Paper 41

Chelopech: An Exploration Perspective

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ABSTRACT

The intermediate-level high-sulfidation Chelopech Cu-Au epithermal deposit has been the subject of near continuous exploration for the past fifty years. Current estimated Measured and Indicated mineral resources within the underground Chelopech deposit are 24.93Mt @ 4.0g/t Au, 1.5% Cu (374,000t Cu, 3.21Moz Au) with additional Inferred mineral resources of 6.5Mt @ 3.2g/t Au, 1.2% Cu (78,000t Cu, 0.67Moz Au). State-funded exploration began over the Chelopech deposit during the mid-1950s, initially with surface geochemical sampling and geological mapping. The results of these activities lead into a prolonged period of surface and underground exploration primarily utilizing diamond drilling technology during the period 1956 to 1990. The Chelopech deposit (Western and Central) is part of the larger Chelopech hydrothermal system which also includes the Vozdol intermediate-sulfidation epithermal vein system, the Sharlodere high-sulfidation epithermal system (also referred to as Eastern) and the Petrovden 'porphyry-style' mineralization. The surface expression of hydrothermal alteration over the Chelopech deposit is characterized by a typical alteration assemblage for high-sulfidation epithermal systems and is relatively discrete and poorly developed over the Western and Central Chelopech orebodies. Exploration activity during the post-1990 period primarily corresponds to underground diamond drilling within the Chelopech deposit together with the introduction of modern geophysical techniques and the recommencement of surface exploration drilling. The primary aim of this paper is to review the results of the surface exploration conducted during the State-funded period and apply them to the current phase of modern exploration; specifically focusing on the Chelopech deposit. Results indicate that discovery rates could have been optimized by electing to drill the Chelopech deposit alteration footprint area on a nominal 100m x 100m surface grid spacing. Insufficient data is available to evaluate the effects of having a robust geological model based on epithermal deposit characteristics available during the early part of the historic exploration programme. The use of appropriate geophysical techniques early in the exploration program is a clearly favorable situation when exploring for Chelopech-style mineralization. Therefore, future underground and surface exploration must be performed on a systematic basis when targeting mineralized domains in areas where data currently exists. Conceptual exploration targeting outside known areas of mineralization should be performed on the basis of a robust 3D geological-structural model for Chelopech-style high-sulfidation epithermal systems. The use of downhole electromagnetic geophysical techniques should logically become a mandatory element of exploration programs within the Chelopech deposit providing that the technical difficulties associated with data acquisition within a high noise operating mine environment can be overcome.

INTRODUCTION

The intermediate-level high-sulfidation Chelopech Cu-Au epithermal deposit is located approximately 60km to the east of Sofia, Bulgaria (European Union member state since 1st January, 2007). During the modern era the deposit area was first described during the late 19th century and again in the early part of the 20th century (Chambefort, 2005). Prior to World War II a French company "Luda Yana" is believed to have first carried out exploration activities, although little evidence remains today to elaborate on said activity.

Well funded exploration began over the Chelopech deposit during the mid-1950s, initially with surface geochemical sampling and geological mapping. The results of these activities lead into a prolonged period of surface and underground exploration primarily utilizing diamond drilling technology during the period 1956 to 1990. This period should be considered as the State-funded exploration period during which the Bulgarian State was responsible for the financing and operation of all geological works. The end of this period correlates with the collapse of the former Soviet Union and a general shift towards a free market economy. In 1990 the Bulgarian Government effectively put the Chelopech deposit into 'care and maintenance' by decreeing that the high arsenic Cu-Au concentrate could no longer be treated at the nearby MDK-Pirdop copper smelter. In January 1994, operations were restarted by Navan Bulgarian Mining BV, a Dutch registered subsidiary of Navan Mining Plc. In 1995, Homestake Mining Company (Homestake) purchased an option to acquire up to a 50% interest in Navan Bulgarian Mining BV. In December 1996 Homestake determined that due to the

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deteriorating political and economic situation in Bulgaria, it was likely that further development of the Chelopech project would be delayed substantially and terminated the option agreement (Homestake Mining Company, 1997). There followed a number of local ownership changes until 1999 when the Bulgarian Council of Ministers and Navan Chelopech AD signed a 30 year concession agreement for the extraction of gold-copper ores. Navan Mining Plc. remained the operator of the Chelopech deposit until they went into receivership in 2002, after which the operations continued under the direct control of an administrator appointed by Deutsche Bank AG of London. During 2003 Dundee Precious Metals Inc. (Dundee) became the operator of the Chelopech deposit following the acquisition of the Bulgarian assets of Navan Mining Plc. Dundee remain as operators to the current day via their Bulgarian subsidiary Chelopech Mining EAD.

Ore production from the Chelopech deposit was first recorded in 1954 (although gold grades are unavailable for the period 1954 to 1966) and apart from 1993, production has been recorded every year through to the present. It should be noted that annual production did not exceed 100,000t per annum until 1971 (Milev et al., 2007). The estimated total production for the period from 1954 to 2002 is 12.97Mt @ 3.09g/t Au, 1.03% Cu (143,411t Cu and 1.30Moz Au). Current Measured and Indicated mineral resources within the Chelopech deposit are 24.93Mt @ 4.0g/t Au, 1.5% Cu (374,000t Cu and 3.21Moz Au) with additional Inferred mineral resources of 6.5Mt @ 3.2g/t Au, 1.2% Cu (78,000t Cu, 0.67Moz Au) as of 2004 and using a 4g/t AuEq cut-off grade (Table 1). In recent years production at Chelopech has stabilized at an annualized rate of just under 1Mt per annum utilizing the longhole open-stoping method of mining. A Definitive Feasibility Study was completed on the Chelopech deposit during 2005 and envisaged increasing production to 2Mt per annum, modernizing the existing flotation concentrator to handle the capacity, the construction of a Metal Production Facility to treat the Cu-Au concentrate with Pressure Oxidation (POX), Carbon in Leach (CIL) and Solvent Extraction and Electrowinning (SXEW) to produce copper cathode and gold doré and also upgrading the existing Tailings Management Facility together with the construction of a new facility for cyanide tailings (RSG Global, 2007). The Chelopech deposit remains as one of the largest Cu-Au epithermal deposits in Europe.

The geology of the Chelopech deposit comprises a basement of Pre-Cambrian granitoid gneisses intruded locally by Paleozoic granites and overlain by Upper Cretaceous magmatic and sedimentary sequences of the Chelopech Formation. These volcano–sedimentary rocks of the Chelopech Formation have been deformed, eroded and transgressively covered by reddish limestone-marls of the Mirkovo Formation (Popov and Kovachev, 1996; Popov et al., 2000). The limestone is overlain by a typical flysch sequence of calcarenites and calcilutites, constituting the Chugovitsa Formation. The volcanic rocks were further preserved from erosion by the 'cover' sedimentary rock units and form the limbs of a syncline which has been affected by post-mineral deformation related activity. The reader is directed to the work of Chambefort (2005) and Chambefort and Moritz (2006) for further detail on the geology, deformation history and controls on mineralization to the Chelopech deposit.

Current production from the underground Chelopech deposit is derived from two main areas, the Western, which comprises the orebodies 150, 151 and 103 and the Central, which comprises the 19, 18 and 17_16 orebodies. These two mining areas combined account for 99% of the current Measured and Indicated mineral resource. Peripheral to the main orebodies a number of other potential orebodies have previously been identified, including, but not limited to, 10, 149, 8 and 390. All currently mined orebodies were initially delineated during the State-funded exploration period and more specifically 1956 to 1974.

The Chelopech hydrothermal system, centered on the Chelopech deposit, covers an area of approximately 7.5km2 and includes the current Chelopech deposit (Western and Central) high-sulfidation epithermal system, the Vozdol intermediate-sulfidation epithermal system located approximately 1km to the north and separated by the steeply south dipping Petrovden Fault structure, the Sharlodere high-sulfidation epithermal system (also referred to as Eastern) located approximately 1km and along strike to the east-northeast and the Petrovden 'porphyry-style' mineralization hosted within a dacite dome and located approximately 1km to the northeast (Figure 1). Exploration of the Chelopech hydrothermal system was primarily conducted during the State-funded exploration period from 1956 to 1990. During that time approximately 473,000m of surface diamond drilling were completed. More recently exploration has recommenced over the Chelopech deposit utilizing geophysical methods and surface diamond drilling techniques in conjunction with underground diamond drilling.

The primary aim of this paper is to review the results of the surface exploration conducted during the Sate-funded period in which all currently defined orebodies were delineated by surface diamond drilling and then taking the outcomes of this review and applying them to the current phase of modern exploration such that informed decisions can be made with the benefit of thirty-four years of exploration history; specifically focusing on the Chelopech deposit. Data available for this review correspond to the Chelopech Mine Database in which reside the historic drilling and assay datasets collected during the State-funded exploration period.

THE STATE-FUNDED EXPLORATION PERIOD

The State-funded exploration period over the Chelopech hydrothermal system corresponds to the period 1956 to 1990 and can be broken down into three general areas of detailed exploration and one area with less detailed exploration, corresponding to the Chelopech deposit, the Vozdol intermediate-sulfidation epithermal vein system, the Sharlodere high-sulfidation epithermal system which can be generally viewed as the eastern extension of the Chelopech deposit and the Petrovden 'porphyry-style' alteration area (Figure 1).

The Vozdol intermediate-sulfidation epithermal occurrence is described as a Au-Cu-Ag-Zn-Pb vein system hosted by Turonian conglomerate and coarse-sandstone, which is the base of the Upper Cretaceous sedimentation, Pre-Cambrian gneiss and partly by dacite in the Petrovden area. The ore bodies are strongly overprinted by faulting and are approximately 500m in length, 4.5 to 12.5m thick and have an estimated 650m vertical extension. Main ore minerals are pyrite, sphalerite, galena and chalcopyrite

Table 1: RSG Global Independent Resource Estimate: Chelopech Copper-Gold Deposit, Bulgaria – October 2004. Prepared and reported in accordance with the Canadian National Instrument 43-101, Standards of Disclosure for Mineral Projects of February 2001 ("the Instrument") and the classifications adopted by CIM Council in August 2000. The resources are reported above gold equivalence grades calculated using the formula, gold equivalence (AuEq) equals gold plus 2 x copper.

Chelopech Copper/Gold Project – 2004 Grade Tonnage Report Grouped by Resource Category Ordinary Kriged Estimate (Regressed As - Cu_ok), 20mN x 20mE x 10mRL Cut Cu, Au and Ag, Min-12 and Max-24 Composites							
Cutoff AuEq	Mt	AuEq	Cu (%)	Au (g/t)	Ag (g/t)	S (%)	As (%)
Measured Resource							
2	3.30	8.1	1.8	4.5	20	18.2	0.5
3	3.27	8.1	1.8	4.5	20	18.3	0.5
4	3.13	8.3	1.8	4.7	21	18.6	0.5
5	2.72	8.9	2.0	5.0	23	19.4	0.6
6	2.32	9.5	2.1	5.3	24	20.0	0.6
Indicated Resource							
2	52.30	4.4	0.9	2.5	7	11.7	0.3
3	33.00	5.6	1.2	3.2	8	12.9	0.3
4	21.80	6.7	1.4	3.9	9	13.9	0.4
5	14.67	7.8	1.7	4.5	10	15.0	0.5
6	9.73	9.0	1.9	5.1	11	16.0	0.6
Measured + Indicated Resource							
2	55.60	4.7	1.0	2.7	8	12.1	0.3
3	36.27	5.8	1.2	3.3	9	13.4	0.4
4	24.93	6.9	1.5	4.0	10	14.5	0.4
5	17.39	8.0	1.7	4.6	12	15.7	0.5
6	12.04	9.1	1.9	5.2	13	16.7	0.6
Inferred Resource							
2	38.3	3.2	0.7	1.8	8	10.2	0.2
3	15.1	4.3	0.9	2.5	10	11.1	0.3
4	6.5	5.6	1.2	3.2	12	11.5	0.4
5	3.1	6.8	1.6	3.7	14	12.1	0.5
6	1.7	7.9	1.9	4.2	15	12.7	0.6

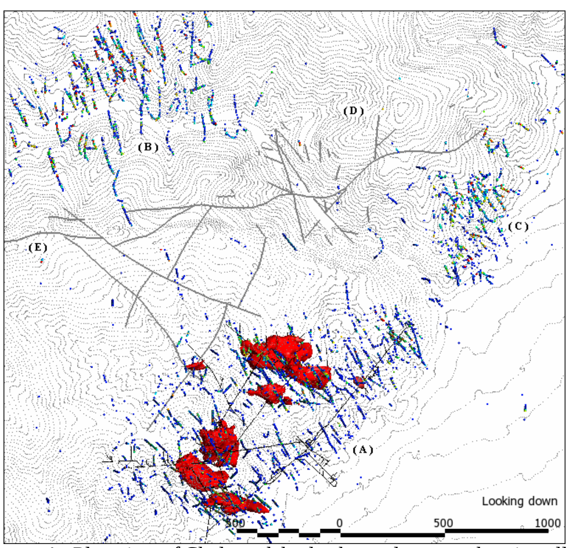

Figure 1: Plan view of Chelopech hydrothermal system showing all historic surface exploration drillholes (Au_best) together with surface topography. (A) Chelopech Deposit (red solids represent the currently defined 4g/t AuEq orebodies), (B) Vozdol, (C) Sharlodere, (D) Petrovden and (E) Petrovden Fault. North up the page.

with a gangue composed of quartz, ankerite, calcite, dolomite, barite and fluorite and surrounded by a carbonate, adularia and sericite alteration zone (Popov and Popov, 2000). The main zone of mineralization occurs approximately 200m below the current topographic surface. Mineral resources as calculated by the Bulgarian State (Non-Canadian National Instrument 43-101 Compliant Mineral Resources) correspond to a Au-Cu-Py ore zone with 13.3Mt @ 1.80g/t Au, 0.47% Cu, 7.49g/t Ag, 0.20% Pb and a Pb-Zn ore zone with 1.5Mt @ 0.2g/t Au, 0.1% Cu, 0.37% Pb, 0.65% Zn. The reader is directed to Henley (2004) for further explanation on Russian mineral reporting. The Vozdol area was subjected briefly to surface diamond drilling during 1959 and 1963 and more continuous exploration during the period 1968 to 1981 in which approximately 114,000m of surface diamond drilling and 3,000m of underground diamond drilling were completed.

The Sharlodere high-sulfidation system is considered as an exhumed part of the Chelopech deposit (Popov et al., 2000). The Sharlodere occurrence is hosted by strongly altered breccia of volcanic origin and a massive andesitic body. The rocks are propyliticly altered and contain hydrothermal biotite and chlorite, grading into quartz-sericite alteration and an advanced argillic alteration (Chambefort, 2005). Mineral resources as estimated by the Bulgarian State correspond to 11.85Mt @ 1.57g/t Au, 0.6%

Cu (221+222 UN Resource Category, Bulgarian State, 2007). The Sharlodere area has been subject to intermittent exploration through the early portion of the State-funded period with the greatest volume of surface diamond drilling occurring during the period 1984 to 1990. A total of approximately 92,000m of surface drilling has been drilled within the Sharlodere area.

The Petrovden ‘porphyry-style’ mineralization is interpreted to be controlled by a fault structure (Petrovden Fault) located along the southern contact of the dacite dome-like body. The primarily, dacite hosted, quartz-stockwork low-grade Cu-Au mineralization is defined by quartz-sericite and argillic (illite) alteration assemblages with peripheral propylitic alteration. The area has been subjected to only minor (in comparison with the other areas) surface diamond drilling activity during the State-funded period and no mineral resources are reported.

The Chelopech Deposit

The first recorded year of surface drilling within the Chelopech deposit was 1956 and the total surface diamond drilling meterage through to 1986 is estimated at 267,000m. While no specific information exists to document exploration other than drilling activity there is a Chelopech Geology and Alteration Map (1960) which encompasses the entire Chelopech hydrothermal system and periphery (approximately 14km2). Based on an understanding of Soviet based exploration methodologies of the period it can be assumed that from 1955 to 1960 (as a minimum) a large volume of surface geochemical sampling was undertaken, primarily in the form of surface trenching, to support the definition of lithological contacts and obtain all available structural information, define zones of hydrothermal alteration and determine the tenor of surface mineralization in support of the geological mapping process which would have by definition been ‘Conditional Mapping’ according to Soviet standards. This would have required documented geological descriptions on a nominal 100m x 50m grid over the entire area of geological mapping.

Geophysical techniques such as induced polarization (IP), deep vertical electrical sounding (VES), ground survey of the vertical magnetic intensity and gravity have been employed, primarily from 1967 to 1971, over the Chelopech deposit however the methods employed do not correspond to modern geophysical standards. Other potential issues were the high level of electromagnetic noise sources attributable to the various mine infrastructure related activities at the time. Moderate to high relief within the Chelopech area has potentially affected historic gravity and magnetic surveys (L. Nikova, 2004, LianGeoconsult OOD, Geophysical characteristics of the Chelopech deposit).

The following section will attempt to summarize the surface diamond drilling exploration activity throughout the period 1956 to 1978 which represents the time frame during which all currently defined orebodies were discovered (Figure 2). In 1979 the first underground diamond drilling took place at Chelopech and effectively represents the end of detailed surface exploration. Minor surface exploration continued post-

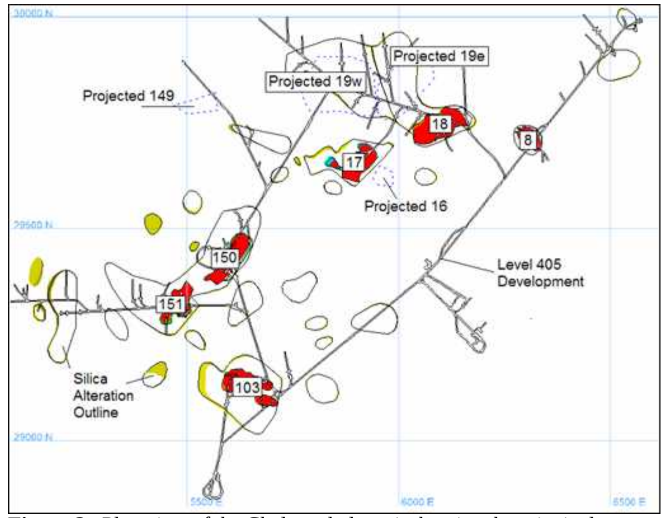

Figure 2.: Plan view of the Chelopech deposit showing the principal orebodies, at and projected to, the 405mRL mining area (Orebody 10 is located approximately 250m northeast from Orebody 8 and Orebody 390 is located approximately 150m west from Orebody 151), north up the page together with 500m grid.

1979 including a deep diamond drilling programme. All drill intersections are reported at a 0.2g/t Au cut-off only with no upper cut and a maximum of 2m internal dilution unless otherwise stated.

1956-1958: Drilling during this period was concentrated in the area between Orebodies 8 and 10. Average drillhole depths were <350m. Generally assay results would be considered as mildly encouraging with 10-30m intervals of low grade Au-Cu mineralization returned. It should be noted that the most extensive zone of surface hydrothermal alteration, classified as ‘silicification’ and ‘sericitization’ according to the Chelopech Geology and Alteration Map (1960) is located immediately above Orebodies 8 and 10.

1959-1960: This period represents the discovery of Orebody 10 with drillhole C56 (47.2m @ 1.19g/t Au, 0.73% Cu) continued drilling during this period further defined the Orebodies 10 and 8 areas. Drilling also progressed southwest and drillhole C75 (57.1m @ 1.88g/t Au, 0.88% Cu) represents penetration of the 2g/t AuEq grade shell in the vicinity of Orebody 18.

1961: Orebody 18 discovery holes C94 (61.05m @ 2.99g/t Au, 2.11% Cu) and C87 (73.45m @ 2.74g/t Au, 0.79% Cu) were drilled. Orebody 10 definition drilling continued. Drillhole C83 (80.5m @ 1.19g/t Au, 0.83% Cu) intersects the 2g/t AuEq grade shell in the vicinity of Orebody 103.

1962: Orebody 103 discovery hole C105 (105.9m @ 2.50g/t Au, 1.13% Cu) and continued exploration of Orebody 103 with most holes penetrating the 2g/t AuEq grade shell. Drill definition continues on Orebody 10 and Orebody 18 – drillhole C111 (84.8m @ 1.29g/t Au, 0.23%Cu) penetrates the 19 Orebody 2g/t AuEq grade shell, the drillhole is approximately 75m from what will become the 19W Orebody.

1963: Orebody 19 discovery drillhole C117 (79.8m @ 3.47g/t Au, 1.11% Cu) is drilled and continued exploration of Orebody 103 results in a 20% success rate in intersecting the 4g/t AuEq grade shell due to irregular surface drill collar spacing. Drill definition of Orebody 10 continues.

1964: Continued exploration of Orebody 103 results in a 30% success rate in intersecting the 4g/t AuEq grade shell due to irregular surface drill collar spacing. Most holes do however intersect the 2g/t AuEq grade shell. Further exploration continues in the Central area. Drillhole C136 ends less than 10m from intersecting the 17 Orebody 4g/t AuEq grade shell.

1965: Continued exploration of Orebody 18 and 103 with limited success. Preliminary exploration begins in the vicinity of Orebody 151; however drillholes are drilled too shallow to intersect the 4g/t AuEq grade shell.

1966: Orebody 150 discovery hole C182 (153.8m @ 3.02g/t Au, 3.60% Cu) and Orebody 19W discovery hole C165 (85.9m @ 3.11g/t Au, 1.01% Cu) was drilled during further exploration drilling in the Central area. Exploration drilling continues in the Orebody 103 and 151 areas with limited success.

1967-1969: Definition drilling during this period is focused on Orebody 150 and the Central area (excluding Orebody 17_16 which is yet to be defined). Drillhole C181 (82.1m @ 1.37g/t Au, 0.38% Cu) is drilled into the 2g/t AuEq grade shell surrounding Orebody 150 – the intersection is located approximately 25m away from the 150 Orebody 4g/t AuEq grade shell. Exploration begins in the Orebody 390 area located approximately 150m west from Orebody 151. Also during this period a series of wide spaced (200m – 400m) exploration drill holes are drilled on the periphery of the currently defined Chelopech mineralization.

1970: Orebody 151 discovery holes C288 (209m @ 3.39g/t Au, 1.42% Cu) and C291 (285m @ 3.06g/t Au, 1.11% Cu) are drilled during the period – fourteen years after the commencement of exploration drilling (Figure 3). Average drillhole depths during this period are 685m. Exploration drilling continued in the Orebody 390 area together with limited definition drilling in the Central area.

1971: Orebody 17_16 discovery hole C237 (53.9m @ 5.18g/t Au, 2.45% Cu) was drilled during the period and definition drilling continues on Orebody 150. Exploration drilling of Orebody 151 commences together with exploration drilling in the area between Orebody 10 and 19.

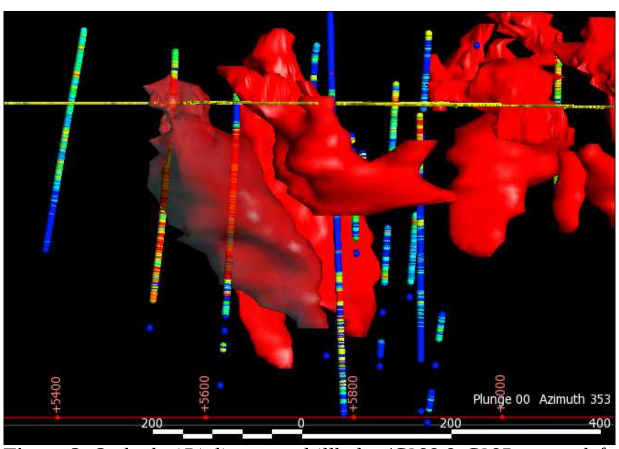

Figure 3: Orebody 151 discovery drillholes (C288 & C285, centre-left location), 1970, red solids represent the 4g/t AuEq grade shell – Orebody 103 located in the foreground centre and Orebody 150 located in the background centre with the Central area in the background upper right, drill traces (blue) are displayed showing Au_best i.e. red colour indicates 4g/t Au or above, 405mRL mine area is shown in yellow for reference.

1972-1973: Exploration corresponds to 'step-out' drilling towards the Chelopech North area (defined as south of the Petrovden Fault within the Chelopech Formation) with drillhole C371 intersecting 271.1m @ 0.23% Cu, 0.12g/t Au (using a 0.1% Cu cut-off only, no upper cut and maximum 8m internal dilution) at a depth below 200mRL. Definition drilling on Orebody 17_16 commences together with exploration drilling in the vicinity of Orebody 151 and 390.

1974: Orebody 149 discovery hole C196a (27m @ 12.02g/t Au, 1.63% Cu) is drilled and all currently defined orebodies have now been delineated – eighteen years after the commencement of surface drilling (Figure 4).

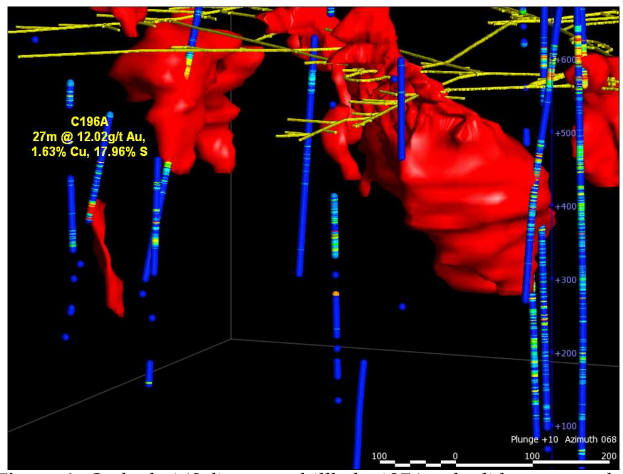

Figure 4: Orebody 149 discovery drillhole, 1974, red solids represent the 4g/t AuEq grade shell – Orebody 151 located in the foreground right and Orebody 19 located in the background upper left, drill traces (blue) are displayed showing Au_best i.e. red colour indicates 4g/t Au or above, 405mRL mine area is shown in yellow for reference.

1975-1978: Exploration during this period is concentrated in a triangular area located between Orebodies 149, 150 and 390 – this area has never been historically subject to exploitation.

1979-1981: No surface exploration. All further Chelopech orebody definition is from underground access only.

1982-1984: Surface exploration recommenced with a 'deep drilling' programme. Three drill holes were completed for final depths of 2007.5m, 1770.7m and 1991.4m respectively. The drillholes were located under the Western area and immediately east of this location beneath the current 405mRL ore pass position. A total of twenty-six drillcore samples were sent for analysis. Reportedly all drillholes were terminated in volcanics of the Chelopech Formation.

1985-1986: Minor surface exploration was completed in the Chelopech North and Petrovden localities.

The surface expression of hydrothermal alteration over the Chelopech deposit is characterized by a typical alteration assemblage for high-sulfidation epithermal systems. Alteration products include an alunite, kaolinite and sericite association (referred to as 'secondary quartzite' in historic literature), and a quartz-sericite association; commonly both associations overprint propylitic alteration assemblages and are more clearly expressed in the volcanic rocks (Mutafchiev and Chipchacova, 1969). As a general comment areas of surface hydrothermal alteration within

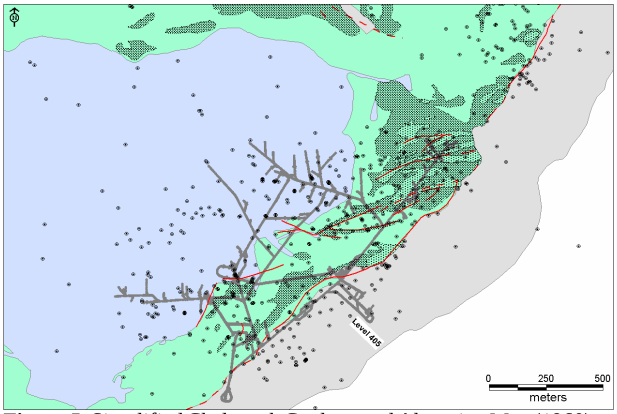

Figure 5: Simplified Chelopech Geology and Alteration Map (1960) showing the sedimentary cover sequence (blue), Chelopech Formation (green), hydrothermal alteration: 'sericitization' (dark coloured hatching) and 'silicification' (light coloured hatching), faults (red), Quaternary sedimentary cover sequence (grey), 405mRL mine level and historic surface drillholes (black dots).

the Chelopech Formation above the Western and Central orebodies are relatively discrete and not areally extensive (Figure 5).

The Central and Western orebodies have markedly different mineralogical composition, with bornite and enargite better developed in the Western orebodies. Zoning of the dominant sulfide (and arsenide) phases is well described in all the various orebodies. For example in the Western orebodies, the eastern and southern margins of the orebodies are dominated by tennantite and enargite. Tennantite and chalcopyrite are the dominant sulfide species in the Central orebodies and pyrite the dominant sulfide species in the Western orebodies. There is good correlation between copper, gold, and sulfur, thus indicating that the main phase of mineralization is, as observed, dominantly Cu-Au-S associated with pyrite (and other sulfides and arsenides). Negative correlation between Cu-Au and Pb-Zn is to be expected as the latter elements dominantly occur in zones peripheral to the core mineralized areas which are characterized by Cu-Au-S mineralization (RSG Global, 2004), (Table 2).

Table 2. Definitions of Textural Features related to ore mineralization in the Chelopech deposit (after RSG Global, 2004).

Chelopech Deposit Copper Mineralisation Styles	
Mineralization Style	Description/Definition
Massive/Semi-Massive Sulfide	>80% sulfide ± veins of Tennantite (Tn) and/or Enargite (En)
Normal Stockwork Sulfide	Sulfide veins with Tn and/or En occurring <0.3m apart (on average); average width of the veins are >1cm.
Weak Stockwork Sulfide	Sulfide veins with Tn and/or En occurring > 0.3m apart (on average); average width of the veins are 1cm; and/or 40-80% pyrite in replacement form.
Disseminated Sulfide	<40% pyrite in replacement or disseminated form; no Tn and/or En veins.

POST-1990 EXPLORATION PERIOD

Exploration activity during this period primarily corresponds to underground diamond drilling within the Chelopech deposit. During 1991 to 1994 less than 200m of underground diamond drilling has been recorded. During the Navan Mining Plc. ownership minor surface exploration drilling activity has been recorded (1997-1998) which related to the drill testing of DCIP anomalies generated during a 1997 survey. The anomalies were located beneath the Quaternary cover sequence immediately southeast and southwest of the current mine infrastructure. A total of approximately 25,000m of underground definition drilling within the Western and Central areas is attributable during this period, of which approximately 4,500m was conducted under the auspices of Homestake. This particular drilling activity was concentrated on Orebody 150 and 19W.

During 2003 to 2004 Dundee undertook a comprehensive, independently managed, 30,000m underground diamond drilling programme which had the dual purpose of confirming historic drill data between the 405mRL and 200mRL and obtaining sufficient data to allow the estimation of a CNI 43-101 compliant mineral resource (Table 1). Operational underground diamond drilling continues to the present day.

During 2004 Quantec Geoscience Inc. were contracted to undertake a Titan-24 Deep Earth Imaging multi-parameter (DCIP and MT) geophysical survey over the Chelopech hydrothermal system. The primary aims of the survey were to define potential Chelopech-style orebodies located beneath the post-mineral cover at depth, effectively sterilize areas of the subsurface based on a lack of geophysical response and attempt to define satellite Chelopech-style orebodies within the current mining sphere of influence and at depth. Initial synthetic (forward) modeling using Chelopech orebody characteristics and physical properties had identified the following (J. Legault, 2004, Quantec Geoscience Inc., Titan-24 Forward & Inverse 2D MT & DCIP Model Simulations, Chelopech Deposit, Bulgaria):

- Chelopech-style orebodies at 250-800m depths are detectable but potentially not always individually resolvable with Titan-24 DCIP due to close separation, small size relative to great depths and a weaker contrast.
- Satellite orebodies at 250-800m depths are potentially detectable and resolvable with Titan-24 DCIP provided that they are sufficiently separated.
- Constrained DCIP inversions will improve resolution and detectability in areas of known geology.
- Chelopech-style orebodies at 250-800m depths are detectable but potentially not individually resolvable with Titan-24 MT due to small size and separation relative to MT dipole size.
- Satellite orebodies at 250-800m depths are detectable but potentially not individually resolvable with Titan-24 MT – constrained models may be required.

The survey was designed to cover a large portion of the Chelopech hydrothermal system and the survey line spacing was optimized to 200m based on the dimensions of the Chelopech 'deposit footprint'.

An important part of the survey was overcoming the large amount of cultural features associated with an operating mine environment to ensure that high quality data was recorded. The Chelopech area is characterized by a very high level of industrial current interferences across a large frequency bandwidth that originate from various sources (Figure 6) such as power lines, buried metal pipes, buried cables, mining activity and electrified rail ways (L. Nikova, LianGeoconsult OOD, pers. comm., 03-2004). Historically these sources had effectively limited electrical and induced polarization surveys to the perimeter of the Chelopech Mine area. Magnetotelluric measurements had not previously been undertaken in the Chelopech area. In addition to the large depth of the orebodies below the surface, the presence of cultural noise is perhaps as great or an even larger impediment, to geophysical exploration at Chelopech (Legault, 2004).

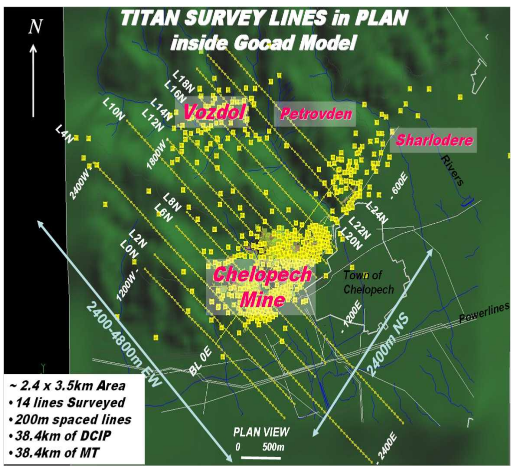

Figure 6:. Titan-24 Survey Extent in Plan and Cultural Features (after Legault, J.).

The Titan-24 system's digital signal acquisition and processing platforms have been in constant development since its inception in 2000. The first step in detecting deeper targets is making more accurate voltage measurements to record smaller signals consistent with the reduced amplitudes from deep targets that are further away from the transducers (E and H field detectors). Using 24 bit A/D converters at speeds up to 96 kHz, the system's voltage reconstruction capability approaches parts per billion. Advanced digital signal processing algorithms and full-waveform time-series acquisition are additional key-stone elements in exploration in near mine environments where the search for additional orebodies is tempered by cultural noise. In particular, what differentiates the Titan system from conventional IP receivers is its ability to continuously sample and record data along the waveform, enabling it to exclude sporadic noise from the true signal (Legault, 2004). The known Chelopech orebodies were accurately detected with Titan-24 DCIP (Figure 7 and 8).
Dundee has recently recommenced surface exploration drilling within the Chelopech hydrothermal system based on the interpretation of results from the Titan-24 geophysical survey. Over twenty combined geophysical anomalies have been characterized as high priority. The top ranked target areas corresponded to the Petrovden and Chelopech North areas and exploration continues.

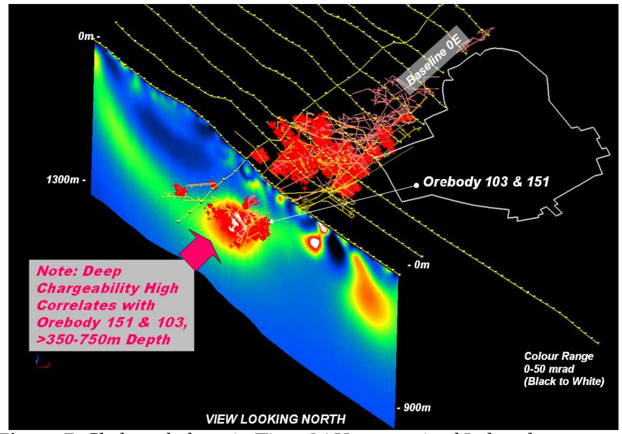

Figure 7: Chelopech deposit: Titan-24 Unconstrained Induced Polarization (IP) Chargeability Inversion, Line 600N (after Legault, J.).

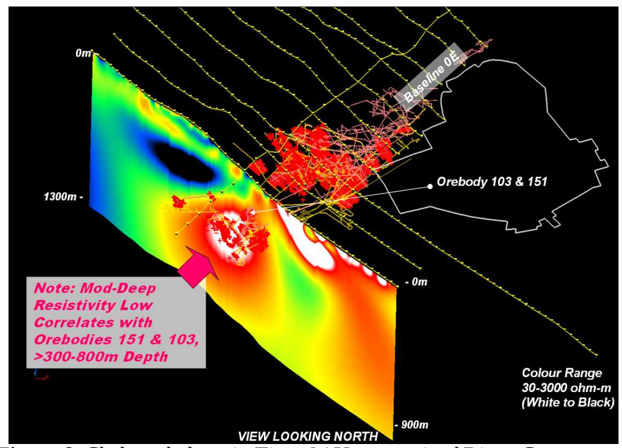

Figure 8: Chelopech deposit: Titan-24 Unconstrained Direct Current (DC) Resistivity Inversion, Line 600N (after Legault, J.).

DISCUSSION

The following section will attempt to discuss the results and implications of fifty years of near continuous exploration over the Chelopech deposit. The author would like to clearly state that the majority of the discussion is based primarily on interpretation of the historic data available and any comments or inferences concerning exploration strategies or methodologies are the author's own.

Surface drilling at Chelopech has seen a major increase in the associated drilling technology through time. For approximately ten years from the initiation of surface drilling in 1956 the only available drill bits were of the hardened steel/alloy variety. It was not until approximately 1967 that 'diamond drilling' technology, utilizing diamond-impregnated drill bits, was introduced to the Chelopech exploration programme. This is clearly indicated by the average annual drillhole depths which range from 350-450m prior to the introduction of diamond drilling technology and on average 700-800m post-1967. Available drill rigs during the period were commonly Soviet machines such as the KAM 500 and KAZM 300 in the earlier years followed by the ZIF series of rigs. All drill rigs were based on the 'conventional' drilling method as opposed to the 'wireline' drilling method which is industry standard today. This form of drilling requires the entire drill rod string to be removed from the hole to obtain the drill core sample or to exchange a drill bit, this commonly resulted in average daily drill production of <10m per twenty-four hour period; by necessity multiple drill rigs would have been required to meet recorded annual production meterages. Another method of optimizing surface drilling performance by reducing the amount of meters required to be drilled is the drilling of 'daughter holes' by wedging off the parent hole at depth. This methodology was first introduced at Chelopech during 1967 and was effectively employed throughout the duration of the surface exploration period.

Review of the historic database during the State-funded period clearly indicates that selective sampling of drill core was common practice. This means that the geologist responsible for the geological documentation of a drillhole would be required to make a decision on which portion(s) of the drillhole should be further processed and sent to the State-operated analytical laboratory for analysis of Cu, Au, Ag and S. It is clear that the decision to sample a specific interval of drill core was based on a visual estimation of potential grade; it is unclear what, if any, parameters were used to allow for sampling consistency across the life of the programme and varying styles of mineralization. There are numerous examples within the database that show mineralized intervals abruptly terminating while often still within 2g/t AuEq mineralized domains. An integral part of any exploration programme is analyzing the drill core material and receiving the assay results in a timely manner (e.g. 10-14 days) such that an informed decision can be made regarding the potential value of drilling further drill holes in any particular area or zone of mineralization – this is known as sample 'turn around time'. It was quite common during the Chelopech surface exploration programme to have sample turn around times exceeding six months.

The Chelopech deposit is a large high-sulfidation epithermal deposit and the actual volume of mineralized material within the deposit is quite sensitive to the AuEq cut-off grade applied (Table 1).

The approximate plan area of the deposit using the 2g/t AuEq grade shell is 1500m x 900m i.e. 'deposit footprint'

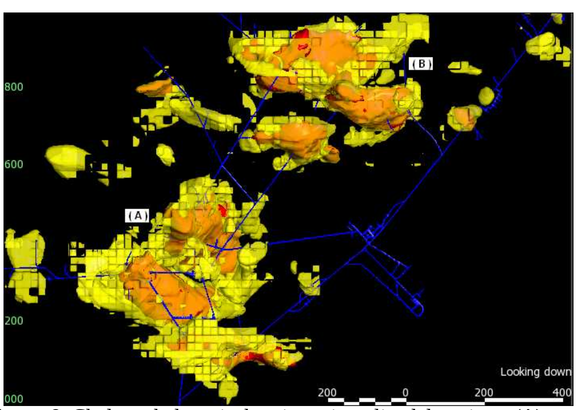

Figure 9: Chelopech deposit showing mineralized domains – (A) Western Orebodies and (B) Central Orebodies; 2g/t AuEq (yellow) versus the 4g/t AuEq (orange) grade shells. The 405mRL level is shown in blue for reference, north up the page.

(Figure 9). Using a nominal drill spacing of 100m x 100m would result in the drilling of approximately 160 drillholes for a total of 128,000m assuming a final drill hole depth of 800m and no use of 'daughter hole' drilling technology. Total surface drilling over the Chelopech deposit during the period 1956 to 1974 (effectively the period during which all currently defined orebodies were identified) was approximately 213,000m.

The simplified discovery history of the Chelopech deposit has the majority of the Central orebodies identified within the initial seven years from programme commencement with the lower tonnage 17_16 Orebody identified later during 1971. Within the Western area the 103 Orebody was identified within six years, the 150 Orebody within ten years and the 151 Orebody only after fourteen years of prolonged surface exploration. The combined Western Orebodies currently account for 69% of the Chelopech Measured and Indicated mineral resource (Figure 10).

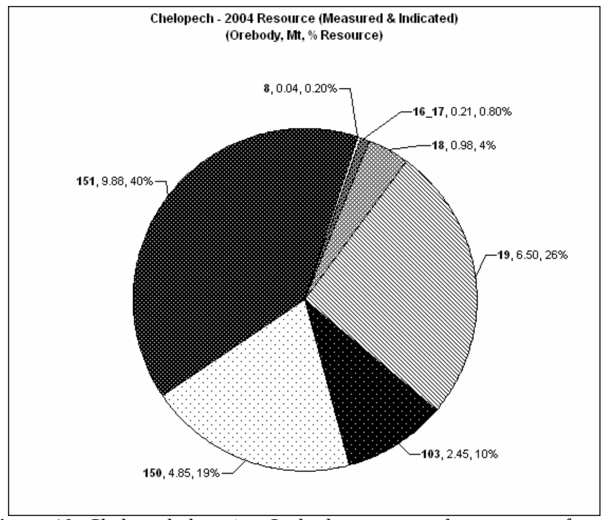

Figure 10: Chelopech deposit – Orebody tonnage and percentage of resource category distribution.

Orebody 149 was initially identified by surface drilling during 1974 and its discovery should perhaps be viewed as fortunate given the subvertical orientation of the orebody, the predominantly subvertical orientation of surface drillholes, the fact that it is located beneath the sedimentary cover sequence and the relatively small dimensions (in comparison with the 151 Orebody) of approximately 160m vertical x 60m wide x 12m thickness (Figure 4). While the actual orebody footprint is small at an approximate 4g/t AuEq cut-off grade, surface drilling on a nominal 100m x 100m grid pattern would have penetrated at least one drillhole into the 2g/t AuEq grade shell as represented by weak stockwork mineralization in the hanging wall position. From an exploration perspective the high grade nature of the mineralization (approximately 15-30g/t Au and 2-3% Cu returned to date) makes such orebodies attractive exploration targets even though overall tonnages are unlikely to exceed 0.5Mt. Such targets should logically be explored from underground access using lower angle drill holes and a regular and consistent drillhole spacing.

Clearly the initial exploration strategy at Chelopech was based on drilling beneath the most pervasive zones of surface hydrothermal alteration. This is evidenced by the large concentration of surface drillholes in the vicinity of the 10 and 8

Orebodies and also within the area located immediately northeast of Orebody 103 - approximately the current location of the 405mRL ore passes and the Capitalna Shaft. Delineation of the Central orebodies followed thereafter when surface drillholes began to penetrate the 2g/t AuEq mineralized domains associated initially with Orebody 18 and then later with Orebody 19. This is also true of the delineation of the Western orebodies when surface drilling began to penetrate the 103 Orebody 2g/t AuEq mineralized domain while initially exploring beneath surface alteration in the nearby vicinity. The discovery of the high tonnage 150 and 151 Orebodies can perhaps best be regarded as perseverance – an essential component of any exploration programme. The alteration footprint over the Chelopech deposit as defined by the Chelopech Geology and Alteration Map (1960) is approximately 1400m x 400m (the sedimentary cover sequence impacts the dimensions in width). A nominal 100m x 100m surface drill spacing over this footprint would have identified all currently defined orebodies for a total of 60,000m of surface drilling assuming 800m drillhole depths and no use of 'daughter hole' drilling technology.

The geological understanding of the hydrothermal system that is being explored is also a crucial component of the exploration strategy. It allows for predictions to be made on potential styles and distributions of mineralization, potential controls to the mineralization (e.g. lithological versus structural) and forms the basis upon which the Explorationist conducts the program. Genetic models of epithermal systems have developed over more recent times and while it is understood that Soviet geologists were also developing an 'epithermal' model during the period of surface exploration at Chelopech it remains unclear what input such thinking has had historically during the exploration process.

Modern geophysical technologies such as the Titan-24 system have proven to be very effective means of identifying subsurface Chelopech-style mineralization due to its ability to collect quality data at depth in a high noise operating mine environment. It is fair to say that if the technology was available in 1956 then the first surface exploration drillhole at Chelopech would have discovered the high tonnage Western orebodies. As a general comment the amenability of the Chelopech orebodies to detection by electromagnetic geophysical techniques would logically make the use of downhole geophysics an integral component in future exploration programs; providing the effects of the high noise mine environment do not preclude quality data acquisition. The utilization of downhole geophysics may provide the necessary means to interrogate subsurface portions of the Chelopech hydrothermal system on a more detailed scale than the Titan-24 survey was able to provide.

Finally, if the production rates for drill rigs during the historic surface exploration period had been more in line with today's average production rates then the time taken to delineate the Chelopech orebodies would have been effectively halved.

CONCLUSIONS

The Chelopech intermediate-level high-sulfidation epithermal deposit has been subjected to over fifty years of exploration. Definition of the major orebodies that comprise the Chelopech deposit was an evolving and lengthy process during the period 1956 to 1974 with the largest tonnage orebodies being discovered in the latter half of this period. Discovery rates could have been optimized by electing to drill the Chelopech deposit alteration footprint area on a nominal 100m x 100m surface grid spacing. This exploration programme would have identified all orebodies currently being exploited and would have also reduced significantly the amount of drill meters required to achieve similar outcomes. Insufficient data is available to evaluate the effects of having a robust geological model based on epithermal deposit characteristics available during the early part of the historic exploration programme. The use of appropriate geophysical techniques early in the exploration program is a clearly favorable situation when exploring for Chelopech-style mineralization and allows for a focused exploration strategy to be implemented.

Therefore, future underground and surface exploration must be performed on a systematic basis, including continuous sampling and assaying of drillcore, when targeting the 2g/t AuEq mineralized domains in areas where data currently exists. Conceptual exploration targeting outside known areas of mineralization should be performed on the basis of a robust 3D geological-structural model for Chelopech-style high-sulfidation epithermal systems. The use of downhole electromagnetic geophysical techniques should logically become a mandatory element of exploration programs within the Chelopech deposit providing that the technical difficulties associated with data acquisition within a high noise operating mine environment can be overcome.

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