	0.676	2.71	385.6	1545.7
Block 23 – C_2	571902	0.89	506318	1199973	0.635	2.58	761.6	3092.6
Total C_1+C_2	839309	0.89	746985	1770354	0.648	2.62	1147.2	4638.3
Level 2670								
Block 24 - C_1	282811	0.94	265842	630046	0.643	3.04	405.1	1915.3
Block 24 – C_2	431378	0.96	412637	977950	1.034	2.94	1011.5	2876.5
Total C_1+C_2	714189	0.95	678480	1607997	0.881	2.98	1416.6	4791.8
Level 2660								
Block 25 – C_1	251309	0.94	236230	559866	0.384	2.22	215.0	1242.9
Block 25 – C_2	233176	0.96	224030	530952	0.407	1.85	215.9	982.4
Total C_1+C_2	484485	0.95	460261	1090818	0.395	2.04	430.9	2225.3
2600 ÷ 2660 Level								
Block 26 – C_2	2078160	0.95	1974252	4678977	0.395	2.04	1848.2	9545.1
Overall C_1	8096419	0.93	7520973	17824707	0.666	2.57	11862.5	45891.6
Overall C_2	6867066	0.93	6378544	15117148	0.609	2.51	9206.5	37965.3
Overall C_1+C_2	14963485	0.93	13899517	32941855	0.640	2.55	21069.0	83856.9

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

Since C2 category reserves have been contoured mainly using the extrapolation method over C1 category reserves and thus they are described by the data of a few exploration cross sections, then their direct calculations could result in big errors in indices. For this reason, the indices corresponding to C1 and C1 + C2 category reserves in Table 1.4 have been given separately by direct calculations, and then based on them the values corresponding to C2 category have been defined, which are given in the table in italic font.

The approved ore reserves of all the sites of Amulsar deposit by C1 + C2 categories are summarized in Table 1.5.

Table 5.

Reserve category	Reserves			Average grades, g/t	
	Ore, thsd. t	Gold, kg	Silver, t	Gold	Silver
C_1	44963.46	38941.0	151.028	0.866	3.036
C_2	44412.82	34792.0	143.339	0.783	3.23
$C_1 + C_2$	89376.28	73733.0	294.367	0.825	3.29

Out of the approved C1 + C2 category reserves the following has been included in the final contours of the open pits under this new working design:

Artavazdes and Tigranes (Open pit 1) – 56434478 t ore (approved reserves in full);

Site Erato (Open pit 2):

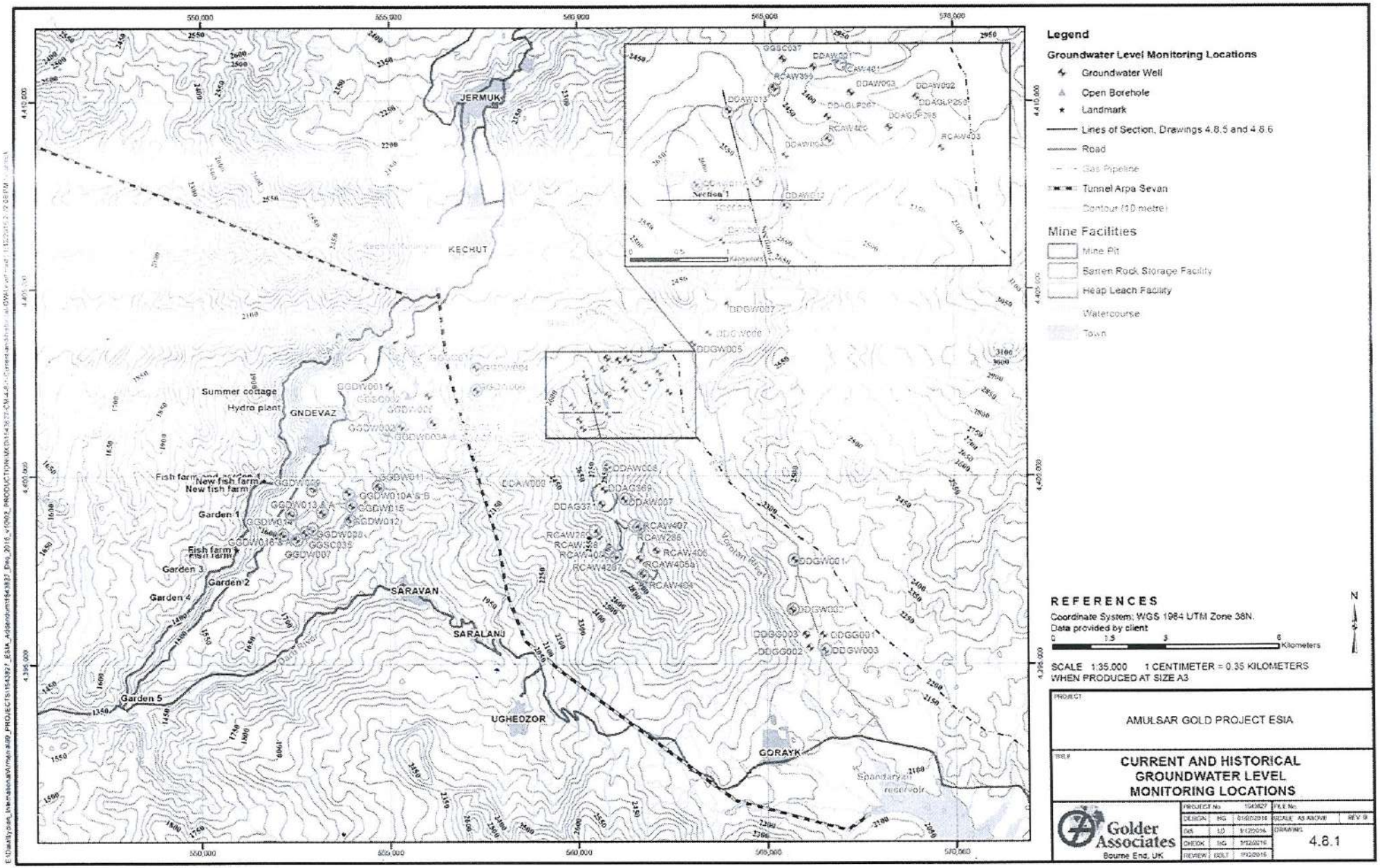
I stage - 21972758t (66.7% of approved reserves)

II stage - 10969097t (33.3% of approved reserves).

The first stage open pit contour matches with the open pit contour designed by the authors of the report.

The original Armenian document has been translated by Lydian into English at the request of the Armenian Corruption, Property Crimes and Cybercrime Investigation Department. If there is any discrepancy between the English and Armenian translation, the Armenian version will prevail as the official document.

Appendix B: Map Showing Hydraulic Conductivity Test Locations


Legend
Groundwater Level Monitoring Locations
Groundwater Well
Open Borehole
Landmark
Lines of Section, Drawings 4.8.5 and 4.8.6
Road
Gas Pipeline
Tunnel Arpa Sevan
Contour (10 metre)
Mine Facilities
Mine Pit
Waste Rock Storage Facility
Heap Leach Facility
Watercourse
Town
JERMUK
KECHUT
GNDEVAZ
SARAVAN
SARALANJ
UGHEDZOR
GORAYK
Summer cottage
Hydro plant
Garden 1
Garden 2
Garden 3
Garden 4
Garden 5
Fish farm
New fish farm
Section 1
Section 2
Vorotan River
Spandaryan reservoir
REFERENCES
Coordinate System: WGS 1984 UTM Zone 38N.
Data provided by client
0 1.5 3 6 Kilometers
N
SCALE 1:35,000 1 CENTIMETER = 0.35 KILOMETERS
WHEN PRODUCED AT SIZE A3
PROJECT
AMULSAR GOLD PROJECT ESIA
TITLE
CURRENT AND HISTORICAL GROUNDWATER LEVEL MONITORING LOCATIONS
Golder Associates
Bourne End, UK
PROJECT No. 1643827
FILE No.
DESIGN MG 01/07/2016
SCALE AS ABOVE
REV. 0
GIS LD 1/12/2016
DRAWING
CHECK MG 3/12/2016
4.8.1
REVIEW EGLT 1/12/2016

Appendix C: Lydian's Responses (April 2019) to ELARD Team Inquiry (Geochemical Model Input Data & Phases and Lydian Press Release about Amulsar Mine Groundbreaking)

Letter for SIC

Question

The highlighted question refers to geochemical modeling. An open system exchanges mass within its surroundings (i.e., allows exchange of gases like carbon dioxide (CO2) and oxygen (O2) between the leachate from the rock and the atmosphere). A closed system does not. The question concerns the assumptions and implementation in the water quality modeling used by Lydian. Specifically, we would like to know whether exchange of the atmospheric gases CO2 and O2 was permitted in the Amulsar model. We understand the model used for the Site is equilibrium, for which the modeler can specify as input whether the modeled waters are in equilibrium with the partial pressures of these gases in the atmosphere.

Response

We assumed an open system. Although our cover modeling showed that the BRSF closure cover will limit oxygen diffusion within the BRSF, it is very complicated to model the depletion of oxygen within the rock. As a simplification, it was assumed that the equilibrium would be fully open with respect to atmospheric CO_2 and O_2.

Question

After the heap leaching operations are completed and before the heap is rinsed with fresh water, what happens to the leach solution that has been used for the past ten years. Please describe the process and actions with sufficient details. And, if such action and details have already been provided or included in the ESIA, please advise where in the ESIA (section and appendix) we can find these details.

Response

From ESIA Chapter 3 (Project Description) Section 3.13.3 Site Wide Project Water Balance during Operation (page 3.65).

The Project will discharge no contact water up to Year 4 of operations. From Year 5 , excess contact water may be generated because the Phase 3 HLF increases contact water volumes beyond the consumptive capacity of the HLF, and because the reduced solution application rate decreases water loss in the HLF. The installation of evaporation sprays on the side slope of the heap will be used to evaporate excess solution. The excess contact water not routed back to the HLP will be treated in a passive treatment system (PTS) (see Section 3.13.5).

Further details on the data behind this can be found in the Site Wide Water Balance (previously provided) in sections 6.1.3 and 6.1.4,

ԼԻԴԻԱՆ
ԱՐՄԵՆԻԱ

26.04.2019թ.
Հ/Ա-2019/84

ՀՀ քննչական կոմիտեի հատկապես կարևոր գործերի
քննության գլխավոր վարչության
կոռուպցիոն, սեփականության ուղղված
հանցագործությունների
և կիբեռհանցագործությունների քննության
վարչության պետ՝
Յու. Իվանյանին

Ի պատասխան Ձեռուկ քննչական կոմիտեից ստացված խնդրանքին, «Լիդիան Արմենիա» ընկերության կողմից տրամադրվել է Շրջակա միջավայրի ազդեցության «Ջերմոցային գազերի արտանետումներ և կլիմայի փոփոխություն» անվանմամբ գլուխ 5.1-ը: Պահանջված փաստաթուղթը ներկայացվել է Կոմիտեին 16 ապրիլի 2019թ:

Տվյալ փաստաթղթի հետ կապված Լիդիանը նկատել է հետևյալ անճշտությունը՝

Խմբագրական վրիպակ է հայտնաբերվել այս գլխում ՇՄԱԳ-ի թարգմանված տարբերակի պատրաստման ընթացքում

- Նկ. 5.1.2-ն իրականում ԲՄԱԳ-ի

Head of Corruption, Property Crimes and Cybercrime Investigation Department

Yura Ivanyan

Lydian Armenia provided Chapter 5.1 Greenhouse Gas Emissions and Climate Change of the Environmental Impact Assessment (2016) in response to a request from the Special Investigative Committee. The requested document was submitted to the SIC on 16 April 2019.

With the document Lydian noted the following error:

During preparation of the translation of the EIA an editorial error has been found in this chapter.

- *Figure 5.1.2 Is actually the same figure extracted from two versions of the ESIA (Figure 6.4.2). The top one is from V10 (2016) and the lower from V9 (2015)*
- *Figure 5.1.4 Is actually the same figure extracted from two versions of the ESIA (Figure 6.4.4). The top one is from V9 (2015) and the lower from V10 (2016)*
- *Figure 5.1.3 is taken from v10 of the ESIA (Figure 6.4.3)*

Lydian included this translation error to maintain full transparency with respect. The EIA was being drafted as the ESIA was being finalised. This

երկու տարբերակներից վերցված նկար է (Նկ. 6.4.2): Վերևի նկարը վերցված է ԲՄԱԳ-ի 10-րդ տարբերակից (v10, 2016թ.), իսկ ներքևինը՝ 9-րդ տարբերակից (v9, 2015թ.)

- Նկ. 5.1.4-ն իրականում ԲՄԱԳ-ի երկու տարբերակներից վերցված նկար է (Նկ. 6.4.4): Վերևի նկարը վերցված է ԲՄԱԳ-ի 9-րդ տարբերակից (v9, 2015թ.), իսկ ներքևինը՝ 10-րդ տարբերակից (v10, 2016թ.)
- 5.1.3 նկարը վերցվել է ԲՄԱԳ-ի 10-րդ տարբերակից (Նկ. 6.4.3)

Թարգմանչական այս վրիպակը նշվում է ՇՄԱԳ-ի թարգմանված փաստաթղթերի ամբողջական թափանցիկություն ապահովելու նպատակով: Քանի որ ՇՄԱԳ-ը կազմվել է ԲՄԱԳ-ի լրամշակման ընթացքում, ապա ՇՄԱԳ-ում սխալմամբ ներառվել են աղյուսակներ ինչպես ԲՄԱԳ—ի տարբերակ 9-ից, այնպես էլ տարբերակ 10-ից: Սակայն միևնույն գրաֆիկի երկու տարբերակների ներառումը որևէ կերպ չի ազդել կամ փոփոխել Ծրագրի գնահատման ընթացքն ու արդյունքները:

Լրացուցիչ հարցերի կամ պարզաբանումների անհրաժեշտության դեպքում, խնդրում ենք դիմել մեզ:

resulted in tables from both v9 and v10 of the ESIA being inadvertently included in the EIA. The inclusion of the two sets of graphs does not, in any way, affect or change the outcome of the assessment of the Project.

Should you have any further questions, or require further clarification, then please do not hesitate to ask.

Հարգանքով՝
«Լիդիան Արմենիա» ՓԲ ընկերության կայուն զարգացման գծով փոխնախագահ
Արմեն Ստեփանյան

ԼԻԴԻԱՆ
ԱՐՄԵՆԻԱ

26.04.2019թ.
Հ/Ա-2019/85

ՀՀ քննչական կոմիտեի հատկապես կարևոր գործերի
քննության գլխավոր վարչության
կոռուպցիոն, սեփականության ուղղված հանցագործությունների
և կիբեռհանցագործությունների քննության վարչության պետ՝
Յու. Իվանյանին

Հարգելի պարոն Իվանյան,

Սույնով հայտնում ենք, որ Ամուլսարի ոսկու ծրագրի շինարարությունը մեկնարկել է 2016թ. օգոստոսի 19-ին: Կից ներկայացնում ենք շինարարության մեկնարկի վերաբերյալ տեղեկությունը:

Հարգանքով
Լիդիան Արմենիա ՓԲԸ կայուն զարգացման գծով փոխնախագահ՝
Ա. Ստեփանյան

Attn: Head of Corruption, Property Crimes and Cybercrime Investigation Department
Yura Ivanyan

Dear Mr. Ivanyan,

Hereby we submit the information on Amulsar Project groundbreaking event that took place on August 19, 2016.

Kind regards
Lydian Armenia Sustainability VP
Armen Stepanyan

Amulsar project Groundbreaking Event

On August 19, a Ground-breaking ceremony for Lydian Armenia's Amulsar project took place in the future area of the heap leach facility, at Vayots Dzor Marz of Armenia.

The ceremony was attended by the Prime Minister of Armenia Mr. Hovik Abrahamyan, Minister of Energy and Natural Resources L. Yolyan, Minister of Economy A. Minasyan, heads of communities of Jermuk, Gndevaz, Saravan and Gorayk, Lydian board of directors, several shareholders, representatives of EBRD and IFC, heads of Yerevan offices of the World Bank Mrs. Laura Bailey and IMF Mrs. Teresa Daban Sanchez also attended the ceremony. Ambassador of the USA in Armenia Mr. Richard Mills and Ambassador of the UK in Armenia Mrs. Judith Farnworth were also present at this milestone event.

(http://www.lydianarmenia.am/img/news/1471965832.33.jpeg)

Addressing more than 100 guests, community members and Lydian staff Lydian President and CEO Mr. Howard Stevenson welcomed all guests to this new and exciting phase of Amulsar project. He conveyed his gratitude to the Government of Armenia, the communities, heads of diplomatic missions for trust and continuous support. "We know what motivates you is the desire to see a different, better mining operation in Armenia. I want to assure we will do our best to show that there is a different way of doing business, that mining can be responsible, that mining can be safe and that it can benefit the people around the mine. We are here to make it happen during the next 12 years together with all of you".

In his speech Prime Minister of Armenia Mr. Hovik Abrahamyan noted:

"From day one we have greatly supported Amulsar project and we are sure it will be successfully implemented. We have come a long way, we had objective and subjective difficulties but importantly this groundbreaking is taking place today for which I am very glad as the head of the Government. With the decline in foreign investments the launch of such a large scale project is essential. I especially want to welcome the participation of IFIs, particularly IFC and EBRD in the project. I am confident that Amulsar project will create new opportunities for the economic development of Armenia."

On the occasion of the start of construction of Amulsar project Ambassador of the United States in Armenia Mr. Richard Mills conveyed a message which reads: "We congratulate Lydian on this remarkable milestone and welcome the Amulsar project to the country, which will help strengthen the Armenian economy. We are pleased with Lydian's involvement, as a member of the AmCham and a member of the Extractive Industries Transparency Initiative (EITI) working group, in creating a level business playing field and strengthening a strong social corporate responsibility culture here in Armenia. We trust the company will continue to serve as an example of responsible mining, operating transparently in line with international environmental and social standards."

In her message Ambassador of the UK to Armenia Mrs. Judith Farnworth noted: "This is a groundbreaking event not just for Lydian but also for Armenia. I congratulate Lydian and their many Armenian partners for their years of hard work to reach this momentous day. I think one of the keys to this success is the dialogue which Lydian has conducted: with the Armenian government, local authorities, civil society and perhaps most crucially with the local communities. Through this engagement Lydian has provided assurances that it is committed to responsible mining, bringing economic and social benefits to Armenia whilst respecting the importance of environmental protection.

This approach embodies the principles of the Extractive Industries Transparency Initiative (EITI). We welcome Armenia's commitment to join EITI and are confident that Lydian will play a constructive role as a member of the Multi Stakeholder Group. The UK Embassy stands ready to continue our support to Armenia in its efforts to attain this global standard to promote the open and accountable management of natural resources by sharing UK experience and expertise. We believe Armenia's membership of EITI will boost investor confidence in Armenia's mining sector and attract new interest from domestic and overseas investors. The British Embassy will also continue to work with the Government of Armenia and industry in other sectors to help improve the business climate and promote economic reform in Armenia for the benefit of all."

Amulsar project is going to be the largest investment project in Armenia, planning to invest 370 million USD into the project construction (2016-2018). At peak construction up to 1300 jobs will be secured, while during 10 years of production up to 700 people will be employed directly by Lydian Armenia.

Amulsar project is the first project in Armenia to have produced an Environmental and Social Impact Assessment compliant with IFC and EBRD Performance Standards and Requirements.

In his speech Lydian Armenia General Manager Mr. Hayk Aloyan reiterated the company's commitment to build and operate the project in line with good industry practice, to benefit the country and the company shareholders.

Home

About Us
Company Overview (index.php?m=pages&p=67)
Lydian Armenia Board of Directors (index.php?m=pages&p=68)

Amulsar Gold Project
About the mine (index.php?m=pages&p=70)
Amulsar Information Center (index.php?m=pages&p=71)

Corporate Governance
Corporate Policies (index.php?m=pages&p=79)
Environmental Policy (index.php?m=pages&p=80)
Social Policy (index.php?m=pages&p=81)
Health and Safety Policy (index.php?m=pages&p=82)
Human Resources (index.php?m=pages&p=83)
Procurement Policy (index.php?m=pages&p=97)

Media
News (index.php?m=news&p=85)
Community Newsletters (index.php?m=newsletters&p=86)
Videos (index.php?m=videos&p=87)
Photo Gallery (index.php?m=photo&p=88)
Presentations (index.php?m=pages&p=89)

Economy
Financial Reports (index.php?m=pages&p=91)
Economic Impact (index.php?m=pages&p=92)

Careers
Amulsar Project Jobs (index.php?m=pages&p=94)
Vacancies (index.php?m=list&p=95)
Our Employees (index.php?m=pages&p=96)

We Are Social

(https://www.facebook.com/LydianArmenia/?ref=bookmarks)

Subscribe

to our newsletter

Enter your E-mail Address

Subscribe

© 2019 Lydian Armenia
All rights reserved.

LYDIAN ARMENIA

Developed by
ITSecurity LLC
(http://www.itsec.am/)

LYDIAN ARMENIA

26.04.2019
Հ/Ա-2019/86

ՀՀ քննչական կոմիտեի հատկապես կարևոր գործերի
քննության գլխավոր վարչության
կոռուպցիոն, սեփականության ուղղված հանցագործությունների
և կիբեռհանցագործությունների քննության վարչության պետ՝
Յու. Իվանյանին

Head of Corruption, Property Crimes and Cybercrime Investigation Department
To Mr. Yura Ivanyan

Հարգելի պարոն Իվանյան,

Յուրի Իվանյանը «Լիդիա Արմենիա» ընկերությունից պահանջել է տրամադրել պատասխաններ Ամուլսարի ոսկու հանքի ծրագրի ԴԱԼ-ի և բացահանքերի հոսակորուստների վերաբերյալ՝ «ELARD» ընկերության կողմից բարձրացված մի շարք հարցերին: Սույն նամակն ու դրան կից ներկայացված փաստաթղթերը Լիդիանի պատասխաններն են նշված հարցերին: Դրանք նաև հիմնավորող տվյալներ են, որոնք, մեր կարծիքով, կօգնեն ԷԼԱՐԴ-ին առավել լավ պատկերացում կազմել տվյալ հարցերի վերաբերյալ

Dear Mr. Ivanyan

Lydian Armenia were requested by Yura Ivanyan to provide answers to a number of queries raised by ELARD relating to BRSF and Pit Seepage Water aspects of the Amulsar Gold Project.

This letter, and its attachments provide the Lydian responses to those questions as well as supporting information where we believe it add to the understanding of ELARD.

ELARD Question/Comments	Lydian Response	Supporting documentation
BRSF and Pit Seepage Water		

We need a description of what is being modelled,		
Sources of water input, including water quality for each source and mixing ratios	See attached memos	Pit Backfill Seepage and Water Quality Model Results_v1 Pit Surface Water Quality Memo_14JUL14
Description of the processes causing changes in the water quality (e.g., flow through the rock in the BRSF resulting in adsorption, precipitation onto the rock surfaces	Equilibrium processes. Precipitation processes. No adsorption considered. Please keep in mind that more complicated geochemical models do not necessary result in better simulations. GRE used a field-data-based approach but still included equilibrium and precipitation. In summary, this is a more complicated mixing model that what was performed by Golder in the groundwater model and in the assessment of the impacts to local water bodies. In GRE's simulations, acid-base reactions, precipitation, and dissolution reactions can occur as solutions based on direct field or laboratory measurements come in contact with each other.	
A discussion of how much pyrite oxidation has been included in developing the input water quality description	The pyrite oxidation was taken as an empirical factor based on humidity cell test results.	
Required model details		
What is the pH of the water?	Variable	See attached memos

Are the systems modelled as open or closed?	Can you please elaborate on this question? – open and closed with respect to what?	
Are the solutions in equilibrium with atmospheric CO_2 and O_2? Are pH and pe specified?	They are specified in the pre-mix solutions.	
What is the log of the activities of CO_2 and O_2?	The geochemical mixing models cover the solution transport either within the BRSF or within the pit walls. Both of these systems were assumed to be in equilibrium with CO2 and O2 within the vadose zone of the barren rock, or in the pit backfill. See embedded table below, it's the equilibrium mix table associated with the PHREEQCI model.	

Name	Saturation Index	Moles	Precipitation Only
Alunite	0	0	TRUE
Basaluminite	0	0	TRUE
Birnessite	0	0	TRUE
Boehmite	0	0	TRUE
CO2(g)	-3.5	1	
CupricFerrite	0	0	TRUE
CuprousFerrite	0	0	TRUE
Diaspore	0	0	TRUE
Fe(OH)2.7Cl.3	0	0	TRUE
Fe(OH)3(a)	0	0	TRUE
Gibbsite	0	0	TRUE
Goethite	0	0	TRUE
Hematite	0	0	TRUE
Jarosite(ss)	0	0	TRUE
Jarosite-K	0	0	TRUE
Maghemite	0	0	TRUE
Magnetite	0	0	TRUE
Nsutite	0	0	TRUE

	O2(g)	-0.67	1	
	Plumbogummite	0	0	TRUE
	Pyrolusite	0	0	TRUE
	Strengite	0	0	TRUE
What is the solution temperature?	25 degrees C. This is not considered to be a sensitive factor			
What redox couple was specified?	We assumed an ARD source taken from the K-cells - and for simplicity only did equilibrium reactions			
What database was used, MinteqA2 or PHREEQC? Or a modified database?	Minteq.v4.dat 11091 2016-04-21			
Is evapoconcentration simulated?	This is not necessary. Please consider that all solutions are immediately treated or consumed – apart from groundwater which will not evapo-concentrate			
Which phases with a saturation index greater than 1 are specified to precipitate?	See table above, all phases listed as TRUE			
Is sorption to hydrous ferric oxide simulated? Number of surface sites and surface area? Are any ions omitted from sorption	It is not. This is a conservative estimate of metals concentration because sorption to ferric iron is not included.			

replaced by aluminum in the

seepage. What

	O2(g)	-0.67	1	
	Plumbogummite	0	0	TRUE
	Pyrolusite	0	0	TRUE
	Strengite	0	0	TRUE
What is the solution temperature?	25 degrees C. This is not considered to be a sensitive factor			
What redox couple was specified?	We assumed an ARD source taken from the K-cells - and for simplicity only did equilibrium reactions			
What database was used, MinteqA2 or PHREEQC? Or a modified database?	Minteq.v4.dat 11091 2016-04-21			
Is evapoconcentration simulated?	This is not necessary. Please consider that all solutions are immediately treated or consumed – apart from groundwater which will not evapo-concentrate			
Which phases with a saturation index greater than 1 are specified to precipitate?	See table above, all phases listed as TRUE			
Is sorption to hydrous ferric oxide simulated? Number of surface sites and surface area? Are any ions omitted from sorption	It is not. This is a conservative estimate of metals concentration because sorption to ferric iron is not included.			
The modelling shows a quantitative replacement of the ferrous iron seen in the humidity cells water being replaced by aluminum in the BRSF seepage. What	We do not believe you are seeing replacement. We believe we are seeing precipitation of the iron as ferric iron.			

reactions account for this replacement?		
Concentrations of all the major ions in water so that we can do a charge (anion-cation) balance!	All anion-cation balances in the resultant solutions are less than 5%. GRE can provide a tour of the PHREEQC models if requested.	
Heap Leach Facility (HLF) - Barren Leach Solution (BLS))		
During operations, the BLS has been in circulation through the ore pile for 10 years, with several reagents added in each cycle, yet, the predicted water quality given in Table 2 of the Hydrogeologic Risk Assessment - Proposed HLF (the BLS and Detoxified Solution Analysis) seems relatively clean.		
Is this water quality the result of geochemical modelling? And, if so, the same questions as BRSF/Pit water modelling above apply and need Lydian's input. If not, what was the basis for the projected water quality	No, it is the result of laboratory work undertaken by SGS	Kappes, Cassidy Associates report is provided
Some parameter concentrations in the Table are questionable. Was the Table checked for typographical errors or verified with the lab?	Yes, the table was checked, but the data was not cross checked with the laboratory by Golder Associates. The original source for the data was Kappes, Cassidy Associates (2013) and the data was included in the projects 43-101 Feasibility Study (SGS, 2015).	Kappes, Cassidy Associates report is provided
Finally, it is somewhat unclear from the reports as to what happens to the leach solution itself after closure. What is the fate of	It goes into its own passive treatment system. *'Geochemical modeling and prediction of post-closure HLF drain down flow will be advanced during the mine life with the results included in future RC&R Plan*	Section 3.2.7.5 of ESIA Appendix 8.18 the Preliminary Mine Reclamation, Closure and Rehabilitation Plan

the barren solution used in the HLF after closure?	*updates. It is anticipated that future drain down modeling and geochemical characterization data will be used to optimize the passive treatment process.'*	

Այս հնարավորությունից օգտվելով կցանկանայինք բոլոր ընթերցողներին հիշեցնել, որ ՇՄԱԳ/ԲՍԱԳ-ի շրջանակներում ԴԱԼ-ի նախագծի հետ կապված այս աշխատանքը հիմնված է եղել 2014թ. առկա տվյալների վրա, և ըստ գնահատման, դատարկ ապարների մոտ 40%-ը պոտենցիալ թթվագոյացնող են: Սակայն, ԹԱԴ Բլոկի մոդելի հիման վրա հետագայում կատարված (նախկինում ներկայացված) գնահատումները ցույց տվեցին, որ ՊԹԳ նյութի քանակությունն իրականում մոտ 11% է, և հետևաբար, արտահոսքի մոդելավորման մեջ կիրառված համամասնականության գործակիցը հնացած է, սակայն, կարևոր է նշել, այն նաև «հատկապես պահպանողական է» մոդելի կանխատեսումների առումով:

We would also like to take this opportunity to reiterate to all readers that the work completed with respect to the design of the BRSF for the EIA/ESIA was based on data available in 2014 and included an estimate that 40% percent of waste rock material was potentially acid generating (PAG) material. However, following further evaluation of the PAG material using the ARD Block Model (previously submitted) the estimated amount of PAG material is actually nearer 11% and therefore all mixing factors used in the seepage modelling are essentially obsolete, but importantly also "extra conservative" with respect to the model predictions.

Հարգանքով՝
«Լիդիան Արմենիա» ՓԲ ընկերության կայուն զարգացման գծով փոխնախագահ
Արմեն Ստեփանյան

"Lydian Armenia" CJSC Vice President of Sustainability
Armen Stepanyan