MRL GOLD PHILIPPINES INC.

and

PANORO MINERALS LTD

Independent Geological Report on the Surigao Property Group Northern Mindanao, Philippines

Tapian-San Francisco, Tapian Main and Agata Properties

By

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1. SUMMARY

The Surigao property group of Mindoro Resources Ltd [MRL] and Panoro Minerals Ltd [Panoro] includes the Tapian-San Francisco, Tapian Main and Agata properties in the Surigao Del Norte and Agusan Del Norte provinces of northeast Mindanao, Southern Philippines. The properties lie between the two provincial capital towns, Surigao and Butuan City, and are located along the Western Highlands which skirts the Mindanao Sea to the west and the Central Lowlands to the east. The properties cover three separate areas and have a combined area of 7,385 hectares. They are subject to a Joint Venture between MRL, Panoro and Minimax Mineral Exploration Corporation [Minimax]. On March 7, 1997 Mindoro concluded a memorandum of agreement (MOA) with Minimax under which it holds an exclusive and irrevocable right to earn up to a 75% direct and indirect interest in six mineral projects located in the Philippines. These include the Agata, Tapian Main and Tapian-San Francisco properties. On April 29, 2004, Mindoro finalized an Option Agreement with Panoro Minerals Ltd. covering Mindoro's Surigao Gold District projects of Northern Mindanao. Panoro may earn a 40% interest in the Surigao Projects by spending CAD$2 million in exploration expenditure over 4 years. Both Mindoro and Panoro may increase their interest to 42.5% at feasibility stage through an interest purchase agreement with Minimax Mineral Exploration Corp., based on future established mining reserves. Mindoro could ultimately hold 42.5% at production, Panoro 42.5% and Minimax 15%.

The Surigao mineral district and the northern portion of the Agusan Del Norte district lie at the northern end of the Eastern Mindanao Ridge, in a region of intense splaying of the Philippine Fault Zone. The Surigao Del Norte district comprises three north-south-trending physiographic units: the Western Range, the Central Lowlands and the Eastern Highlands that are bounded by strands of the Philippine Fault. The basement rocks of the Surigao mineral district comprise greenschists and metamorphic rocks of Cretaceous age, and are overlain by basalts and imbricated ophiolite slabs that were emplaced during the Cretaceous to Palaeocene. The ophiolite slices comprise largely of harzburgite, with lesser dunite, and are regionally serpentinized. The ultramafic rocks are overlain by Upper Eocene clastics and limestones and by calcareous conglomerates. During the Oligocene through to Lower Miocene, a mixed volcano-sedimentary package of basaltic flows and breccias, limestones, limestone conglomerates, wackes, siltstones and muddy limestones of the Bacuag Formation were deposited in the Surigao district. During the Pliocene, andesitic and minor dacitic pyroclastic eruptions and lava flows occurred throughout much of the district and were largely re-deposited as thick epiclastic mass flows below sea-level, although locally deposited in fluviatile environments. These are the Mabuhay Clastics. Epithermal mineralization in the Surigao district is associated with the Pliocene-age andesitic to dacitic magmatism that erupted during deposition of the Mabuhay Clastics. During the Upper Pliocene to Lower Quaternary, the Mabuhay Clastics were overlain by marls and massive coralline and algal limestones. The youngest unit in the Surigao district is the late Quaternary (<100 Kyr) Paco Andesite.

In the Surigao district, the Philippine Fault has played an important role in the development of the Late Neogene physiography, structure, magmatism and porphyry Cu-Au plus epithermal Au metallogenesis. An intense clustering of porphyry Cu-Au and epithermal Au deposits occurs along the Eastern Mindanao Ridge. The cluster of deposits on the Surigao peninsula consist chiefly of epithermal gold stockworks and vein plus manto deposits developed in second-order splays off the Philippine Fault. Rapid uplift of the belt of andesitic

volcanic rocks that comprise the Western Range raises potential for exposure of the deeper, lithostatically-pressured porphyry-level of magmatic hydrothermal systems in this region. There is a strong structural control on the distribution of Au-Cu deposits in the Surigao district, and a clear association of deposits and mineral occurrences with high-level intrusives and subvolcanic bodies. Most of the centres of mineralization are located along NNW-SSE-trending second-order fault splays of the Philippine Fault, and where these arc-parallel structures are intersected by northeast-trending cross-faults. The Tapian-San Francisco property of Mindoro-Panoro lies in a favorable structural setting at the district-scale, at the intersection between multiple strands of a NE-trending cross-structure and the Lake Mainit Fault. This same NE-trending structural axis encapsulates both the Boyongan porphyry deposit and the Placer epithermal gold deposits. Following the recent discovery of the gold-rich Boyongan porphyry Au-Cu deposit by Anglo-American, there has been a resurgence of exploration activity in the Surigao Del Norte and Agusan Del Norte districts.

MRL commenced exploration in the Western Range in 1997, and focused their effort in areas of previous mining activity by both mining corporations and artisanal miners. The Tapian-San Francisco property comprises 14 claim blocks that collectively cover an area of 1,134 hectares. The area was covered by a United Nations Development Project (UNDP) conducted in 1984-1986 (UNDP 1984, 1987). The first company to explore within the property area was Dela Rama Mining who purportedly mined for a year in the Gold Hill Prospect area during World War II. After the war, gold was extracted from Gold Hill in the San Isidro mine. Frontino Mining operated for a year in 1964 on the Limon prospect and worked along the limestone-serpentinite contact near the headwaters of Limon Creek. In 1968, White Eagle Mining commenced operations, purportedly for 2 years, and drilled several exploration holes. Between 1973 and 1975, the Lepanto Consolidated Mining Company conducted further exploration and drilled up to 6 holes in the Limon prospect. This mining and exploration activity was concentrated in the southern portion of the Tapian-San Francisco property. Andrada *et al.* (1980) noted the occurrence of gold prospects adjoining the northwest corner of the Tapian-San Francisco property, in the Barangay Masgad region, Malimono. The Tapian-San Francisco property and adjoining areas to the northwest have seen gold mining activity in near-surface positions by both mining corporations and local high-graders.

The oldest unit on the Tapian-San Francisco property is an ultramafic unit comprising harzburgites. It is unconformably overlain by limestones of probable Upper Eocene to Lower Oligocene age along the eastern side of the property. The limestones are unconformably overlain by locally porphyritic basaltic andesite flows and pyroclastics. A hornblende-feldspar-andesite porphyry unit intrudes older units at the northern end of the Tapian-San Francisco property. This large intrusive pluton is associated with the Masgad and Mayad porphyry prospects. The same hornblende-bearing unit has been observed by MRL geologists in the Gold Hill and Limon prospects areas at the southern end of the property. It is likely that the magmatic rocks responsible for alteration and mineralization at Cantikoy (Limon) and Gold Hill are correlatives, if not direct deep extensions, of this hornblende-bearing intrusive body.

MRL conducted geological mapping, rock-chip sampling and soil sampling over the southern portion of the property (Gold Hill and Limon prospects), and limited stream sediment sampling to the north over the Riverside prospect. Extensive hydrothermal alteration was identified in the south and appears to extend southward into

the Canaga region. Alteration comprises both low and high-temperature propylitic alteration, structurally controlled zones of phyllic alteration, regions of argillization and silicification, and a local occurrence of potassic alteration. Low-grade but pervasive gold mineralization has been identified by extensive rock-chip sampling at surface along the Cantikoy phyllic alteration zone. The average grade of a suite of 54 rockchip samples, collected from an 800-metre-long zone of phyllic alteration, was 0.25 g/t Au, with a peak of 3.34 g/t Au. Extensive Au and Cu soil anomalies that collectively cover an area of ~1.2 km by ~0.8 km, broadly coincide with Pb, Zn and As soil anomalies over the northern portion of a large hydrothermal system that is open to the south. MRL have recently completed 35.15 line kilometers of pole-dipole IP electrical geophysical surveying over five prospect areas (Riverside, Quino, Cantikoy, Mina and Gold Hill). A series of seven (7) chargeability anomalies and four (4) resistivity anomalies were identified by the IP survey. The most extensive chargeability anomalies are the southernmost C5 and C6 anomalies that trend southward from Mina and Cantikoy respectively. They are overlain by an extensive zone of high resistivity near surface. The C6 anomaly underlies the zone of phyllic alteration at Cantikoy, and constitutes the C6 porphyry Cu-Au target that is defined by the ~ 200-metre-long chargeability anomaly that extends from 10,000 mN to 10,200 mN. The C6 chargeability anomaly is open to the newly-acquired ground to the south. The C5 chargeability anomaly is the most extensive anomaly and extends 400 metres southward from near the Gold Hill prospect, from 10,400 mN to 10,000 mN, and is open to the south and at depth. The C1 chargeability IP anomaly at the Riverside prospect underlies a separate centre of shallow high resistivity.

The alteration exposed at Tapian-San Francisco is interpreted to comprise the high-levels of a porphyry-Cu-Au magmatic-hydrothermal system. Several alteration types are strongly aligned with regional structures that transect the property. The implication of these alignments is that some of the through-going structures acted as channelways that tapped magmatic volatiles from one or more intrusive bodies at depth. The NE-trending faults form part of a regional fault corridor that passes through the Boyongan porphyry district and the Placer district in the eastern part of Surigao Del Norte. These structures are thus likely to be deeply penetrating and to have focused magmatic-hydrothermal fluids where they cross-cut intrusive complexes as are inferred to occur beneath the Placer deposit, the Boyongan porphyry Cu-Au deposit and the Tapian-San Francisco system. A recommended exploration program on this property includes a program of mapping and prospecting at the northern end of the tenement where intrusives are outcropping, extension of the soil grid southward over the Canaga region, trenching or auger drilling of the Cu-Au soil anomaly at Gold Hill, induced polarization and ground magnetic surveys in the newly-acquired Bautista ground to the south of the prospect, and the drilling of three (3) deep diamond drillholes into the C1, C5 and C6 chargeability anomalies plus three (3) contingent 300-m-long holes. A total budget of US$627,200 is proposed to accomplish this.

The Tapian Main property comprises 16 mining claim blocks that collectively cover an area of 1,296 hectares. The 16 blocks form part of the same MPSA application and two Exploration Permits as those of the Tapian-San Francisco property, and are subject to the same terms and conditions and ownership agreements between Minimax, Mindoro and Panoro. Prior to World War II the Tapian Gold Mines, located in the southeast portion of the Tapian Main property, were operated by Tapian Surigao Gold Mines Incorporated using underground mining methods. They employed a 100-ton-per-day cyanidation mill which commenced operation in March 1939. In the early 1970's, MarCopper Mining Corporation explored the area for porphyry copper deposits,

during which they re-opened the old Homer tunnel. Numerous gold workings developed by local high-grading artisanal miners occur in the Mt Tapian prospect.

The basement sequence on the Tapian Main property comprises a greenschist unit of probable Cretaceous age that is over-thrust by serpentinised ophiolites. An Upper Eocene limestone unit unconformably overlies the greenschist basement and ultramafic thrust sheets. The pre-war workings on the Mt Tapian prospect, that comprise the Homer and Jesus tunnels, extend along the contact between one of these limestone bodies and intrusive hornblende andesite stocks of inferred Pliocene age. The Eocene limestone units are inturn overlain by basaltic andesites on the northern part of the property. In the southern part of the property, the ultramafic sequence is intruded by hornblende-bearing porphyritic andesites. These intrusives are of inferred Pliocene age, and may correlate with the metallogenically fertile andesitic magmatism associated with the Mabuhay Clastics. The intrusions in the Mt Tapian prospect area are clustered and irregular, and their outcrop distribution is reminiscent of the complex upper-levels of large intrusive complexes. The intrusions are associated with Cu anomalism and Au mineralisation in the Mt Tapian prospect. The youngest unit in the project area comprises a limestone of upper Pliocene to Quaternary age. The mineralization and alteration that is present in the southern portion of the Tapian Main property displays characteristics typical of shallow epithermal mineralization of low-sulfidation nature. Observed mineralization styles on the Mt Tapian prospect include quartz stockworks in argillised intrusives, quartz-calcite-pyrite fissure veins, banded quartz-carbonate veins and replacement sulfides in recrystallised contact limestones. The volcanic sequence on the Mt Tapian prospect is extensively propylitic-altered. Silicification and argillisation occur mostly along the contacts of the intrusive rocks, in the wallrocks adjacent to the intrusives, and in faults and shears. The limestone bodies that are in direct contact with intrusives commonly show intense recrystallisation, brecciation and sulfidation associated with gold mineralization. The zones of argillic alteration comprise of clays, silica and pyrite.

MRL conducted regional stream sediment sampling and mapping over the property, and a series of Cu and Au anomalies were generated over the area of workings at the Mt Tapian prospect. Subsequent grid-based soil sampling defined strong Au and Cu anomalies over the NNE-trending Rosario and Samson zones. The Au soil anomaly at Rosario is >400m in length and ~100m wide at a 100 ppb cut-off, and is open to the north. Gold values in soil samples peak at 1,670ppb. The Samson Zone lies southeast of the Rosario Zone and consists of a strong Au soil geochemical anomaly (>100 ppb Au) ~300 metres by 200 metres in dimension. Au mineralization near the headwaters of Samson Creek is related to quartz-calcite-pyrite veins and stockworks that are developed in argillic-altered and hornblende-bearing intrusives, schists and ultramafics. An interval of surface argillic alteration in the northern Samson Creek headwaters assayed 1.19 g/t Au over 24.2 metres. Approximately 50 metres to the southwest, quartz-carbonate-sulfide stockworks occur in strongly limonitic, clay-altered and fractured ultramafics adjacent to a porphyry intrusive contact where an 8 metre continuous rockchip sample collected by MRL assayed 3.01 g/t Au. Local zones of higher-grade mineralization occur in altered limestones that are in contact with porphyritic andesite intrusives, and assays from samples collected by MRL yielded 26.44 g/t Au from one 1.4 metre channel sample. MRL have recently completed six (6) lines of 150m pole-dipole IP surveying across the Mt Tapian prospect. The IP anomalies near the surface in the Rosario and Samson Zones appear to be aligned parallel to a NW-trending fault. The IP anomalies continue to the north

and to the south at shallow levels. A shallow NW-trending IP chargeable zone (at N=2; ~225m) links and balloons into a large IP chargeable zone at depth to the west of the Mt Tapian prospect. This larger and deeper region of higher chargeability covers an area of ~1.4 km by 0.6 km and extends from line 9600mN to 10200mN. It is open to the south. The IP anomalies at shallow levels have a good spatial relationship with mapped intrusions. If the chargeability anomalies remain after inversion modeling of the IP data, and are caused by sulfide that deposited from magmatic fluids around the carapace of one or more large intrusive stocks, then a porphyry target could exist on the IP grid area immediately west of the Mt Tapian prospect, and in the area to the immediate south where a deep high-chargeability anomaly remains open. The raw (unmodelled) geophysical IP survey data suggest that the hydrothermal system, as expressed by the distribution of high chargeability anomalies, continues beyond the areas of IP surveying.

The intrusions may have been focused by a major NNW-trending fault, with hydrothermal fluids migrating up along NE-trending cross-structures to generate the NE-trending zones of Au anomalism expressed in the soil geochemical patterns. Locally, high-grade Au zones are encountered in areas where recrystallised carbonates are in contact with the intrusions. The shallow levels of the Mt Tapian prospect have potential as a low-sulfidation epithermal target. A conceptual model for the Mt Tapian prospect is postulated which entails a low-sulfidation epithermal system at shallow levels that is related to structural focusing of magmatic volatiles from a deeper and peripheral porphyry system. The Mt Tapian prospect may be exposed high in the magmatic-hydrothermal system, and significantly higher than the system at Tapian-San Francisco. An exploration program is proposed that involves: mapping on the northern portion of the Tapian Main property; additional soil sampling at the Mt Tapian prospect to close-off the Cu and Au soil anomalies to the north, south and west of the existing soil grid; trenching across the Au soil anomalies at Rosario and Samson; an ~800 metre RC drilling program along the Rosario and Samson trends; extension of IP surveying to the north, south, NW and SE; and two 450m deep diamond drilholes (includes one contingent drillhole) to test the chargeability IP anomaly that lies west of the Mt Tapian prospect. A budget of US$393,000 is proposed to accomplish this.

The Agata property comprises 66 mining claim blocks that collectively cover an area of 4,955 hectares, spanning the Western Range, and extending eastward over the Tubay River flood plain. The 66 blocks form part of MPSA 134-99-XIII. They lie approximately 25 km south of the Tapian Main property, and due west of the Tubay River which drains southward from Lake Mainit. Early geological assessment of the region included geological reconnaissance of northern Agusan by Teves *et al*. (1951) who reported the presence of undeveloped gold claims in the Agusan Del Norte region. The Mines Regional Office in Surigao undertook regional mapping in the Jagupit Quadrangle (Madrona 1979). The UNDP conducted regional geological mapping at 1:50,000 scale and collected stream sediment samples over northern Agusan in 1982. The UNDP report of 1984 described the geological evolution of the Agusan Del Norte region. The Asiga porphyry system that lies east of the Agata tenements was explored by Sumitomo Metal Mining Company of Japan in the 1970's and 1980's. In the late 1970's, La Playa Mining Corporation explored within the Agata project area for nickel and cobalt enrichment of the laterite profile that is developed over ultramafic rocks. From 1978 to the mid-1980's, the Agata region was the centre of extensive small-scale mining activity as local artisanal miners extracted gold from the saprolite profile in the region.

The oldest rocks on the Agata property comprises greenschists of probable Cretaceous age that are overlain by two extensive areas of ultramafic rocks comprising serpentinites, serpentinised harzburgites, peridotites and lesser dunite. The ultramafic sequence has potential for nickel mineralization due to observed Ni-enrichment in the weathering profile. Crystalline limestones of probable Upper Eocene age overly the ultramafic rocks. The limestones have undergone extensive recrystallisation during intrusive activity. The limestones are overlain by a widespread crystal tuff, and are intruded by Upper Oligocene to Lower Miocene alkalic to calc-alkalic intrusives in close proximity to a strand of the Philippine fault. There are several styles of mineralisation that occur on the Agata property. These include Au-oxide mineralization in saprolite that is developed over shallowly-buried intrusions, Cu and Au mineralization associated with quartz veinlet and pyritic stockworks along the margins of monzonitic to dioritic plutons, Au associated with disseminated pyrite in sooty carbonaceous limestones, and nickel mineralization generated by surficial zones of nickel-enrichment in laterites developed on ultramafic protoliths. The monzonites in the American Tunnel and Lao prospects are variably hydrothermally altered, and Au mineralization occurs both within the margins of the intrusions and in the ultramafic country rocks.

MRL commenced a phased exploration program on the Agata property in 1997 involving gridding, regional mapping, surface and underground rockchip sampling, regional soil sampling, petrology, and diamond drilling at the Assmicor-Lao-Limestone prospect area. MRL resampled five of La Playa Mining Corporations' tests pits for Ni and Co mineralization and confirmed Ni-enrichment in the laterite profile. The regional soil geochemical survey generated widespread Cu and Au soil anomalies that are spatially associated with outcropping alkalic to calc-alkalic intrusions. The Cu anomalies extend sporadically for ~1 km between the Lao prospect and the American Tunnels prospect, and are open to the east under sediments of the Tubay River flood plain. A second area of extensive Cu anomalism in soils samples coincides with areas of mapped phyllic alteration, and extends for >1.5 km in a north-south direction. Au anomalism in soils mimics Cu anomalism in soils over the American Tunnels and Assmicor-Lao-Limestone prospect areas. A second extensive Au soil anomaly occurs in limestones at the Limestone Prospect. Channel sampling was conducted over the multi-phase intrusives of the Assmicor prospect and across limestone outcrops in the Limestone prospect area. Fifteen channel samples collected by MRL over 47.95 metres of development within the upper levels of the Assmicor Mine, in near-continuous channels within the margins of a monzonite intrusive, yielded an average grade of 6.28 g/t Au. The two peak grades were 26.82 g/t Au and 13.24 g/t Au over two separate 2.3 metre channel samples. When the channel samples from the upper and lower workings of the Assmicor underground development are composited, the average grade over 86.7 metres of channel sampling is 5.2 g/t Au. Surface rockchip samples from the American Tunnels region range from 0.01 g/t Au to 32.49 g/t Au. The presence of bonanza-type Au grades is evident, however mineralization at the American Tunnels locale appears to be restricted to a narrow zone along the intrusive-mafic contact, and although its continuity and width appears to be limited, it is poorly tested. MRL drilled eleven (11) diamond drillholes into the Assmicor and Limestone prospects in 1999 and encountered significant Au intersections associated with limonitic stockworks in biotite monzodiorite intrusives. These include 18.8m @ 1.13 g/t Au and 24.2m @ 1.38 g/t Au in holes DH 99-05 and DH 99-06 respectively. The intrusives comprise larger biotite monzodiorite bodies that are cross-cut by younger diorite dykes, plagioclase diorite dykes, biotite diorites and quartz diorites. These dykes and intrusive bodies dip

eastward, suggesting that a deeper magmatic source lies to the east, possibly along the trace of the Lake Mainit splay of the Philippine Fault, beneath the alluvial flood plain of the Tubay River. Drillhole DH 99-11, collared east of the Assmicor shaft, intersected porphyry-style quartz-magnetite veins in biotite diorite, quartz diorite and in hornblende-quartz diorite.

Induced polarisation (IP) surveying on the Agata property has identified numerous IP chargeability anomalies that form finger-like apophyses at shallow levels and which amalgamate into larger anomalies at deeper levels. The IP chargeability anomalies tend to strengthen with depth in the core anomaly regions (Southern Target anomaly and Northern Target anomaly). The IP chargeability anomalies attain values that locally exceed 40 msecs, and routinely exceed 20 msecs on most of the IP pseudo-sections from Agata. Weaker modelled IP chargeability anomalies are associated with known mineralisation at Assmicor (10-18 msecs) and in other satellite positions adjacent to the two core Northern and Southern target anomalies. An exploration program is proposed that involves: detailed mapping of existing phyllic alteration zones in the vicinity of the Southern IP Target area; infill soil sampling over gaps in the existing soil sample coverage, including the area immediately southwest of the zone of mapped phyllic alteration; mapping and prospecting in regional areas of Cu anomalism in the southern portion of the soil grid; additional IP surveying to cover the newly-acquired Bautista Block and to close-off an IP chargeability anomaly at the northern end of the IP grid and a resistivity anomaly to the east of Assmicor; a diamond drillhole to test a coincident As soil anomaly and a >22msec IP chargeability anomaly between Assmicor and American Tunnels; two (2) ~500m deep diamond drilllholes to test two extensive IP chargeability anomalies at the South Target and North Target, and two (2) additional contingent 400-metre-long diamond drillholes. A budget of US$538,600 is proposed to accomplish this.

In summary, the Tapian-San Francisco, Tapian Main and Agata properties have high potential for the discovery of both porphyry Cu-Au style mineralization at depth and epithermal style mineralization at shallower levels in the vicinity of the principal defined prospect areas. The Tapian-San Francisco property has very high potential for the presence of a porphyry Cu-Au system on the property associated with extensive IP chargeability anomalies that underlie surficial zones of high-resistivity, widespread Cu and Au anomalism, surface artisanal workings, widespread hydrothermal alteration, and mineralisation. The Tapian Main property has potential for definition of a shallow epithermal resource along the Rosario and Samson zones and their possible extensions. A newly-defined porphyry target at Tapian Main adjoins and lies at depth to the west and southwest of the Mt Tapian prospect, and may be linked by a feeder structure to the zones of surficial Cu and Au geochemical anomalism that lie at shallow levels along its eastern margin at the Mt Tapian prospect. The Agata project has high potential for the presence of one or more porphyry-type Cu-Au hydrothermal systems associated with 3 principal targets, and multiple satellite targets, that are associated with zones of high IP chargeability. Porphyry-style mineralization has been encountered previously in the Agata region by shallow drillholes in targets that are associated with modest IP chargeability anomalies. The Agata property posseses multiple conceptual target styles (porphyry, epithermal, Carlin-type and Ni-laterite) and will require substantial further exploration and staged drill testing. An exploration and drilling program with an expenditure of US$1.58 million and a contingency drilling program of a further US$0.648 million has been costed to test a range of targets on the 3 project areas, as well as progressing exploration on regional areas.

2. INTRODUCTION AND TERMS OF REFERENCE

This technical report has been prepared for Panoro Minerals Ltd and Mindoro Resources Ltd. [MRL Gold Philippines Inc.]. The report was prepared following email communications between the writer and Mr J.A. Climie of MRL Gold Philippines Inc. who was acting on behalf of Mr H. Wöber of Panoro Minerals Ltd to engage a qualified person to write a technical report on the Suriago properties of MRL Gold Philippines Inc. Panoro Minerals Ltd have the right to acquire an interest in the properties by way of an earn in agreement with Mindoro Resources Ltd.

The report provides a detailed summary of the geology and mineralization of the Agata, Tapian-San Francisco and Tapian Main properties in the Surigao property group, assesses historical and ongoing exploration activity on the properties, and makes recommendations regarding future exploration activity and exploration strategy on the properties. This report was also written to independently assess the technical merits of the Surigao properties.

This report is compiled from technical reports written by MRL Gold Philippines Inc., from reports held by the Mines and Geosciences Bureau (Philippines), from technical reports by the United Nations Development Program (UNDP) that were prepared for the government of the Philippines, from a report by a consultant for the provincial government of Surigao Del Norte, from published technical data, and from observations made by the author in the field on all three properties during two field trips on the 19th to 27th October 2004 and on the 7th to 11th February 2005. The author was accompanied in the field by MRL Project Manager of the Surigao-Agusan project, Mr Reinhold Salas (1st trip) and by MRL director, Mr Tony Climie, and MRL project geologist Mr Ferland Tagura (2nd trip). All sources of data used in this report are cited herein and are listed in Section 19.

3. DISCLAIMER

All details in this report pertaining to ownership arrangements, royalty agreements, Memorandum of Agreements and other legally binding contracts between Minimax Mineral Exploration Corporation, Mindoro Resources Ltd, MRL Gold Philippines Inc., Panoro Minerals Ltd and local claim owners, as referenced from prior company reports of MRL Gold Philippines Inc. and in reports to Panoro Minerals Ltd, is taken as true, and the author takes no responsibility for the accuracy of such details as referenced.

4. PROPERTY DESCRIPTION AND LOCATION

The Surigao tenement group, that collectively form a joint venture between Panoro Minerals Ltd and Mindoro Resources Ltd, lie along the western side of the Surigao Del Norte province and at the

northern end of the Agusan Del Norte province in Mindanao, Philippines. The location of these tenements is shown in Figure 1, together with the ground holding of other companies in the district. The 3 properties that are the subject of this technical report lie along the Western Range, near the northwest and southern margins of Lake Mainit.

4.1 Tapian - San Francisco

The Tapian - San Francisco property is located in the Surigao Del Norte province of Mindanao, Republic of the Philippines. The property comprises 14 claim blocks that collectively cover an area of 1,143 hectares (Figure 1). Six of the westernmost blocks of the property lie in the municipality of Malimono whereas the remaining eight blocks to the east lie in the municipality of Mainit. The 14 blocks comprise "Parcel-1" of a Mineral Production Sharing Agreement (MPSA) application that was submitted to the Philippine government by MRL for Minimax Mineral Exploration Corporation ("Minimax"). The blocks are titled: Thessalonica 1-6, 9, 12, 16, 17, 20 and Titus 26-28. The claim blocks form a contiguous group.

The Tapian-San Francisco tenements are within an existing Exploration Permit (EP No. XIII-016) granted on June 21, 2004 and an existing MPSA application (APSA 009-XIII). The part of the EP within the Tapian-San Francisco Project has an area of about 738 has. while the MPSA application has an area of approximately 405 has.

Fourteen (14) mining blocks cover the Tapian-San Francisco Project. The mining claims denominated as "Thessalonica 1-6; 9, 12, 20, 16 and 17" were located by Alluvial Mineral Exploration Corporation on April 8, 1987. These claims were deeded to Minimax on February 1997. The Deed was registered with MGB-XIII on February 28, 1997.

The three (3) mining claims, "Titus 26-28", were located by Porphyry Mineral Exploration Corporation on March 10, 1987. Porphyry executed a Deed of Assignment in favor of Minimax and the same was registered on February 28, 1997.

Recently, MRL Gold was able to acquire, via an Agreement to Explore, Develop and Operate Mineral Property, six claim blocks of approximately 486 has. east and south of the Tapian-San Francisco Project known as the Bautista-Can-aga MPSA Area. The Agreement was signed between Estrella Bautista, Contractor, and MRL Gold and was registered with MGB-XIII on December 14, 2004. The said claim blocks are covered by an existing MPSA (MPSA 33-95-XIII). The renewal of the MPSA's Exploration Period is presently being processed by MRL Gold (See Figure 1).

On March 7, 1997 Mindoro concluded a memorandum of agreement (MOA) with Minimax under which it holds an exclusive and irrevocable right to earn up to a 75% direct and indirect interest in six mineral projects located in the Philippines. Four projects, Agata, Tapian, Mat-I, and Nabago (now terminated) (collectively the "Northeast Mindanao Projects"), are located in the Surigao region of northeastern Mindanao.

The right to earn an interest is exercisable over three phases. The Phase One Interest of 10% may be earned by expending in the case of the Northeast Mindanao Projects PP10,000,000 (approximately US$200,000). The Phase Two and Phase Three Interests, comprising 30% and 35% interests respectively, may be earned by expending a further PP15,000,000 (approximately US$300,000) per project during each of the applicable earnings periods. All of the foregoing amounts are to be incurred at the option of Mindoro except that Mindoro was obligated to pay up to PP2,500,000 (approximately US$50,000) to be applied to outstanding assessments due in respect of the underlying mineral claims.

The MOA entitled Minimax to receive 50,000 Mindoro shares within 60 days of Mindoro obtaining the requisite regulatory approval of the MOA and there is provision for up to three additional tranches of shares to be issued as follows: 50,000 shares for each project on which Mindoro elects to proceed to Phase Two; 100,000 shares for each project on which Mindoro elects to proceed to Phase Three, and 500,000 shares for any project on which a production decision is made.

In October 2001, the Company issued 300,000 common shares to Minimax in consideration for extending the earning periods of two projects in the Philippines including the Agata Phase III earning periods to January 2, 2003.

Where its interest in a project is 25%, Minimax may elect to contribute proportionately to all further expenditures, failing which Mindoro shall advance its share of such expenditures, which amounts, together with interest, are recoverable from Minimax's share of production proceeds. In addition, where a production decision is made, Mindoro has undertaken to arrange project financing.

Once Mindoro has completed earning an interest, the parties will contribute their respective ownership interests to a joint venture corporation to be governed by a shareholders agreement that will incorporate certain principles set out in the MOA. Under Philippine mining law, Mindoro is required to establish a duly qualified Philippine affiliate and assign its interests under the MOA to that affiliate.

On April 29, 2004, Mindoro has finalized an Option Agreement with Panoro Minerals Ltd. covering Mindoro's Surigao Gold District projects of Northern Mindanao, Philippines. Panoro may earn a 40% interest in the Surigao Projects by spending CAD$2 million in exploration expenditures over 4 years. Both Mindoro and Panoro may increase their interest to 42.5% at feasibility stage through an interest purchase agreement with Minimax Mineral Exploration Corp., based on future established mining reserves. Mindoro could ultimately hold 42.5% at production, Panoro 42.5% and Minimax 15%.

MRL currently has earned ~40% equity in the Tapian-San Francisco property and can earn up to 75% equity from Minimax in its own right.

The location of known alteration zones and mineral occurrences on the Tapian-San Francisco property are shown in Figures 9, 14 and 15 (Sections 7.3 and 7.5). An extensive area of alteration with widespread mineral occurrences lies in the southern portion of the property, in areas of former small-scale mining activity by local "high-graders" and historical mining groups. This area comprises several prospect areas known as Cantikoy (formerly Limon), Mina, Gold Hill, Quino and Waterfall. Historical mining activity occurred at the Limon, Mina and Gold Hill prospect areas. No mineral resource, nor mineral reserve, has been established by the present owners on the property to date.

4.2 Tapian Main

The Tapian Main property is located in the Surigao Del Norte province of Mindanao, Republic of the Philippines, and lies several kilometers south of the Tapian – San Francisco property. The property comprises 16 mining claim blocks that collectively cover an area of 1,296 hectares (Figure 1). The Tapian Main project is located in Barangay Tagbuyawan and Barangay Tapian, within the municipality of Mainit. The 16 blocks comprise "Parcel-2" of a Mineral Production Sharing Agreement (MPSA) that was submitted to the government by MRL for Minimax Mineral Exploration Corporation ("Minimax"). The blocks are titled: Titus 20 and 21, Aludia 1 and 2, Nathan 40, 45-47, and Damascus 1-8. The claim blocks form a contiguous group. The blocks that comprise the Tapian Main project formed part of the same MPSA application as those of the Tapian-San Francisco property, and are subject to the same terms and conditions and ownership agreements between Minimax, Mindoro and Panoro.

The Tapian-Main tenements are within existing Exploration Permits (EP No. XIII-016 and EP No. XIII-018) granted on June 21, 2004 and November 16, 2004. The part of EP No. XIII-016 within the Tapian-Main Project has an area of about 1,201 has. while EP No. XIII-0018 has an area of approximately 164 has.

Sixteen (16) mining blocks cover the Tapian Main Project. The mining claims denominated as "Thessalonica 1-6; 9, 12, 20, 16 and 17" were located by Alluvial Mineral Exploration Corporation on April 8, 1987. These claims were deeded to Minimax on February 1997. The Deed was registered with MGB-XIII on February 28, 1997.

Aludia Torino registered her two (2) mining claims on March 2, 1987 and April 10, 1987. She signed up these claims with Minimax via a Royalty Agreement with Option to Purchase on April 18, 1987 and registered with Bureau of Mines and Geosciences on July 31, 1987. The Royalty Agreement was renewed on April 18, 1997 and registered with the MGB-XIII on June 4, 1997.

Two blocks of mining claims, "Titus 20 an 21" were registered by Leo Deiparine on March 10, 1987. He then executed and registered with MGB-XIII a Special Power of Attorney in favor of Jose de Guzman in 1987. On February 7, 1997, Leo Deiparine through his Attorney-in-Fact, executed a Deed of Assignment for their mining claims in favor of Minimax. This was registered with the MGB-XIII on February 28, 1997.

Pilgrim Mineral Exploration Corporation registered its four (4) mining claims on May 25 and 27, 1987; Lakeshore Mineral Exploration Corporation registered its eight (8) mining claims on May 25, 1987. Pilgrim and Lakeshore deeded their mining claims in favor of Minimax and registered this Deed on February 28, 1997.

Tapian Project is one of the Projects included in the Memorandum of Agreement between Minimax and Mindoro and the Option Agreement between Mindoro and Panoro. The major points of these Agreements are discussed in Section 4.1 above.

MRL currently has earned ~40% equity in the Tapian Main property and can earn up to 75% equity from Minimax in its own right.

On September 29, 2000, immediately after the Boyungan Porphyry Copper discovery, Minimax' affiliate, Apical Mining Corporation filed an EP application covering 8,095 has. of ground adjacent to (south, and far southeast) of the Tapian Project. This property is known as the Tapian Extension (Figure 1). The application is in the advance stage of processing by MGB-XIII.

The location of known alteration zones and mineral occurrences on the Tapian Main property, namely the Mt Tapian prospect, lie at the southern end of the property and occur in association with a series of mapped intrusions (Figure 21, Section 8.3). The prospective zones within the Mt Tapian prospect are known as the Samson Zone and the Rosario Zone. These areas coincide with small-

scale mining activity by local "high-graders", and with historical mine workings. No mineral resource, nor mineral reserve, has been established by the present owners on the property to date.

4.3 Agata

The Agata property is located within the northern part of the Agusan Del Norte province of Mindanao, Republic of the Philippines. It lies within the Western Range, approximately 10 km south of Lake Mainit and approximately 25 km SSE of the Tapian Main property. The property comprises 66 mining claim blocks that collectively cover an area of 4,955 hectares (Figure 1). The Agata property falls within the municipal jurisdictions of Jabonga, Santiago and Tubay. The majority of exploration activity on the project area is located in barangay E. Morgado (formerly Agata). The mining claim blocks are bounded by the geographical coordinates 9^0 19' 30" and 9^0 10' 30" North latitude and 125^0 29' 30" and 125^0 33' 30" East longitude. The 66 claim blocks that comprise the Agata project are part of a Mineral Production Sharing Agreement (MPSA) denominated as MPSA 134-99-XIII.

Originally, there were 99 claim blocks comprising the approved MPSA. These are detailed in the table below.

Leonor Cocon, Jr. caused Jessie Juansengfue to be the Attorney-In-Fact of his mining claims when he executed a Special Power of Attorney on April 12, 1986. This legal instrument was registered with the Bureau of Mines in Surigao City on March 10, 1987. On July 31, 1987, Jessie Juansengfue signed his two mining claims with Minimax Mineral Exploration Corporation (Minimax) a Royalty Agreement with Option to Purchase. This was registered with the Bureau of Mines and Geosciences on August 5, 1987. On April 17, 1997, this agreement was amended via an Amendment to Royalty Agreement, which was registered with the Mines and Geo-sciences Bureau in Surigao City (MGB-XIII) on June 4, 1997.

On December 4, 1987, Ruperth Villamucho, Leo Deiparine, and Edsel Abrasaldo executed a Special Power of Attorney regarding their mining claims in favor of Jose de Guzman. This was registered with the Bureau of Mines and Geo-sciences in Surigao City on December 7, 1987. On February 7, 1997, Ruperth Villamucho, Leo Deiparine, and Edsel Abrasaldo, through their Attorney-in-Fact, executed a Deed of Assignment for their mining claims in favor of Minimax. This was registered with the MGB-XIII on February 28, 1997.

DETAILS OF ORIGINALLY APPROVED CLAIM BLOCKS MPSA NO. 134-99-XIII			
Name of Mining Claims	**Number of Mining Claims**	**Name of Locator**	**Date of Registration**
Lingling 1-2	2	Leonor Cocon, Jr.	10-Mar-86
Titus 1-3	3	Ruperth Villamucho	27-Feb-87
Titus 10-11	2	Leo Deiparine	27-Feb-87
Titus 14, 16	2	Edsel Abrasaldo	27-Feb-87
Guiah and Sheryl	2	Marenda Cabiling	20-Mar-87
Noah 52	1	Galactica Mineral Exploration Corporation	25-May-87
Japeth 10, 12, 15, 19	4	Galactica Mineral Exploration Corporation	27-May-87
Japth 1, 3, and Jabez; Noah 53, 55, 57, 58	7	Galactica Mineral Exploration Corporation	27-May-87
Noah 54	1	Lakeshore Mineral Exploration Corporation	27-May-87
Titus 20, 26, 27	3	Resource Mineral Exploration Corporation	2-Jul-87
Titus 82	1	Solar Mineral Exploration Corporation	9-Jul-87
Banner 1-9; 12-13; 16-19; 22-29; 31; 33; 38; 40-41; 43; 44-B; 46; 47; 49; 51; 53; 55; 57; 59	38	Affluent Mineral Exploration Corporation	9-Sep-87
Jerto 38F, 7, 19-21	5	Nestor Tamayo	6-Jul-89
Jerto 23-25	3	Consorcia Tamayo	6-Jul-89
Jerto 32, 35	2	Rodrigo Villaflores	6-Jul-89
Jerto 37	1	Ignacio Moleta	6-Jul-89
Jerto 13, 14, 15, 29	4	Myrna Menor	6-Jul-89
Jerto 1	1	Conchita Frasco	14-Jul-89
Jerto II, IV, 36, VI , V, 39	6	Juanillo Pullos	27-Jun-89
Jerto 8, 10, 12, 9F, 11F; 16-18; 30	9	Anita Boticario	6-Jul-89
Jerto 22, III	2	Oliveros Sanchez	6-Jul-89
TOTAL NUMBER OF CLAIM BLOCKS	99		

On May 15, 1987, Marenda Cabiling executed and registered with the Bureau of Mines and Geosciences in Surigao City a Special Power of Attorney in favor of Rod Manigos regarding her two (2) mining claims in Agata. Rod Manigos in turn, signed the subject mining claims with Minimax via a Royalty Agreement with Option to Purchase on August 4, 1987. The Agreement was registered with the Bureau of Mines and Geosciences on August 5, 1987. The Royalty Agreement

was amendment via an Amendment to Royalty Agreement on April 17, 1997 and registered with the MGB-XIII on June 4, 1997.

On February 7, 1997, Resource Mineral Exploration Corporation executed a Deed of Assignment over its mining claims in favor of Minimax. On February 12, 1997, Galactica Mineral Exploration Corporation deeded the mining claims Japeth 10, 12, 15 and 19 via a Deed of Assigment in favor of Minimax. Likewise, on February 14, 1997, Solar Mineral Exploration Corporation made a Deed of Assignment regarding its mining claims in favor of Minimax. These Deeds were registered with the MGB-XIII on February 28, 1997.

On August 18, 1997, Lakeshore Mineral Exploration Corporation, Affluent Mineral Exploration Corporation and Galactica Mineral Exploration Corporation (for the mining claims "Japeth 1,3", "Jabez", "Noah 52, 55, 57, and 58") deeded their mining claims to Minimax. The Deed of Assignment was registered with MGB-XIII on October 3, 1997.

On July 25, 1997, Anita Boticario and Oliveros Sanchez deeded their mining claims in favor of Ivonne Go. These Deeds were registered with MGB-XIII on September 11, 1997. On September 8, 1997, Ivonne Go signed up her mining claims with MRL Gold thru an Exploration Agreement with Option to Purchase, which was registered with MGB-XIII on September 11, 1997. An addendum to the Exploration Agreement was made on October 13, 2003 and the same was registered with MGB-XIII on November 21, 2003.

Nestor Tamayo, Rodrigo Villaflores, Ignacio Moleta, Myrna Menor, Conchita Frasco, and Juanillo Pullos executed a Deed of Assignment covering their claims in favor of Consorcia Tamayo. These Deeds were registered with MGB-XIII on September 11, 1997. On September 10, 1997, Consorcia Tamayo signed up her mining claims with MRL Gold thru an Exploration Agreement with Option to Purchase, which was registered with MGB-XIII on September 11, 1997. An addendum to the Exploration Agreement was made on October 13, 2003 and the same was registered with MGB-XIII on November 21, 2003.

On May 26, 1999, the Department of Environment and Natural Resources signed Minimax MPSA application covering 7,679 has. comprising 99 claim blocks. The approved MPSA was registered on June 17, 1999.

On May 18, 2000, 32 claim blocks with an area of approximately 2,700 has. were relinquished by Minimax, leaving 4,955 has. of the approved Contract Area.

Recently, MRL Gold was able to acquire, via an Agreement to Explore, Develop and Operate Mineral Property, one claim block of approximately 82 has. within the Agata Project known as the Bautista Claim. The Agreement was signed between Estrella Bautista, claim-owner, and MRL Gold and was registered with MGB-XIII on November 4, 2004. The said claim block is covered by an existing MPSA application (APSA 0018-XIII). The application will be converted into an Exploration Permit application.

MRL currently has earned ~40% equity in the Agata property and can earn up to 75% equity from Minimax in its own right.

On September 29, 2000, immediately after the Boyungan Porphyry Copper discovery, Minimax' affiliate, Apical Mining Corporation filed an MPSA application covering 7,764 has. of ground adjacent to (north, southeast, and south of) Agata Project. This property is known as the Agata Extension (Figure 1). The application is in the advance stage of processing by MGB-XIII.

The location of known alteration zones and mineral occurrences on the Agata property are shown in Section 9.3 and Section 9.4. The main region of prospectivity, as currently identified from past exploration, lies near the central portion of the project. This area encapsulates the American Tunnel, Assmicor and Limestone prospects. The American Tunnel and Assmicor prospects coincide with areas of extensive small-scale mining activity by local artisans working alluvial gravels and bedrock sources of gold. No mineral resource, nor mineral reserve, has been established by the present owners on the property to date.

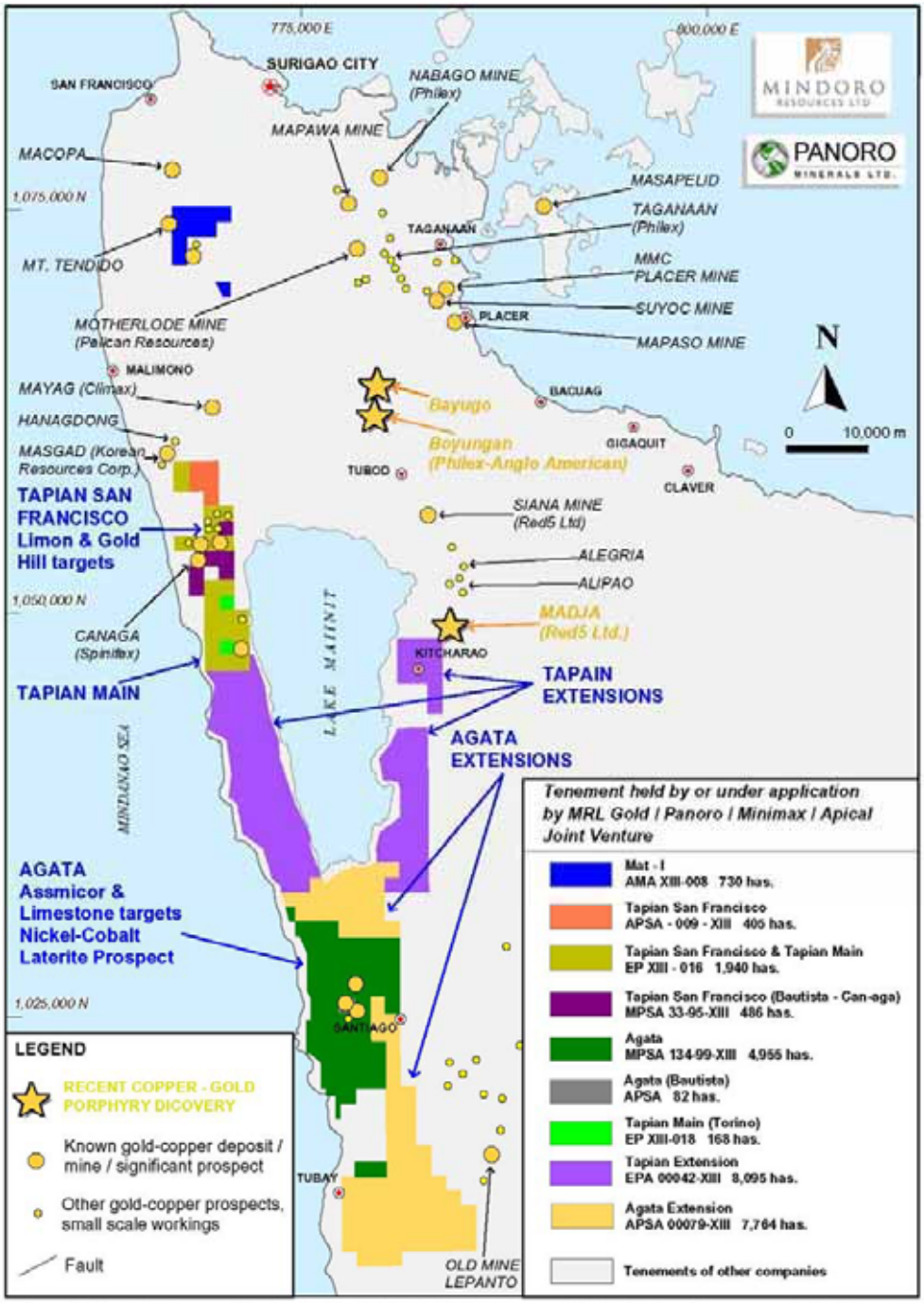


Figure 1- Map of tenement blocks that comprise the Panoro Minerals Ltd - Mindoro Resources Ltd joint venture

5. GEOLOGICAL SETTING

5.1 Regional Geology

The tectonic evolution of the Philippines is linked to a long history of convergent and strike-slip interaction between three principal tectonic plates over the past 50 Ma. These are the Eurasian Plate, the Philippine Sea Plate and the Indian-Australian Plate. Within the Philippines, this interaction has produced a complexly evolving terrain exhibiting multiple episodes of subduction, subduction polarity reversal, island arc generation, rifting, marginal back-arc basin opening and closure, terrane accretion, ophiolite obduction, plus terrane dissection and juxtaposition by strike-slip tectonics. The archipelago is the site of recent small-scale collisions between the Philippine Sea Plate, which contained an assemblage of older, extinct early Cenozoic arc systems, and the southeast Eurasian Plate margin that comprised several continental crustal fragments rifted away from the Eurasian Plate and separated by marginal basins.

The principal tectonic element of the Philippine archipelago is the elongate Philippine Mobile Belt (PMB – Rangin, 1991) which is bounded to the east and west by two major subduction zone systems, and is bisected along its north-south axis by the medial, 2000 km long, sinistral Philippine Fault (Figure 2). The entire western seaboard of the Philippines, extending from Taiwan through Zambales, Mindoro, Palawan, western Panay, southern Mindanao (Zamboanga plus Sarangani Peninsulas and the Daguma Range) and the Molucca Sea, represents collision zones of variable intensity, induced by convergent interaction between the Eurasian Plate and the Philippine Sea Plate along the complex, multi-strand boundary zone comprising the PMB (Pubellier *et al*. 1991). Rifted continental fragments of the Eurasian margin in the western half of the PMB (i.e., Palawan Block - Taylor and Hayes, 1980; Mindoro, western Panay, Zamboanga Peninsula and Daguma Range of southern Mindanao - Rangin, 1991; Hall, 1996) are sutured to the basement of the eastern half of the PMB via sutured collisional terranes. The eastern basement (light green on Figure 2) comprises volcanic arcs of Oligocene age (Rangin *et al*. 1996). The fragments of rifted continental crust that are derived from the Eurasian Plate are separated by marginal basins that are floored by oceanic crust of the South China Sea, Sulu Sea and Celebes Sea. The continental fragments on the subducting Eurasian/Sundaland Plate indent the western trenches, defining segments distinguished as the Manila, Negros and Cotabato trenches. Thick oceanic crust of the Benham plateau plays the same indentor role east of northern Luzon. The Philippine Sea Plate is subducting northwestward as a coherent and continuous slab. Quaternary volcanic arcs that are associated with presently active trenches extensively overprint Miocene, Oligocene and Cretaceous volcanic arcs.

At the Miocene-Pliocene transition (6-4 Ma), the Philippine arc systems on the Philippine Sea Plate began to collide with the Eurasian continental margin in Taiwan. This collision subsequently

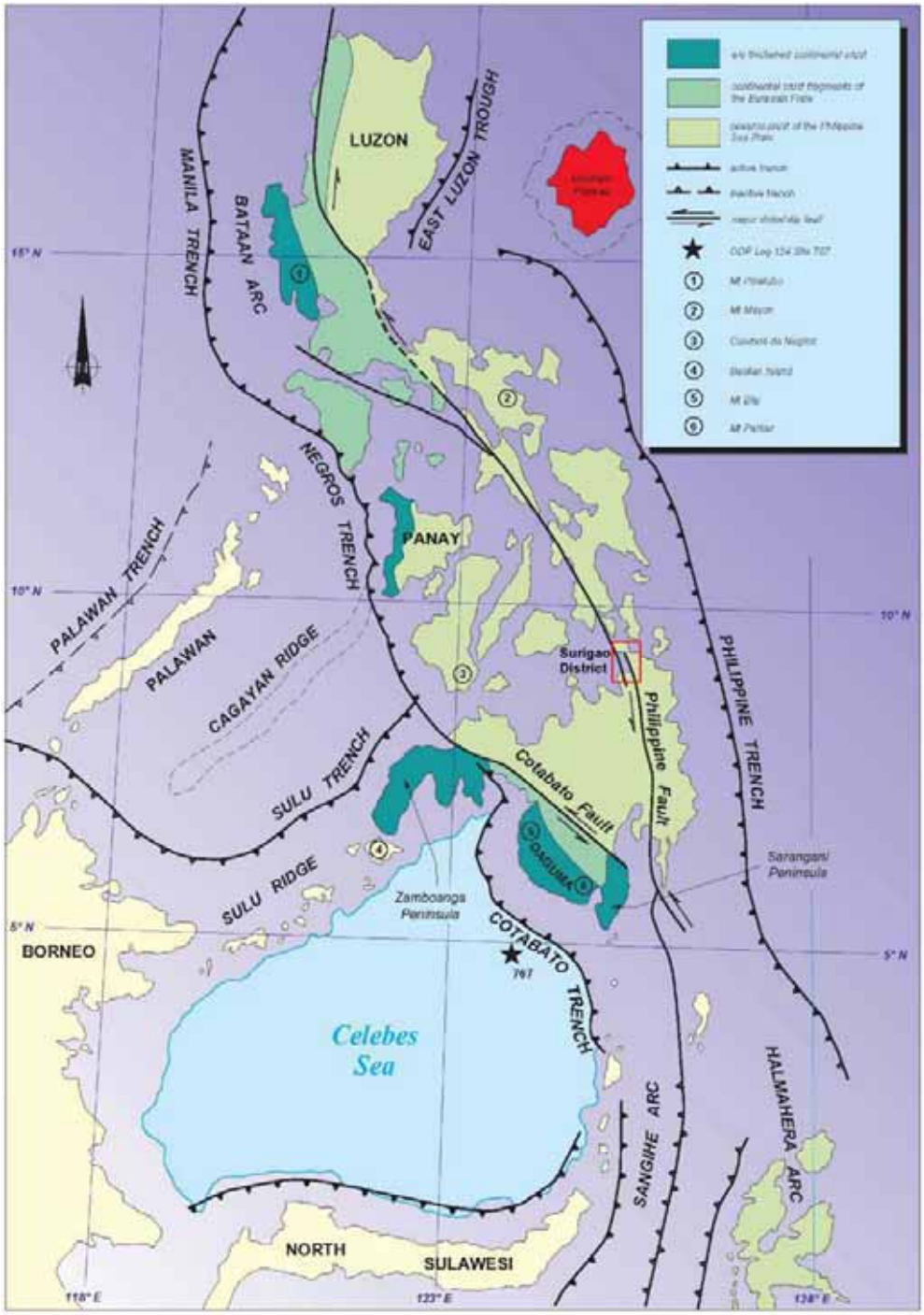


Figure 2 - Distribution of crustal basement types and principal tectonic elements of the Philippines (after Rohrlach 2002)

migrated southward and affected the central and southern Philippines, including Mindanao. In south-east Mindanao, the Sangihe and Halmahera arcs collided during the Miocene-to-Pliocene transition. As the arcs collided following complete consumption of the Molucca Sea Plate at the Sangihe and Halmahera trenches, convergence between the Philippine Sea Plate (PSP) and the PMB was partitioned into compressive structures (thrust faults and folds) that deformed the Pacific Cordillera at the southern end of the East Mindanao Ridge. During the mid-to-late Pliocene, crustal stress was gradually relieved again as plate convergence became increasingly accommodated by outer thrusts that evolved into the young Philippine and Cotabato subduction systems via a process known as subduction polarity reversal. In the Pacific Cordillera, at the southern end of the East Mindanao Ridge, widespread porphyry and epithermal mineralisation formed synchronously with subduction reversal in the Pliocene. In the North Davao mining district a 4.3 Ma age is reported for the Masara epithermal Au deposit (Sillitoe 1989). The Masara and Hijo epithermal vein deposits and the Mapula and Amacan porphyry Cu-Au deposits are clustered around the margin of the Lake Leonard andesitic-dacitic volcano, for which Sajona *et al*. (1984) report Pleistocene to Holocene radiometric ages. Sillitoe (1989) infers a Pliocene-Pleistocene age for all of them, including the King King porphyry Cu-Au deposit.

The Philippine Fault is a 2000 km long sinistral strike-slip wrench fault which traverses the entire Philippine Mobile Belt from Luzon to Mindanao. Its sinistral displacement reflects clockwise rotation of the PSP in the east relative to the PMB along which the fault follows. The Philippine Fault behaves as a zone of decoupling whereby oblique convergence between the PSP and the PMB is partly accommodated by horizontal drag along the Philippine Fault (Fitch, 1972; Rangin, 1991 & Aurelio *et al*., 1991). The perpendicular component of oblique convergence is accommodated at the Philippine Trench. This model of Fitch (1972) implies that both the Philippine Trench and the Philippine Fault function in unison and were initiated at approximately the same time. Aurelio *et al*. (1991) and Barrier *et al.* (1991) both imply a < 5 Ma age for the Philippine Fault and the Philippine Trench, placing their timing soon after widespread intra-arc compression in the eastern part of Mindanao.

In the Surigao district, the Philippine Fault has played an important role in the development of the Late Neogene physiography, structure, magmatism and porphyry Cu-Au plus epithermal Au metallogenesis. Figure 3 shows the intense clustering of porphyry Cu-Au and epithermal Au deposits along the Eastern Mindanao Ridge. There has been rapid and large-scale uplift of the cordillera in the Quaternary, and limestones of Pliocene age are widely exposed at 1000-2000 metres elevation (Mitchell and Leach 1991). The cluster of deposits on the Surigao peninsula in the north consist chiefly of epithermal gold stockwork, vein and manto deposits developed in second-order splays off the Philippine Fault (Sillitoe 1988). The ore-associated igneous rocks in Surigao and in the Compostella district in the central part of the cordillera consist mostly of small plugs,

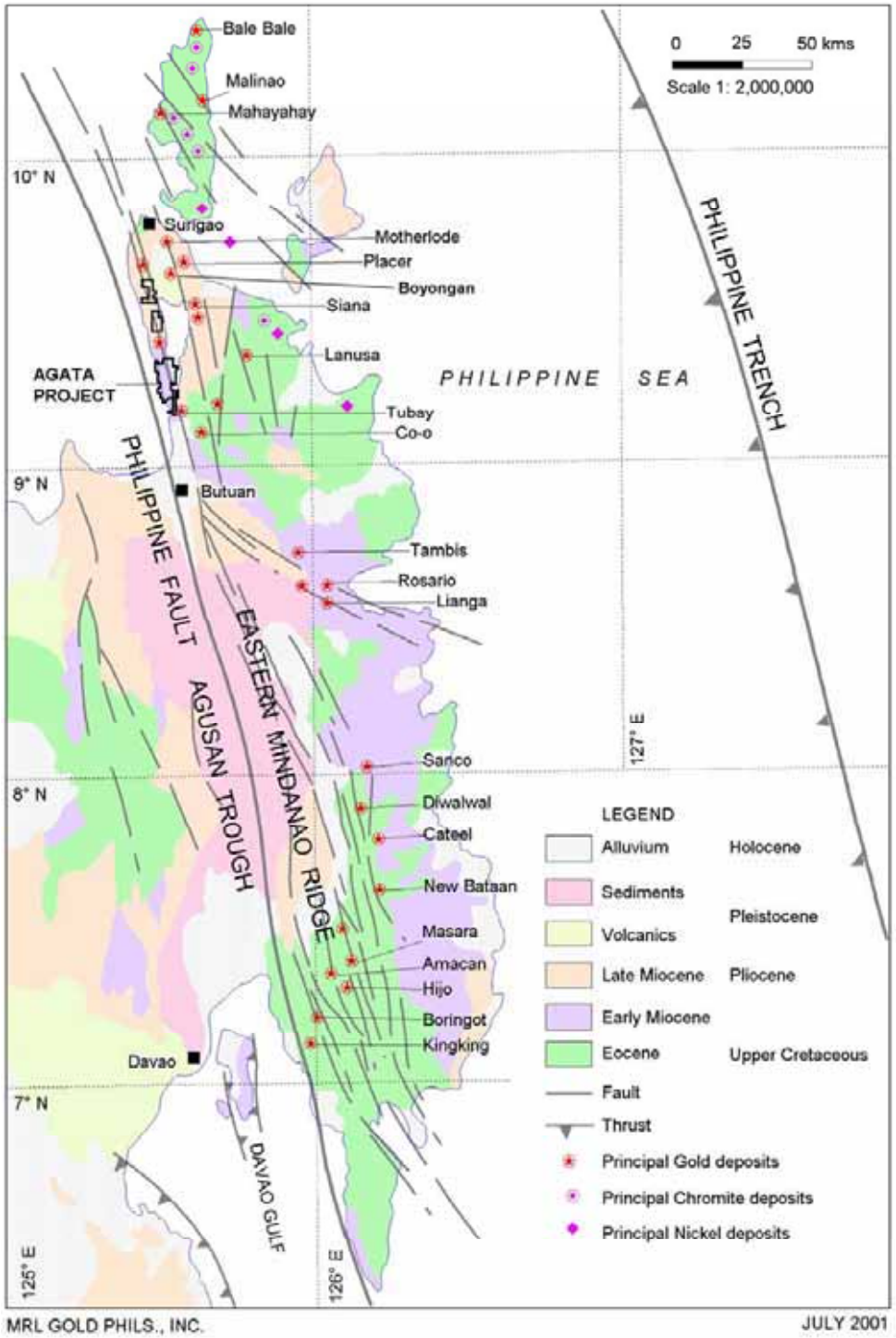


Figure 3 - Regional geological map of eastern Mindanao, with major mineral deposits and faults (adapted from Climie *et al*., 2000 [after Louca 1995]).

cinder cones and dykes dated by K-Ar as mid-Pliocene to mid-Pleistocene (Mitchell and Leach 1991; Sajona *et al*. 1984). The igneous activity is closely associated with the Philippine fault, because the fault transects hot and weaker rocks along the axis of the arc. The lack of topographically significant volcanic centres probably represents low rates of magma production along the slowly converging southern part of the Philippine Trench (~3 cm/year), and horizontal compressive stress which favors intrusion over extrusion of all but the most highly evolved arc magmas. Mineralisation wanes northward through Leyte and the southern Bicol peninsula as the Quaternary volcanic edifices become more imposing, the stress regime less compressive and the magmas less hydrous.

Several of many contributions to understanding the tectonics of the southern Philippines have been made by Aurelio *et al*. (1991), Barrier *et al*. (1991), Bellon and Rangin (1991), Fitch (1972), Hall *et al. (1995),* Moore *et al*. (1981), Nichols and Hall (1995), Pubellier *et al*. (1990), Pubellier *et al*. (1999), Quebral *et al*. (1996), Rangin (1991), Rangin and Silver (1991), Rangin *et al*. (1995, 1999), Silver and Rangin (1991) and Silver and Moore (1978).

5.2 District Geology

5.2.1 Physiography and Faulting

The Surigao mineral district and the northern portion of the Agusan Del Norte district lie at the northern of the Eastern Mindanao Ridge, in a region of intense splaying of the Philippine Fault Zone. The Surigao Del Norte district comprises three north-south-trending physiographic units: the Western Range, the Central Lowlands and the Eastern Highlands that are bounded by strands of the Philippine Fault. The Western Range is an uplifted block that is bound by two major strands of the Philippine Fault system. The western strand lies offshore on the western side of Surigao Peninsula whereas the eastern strand is a sub-parallel splay, termed the Lake Mainit fault, which separates the Western Range from the Central Lowlands. The steep eastern face of the Western Range indicates substantial Quaternary uplift. The Central Lowlands comprises a down-faulted graben that is the site of Pliocene to Quaternary sedimentation (Louca 1996). The volcanic mountains around Mt Maniayao (an andesitic dome) separate the Central Lowland strip into two sub-units, Lake Mainit in the south and the Lowlands to the north (UNDP 1987). Lake Mainit drains to the south along the Tubay River. The river follows the Lake Mainit Fault on the western margin of a ~2-km-wide valley that wedges southward between the Western Range and the Eastern Highlands in the Jagupit Quadrangle. The Eastern Highlands comprise the northern end of the Diwata Range which extends southward along the East Mindanao Ridge. The Tapian-San Francisco, Tapian Main and Agata tenements of the Mindoro-Panoro joint venture lie along the uplifted and fault-bound Western Range.

The earliest recognized generation of faulting in the Surigao district comprises pre-Oligocene thrust faults on Dinagat Island, and within the Western Range. These faults controlled the emplacement of probable Cretaceous-age ophiolites in the region. They have minimal physiographic expression. The principal faults in the district that have the strongest physiographic expression are the young, north-south to NNW-SSE-trending strike-slip faults of the Philippine Fault system. The crustal slivers that are transected by these strands of the Philippine Fault have locally undergone substantial vertical movement as evidenced by the Quaternary "pop-up" movement of the fault-bound Western Range. A segmented second-order strand of the Philippine Fault lies east of the Lake Mainit Fault. A segment of this second-order fault is the Surigao Valley Fault which trends through the Boyongan and Siana mineral deposits. This NNW-SSE-trending structure is segmented by northeast-trending arc-normal cross-structures (Figure 5).

5.2.2 Basement Geology

The basement rocks of the Surigao mineral district comprise greenschists and metamorphic rocks that include the Sohoton Formation and Nueva Estrella Schist of Cretaceous age (Louca 1996). The Sohoton formation comprises schistose meta-sedimentary and meta-volcanic rocks. The Nueva Estrella formation comprises amphibolite schist, garnetiferous amphibolite, biotite schist and lesser quartzofeldspathic schists which occur as tectonic outliers within overthrust ophiolites on Dinagat island (Louca 1996). The basement sequence is over-thrust by basalts and imbricated ophiolite slabs of the Dinagat Ophiolite Complex (DOC). The DOC and associated ultrabasic rocks occupy a NNW-SSE-trending zone that lies along the coastal fringe of the Eastern Highlands and occupies the islands of Buca Grande, Hinatuan, Nonog and Dinagat (Louca 1996). In the Agusan Del Norte province, the Conception Greenschist is overthrust by the pillowed Pangulanganan Basalt of Cretaceous to Palaeocene age, and which in turn is over thrust by the Humandum Serpentinite (Figure 4). The emplacement of the ophiolite slices probably occurred during the Cretaceous, although may have been emplaced as late as the Palaeocene. The ophiolite slices comprise largely of harzburgite, with lesser dunite, and are regionally serpentinized. In the Agusan Del Norte region, the serpentinized harzburgite sheets (Humandum Serpentinite, Figure 4) are overlain by Upper Eocene clastics and limestones of the Nabanog Formation (UNDP 1987) whereas the serpentinites of Surigao Del Norte are overlain by calcareous conglomerates of the Madanlog Formation (Figure 4) of Upper Eocene age. Remnants of this once widespread ophiolite complex are also preserved in the Western Range and on the Agata property of Mindoro-Panoro, where they are prospective for nickel and cobalt.

5.2.3 Stratigraphy

The regional stratigraphic package in the Surigao Del Norte and Agusan Del Norte districts is presented in Figure 4. In the Surigao Del Norte district, serpentinised harzburgites of the DOC are overlain by calcareous conglomerates of the upper Eocene Madanlog Formation (described by Santos *et al*. 1962). Its correlatives in the Agusan district are clastic terrigenous and calcareous sediments of the Nabanog Formation.

During the Oligocene through to Lower Miocene, a mixed volcano-sedimentary package of basaltic flows and breccias, limestones, limestone conglomerates, wackes, siltstones and muddy limestones of the Bacuag Formation were deposited in the Surigao district. The Siana Beds which host the carbonate-replacement mineralization in the Siana mine form part of the Bacuag Formation. The Bacuag formation is also exposed on the northern part of Masapelid Island. In the Agusan district, the equivalent stratigraphic packages to the Bacuag Formation are the Oligocene Nagtal-O Formation which comprises conglomeratic andesite wacke with lesser pillow basalts and hornblende andesites, and the Lower Miocene Tigbauan Formation which comprises a thick sequence of conglomerates, amygdaloidal basalts, wackes and limestones, similar to the volcano-sedimentary package of the Bacuag Formation in the Surigao province.

The Bacuag Formation in Surigao is overlain by a Lower to Upper Miocene turbidite package – the Motherlode Turbidite – comprising a basal limestone conglomerate, and overlying turbidite wackes, siltstones, calcsiltites, marls, and local pebble conglomerates. It reaches a maximum thickness of 700 metres (UNDP 1987). In the Agusan province, the correlative sequence comprises the Kitcharao Limestone of Lower Miocene age and the lower part of the Jagupit Formation which consists of conglomeratic sandstone, mudstone and minor limestone. The Jagupit Formation is thought to extend from the Middle and Upper Miocene through to the Pliocene (UNDP 1984).

During the Pliocene andesitic and minor dacitic pyroclastic eruptions and lava flows occurred throughout much of the Surigao district and were largely re-deposited as a thick epiclastic mass flow sequence below sea-level, but with some deposited in fluviatile environments (UNDP 1987). These are the Mabuhay Clastics. Five sub-facies are recognised within the Mabuhay Clastics, these are the Kambilibid boulder beds, the west Siana calcareous rocks, the Briggs pyroclastics, the Placer conglomerates and minor lava flows and intrusions. The upper part of the Jagupit Formation in the Agusan district may be the time equivalent of the Mabuhay Clastics. The Mabuhay Clastics are associated with a number of *Pliocene-age intrusive* events in the Surigao district. *Hill 259 Andesite Porphyry* and nine other similar stocks, plugs and dykes, occur in the vicinity of the Placer-Mapaso mine area where they are mineralized. Similar intrusive bodies are known on Masapelid Island (UNDP 1987). One of these andesite porphyry bodies has been dated at 3.18 ±

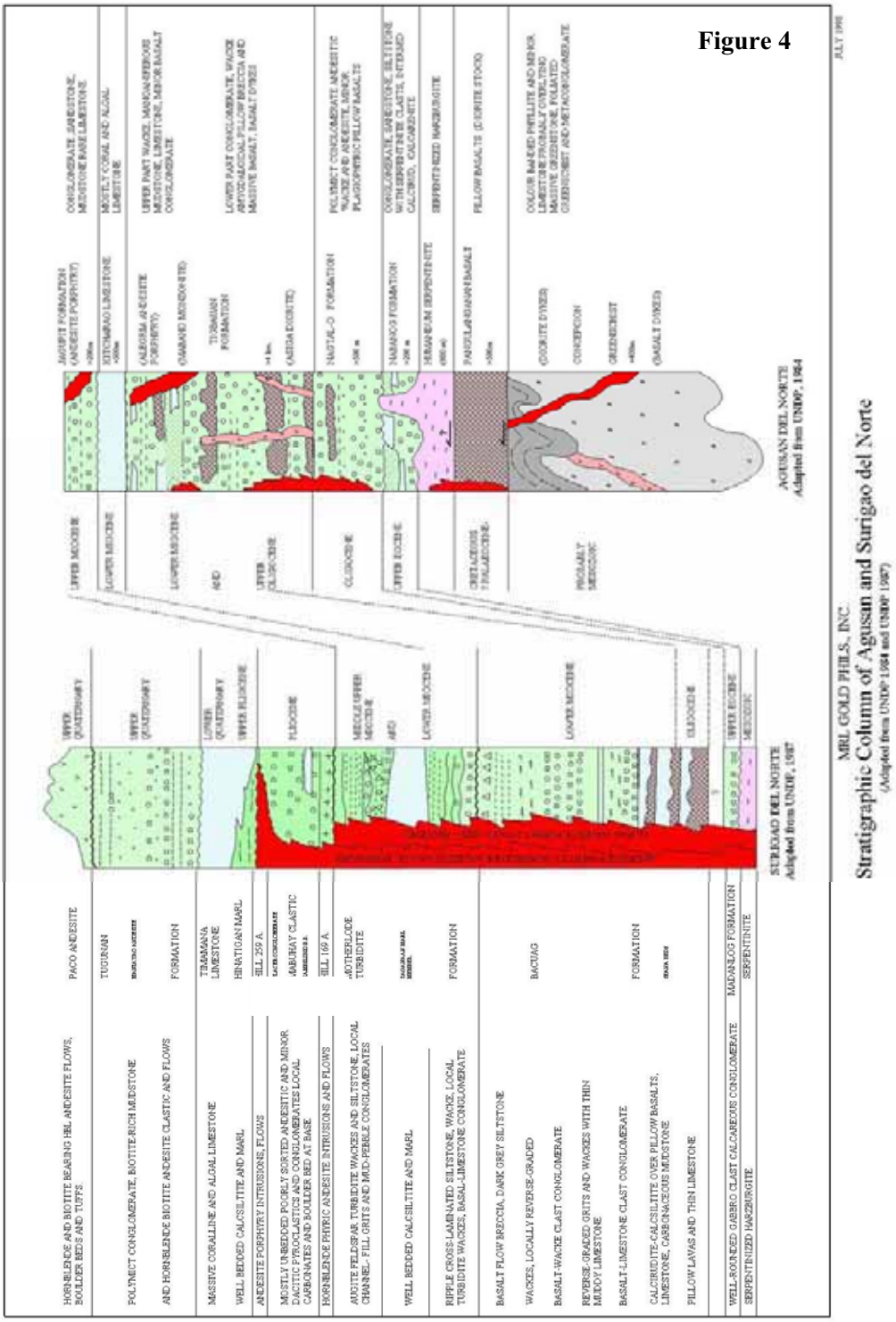


Figure 4
MRL GOLD PHILS., INC.
Stratigraphic Column of Agusan and Surigao del Norte
(Adapted from UNDP 1984 and UNDP 1987)
SURIGAO DEL NORTE
Adapted from UNDP, 1987
AGUSAN DEL NORTE
Adapted from UNDP, 1984
JULY 1998
HORNBLENDE AND BIOTITE BEARING HBL ANDESITE FLOWS, BOULDER BEDS AND TUFFS
PACO ANDESITE
POLYMICT CONGLOMERATE, BIOTITE-RICH MUDSTONE
TUGUNAN
AND HORNBLENDE BIOTITE ANDESITE CLASTIC AND FLOWS
FORMATION
MASSIVE CORALLINE AND ALGAL LIMESTONE
TIMAMANA LIMESTONE
WELL BEDDED CALCSILTITE AND MARL
HINATUGAN MARL
ANDESITE PORPHYRY INTRUSIONS, FLOWS
SILL 259 A.
MOSTLY UNBEDDED POORLY SORTED ANDESITIC AND MINOR DACITIC PYROCLASTICS AND CONGLOMERATES LOCAL CARBONATES AND BOULDER BED AT BASE
ABAUNAY CLASTIC
HORNBLENDE PHYRIC ANDESITE INTRUSIONS AND FLOWS
SILL 169 A.
AUGITE FELDSPAR TURBIDITE WACKES AND SILTSTONE, LOCAL CHANNEL- FILL GRITS AND MUD-PEBBLE CONGLOMERATES
MOTHERLODE TURBIDITE
WELL BEDDED CALCSILTITE AND MARL
RIFFLE CROSS-LAMINATED SILTSTONE, WACKE, LOCAL TURBIDITE WACKES, BASAL-LIMESTONE CONGLOMERATE
FORMATION
BASALT FLOW BRECCIA, DARK GREY SILTSTONE
WACKES, LOCALLY REVERSE-GRADED
BACUAG
BASALT-WACKE CLAST CONGLOMERATE
REVERSE-GRADED GRITS AND WACKES WITH THIN MUDDY LIMESTONE
BASALT-LIMESTONE CLAST CONGLOMERATE
CALCIRUDITE-CALCSILTITE OVER PILLOW BASALTS, LIMESTONE, CARBONACEOUS MUDSTONE
FORMATION
PILLOW LAVAS AND THIN LIMESTONE
WELL-ROUNDED GABBRO CLAST CALCAREOUS CONGLOMERATE
MADANLOG FORMATION
SERPENTINIZED HARZBURGITE
SERPENTINITE
UPPER QUATERNARY
LOWER QUATERNARY
UPPER PLIOCENE
PLIOCENE
MIDDLE UPPER MIOCENE
MIDDLE MIOCENE
LOWER MIOCENE
UPPER EOCENE
MESOZOIC
UPPER MIOCENE
LOWER MIOCENE
OLIGOCENE
CRETACEOUS, PALAEOCENE
PROBABLY MESOZOIC
JAGUPITE FORMATION (ANDESITE PORPHYRY)
CONGLOMERATE, LIMESTONE, MUDSTONE RARE LIMESTONE
KITCHARAO LIMESTONE
MOSTLY CORAL AND ALGAL LIMESTONE
(ALEGRIA ANDESITE PORPHYRY)
UPPER PART WACKE, MARINE-SEDIMENTS MUDSTONE, LIMESTONE, MINOR BASALT CONGLOMERATE
(BAMAND MONZONITE)
TISAGAN FORMATION
LOWER PART CONGLOMERATE, WACKE ANTHRACITIC COAL, PILLOW BRECCIA AND MASSIVE BASALT, BASALT DYKES
(ANDESITE DYKE)
NASTULO FORMATION
POLYMICT CONGLOMERATE ANDESITIC WACKE AND ANDESITE, MINOR PLAGIOPHYRIC PILLOW BASALTS
NAMANOG FORMATION
CONGLOMERATE, SANDSTONE, SILTSTONE WITH SERPENTINITE CLASTS, INTERBED CALCIRUD, CALCARENITE
HUMANEUM SERPENTINITE
SERPENTINIZED HARZBURGITE
PANGULAHAN BASALT
PILLOW BASALTS (DIORITE STOCK)
(DIORITE DYKES)
CONCEPCION
GREENCREST
(BASALT DYKES)

0.27 Myr (K/Ar, mid-Pliocene, UNDP 1987). The *Bad-as Dacite* intrudes the Hill 259 Andesite Porphyry and is similar to the Briggs pyroclastics. A similiar plug of dacite intrudes the Mabuhay Clastics in the vicinity of the Layab mine. Dyke-like breccias bodies associated with andesite porphyry are also developed in areas such as the Placer mine and in the Siana mine pit. Most epithermal mineralization in the Surigao district is associated with this Pliocene-age andesitic to dacitic magmatism that erupted during deposition of the Mabuhay Clastics.

During the Upper Pliocene to Lower Quaternary, the Mabuhay Clastics were overlain by the Hinatigan Marl and the massive coralline and algal Timamana Limestone. The limestone is commonly unconformable on older Bacuag Formation and Motherlode Turbidite. The Upper Quaternary Tugunan Formation in the Surigao district comprises clastic sedimentary rocks that are interbedded with biotite-hornblende andesites of the Mt Maniayao Andesite. The youngest unit in the Surigao district is the late Quaternary (<100 Kyr) Paco Andesite. It comprises hornblende andesite which forms a small juvenile volcanic cone consisting of flows and lahars.

5.2.4 Mineralization and Alteration

The Surigao district is one of the prolific Au districts within the Philippines. Most of the known hydrothermal gold mineralization within the district is of low-sulfidation epithermal character. The mineralization is predominantly of Pliocene age and is spatially and temporally associated with the Mabuhay andesitic volcanism. Epithermal mineralization tends to be confined to the Mabuhay Clastics and associated andesitic stocks, lavas and pyroclastics, and in older rocks immediately beneath the unconformity at the base of the Mabuhay Clastics. The principal low-sulfidation epithermal-type (*), carbonate-replacement-type and porphyry-type deposits and occurrences include:

- Vein-type (Tabon-Tabon vein, Plancoya vein)*
- Bulk Mineable Stringer Stockworks (Placer, Motherlode, Mapaso, Nabago)*
- Stratabound Ore or Carbonate-hosted (Siana mine, “fossil soil” at Placer, Alegria, Dayano stream and Danao (UNDP 1987)
- Surface workings in argillised zones (Mapawa, Hill 664, Manpower, Layab, Gumod)*
- Placer Gold (Malimono-Masgad region)
- Porphyry Cu-Au (Boyongan, Bayugo, Asiga and Madja)
- High-level porphyry-style alteration (Masgad, Malimono, Tapian-San Francisco)
- High Sulfidation (Advanced argillic alteration on Masapelid Island)

The vein-type deposits comprise steeply dipping veins or multiple vein systems that are mineralized with quartz, calcite, clays and sulfides. Regional argillisation, sulfidation and

silicification haloes are strongly developed in the epithermal systems of the Surigao district which comprise extensive quartz stockworks or multiple vein systems. At depth these vein systems may pinch down to single veins rooted in andesite porphyry (e.g. Reno pit – Placer Mine, UNDP 1987) where alteration haloes are narrower. Argillic-altered rocks are cut by narrow quartz-pyrite veinlets and stringers from 0.1 to 2cm wide (e.g. Mindoro pit, Placer Mine, UNDP 1987). Veins within the older rocks below the Mabuhay Clastics tend to be tight quartz bodies in propylitic-altered rocks. In the overlying Mabuhay Clastics the veins form multiple and extensive vein networks within more extensively argillised rock and have greater mineralisation widths, probably due to increased permeability within the clastic-dominated sequence (UNDP 1987) of the Mabuhay Clastics.

The characteristics of the carbonate-hosted stratabound deposits are best portrayed by the mineralization at the old Siana mine. Ore occurs within the calcareous "Siana Beds" which are thrust against basaltic pillow lavas and calcareous mudstones. The ore trends broadly parallel to bedding, although is slightly oblique to bedding in limestone and calcareous mudstones (UNDP 1987). Gold ore occurs as both gold-bearing massive sulfide in limestone and as disseminated gold in clay gouge and limestone. The ore horizon comprises black carbonaceous and pyritic clay that envelope blocks and clasts of limestone. The author has seen drill core from the Siana ore system and noted carbonaceous-rich muddy limestone (albeit heavily brecciated) that is a similar primary lithology to that observed in drill-core from Mindoro-Panoro's Agata property.

Most of the epithermal vein deposits are related to andesitic magmatism of Pliocene age that was coeval and synonymous with the andesitic Mabuhay volcaniclastics. Intrusive stocks and plugs appear to have established high-level geothermal systems within the Surigao district during the Pliocene, leading to shallow epithermal mineralisation. The Boyongan porphyry Cu-Au deposit (Boyungan in UNDP 1987) was discovered in a region which the UNDP identified as having the signatures of an epithermal environment (viz-a-viz argillization, pyrite-quartz stringers, laminated black chalcedonic silica, and rockchip samples anomalous in Ag, As, Sb, Te). Bailey (2003) stated that the epithermal deposit at Placer, to the northeast of the Boyongan porphyry deposit, had indications of a porphyry system at depth below the epithermal ore. It is widely accepted in holistic models that the duration (up to ~300 Kyr) and scale (up to ~8 vertical km) of porphyry Cu-Au ore-forming "systems" allow a spectrum of deposit types to form within a single magmatic-hydrothermal system. Such deposit types include porphyry Cu-Au, high-sulfidation and low-sulfidation epithermal Au deposits and their numerous variants, distal carbonate replacement Au deposits, proximal Au skarns and mesothermal vein deposits.

Following the recent discovery of the gold-rich Boyongan porphyry Au-Cu deposit by Anglo-American, there has been a resurgence of exploration activity within the Surigao Del Norte and

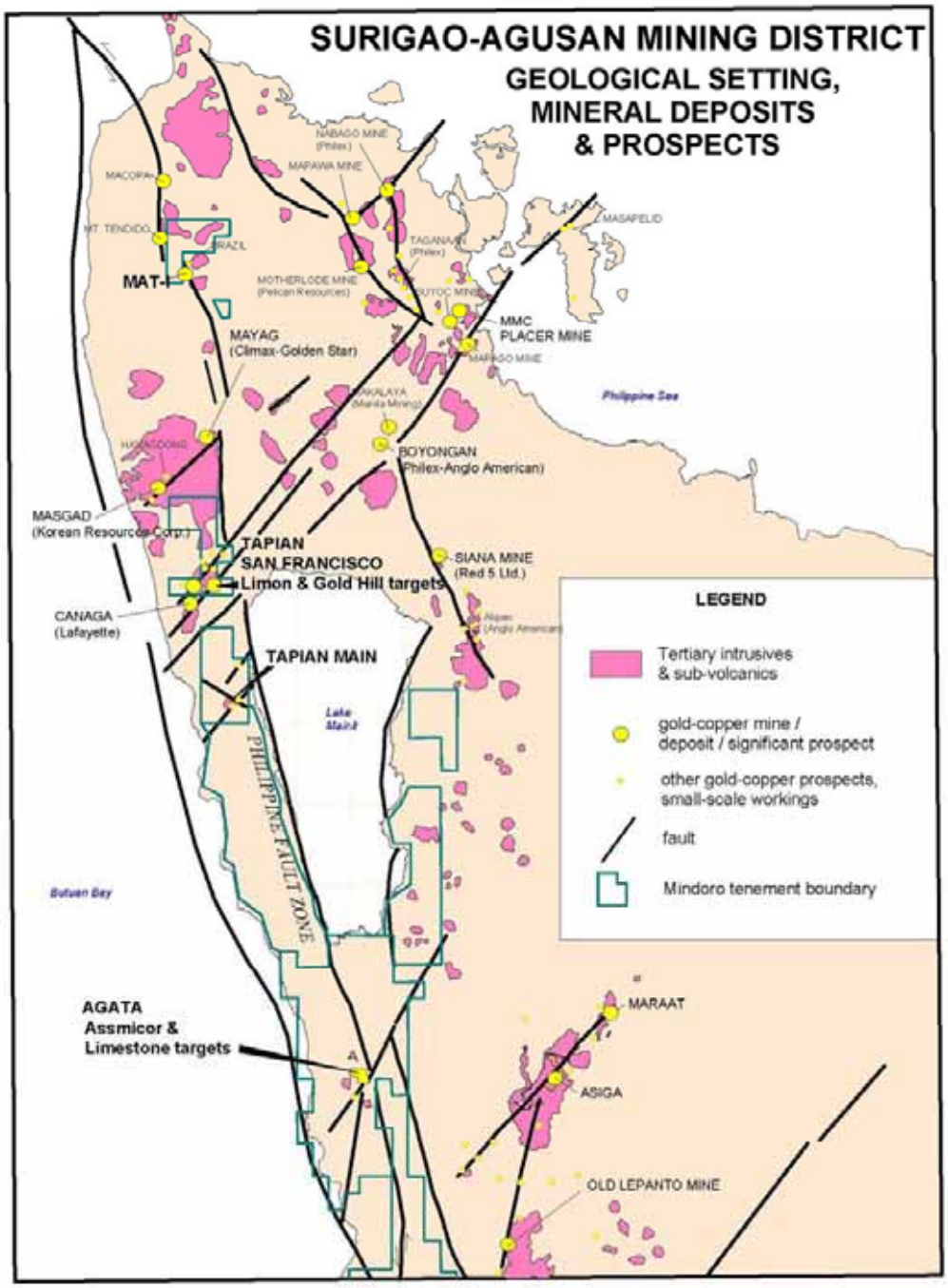


Figure 5 - Regional faults, intrusive centres and gold-copper mines, deposits, prospects and workings in the Surigao mineral district. Mineral occurrences have strong structural controls at the district-scale, and are closely associated with high-level intrusions. The intersection of NNW-SSE-trending, second-order splays of the Philippine fault with northeast-trending, arc-normal cross-structures are particularly favorable targets.

Agusan Del Norte districts. Several companies are actively undertaking exploration in the Western Range of the Surigao district. Rapid and extensive uplift of the belt of andesitic volcanic rocks that comprise the Western Range between two strands of the Philippine Fault raises potential for exposure of the deeper, lithostatically-pressured porphyry-level of magmatic hydrothermal systems in this region. The author has observed two porphyry-style alteration systems in the Western Range, one that lies on the Tapian-San Francisco property, and the other which lies further to the north. It is the author's view that whereas the Eastern Highlands have high potential for shallow, epithermal Au systems, the Western Range has good potential for exposure of the deeper porphyry environment.

Figure 5 shows the strong structural control on the distribution of Au-Cu deposits in the Surigao district, and the association of deposits and mineral occurrences with high-level intrusives and subvolcanic bodies. Most of the deposits are located along NNW-SSE-trending second-order fault splays of the Philippine Fault, and where these arc-parallel structures are intersected by northeast-trending cross-faults. The Tapian-San Francisco property of Mindoro-Panoro lies in a very favorable structural setting at the district-scale, at the intersection of multiple strands of a northeast-trending cross-structure and their intersection with the Lake Mainit Fault. This same northeast-trending structural axis encapsulates both the Boyongan porphyry deposit and the Placer epithermal gold deposits.

6. DEPOSIT TYPES

6.1 Deposit Types

The principal deposits types that are being explored for on the Tapian-San Francisco (TSF), Tapian Main (TM) and Agata (Ag) properties are:

Porphyry Cu-Au of calc-alkaline or alkaline affinity - (<u>TSF</u>, Ag, TM)
Low-sulfidation epithermal Au - (<u>TM</u>, TSF, Ag)
High-sulfidation epithermal Cu-Au (TSF)
Carbonate-hosted Disseminated Au-Ag Ore (<u>Ag</u>)
Skarn Au-(Cu) - (<u>Ag</u>, TSF)

The property of most relevance to each deposit type is underlined. These deposit types collectively belong to the broad family of magmatic-hydrothermal Cu-Au deposits that form above, within and around the periphery of high-level intrusive stocks of hydrous, oxidized, calc-alkaline to potassic alkaline magmas that are emplaced at shallow levels in the crust of active volcanic arcs. These different deposit types form at different structural levels of magmatic intrusive complexes, and their character is governed by a multiplicity of factors that include depth of magmatic

degassing, degassing behaviour, host-rock lithology and structural preparation. The broad geological models for these deposit types are summarized below in Section 6.2. Under each deposit model summary presented below, the key controls on the known deposits in the Surigao district are discussed where relevant to the Tapian San-Francisco, Tapian Main and Agata properties. This is followed by a discussion of the basis for the exploration programs previously conducted (Section 7, Section 8 and Section 9) and proposed (Section 18).

Occurrences of nickel- and cobalt-bearing iron-rich laterites developed on ultramafic rocks are reported from several areas of the Surigao Del Norte province (Louca 1995). Laterites developed on ultramafic rocks comprising serpentinized peridotite occur within the Agata project area, and potential exists within the Agata and Tapian-San Francisco property for these deposit types, in as much as ultramafic rocks are present on these two properties.

6.2 Geological Model and Concepts

6.2.1 Porphyry Cu-Au (Mo)

This class of deposit comprises members that represent some of the largest known accumulations of Cu and Au metal. The principal features of the porphyry copper model have been expounded over the past 30 years by numerous authors, including Burnham (1967); Lowell and Gilbert (1970); Sillitoe (1973); Gustafson and Hunt (1975); Gustafson and Titley (1978); Henley and McNabb (1978); Beane and Titley (1981); Titley and Beane (1981). In the island arc environment, models for porphyry Cu-Au deposits have been discussed by Gustafson and Titley (1978), Sillitoe and Gappe (1984), Solomon (1990) and Corbet and Leach (1994). The most succinct reference to the character of porphyry deposits in the Philippines is that of Sillitoe and Gappe (1984) who discussed the geologic setting and their characteristics.

Porphyry ores are the product of repeated hydrothermal fracturing around the carapace and within the margins of cooling high-level plutons at ~2-5 km depth under lithostatic pressure. In broad terms, dewatering of subducting oceanic crust in the upper mantle causes fluid metasomatism of the mantle wedge over the subducting slab. Introduction of fluids into the hotter core of the mantle wedge lowers its solidus and induces melting that feeds island and continental arc magmatism in the over-riding plate. The mantle-derived melts undergo crystal fractionatation during a staged ascent through the mantle wedge and lower crust. Progressive magmatic evolution through multiple cycles of crystal fractionation, cumulate segregation, recharge and tapping of batholith-scale magma chambers within the sub-arc crust allow the magma to differentiate to progressively volatile- and incompatible-element-rich hybrids that are the parental melts to porphyry ores.

From a regional tectonic perspective, porphyry Cu-Au ore deposits are preferentially developed in highly compressive arc segments, and occur during episodes of uplift associated with thrusting, deformation and thickening of the arc crust. The emplacement of ore-forming magmas typically spans a limited time interval within each porphyry district (~3-10 Myr). Pulses of porphyry mineralisation tend to be short-lived (~3-10 Myr). Some of these discrete time intervals of ore formation include: the deposits of the Andean cordillera [4-12 Ma, 20-22 Ma, 33-41 Ma, 55-60 Ma -Titley and Beane (1981)]; the southwest continental US [39-40 Ma, 52-59 Ma, 62-67 Ma -Titley and Beane (1981)]; the Philippines [1-5 Ma]; Papua New Guinea [1-6 Ma] and the New Ireland/Solomon Islands/Fiji region [0-4 Ma]. These time intervals of metallogenically fertile magmas correlate with the timing and duration of collision events within these arcs. Compression in arcs is induced by the subduction of buoyant spreading ridges and seamount chains, collision between arcs or between arcs and oceanic plateaus, and by subduction below the convex cusps of contiguous arcs. In the thinner crust of the southwest Pacific arcs, compression peaks during subduction reversal. Solomon (1990) noted a causal association between subduction reversals and porphyry-Cu metallogenesis. Porphyry-Cu-generating magmas are intrinsically hydrous, much more so than the average arc magma, and evolve by prolonged entrapment and differentiation in chambers trapped by the compressive stress regime in the lower crust during arc compressive episodes. The strongly calc-alkaline nature of most porphyry magmas, their hornblende fractionation signature, and their high magmatic water contents are collectively caused by magmatic evolution in long-lived magma chambers in the lower crust that undergo prolonged cyclic volatile enrichment over the duration of a compressive episode, and whose entrapment is facilitated by compressive orogeny in arcs (Rohrlach and Loucks 2004). These deeply trapped and hence extremely slow cooling reservoirs are sufficiently voluminous, long-lived and fertile that they are capable of generating clusters of porphyry Cu-Au systems within a single district.

Magmas that fractionate to the dacite stage often achieve sufficient buoyancy to overcome the compressive stress and propagate dykes into the upper crust to sustain subvolcanic magma reservoirs. The solubility of water in melts is a strong function of total confining pressure. Ascending magmas with high dissolved water contents saturate with a saline magmatic brine during ascent through the crust. In mid- to upper-crustal chambers, volatiles may also exsolve from zones of sidewall crystallization where magma convection is less vigorous and crystallization is more advanced. Exsolved volatiles form spanning clusters of bubbles that interlink and percolate upward through the partially crystallized margins of the chamber. At higher concentrations of volatiles, ascending fluids may entrain melt as a buoyant sidewall plume. These volatiles and volatile-laden melts may accumulate in the apical portions of chambers or ascend above the periphery of the chamber to form prolate stocks. Many porphyry deposits developed in continental crust are located on the margins of large magnetic anomalies that represent solidified batholiths, a distribution that is

thought to reflect the propensity for volatiles to accumulate above the *side-walls* of regional magma chambers. The elongate aspect ratio of many porphyry related intrusives, as prolate or finger-like stocks, suggests that melts were actively ascending as they exsolved magmatic-hydrothermal fluids, and that the stocks rapidly solidified during ascent because water loss raises the melt's solidus.

Two contrasting models for the behavior of magmatic fluids in the porphyry ore environment are those of Henley and McNabb (1978) (for vapor-rich systems) and Burnham (1979) (for liquid-rich systems). In the Henley and McNabb model, ore-forming stocks are emplaced above the surrounding lithostatic-hydrostatic boundary, and the plastic carapace forms an attenuated shell that narrowly separates the stock from hydrostatically-pressured groundwaters. Magmatic *vapors* are released from the stock and ascend as a coherent vapor plume through the hydrostatically-pressured rock column. The ore-forming fluids condense from the vapor plume as it rises through cool, fractured country rocks, and disperses within the hydrostatic environment. The plume displaces meteoric water along its axial core so that condensates may gravitationally drain back down fractures, thus accounting for the dominantly magmatic isotopic signature in the core of the porphyry system. Condensate droplets that form further towards the margins of the plume may be forced by reflux to the margins where they mix and disperse into the peripheral groundwater system. The essential feature of the Henley and McNabb model is that the porphyry ores form from vapor condensates within a plume that lies above the brittle-ductile transition. In the porphyry model of Burnham (1979), the activity occurs at substantially deeper levels in the lithostatic environment. In the Burnham model, the apical regions of high-level stocks collect and store *brines* that exsolve from the magma during in situ crystallisation. When these saline, single or two-phase fluid pockets exceed the lithostatic pressure, they hydraulically fracture the crystalline carapace. Temporal interconnectivity of these fractures between the stock and the overlying hydrostatic zone may allow the stock to catastrophically decompress, further lowering the solubility of residual water within the melt and forcing large quantities of vapor and brine to exsolve. The Burnham (1979) model entails a steady accumulation and storage of fluids during crystallisation, and successive, high-energy fluid-release events associated with large vertical fluctuations in the depth of the brittle-ductile boundary. Subsequent mineral deposition seals the fracture/breccia networks and the system temporarily returns to quiescent, lithostatically-pressured conditions in the carapace. Subsequent batches of coaxially emplaced melt, and their shallow crystallisation, allow this process to be repeated.

Within the porphyry ore environment, the core of the magmatic-hydrothermal system undergoes potassic alteration. Potassic alteration in the southwest Pacific porphyry systems tends to be defined by a predominance of secondary biotite in contrast to K-feldspar that is typical of porphyry systems developed in continental crust. Gold-rich porphyry systems are commonly associated with high

magnetite contents. Propylitic alteration forms an extensive shell that forms synchronously with potassic alteration. High-temperature chlorite and epidote are also common in the potassic core associated with biotite-magnetite-anhydrite, and in the inner portions of the propylitic envelope. The cooler outer portions of the propylitic alteration shell have less epidote. Propylitic alteration is characterized by the assemblage albite-epidote-chlorite-calcite-magnetite and is present as an outer, pyritic halo to porphyry systems. In the Philippine porphyry systems, sericite-chlorite-clay alteration ("SCC" of Sillitoe and Gappe, 1984) commonly occurs in an extensive zone between the potassic core and the propylitic shell. The SCC alteration assemblage is interpreted by Corbett and Leach (1994) to form as an argillic overprint on pre-existing phyllic alteration, whereas Cooke (1994) suggests that it represents an early phase of magmatic-hydrothermal sericite-chlorite alteration that is overprinted by later argillic (kaolinite or illite) alteration. Activity-activity diagrams for stabilities of silicate minerals at 350°C and 500 bars pressure at quartz saturation (Beane and Titley, 1981) indicate that chlorite and sericite can occur as an equilibrium assemblage, and are most likely to develop in diorite-related porphyry deposits where the lower K and higher Mg whole-rock compositions of relatively primitive, mafic island arc rocks favor biotite-chlorite and chlorite-sericite. In contrast, the granitoid-associated porphyry Cu systems associated with K-rich continental sialic crust are characterized by a K-feldspar-muscovite equilibrium assemblage. The sericite-chlorite facies, an important feature of the Philippine porphyry systems, is considered by the author to be a bona-fide alteration facies that develops as an equilibrium assemblage adjacent to potassic alteration. In Philippine porphyry systems, the SCC alteration zone is the principal host to most ore. Phyllic alteration (pyrite-sericite-quartz) locally overprints the above alteration assemblages, and commonly forms partial annuli near the stock contacts (Sillitoe and Gappe, 1984). Phyllic alteration in island arc porphyry systems tends to be less well developed than in their continental arc counterparts. Late-stage advanced argillic alteration at high levels above porphyry ore is common in the Philippine porphyry systems and comprises silica-pyrite-enargite-alunite associated with high-sulfidation epithermal Cu-Au ore. The advanced argillic blankets commonly form extensive tabular zones of alteration in volcanic rocks above the porphyry environment.

6.2.2 High-Sulfidation Epithermal Cu-Au

High-sulfidation (Hedenquist 1987) epithermal deposits are magmatic-related Cu-Au deposits that are characterised by a high fS_2 sulfide mineral assemblage, typically enargite-luzonite-bornite-chalcocite-digenite-covellite, and are associated with advanced argillic alteration mineral assemblages which are typically zoned outward from quartz-alunite-diaspore through to pyrophyllite-dickite, illite-kaolinite and peripheral chlorite.

Work over the past 15 years in porphyry and epithermal systems has revealed a close spatial and, in some cases, an enigmatically close temporal association between some porphyry deposits and

high-sulfidation epithermal Cu-Au deposits. Early recognition of these associations led Sillitoe (1983, 1989, 1991) to propose a genetic relationship wherein high-sulfidation enargite-bearing epithermal mineralisation represented a shallow facies of subvolcanic porphyry-ore-forming magmatic systems, where low-density magmatic gas condensed at shallow levels. Stoffregen (1987) demonstrated that the textural features observed in the Summitville high-sulfidation deposit, Colorado, were the product of extreme acid leaching by hydrothermal fluids at pH <2 and at temperatures around 250°C. Steven and Ratté (1960) defined an alteration zonation at Summitville which represented progressive neutralisation of acidic hydrothermal fluids by interaction with the country rock. Early published work on high-sulfidation Cu-Au deposits include Ashley (1982), Bethke (1984), Bonham (1984), Berger (1986), Heald *et al*. (1987), Hedenquist (1987) and Berger and Henley (1989). Models for high-sulfidation epithermal deposits have been proposed by Berger and Henley (1989), Sillitoe (1989), White (1991), Giggenbach (1992), Rye (1993) and Hedenquist *et al*. (1994).

Paired porphyry Cu and high-sulfidation epithermal Cu-Au deposits are rarely observed superimposed within the same rock column on the deposit-scale, though they are locally observed occurring within the same district. The loose coupling is interpreted by Sillitoe (1973, 1983) to reflect the large vertical scale (~ 8 km) over which magmatic hydrothermal systems operate in the upper-most crust, and the fact that exposure of the deep porphyry environment requires erosion of high-level epithermal enargite mineralisation that often overlies porphyry systems. Sillitoe (1983) recognised the requirement for significant syn-mineralisation erosion in some deposits to produce the "telescoping" of mineral assemblages required to preserve both porphyry and high-sulfidation epithermal mineralisation in close proximity to each other. The inferred genetic association first made by Sillitoe (1983), and corroborated by subsequent workers, is based on several key porphyry and high-sulfidation-epithermal deposit pairs: Lepanto and Far Southeast in Luzon (Arribas *et al*. 1995); La Mejicana and Nevados de Famatina in Argentina (Losada-Calderón and Bloom, 1990); El Hueso and Potrerillos in Chile (Marsh *et al*. 1997), and enargite occurrences above porphyry ore at Bor, Yugoslavia; Resck, Hungary; El Salvador, Chile; Frieda River, PNG; and Butte, Montana (Sillitoe, 1983). Additional high-sulfidation-style mineralisation, such as enargite-bornite veins, is observed associated with porphyry ore at Escondida, Chuquicamata, El Abra, El Salvador, Collahuasi and Potrerillos, Chile (Sillitoe, 1991). The Lepanto high-sulfidation epithermal and Far Southeast porphyry deposits in Luzon (Philippines) were shown by Arribas *et al*. (1995) to be contemporaneous in age, and related to a single hydrothermal system of ~300 Kyr duration. The La Mejicana porphyry and Nevados de Famatina epithermal deposit pair in Argentina were interpreted by Losada-Calderón and Bloom (1990) to be part of the same hydothermal system on the basis of fluid inclusion and alteration studies. In contrast, "main-stage" massive enargite-chalcocite-bornite-alunite high-sulfidation veins at Butte postdate porphyry Cu mineralisation by ~5 Myr (Brimhall,

1974), and thus reflects a separate hydrothermal event. Furthermore, high-sulfidation mineralisation at the El Hueso epithermal deposit in the Potrerillos district in Chile predates mineralisation in the Cobre and Norte porphyry deposits by ~5 Myr (Marsh *et al*. 1997). The Tampakan deposit in southern Mindanao represents a similar deposit pair with disparate ages, with extensive high-sulfidation enargite-chalcocite-bornite-covellite mineralisation occurring within an advanced argillic blanket that locally penetrates down cross-cutting faults and overprints chlorite and secondary-biotite potassic alteration assemblages of an underlying and older porphyry system (Rohrlach *et al*. 1999; Rohrlach 2002).

The genetic relationship of these deposit types is supported by Heinrich *et al*. (1999) and Ulrich *et al*. (2001). They present evidence from the Grasberg and Bajo de Alumbrera porphyry deposits that metal-complexing agents other than chloride may control the partitioning of metal to a magmatic gas. Their work shows that segregation of sulphur-rich magmatic gas from porphyry-stage brines allows transport of S, As, Au and Cu in a vapor phase that is implicated in forming high-sulfidation ores at high levels in volcanic edifices.

6.2.3 Low-Sulfidation Epithermal Cu-Au

Low sulfidation epithermal Au-Ag deposits, also known as adularia-sericite, quartz-adularia, and bonanza Au-Ag type deposits, produce Au and Ag with Pb, Zn and Cu by-products. Examples of this deposit class include Creede (Colorado), Comstock (Nevada), Ladolam (Lihir Is - PNG) and deposits of the Baguio district (Philippines). These deposit types occur in volcanic island arcs and continental arcs in areas that have undergone extension within the upper crust. The deposits form within high-level hydrothermal systems at depths of ~ 1km or less, and are commonly associated with hot spring activity in palaeo-geothermal fields. The deposits form within regional-scale fractures in volcanically active terrains, and may also form within extensional graben faults, resurgent calderas, flow-dome complexes and diatremes. These deposits are also found in shallow sub-volcanic stocks and breccia complexes. Host rocks are typically volcanic rocks in which calc-alkaline compositions are dominant, although shoshonitic and alkalic rocks are important in many Au-rich deposits [Cripple Creek (Colorado), Porgera (PNG), Emperor (Fiji)]. Low-sulfidation epithermal ores commonly form upward-flaring alteration and breccia zones that are centered on structural conduits. Mineralization ranges from bonanza veins to larger stockworks, with lesser disseminations and replacements. Ore forms in open-space filling veins that are often crustiform-textured or comprise low-temperature colloform silica. Vertical zonation in ore zones typical ranges from a base-metal but Au- and Ag-rich upper portion to increasing base-metal contents in the lower portion. Silicification is extensive in areas of multiple quartz veining, and is usually surrounded by envelopes of argillic (sericite-illite-kalinite) or intermediate argillic alteration (kaolinite-illite-smectite). Propylitic alteration occurs at depth and peripheral to the ore systems. Deposits within

individual districts are commonly linked to a specific structural or magmatic event and form along a palaeohorizon within ~1 km of the surface. The ore fluids are relatively cool dilute hybrids of magmatic and meteoric fluid that circulate in near-surface geothermal systems or in deeper structurally- and permeability-controlled zones marginal to porphyry type systems in island arc stratovolcanoes. The Victoria low-sulfidation veins in the Lepanto district may be such an example of distal, high-level low-sulfidation ore on the margins of the large Far South East porphyry system in the Mankayan district of Northern Luzon.

6.2.4 Carbonate-Hosted Disseminated Au-Ag

These deposit types are locally termed "Carlin-type" gold deposits, and occur as stratabound ore zones of Au-(Ag) replacement mineralization in carbonate and silty to argillaceous carbonaceous limestone. They are typically low-sulfide ores comprising micron-scale Au associated with As, Sb and Hg enrichment. Arsenic is an important component of the geochemical signature of these ore types due to the presence of arsenopyrite and gold-bearing arsenical pyrite. The deposits form tabular replacement bodies that are commonly localized at lithological contacts. Sulphide (pyrite) and gold are typically disseminated. These deposit types are associated with silica replacement of carbonate. Silica veins and jasperoidal bodies occur in the core of the mineralized systems, and can be surrounded by argillic alteration. Brecciation is common due to volume loss during silicification of carbonate. Felsic plutons may be important in the generation of these deposit types. A popular model for carbonate-hosted disseminated Au-Ag deposits of the Carlin variety is the distal skarn model, since they form in relative proximity to intrusions, skarns and calc-silicate rocks.

6.2.5 Skarn Au-(Cu)

Gold skarn deposits are associated with many porphyry Cu districts. Limestone and carbonates- and organic-rich sediments that occur within the wall-rocks to porphyry-forming intrusive bodies can react extensively with exsolved magmatic-hydrothermal fluids to form Au-rich replacement skarn ores. A good example of this type of mineralisation occurs in the OK-Tedi deposit (PNG) and in the Ertzburg district of Irian Jaya. Au skarns often develop calcic skarns with exoskarn assemblages that comprise calc-silicate assemblages of garnet and pyroxene.

7. TAPIAN-SAN FRANCISCO PROPERTY

7.1 Accessibility, Climate, Local Resources, Infrastructure and Physiography

The Tapian-San Francisco property lies approximately 32 kilometres south of Surigao City in the province of Surigao Del Norte, Northeast Mindanao. The property lies in rugged terrain that spans the crest of the north-south-trending Western Range. The highest point on the southern part of the property is known as Gold Hill and lies at 621 metres above sea level (ASL). Trending northward from Gold Hill are a series of undulating peaks that define the crest of the range. These attain a maximum elevation of 896 metres ASL near the north end of the property. The topography along the eastern margin of the property dips steeply eastward whereas along the western side it dips modestly westward.

Plate 1 – Looking SSW along the phyllic alteration zone of the Cantikoy porphyry Cu prospect on the Tapian-San Francisco property. The zone of phyllic alteration occupies the western flank of the hills in the middle distance.

Vegetation on the property is dominated by secondary forest growth along the higher elevations and steep eastern margin of the property. There are a greater number of agricultural plots on the western part of the property on which coconut, banana and other subsistence food crops are grown. The property can be accessed from the eastern and western side of the Western Range. From the east, access from Surigao City is by an all-weather concrete road to Magpayang road junction and then by an unsealed road that passes through the town of Mainit, on the northern shore of Lake Mainit, to Barangay Hacienda San Francisco. From this point, the southern part of the project is accessed by a steep foot trail that ascends the eastern flank of the Western Range. Alternatively the

property can be accessed from the west via a gravel road that runs south along the coast from Surigao City, along the western side of the Western Range. An old logging road near Cantapoy extends eastward to Barangay Villa Riza, the latter lying on the western margin of the property. Local public transport is ubiquitous on major roads in the region. The wettest months in the Surigao province coincide with the northeast monsoon which extends from October to February. The southwest Monsoon extends from June to September. March, April and May are the driest months. This climate pattern pertains also to the Tapian Main and Agata properties discussed below.

7.2 History

The record of historical exploration and mining activity in the Tapian-San Francisco region is sparse, and little information is available from the records of the Mines and Geoscience Bureau. Some fragmentary information on past mining activity has been gleaned by company geologists via verbal recounts of local residents. Regional surveys conducted by government geologists and as part of government sponsored development projects are reported in Santos and Oca (1946), Teves *et al*. (1951), Santos *et al*. (1962), Madrona (1979), and the United Nations Development Project which was conducted in 1984-1986 (UNDP 1984, 1987). The geological reconnaissance reports of Teves *et al*. (1951) and Madrona (1979) pertain to the Agusan Del Norte province, south of the Tapian-San Francisco property (Figure 6).

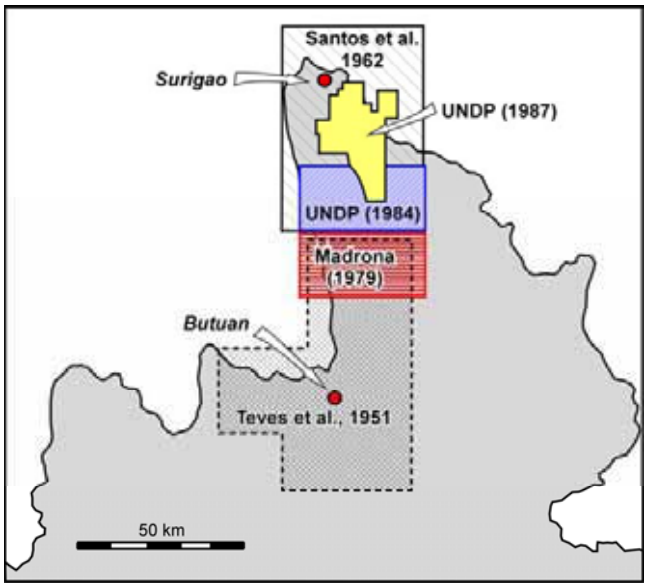


Figure 6 – Area of historical government-sponsored and UNDP-sponsored geological survey and work programs in the Surigao Del Norte and Agusan Del Norte provinces.

The first company to explore within the project area was Dela Rama Mining. The company purportedly mined for a year in the Gold Hill Prospect area which lies in the southern portion of the Tapian-San Francisco property. The operations of Dela Rama Mining ceased in 1942 during World War II. After the war, gold was extracted from Gold Hill in the San Isidro mine (Santos-Ynigo and Oca, 1946). Santos-Ynigo and Oca (1946) describe the ore at Gold Hill as occurring in quartz-filling shear fractures in shale which was intruded by andesite. They indicate that the gold in the ore was too fine to be discerned by the naked eye, but that it gave "unusually high assays". The mine records were destroyed during the war. Frontino Mining operated for a year in 1964 on the Limon prospect and worked along the limestone-serpentinite contact near the headwaters of Limon Creek (Fetiza, 1999). Some ~90 tonnes of direct shipping copper ore was purportedly extracted from the Mina prospect and shipped to Japan (Salas, R. [MRL] pers. comm.). In 1968, White Eagle Mining commenced operations, purportedly for 2 years, and also drilled several exploration holes. The results of these drill holes are not known. Between 1973 and 1975, the Lepanto Consolidated Mining Company conducted further exploration and drilled up to 6 holes in the Limon prospect. The results of this program are also unknown. A number of small-scale pits, adits and tunnels were observed by the author in the Gold Hill prospect region together with concrete foundations from an old processing plant. Several of the diggings had been worked by local high-graders as recently as 2 years ago (Salas, R. [MRL] pers. comm.). Several additional tunnels and adits were also observed by the author in areas to the north.

The mining and exploration activity discussed above was concentrated in the southern portion of the Tapian-San Francisco property. However, Andrada *et al*. (1980) noted the occurrence of gold prospects adjoining the northwest corner of the Tapian-San Francisco property, in the Masgad region, during geological assessment of the group of claims owned by the Queen City Corporation in Barangay Masgad, Malimono. These government geologists conducted observations along rivers and creeks, and observed tunnels, trenches and various other workings in the Western Highlands. They also identified a gold prospect area that overlaps the northern 6 claim blocks of the Tapian-San Francisco property, and extends further north and west. Andrada *et al*. (1980) reported that local residents in the Masgad region were actively sluicing and panning for gold in the soil mantle which comprised clay and rock fragments formed by weathering and erosion of andesite. They also reported sluicing and panning of sand deposits along the shoreline and offshore in Barangay Masgad. Fine gold was reported in sandy deposits of the delta adjacent to Barangay Masgad, whereas coarser gold as micro-nuggets, up to 1mm in size, were recovered in the upper portions of some streams in the region. Vein gold in claim areas of the Queen City Mining Corporation was being extracted from adits and sinks.

The Tapian-San Francisco property and adjoining area to the northwest have seen gold mining activity in near-surface positions by both mining corporations and local high-graders. To the author's knowledge, the only large-scale or "hydrothermal-system-wide" synthesis of alteration, mineralization and other geological data is that currently being undertaken by MRL, primarily because earlier activity on the project areas predated seminal papers by Sillitoe (Sillitoe 1973, 1983) that illustrated the large scale of porphyry-related magmatic-hydrothermal systems.

7.3 Property Geology

The oldest mapped unit on the Tapian-San Francisco property is an ultramafic unit which occupies much of the southwestern half of the property. The ultramafic unit comprises harzburgites. This unit is probably correlative with, or forms part of, the Dinagat Ophiolite Complex.

A limestone of probable Upper Eocene to Lower Oligocene age unconformably overlies the serpentinite unit. The limestone unit lies mostly along the steep eastern side of the Tapian-San Francisco property. The limestone unit comprises a white to pale-grey calcirudite, calcarenite and calcisiltite. The unit has been described as a fossil-bearing biomicrite clastic limestone. Carbonaceous shale and mudstone interbeds occur within the limestone and vary from 1-10 metres in thickness (Fetiza 1999). The lithology is relatively similar to units of the Bacuag Formation that host the Siana orebody, and consequently the silty and carbonaceous limestone units on the eastern side of the Tapian-San Francisco property have potential to host replacement-style mineralization.

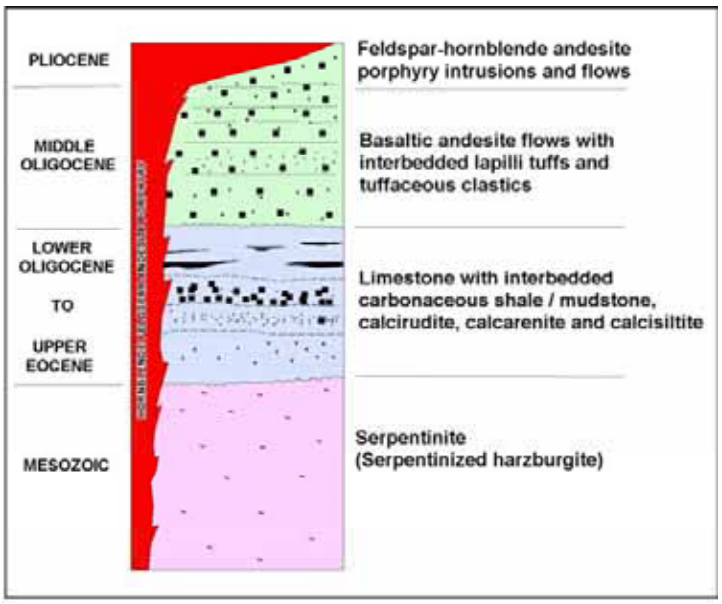


Figure 7 – Stratigraphic column for the Tapian-San Francisco property (from Fetiza 1999).

Andesite flows and pyroclastics unconformably overlie the Upper Eocene to Lower Oligocene limestone unit (Figure 7). The flows are partly basaltic (basaltic andesites) and display both porphyritic and amygdaloidal textures in places. In the southern portion of the property shown in Figure 8, they are green to gray colored due to chlorite associated with variable propylitic alteration. In thin section they comprise plagioclase, augite and magnetite phenocrysts within a groundmass of plagioclase microlites, chlorite, hematite and trace chalcopyrite (Fetiza 1999).

A hornblende-feldspar-andesite porphyry intrudes older units at the northern end of the Tapian-San Francisco property. This intrusive pluton covers several square kilometres within the confines of the property, and extends further north. This large intrusive pluton is associated with the Masgad and Mayad porphyry prospects that are owned by KORES and Climax respectively. The author has observed an additional porphyry-type alteration system in the field to the north of the Tapian-San Francisco property that is also associated with this large intrusive body. The same hornblende-bearing unit has been observed by MRL geologists in the Gold Hill and Limon prospects areas at the southern end of the property (Fetiza 1999). A near ubiquitous feature of porphyry-ore-forming magmatic rocks is their high abundance of hydrous phenocryst phases, typically hornblende. It is probable that the magmatic rocks responsible for alteration and mineralization at Cantikoy (Limon) and Gold Hill are correlatives, if not direct deep extensions, of this hornblende-bearing intrusive body. This unit is thought to be correlated with the Mabuhay Andesite (of Santos *et al*. 1962), the Mabuhay Clastics (of UNDP 1987) and the Mabuhay Formation (of Louca 1996). These are synonymous terms for the andesitic intrusives, eruptives and epiclastic derivatives of Pliocene age that are associated with epithermal Au mineralization in the Surigao district. Plates 2A to 2H show the range of altered igneous rocks that were collected by the author from the Masgad River that drains off the hornblende-feldspar andesite in the vicinity of the northern margin of the Tapian-San Francisco property. While it is not certain whether the rocks were shedding from the northern-most portion of the Tapian-San Francisco property or further north from the Masgad prospect, they nevertheless illustrate the style of alteration associated with igneous rocks of this regional intrusive "complex".

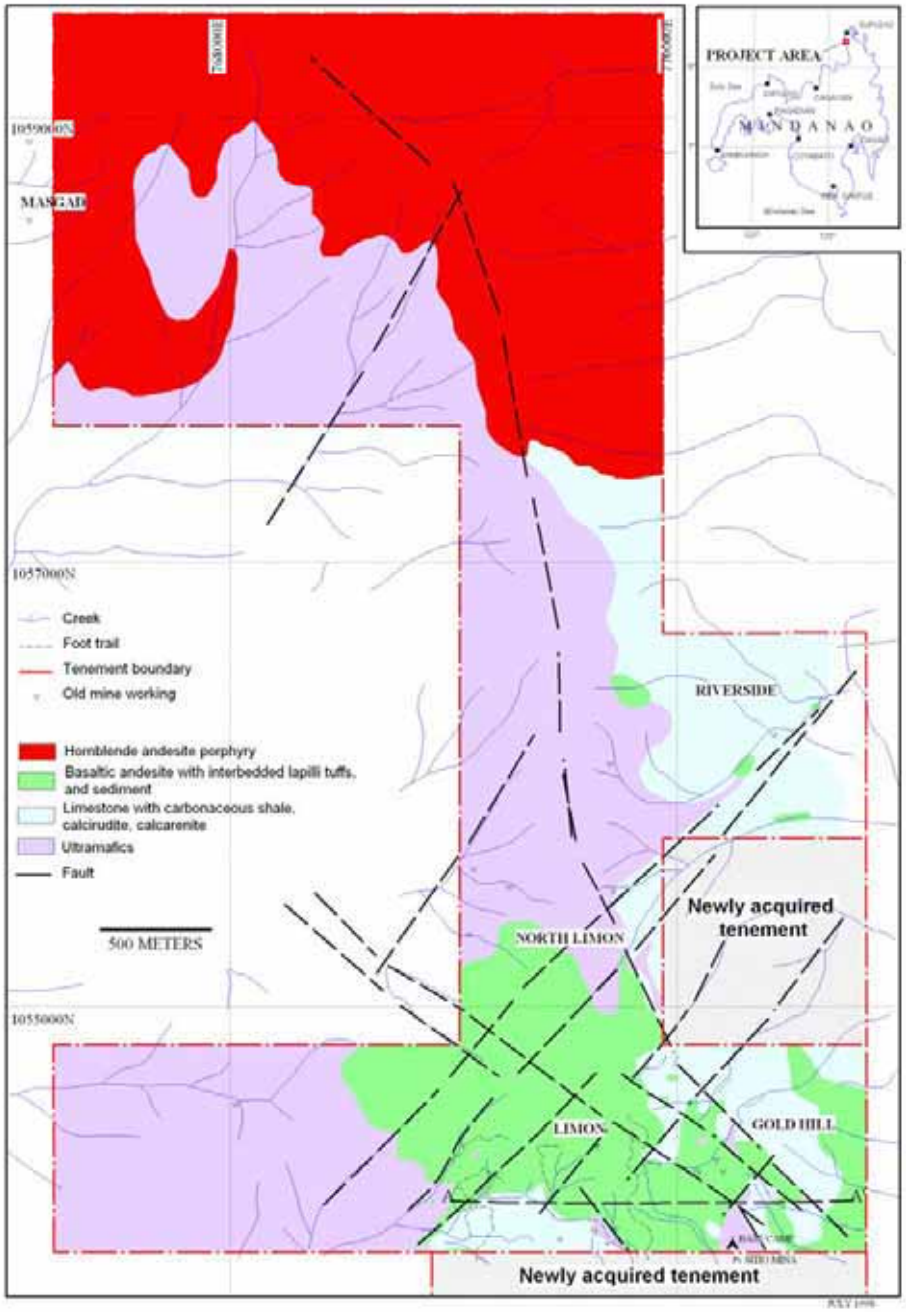


Figure 8 - Initial geological map of the Tapian-San Francisco property (from Fetiza 1999). The "newly acquired tenement" labels were superimposed by the author to reflect the current tenement status. Detailed mapping of alteration zones in the southern portion of the property is presented as Figure 9.

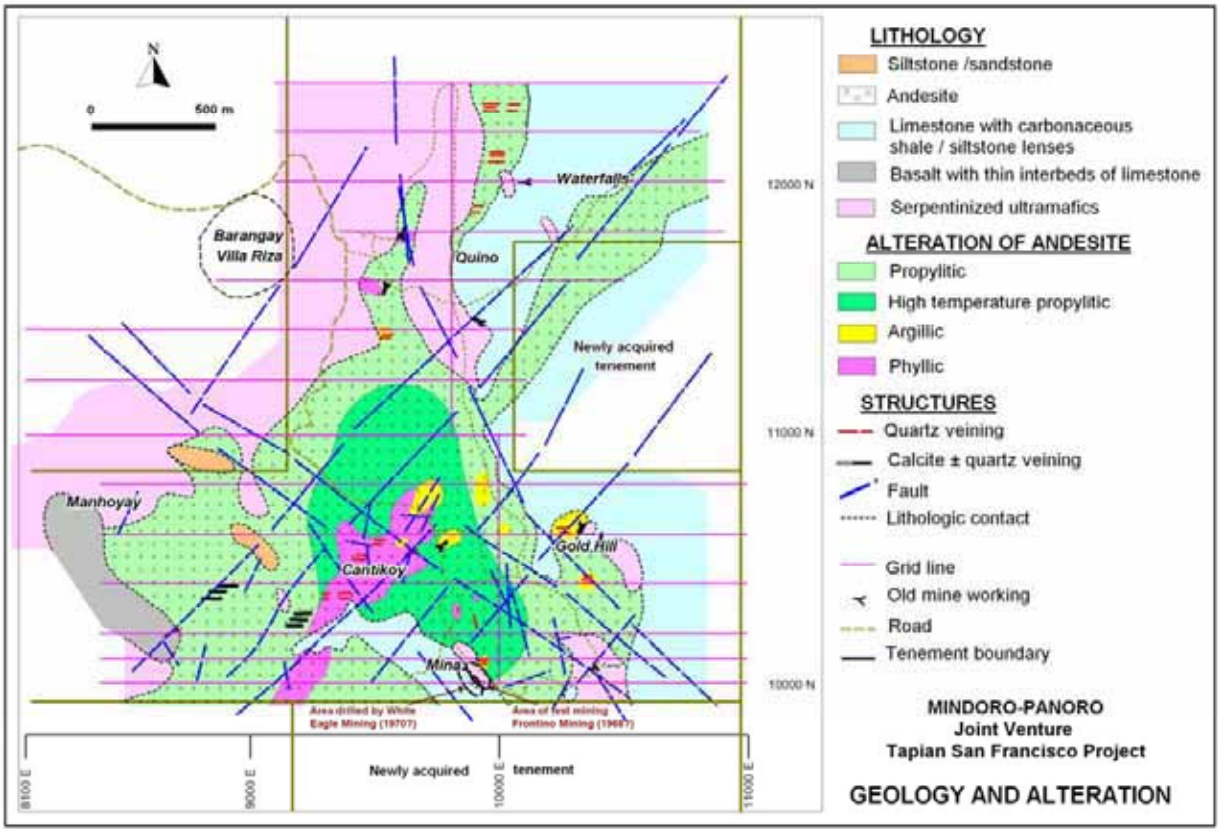


Figure 9 - Geological map of the southern portion of the Tapian-San Francisco property, covering the Cantikoy (formerly Limon), Gold Hill, Mina, Quino and Waterfalls prospects.

Plate 2 (overleaf) – Field descriptions of igneous rock textures and alteration types in the lower Masgad Creek which drains off the region of hornblende-andesite near the northern margin of the Tapian-San Francisco property.

A – Relatively fresh quartz diorite with weak chlorite alteration of the groundmass and weak chlorite alteration of mafic phenocryst phases.

B – Porphyritic andesite with initial propylitic alteration and overprinting illite alteration comprising illite alteration of feldspar phenocrysts. Trace sulfides are present.

C – A propylitically-altered, crowded andesite porphyry grading to diorite. Feldspar phenocrysts are preserved and minor chlorite alteration occurs within mafic phenocrysts and in the groundmass. Approximately 1% sulfide (pyrite) occurs as disseminations within the groundmass.

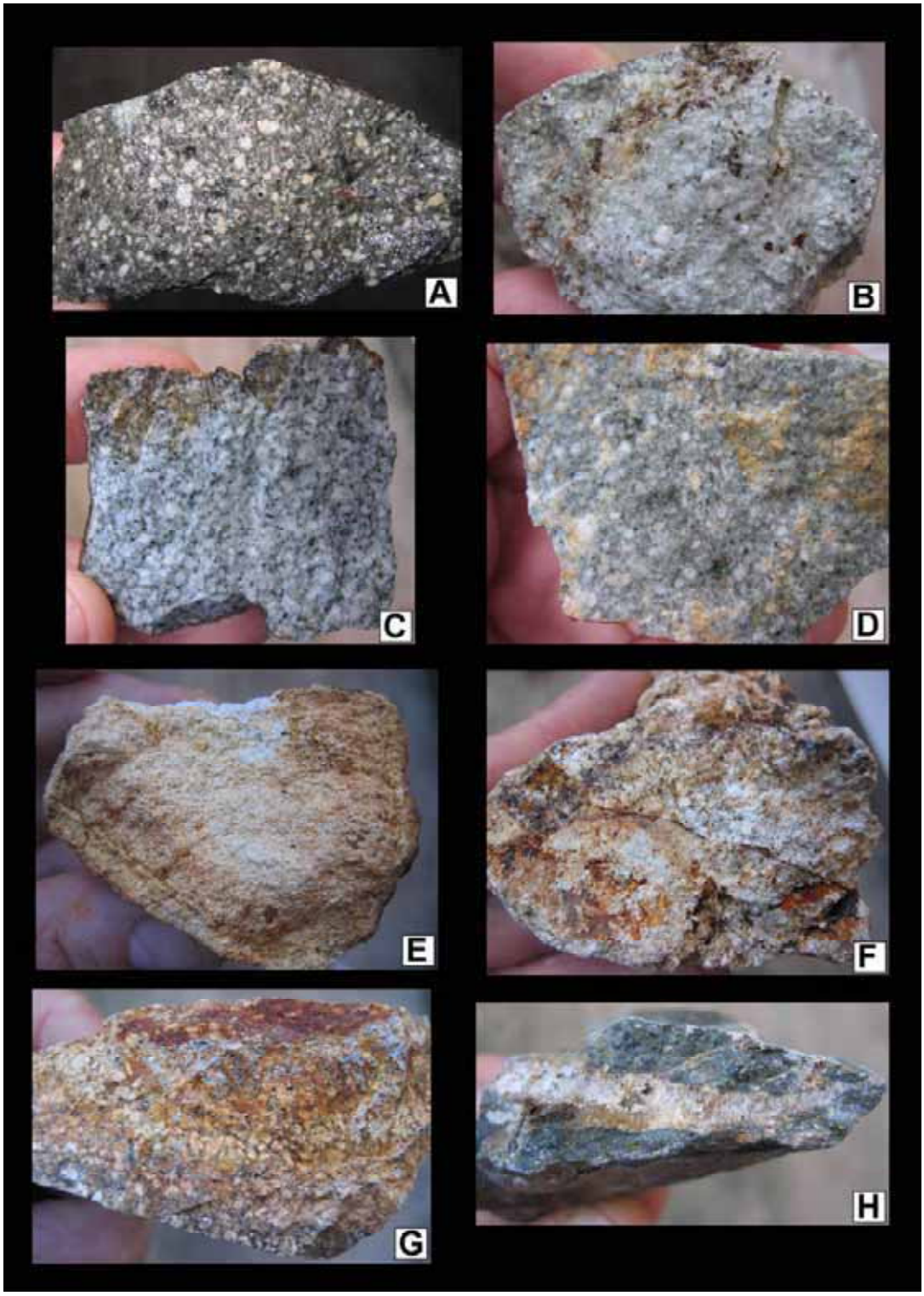
D – A propylitically-altered and weakly argillised, crowded andesite porphyry. Feldspars are relatively fresh however the chlorite and weak illite alteration occur within the groundmass. Mafic phenocrysts are chlorite-altered. Pyrite (~3%) occurs as disseminations through the rock. The groundmass is weakly siliceous.

E – Heavily argillised porphyritic andesite with a weathering overprint. The phenocrysts and groundmass show equal amounts of clay alteration.

F – A crowded porphyritic andesite to diorite. The rock is strongly argillised and has goethite and limonite on fractures. Some voids in the rock are lined by inward-projecting quartz crystals coated in rinds of iron-oxides.

G – A strongly argillised, crowded porphyritic andesite to diorite with intense illite alteration of feldspar phenocrysts. The groundmass is strongly siliceous in places whereas in other areas it comprises an intergrowth of quartz and chlorite. Minor voids in the rock are defined by disseminated ex-pyrite box-work.

H – An aphanitic basaltic andesite cross-cut by quartz veins with inward projecting sparry quartz crystals. A series of fractures are partly limonitic and are associated with fine silica veinlets and druzy quartz.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A set of northeast- and northwest-trending faults transect the southern portion of the Tapian-San Francisco property. The northeast-trending faults are the dominant set and appear to form part of a major fault zone. Individual strands of this fault zone control the distribution of phyllic alteration along Cantikoy creek and the outcrop distribution of andesite in the Quino and Waterfall prospect areas. This northeast-trending fault set, which passes through the Cantikoy (Limon), Gold Hill, Quino and Waterfall prospects, forms part of a regional structural corridor that extends to the northeast through the Boyongan deposit, and further to the vicinity of the Placer mine (Figure 5). The northwest-trending faults are a subordinate conjugate set.

7.4 Mineralisation and Alteration

The mineralization and alteration that is present in the southern portion of the Tapian-San Francisco property displays characteristics that may be interpreted as being related to an underlying and buried porphyry Cu-Au system.

Regional alteration mapped by MRL in the southern portion of the Tapian-San Francisco property comprises a north-east trending zone of strong phyllic (quartz-sericite-pyrite) alteration that is ~1.6 km in length and ~100-300 metres in width and which is developed in porphyritic andesites. Abundant float and outcrop of intense silica alteration occur within this zone of phyllic alteration. Petrographic analyses of this zone of alteration indicate the presence of illite/sericite flooding in association with pyrite. The north-east trend of this zone of intense silica-clay alteration is near parallel to major northeast-trending lineaments that are inferred to be regional faults which transect through the southern portion of the tenement. These lineaments define a structural corridor that pass through and encapsulate the Boyongan porphyry Cu-Au deposit to the northeast of the Tapian San-Francisco property. The Cantikoy prospect lies within this zone of intense phyllic alteration.

This seemingly structurally-controlled zone of phyllic alteration is surrounded by high-temperature propylitic alteration at its northern end, between ~10300mN and ~10800mN. This alteration facies is defined by chlorite and epidote alteration with the presence of minor veining that comprises epidote, epidote-quartz or magnetite. It is developed in hornblende-bearing porphyritic andesites. The central and southern portion of the phyllic alteration zone is surrounded by propylitic-altered andesites.

An area containing float boulders with potassic alteration was identified by MRL geologists to occur in the Limon area (Fetiza 1999). Bailey (2003) described these potassic-altered rocks as coming from within the broader phyllic alteration zone. Thin-section descriptions of these samples by Comsti (1997) identified an episode of potassic alteration that is attested by secondary biotite in association with epidote and opaque minerals. Calc-silicate alteration is locally observed east of

Cantikoy creek, and represents recrystallisation of limestone and calcareous sediments within the region.

Patches of argillic alteration occur in the Gold Hill prospect region, and extend westward to the northern end of the Cantikoy prospect (Figure 9). They also occur in an extensive NNW-trending zone that is >700 metres in length and ~200-300 metres in apparent mapped width. This zone encompasses an area to the south of Cantikoy, known as the Canaga prospect area, where Spinifex conducted shallow drilling during the 1990's (Figure 15).

The alteration zones are modestly well mapped over the Riverside-Gold Hill-Cantikoy-Quino regions in the northern part of the alteration system, but have undergone only partial and preliminary reconnaissance mapping in the southern portion of the alteration system that overlies the Canaga region. The dominant rock type comprises variably altered and variably porphyritic andesite and diorite.

Work conducted during Phase 1 of exploration by MRL defined four prospect areas within the property, these being: Cantikoy (formerly Limon), Quino (formerly North Limon), Riverside (Waterfalls) and Gold Hill prospects. In addition known mineralization occurs within the Mina area, and in the south in the Canaga region where MRL have recently gained access to additional tenement blocks. The mineralization in these areas is described sequentially below. There are a number of old and abandoned small-scale mine workings that have been reported by MRL Gold Philippines Incorporated in the southern portion of the Tapian-San Francisco project area (Fetiza 1999). These workings include 9 shafts, 17 adits and 2 mill sites that have been discovered to date. The author has observed 4 of these adits, 3 areas of workings, 2 collapsed shafts and an old milling site.

CANTIKOY (Limon) – The Cantikoy prospect is defined by a NNE-trending zone of intense phyllic alteration that comprises quartz-sericite/illite-pyrite. The phyllic alteration is coincident with a zone of Cu (>250 ppm) and Au (>50 ppb) enrichment and Pb plus Zn anomalism in soil samples (Figures 11 and 12). The peak Au value in soils was 2.071 g/t. The Au soil anomaly is open along strike to the southwest and may continue along the mapped continuation of the phyllic alteration zone in Cantikoy Creek. Weakly mineralised rock-chip samples from phyllic-altered rocks in this zone have Au values ranging from 0.105 g/t Au to 0.715 g/t Au, with a peak outlier at 3.35 g/t Au. The graph below illustrates the range of assays from rock-chip samples collected from within the mapped outline of the phyllic alteration zone. Of 54 rockchip samples collected from within the mapped boundary of phyllic alteration, the average gold grade is 0.25 g/t Au. These samples were collected by MRL geologists from over an ~800 metre strike length of the phyllic alteration zone

(Figure 13), with elevated grades above 0.2 g/t Au being obtained from the southern, central and northern portion of the 800-metre-long sampled interval.

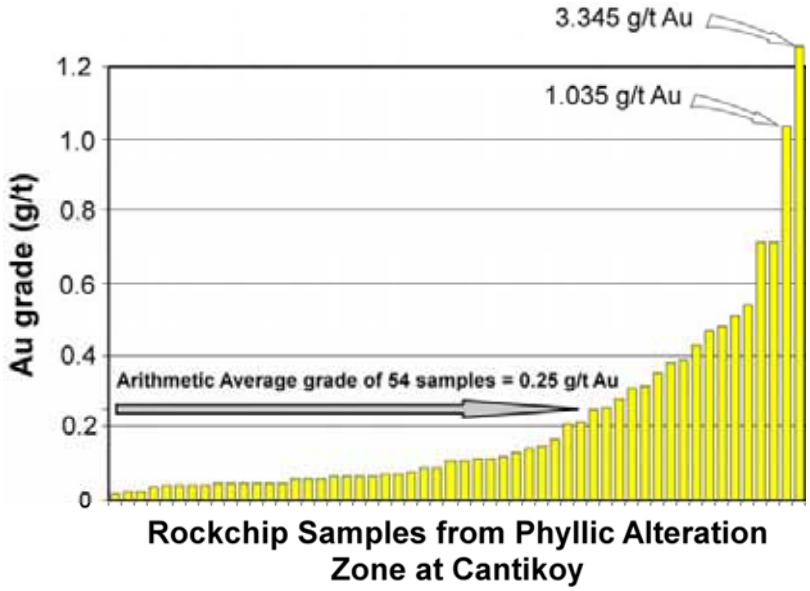


Figure 10 – Graph of Au assays obtained from rock-chip samples collected from along an ~800m strike extent of the northern half of the mapped zone of phyllic alteration at the Cantikoy prospect. The average grade of 54 rock-chip samples is 0.25 g/t Au.

Boulders of pyrite-bearing phyllic alteration from Cantikoy Creek are locally foliated and sheared, consistent with the presence of major NNE-trending structures that are inferred to control the regional distribution of the phyllic alteration zone. Float boulders of calcite-cemented breccia and an outcrop of hydrothermal breccia (0.13 g/t Au) have also been observed in the Cantikoy (Limon) prospect by MRL geologists (Fetiza 1999), and may attest to substantial fluid over-pressuring along the regional structural conduit that is inferred to localize the zone of phyllic alteration. The sulfide assemblage within the phyllic alteration zone at Cantikoy is dominated by pyrite.

As described in Section 7.5.2, the Cantikoy prospect is coincident with two deep-seated IP chargeability anomalies that underlie the surface alteration, and is coincident with an extensive and shallow resistivity anomaly that was defined by IP surveying in 2004. In summary, mineralization at Cantikoy appears to be related to a structurally-controlled zone of pyrite-bearing phyllic alteration with significant, albeit low-level, gold mineralization at shallow levels.

Plate 3 (overleaf) – Field descriptions of rock types and alteration within the Cantikoy and Mina prospects. (Note: the digital images overleaf have sufficient resolution to be viewed under up to 500% resolution when viewed on screen).

A – Propylitic-altered andesite from immediately west of the Cantikoy phyllic alteration zone. The andesite is modestly chloritised with minor epidote disseminations, cross-cutting epidote veins and epidote-quartz veins. Minor fresh hornblende is preserved together with disseminated primary magnetite.

B – Massive phyllic to argillic alteration in the central portion of the Cantikoy phyllic alteration zone.

C – Massive phyllic to argillic alteration in the central portion of the Cantikoy phyllic alteration zone.

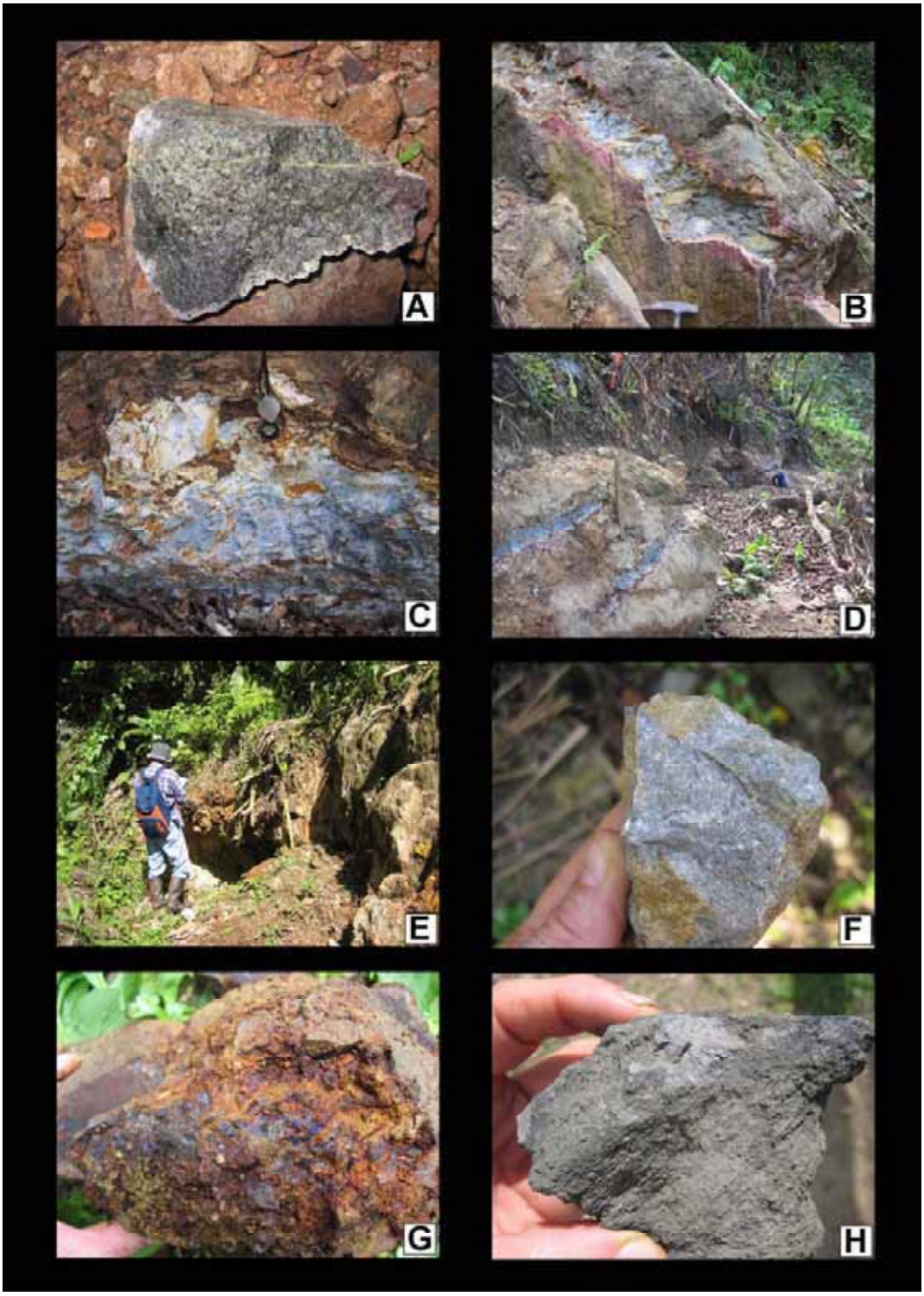
D – Channel samples across the central portion of the phyllic alteration zone above the headwaters of Cantikoy Creek at 10700 mN. The rocks exhibit strong sericite alteration, with pervasive disseminated pyrite that comprises 2-3% of the rock. A 25-metre-long channel sample exposed highly fractured and broken quartz-sericite-pyrite-altered andesites, with limonite staining on fracture surfaces. The phyllic alteration is pervasive.

E – A high-graders exploratory pit dug on the western bank of Cantikoy creek in an area of strong phyllic to argillic alteration. The "muck-out" material comprises highly silicified and argillised andesite with disseminated pyrite and extensive limonite staining in the roof rocks of the pit. Anomalous channel samples in this section of Cantikoy creek yield values up to 0.31 and 0.35 g/t Au.

F – Silicified and argillised andesite that has been "mucked-out" from the high-graders exploratory pit shown in Plate E. The sample comprises ~85% hydrothermal silica and 6-7% disseminated pyrite.

G – Highly ferruginous and goethitic gossan with secondary Cu-carbonate minerals (azurite and malachite). The presence of Cu-oxides is used as a guide, by local high-graders, to indicate that the Au tenor is likely to be high. The sample comes from a series of small, crudely timbered pits to the east of the Mina prospect area.

H – A sample of high-grade mineralisation obtained from a small high-grader's excavation pit to the east of the old Mina mine. The sample comprises massive sulfide (~50-60% sulfide) in highly silicified rock. The sample assayed 289.96 g/t Au, 2.36% Cu, 1860.8 ppm Ag, 35.75 % Pb and 17.27 % Zn.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QUINO and **RIVERSIDE** (Waterfalls) – The Quino and Riverside prospects are defined by a contiguous zone of Au anomalism in stream sediment samples (>200 ppb) with a peak of 1043 ppb, plus Cu, As and Zn anomalism in stream sediment samples. The Au stream-sediment anomaly broadly correlates with a NE-trending fault set that runs through the Riverside (Waterfalls) prospect area and southwestward through the Quino prospect and to the northern portion of the Cantikoy prospect. The western ridges of the Riverside prospect comprise serpentinite whereas the eastern portion of the prospect at lower elevations comprises variably recrystallised calcarentite and calcirudite limestone. A NE-trending, linear, faulted sliver of propylitic-altered andesite occurs along the projection of the NE-trending fault corridor within the limestone sequence (Figure 9).

Several abandoned mine workings are present in the Riverside area (Fetiza 1999) and visual identification of chalcopyrite, bornite, malachite and covellite was reported by Fetiza (1999) from several float boulders near a padlocked adit in the Riverside prospect. The southern end of the stream sediment Au anomaly coincides with the Quino prospect which lies due east of Villa Riza. The author observed outcrops of silicified and weakly sericite-altered porphyritic andesite that lie within a broader region of propylitic alteration and which is cross-cut by quartz veins. A rock-chip Au assay from these rocks yielded up to 2.04 g/t Au (Plate 4C). Magnetite stringers are present within silicified andesite, and local hydrothermal breccias with sericite-alteration and traces of sulfide were observed in the vicinity of a tunnel in the Quino prospect area. A second tunnel at Quino, east of Villa Riza, was observed by the author extending ~5 metres into argillised andesites that are surrounded by propylitic-altered andesites. A rockchip sample collected by MRL geologists from within this tunnel yielded 7.58 g/t Au (R.Salas [MRL] pers. comm.).

The mineralization at Quino and Riverside appear to have a structural control at the regional scale. The presence of argillic alteration, the sporadic sericite alteration and silicification within a wider zone of propylitic alteration, the presence of minor hydrothermal breccias, the presence of As anomalism in stream sediments (peak 162 ppm), and sporadic but significant Au values in some rock-chip samples, collectively suggest that the mineralization in these prospect areas is related to channeling of hydrothermal fluids along a NE-trending structural conduit at high-levels in a magmatic hydrothermal system.

As described in Section 7.5.2, the Riverside-Quino prospect area is associated with irregular chargeability anomalies that underlie the surface alteration, and with a shallow zone of high resistivity that was defined by IP surveying in 2004.

Plate 4 (overleaf) – Rock types and workings within the Quino prospect area on the Tapian-San Francisco property and their field descriptions. (Note: the digital images overleaf have sufficient resolution to be viewed under up to 500% resolution when viewed on screen).

A – Outcrop of silicified and weakly sericite-altered porphyritic andesite at 11800mN. The outcrop occurs on the western flank of the hill that lies east of Villa Riza, and occurs within a broader region of propylitic-altered andesite with weak patchy phyllic alteration. The andesite is cross-cut by quartz veins that display a medial crack-seal line and inward projecting sparry quartz crystals.

B – Close-up image of a sample of silicified and magnetite-altered andesite from the same outcrop as Plate A. Abundant magnetite forms fine-grained laminae and stringers within strongly silicified rock.

C – Strongly silicified and modestly sericitised porphyritic andesite with quartz veining and strong limonite development on fracture surfaces. A sample collected from this outcrop assayed 2.04 g/t Au.

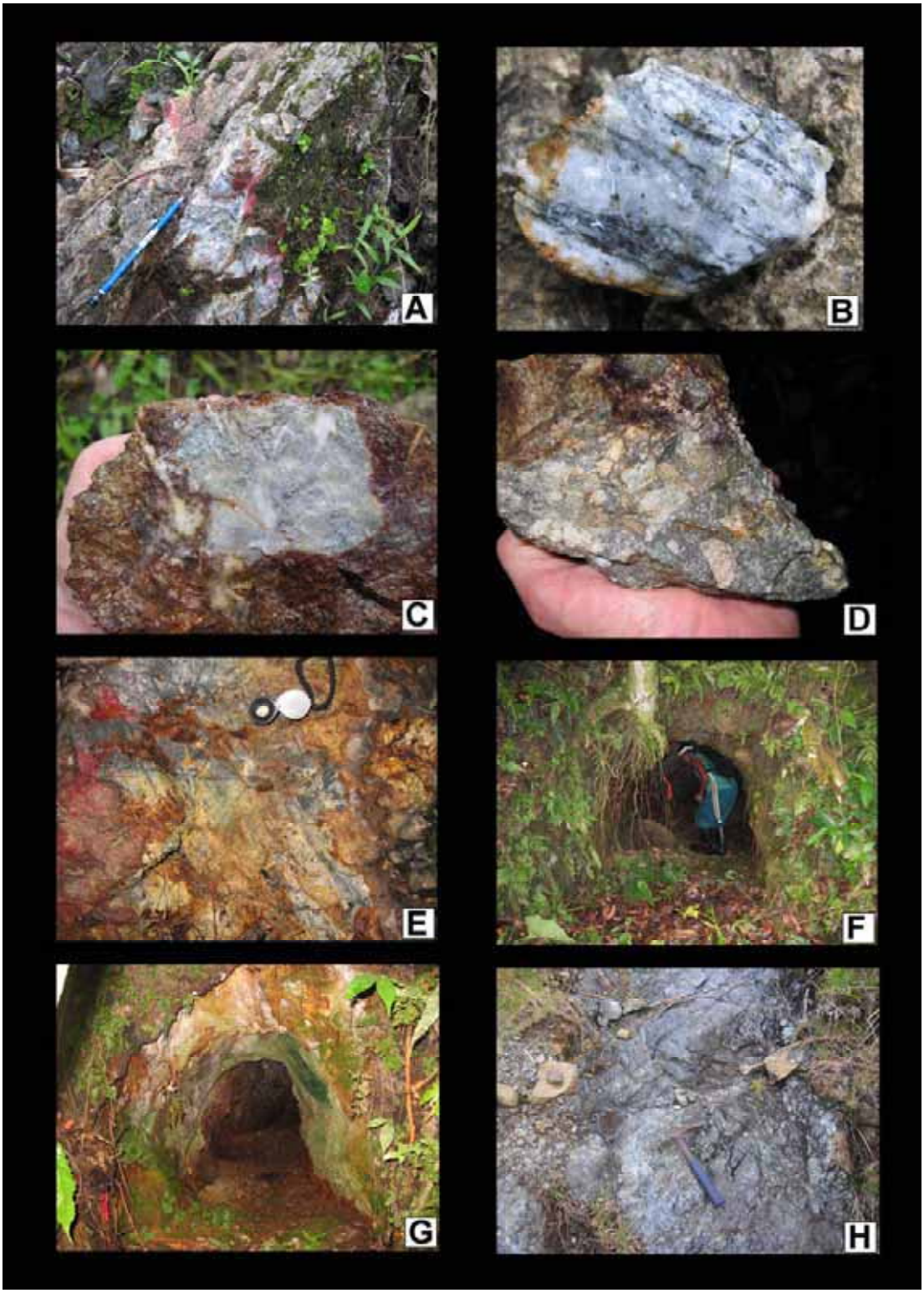
D – A hydrothermal breccia from on line 11600 mN adjacent to the tunnel shown in Plate G. The breccia is transitional from a matrix-supported to clast-supported breccia and exhibits modest rounding of the breccia clasts. The breccia is moderately sericite-altered, weakly silicified, and contains traces of sulfide. The breccia outcrops in the creek bed adjacent to fractures that run along the creek.

E – Highly silicified and sericite-altered andesite which is strongly fractured by a fine network of breccia veins. The veins are filled by milky and sparry crystalline quartz. Limonite occurs along oxidation surfaces of cross-cutting fractures. A sample from this same outcrop, collected from ~30 metres upstream of the tunnel in Plate G, graded 0.74 g/t Au, and 1807 As, 258 ppm Mo.

F – Tunnel at Villa Riza prospect. The tunnel penetrates ~5 metres into the hill and connects with a drift to the left. The walls of the tunnel are strongly argillised, and a sample from within the tunnel assayed 7.58 g/t Au. The rocks outside the tunnel comprise propylitic-altered andesites with some pyrite disseminations along fractures and minor magnetite.

G – A tunnel excavated by small-scale miners into strongly sericite-altered andesitic volcanics in the creek bank on line 11600 mN. The andesitic volcanics are locally cross-cut by fine hydrofractures. The hydrofractures are sealed with silica, and limonite is well developed on fracture surface. A sample collected from within the tunnel assayed 0.515 g/t Au and 1000 ppm As.

H – Ultramafic rocks outcropping along a footpath near top of the hill east of the tunnel shown in Plate G. The ultramafics are highly serpentinised and exhibit strong cataclastic fracturing.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GOLD HILL – The Gold Hill prospect lies along a set of two interpreted northwest-trending faults that are broadly orthogonal to the northeast-trending faults that run through the Riverside-Quino-Cantikoy prospects. The prospect is also cross-cut by an interpreted northeast-trending fault (Figure 15). The rock types encountered within the Gold Hill prospect area include serpentinites, overlying limestone intercalated with carbonaceous shales, and basaltic andesite with interbedded tuffs (Fetiza 1999). Most of the old mine workings in the Gold Hill prospect area lie within the basaltic andesite unit. Minor hornblende-feldspar porphyry are reported to have intruded the units at Gold Hill as narrow dykes up to 5 metres in width (Fetiza 1999). These dikes are thought to be correlative with a large hornblende-feldspar porphyry body that lies adjacent to the Masgad prospect off the northwestern margin of the Tapian-San Francisco property. Their presence may indicate a similar, underlying intrusive body at Gold Hill that could be the progenitor of shallow-level mineralisation.

The basaltic andesites at Gold Hill have undergone propylitic and minor phyllic plus argillic alteration. Some five adits and nine shafts plus a pre-WWII mill site have been identified at the Gold Hill prospect area within an area of ~300x250m (Fetiza 1999). Within this area, quartz-sericite-calcite-pyrite veins and sparse stockworks are observed within basaltic andesite, limestone and carbonaceous shale interbeds and often preferentially occurr along unit contacts (Fetiza 1999). Reactive carbonaceous shale and limestone units are locally mineralized. The mineralization at Gold Hill coincides with a Au, Cu and As anomaly in soil samples. The zone of Au enrichment in soil samples covers an area of ~325 x 250 meters and is coincident with the upper reaches of Goldhill Creek. The anomalous values obtained in soil samples range from 65-10,100 ppb (Au), 65-1,700 ppm (Cu), 25-1120 ppm (As), 25-15,900 ppm (Pb), 100-1,600 ppm (Zn) and 2.5-57.1 ppm (Ag).

As described in Section 7.5.2, the Gold Hill prospect is coincident with a broad shallow-level, NNE-trending zone of high resistivity as defined by IP surveying in 2004.

MINA – The Mina prospect area is a former old mine site that was developed by Frontino Mining in the 1960's. Several benches were cut in an area that spans the contact between ultramafic rocks and silicified limestones. A collapsed tunnel was observed in the overgrown Mina mine area that extends into strongly calcite veined and partially silicified limestone. Several high-grader pits were observed by the author near the eastern margin of the old Mina mine area, and local high-graders have excavated azurite- and malachite-bearing goethite gossan from at least one of these pits. A sample of fresh massive sulfide that was collected by MRL from the same vicinity, and observed by the author, yielded a Au assay of 289.96 g/t Au (Plate 3H). The mineralization at Mina appears to

be related to both vein stockworks along the contact between serpentinites and limestones, and also to local massive replacement mineralization in some limestone units.

CANAGA – The Canaga prospect area refers to an extensive area that lies south of prospect gridline 10,000mN. The area is partly covered by newly acquired tenement blocks through an agreement between MRL and a local claim holder. Two of the blocks which occur within the broad Canaga prospect area are designated as 'Minahang Bayan' areas in which surface rights have been assigned to local small-scale miners. The two 'Minahang Bayan' blocks are illustrated in Figure 15. The alteration within the broader Canaga area is poorly understood at present due to recent access to the claim blocks by MRL geologists. The observed surface alteration and mineralization in the Canaga region south of gridline 10,0000 mN may be considered as the southern extension of a larger-scale magmatic hydrothermal system(s) that is (are) present in the Cantikoy, Mina, Gold Hill, Quino and Riverside prospect areas.

Broad reconnaissance mapping of the Canaga Prospect was conducted as part of the technical due diligence over the property. This outlined the SSW-trending southern extension of the Cantikoy phyllic alteration zone and the argillic alteration further to the south. This latter zone trends to the SSE, is >700 metres in strike extent, is open to the south, and is 200-300 metres in apparent width at surface (Figure 15). This zone of argillic alteration was tested by eight shallow percussion holes drilled by Spinifex in the early 1990's. The zone of argillic alteration comprises clay-silica-limonite-chlorite with minor pyrite associated with oxidized quartz veinlets. An outcrop of highly fractured diorite exposed by a recent landslip was observed by the author near the southern end of the mapped argillic zone. The diorite body is altered to clay-chlorite-limonite, and malachite and other Cu-oxides were observed on fracture surfaces and in association with thin quartz veinlets.

At the northern portion of the Bautista MPSA area located 800m south of Mina Prospect, three strongly mineralized float boulders, each measuring over a square metre in area and distributed over an area of 50 x 30 metres, were observed by the author to contain strong Cu mineralization as breccia veins of malachite and covellite or bornite. The boulders were highly fractured and appear to have been sourced from upslope to the east. Assays for 2 of these well mineralized samples are: 1) 22.98 % Cu, 0.58 g/t Au and 2) 8.43 % Cu, 0.82 g/t u.

As described in Section 7.5.2, the Canaga prospect may contain the southern extension of two deep IP chargeability anomalies (C5 and C6) and the southern extension of a zone of high resistivity that extends at shallower levels northward to the Gold Hill prospect area.

7.5 Exploration

7.5.1 MRL Exploration (1997-2000)

Exploration activity undertaken by MRL between 1997 and 2000 was focused on areas of known surface gold mineralization at Gold Hill and at Limon (Cantikoy). This work included surveying of grid-lines, semi-detailed geological mapping, stream sediment sampling, soil geochemical sampling and rock-chip sampling. In addition, a satellite radar image was interpreted over the project areas of MRL in northern Mindanao, including over the Tapian-San Francisco property. This interpretation was conducted by DOZ Technologies of Canada, with synthetic aperture radar (SAR) interpretation being carried out by M.J. Bart.

A total of 32.975 line km of grid lines were established by MRL at Gold Hill and at Limon (Cantikoy prospect). The elevations that were obtained from the surveying of the grid-lines was computed and plotted following GPS location of the baseline, and a topographic map was derived for use as a base-map. Semi-detailed geological mapping and stream sediment sampling (18 samples) were conducted by MRL over the Riverside area over an area of ~2.43 km^2. Stream sediment samples were analysed for Au, Cu, As, Pb, Zn and Ag. Details of the stream sediment sampling procedures are discussed in Section 10.1.

Reconnaissance geological mapping was conducted by MRL geologists over major streams and tributaries in the Tapian-San Francisco project. Geological mapping was also undertaken on the gridded areas during the collection of soil geochemical samples. A total of 1,183 soil samples were collected together with 46 duplicate soil samples. The samples were analysed for Au, Cu, As, Pb, Zn and Ag. Details of the soil sampling procedures are discussed in Section 10.2 while Figures 11 and 12 summary the results of Cu, Au, As, Pb and Zn geochemistry from this soil survey. A series of 111 rock samples were also collected from outcrop and from float boulders.

The Au and Cu soil assays, at >50 ppb Au and >250 ppm Cu, define an arcuate belt of discontinuous anomalies that extend along the northeast-trending phyllic alteration zone at Cantikoy, trend eastward from Cantikoy to the Gold Hill prospect area and then southward. The eastern and western limbs of the arcuate zone of anomalous Au and Cu in soils are open to the south of grid-line 10,000mN, along the northern margin of the Canaga prospect area. Au values in soil samples from the headwaters of Cantikoy Creek include four consecutive 25m-spaced soil samples that assayed 2.07 g/t Au, 1.42 g/t Au, 1.1 g/t Au and 0.6 g/t Au. A distinct zone of As anomalism in soil samples (>100 ppm As) is present over the Gold Hill prospect area and suggests an epithermal character to the mineralization at Gold Hill. The interpretations of the results of geological mapping in the Tapian-San Francisco area are incorporated in Sections 7.3 and 7.4.

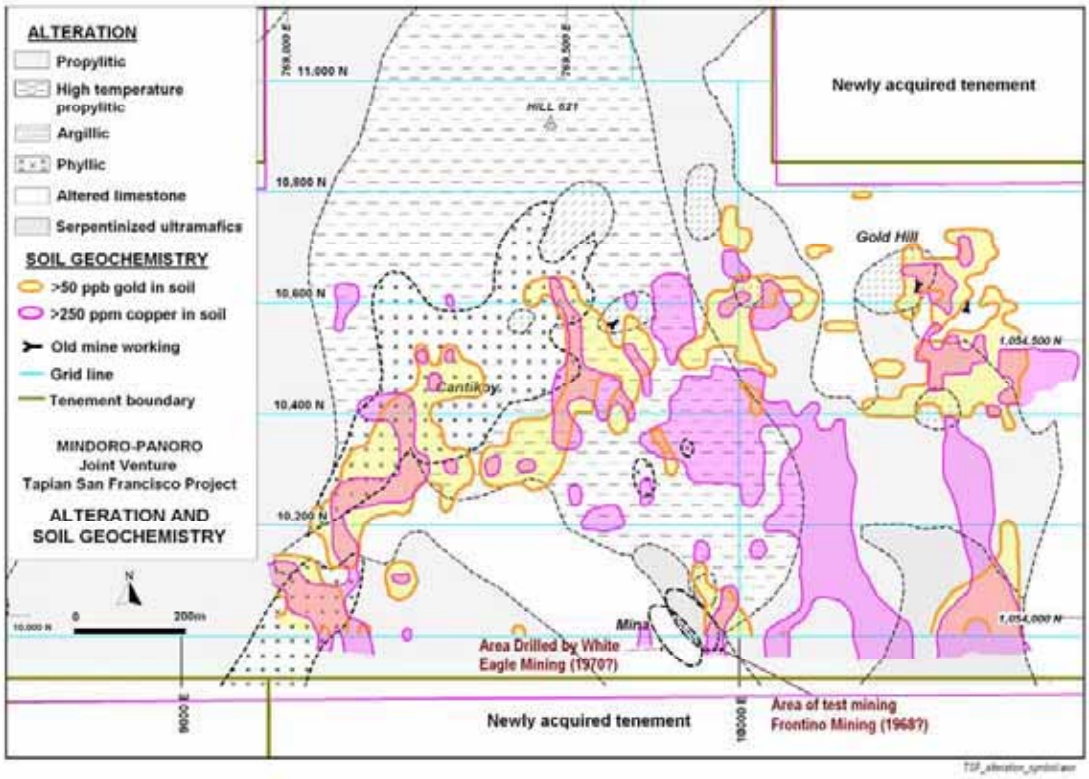


Figure 11 – Gold and copper geochemical anomalies generated from soil samples collected by MRL along 200 x 50m, 150x50m, 50x25m and 25x25m soil grids over the Cantikoy, Gold Hill and Mina prospect areas.

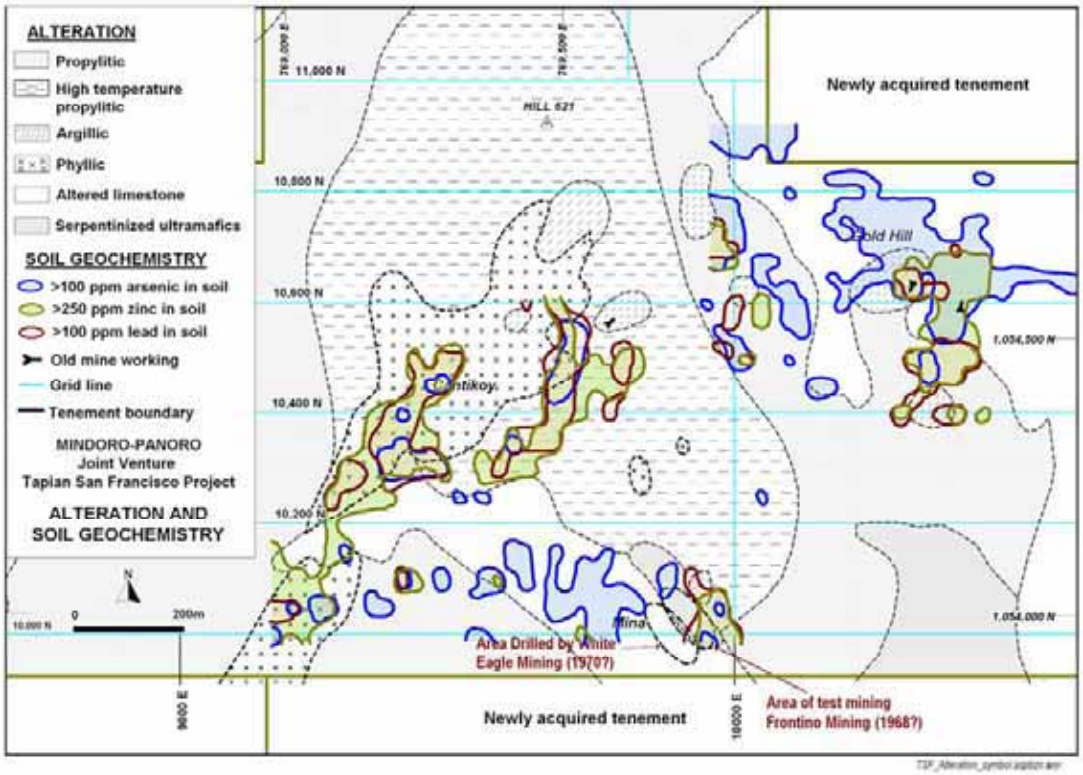
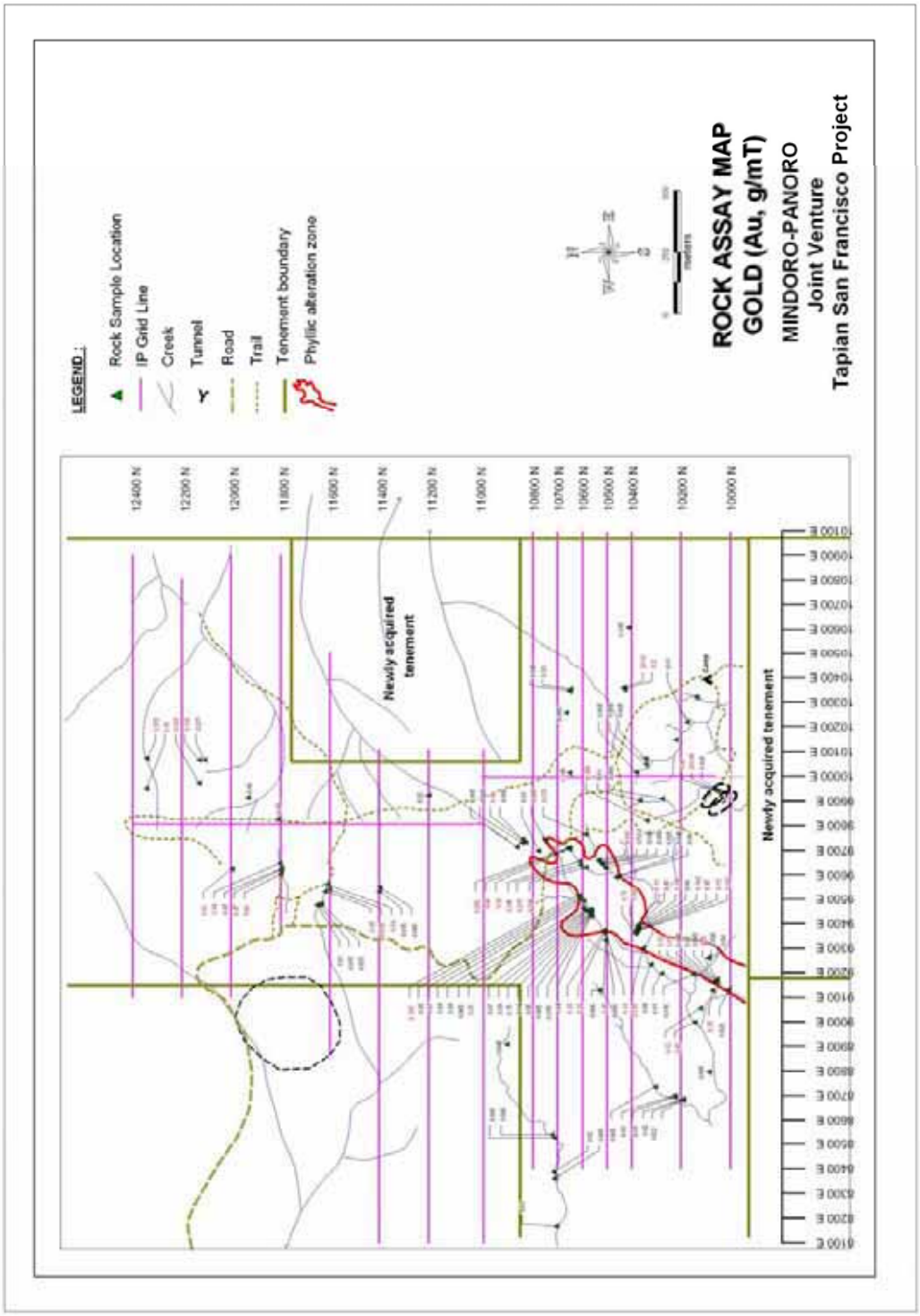


Figure 12 – Arsenic, lead and zinc geochemical anomalies generated from soil samples collected by MRL along 200 x 50m, 150x50m, 50x25m and 25x25m soil grids over the Cantikoy, Gold Hill and Mina prospect areas.

Figure 13 – (overleaf) - A map of the distribution and grade of Au assays obtained from rock-chip samples that were collected in the southern portion of the Tapian-San Francisco property.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Rock Sample Location
IP Grid Line
Creek
Tunnel
Road
Trail
Tenement boundary
Phyllic alteration zone
ROCK ASSAY MAP
GOLD (Au, g/mT)
MINDORO-PANORO
Joint Venture
Tapian San Francisco Project
Newly acquired tenement
Newly acquired tenement

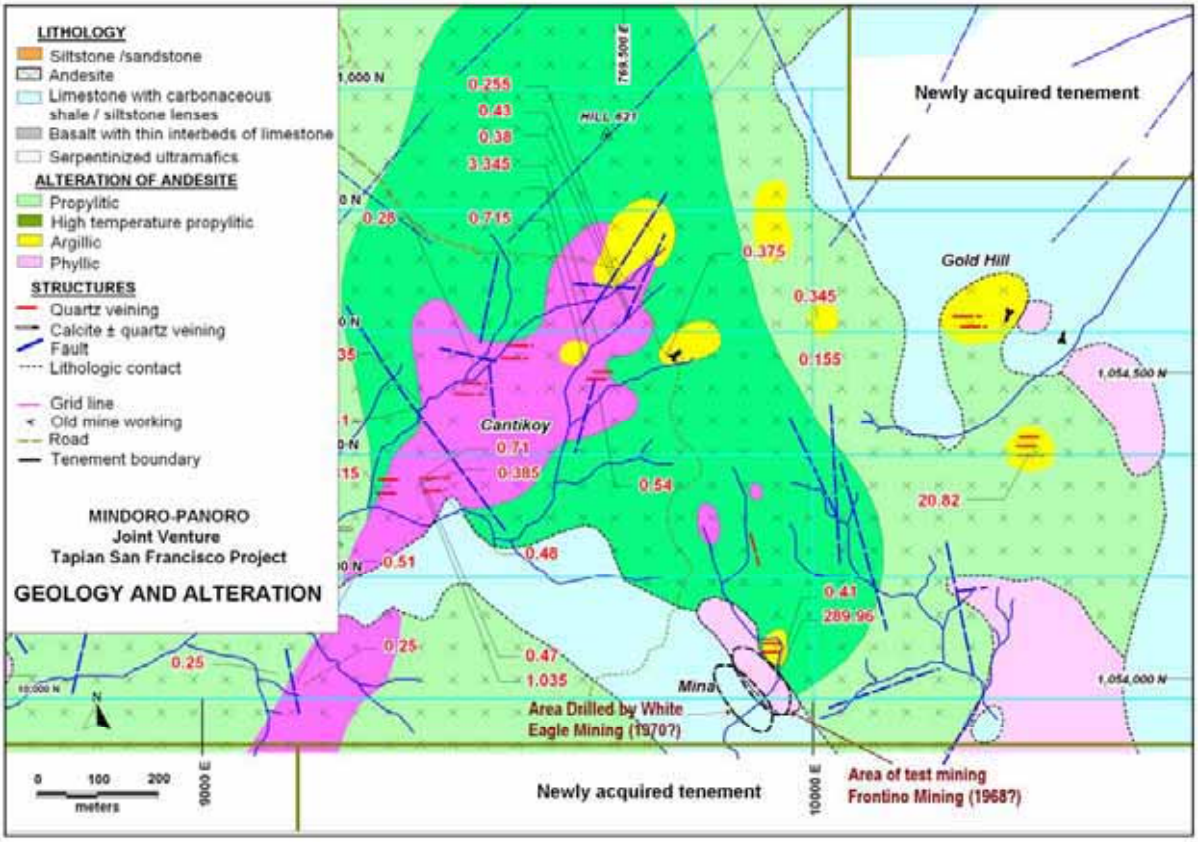


Figure 14 – A map of the distribution and grade of Au assays obtained from rock-chip samples that were collected in the Cantikoy, Mina and Gold Hill prospect areas in the southern portion of the Tapian-San Francisco property.

7.5.2 MRL Exploration (2004-2005)

In 2004 MRL, under joint venture with Panoro Minerals, undertook a renewed phase of exploration that was focused on the prospects in the southern portion of the Tapian-San Francisco property. This activity included more detailed geological mapping over the Cantikoy (Limon), Gold Hill, Mina, Quino and Waterfall prospect areas, additional channel sampling and rock-chip sampling in concert with the detailed lithological and alteration mapping, and an extensive grid-based pole-dipole Induced Polarisation (IP) geophysical survey over the cluster of prospects at the southern end of the property. The specifications and results of these recent programs are discussed below.

Geological Mapping

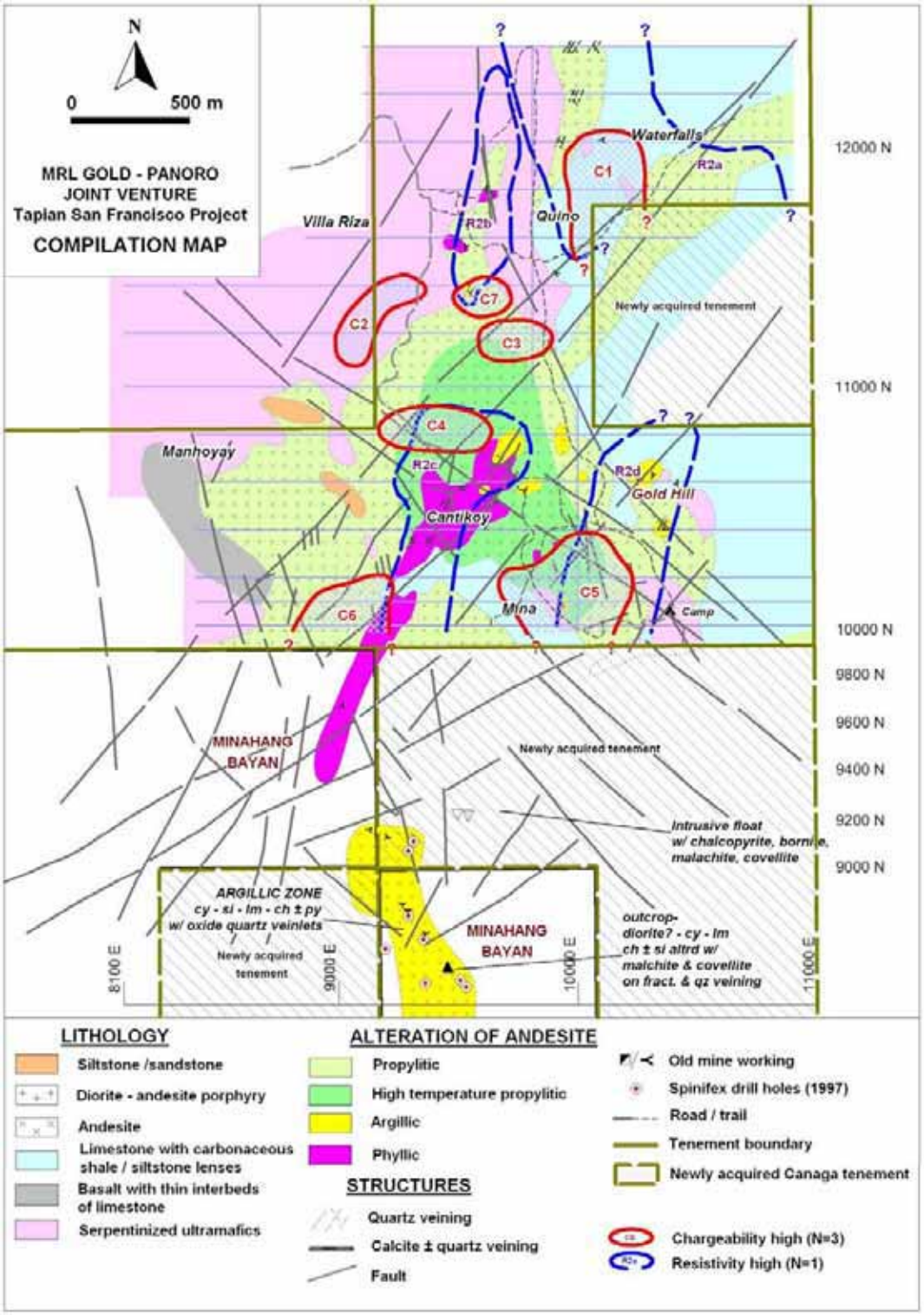
The latest phase of geological mapping on the Tapian-San Francisco property was conducted to better understand the geometry of alteration types within the southern prospect areas (Cantikoy [Limon], Gold Hill, Mina, Quino and Waterfall), to verify the position of faults and lineaments previously identified from regional data-sets, and to enable better interpretation of the cause of extensive Au and Cu anomalism that was defined by an earlier soil sampling program conducted my MRL (Figures 11 and 12). The latest geological map is shown in Figure 15. Prior maps of the region showed an extensive area of basaltic andesite cross-cut by numerous northeast-trending faults and lesser northwest-trending faults (Figure 8). The latest mapping defines the broad systematics of the large-scale alteration system at Tapian-San Francisco as discussed in Section 7.4.

Pole-Dipole Induced Polarisation Surveying

Extensive pole-dipole induced polarization surveying was conducted in the southern portion of the Tapian San-Francisco property by Elliot Geophysics International for MRL and Panoro. The survey was implemented to define the spatial distribution of sulfide minerals that may coincide with zones of porphyry mineralization or epithermal mineralization. The surveys also allowed zones of resistivity to be identified. These zones of high resistivity may be caused by zones of silicification that may relate to shallow-level epithermal mineralisation.

The east-west survey lines were spaced at 100 metre and 200 metre intervals over the Waterfall, Quino, Cantikoy, Gold Hill and Mina prospects. Data were acquired from 14 east-west lines using a dipole spacing of 150 metres. Data were collected using a Zonge Engineering GDP-32 Receiver and a Zonge Engineering GGT-10 Transmitter. A total of 35.9 line kilometers of IP surveying were conducted on the Tapian-San Francisco property. Induced polarisation pseudo-sections are presented in Appendix 1. A series of seven chargeability anomalies and four resistivity anomalies were identified by the survey. Figure 15 shows the location of the IP survey lines and the spatial distribution of the chargeability anomalies at N=3 (~300 metres depth) and the resistivity highs at N-1 (~150 metres depth) relative to the mapped surface geology. Figures 16, 17 and 18 show projected plan and perspective views of the chargeability and resistivity high anomalies on the Tapian-San Francisco property. IP data have been inversion modelled.

Figure 15 (next page) – Geological map of the southern portion of the Tapian-San Francisco property, covering the Cantikoy (formerly Limon), Gold Hill, Mina, Quino, Waterfalls and Canaga prospects. The horizontal grey lines show the position of IP survey lines conducted during 2004 and 2005. The chargeability anomalies at N=3 (~300 metres depth) are shown by the red outlines whereas the resistivity highs at N=1 (~150 metres depth) are shown by the blue outlines.


N
0
500 m
MRL GOLD - PANORO
JOINT VENTURE
Tapian San Francisco Project
COMPILATION MAP
Waterfalls
R2a
C1
Villa Riza
R2b
Quino
C7
C2
C3
Newly acquired tenement
C4
Manhoyay
R2c
R2d
Gold Hill
Cantikoy
C5
C6
Mina
Camp
MINAHANG
BAYAN
Newly acquired tenement
Intrusive float
w/ chalcopyrite, bornite,
malachite, covellite
ARGILLIC ZONE
cy - si - lm - ch ± py
w/ oxide quartz veinlets
Newly acquired
tenement
MINAHANG
BAYAN
outcrop-
diorite? - cy - lm
ch ± si altrd w/
malchite & covellite
on fract. & qz veining
12000 N
11000 N
10000 N
9800 N
9600 N
9400 N
9200 N
9000 N
8100 E
9000 E
10000 E
11000 E
LITHOLOGY
Siltstone /sandstone
Diorite - andesite porphyry
Andesite
Limestone with carbonaceous
shale / siltstone lenses
Basalt with thin interbeds
of limestone
Serpentinized ultramafics
ALTERATION OF ANDESITE
Propylitic
High temperature propylitic
Argillic
Phyllic
STRUCTURES
Quartz veining
Calcite ± quartz veining
Fault
Old mine working
Spinifex drill holes (1997)
Road / trail
Tenement boundary
Newly acquired Canaga tenement
Chargeability high (N=3)
Resistivity high (N=1)

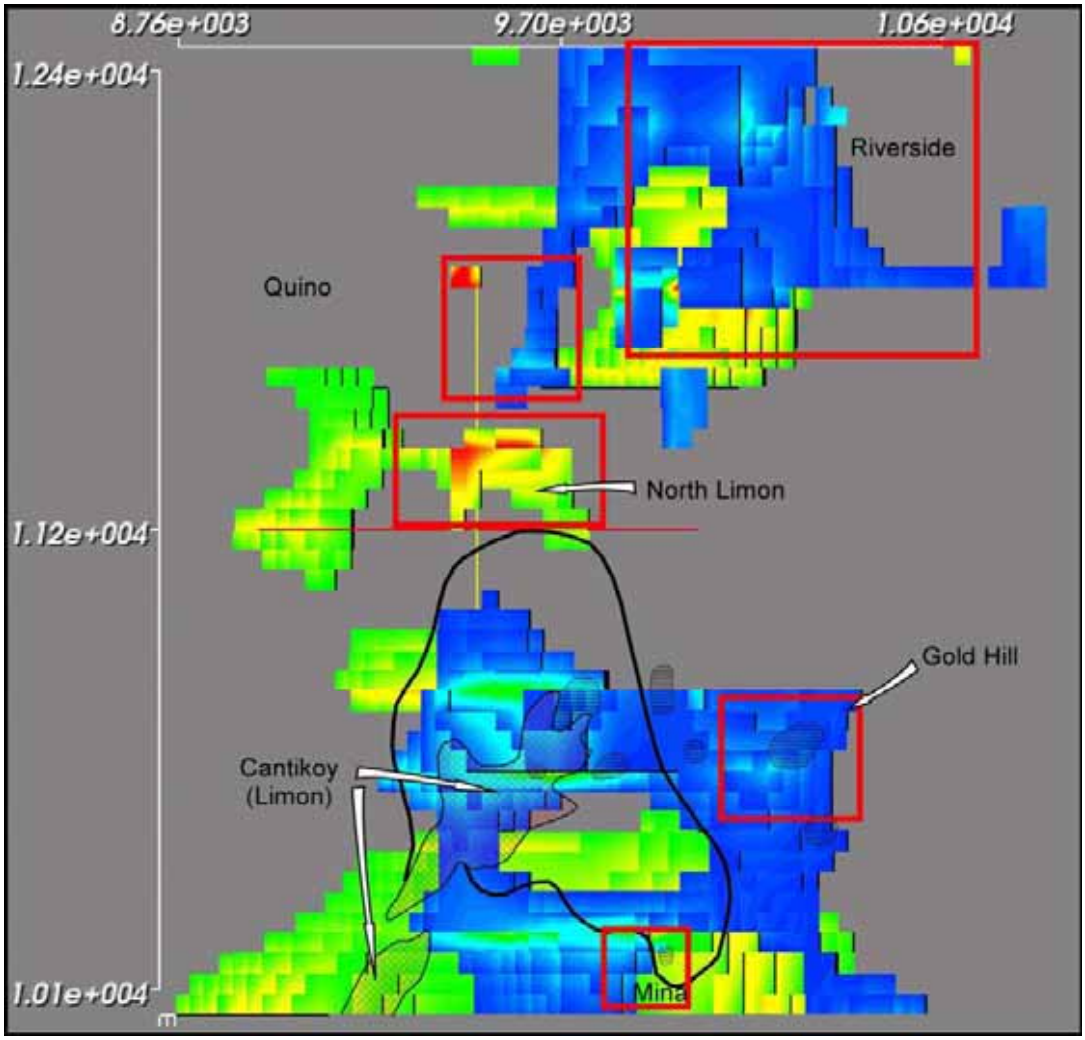


Figure 16 – Plan view of the distribution of chargeability anomalies and high resistivity anomalies at Tapian San-Francisco. The location of the main prospect areas defined by MRL are labeled and shown in red boxes. The phyllic alteration zone at the Cantikoy prospect is shown by the cross-hachured pattern, the zones of argillic alteration are shown by the horizontal hachure pattern and the zone of high-temperature propylitic alteration is shown by the dark outline. The areas of chargeability are shown in the red-yellow-green color range whereas the zones of high resistivity are shown by the light and dark blue color range. Their respective legends are shown in Figure 17 below. Only areas with a chargeability greater than ≥ 12 msec and resistivities ≥ 500 ohm-m are plotted. The data are plotted using ParaView, a parallel visualization program developed by Kitware Inc.

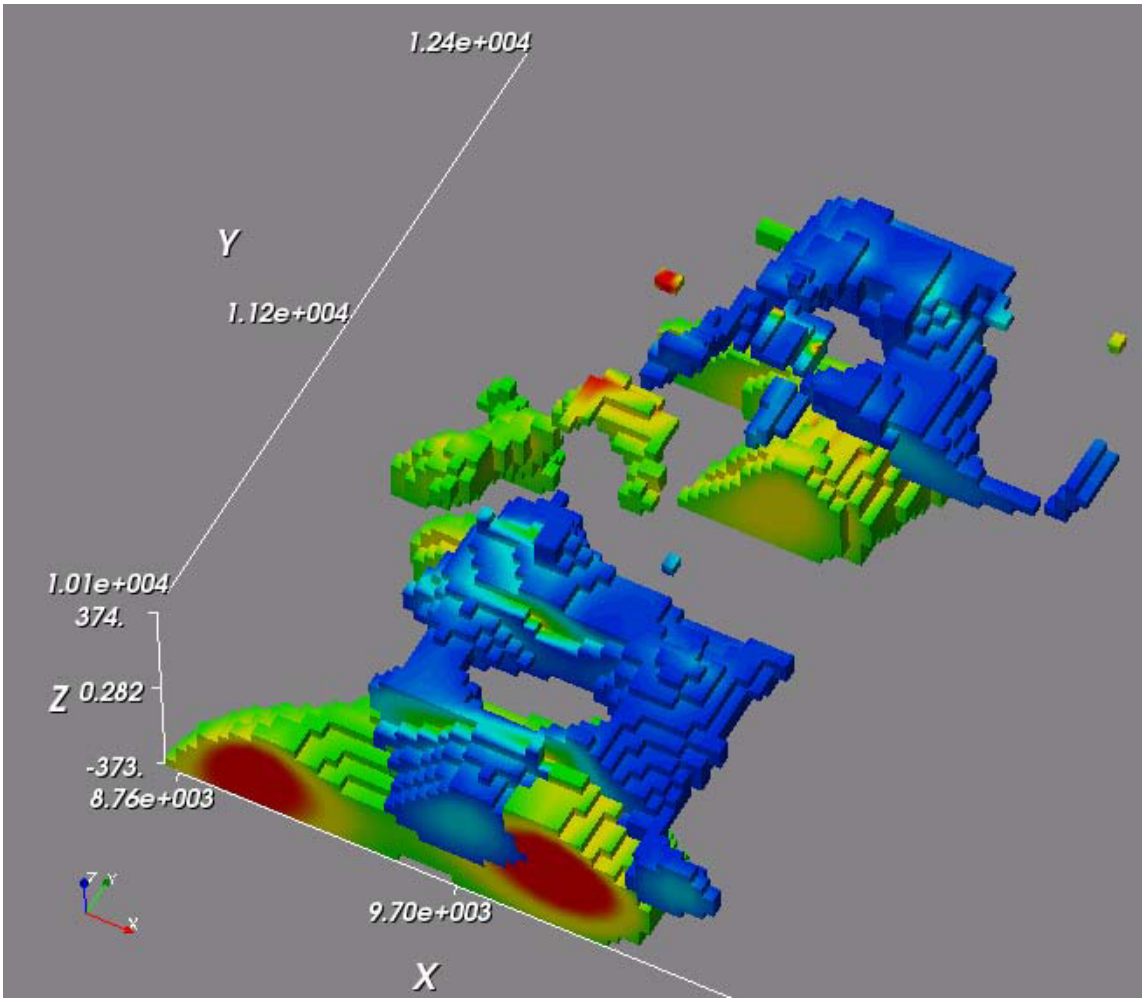
At a cut-off of 500 ohm-m (resistivity) and 12 msecs (chargeability), zones of high resistivity define broad donut-shaped regions that lie at shallow levels above deeper zones of chargeability at both the Riverside-Quino and Northern Cantikoy - Gold Hill - Mina regions. The strongest chargeability zones occurs at the C1 anomaly (Figure 15) where chargeabilities peak at just over 20 msecs, and at the C5 anomaly (Figure 15) where chargeabilities peak at just over 19 msecs.

The chargeability anomalies define a contiguous anomaly at values less than 12 msecs, but break up into core zones of higher chargeability at values greater than 12 msecs that coincide with the main prospect areas listed below:

Riverside – C1
Quino to North Limon – C2, C3 and C7
Northern Cantikoy – C4
Mina extending south to Canaga? – C5
Southern Cantikoy extending south to Canaga? – C6

The most extensive chargeability anomalies are the southernmost C5 and C6 anomalies that trend southward from Mina and Cantikoy respectively towards the Canaga region. At the "level" N=3, the chargeability anomalies are open towards the Canaga region. The C6 anomaly underlies the zone of phyllic alteration and associated elevated Au in rock-chip samples that define the Cantikoy prospect (Figure 15). The C5 chargeability anomaly is the most extensive chargeability anomaly and extends over 400 metres in a north-south direction, from 10000mN to 10400mN. The C5 anomaly is open to the south (Figure 15).

The zone of high resistivity that occurs over the Gold Hill prospect area (R2d – Figure 15) appears to extend southward toward the Canaga region at shallower levels than the underlying C5 chargeability anomaly.



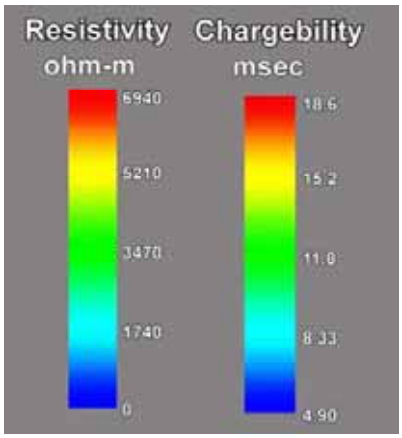
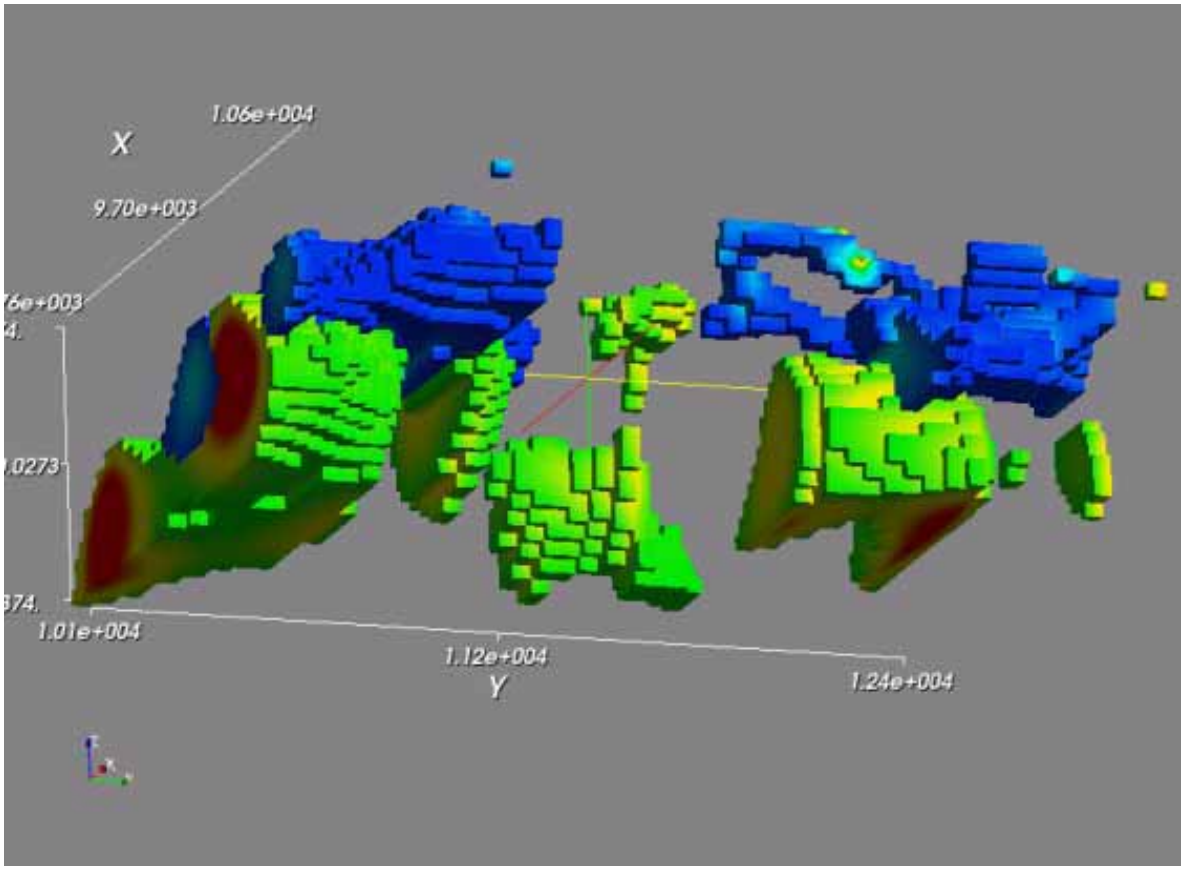


Figure 17 – Perspective view of chargeability and resistivity anomalies at Tapian-San Francisco. The Canaga region adjoins to the south (bottom axis of image). The view is looking downward and towards the northwest. Areas of high resistivity are shown in the blue color range and lie at higher levels above zones of deeper chargeability that are portrayed by the red-yellow-green color spectrum. Two main zones of high resistivity define donut-shaped areas that lie above the Riverside-Quino prospect area in the north (Figure 16) and over the North Cantikoy-Gold Hill-Mina area to the south (Figure 16). The zones of high chargeability lie at deeper levels and extend toward the Canaga region to the south. The zones of high chargeability are not closed off at depth.



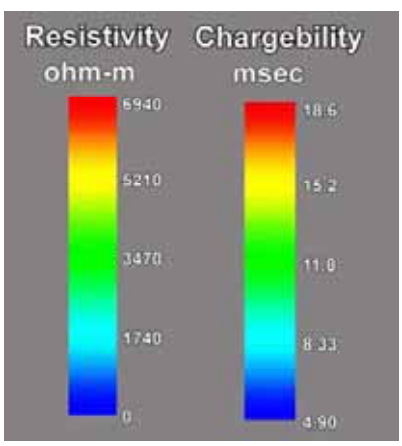


Figure 18 – Perspective view of chargeability and resistivity anomalies at Tapian-San Francisco. The Canaga region adjoins to the south (left hand side of image). The view is looking upward towards the WNW. The areas of high resistivity are shown in the blue color range and lie at higher levels above zones of deeper chargeability that are portrayed by the red-yellow-green color spectrum. The zones of high chargeability are not closed off at depth.

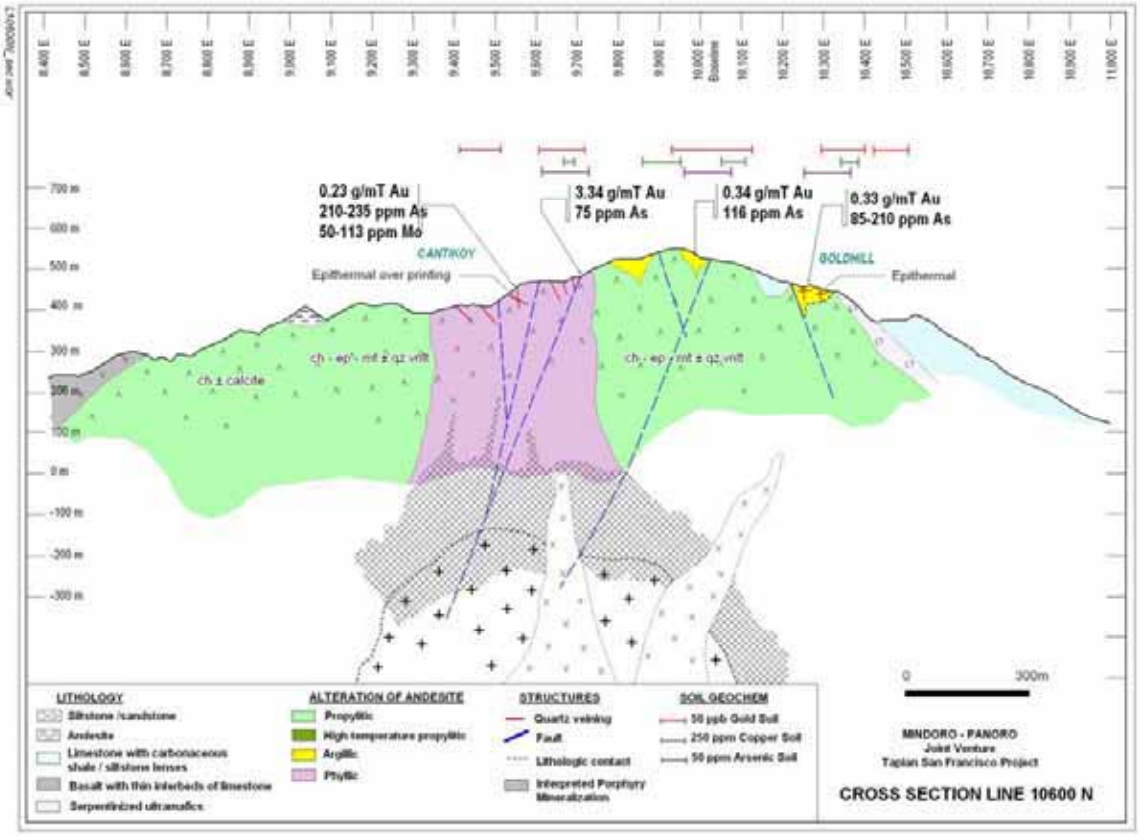


Figure 19 – Scaled geological cross-section through Tapian-San Francisco at 10,600 mN drawn by MRL geologists and based on surface geology. The cross-hachured region defines the porphyry Cu-Au target beneath the Cantikoy phyllic alteration zone.

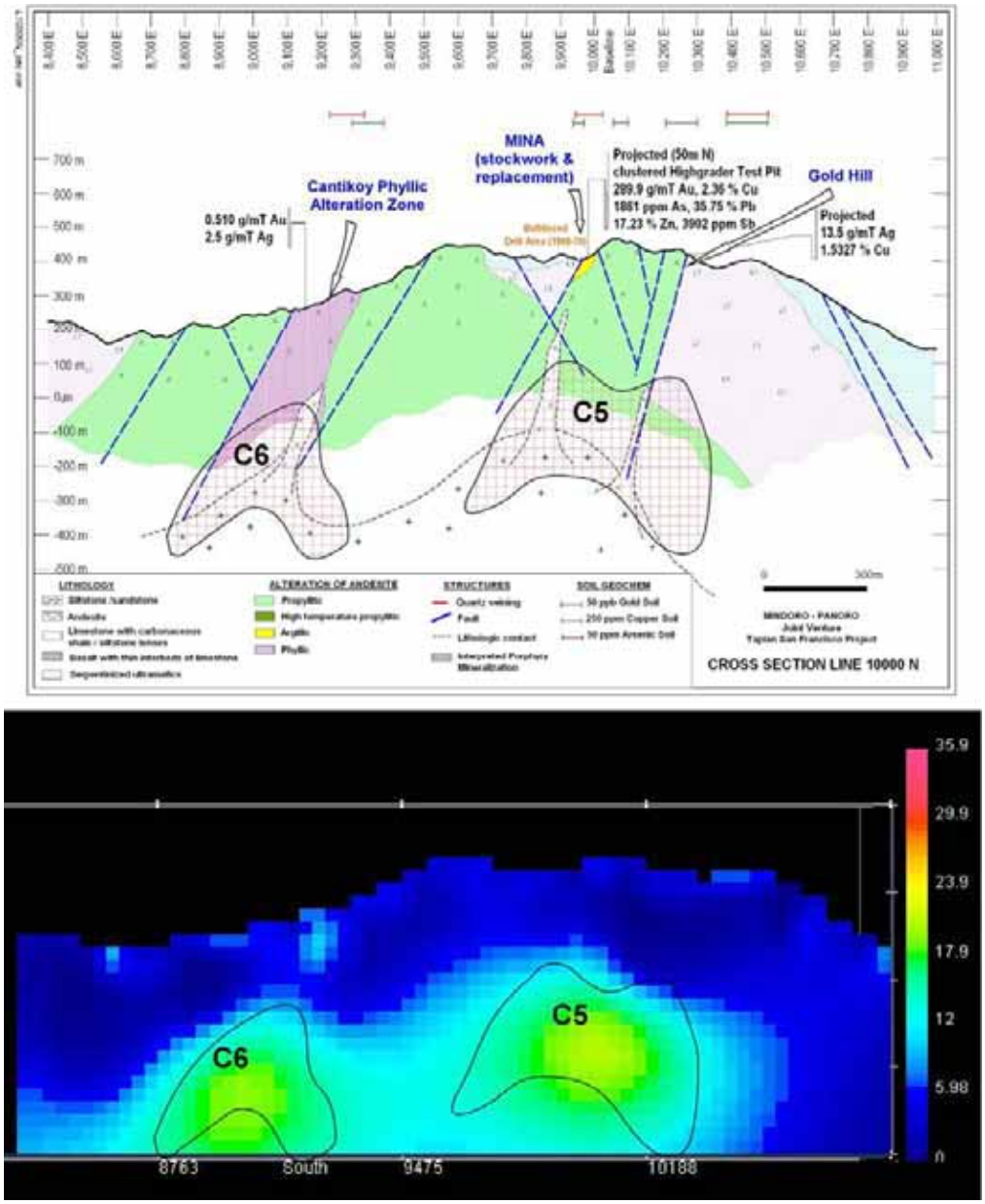


Figure 20 – (Top) Scaled schematic geological cross-section through Tapian-San Francisco at 10,000 mN drawn by MRL geologists and based on observed surface geology. The figure is subsequently modified by the author to show the schematic outline of porphyry Cu-Au targets that coincide with IP chargeability zones at C5 and C6. (Bottom) Distribution of modeled chargeability on 10,000mN plotted at the same scale as the geological section above. The C6 porphyry Cu-Au target coincides with a 200-metre long chargeability anomaly that extends from 10,000-10,200mN (Figure 15) and which underlies the mapped zone of phyllic alteration at Cantikoy. The C5 porphyry Cu-Au target is a ≥400 metre long zone of IP chargeability (Figure 15) that lies east of C6. It extends southward from near Gold Hill to beneath the Mina prospect and appears to extend south into the Canaga region. The zones of high chargeability are not closed off at depth.

8. TAPIAN MAIN PROPERTY

8.1 Accessibility, Climate, Local Resources, Infrastructure and Physiography

The Tapian Main property lies several kilometers south of the Tapian-San Francisco property, and 35 kilometres south of Surigao City in the province of Surigao Del Norte. The property is bordered by Lake Mainit to the east and by the Mindanao Sea to the west, and straddles the north-south-trending mountainous belt known as the Western Range. The topography of the project area varies from moderate rolling hills to steep hills and ridges. Elevations range between 100 to 446 metres ASL, with the highest elevation being on Mt Tapian in the south-central portion of the project. The property straddles the water-divide of the Western Range. Dendritic tributaries in the north and southeast of the property drain eastward into Lake Mainit. Tributaries in the southwest of the property flow westward into the Mindanao Sea. Secondary forest covers extensive parts of the northern and southern portions of the property, and is interspersed with strands of cultivated coconut. The central parts of the project area have large areas of cogon grass. Access to the Tapian-Main property is the same as for the Tapian-San Francisco property from Surigao to the town of Mainit. An unsealed road from Mainit extends southward to Barangay Tagbuyawan and Barangay Tapian along the western shore of Lake Mainit.

Plate 5 – Looking south along the Tapian Main property on the western side of Lake Mainit. The clearing in the foreground is used by local "high-graders" to slide sacks filled with auriferous saprolite down the incline, from an area of surface workings on the Samson Zone to sluicing sites in adjacent streams.

8.2 History

The record of historical exploration and mining activity in the Tapian Main region is sparse, and little information is available from the records of the Mines and Geosciences Bureau. Prior to World War II the Tapian Gold Mines, located in the southeast portion of the Tapian Main property, were operated by Tapian Surigao Gold Mines Incorporated using underground mining methods. They employed a 100-ton-per-day cyanidation mill which commenced operation in March 1939 (Salas, 1999). Production records have not been found and presumably they were lost during the war. An account by Jonson (1987) states - "*The pre-war mine workings were substantial, about 9,000 ft of drifting and crosscuts, 560 ft of raises and 1,260 ft of exploratory tunnels were developed in over two years of operation. Most of the development work was done on the Rosario vein system, which is generally striking N15ºE and dipping southeast. It was opened-up for about 800 ft along strike and exposed on six levels over 320 vertical ft*".

In the early 1970's, MarCopper Mining Corporation explored the area for porphyry copper deposits. They re-opened the old Homer tunnel as part of their exploration program. Although MarCopper conducted extensive geological mapping, geochemical stream sediment sampling and soil sampling adjacent to the old mines, the data are unavailable (Salas, 1999). Andrada *et al*. (1980) reports assessments of gold mining prospects in the Western Highlands of the Surigao Del Norte district on behalf of the Bureau of Mines and Geosciences. They noted that the occurrence of sinks and adits in Barangay Tagbuyawan represented an abandoned mine site.

The author observed numerous gold workings developed by local "high-graders" in an area ~40 metres wide by ~80 metres in length that spanned a ridge in the vicinity of the Homer Tunnel. Numerous pits and excavations, some crudely timbered, had been recently worked, and several high-graders present were observed moving bags of saprolite to adjacent streams for sluicing.

8.3 Property Geology

The basement sequence on the Tapian Main property comprises a greenschist unit of probable Cretaceous age. Exposures of the greenschist unit occur along the southwestern foothills and shoreline of the project area and also as small relic windows within the Mt Tapian prospect. The greenschist is chlorititised, epidote-bearing, and massive to weakly foliated (Salas 1999). The greenschist unit is over-thrust by serpentinised ophiolites that occupy the southern half of the Tapian Main property. The areas of ultramafic outcrop and subcrop are commonly denuded of large vegetation. The ultramafic rocks occur over an area of approximately 9 km^2 and comprise serpentinised harzburgite. The serpentinite is typically fractured and sheared with intense slickenside development along shear surfaces. Primary pyroxene and olivine grains can be

identified in thin-sections of the harzburgite. Within the ultramafic sequence there are local boulder conglomerate lenses with clasts of gabbroic composition (Plate 9a).

An Upper Eocene limestone unit with interbedded terrigenous clastics unconformably overlies the greenschist basement and ultramafic thrust sheets. This limestone unit may be equivalent to the Upper Eocene Nabanog Formation in the Agusan Del Norte province. Two outcrops of this limestone unit occur adjacent to the Homer Tunnel and Rosario Shaft (Figure 23). The limestone unit is clastic-rich and consists of calcirudite beds intercalated with finer-grained micritic carbonate. The pre-war workings on the Mt Tapian prospect, that comprise the Homer and Jesus tunnels, extend along the contact between one of these limestone bodies (150m x 100m) and intrusive hornblende andesite stocks of inferred Pliocene age (Figure 23). The Eocene limestone units are inturn overlain by basaltic andesites on the northern half of the property. The basaltic andesites comprise lava flows that are intercalated with tuffaceous clastic intervals. Petrographic analysis of a representative rock from this unit, collected from 250m southwest of Barangay Tagbuyawan, is described by Salas (1999) as: …. "*porphyritic augite andesite consisting of tabular plagioclase and augite set in a felsophyric groundmass of interlocking stubby plagioclase microlites and interstitial augite, magnetite and chlorite. Irregular-shaped vesicles riddle the mesostasis and are partly to wholly filled with chlorite*"

In the southern part of the property, the ultramafic sequence is intruded by a series of hornblende-bearing porphyritic andesites in the Mt Tapian prospect area. These intrusives are of inferred Pliocene age, and probably correlate with the metallogenically fertile andesitic magmatism associated with the Mabuhay Clastics. The intrusions in the Mt Tapian prospect area are clustered and irregular, and their outcrop distribution is reminiscent of the complex upper-levels of a larger and more contiguous intrusive complex at depth (Figure 21). These intrusive bodies appear to be associated with Cu anomalism and Au mineralisation in the Mt Tapian prospect. Their mapped distribution, which shows their confinement to the southern portion of the property, may be biased since detailed mapping has been conducted only in the Mt Tapian prospect area in the south. The texture of these intrusive andesites ranges from porphyritic to medium-grained equigranular. The intrusions are characteristically hornblende-bearing, indicating that the magmas were relatively hydrous in comparison to pyroxene-dominated assemblages of the older basaltic andesites. In thin-section the hornblende andesite intrusives are described by Salas (1999) as…"*hornblende andesite porphyry. They consist of abundant plagioclase and hornblende phenocrysts, set in a microgranitic groundmass of dense aggregates of feldspar*". The youngest unit in the project area comprises a limestone of upper Pliocene to Quaternary age that lies unconformably on basement greenschists in the southwest corner of the Tapian Main property.

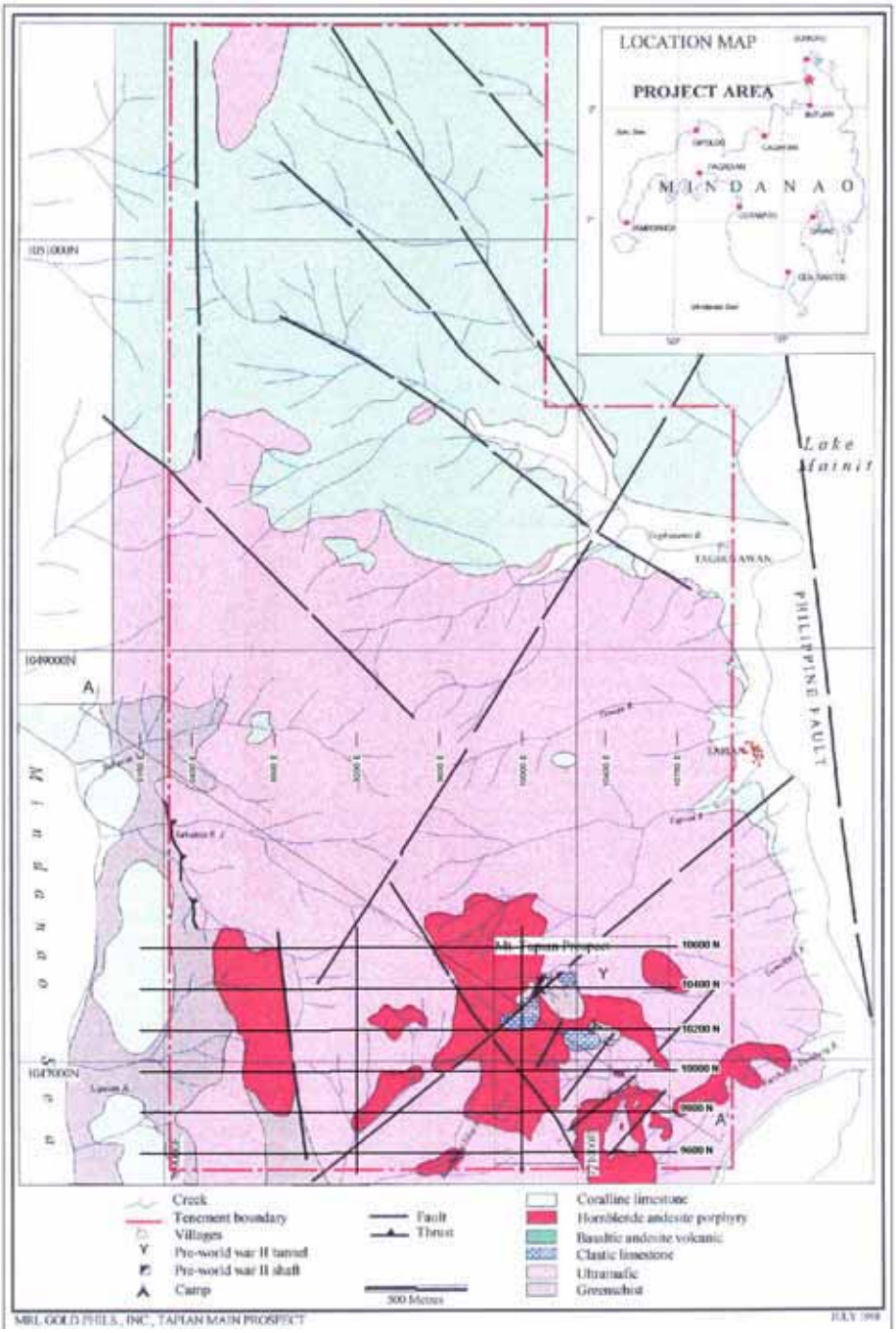


Figure 21 – Geological map of the Tapian Main property (from Salas 1999). The Mt Tapian prospect is centered on a cluster of high-level calc-alkaline stocks of inferred Pliocene age. The stocks may be coeval or correlative with the fertile Mabuhay Andesite that is associated with epithermal mineralization in large areas of the Surigao Del Norte mineral district.

Like the Tapian-San Francisco property, the dominant faults on the Tapian Main property strike northwest and northeast. NW-SE-trending structures appear to be the dominant set. These structures are secondary structures related to the regional NNW-trending Philippine Fault system. A major NNW-trending splay of the Philippine Fault runs along the western margin of Lake Mainit, east of the Tapian Main property.

8.4 Mineralisation and Alteration

The mineralization and alteration that is present in the southern portion of the Tapian Main property displays characteristics that may be interpreted as being related to shallow-level epithermal mineralization of low-sulfidation character. Observed mineralization styles on the Mt Tapian prospect include quartz stockworks in argillised intrusives, quartz-calcite-pyrite fissure veins, banded quartz-carbonate veins and replacement sulfides in recrystallised contact limestones. The volcanic sequence on the Mt Tapian prospect is extensively propylitic-altered, with alteration occurring mostly within the basaltic andesite volcanic sequence and within hornblende andesite porphyry intrusives. At the Mt Tapian prospect, silicification and argillisation occur mostly along the contacts of the intrusives rocks, in the wallrocks adjacent to the intrusives, and in narrow faults and shears. The limestone bodies that are in direct contact with intrusives commonly show intense recrystallisaton, brecciation and sulfidation associated with gold mineralization.

Propylitic alteration is the most extensive alteration facies, and is described in mineragraphic analyses as consisting of epidote ± chlorite ± illite ± albite ± clinozoisite with minor to trace pyrite and magnetite. Argillic alteration is mostly confined to the contact zones between hornblende andesite intrusives and limestones, ultramafic rocks and greenschist. The zones of argillic alteration comprise of clays, silica and pyrite, with variable limonite and hematite staining. Zones of silicification are also present along fractures, shears and contacts, and may occur as quartz vein stockworks and stringers, as zones of massive silification and as zones of silicified carbonate adjacent to contacts with intrusive hornblende andesite porphyry and diorite. Zones of massive silicification are more commonly developed adjacent to intrusive bodies and form narrow zones, up to several metres wide, along intrusive contacts. Secondary quartz is common in recrystallised limestones that lie in contact with intrusive rocks.

The author has not visited the northern portion of the Tapian Main property. MRL geologists indicate that no systematic zonation in alteration facies is recognized in the northern area. Most of the recognized mineralisation in the Tapian Main property occurs in the south, within the Mt Tapian prospect area. In this region, Au and lesser Cu mineralisation occurs as fissure veins, beccia veins, stockworks and zones of disseminated and replacement sulfide in carbonate country rocks adjacent to intrusions. The workings in the region include the Rosario Shaft, the Homer Tunnel and the Jesus

Tunnel. The Homer Tunnel, currently collapsed (Plate 8a) runs to the northwest for more than 800 feet towards the Rosario Shaft. Its portal lies in chlorite-altered porphyritic andesites although the tunnel is driven mostly in intrusive rocks. The Jesus Tunnel trends southwest and intersects the Homer Tunnel. Cross-cuts off both of these tunnels were used to mine ore from along an intrusive limestone contact (Figure 23).

The Au mineralisation at the Mt Tapian prospect is associated with Au and Cu soil geochemical anomalies in the Rosario Zone, the Samson Zone and the Southeastern Zone. The Au anomaly over the Rosario Zone trends NNE to northeast, sub-parallel to several faults that have been interpreted by MRL geologists in the region (Figure 23). The Au soil anomaly is greater than 450 metres in length, is approximately 100 metres in width and is open to the north (Figure 23). The main ore zone of the Rosario vein is not exposed at surface, however rockchip samples collected from the wall-rocks near the vein yielded assays which included 0.54 g/t Au and 0.13 g/t Au (central portion of Rosario Zone), and 0.48 g/t Au and 0.28 g/t Au (western portion of Rosario Zone).

The Samson Zone lies to the southeast of the Rosario Zone, and is also characterized by a strong Au soil geochemical anomaly (>100 ppb Au). The anomaly is approximately 300 metres by 200 metres in dimension, slightly elongate in the NE-SW dimension parallel to faults interpreted by MRL, and is broadly coincident with a modest Cu geochemical anomaly in soil samples. Au mineralization near the headwaters of Samson Creek is related to quartz-calcite-pyrite veins and stockworks that are developed in argillic altered hornblende-bearing intrusives, schists and ultramafics (Salas 1999). An interval of surface argillic alteration in the northern part of the Samson Creek headwaters assayed 1.19 g/t Au over 24.2 metres (Salas 1999). Approximately 50 metres to the southwest, quartz-carbonate-sulphide stockworks occur in strongly limonitic, clay-altered and fractured ultramafics adjacent to a porphyry intrusive contact. An 8 metre continuous rockchip sample collected by MRL across the argillised ultramafic rocks assayed 3.01 g/t Au. Local zones of higher-grade mineralization occur in altered limestones that are in contact with intrusive rocks. Outcrops of silicified limestone were observed by the author in contact with porphyritic andesite intrusive rocks, and assays by MRL yielded 26.44 g/t Au from one 1.4 metre channel sample over the contact between siliceous limestones and porphyritic andesite intrusives.

The Southeast Zone is defined by a discreet Au geochemical soil anomaly that is ~200 metres by 80 metres in dimension and which lies in the upper portion of Karihatag Creek (Figure 23). Limonitic andesite porphyry and pyritic plus silicified limestone occur as float boulders in the creek, and two boulders from this portion of the creek assayed 0.24 g/t Au and 0.44 g/t Au.

The images in Plates 6 to 11 below were taken by the author during the first field trip to the Tapian Main property in October 2004.

Outcrop of silicified, variably pyritic and partly limonitic limestone from the lower eastern flanks of the Mt Tapian prospect area (eastern head-waters of Homer creek). Samples assayed up to 0.475 g/t Au. Spots of malachite occur in highly silicified portions of the limestone, often in silica-lined vugs. Silica occurs also as clots and veinlets.

Small high-graders tunnel excavated into saprolite on the margin of the limestone outcrop shown in Plate (a) above. The tunnel is timbered, and local artisanal miners hand carry bags of gold-bearing saprolite to a sluicing site several hundred metres downhill.

Sample of silicified limestone exhibiting an anastomosing network of breccia veins that form an interconnected network in the matrix to the breccia clasts. The textures are blurred by pervasive hydrothermal silicification of the carbonate. Traces of malachite spotting were observed in the vicinity of this outcrop.

Highly limonitic carbonate breccia, with limonite-stained breccia clasts surrounded by a goethite-rich matrix which has relics of pyrite. The sample comes from the mineralised carbonate outcrop shown in Plate 6a.

The larger view of this image is of the collapsed entrance to the Homer tunnel. The small tunnel on the lower right hand side is a more recent working and is well timbered. The wall rocks observed in the "muck-out" material at the entrance to the Homer tunnel comprise porphyritic andesite which has a chloritic groundmass and illite-alteration of the feldspar phenocrysts, and is cross-cut by fine limonitic fractures.

Eocene-age crystalline limestone. The limestone is medium grey, indurated and highly recrystallised. Abundant carbonate veins cross-cut the limestone. Carbonate has been remobilised and precipitated as clean, sparry calcite veins. The sulfide content is minor (trace), however there is sulfide in this unit where it lies in contact with intrusions.

A large boulder comprising conglomerate beds that are intercalated with the ultramafic package in the Mt Tapian prospect region. The conglomerate ranges from a sandy pebble conglomerate to a coarse boulder conglomerate and is bedded on a scale of 10-30 cm. This boulder lies within the stream that drains eastward from the Rosario area. The conglomerate clasts comprise predominantly of mafic gabbro.

Outcrop of serpentinised ultramafic in a stream bank east of the Rosario shaft. The serpentinite is highly sheared and fractured, and extensive talc occurs along slickenside surfaces on the shear partings.

Area of "high-grader" mining activity by small-scale artisanal miners in the Samson Zone of the Mt Tapian prospect.

Local small-scale miners bagging gold-bearing saprolite. The saprolite is manually hauled to a sluicing site located in the stream below. This image is on the south-facing slope of the area of artisanal mining along the ridge crest shown in the previous plate.

Sample of oxidised surface material from the region of small-scale mining activity shown in Plate 10a (Samson Zone). The rocks comprise probable tuffaceous volcanics that are strongly limonitic and goethitic. Sulfide boxworks occur in association with cross-cutting networks of quartz breccia veins.

Sample of oxidised surface material collected from the region of small-scale mining activity in the Samson Zone at the Mt Tapian prospect. The rock sample is pervasively silicified, and contains traces of disseminated pyrite that forms limonitic boxworks along oxidised fractures.

8.5 Exploration

8.5.1 MRL Exploration (1997-2000)

Exploration activity undertaken by MRL on the Tapian Main property between 1997 and 2000 was conducted initially by Marshall Geoscience Services Pty Ltd, an independent geological consultancy firm. Marshall Geoscience Services Pty Ltd were contracted by MRL to carry out initial geological investigations on the economic potential of the Tapian Main property and on other properties that belonged to MRL. The work undertaken by Marshall Geoscience Services Pty Ltd on Tapian Main included reconnaissance geological mapping and a semi-detailed stream sediment geochemical survey over 16 mining claims during September to October 1997. The Mt Tapian prospect was identified by this work as a result of strong gold and copper anomalies in stream sediment samples from the southern portion of the Tapian Main property. Subsequently the Mt Tapian area was followed-up with further geological surveying, rockchip sampling and a soil geochemical survey during January 1998 to May 1998. Petrographic, mineragraphic, fluid inclusion and x-ray diffraction analyses were undertaken by independent petrographer, Ms. Elveta C. Comsti, from Applied Science of Terradata Inc.

Initially 35 rockchip samples were collected (TMR-001 to TMR-035) and analyzed for Au, Cu, Zn, Pb, As and Ag. A total of 194 stream sediment samples (49001 to 49194) were also collected on the property, and include 10 duplicate samples. The stream sediment samples were analysed for Au, Cu, Zn, Pb, As and Ag. The Mt Tapian prospect area was gridded using a north-south oriented and 1-km-long baseline and east-west crosslines. A detailed follow-up geological survey comprised mapping of outcrop plus rock-chip and float sampling. Geological mapping was undertaken to define the location and orientation of faults, to map the rock-type distribution, to define alteration zones and to identify mineralization. A total of 87 rock-chip samples (TMR-36 to TMR-122) were collected during this follow-up activity, and analysed for Au, Cu, Zn, Pb, As and Ag.

Soil sampling on the Mt Tapian prospect was conducted on a 50m and 100m grid. Of the 426 soil samples collected on the Mt Tapian grid, 291 samples, which include 9 duplicates, were analysed for Au, Cu, Zn, Pb, As and Ag. Most analysed samples form a 50m x 50m grid pattern over an area of approximately 900m x 800m (Figures 23 and 24).

Geological mapping in the Mt Tapian prospect area by MRL identified a series of high-level calc-alkaline intrusives that penetrate into a dominantly ultramafic cover sequence (Figure 21). Local outliers of greenschist and limestone were mapped within the ultramafic sequence during follow-up mapping (Figure 22).

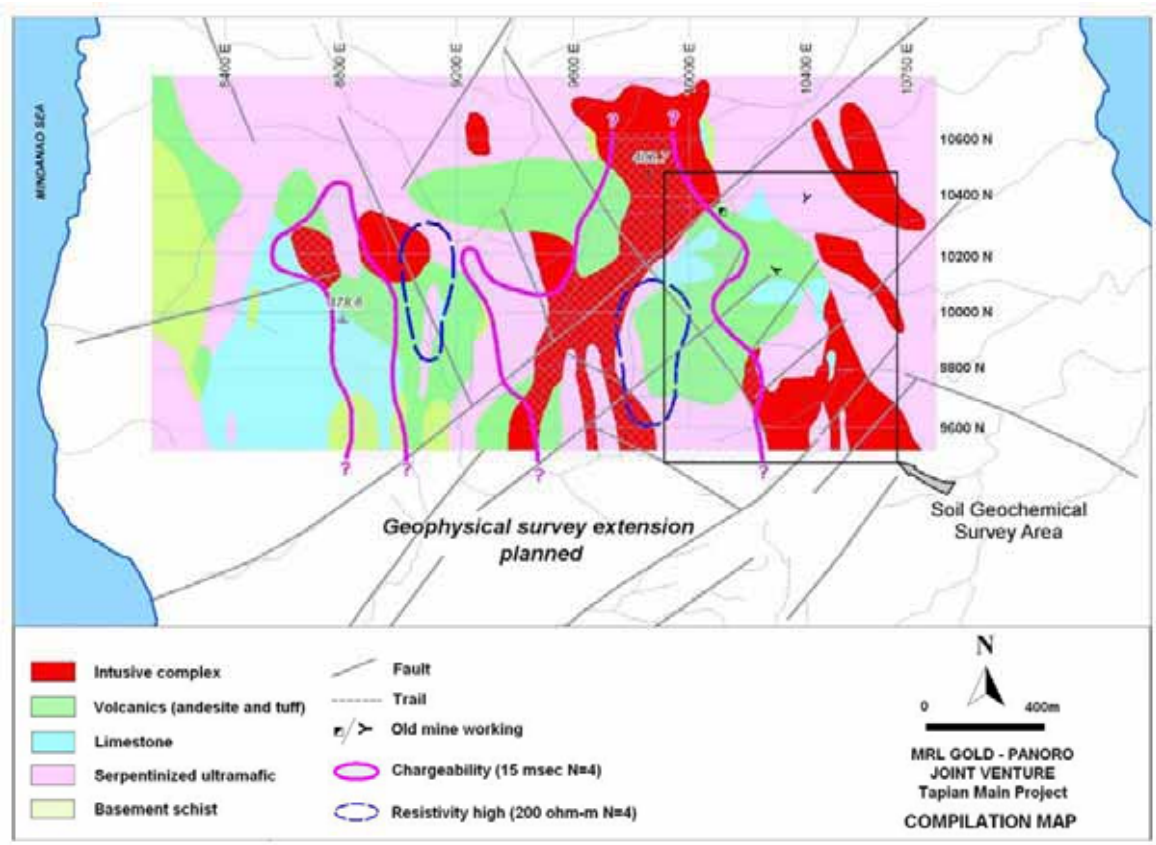


Figure 22 – Geology of the Mt Tapian prospect area from follow-up mapping. The geology is plotted together with the distribution of chargeability and resistivity anomalies (raw IP data, not modelled) that are discussed in Section 8.5.2.

The results of the regional stream sediment geochemical survey on the Tapian Main property are tabulated below.

Element	Range	Average Value
Au (ppb)	< 5 – 8770	108.08
Cu (ppm)	21-292	80.84
Zn (ppm)	37 – 723	88.22
Pb (ppm)	<5 – 794	13.59
As (ppm)	1 - 216	8.48
Ag (ppm)	< 0.5	

Extensive gold stream sediment anomalies were defined around a series of hornblende andesite porphyry stocks that penetrate into the ultramafic, greenschist and carbonate cover sequence in the southeast portion of the project area. In this region, a 20-100 ppb anomaly surrounds a core inner

anomaly that ranges from 100-1000 ppb. The inner anomaly comprises 13 stream sediment samples that cover a water-shed area of ~1100 metres by 600 metres. Two stream sediment samples yielded peak assays of 2.4 g/t Au and 8.77 g/t Au. Weak copper anomalies in the northern portion of the project area are underlain by basaltic andesites, and may reflect back-ground values. The central to southern Cu anomalous zones defined in the stream sediment survey are defined by values > 50 ppm (peaks at 230 ppm and 292 ppm) and cover an irregular water-shed area of ~2.7 km x 2.5 km. They correlate with Au and Zn anomalies in stream sediment samples and with Pb and As stream sediment anomalies in parts of the Mt Tapian prospect. The central to southern anomalous zone on the Tapian Main property is also variably anomalous in Zn (peak 723 ppm). A water-shed containing anomalous Pb in stream sediment samples (peak 794 ppm) was defined over an area of ~900 metres by 500 metres in the Mt Tapian prospect area. Stream sediment samples are typically low for Ag, Hg and Sb. The stream sediment survey clearly identified the Mt Tapian prospect area as the principal area of exploration interest on the Tapian Main property.

The soil geochemical survey conducted over the Mt Tapian prospect generated strong Au and Cu anomalism. Gold values in soil samples ranged from <10 ppb to 1,670 ppb (aver. 81 ppb). The Au soil anomalies form broadly NE-SW-elongate zones that are termed the Rosario and Samson Zones, plus a smaller zone further to the southeast and called the Southeast Zone (Figure 23). These 3 anomalies are surrounded by a lower grade halo of >50 ppb Au (Figure 23). The Au anomalies are broadly associated with the margins of mapped intrusions (Figure 23). The details of the soil anomalies are tabulated below.

Zone	Area	Cut-off	Peak	Comments
Rosario Zone	250 x 500 m	100 ppb	1670 ppb	Open to north
Samson Zone	300 x 600 m	100 ppb	575, 750, 1220* ppb	
Southeast Zone	100 x 200 m	100 ppb	340 ppb	

* The soil sample that assayed 1.22 g/t Au from the Samson Zone was collected from an area of small-scale workings along a ridge crest that lies approximately 200m SSW of the Homer Tunnel (see Plates 10 a and 11a).

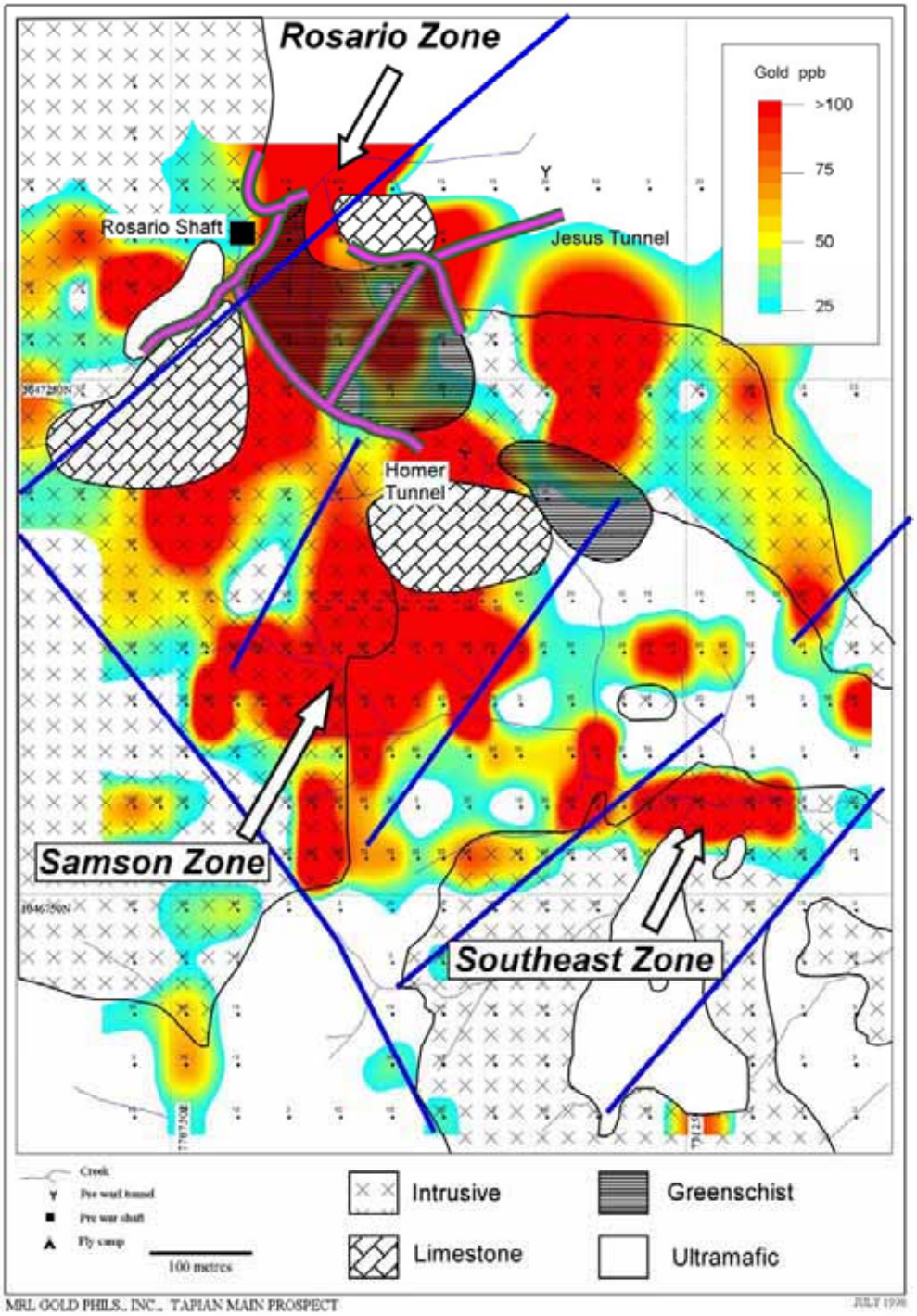


Figure 23 – Soil gold anomalies (ppb) associated with the margins of hornblende andesite intrusions at the Mt Tapian prospect (Geology from Phase 1 mapping [Figure 21] overlain on soil Au geochemistry).

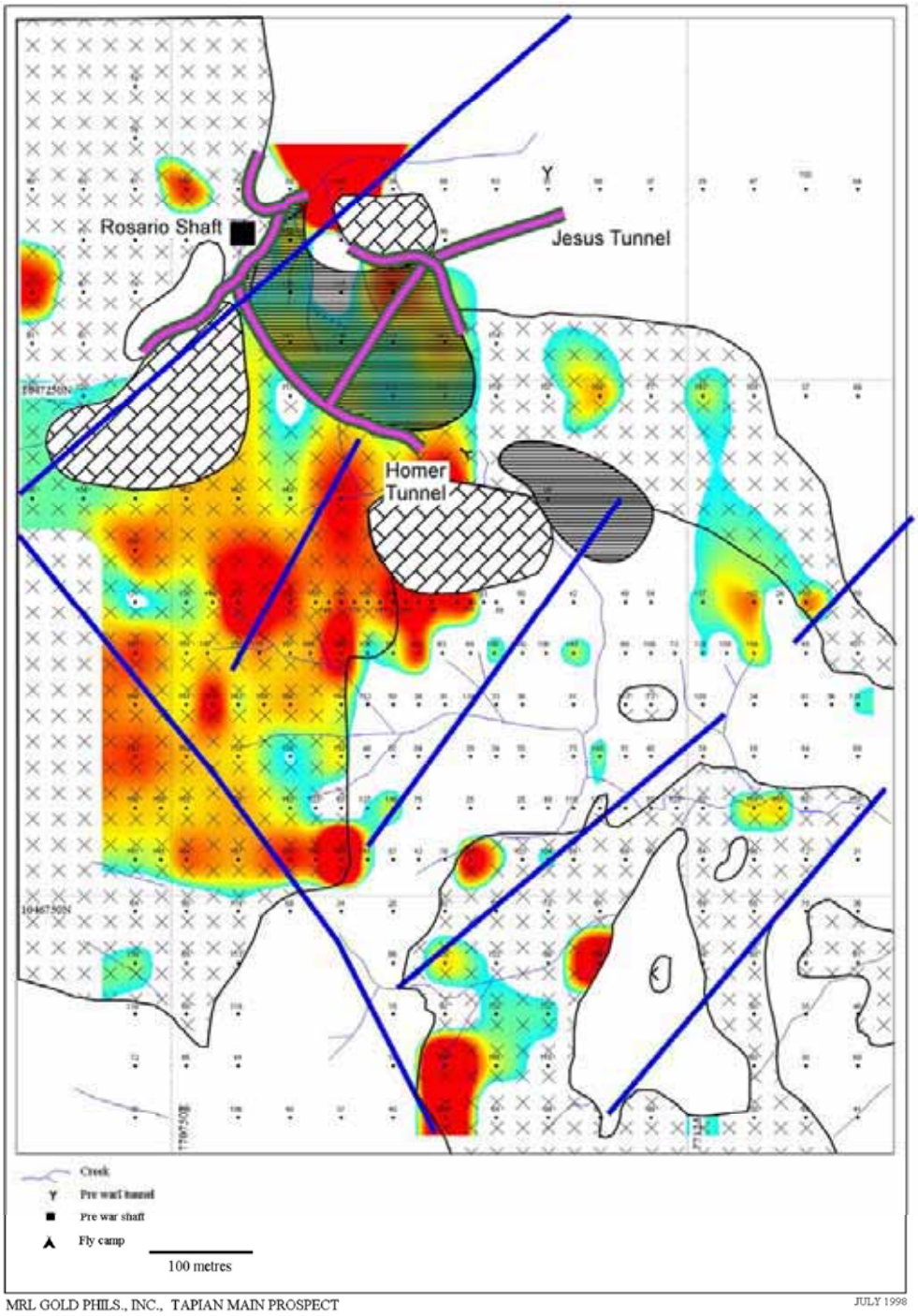


Figure 24 – Soil copper anomalies (ppm) associated with the margins of hornblende andesite intrusions at the Mt Tapian prospect. (Geology from Phase 1 mapping [Figure 21] overlain on soil Cu geochemistry).

Moderate to weak Cu anomalies occur in soil samples northeast of the Rosario shaft (peak 1,192 ppm), southwest of the Homer Tunnel (peak 278 ppm), and in two separate areas south of the Homer tunnel where Cu peaks at 546 ppm and 309 ppm (Figure 24). In the northern and central area, the Cu anomalies correlate well with the gold soil anomalies that define the northern portion of the Rosario Zone and most of the Samson Zone.

Areas of Zn and Pb anomalism tend to be weaker in soil samples from the Mt Tapian prospect area. Arsenic in soils tends to be weak also, although several As soil anomalies correlate with the Au and Cu anomalies at Rosario and Samson.

8.5.2 MRL Exploration (2004-2005)

MRL undertook a renewed phase of exploration activity in 2004 which was focused on the Mt Tapian prospect area. This activity involved additional rock-chip sampling plus extensive grid-based pole-dipole induced polarization (IP) geophysical surveying across the cluster of soil geochemical anomalies that occur over the Mt Tapian prospect. The data were acquired by Elliot Geophysics International using a Zonge GGT-10 transmitter, a Zonge GDP-32 receiver and a 7.5 KVA generator. The dipole spacing used in the survey was 150 metres. The results of the IP program are presented below.

At the time of writing, the author has viewed only standard IP pseudo-sections for the six 200-metre-spaced IP lines that run across the Mt Tapian prospect. The sections are presented in Appendix 1. The IP pseudo-sections suggest that several buried zones of moderate chargeability underlie the Mt Tapian prospect area. The higher chargeabilities values range up to 26.7 msecs. In the zones of elevated chargeability the values typically lie in the range of 18-22 msecs. These chargeable zones may correlate with disseminated sulfide contents of a few percent (2-4%). The zones of higher chargeability zones are best developed on levels N=2 and N=4, and broadly define a NNW-trending zone of higher chargeability that weakens towards the surface (Figure 25).

The highest measured resistivities (1225 ohm-m) occur at N=1 (~150m depth) at 9800mN and 8900mE (Appendix 1). This locality coincides with mapped outcrop of limestone at surface and lies above a linear zone of higher chargeability at depth (N=4). Limestones are commonly silicified where they are in contact with andesitic intrusions in the Mt Tapian prospect, and can locally contain high-grade gold mineralisation. Consequently the high resistivity anomaly at 9800mN and 8900mE is worthy of follow-up ground inspection for the presence of silicified contact limestones.

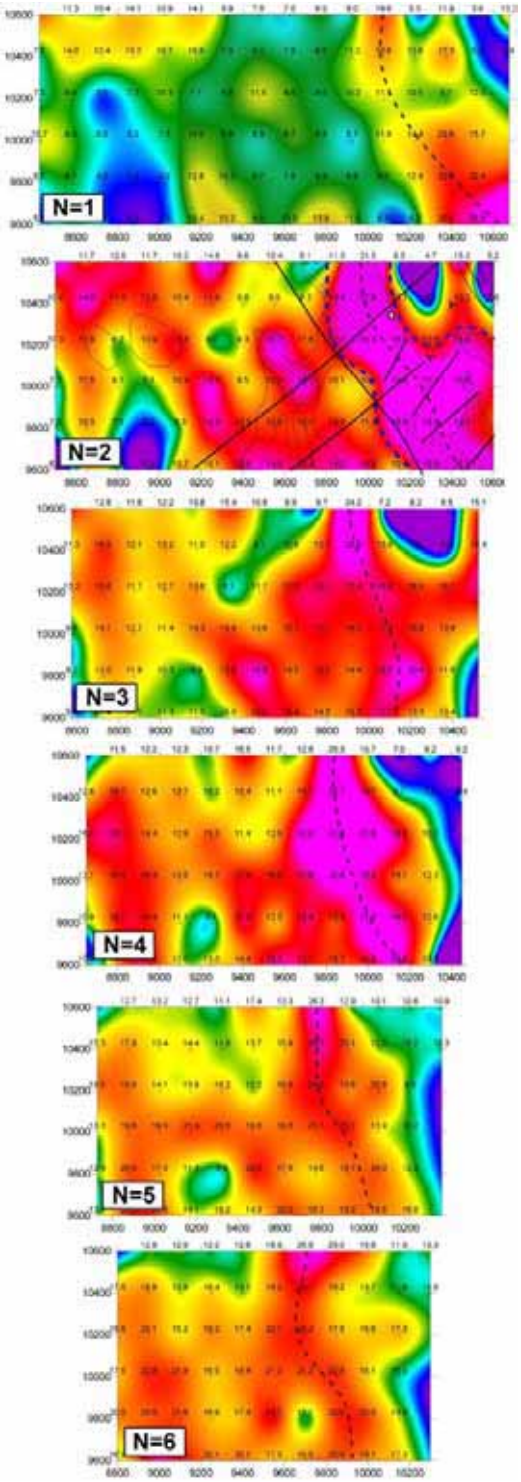


Figure 25 - Level plans of pole-dipole IP chargeability at the Mt Tapian prospect (raw data). Note: the colour-scale used for the chargeability values varies between some frames. On plan N=2 (see Figure 26 for enlargement) the distribution of intrusions (black outlines), as defined during follow-up mapping on the Mt Tapian prospect (Figure 22), are superimposed on the IP data together with the position of interpreted faults. The portions of these mapped intrusions that are coincident with high chargeability anomalies are indicated by the cross-hachured areas. Several zones of higher chargeability at N=2 correlate well with mapped surface expressions of magmatic intrusions (Figure 26). The most coherent zone of high chargeability (dashed blue line) trends NNW, with its eastern margin passing near the entrance to the Homer tunnel (southern-most Y symbol) and the Rosario shaft (white square). The presentation on the N=2 plan (Figure 26) suggests that the mapped intrusive bodies at 'A' and 'B' may link together at depth, and form a NNW-trending intrusive body that lies sub-parallel to the interpreted NNW-oriented fault. The northeast projection of the zone of high chargeability at 'C' (Figure 26) coincides with mapped northeast-trending faults (F1 and F2). These faults may account for the northeast extension (displacement) of the chargeability zone that coincides with the Samson Zone. These two faults form part of a wider fault set that are oriented parallel to the main zones of Au anomalism defined in soil samples (Figure 23).

The NNW-trending zone of high chargeability on N=2 appears to step consistently westward from N=1 down through to N=6 (dashed line on N=1 to N=6).

The irregular distribution and geometry of the zones of higher chargeability at the Mt Tapian prospect may be a function of both the multiple intrusive bodies mapped within the Mt Tapian prospect area and the localization of observed mineralization along intrusive contacts.

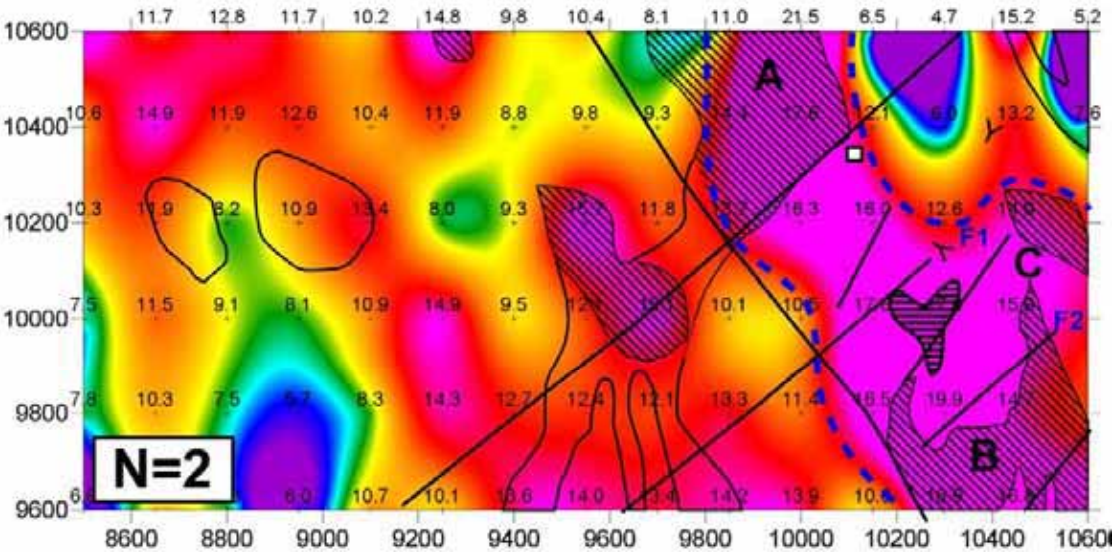
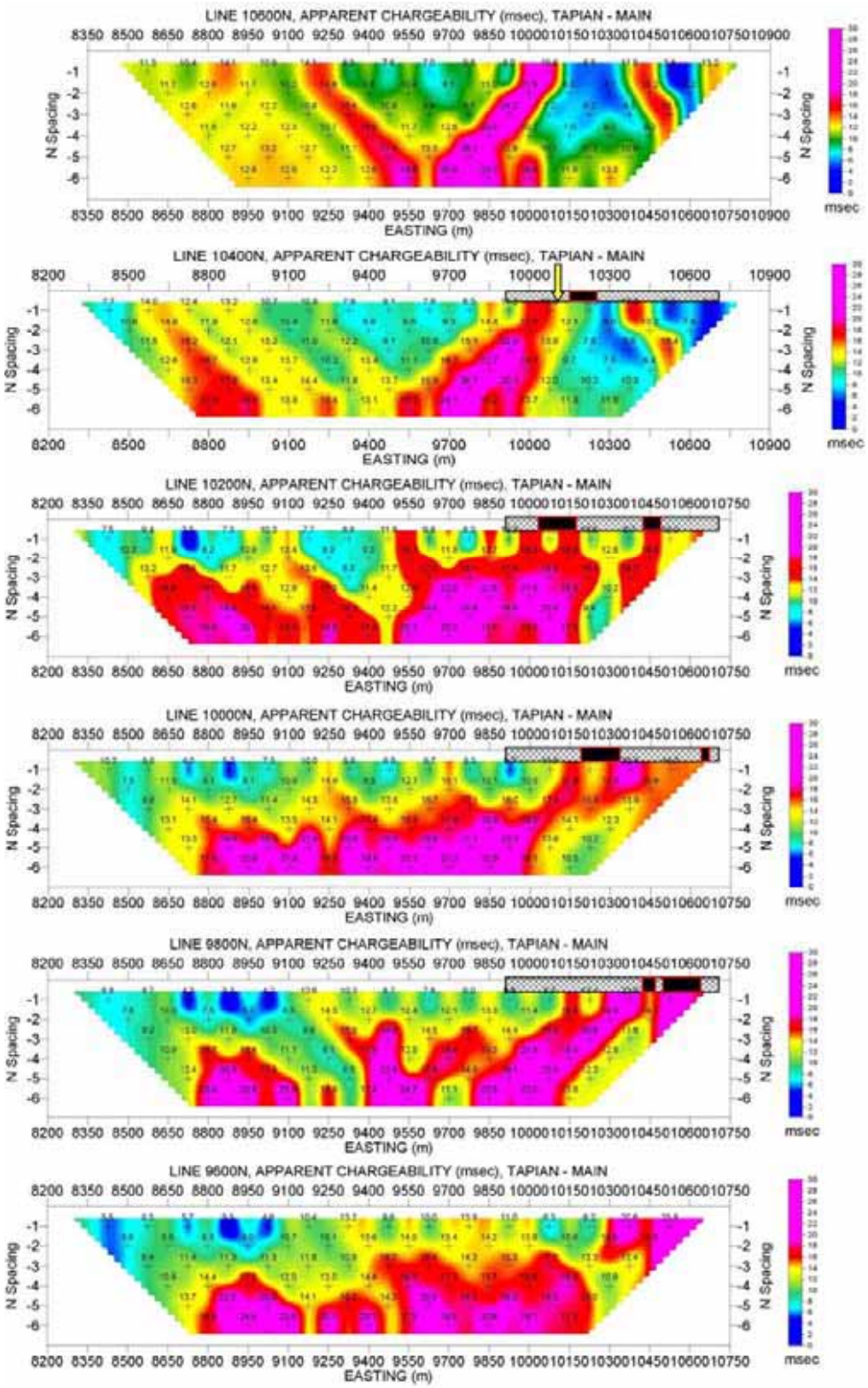


Figure 26 - Plan of pole-dipole IP chargeability at the Mt Tapian prospect (N=2; raw data). Zones of high chargeability (purple) are commonly associated with the surface expression of mapped intrusions (inclined line hachure). The intrusions mapped at 'A' and 'B' may interlink at depth along the NNW-trending high-chargeability zone. The zone defined by the horizontal hachure near the Homer Tunnel is the area of small-scale high-grading activity by local artisanal miners (Plates 10a and 10b) in the Samson Zone (Figure 22).

Figure 27 shows IP pseudo-sections from the southern portion of the Tapian Main property arranged in order from north to south. In Figure 25, the main NNW-trending zone of highest chargeability steps progressively westward with increasing depth (N=1 → N=6). This zone is sub-parallel to a mapped NNW-trending fault that skirts the anomaly at N=2 (Figure 25). If this structure controls the distribution of the high chargeability anomaly near the surface (N=2) and at greater depth, directly or indirectly, then the NNW-trending structure must dip to the WSW.

Figure 27 (overleaf) – Pole-dipole IP pseudo-sections from the southern portion of the Tapian Main property, arranged in order from north (top) to south (bottom). The data are raw, unmodelled data. A semi-continuous and deep-seated chargeability anomaly (>20 msecs) occurs on all IP pseudo-sections. This large IP anomaly approaches the surface along a narrow linear zone on the eastern side of the deep chargeability anomaly area, particularly on sections 9,800mN, 10,000mN and 10,200mN. The stream sediment survey discussed in Section 8.5.1 identified anomalous Cu and Au in the southeast portion of the Tapian Main tenement. This area was followed up by soil sampling and defined the Rosario, Samson and Southeast Zones on the Mt Tapian prospect. Strong soil Au (and Cu) anomalies were identified. In the pseudo-sections below, the coverage of the soil sampling survey relative to the IP lines is shown by the cross-hachured rectangle on lines 9,800mN through to 10,400mN. *The area of >100 ppb Au in soils (see Figure 23) is transposed on this diagram and is represented by the horizontal black bars*. It is obvious that there is a good spatial correlation between the >100 ppb Au soil anomalies at surface and the region on the eastern side of the deep chargeability anomaly where the chargeable zone approaches the surface. The position of the Rosario shaft is shown by the yellow arrow projected onto the nearest IP line. These data suggest that the Rosario, Samson and Southeast zones are distal surface expressions of a potentially larger hydrothermal system which finds greater areal expression (as inferred sulfide deposition) at depth to the west.


LINE 10600N, APPARENT CHARGEABILITY (msec), TAPIAN - MAIN
LINE 10400N, APPARENT CHARGEABILITY (msec), TAPIAN - MAIN
LINE 10200N, APPARENT CHARGEABILITY (msec), TAPIAN - MAIN
LINE 10000N, APPARENT CHARGEABILITY (msec), TAPIAN - MAIN
LINE 9800N, APPARENT CHARGEABILITY (msec), TAPIAN - MAIN
LINE 9600N, APPARENT CHARGEABILITY (msec), TAPIAN - MAIN
N Spacing
EASTING (m)
msec

This dip is consistent with the dip of the shallow, eastern, chargeability anomalies shown in Figure 27 on sections 10,600mN, 10,400mN, 10,000mN and 9,800mN.

The raw (unmodelled) geophysical IP survey data suggest that the hydrothermal system, as expressed by the distribution of high chargeability anomalies, continues beyond the areas of IP surveying, however this needs to be confirmed by inversion modeling. At shallow levels (Figure 25; N=2), the IP anomalies continue to the north and to the south. The IP anomalies near the surface in the Rosario and Samson Zones appear to be aligned parallel to a northwest-trending fault (Figure 25; N=2 image). This northwest trending IP chargeable zone (N=2) links to and balloons into a large IP chargeable zone at depth to the west (Figure 27; 9,800mN, 10,000mN, 10,200mN and 10,400mN). This larger and deeper area of higher chargeability covers an area of approximately 1.4 km by 0.6 km and extends from line 9600mN through to 10200mN. It is open to the south. The deep chargeability anomaly narrows to the north on sections 10400mN and 10600mN, however it is still open to the north. If these chargeability anomalies remain after inversion modeling of the IP data from Tapian Main, and are caused by sulfide that deposited from magmatic fluids around the carapace of one or more large intrusive stocks, then a porphyry target could exist on the IP grid area at Tapian Main, and in the area to the immediate south where a deep high-chargeability anomaly remains open.

* Depth of N=1is ≈ dipole spacing (i.e. 150m). Depth of N=2 is depth of N=1 (150m) + half dipole spacing (75m) = 225m.

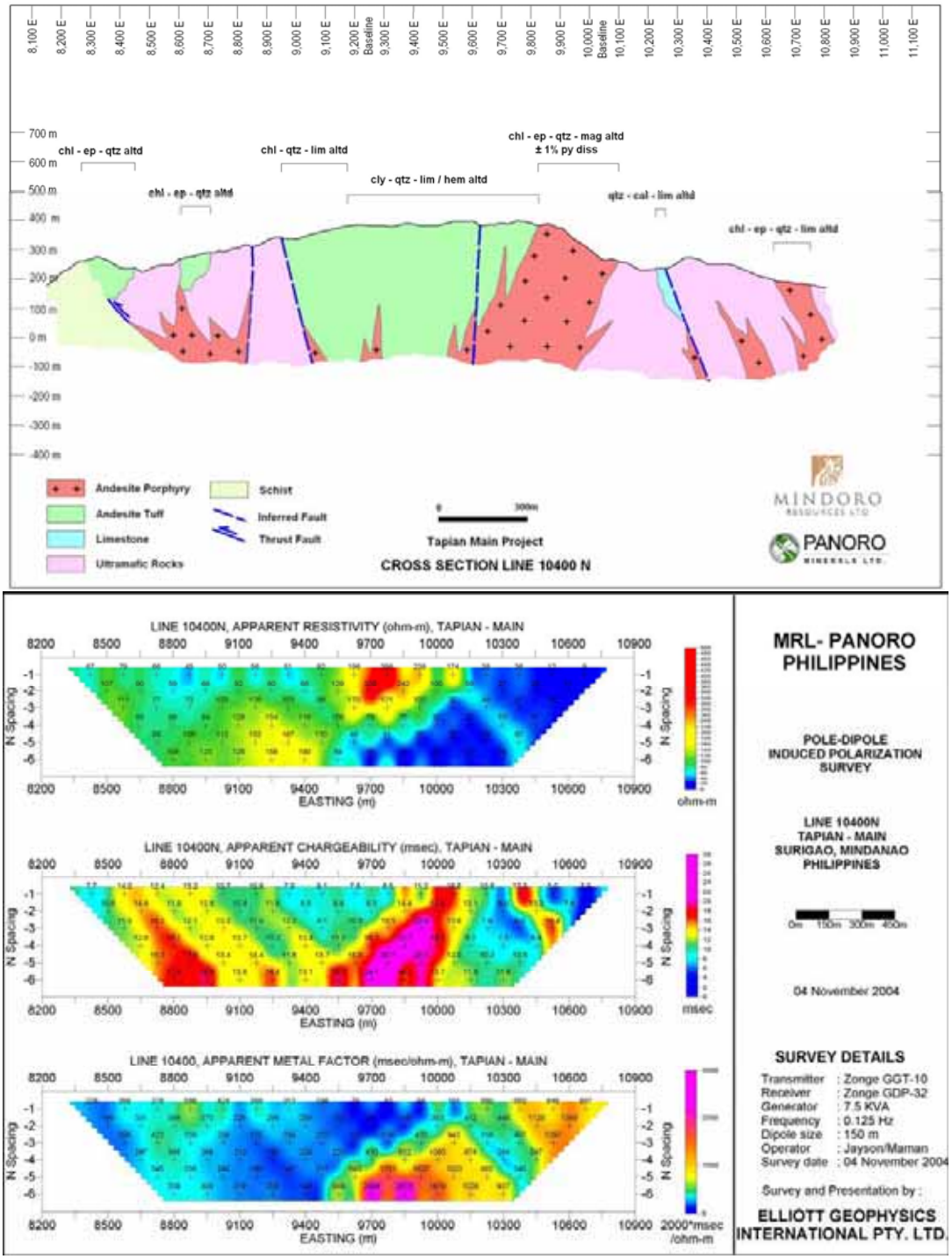


Figure 28 – Geological cross-section and IP pseudo-section through 10,400mN on the Mt Tapian prospect.

9. AGATA PROPERTY

9.1 Accessibility, Climate, Local Resources, Infrastructure and Physiography

The Agata property lies over the Western Range in the northern portion of the Agusan Del Norte province. It lies approximately 25 kilometres south of the Tapian Main property, and due west of the Tubay River which drains southward from Lake Mainit. The topography in the project area is moderate to locally steep, and elevations range from sea-level to 333 metres ASL. The blocks that comprise the property extend eastward from the coast, across the NNW-SSE-trending Western Range, and partly across the flood plain of the Tubay River to the west margin of the Eastern Range. The vegetation in the project area is dominated by secondary forest in the elevated portions, and forest vegetation is transitional to agricultural areas at lower elevations that comprise rice, maize, coconut and banana. The main access route to the property is via the all-weather Pan-Philippine Highway which extends south from Surigao City and passes through Santiago. Access from Santiago is by gravel roads that lead westward to Barangay La Paz. Local motorized outrigger canoes (bangkas) ply the Tubay River from Barangay La Paz to Barangay E. Morgado. Alternatively, the turn-off point on the Pan-Philippine Highway at Santiago can be reached from Butuan City, the capital of Agusan Del Norte province.

Plate 12 – Looking south along the Agata property from the Limestone prospect. The southward-flowing Tubay river lies along the western side of the lowland that separates the Western Highlands (right) from the Eastern Highlands (left).

9.2 History

The earliest documented work which extended over the Agata project area involved regional geological reconnaissance of northern Agusan (Teves *et al*. 1951; Figure 6). They mapped sedimentary rocks (limestones, shales and sandstones) of Eocene to mid-Teriary age. Teves *et al*. (1951) reported the presence of gold claims in the Agusan Del Norte region, but that they had not been developed. Following this preliminary reconnaissance work, geologists from the Mines Regional Office in Surigao documented the results of regional mapping in the Jagupit Quadrangle (Madrona 1979). The quadrangle is located between approximately 125º29'E to 125º45'E longitude and 9º10'N to 9º20'N latitude (Figure 6). Madrona (1979) described the geology of the Western Range as a belt of pre-Tertiary metasediments, metavolcanics, marbleized limestone, sporadic occurrences of schist and phyllite, and containing a Neogene ultramafic complex. Madrona (1979) defined the principal volcano-sedimentary and structural framework of the region and recognized the allochtonous nature of two areas of ultramafic rocks that comprise serpentinised peridotite in the Western Range, one between the Asiga and Puya rivers in the Agata project area and the other west of Jagupit. These were mapped by Madrona (1979) as blocks thrust westward, or injected into the metavolcanics between fault slices. Dirty white to grey marbleized limestone was described as being associated with metasedimentary rocks and minor red chert along the eastern side of the Western Range. Madrona (1979) described large areas of altered rock in the Eastern Range that relate to centres of fracturing and intrusion, whereas in the Western Range limited alteration occurs along highly sheared zones. Porphyry copper mineralization is reported in the Upper Asiga River region of the Eastern Range, in the Jagupit quadrangle area.

In 1982 the United Nations Development Program (UNDP) conducted regional geological mapping at 1:50,000 scale and collected stream sediment samples over northern Agusan. The UNDP report of 1984 described the geological evolution of this region and included a detailed stratigraphic column for the Agusan Del Norte region. Two anomalous stream sediment sites were defined near the Agata project during this phase of work. The Asiga porphyry system that lies east of the Agata tenements was explored by Sumitomo Metal Mining Company of Japan in the 1970's and 1980's (Abrasaldo 1999).

La Playa Mining Corporation was financed by a German company in the late 1970's to explore within the Agata project area for nickel and cobalt enrichment developed in the laterite profile over ultramafic rocks (Bailey 2003). La Playa Mining Corporation excavated at least five (5) test pits within the laterite profile. From 1978 through to the mid-1980's the population of the Agata area increased substantially, to around 3000 people, as small-scale miners flocked to the area following discovery of gold in saprolite. The region of small-scale mining activity was subsequently named "Kauswagan de Oro" (translated: progress because of gold). After the soft oxidized material at

surface had been depleted by mining, artisanal high-graders encountered more resistant bedrock. The majority subsequently left the region for other high-grading areas in Mindanao. A few artisanal miners remained to undertake underground mining operations at the Assmicor and American tunnels area. Minimax placed claims over the Agata area in 1987 and then conducted reconnaissance and detailed mapping and sampling. Geological mapping at 1:1,000 scale was undertaken in the high-grading localities, and an aerial photographic survey was conducted and interpreted. MRL established a deal with Minimax in 1997 and commenced exploration in the same year (Section 9.5.1).

9.3 Property Geology

The geology of the Agata property shown in Figure 29 is a compilation of geological mapping by MRL geologists and earlier mapping conducted by Madrona (1979) and UNDP (1984). The Agata property spans the full width of the Western Range. It extends eastward over the low-lying flood plain of the Tubay River that flows south from Lake Mainit. Portions of the property span two strands of the Philippine Fault. These fault strands lie on either side of the Tubay River topographic depression. The basement sequence on the property comprises greenschists, of probable Cretaceous age, which occur mostly in the central-western coastal portion of the Agata property (Figure 29). The greenschists on the Agata property correlate with the Conception Greenschists (UNDP 1984).

This basement sequence is overlain by two extensive areas of ultramafic rocks that are well preserved on the Agata property. These comprise serpentinites, serpentinised harzburgites, peridotites and lesser dunite which are fractured and cross-cut by fine networks of talc, magnesite and/or calcite veins. The serpentinites in the Agata property correlate with the Humandum Serpentinite (Section 5.2.2), and have potential for nickel due to observed nickel-enrichment in the weathering profile.

Two crystalline limestone bodies of probable Upper Eocene age are mapped in the project area. The eastern-most limestone body lies in the Assmicor-Lao prospect region, in the central portion of the property. The limestones are typically fine-grained and crystalline, and have undergone substantial recrystallisation during younger intrusive activity. The limestone outcrops in the Assmicor-Lao prospect areas are commonly cross-cut by calcite veins. Overlying the crystalline limestones is a widespread crystal tuff. This unit was not observed during the authors visit to the property because it is located further north and south of the known mineral prospects that were visited by the author at the American Tunnel, Assmicor and Lao areas. Geological contacts between this tuffaceous unit and the older ultramafics are shown as faulted contacts on the geological map, and several exposures of this unit are described by Abrasaldo (1999) as being strongly fractured adjacent to northeast-trending faults.

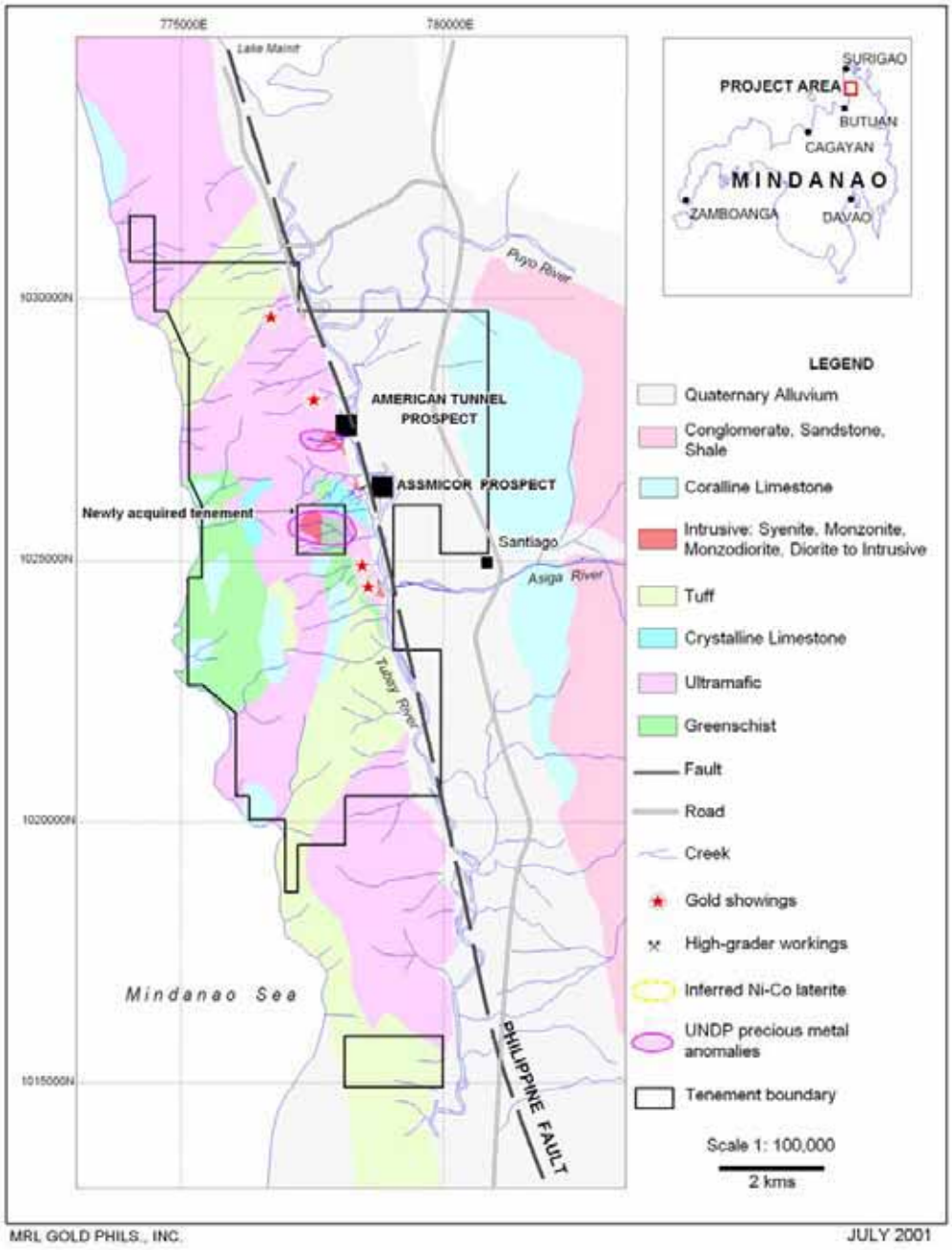

775000E
780000E
Lake Mainit
1030000N
1025000N
1020000N
1015000N
AMERICAN TUNNEL PROSPECT
ASSMICOR PROSPECT
Newly acquired tenement
Santiago
Asiga River
Tubay River
Pigo River
Mindanao Sea
PHILIPPINE FAULT
SURIGAO
PROJECT AREA
BUTUAN
CAGAYAN
MINDANAO
ZAMBOANGA
DAVAO
LEGEND
Quaternary Alluvium
Conglomerate, Sandstone, Shale
Coralline Limestone
Intrusive: Syenite, Monzonite, Monzodiorite, Diorite to Intrusive
Tuff
Crystalline Limestone
Ultramafic
Greenschist
Fault
Road
Creek
Gold showings
High-grader workings
Inferred Ni-Co laterite
UNDP precious metal anomalies
Tenement boundary
Scale 1: 100,000
2 kms
MRL GOLD PHILS., INC.
JULY 2001

Figure 29 (previous page) - Geological map of the Agata property. The Western Range is dominated by basement sequences of greenschist that are overthrust by ultramafic complexes. The ultramafic rocks have locally undergone variable nickel-enrichment in the oxide profile. Intrusive bodies of monzonite, monzodiorite, syenite and diorite of Upper Oligocene to Lower Miocene age that are located near the Philippine Fault splay are prospective for Cu and Au.

A series of Upper Oligocene to Lower Miocene intrusives of alkalic and calc-alkaline composition occur in close vicinity to a major strand of the Philippine fault (Lake Mainit Fault). These intrusive rocks include syenites, monzonites, monzodiorites and diorites. Drill intersections of these intrusives bodies in the Assmicor prospect region indicate that they are multi-phase intrusions that range from larger bodies to narrow cross-cutting dykes. The intrusions are closely associated with gold mineralization in the Assmicor and Lao prospect areas. In the past, active tunnelling was conducted around the periphery of the intrusive bodies by both commercial operators and small-scale miners. The monzonites in the American Tunnel and Lao prospects tend to be medium- to coarse-grained and equigranular. A porphyritic trachyte has been described near the Lao prospect. The intrusives have undergone varying degrees of hydrothermal alteration, and gold mineralization occurs both within the margins of the intrusions and in the ultramafic rocks that are in contact with them. The intrusions in the Lao and American Tunnel prospects have been tentatively correlated with the Mabaho Monzonite of probable Lower Miocene age (UNDP 1984). Further to the south in the vicinity of the Asiga River, monzonites and hornblende plagioclase porphyry have been identified by MRL geologists (Abrasaldo 1999).

Correlatives of the Kitcharao limestone occur scattered through large areas of the Agata property. These rocks are of Lower Miocene age. Minor outcrops of the Jagupit Formation lie in the eastern claim block adjacent to Bangonay town (Abrasaldo 1999). The Jagupit Formation is Upper Miocene or younger in age. The youngest stratigraphic unit within the project area comprises the Quaternary alluvial deposits of the Tubay River flood plain. These sediments lie within the down-thrown block between the Western Range and the Eastern Highlands, and form a NNW-trending belt within a tectonic graben that runs parallel to splays of the Philippine Fault.

9.4 Mineralisation and Alteration

There are several styles of mineralisation that occur on the Agata property. These include Au-oxide mineralization in saprolite that is developed over shallowly-buried intrusions, Cu and Au mineralization associated with quartz veinlet and pyritic stockworks along the margins of monzonitic to dioritic plutons, Au associated with horizons of disseminated pyrite in sooty carbonaceous limestones, and nickel mineralization generated by surficial zones of nickel-enrichment in laterites that are developed on ultramafic protoliths.

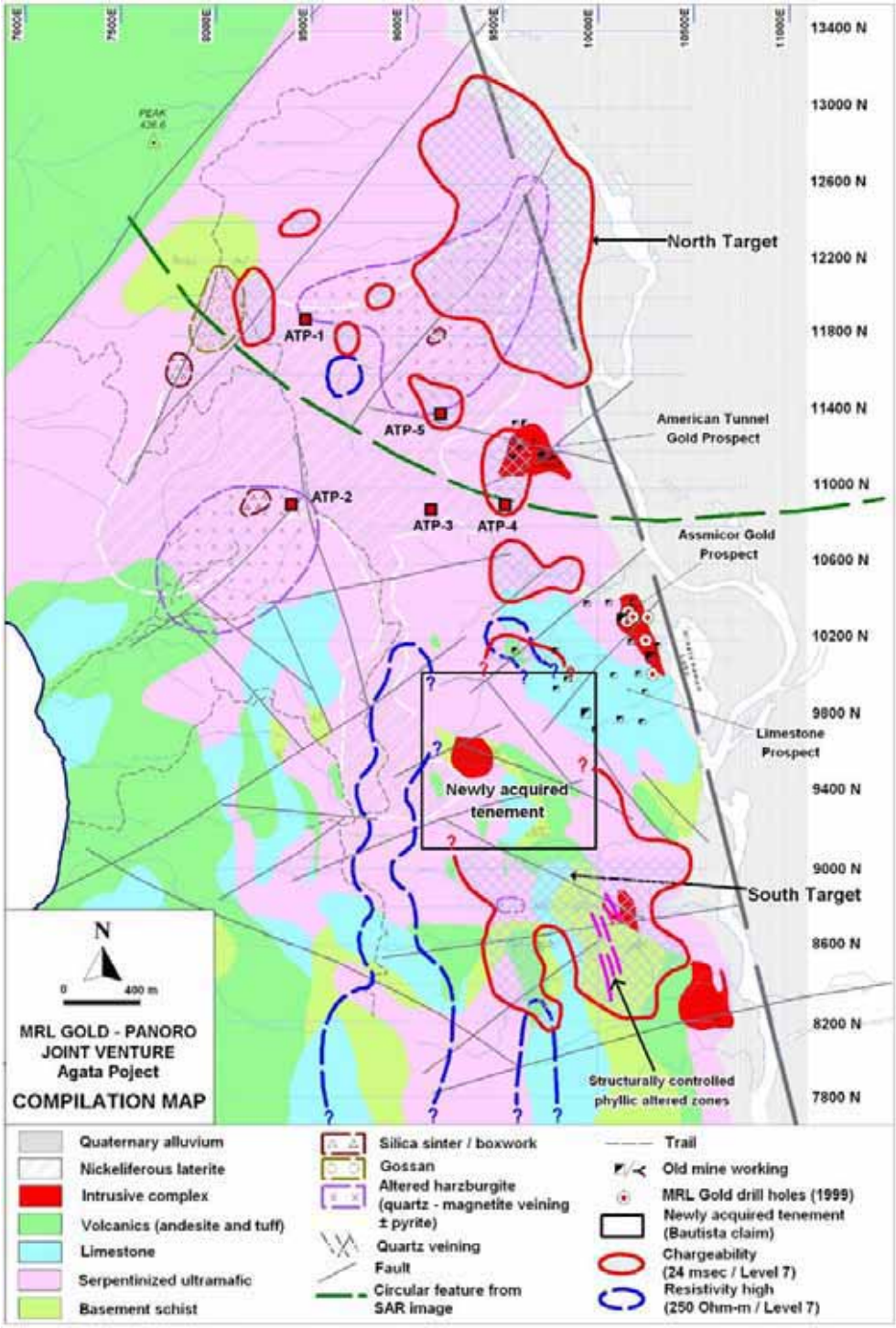

13400 N
13000 N
12600 N
12200 N
11800 N
11400 N
11000 N
10600 N
10200 N
9800 N
9400 N
9000 N
8600 N
8200 N
7800 N
North Target
South Target
ATP-1
ATP-2
ATP-3
ATP-4
ATP-5
American Tunnel Gold Prospect
Assmicor Gold Prospect
Limestone Prospect
Newly acquired tenement
Structurally controlled phyllic altered zones
N
0
400 m
MRL GOLD - PANORO JOINT VENTURE
Agata Poject
COMPILATION MAP
Quaternary alluvium
Nickeliferous laterite
Intrusive complex
Volcanics (andesite and tuff)
Limestone
Serpentinized ultramafic
Basement schist
Silica sinter / boxwork
Gossan
Altered harzburgite (quartz - magnetite veining ± pyrite)
Quartz veining
Fault
Circular feature from SAR image
Trail
Old mine working
MRL Gold drill holes (1999)
Newly acquired tenement (Bautista claim)
Chargeability (24 msec / Level 7)
Resistivity high (250 Ohm-m / Level 7)

Figure 30 – (previous page). Geological map of the main area of exploration interest on the Agata property, and showing the location of the American Tunnel, Assmicor and Limestone prospect areas plus the location of two additional targets (North target and South target) that have been defined by a comprehensive regional IP survey (Section 9.5.2). The outlines of high chargeability and high resistivity are from unmodelled raw IP data.

Mineralisation that has been encountered to date occurs in four main prospect areas: the American Tunnels area, the Assmicor Prospect, the Limestone (Lao) Prospect, and the lateritic plateaus that lie to the northwest of the American Tunnels region. These are summarized by prospect below.

9.4.1 Assmicor Prospect

The Assmicor prospect area lies approximately 1 km south of the American Tunnels prospect and is contiguous with the Limestone or Lao Prospect area that is decribed in Section 9.4.3 (Figure 30). The Assmicor prospect hosts intrusion-related gold mineralization associated with monzonite and monzodiorite intrusions that have been emplaced along a regional strand of the Philippine Fault. The prospect is named after the Association of Small Scale Miners Corporation whose small-scale mining operations lack the required government permits. The main workings occur at the Assmicor mine. The Assmicor shaft is located near the centre of the Assmicor intrusion as mapped at surface. Gold is extracted from tunnels that run NNW along a faulted contact between the western margin of the Assmicor intrusive and sheared serpentinites (Climie *et al*. 2000).

The intrusives at Assmicor are propylitically-altered and comprise an alteration assemblage of chlorite-illite-albite-epidote ± quartz ± smectite ± calcite ± zeolite ± pyrite ± sphene ± magnetite (Abrasaldo 1999). Sericite alteration, comprising quartz-sericite-pyrite ± illite ± chlorite, is observed in some outcrops (Abrasaldo 1999). In the Assmicor Mine, Au mineralization is associated with multi-directional quartz veinlets that occur with fine-grained disseminated pyrite and rare fine gold (Abrasaldo 1999). Sparse quartz-sulphide stockworks were observed by the author in several drill holes drilled by MRL in the Assmicor prospect, and east of the Assmicor shaft under the flood plain of the Tubay River (Figure 15b, 16a/b and Section 9.6). The quartz stockworks observed by the author in hole DH99-11 may be associated with a porphyry-Cu-type system at depth below or lateral to the Assmicor prospect. The saprolite which is developed on top of the monzonitic intrusives at Assmicor shows relics of fractures within monzonitic protoliths, and fine gold is obtained by small-scale miners who sluice and pan the clay-rich saprolite (Figure 13a). At deeper levels in the zone of partial oxidation, iron and manganese oxides fill fractures within the intrusive and are associated with fine-grained gold.

Fifteen separate channel samples collected by MRL over 47.95 metres of development within the upper levels of the Assmicor Mine, in near-continuous channels within the margins of the

Small scale mining activity along the banks of the Tubay River on the Agata property, approximately 200 metres south of Assimcor (Lao area). The river bank is being sluiced by ~30-40 artisanal miners to a depth of 3-5 metres where bedrock is encountered.

Distal view of the area in Plate 13a. View is looking to the east from the Western Range across the Tubay River valley to the Eastern Highlands. An area of small scale mining (sluicing and panning) of alluvial deposits occurs on the western bank of the Tubay River system.

monzonite intrusive, yielded an average grade of 6.28 g/t Au. The two peak grades were 26.82 g/t Au and 13.24 g/t Au over two separate 2.3 metre channel samples. When the channel samples from the upper and lower workings of the Assmicor underground development are composited, the average grade over 86.7 metres of channel sampling is 5.2 g/t Au (Abrasaldo 1999).

9.4.2 Limestone (Lao Prospect)

The Limestone Prospect comprises an area of variably altered and mineralised limestone which lies to the south and west of the Assmicor Prospect. The limestones form part of the overlying roof rocks that are inferred to be intruded by monzonites and monzodiorites that are equivalent to those present at the Assmicor Prospect. The Lao shaft lies at the northeast edge of the Limestone Prospect (Figure 31).

The limestones lie unconformably on the underlying ultramafic ophiolites, and in places they were deposited directly on basement schists (Conception Greenschist) where the palaeotopography was presumably more deeply incised. The limestone unit has undergone varying degrees and styles of calc-silicate alteration. The most extensive, albeit weak, alteration facies comprises chlorite and epidote alteration of an otherwise crystalline sparry limestone. Increasing degrees of calc-silicate alteration are defined by the assemblage of carbonate-chlorite-actinolite-tremolite ± epidote ± garnet (Climie *et al*. 2000). It is not clear if this alteration is due to regional metamorphism or is due to skarn-related metasomatism in the thermal aureole to intrusives at depth. Climie *et al*. (2000) indicate that the presence of Cu and Au soil anomalies developed over the limestones at the Limestone Prospect support an intrusive-related metasomatic origin for the alteration, rather than a metamorphic origin. The author agrees with this line of reasoning. The location of more intensely calc-silicate-altered limestones in closer proximity to the intrusives at Assmicor and Lao (Figure 31; dark blue areas) relative to more weakly-altered and crystalline limestones further to the southwest (Figure 31; light blue areas) supports this inference. The third rocktype within the limestone unit comprises a non-calcareous chlorite schist.

Mineralisation in the Limestone Prospect can be characterised both from surface observations and from intersections in drillcore. The strongest soil Au anomaly in the Limestone Prospect (2,300 ppb Au) occurs in limestone adjacent to the intrusives on the eastern margin of the prospect. The limestones in this region are described by Abrasaldo (1999) as …. Quote "*the bedded, highly fractured limestone is partly oxidized and is crisscrossed by calcite veinlets of hydrothermal origin. Primary gold mineralization, although not directly observed, is believed to occur in the form of gold disseminations associated with calcite-quartz (?)-sulphide stockworks and veins*" … end quote.

Gold mineralization in drill core from drillhole DH 99-09 (Plate 15a) occurs in Fe-stained carbonates (sideritic?) associated with disseminated pyrite and local brittle fracturing (Climie *et al*. 2000). The author sampled two representative specimens of carbonate from drillhole DH 99-09 as illustrated in Plate 15a. One sample comprised a calcareous sandy limestone with very little pyrite and organic content. The second sample lay near adjacent to the first sample and comprised dark, sooty and highly carbonaceous limestone with 3-4% disseminated pyrite. The latter sample yielded 0.7 g/t Au (A. Climie pers. comm.). The zones of Au mineralization identified by drilling in the Limestone Prospect (Section 9.6) appear to be stratabound zones of mineralization that are characterized by elevated abundances of pyrite and locally by carbonates that are rich in organic material. The observed style of mineralization, comprising very fine-grained and stratabound Au in organic-rich calcarous rocks, is anomalous in arsenic, and has similarities to Carlin-type mineralization (see discussion in section 9.7).

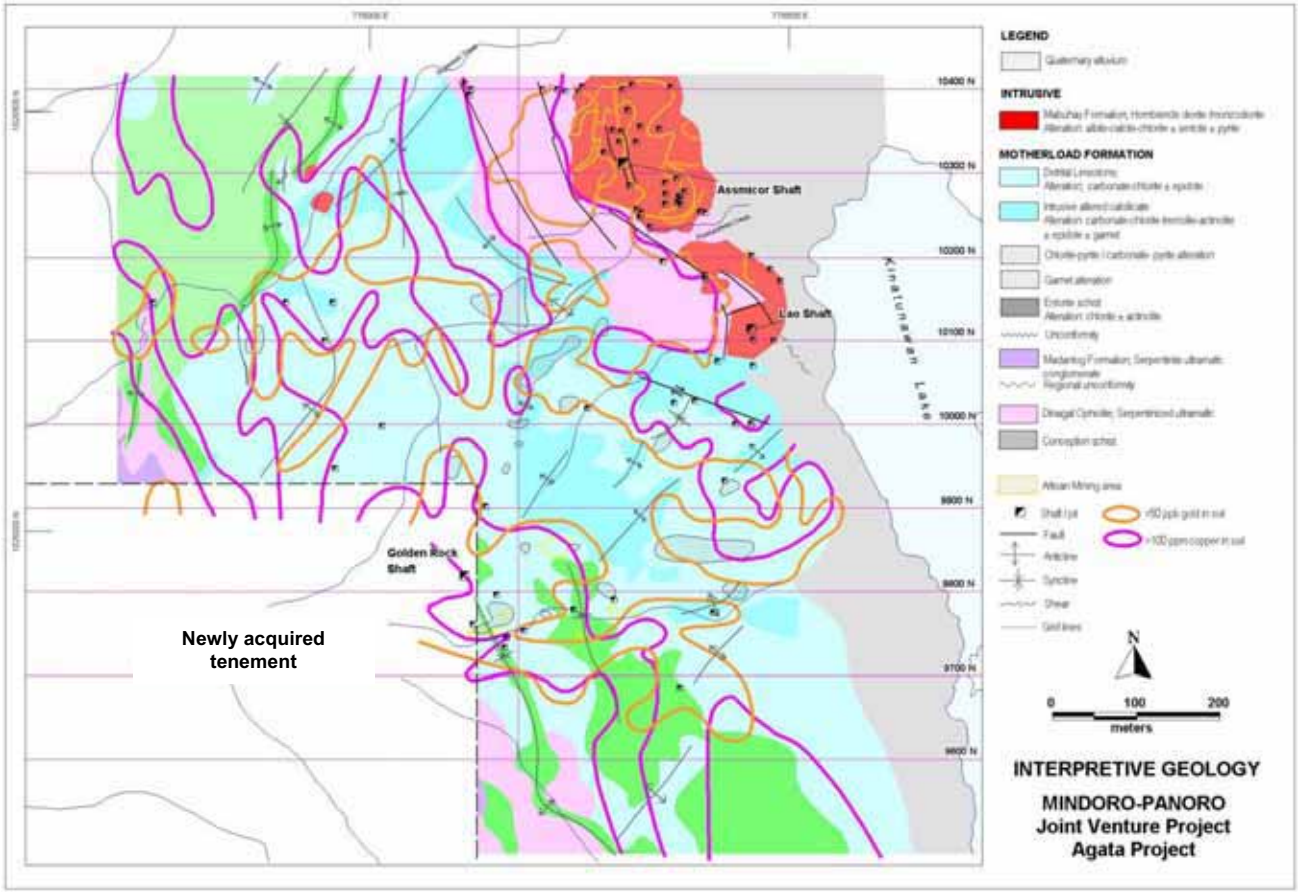


Figure 31 – Geological map showing alteration facies within the limestones at the Limestone Prospect, and the location of widespread Au and Cu soil anomalies.

9.4.3 American Tunnels

The American Tunnels prospect (Figure 30) comprises syenite, monzonite, monzodiorite and diorite intrusives that penetrate into ultramafic rocks that comprise peridotites and pyroxenites (Climie *et al*. 2000). The intrusives are commonly capped by saprolite in the oxide zone. The partially oxidized zone below the saprolite comprises sericitic and propylitic-altered intrusives that are cross-cut by numerous quartz-calcite-sulfide stringers and sulfide disseminations (Abrasaldo 1999). Primary hornblende and bioitite have been altered to a dominantly propylitic assemblage comprising chlorite and epidote. Illite and sericite have been identified as hypogene alteration products of feldspar (Comsti 1998). Comsti (1998) noted that chlorite-epidote-carbonate veins are commonly associated with opaque minerals comprising pyrite, magnetite and lesser chalcopyrite. These vein stockworks increase in intensity adjacent to intrusive contacts. A wide range of igneous rocks were described by Comsti (1998) in thin-sections from the American Tunnels prospect, and include syenite, monzonite, monzodiorite and diorite. The syenites and monzonites are of alkalic affinity.

Small-scale mining activity comprising tunnels and diggings are concentrated along the contact between intrusives and ultramafic country rocks over a strike extend of ~240 metres (Plates 14a and 14b). The monzonites observed by the author from a small tunnel along this contact contained several percent disseminated pyrite associated with traces of chalcopyrite. The pyrite-bearing monzonites were being excavated by artisanal miners together with intensely sheared and talc-bearing ultramafic rocks from along the contact of the monzonite intrusion.

There are numerous adits in the American Tunnels prospect area. These include the Aparice, Bobit, Sarlito, Sepen, Marciano and American Tunnel workings. Most of these workings in the American Tunnels prospect area straddle the northwestern margin of a triangular, lobate-shaped intrusive that is approximately 0.1 km^2 in area and which is in fault contact with ultramafic rocks (Climie *et al*. 2000). The grades of Au observed in rockchip grab samples from this northwest trending zone of workings range from 0.01 g/t Au to 32.49 g/t Au. The highest grades obtained from spot samples collected by MRL geologists included 32.49 g/t Au from the American Tunnel, 23.67 g/t Au from Sammy's Pit and 21.74 g/t Au from a shaft southeast of the Sarlito adit. Grab samples from the Loloy adit yielded 0.12 to 0.37 g/t Au (Abrasaldo 1999). During Marshall's 1997 assessment activity at Agata, he collected a sample of feed from the Loloy adit which assayed 5.9 g/t Au. Abrasaldo (1999) indicates that there are reports of grades attaining 200 g/t Au from selective mining of narrow high-grade zones by small-scale miners. The presence of bonanza-type Au grades is evident, however mineralization at the American Tunnels locale appears to be restricted to a narrow zone along the intrusive-mafic contact, and although its continuity and width appears to be limited, it is poorly tested.

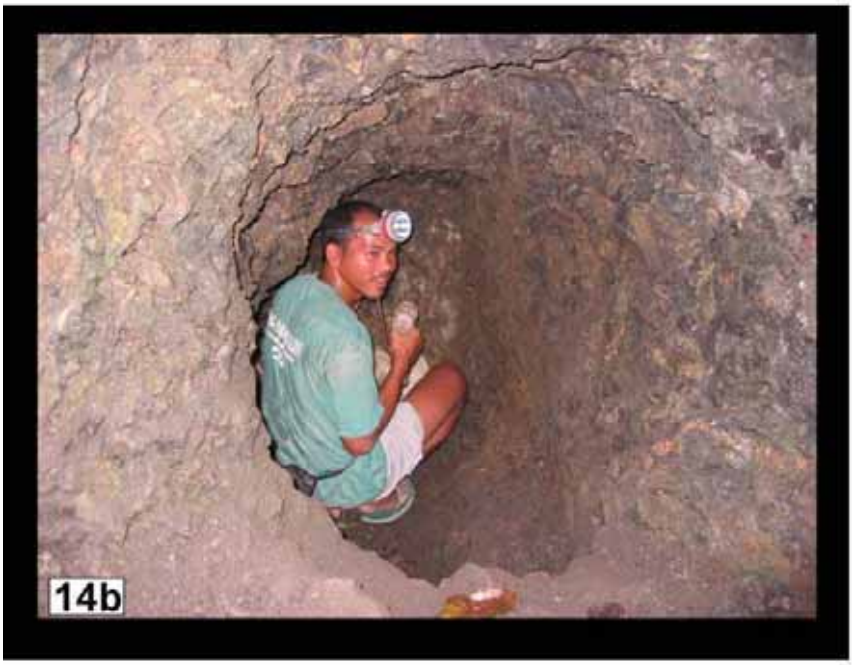
9.4.4 Northwest of American Tunnels - (Nickel Laterite Prospect)

Nickeliferous laterites are present over a broad region to the northwest of the American Tunnels prospect. The laterites are developed on three ultramafic bodies that lie along the Western Range (Figure 29) and that consist of dunites, peridotites and pyroxenites. The ultramafic bodies are of probable Cretaceous age, and were emplaced as ophiolites during the Upper Eocene (Abrasaldo 1999). Formation of the laterites is thought to have occurred during the Pliocene or early Pleistocene. The largest of the laterite bodies overlies the central ultramafic body and occupies an area that is ~9 km long and 0.1 to 3.2 km wide (Figure 29). MRL undertook aerial photograph interpretations and field inspections, and on the basis of these, defined areas of potential laterite formation. An estimate by MRL of the area of the lateritic soils developed on the central ultramafic complex is 8,900,000 m^2. A second area of laterite development on ultramafic rocks on the Agata property has an estimated area of 808,000 m^2 (Abrasaldo 1999). An area of laterite was inspected by the author during the 2nd field visit to the Agata property. The observed laterite occurs northwest of the American Tunnels prospect and west of the North Target (see Figure 30). The soil profile is intensely ferruginous in this region, and relic cobbles of intensely fractured and serpentinised ultramafic rock lie scattered throughout the region of observed laterite development. At higher elevations, along the topographic divide, ferruginous pisolites and blocks of lateritic crust were observed developed on an ultramafic protolith. A sample of this surface lateritic crust collected by MRL immediately following the field trip (sample AGA 170205-2) yielded 43.34 % Fe, 0.77 % Ni and 0.6 % Cr.

Test pits that were excavated by La Playa Mining Corporation encountered laterite thicknesses of 2.48 to 9.40 metres. MRL re-sampled five (5) of the La Playa test pits by channel sampling (ATP-1 to ATP-5; Figure 30). The test pits are located in an area that is ~1 km in north-south extent and ~1 km in east-west extent, west of the Tubay River and north of Agata creek. The composited assay values for each of the re-sampled test pits are tabulated below. The highest individual assay of 1.04 % Ni was within test pit ATP-5.

Test Pit	Depth	Ni (%)	Co (%)
ATP-1	3.85 m	0.55	0.03
ATP-2	6.30 m	0.62	0.11
ATP-3	3.25 m	0.94	0.05
ATP-4	2.00 m	0.43	0.06
ATP-5	9.40 m	0.83	0.08

An adit in the American Tunnels area. The adit runs into the contact zone between coarse grained and equigranular monzonites and ultramafic basement rocks. Trace to several percent sulfide occurs disseminated in the muck-out material (monzonite) from this adit.



A small-scale miner advancing his exploratory dig in the American Tunnels area at Agata. The tunnel occurs within monzonites that are in contact with ultramafic country rocks.

Carbonate rocks from drill-hole DH 99-09 in the Assimcor prospect. The lower sample is highly carbonaceous and pyritic (~3-4 % sulfide). The upper sample is a calcareous sandy limestone unit with traces pyrite and which is poorly carbonaceous. The lower sample carries Au grade whereas the upper sample is barren.

An intrusive diorite from 71 metres depth in drill hole DH 99-11. Pale, irregular vitreous quartz veins (~ 1cm wide) crosscut the rock and are offset by late fractures. The veins are pale pink colored, typical of porphyry quartz veins that are developed in propylitic alteration zones where there is minimal argillic-phyllic overprint.

A quartz-biotite diorite from drill hole DH 99-11 which was drilled through a dominantly intrusive sequence under the flood plain east of the Assimcor prospect. A pseudo porphyritc texture is evident. The white colored zones are zones of silica replacement along fractures. The silica replacement zones are overprinted by sparse networks of fine silica veinlets.

Enlargement of Plate 16a above.

Petrographic descriptions of the peridotites reveal that they are serpentinised wehrlites that comprise olivine, clinopyroxene (augite) and chrome spinel (~1%). Olivine and clinopyroxene grains are commonly fractured and the wehrlites are typically traversed by fine meshworks of serpentine and chrome-spinel micro-veinlets.

9.5 Exploration

9.5.1 MRL Exploration (1997-2000)

Initial work instigated by MRL on the Agata property between 1997 and 2000 comprised a geological evaluation conducted by Marshall Geoscience Services Pty Ltd. The work was conducted as part of a due-diligence assessment of the property prior to entering into a Joint Venture with Minimax. This work suggested that hydrothermal gold mineralization at Agata is related to andesitic or dioritic intrusives, that vein mineralization is representative of the upper levels of a porphyry system and that there is prospectivity for skarn mineralization within limestones on the property (Marshall 1997; Climie *et al*. 2000).

The 1st phase of exploration activity commenced in May 1997, and comprised of grid establishment (52.175 km) on east-west-oriented lines across the Assmicor region. The gridding was conducted for a subsequent soil geochemical survey (1617 soil samples + 36 duplicate samples; analysed for Au, Ag, Cu, Pb, Zn, As), concomitant geological mapping at 1:1,000 scale plus selective rockchip sampling in creeks. Stream sediment samples were not collected due to widespread small-scale mining in numerous areas within the property. Petrographic descriptions of 33 rock samples were conducted by an independent petrographer, Ms. Elveta C. Comsti, of Applied Science of Terradata Inc. Furthermore, DOZ technologies of Quebec, Canada, interpreted a RadarSat image of the Agata area and generated a 1:50,000 scale interpretation of the region. In addition to the above activities that were undertaken to assess the potential of the property for Au and Cu mineralization, MRL re-sampled five (5) test pits that were excavated by La Playa Mining Corporation and submitted 24 samples for Ni, Co and Au analysis by atomic absorption spectroscopy.

Exploration activity undertaken on the Agata property by MRL during a 2nd phase of exploration activity between June 1999 and December 1999 is tabulated below from Climie *et al*. (2000).

Activity	Service Provider	Details
Grid re-establishment	MRL	16.2 line km (refurbished) 2.05 line km (established)
Geological Mapping	MRL	13.675 line km (Assmicor Prospect) 3.875 line km (American Tunnels)
Ground Magnetic Survey	MRL	7.7 line km
Soil Geochemistry	MRL / McPhar Geoservices Ltd MRL / McPhar Geoservices Ltd	43 soil samples (South Limestone target) 7 soil samples (East and West Limestone)
Rock Geochemistry	MRL / McPhar Geoservices Ltd MRL / McPhar Geoservices Ltd MRL / Intertek Testing Services	4 rockchips 250 split diamond core samples 13 drillcore check assays
Petrology	E. Comsti	3 samples
Diamond Drilling	East-West Drilling	11 Diamond drillholes (797.85 m)

The soil sampling survey over the Agata property was conducted on several grid spacings: a 400m x 100m grid; a 100m x 50m grid; a 50m x 25m grid; and a 25m x 25m grid. The survey generated widespread Cu and Au soil anomalies. A Cu anomaly that is associated with outcropping intrusives at the Lao prospect extends sporadically NNW-ward towards the American Tunnels prospect and covers a north-south extent of ~1 km (Figure 33). The Cu anomalies are defined by values of ~200 to 800 ppm. Background Cu values are in the range of 20 ppm to 100 ppm. The Cu anomalies are open to the east beneath the young sediments that are deposited on the Tubay River flood plain (Figure 33). An extensive north-south- to NNW-trending soil Cu anomaly (>140 ppm) extends from the southern margin of the southern IP anomaly (South Target; cf. Figures 30, 32 and 37), encapsulates areas of mapped phyllic alteration (Figures 30 and 32), and extends southward over a distance >1.5 km and with a width of ~250 metres (Figure 32).

The distribution of Au anomalism in soils broadly mimics the distribution of Cu anomalism in soils, although Au is more widespread and extends further to the west (Figure 34). An additional strong Au soil anomaly is defined in the area immediately south and southwest of the Lao shaft, in the Limestone Prospect, and trends WNW-ward into the headwaters of Agata Creek (Figure 34). This soil Au anomaly is the East Limestone Gold anomaly and the West Limestone Gold Anomaly (Figure 34). In the area southwest of Lao, the East Limestone Gold Anomaly comprises Au values that range from 100 ppb to 2300 ppb. It covers an irregular, east-west-trending zone that is ~450 long (east-west dimension) and ~350 wide (north-south dimension) and lies over calcsilicate-altered limestones. The soil Au anomaly is open to the east beneath recent cover of the Tubay River flood plain. An irregular clustering of Au soil anomalies also occurs further to the SSW of the east Limestone Gold Anomaly (Figure 34), and extends to the edge of the soil survey area immediately southeast of the headwaters of Kinatonawan Creek. The arsenic (As) anomalies in soil samples are more contiguous than the Cu and Au anomalies. The anomalous values >75 ppm, that occur against a background of 1-20 ppm As, form a semi-coherent anomaly that lies south of the American Tunnels prospect, *surrounds* the Assmicor propect, and which lies over the Limestone prospect. The As

anomalies are pronounced in the areas of limestone outcrop but are weak over areas of outcropping intrusives at American Tunnels and Assmicor (Figure 35). The As anomalism in soils extends further southward, and covers a north-south distance of ~1.5 km. The soil Cu, Au and As anomalies are illustrated in Figures 32, 33, 34 and 35.

The results of geological mapping on the Agata property by MRL (Figures 29, 30 and 31) are discussed in Sections 9.3 and 9.4. Rockchip sampling was conducted during the geological mapping, and concentrated mainly in the Limestone, Assmicor and American Tunnels prospects. Channel sampling was conducted over the multi-phase intrusives of the Assmicor prospect and across selected limestone outcrops in the Limestone prospect area. Underground channel sampling was conducted in the Assmicor workings (Section 9.4.1), and in Loloy's adit at the American Tunnels prospect (Section 9.4.3). Nineteen (19) surface channel samples were collected in the Limestone Prospect area by MRL. Sixteen of these channel samples yielded grades ranging from 0.02 g/t Au to 0.85 g/t Au. Three of the channel samples graded 2.79 g/t Au over 3.7 metres, 3.77 g/t Au over 2 metres and 1.48 g/t Au over 3 metres. The channel samples indicate a zone of anomalous gold above 0.1 g/t in rock samples that extends over an area of 100m by 50m in oxidised limestone at the Limestone Prospect.

Petrographic analyses by Comsti (1997) and Comsti (1998) reveal that the intrusive rocks at Agata consist of alkalic, silica-undersaturated plutonic rocks. These comprise of syenites and monzonites that display varying degreees of sericitic and propylitic alteration. Potassic feldspar is a primary mineral phase in many of these rocks. Although the author has not sighted any petrochemical data from these rocks, the presence of primary K-feldspar may indicate that the intrusives are potassic-alkalic rather than sodic-alkalic.

An in-house ground magnetic survey was conducted by MRL in 1999. The magnetic data comprised a series of semi-continuous magnetic highs, with values >40250nT, that broadly coincide with the distribution of ultramafic rocks along the western margin of the Lao and Assmicor areas. The magnetic signature decreases gradually westward where the ultramafic rocks are thought to be buried at deeper levels beneath unconformably overlying limestones. The initial magnetic survey was limited in extent, so it is difficult to ascertain from this survey as to whether the ultramafic rocks are inherently magnetic, or if they are magnetic only in close proximity to the intrusions at the Lao (Limestone) and Assmicor prospects.

MRL drilled eleven (11) diamond drillholes into the Assmicor and Limestone prospects in 1999. The results of this drilling campaign and intersections of mineralization are presented in Section 9.6.

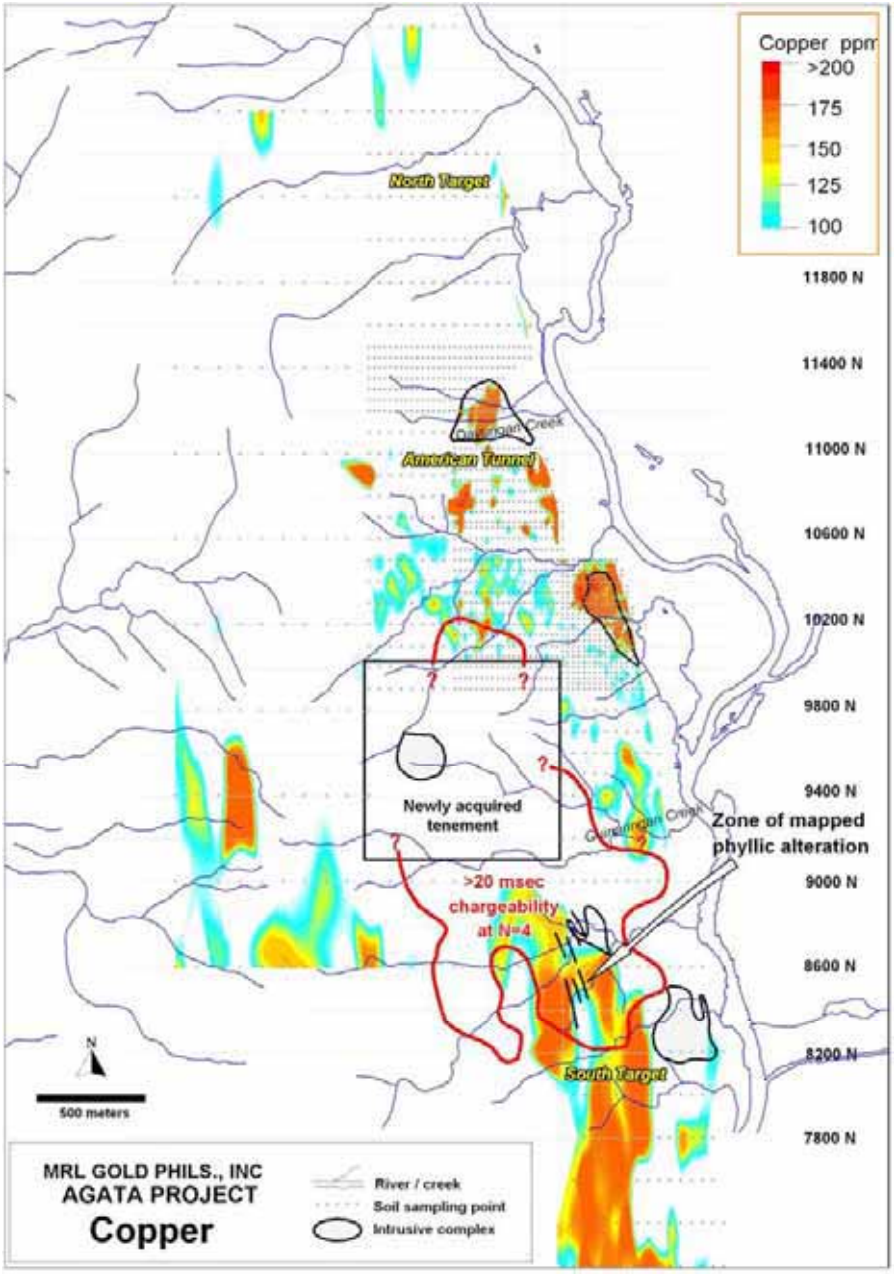


Figure 32 – Regional Cu anomalies in soil samples from Agata. A >20 msec chargeability high is shown by the red outline (unmodelled raw data). Intrusive complexes (black outlines) are associated with Cu anomalies at American Tunnels and Assmicor-Lao. Extensive soil Cu anomalies that overlap the southern margin of the South Target IP Anomaly (red outline) broadly correlate with zones of phyllic alteration as identified in reconnaissance mapping (black trend lines). The southern Cu anomaly and zones of phyllic alteration at surface trend NNW-ward toward the major zone of high chargeability (at N=4) that inturn encapsulates a surface outcrop of intrusive rocks in the headwaters of Agata and Guinaringan Creeks.

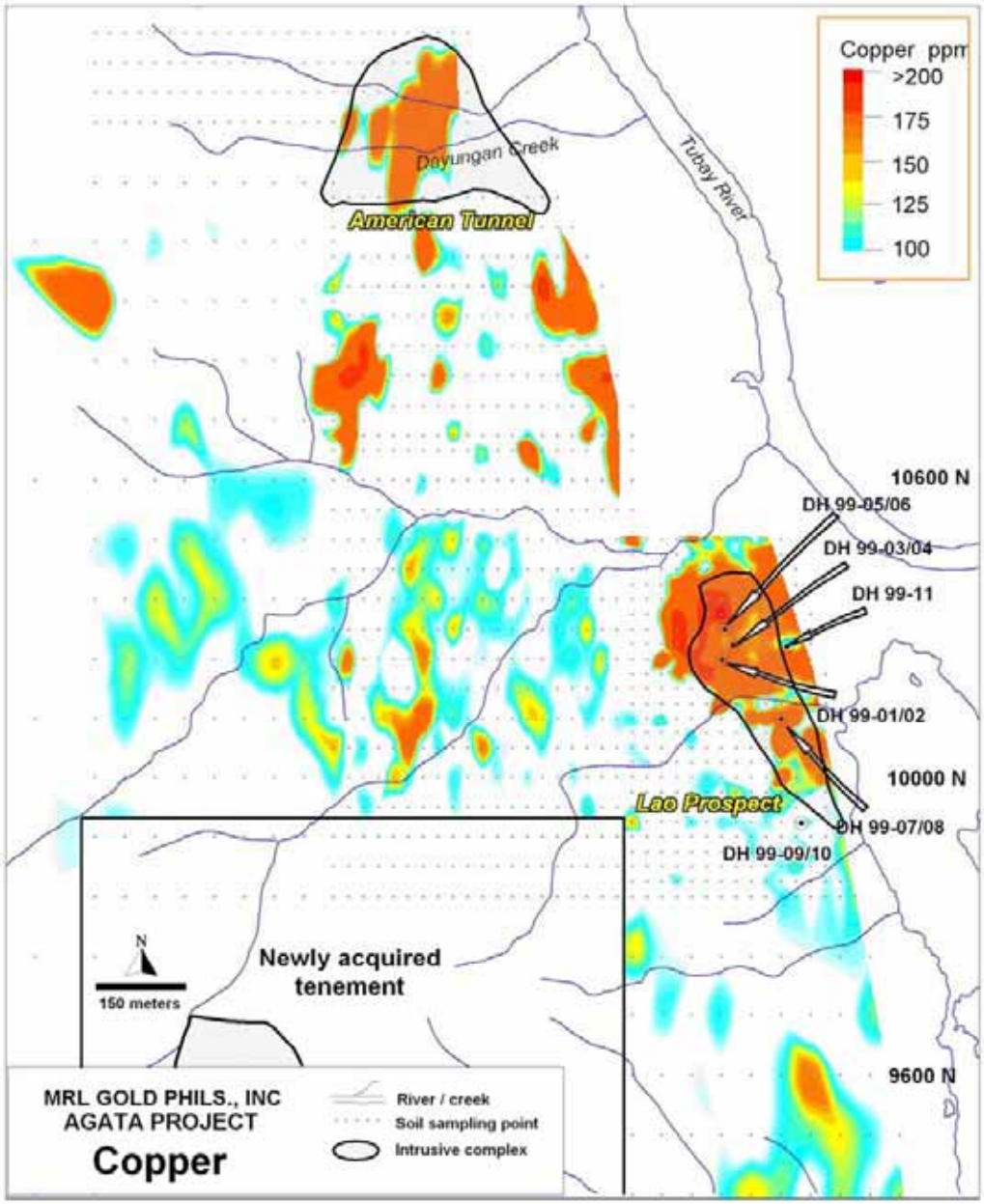


Figure 33 – Soil copper anomalies in the American Tunnels, Assmicor, Lao and Limestone prospect areas. Copper anomalies are closely associated with mapped intrusive complexes at the American Tunnels and Assmicor-Lao prospect areas. Copper anomalies are weak over the Limestone prospect area where surface lithologies are dominated by carbonate. The location of diamond drillholes DH 99-01 to 11 are shown by the black rings. The soil copper anomaly at Assmicor-Lao and the two copper anomalies between Assmicor and American Tunnels are open to the east beneath alluvial cover of the Tubay River.

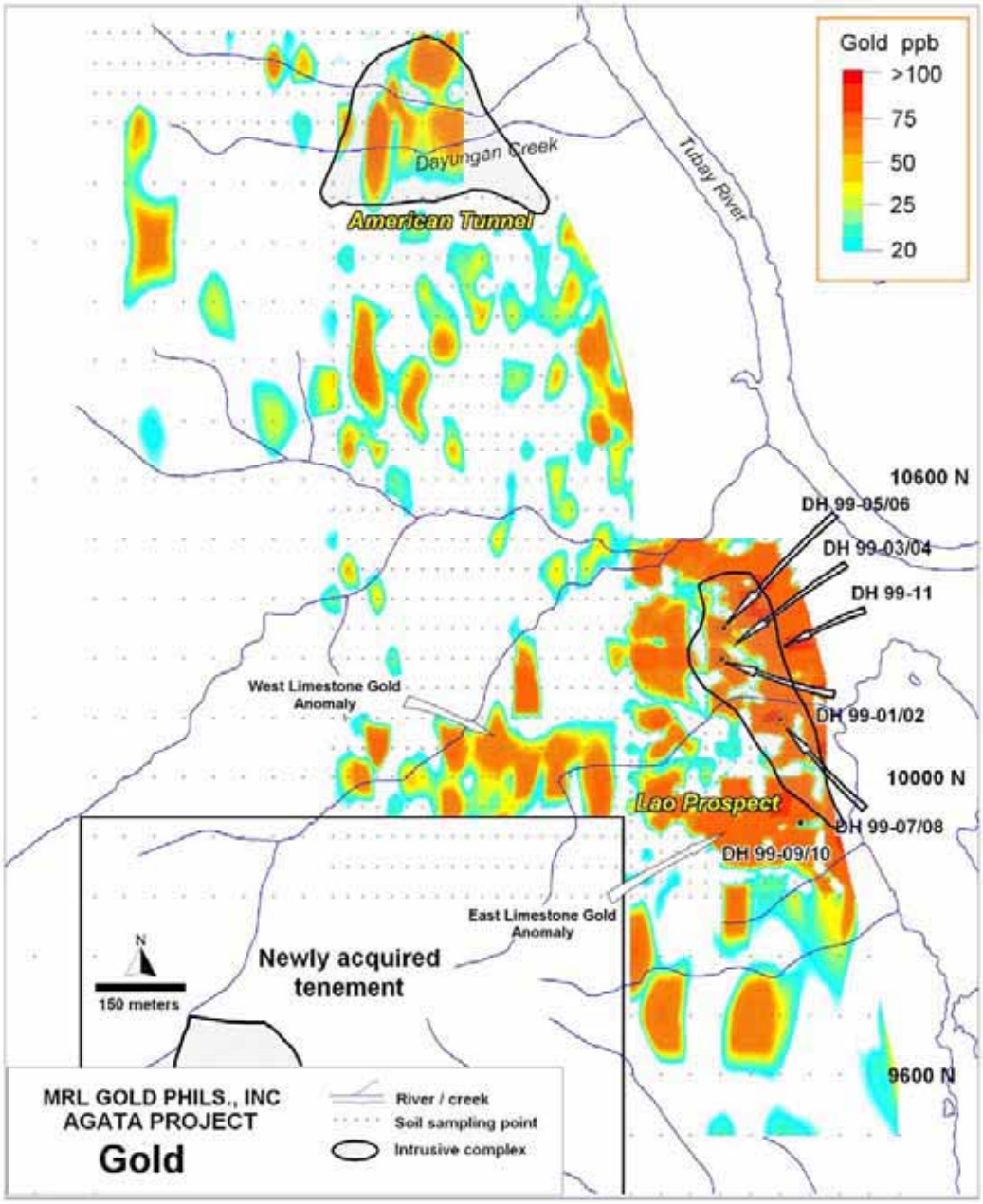


Figure 34 – Soil gold anomalies in the American Tunnels, Assmicor, Lao and Limestone prospect areas. Gold anomalies are closely associated with mapped intrusive complexes at the American Tunnels and Assmicor-Lao prospect areas. Gold anomalism tends to be more widespread than copper anomalism in soils. Gold anomalies extend substantially further westward into areas of outcropping limestone. The gold anomaly at Assmicor-Lao remains open to the north and east beneath alluvial deposits of the Tubay River.

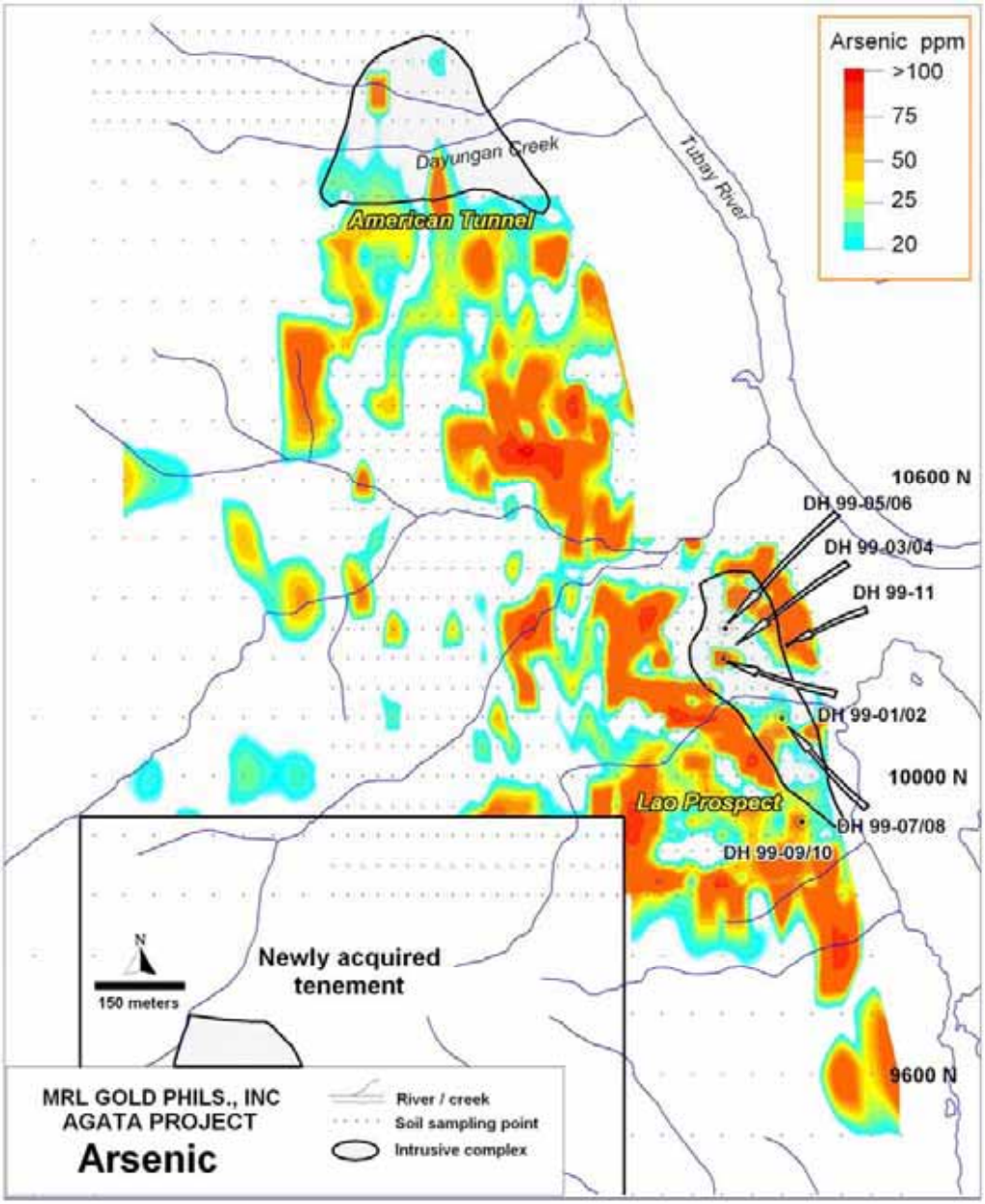


Figure 35 – Soil arsenic anomalies in the American Tunnels, Assmicor, Lao and Limestone prospect areas. Arsenic anomalies appear to be displaced from the areas of mapped intrusive complexes at the American Tunnels and Assmicor-Lao prospect areas. Arsenic anomalism extends much more widely than Cu anomalism and is widespread in the carbonate sequences southwest of the Lao prospect area.

9.5.2 MRL Exploration (2004-2005)

MRL undertook a third phase of exploration activity in 2004 on the Agata property. This activity involved gridding, mapping and extensive grid-based pole-dipole induced polarization (IP) geophysical surveying along 30 east-west-oriented survey lines that extend from 7,800 mN to 13,400 mN. The IP data were acquired by Elliot Geophysics International using a Zonge GGT-10 transmitter, a Zonge GDP-32 receiver and a 7.5 KVA generator. A total of 77.10 km of grid were surveyed by pole-dipole IP. The dipole spacing used in the survey was 150 metres. The IP pseudo-sections for the thirty 400-metre-spaced, 200-metre-spaced and 100-metre-spaced IP lines that run across the Agata property are presented in Appendix 1. The results of the IP program are discussed below. The data were modelled by Dr Peter Elliot of Elliot Geophysics International using inversion modeling.

Numerous zones of IP chargeability were identified on the Agata property, and these are presented and discussed in plan view. Figure 36a illustrates the spatial distribution of IP chargeability anomalies (unmodelled data) at N=2 (~225 m depth) whereas Figure 36b shows an inversion model of the data from a broadly similar level. The IP chargeability anomalies that are >20 msecs in the raw data and in the inversion model form a scattered distribution of ovoid to amoeboid anomalies (Figures 36a and 36b). Their distribution pattern is reminiscent of the outcrop pattern of intrusive rocks that is often seen in districts that are eroded to the upper carapace level of underlying intrusive batholiths (e.g. northeast portion of the Surigao district, Figure 5). A NNW-control may be evident in the distribution of these shallow IP anomalies at N=2 (Figure 36a and 36b, black dashed lines). Other vague NNW-trends may include the surface alignment of mapped intrusive rocks (Figure 36a, blue lines), and the distribution of zones of phyllic alteration that have been identified in reconnaissance mapping by MRL geologists in the southern target area (Figure 30). A NNW-alignment of components of some IP chargeability anomalies is also evident on the deeper chargeability plans (Figures 37a and 37b).

At deeper levels (Figure 37a, N=4, ~375 metres depth, unmodelled raw IP data; Figure 37b, Level 7, inversion modelled data) the IP anomalies tend to group or amalgamate into two (2) large anomalies at > 20 msecs, a northern anomaly and a southern anomaly. Smaller IP chargeability anomalies are present between these two larger anomalies as well as west and southwest of the northern anomaly. The northern and southern IP anomalies (labelled as “targets” in Figure 37a) are both elongate in the NNW-dimension, consistant with the NNW structural controls that are inferred to be important in the distribution of the IP chargeability zones.

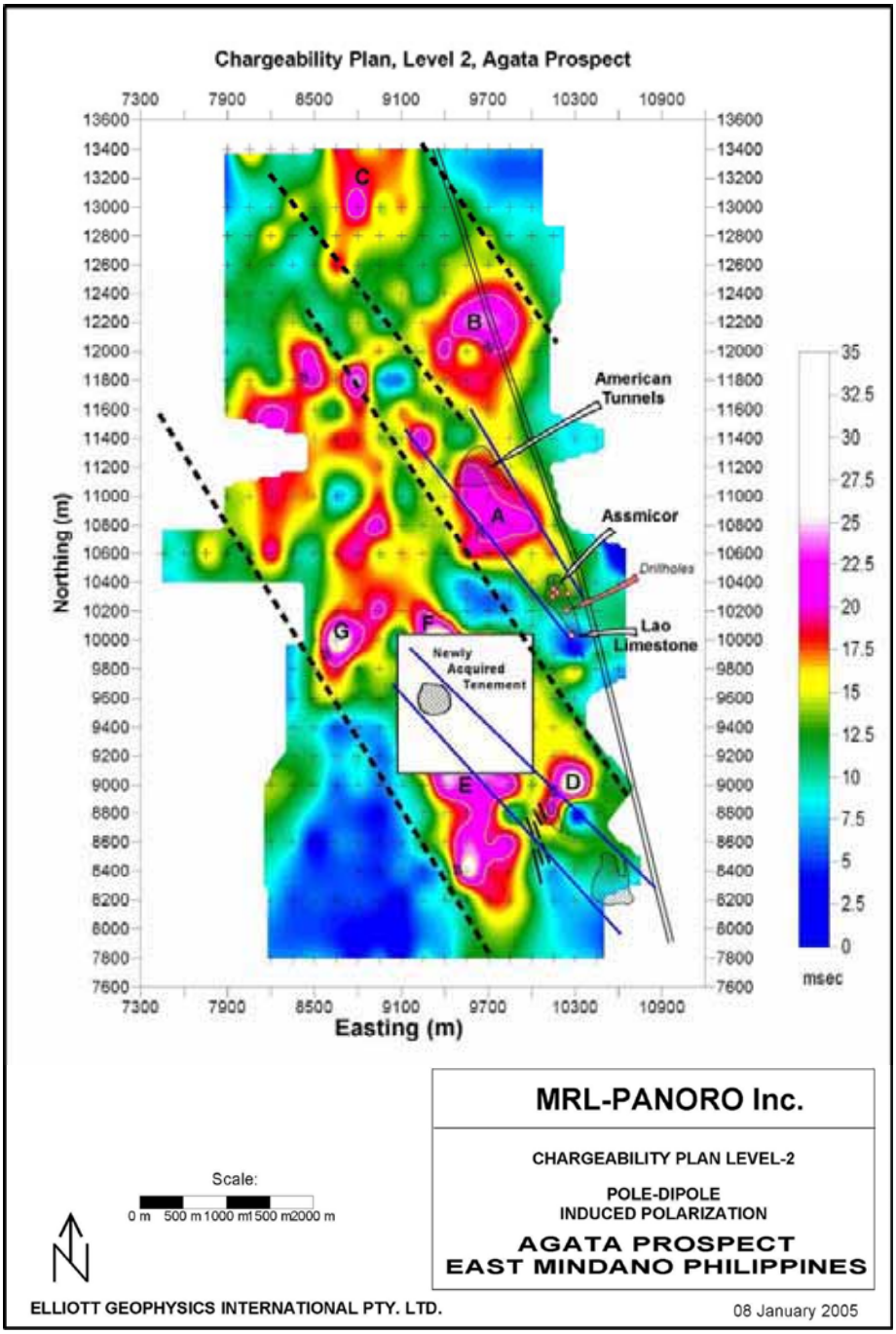


Figure 36a – Distribution of IP chargeability responses on the Agata property (unmodelled raw data). The data are plotted for level N=2, and so represent a plan of IP chargeability at ~225 metres depth below the surface. Intrusive complexes at surface are shown by the hachured outlines. The double line represents the trace of the Philippine fault splay. Other labels and annotations by the author are discussed in the text.

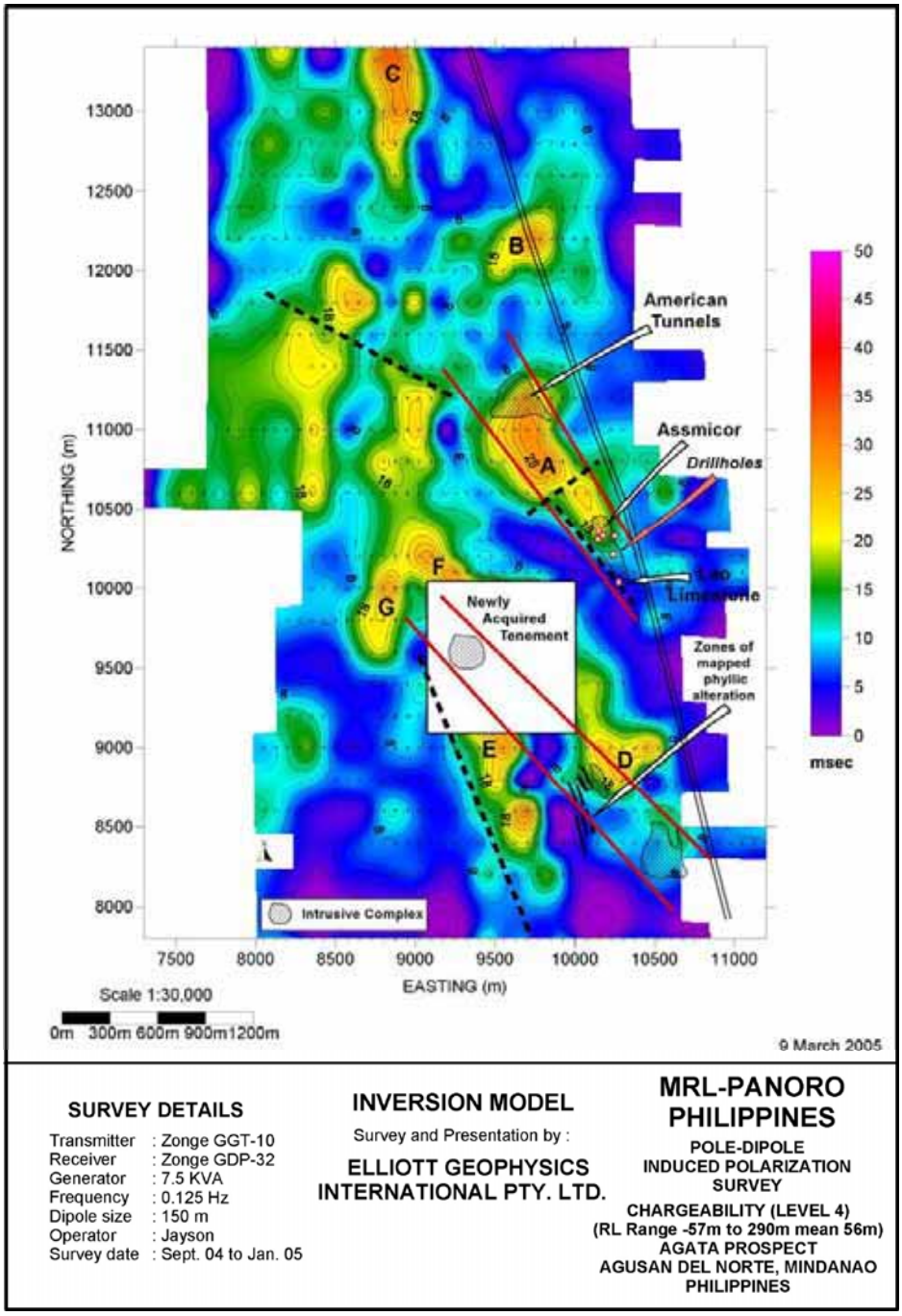


Figure 36b – Distribution of IP chargeability responses on the Agata property (inversion model data). The data are plotted for Level 4 of the inversion model which approximates N=2 in Figure 36a above. Intrusive complexes at surface are shown by the hachured outlines. The double line represents the trace of the Philippine fault splay. Other labels and annotations by the author are discussed in the text.

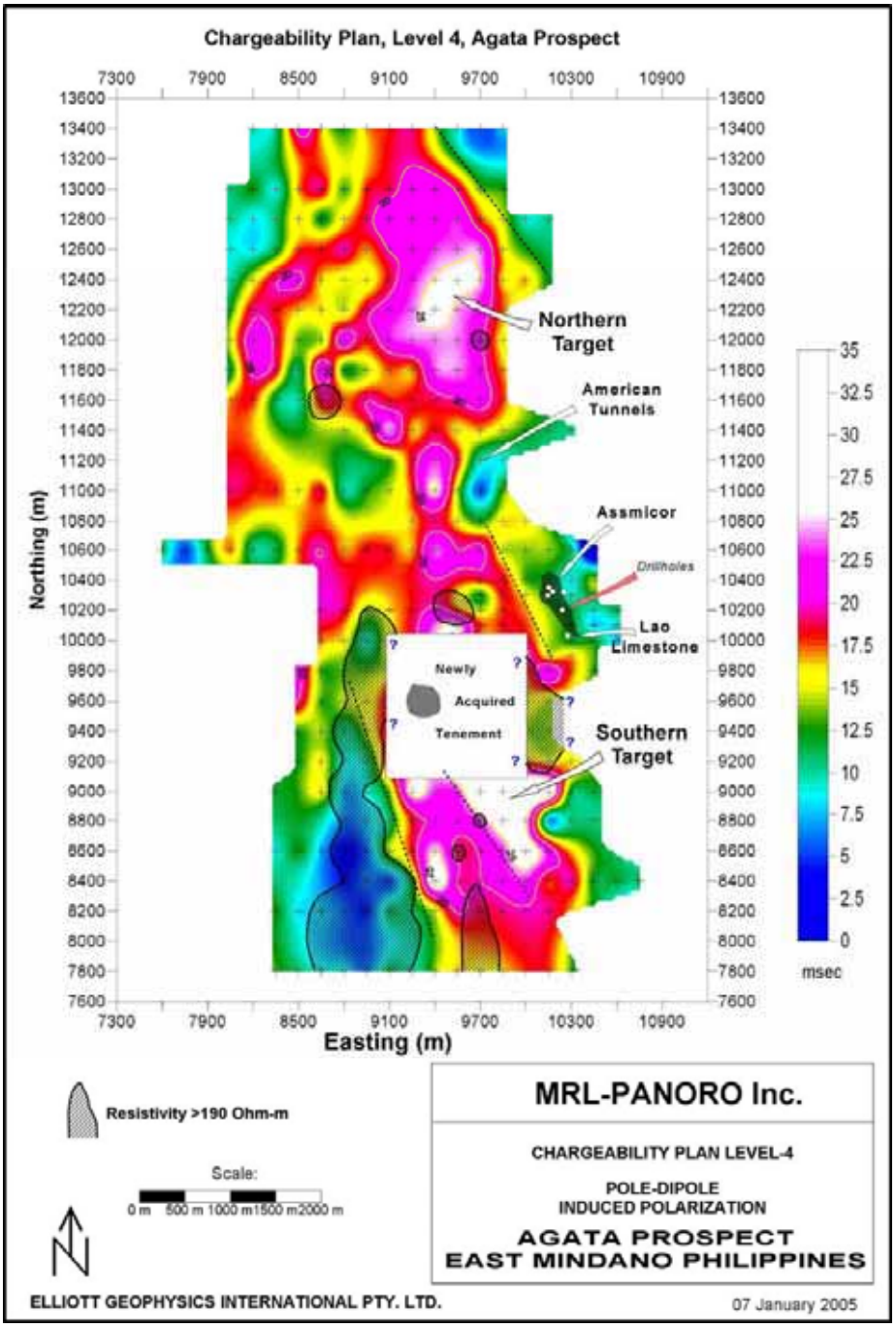
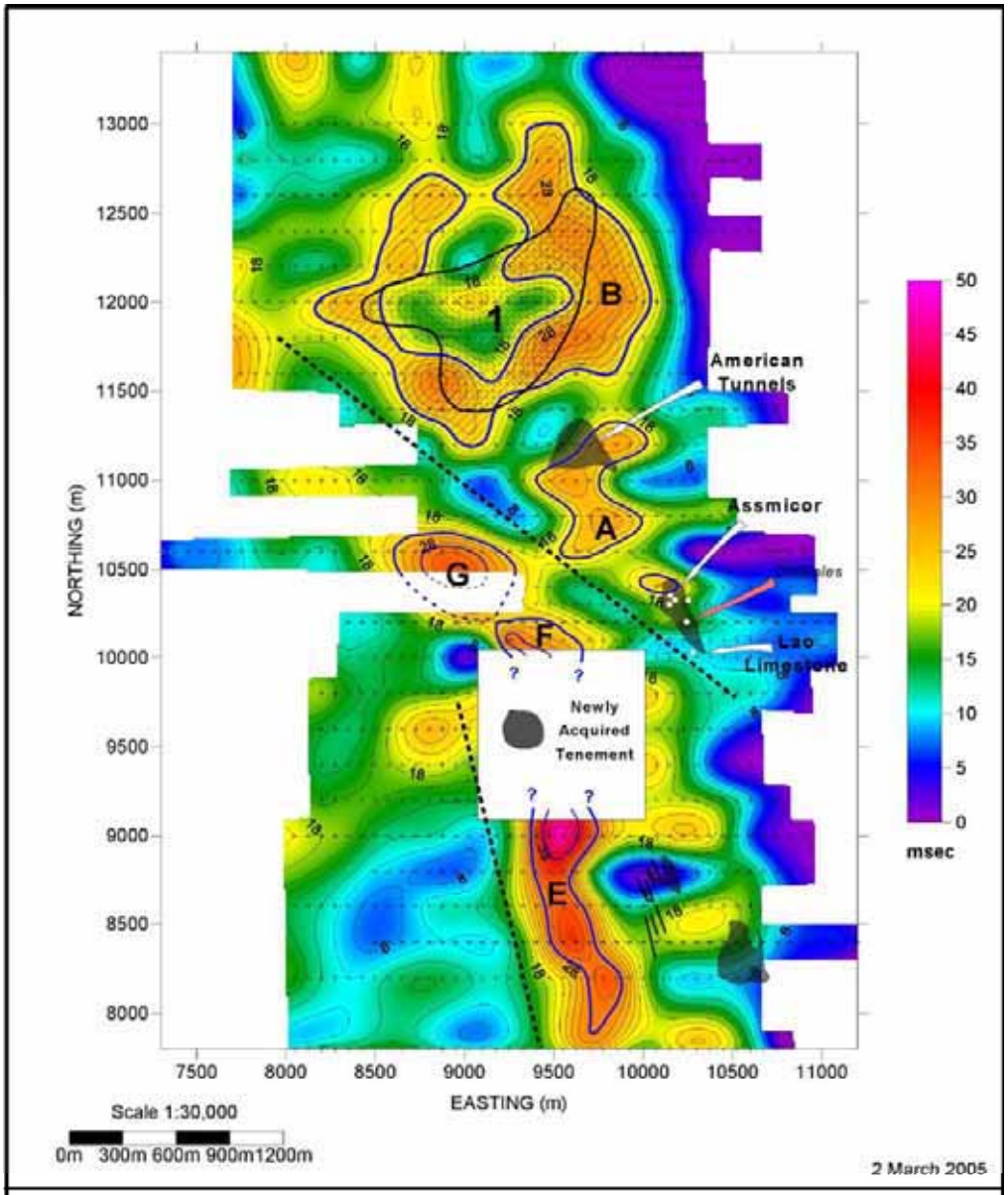


Figure 37a – Distribution of IP chargeability responses on the Agata property (unmodelled raw data). The data are plotted for level N=4, and so represent a plan of the chargeability at ~375 metres depth below the surface. The author has superimposed the outline of unmodelled resistivity anomalies at N=4 as shown by the hachured areas, and linear edges to IP chargeability features are shown by the dashed lines.



SURVEY DETAILS

Transmitter : Zonge GGT-10
Receiver : Zonge GDP-32
Generator : 7.5 KVA
Frequency : 0.125 Hz
Dipole size : 150 m
Operator : Jayson
Survey date : Sept. 04 to Jan. 05

INVERSION MODEL

Survey and Presentation by :

ELLIOTT GEOPHYSICS INTERNATIONAL PTY. LTD.

MRL-PANORO PHILIPPINES

POLE-DIPOLE INDUCED POLARIZATION SURVEY

CHARGEABILITY (LEVEL 7)
AGATA PROSPECT
AGUSAN DEL NORTE, MINDANAO
PHILIPPINES

Figure 37b (previous page) – Distribution of IP chargeability responses on the Agata property (inversion model data). The data are plotted for Level 7 of the inversion model, and which approximates N=4 in Figure 37a above. The author has superimposed the outlines of intrusives mapped at surface (grey hachured areas), lineaments interpreted by the author from the modelled IP chargeability data, outlines of IP chargeability anomalies A and B (>22 msecs), E (> 30 msecs and > 40 msecs) and G and F (> 24 and > 30 msecs), and the outline of a zone of intense fracturing and minor fine chalcedonic silica veining within the ultramafic cover rocks (mapped by MRL). A prominent NW-trending break is evident in the inversion model data which separates chargeability anomalies A and B from anomalies E, F and G. This linear feature is also evident on Figure 39 as a NW-trending margin to the zone of higher resistivity to the south of the linear feature. An intrusion that is mapped at surface between chargeability anomalies E and F lies at the northern end of a linear NNW-trending chargeability high which corresponds to the South Target depicted in Figure 37a. The >40 msec model chargeability high in the core of anomaly E should be drill tested. The hachured black outline to the north (labeled 1, superimposed from MRL mapping shown in Figure 30) is the outline of a zone of intense fracturing, meshwork veinlets of sepentinite and chrome spinel, and local restricted patches of fine silica veinlets that, in places, were observed by the author to give the rock a "bladed-calcite appearance" due to leaching of the intervening ultramafic components. An independent petrographer Ms. Elveta C. Comsti of Applied Science of Terradata Inc. describes the silica in this rock as comprising chalcedonic and fibrous quartz with banded silica cement. This zone of surface disturbance of the ultramafic cover rocks, as mapped by MRL geologists, lies directly over a highly circular zone of high chargeability (>22 msecs) at deep levels (anomaly B above), and may present a porphyry target at deep levels around the eastern annulus of the chargeability anomaly where the model chargeability values are highest (>28 msecs).

The smaller chargeability anomalies at shallower levels (e.g. Figure 36a - raw data; Figure 36b - inversion model data) amalgamate and broaden into larger anomalies at deeper levels (e.g. Figure 37a, raw data; Figure 37b, inversion model data).

Figure 38 shows an inversion model cross-section through 10400 mN. The section transects the northern portion of the Assmicor Prospect (Figure 31). Diamond drillholes DH 99-01, -02, -03, -04, -05, -06 and -11 at the Assmicor Prospect are plotted to scale on the inversion model. Drillholes DH 99-01 to -06 collectively contained carbonate-sericite-pyrite, chlorite-carbonate-pyrite, limonite-pyrite and chlorite-epidote-limonite-pyrite-magnetite stockwork veins or fractures (Climie *et al*. 1999). Significant assay intersections from these drill-holes are tabulated in Section 9.6. Drillhole DH 99-11 intersected quartz-biotite-diorite that contained chlorite and sericite alteration and probable porphyry-type quartz veins. Copper values from this hole assayed up to 0.3% (3030 ppm). The modelled chargeability values of the rocks intersected by the drill-holes in the Assmicor prospect area (Figure 38) are significantly less than the IP chargeability values that are identified both at depth below Assmicor (Figure 38) and also in numerous regional anomalies (Figures 36 and 37).

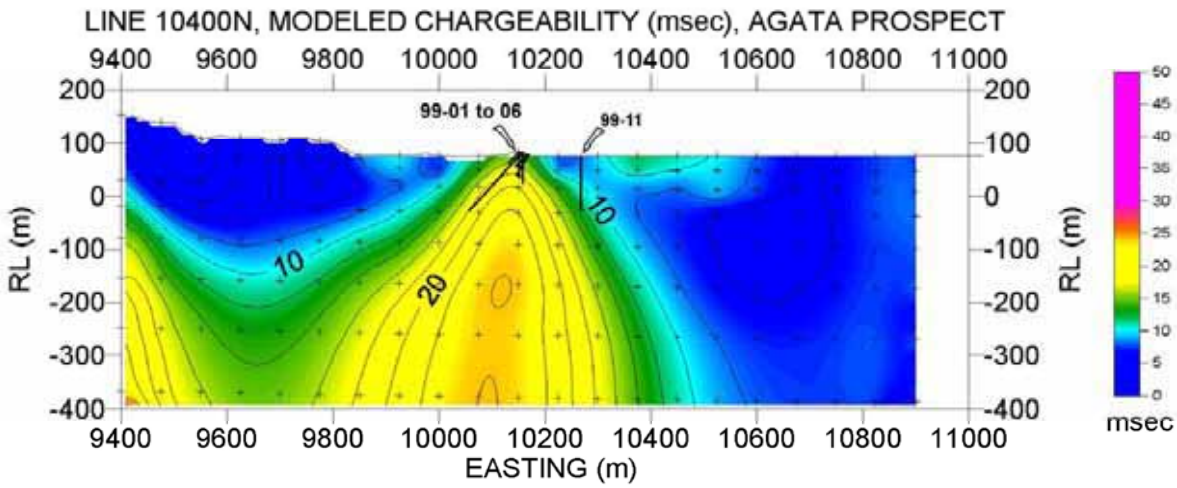


Figure 38 – Inversion model conducted by Dr P.Elliot of Elliot Geophysics International for pole-dipole IP data on section 10,400 mN at Agata. This cross-section transects the northern portion of the Assmicor Prospect (Figure 31). Diamond drillholes DH 99-01, -02, -03, -04, -05, -06 and -11 at the Assmicor Prospect are plotted to scale on the inversion model. Drillholes DH 99-01 through to DH 99-06 contained various combinations of carbonate-sericite-pyrite, chlorite-carbonate-pyrite, limonite-pyrite and chlorite-epidote-limonite-pyrite-magnetite stockwork veins or fractures. Drillhole DH 99-11 intersected quartz-biotite-diorite with chlorite and sericite alteration (Plates 15b, 16a and 16b) with probable porphyry-type quartz veins and Cu assays up to 0.3 % (3030 ppm). The inversion model suggests that a broad and vertically-oriented zone of chargeability underlies the Assmicor Prospect.

Areas of high resistivity are mostly restricted to the southern half of the IP survey area (Figure 39). These zones of high resistivity are >200 ohm-m in value compared to background resistivity values that are typically <50 ohm-m. The zones of high resistivity appear to form an enveloping shell or rind around the southern IP chargeability anomaly (Figure 37b, anomaly E). The two eastern-most zones of high resistivity at N=4 (Figure 30; outline adopted from unmodelled raw data) are spatially coincident with the contact, albeit at surface, between limestones and ultramafics (Figure 30). Climie *et al*. (1999) identify a non-calcareous chlorite schist that separates these two rock units, and it is possible that the resistive feature is related to this unit. However, it should not be discounted that the resistive zones are due to silicification of limestones along a permeable contact. The inversion model data fail to reproduce this correlation between the eastern resistivity anomalies and the ultramafic-limestone contact. However, there is a strong correlation between the zones of phyllic alteration that were mapped at surface by MRL geologists (and observed by the author) and the resistivity anomaly around 9,900-10,300 mE and 8,300-9,000 mN (Figure 39). More detailed mapping is required in this region, and in particular, in and around the zones of phyllic alteration in the Southern Target area.

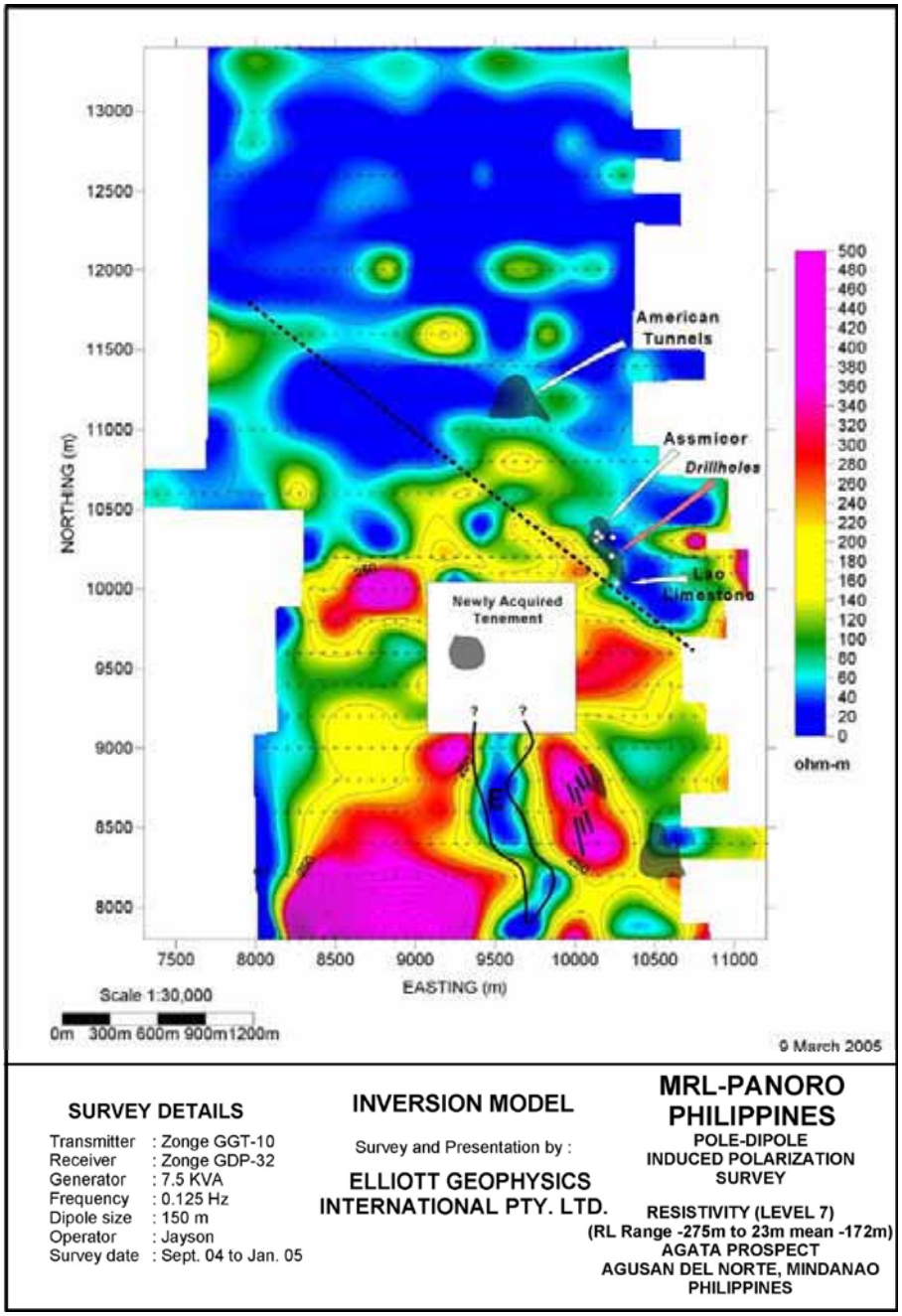


Figure 39 – Distribution of IP resistivity responses on the Agata property (inversion model IP data). The data are plotted for level N=7. The chargeability anomaly (> 30 msecs) at the Southern Target (E) [see Figure 37b] is shown by the black outline and is surrounded by zones of high resistivity. Areas of mapped phyllic alteration shown by the black lines coincide with a resistivity high around 10,000 to 10,200 mE and 8,300 to 8,900 mN, consistent with the presence of silica in zones of phyllic (quartz-sericite ± pyrite) alteration.

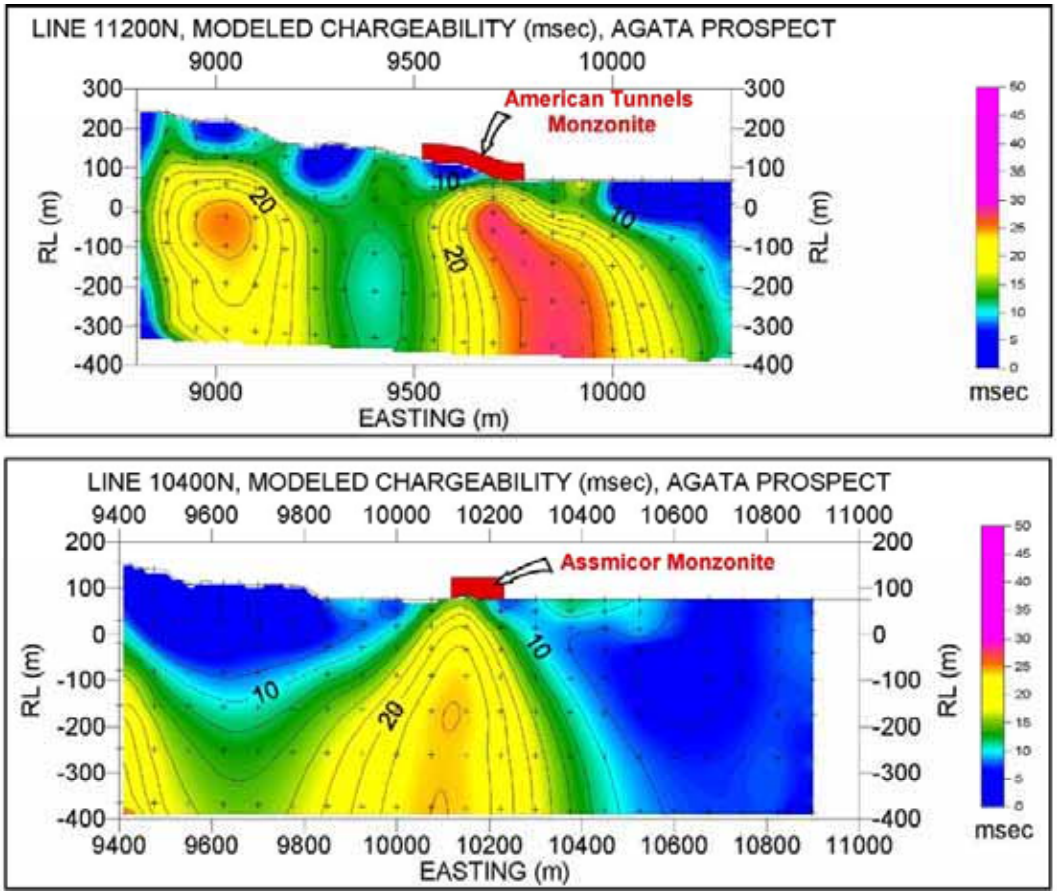


Figure 40 – Inversion models of IP chargeability on sections 11200mN and 10400mN. The inversion modelling was conducted by Dr P.Elliot of Elliot Geophysics International. The author has superimposed the outcrop distribution of intrusives at the American Tunnels and Assmicor areas onto the relevant sections. The strong spatial correlation between intrusives at surface and underlying zones of high IP chargeability provides good support for the inference that many of the observed IP anomalies are caused by sulfide and not by serpentinite in the ultramafic country rocks.

9.6 Drilling

MRL drilled 11 diamond drillholes in the Assmicor and Limestone-Lao prospect areas in 1999. The location of these drillholes is shown in Figures 30 and Figures 33-38. The holes were drilled to test various targets in and around the Assmicor and Limestone-Lao prospect areas. The reasons for siting the 11 drillholes, as recorded by Climie *et al*. (1999), are tabulated below. The 11 initial drillholes were drilled in 1999, prior to expansion of the exploration focus to regional targets using pole-dipole IP surveying documented above.

DH 99-01 & -02 Collared 25m southwest of the Assmicor shaft.
Assess the downdip potential of mineralization that was mined at Assmicor.

DH 99-03 & -04 Collared 25m north of DH 99-01 and -02.
Access the downdip potential of mineralization that was mined at Assmicor.

DH 99-05 & -06 Collared 25 m north of DH 99-03 and -04.
Test for fault-hosted mineralization further west of Assmicor in an area of anomalous soil Au geochemistry.

DH 99-07 & -08 Collared southeast of the Assmicor shaft.
Test the mineralization potential of a westerly-trending lobe of the Assmicor intrusive where it intersects a NW-trending fault that separates ultramafic rocks in the west from intrusive rocks to the east.

DH 99-09 & -10 Collared in limestones that lie south of the Lao shaft.
Test the downdip potential of a WNW-trending fault that was coincident with numerous small-scale surface workings in the East Limestone soil gold anomaly (Figure 34).

DH 99-11 Collared east of the Assmicor intrusive.
Test the region east of the Assmicor intrusive in an area of surface artisanal workings.

Drillhole	Northing	Easting	Azimuth/Dip	Depth (m)	Target Area
99-01	300N	150E	270º / - 45º	30.7	Assmicor Shaft area
99-02	300N	151E	270º / - 90º	51.4	Assmicor Shaft area
99-03	321N	166.5E	270º / - 48º	34.55	Assmicor Shaft area
99-04	321N	166.5E	270º / - 60º	47.6	Assmicor Shaft area
99-05	352N	157E	270º / - 47.5º	150.9	Assmicor Shaft area
99-06	352N	158.5E	270º / - 90º	59.8	Assmicor Shaft area
99-07	200N	243.5E	270º / - 45º	42.8	NW-trending fault
99-08	200N	245E	270º / - 90º	36.9	NW-trending fault
99-09	025N	287E	270º / - 45º	122.4	East Limestone Au Anomaly
99-10	025N	288.5E	270º / - 90º	116.7	East Limestone Au Anomaly
99-11	325N	267E	270º / - 90º	104.1	East Assmicor
11 holes				**797.85 m**	

The drillhole gold intersections and rock types encountered in these 11 drillholes are tabulated below.

Drillhole	From	To	Lithology	Alteration	Au Intersection
99-01	0	7.8	Saprolite	Ab-lm-ser	7.8m @ 0.63 g/t
99-02	0	7.2	Saprolite	Ab-lm-chl-ser	7.2m @ 0.43 g/t
99-03	33	33.3	Monzodiorite dyke	Ab-chl-carb-ep-py	0.3m @ 1.90 g/t
99-03	9	18	Intrusive with limonitic stk-wks	Ab-ser-chl-lm	9.0m @ 0.51 g/t
99-04	11.20	12	Biotite-quartz diorite dyke	Ab-chl-py	0.8m @ 12.4 g/t
99-04	12	18.85	Intrusive with limonitic stk-wks	Ab-ser-chl-lm	6.85m @ 0.27 g/t
99-04	43.80	45.30	Quartz monzonite dyke	Q-chl-carb-py	1.5m @ 5.58 g/t
99-05	2.40	21.20	Intrusive with limonitic stk-wks	Ab-ser-chl-lm	18.8m @ 1.13 g/t
99-06	0	24.20	Intrusive with limonitic stk-wks	Ab-ser-lm	24.2m @1.38 g/t
99-07	0	5.60	Saprolite	Ab-lm-ser	5.6m @ 0.72 g/t
99-09	6	13	Calc-silicate	Chl-act-trem-py	7.0m @ 2.68 g/t
99-09	53	57	Calc-silicate	Chl-act-trem-py	4.0m @ 0.51 g/t
99-10	3	11	Calc-silicate saprolite	Chl-act-trem-py	8.0m @ 2.2 g/t
99-10	39.2	47.5	Calc-silicate	Chl-act-trem-py	8.3m @ 1.3 g/t
99-11	38.10	41.95	Intrusive (5% dissem. Py)	Ab-chl-ep-py	3.85m @ 0.56 g/t
99-11	100.6	103.6	Intrusive (5% dissem. Py)	Q-mag-chl-ep-py	3.0m @ 0.51 g/t

* Adapted from Climie *et al*. (1999).

The longest intersections encountered in the drilling to date are those associated with limonitic stockworks that occur within biotite monzodiorite intrusives. These include 18.8m @ 1.13 g/t Au and 24.2m @ 1.38 g/t Au in holes DH 99-05 and DH 99-06 respectively (Figure 43). Gold intersections also occur in biotite-quartz diorite dykes and in porphyritic plagioclase diorite dykes. (Figure 46). Geological cross-sections that show the downhole geology are presented as Figures 41, 42, 43, 44, 45 and 46. The intrusives comprise larger biotite monzodiorite bodies that are cross-cut by younger diorite dykes, plagioclase diorite dykes, biotite diorites and quartz diorites. These dykes and intrusive bodies dip predominantly toward the east (Figures 41 to 45), suggesting that a deeper magmatic source lies to the east, possibly along the trace of the Lake Mainit splay of the Philippine Fault, beneath the alluvial flood plain of the Tubay River.

Drillhole DH 99-11, collared east of the Assmicor mine area on the flood plain of the Tubay River, intersected porphyry-style quartz-magnetite veins in biotite diorite, quartz diorite and in hornblende-quartz diorite (Figure 46). The author inspected this drillhole in the MRL onsite core storage area and considers the style of veining and alteration to be consistent with porphyry-style mineralization, despite the generally low grades encountered.

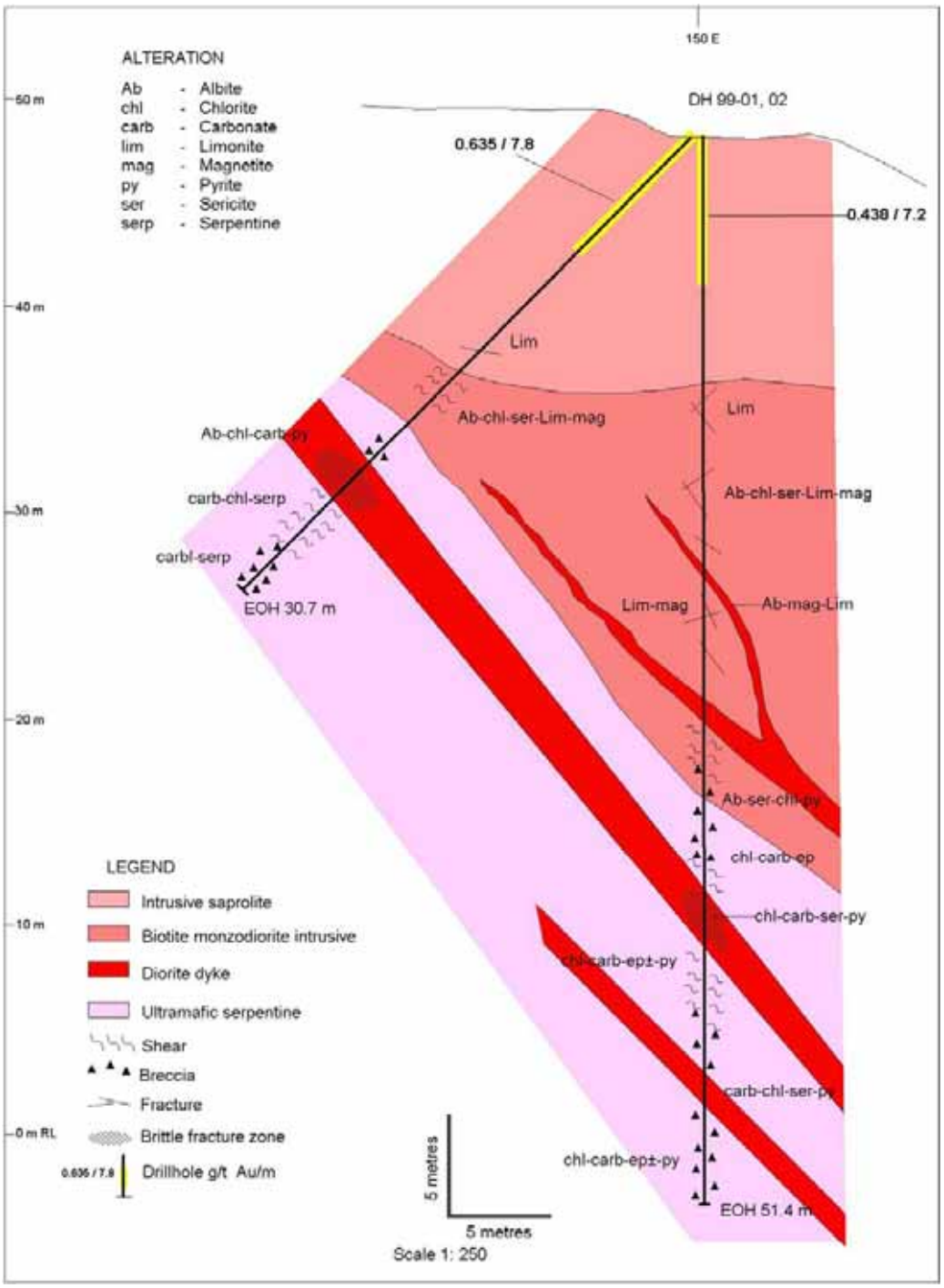


Figure 41 – Drill cross-section through drillholes DH 99-01 and DH 99-02 (Assmicor prospect).

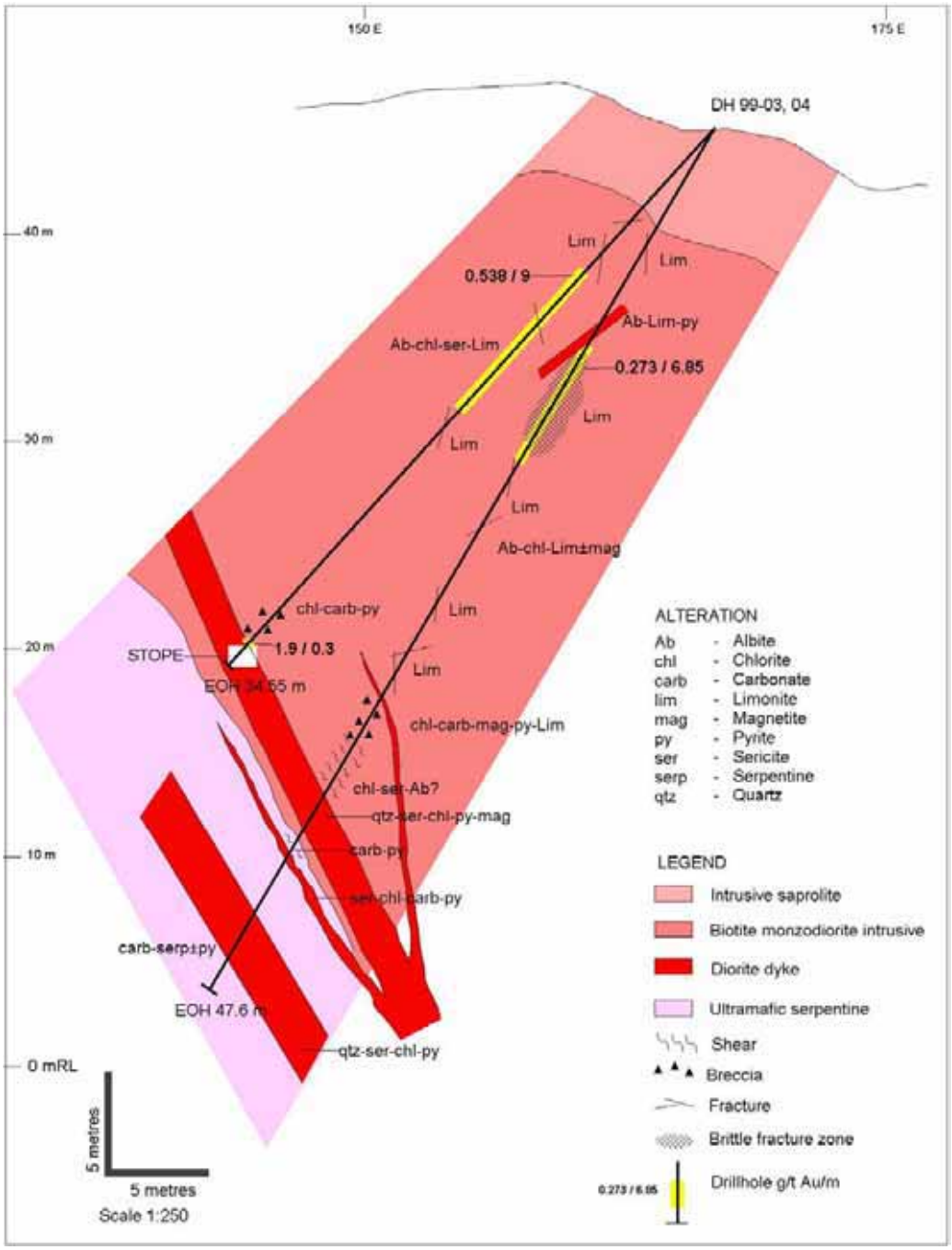


Figure 42 – Drill cross-section through drillholes DH 99-03 and DH 99-04 (Assmicor prospect).

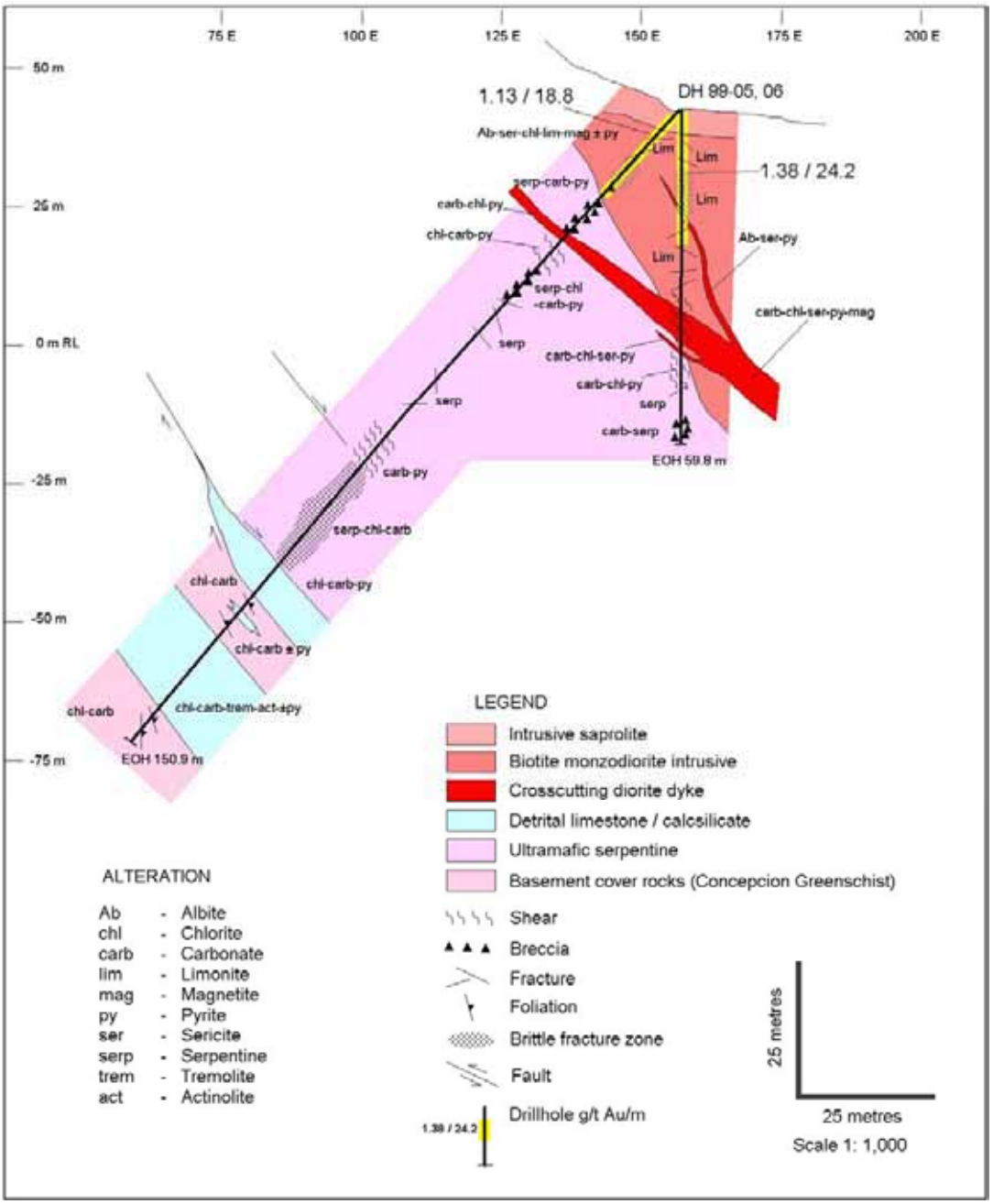


Figure 43 – Drill cross-section through drillholes DH 99-05 and DH 99-06 (Assmicor prospect).

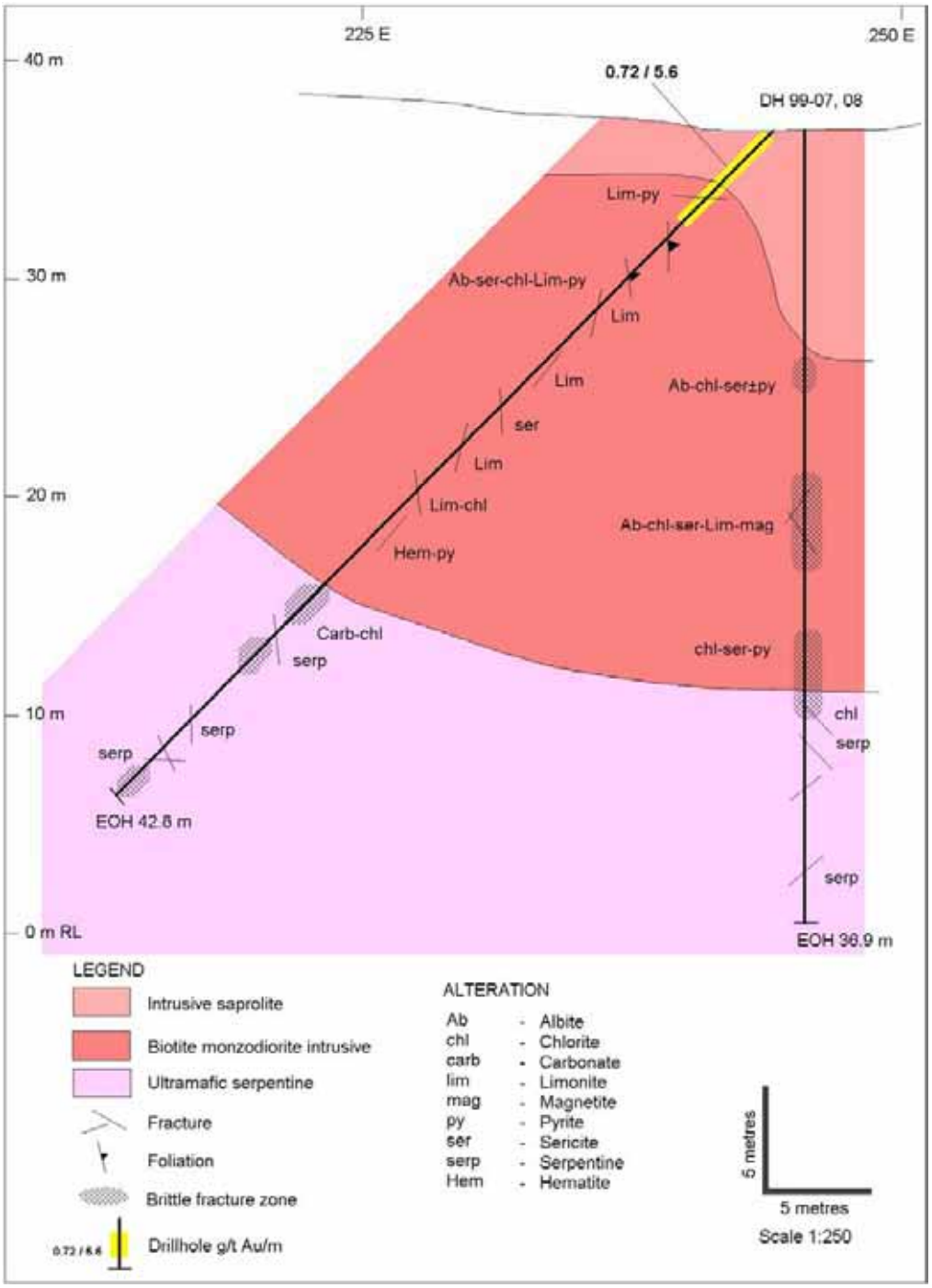


Figure 44 – Drill cross-section through drillholes DH 99-07 and DH 99-08 (Assmicor prospect).

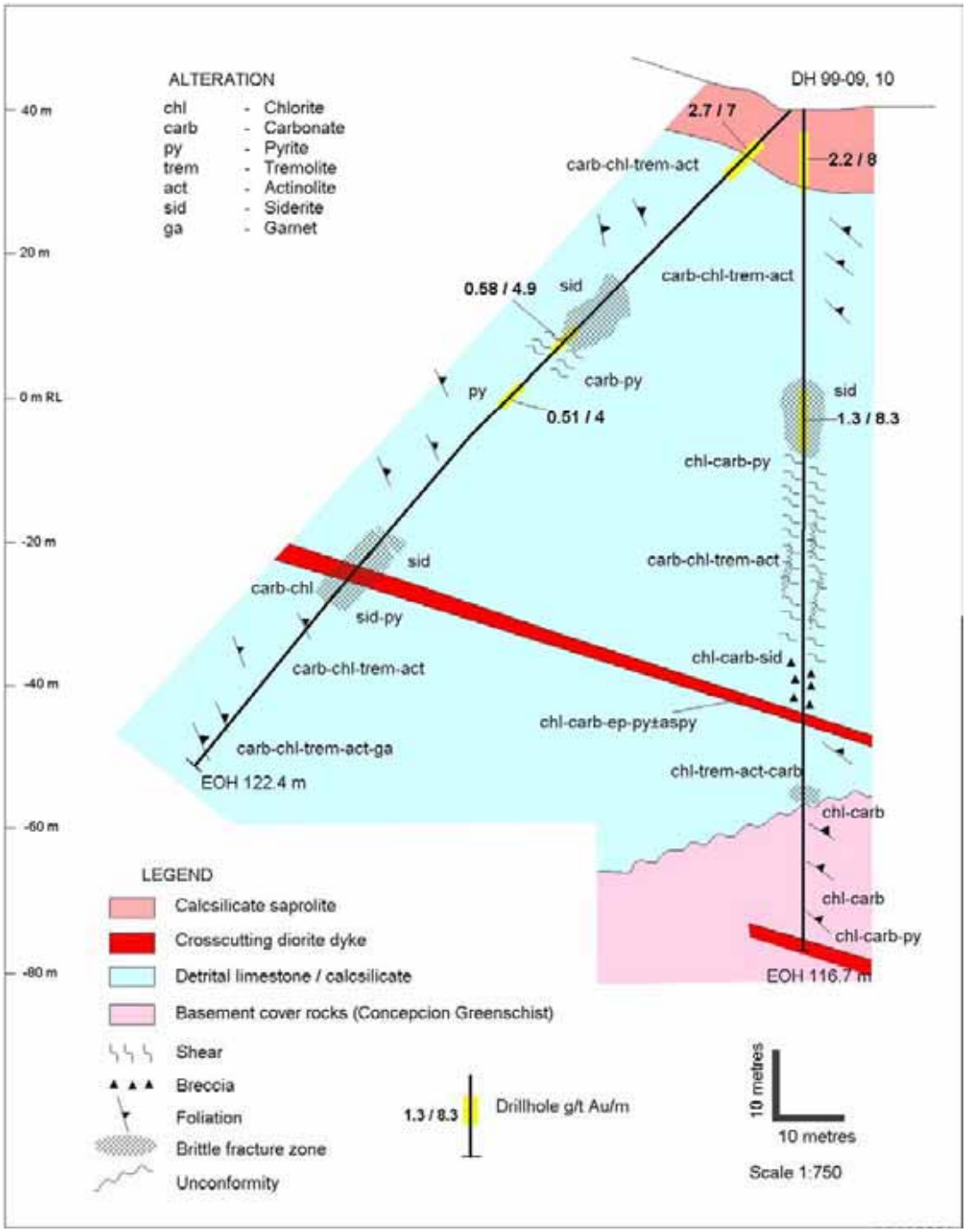


Figure 45 – Drill cross-section through drillholes DH 99-09 and DH 99-10 (South Limestone prospect).

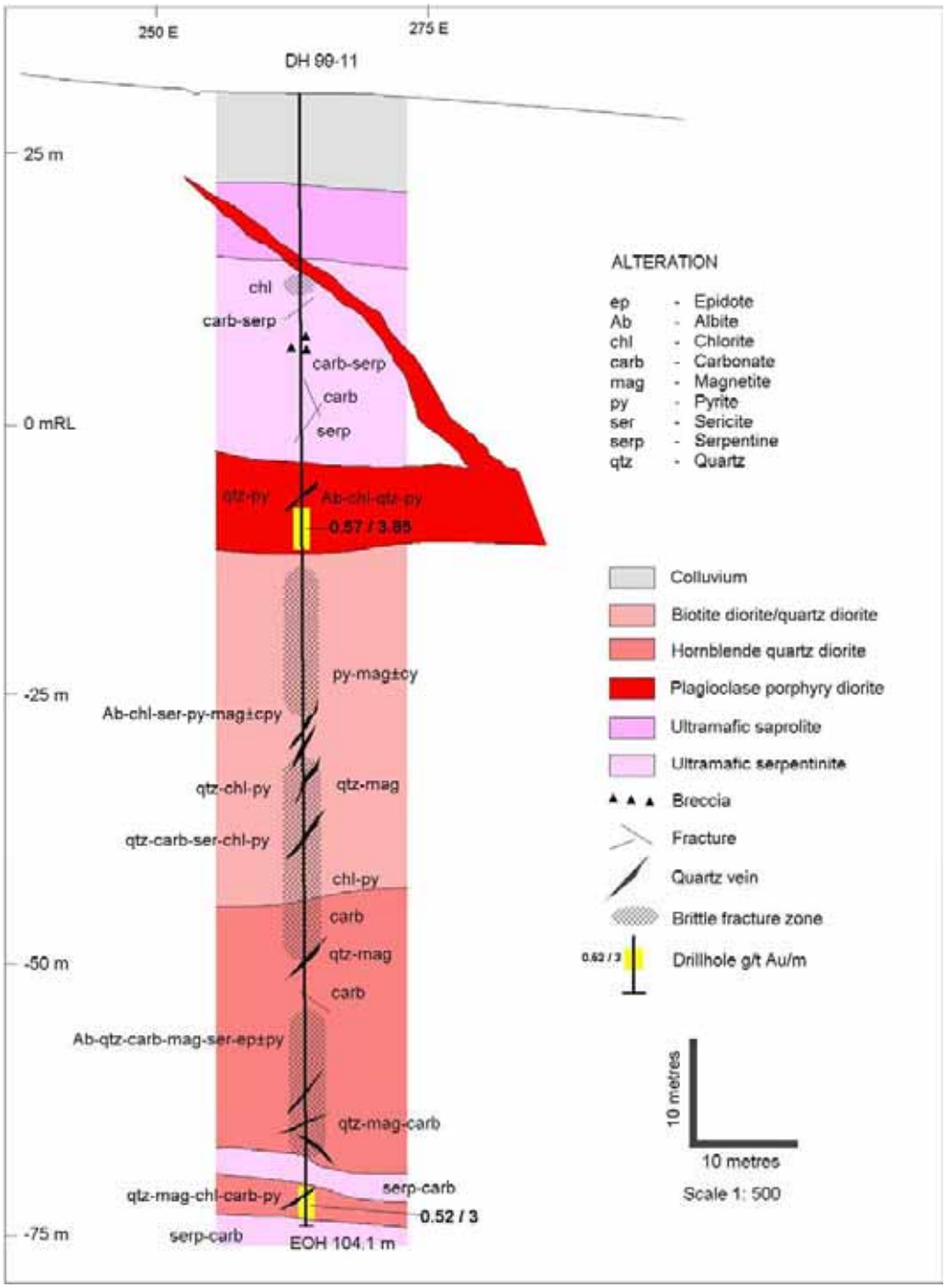


Figure 46 – Drill cross-section through drillhole DH 99-11 (East Assmicor).

10. SAMPLING METHOD AND APPROACH

The principal sampling methods conducted on the properties were: stream sediment samples, soil samples; rock chip samples; channel samples; petrographic samples and diamond drillcore samples.

10.1 Stream Sediment Samples

Stream sediment samples were collected on the Tapian-San Francisco and Tapian Main properties, but not on the Agata property due to the presence of artisanal miners. Stream sediment samples were collected from 10-metre-long sections of drainage channels. Material was collected from the active stream and creek beds, and material from the sides of the drainages was systematically avoided. Samples were collected every 200-400 metres along the drainage channels depending on the availability of sediment. The samples were either wet or dry sieved on site, depending on the availability of water. Sieved samples were stored in wet-strength Kraft envelopes that were pre-numbered using sequential numbers provided by McPhar Geoservices (Phils) Inc. on a series of sample submission stubs. McPhar Geoservices Inc. conducted the analyses on the samples. Relevant data pertaining to each sample was recorded on a data recording form, and the field site was marked with flagging ribbons labeled with MRL's sample numbering system. On the Tapian Main property, approximately 500 grams of -30 mesh sample were collected per sampling point. McPhar Geoservices analysed the -80 mesh fraction. A total of 194 stream sediment samples (including 10 duplicates) were collected from the Tapian Main property over a much more extensive area. A total of 18 stream sediment samples were collected from the Tapian-San Francisco property over an area of ~2 km^2. The author is not aware of any sampling bias following discussions with the MRL Surigao Project Manager.

10.2 Soil Samples

Soil samples were collected from all three properties. Soil sampling was conducted away from areas of anthropogenic ground disturbance and away from stream banks. The soil samples were collected from the B-horizon of the soil profile. The B-horizon was found usually at depths of 30-40 cm. 300-500 gram aliquots of the undersize material that passed through -16 mesh was sealed in Kraft paper bags. The Kraft bags were also pre-numbered with the analytical laboratories numbering system. A geochemical field data form was filled out at each soil sampling site, and recorded its grid location, soil color, sampling depth, horizon type, vegetation at the site, lithology if present, rock alteration and mineralisation if present. A duplicate sample was collected at every 20th sample site. On the Tapian Main property, a duplicate sample was collected on each soil sampling line. A total of 1617 soil samples were collected from the Agata project from a north-south-oriented area of ~7-8 km^2, 426 soil samples were collected form the Tapian Main project (291 samples analysed), and 1183 soil samples were collected from the Tapian-San Francisco

property over an area of ~2.5 km^2. A wide variety of soil sample spacings were employed in the project areas, depending on whether pre-existing soil anomalies had been defined or areas of known prospectivity had been defined by the presence of artisanal miners. The spacing of soil sample grids included 400x100m, 200x50m, 100x50m, 50x25m and 25x25m.

10.3 Rock Chip Samples

Rock samples were collected either from outcrop, or from locally-derived float in areas of poor outcrop. The rock samples were collected during the course of geological mapping, and a subset of the rock samples were submitted for mineragraphic description. Rock sampling sites were marked in the field by labeled flagging tape.

10.4 Channel Samples

Channel samples were collected from all three properties. Channels were sampled in lengths ranging from one to ten metres, depending on the available exposure. Channel samples that were collected from adits were generally horizontal, although they were oriented perpendicular to the alignment of stringer veins.

10.5 Diamond Drill-core Samples

Eleven diamond drillholes were conducted by East-West Drilling Limited of Manila on the Agata property in 1999. The holes were drilled using a Longyear model 34, man-portable diamond drilling rig. The drill rig was powered by a 60 hp Deitz-Allison diesel power plant and provided a maximum hoist of 10,230 daN and a maximum pullback of 11,160 daN. The drill rig is capable of drilling HQ diameter core holes to vertical depths of ~250 metres and NQ diameter core holes to vertical depths >350m. The upper portion of the holes were drilled using a Tricone bit (13.3 cm) and were cased with PVC in the pre-collar to prevent collapsing of the saprolite overburden. Core was recovered in maximum intervals of 1.5 metres in a split tube assembly. Core recoveries were calculated by MRL for all analytical sample intervals. Core recoveries were highly variable, ranging from total loss over 3 metre intervals in zones of clayey fault gouge to more persistent areas of 95-100% recovery in weakly fractured intrusive and calc-silicate rocks. The overall recovery in drillholes ranged from 55-90% (Climie *et al*. 2000). A Dembicon electric rock saw equipped with a tungsten-carbide cutting wheel was used to sample the drill core. Sampling intervals were selected to match boundaries in rock type, alteration, and sulfide content. The drillholes were logged by MRL geologists and both drillhole summary sheets and detailed graphical and descriptive geological logs were generated for all the drillholes.

10.6 Sampling of Test Pits in Nickeliferous Laterite

Five test pits that were excavated by La Playa Mining on the Agata property in the late 1970's were re-sampled by MRL geologists. The pits were cleaned of debri and the walls were scraped clean prior to sampling. A 20cm wide by 10cm deep vertical channel was sampled at 1 metre intervals, with each sample being mixed, coned and quartered prior to bagging of a representative aliquot for analysis. Sufficient care appears to have been taken to obtain representative samples of the laterite exposed in these test pits.

11. SAMPLE PREPARATION, ANALYSES AND SECURITY

All samples collected on the project areas by MRL geologists were sent to the laboratory of McPhar Geoservices in Manila (BJS compound, 1869 P. Domingo Street, Makati City). The McPhar laboratory is accredited to ISO 9002 standards.

The usual sample preparation procedure for rock samples in the McPhar laboratory were:

- Dry (SP2) > Crush to ¼ (SP7) > Split 1 kilo > Fine pulverize to -200 mesh (SP9) > Sampling for chemical analyses

The usual sample preparation procedures for soil and stream sediment samples in the McPhar laboratory were:

- Dry (SP1/SP2) > Sieve to -80 mesh (SP4) > Sampling for chemical analyses

The usual procedures for rock and soil chemical analyses are:

- Cu, Pb, Zn, Ag by AAS following hot HCL leach and HCL/HNO3 leach in latter stages for 1 hour on 0.25g sample.
- Au by Fire Assay on 30g sample (det. limit – 10 ppb)
- As, Sb by Vapor Generation/AAS from the acid leach
- Mo by Modified Dithiol Method following Potassium Pyrosulfate leach on 0.2g sample
- Hg by Flameless AAS

The usual procedures for stream sediment chemical analyses are:

- Cu, Pb, Zn, Ag by AAS following hot HCL leach and HCL/HNO3 leach in latter stages for 1 hour on 0.25g sample.
- Au by Solvent Extraction/AAS/GTA following Aqua Regia Leach on 20g sample (det. limit – 5 ppb)
- As, Sb by Vapor Generation/AAS from the acid leach
- Mo by Modified Dithiol Method following Potassium Pyrosulfate leach on 0.2g sample
- Hg by Flameless AAS

The gold analyses for soils and rocks included one reagent blank and one standard charge for every 30-sample charge.

Sample rejects were retained by the McPhar laboratory for 6 months.

In relation to sample security, samples were collected in the field by trained laborers. The sample collection occurred under the supervision of the relevant project geologist on site. Samples were packed in sealed boxes and sent to the McPhar laboratory in Manila. The sampling of drill core samples also took place under the supervision of the MRL site geologist. The remaining drill core is stored in core trays which in turn are stored in a locked purpose-built core shed on site on the Agata property. The core was observed by the author to be in good order and secure.

A total of 13 drillcore samples were also sent by MRL to Intertek Testing Services (ITS) for assay. Intertek is an Australian-owned and internationally reputed laboratory located in Jakarta, Indonesia. Intertek-Jakarta is the only ISO 17025-accredited mineral laboratory in Indonesia.

12. DATA VERIFICATION

Verification of analytical data involved systematic acquisition and/or measurement of duplicate samples both in the field and in the laboratory. During the collection of soil samples, a duplicate check sample was collected for every 20th sample, and the duplicate sample was acquired from approximately one metre from the original sample site in order to check the sample site variance and the reliability of results from the McPhar laboratory. Results of these duplicate samples vary within acceptable limits (Abrasaldo 1999; Fetiza 1999).

In the laboratory, the gold analyses for soils and rocks included one reagent blank and one standard charge for every 30-sample charge. Every 10th sample and samples with unusually high gold contents were routinely rechecked by the laboratory. The author has reviewed the analytical

results sheets reported by McPhar and is satisfied that the rechecked samples are highly reproducible.

13. ADJACENT PROPERTIES

Several additional properties in the Surigao and Northern Agusan districts are under application by the MRL/Panoro/Minimax/Apical Joint Venture. The details of these tenements are tabulated below. There is little geological information on these properties as no exploration has been conducted on them.

Property	Application Title	Area
Mat-1	AMA XIII-008	730 ha
Tapian Extension	EPA 00042-XIII	8,095 ha
Agata Extension	APSA 00079-XIII	7,764 ha

The Mat-1 area (Figure 1) lies to the north of the Tapian-San Francisco property, and is the site of small-scale mining activity involving gold extraction from saprolite (Bailey 2003). Copper and gold geochemical anomalies have reportedly been identified within the application area (Bailey 2003). The Mat-1 application lies in a region of several clustered and outcropping intrusive stocks (Figure 5). Hence the Mat-1 application area may lie at a suitable structural level for Cu-Au mineralization, i.e. near the carapace of a potentially more extensive intrusive stock at depth.

The Tapian Extension area lies to the east and west of Lake Mainit (Figure 1) and is under an exploration permit application. It covers an area of 8,095 ha. If the Tapian Extension application is granted together with the Agata Extensions MPSA (Mineral Production Sharing Agreement) application, then MRL-Panoro would hold complete coverage of the land that lies between the Tapian Main property and the Agata property.

The Agata Extension MPSA application covers an area of 7,764 ha. A preliminary target on this application area is the intersection between the Philippine Fault and the southwesterly extension of a NE-trending structure that passes near or through the Maraat gold prospect and the Asiga porphyry Cu-Au prospect (Figure 5).

14. MINERAL PROCESSING AND METALLURGICAL TESTING

The properties discussed in this report are in the exploration stage of assessment. The exploration activity is advanced to varying degrees in different parts of the three properties. In some areas exploration is at the reconnaissance stage, while in other areas, there are clearly defined drill targets

based on the results of recent geophysical electrical surveys. Consequently exploration has not yet reached the stage where mineral processing or metallurgical testing is warranted.

15. MINERAL RESOURCE AND MINERAL RESERVE ESTIMATES

No mineral resource, nor mineral reserve, has been defined on any of the properties discussed in this report.

16. OTHER RELEVANT DATA AND INFORMATION

An overview of the Philippine Mining Act of 1995, and its policies, rules and implementing regulations, has been presented in Appendix A of Bailey (2003). The reader is directed to this source for pertinent information relating to the mining and exploration law in the Republic of the Philippines.

During the duration of two field visits to the Tapian San Francisco, Tapian Main and Agata properties, the author did not experience nor come across any problems between local landholders and the company personnel in the region. The author gained the impression that MRL personnel were well received in the local communities on the three project areas. MRL have contributed to a series of community relations projects in the project areas, and continue to maintain high levels of dialogue and consultation with community officials and local people in the areas of exploration activity.

17. INTERPRETATION AND CONCLUSIONS

The Surigao district is highly endowed in magmatic-related epithermal Au and porphyry-style Cu-Au mineralization, with substantial potential for carbonate-hosted gold mineralization and laterite-hosted nickel mineralization in areas where suitable host rocks occur. High-level intrusive rocks are widespread throughout large areas of the Surigao district. These intrusives are spatially associated with regional crustal fractures and with the distribution of historically and presently economic orebodies. The Surigao district became a centre of renewed exploration activity in the Philippines following the discovery of the gold-rich Boyongan porphyry Cu-Au deposit by Anglo-American in August 2000.

The properties of the MRL–Panoro joint venture lie along the Western Range, an uplifted sliver of crust that is bound by two major strands of the crustal-scale Philippine Fault, and cross-cut by regional arc-normal faults. Historical exploration has identified a number of gold occurrences, with several former small mines having operated in the past. These areas of known mineralization are

characterized by artisanal workings along the Western Range. Despite this historical activity, the region has seen very little modern exploration. MRL is presently the principal stakeholder in the Western Range and became interested in the region after the Philippine government renewed the Philippine Mining Act in 1995 to encourage foreign investment and the utilization of modern technology in the Philippine mineral industry.

MRL made a strategic decision to maintain a continued presence in the country after the mid-late 1990's, during the period when the constitutionality of the Philippine Mining Act of 1995 was challenged in the lower courts. A recent ruling of the supreme court of the Philippines has confirmed the constitutionality of the Philippine Mining Act of 1995, and the validity of the FTAA (Financial or Technical Assistance Agreement) as an instrument to attract foreign investment in the country. This watershed decision in 2004 injected new life into the Philippine mining industry and resulted in the recent renewed influx of foreign investors and capital into the country. As a consequence of the foresight and commitment of MRL in the late 1990's, MRL and its joint venture partner Panoro Minerals Ltd are well placed with substantial ground holdings at Tapian San-Francisco, Tapian Main and Agata, in the highly prospective Surigao mining district of Mindanao.

The populace of the Surigao district is, on the whole, supportive of the mining industry as evidenced by numerous past and presently operating mines in the district.

17.1 Discussion: Tapian-San Francisco

The southern portion of the Tapian San-Francisco property shows a number of features indicative of one or more porphyry Cu-Au targets at depth beneath the small-scale but widespread surface workings and zones of anomalous surface geochemistry. Several of these indicators are discussed below:

1) The district is transected by several major NE-trending lineaments. These lineaments trend northeastward and pass through the Boyongan district which hosts the Boyongan Cu-Au porphyry deposit.

2) The district contains widespread exposures of andesitic volcanics that are intruded by diorite dykes and intrusive bodies typical of porphyry districts.

3) Porphyry Cu-Au systems commonly occur in clusters for reasons expounded in Section 6.2.1. The northern portion of the Tapian San-Francisco property overlaps the southern edge of a large intrusive complex approximately 6 km in diameter that hosts the Masgad porphyry system on its western margin and the Mayad porphyry system on its eastern margin (Figure 5). The batholith-scale intrusive body may extend beneath volcanic cover to the south, with dykes propagating upward beneath the Gold Hill and Cantikoy prospects.

4) Alteration in the district region is widespread, pervasive, and typical of the facies that are commonly developed in porphyry systems. These include widespread propylitic alteration, widespread argillic alteration, minor calc-silicate alteration, structurally-controlled phyllic alteration and reported occurrences of potassic alteration. These alteration assemblages span an area that exceeds 3.5 km by 2 km, typical of large magmatic hydrothermal Cu-Au ore-forming systems.

5) Small-scale workings (shafts, adits, and pits) are widespread on the property and cover a large extent of the mapped alteration. Various styles of mineralization are encountered at or near the surface, and include high-grade Au in a possible massive sulfide replacement body (Mina), vein stockwork Au-Cu mineralization (Gold Hill), Cu and Au in breccia veins (Canaga), Cu-oxides in dense fracture networks within diorite (Canaga), disseminated sulfides in phyllic-altered rocks (Cantikoy), and Au in argillised andesites (Canaga, Quino and Gold Hill).

6) Zones of silicification and As-enrichment are typical of the epithermal environment that is commonly developed at shallow levels above the top of, or marginal to, porphyry systems. There are 2 distinct zones of high-level silicification that are inferred from the IP resistivity data, and these coincide with the Riverside-Quino prospect areas and the Cantikoy-Gold Hill-Mina prospect areas. The zones of high resistivity lie above deeper zones of chargeability, and this vertical transition from chargeable zones at depth to resistive siliceous zones higher in the rock column is common in telescoped porphyry systems. Zones of As-enrichment in soil samples occur at the Mina prospect and at the Gold Hill prospect (Figure 12) and suggest that these two prospects represent the epithermal level of the magmatic hydrothermal system in the region.

7) Cu and Au are enriched in soil samples that occur over an extensive region, and Au is elevated in many rock samples at surface (e.g. >2 g/t Au).

The hydrothermal system exposed at Tapian-San Francisco is interpreted to comprise the high-levels of a porphyry-Cu-Au magmatic-hydrothermal system. Several alteration types are strongly controlled by regional structures that transect the property (phyllic and argillic zones). Several rock units display strong structural control, especially in the Riverside area, and several IP chargeability and resistivity anomalies are locally aligned parallel to dominant northeast and northwest fault sets. The C2 chargeability anomaly, the R2c resistivity anomaly and the phyllic alteration zone at Cantikoy are aligned parallel to northeast-trending faults, whereas the argillic zone at Canaga is aligned sub-parallel to northwest-trending faults (Figure 15). The implication of these alignments is that some of the through-going structures in the district appear to have acted as channelways that tapped magmatic volatiles from one or more intrusive bodies at depth. The northeast-trending faults

form part of a regional fault corridor that passes through the Boyongan porphyry district and the Placer district in the eastern part of Surigao Del Norte. These structures are thus likely to be deeply penetrating and to have focused magmatic-hydrothermal fluids where they cross-cut intrusive complexes as are inferred beneath the Placer deposit, the Boyongan porphyry Cu-Au deposit and the Tapian-San Francisco system.

The entire region shown in Figure 15 (section 7.5.2) is cross-cut by numerous structures that were interpreted by MRL geologists from topographic data. The scattering of chargeability anomalies plotted in Figure 15 is a function of the cut-off value applied in their definition. Nevertheless, there are numerous anomalies, and they are likely to be caused by several intrusive bodies that have been tapped by structures which may intersect a parental magma chamber at depth below the district. This inferred deeper magma body may represent the southern continuation of the large intrusive body at the northern end of the Tapian-San Francisco property (Figure 5).

The main mineralisation event in the Surigao district is of Pliocene age, broadly contemporaneous with initiation of the Philippine fault system that bounds the eastern and western margins of the uplifted Western Range horst. Hence active uplift may have occurred in the region during the life of the hydrothermal system at Tapian-San Francisco, raising the potential for telescoping of shallow-level epithermal mineralization on underlying porphyry mineralization.

The presence of epithermal-style mineralization at Gold Hill, extensive silicification, As anomalism and minor chalcedonic silica observed by the author near the Canaga argillic zone suggest that if a porphyry system exists on the property, it is likely to be well preserved below the level of erosion. The presence of continuous chargeability anomalies over 400m in length and open to the south (C5) and ~200 metres in length and open to the south (C6), well below shallower zones of resistivity and interpreted silicification, suggest that the C5 and C6 chargeability anomalies represent porphyry targets that require drill testing.

Exploration recommendations are made in Section 18.

17.2 Discussion: Tapian Main

The Tapian Main property lies on the western side of Lake Mainit. The main zone of exploration interest identified to date occurs in and around the Mt Tapian prospect, a former small-scale underground mining site for high-grade epithermal gold mineralization. The Mt Tapian property comprises a series of clustered intrusives that penetrate into overlying carbonate, andesite and ultramafic cover rocks. The clustered geometry of multiple intrusions observed within the Surigao district (Figure 5) and within the Mt Tapian prospect region (Figures 21, 22 and 28) is typical of

horizontal sections above the top of large magma chambers parental to porphyry Cu systems (see discussion of side-wall processes in magma chambers in Section 6.2.1). Consequently, it is likely that the mapped intrusions amalgamate at depth in closer proximity to a parental magma chamber. If the chargeability anomalies at depth to the west of the Mt Tapian prospect are caused by sulfide that deposited from magmatic fluids around the carapace of one or more large intrusive stocks, then a porphyry target could exist on the IP grid area at Tapian Main, and in the area to the immediate south where the deep high-chargeability anomaly remains open.

The broad geometry of shallow-level *epithermal* mineralisation at the Mt Tapian prospect is one of zones or sheaths of mineralization that developed along the contact zone of high-level, 'finger-like' intrusions (Figure 27). The mineralisation is developed as fissure veins, beccia veins, stockworks and zones of disseminated and replacement sulfide in carbonate country rocks adjacent to the intrusions. The intrusions may have been focused up a major NNW-trending structure, with hydrothermal fluids migrating up along NE-trending cross-structures to generate the broadly NE-trending zones of Au anomalism that is expressed in the soil geochemical patterns (Figure 23). Locally, high-grade Au zones are encountered in areas where recrystallised carbonates are in contact with the intrusions. The mineralised contact zones have developed in ultramafic, greenstone and carbonate country rocks and are variably argillised and silicified. The regional alteration is dominated by weak propylitic alteration.

The geological observations above suggest that the *shallow* levels of the Mt Tapian prospect have potential as a low-sulfidation epithermal target, with Au soil anomalies open to the northeast of the Rosario zone and persistent shallow IP high-chargeability anomalies open to the north and south (Figure 25). The Mt Tapian prospect may be exposed high in the magmatic-hydrothermal system, so exploration targeted at shallow levels near the Rosario and Samson zones may locate lateral extensions to these zones. The Mt Tapian epithermal prospect is located in a region of multiple intrusive bodies that penetrate into dominantly propylitic-altered country rocks. Extensive high-chargeability IP anomalies occur at greater depth peripheral to the prospect (Figure 27).

A conceptual model for the Mt Tapian prospect is postulated which entails a low-sulfidation epithermal play at shallow levels and related to structural focusing of magmatic volatiles from a deeper and peripheral porphyry system. The surface alteration at the Mt Tapian prospect is dominated by propylitic alteration. In contrast, the surface alteration at Tapian-San Francisco has greater expression of phyllic and argillic alteration facies. The evidence for a porphyry-Cu-type system at depth below Tapian Main is not as strong as at the Tapian-San Francisco and Canaga properties. The Mt Tapian system probably occurs at shallower levels in a magmatic hydrothermal system than the Tapian San-Francisco system. Consequently porphyry targets at Tapian-San

Francisco are conceptually shallower than at Tapian Main. The extensive IP anomalies at depth to the west of the Mt Tapian prospect should be tested by drilling once the IP anomaly has been closed off to the south, provided the anomalies remain after inversion modeling, and provided economic hurdles are factored into any decision criteria to drill test the deep exploration target.

The presence of local high-grade Au assays at surface, the ubiquity of mapped intrusions, the strong association between soil geochemistry and IP anomalism, and the pronounced increase in IP chargeability at N=2 (~225 metres depth*) relative to N=1 (~150 metres depth) and at greater depths, all suggest that additional exploration activity is warranted at the Mt Tapian prospect and its peripheral regions to the north, south, and at depth to the west.

Exploration recommendations are made in Section 18 of this report.

17.3 Discussion: Agata

Cu-Au and Au mineralisation identified within the Agata property to date comprises both porphyry-style mineralisation identified in the East Assmicor prospect area (drillhole DH 99-11), Au-bearing pyritic (and limonitic) stockwork mineralization developed in biotite monzodiorites in the Assmicor prospect that may also be related to porphyry-style mineralisation, and carbonate-replacement-style Au mineralization in the Limestone prospect area that may have affinities with Carlin-type Au deposits.

The intrusives rocks identified on the Agata property are monzonites, syenites, monzodiorites and diorites. The monzonites and syenites are typically biotite-bearing with significant primary potassic feldspar, and have been identified as alkalic plutonic rocks by Comsti (1997a and 1997b). Potassic alkalic igneous rocks (i.e. the shoshonite suite) are commonly associated with large, Au-rich porphyry deposits.

Induced polarisation (IP) surveying on the Agata property has identified numerous IP chargeability anomalies that form finger-like apophyses at shallow levels and which amalgamate into larger anomalies at deeper levels. The IP chargeability anomalies tend to strengthen with depth from N=2 (~225m) to N=4 (~375m) in the core anomaly regions (southern target anomaly and northern target anomaly). The IP chargeability anomalies attain high chargeability values that locally exceed 40 msecs, and routinely exceed 20 msecs on most of the IP pseudo-sections from Agata (Appendix 1). Weaker modelled IP chargeability anomalies are associated with known mineralisation at Assmicor (10-18 msecs; Figure 38).

There is an indication, from the four plan views of the IP chargeability data, that NNW to NW faults may be important in controlling the distribution and shape of many of the IP anomalies at Agata (Figures 36a,b and 37a,b). Faults that lie along these trends are expected to lie in a dilational orientation in relation to the regional stress field associated with sinistral movement on the near north-trending Philippine Fault splay.

Soil Cu anomalies tend to be closely restricted to mapped intrusions at American Tunnels and Assmicor-Lao. Soil Au anomalies are more widespread and extend into the surrounding and overlying carbonate rocks. In contrast, soil As anomalies appear to be weakly developed over the intrusions but more strongly developed over carbonates. The Cu and Au soil anomalies associated with the Assmicor-Lao prospect region (Figures 33 and 34) are open to the east beneath the alluvial flood plain sediments of the Tubay River. The potential for an extension of the Assmicor mineralization to the immediate east beneath the Tubay River flood plain is strengthened by the observation that the dykes and intrusives encountered in drilling at Assmicor dip towards the east, that porphyry-like quartz veins were encountered in drillhole DH 99-11 which lies east of the Assmicor prospect (Plate 15b and 16a; Figure 45), and the evidence of a resistivity anomaly developing on the edge of the IP survey east of the Assmicor prospect (Figure 39).

Carlin-type gold deposits typically occur in carbonate-bearing sedimentary rocks, however they share a common element association with high-sulfidation epithermal gold deposits (S, As, Au, Ag, Sb, Te, Bi, Tl and Hg) (Kesler *et al*. 2003). The ore transporting fluids are thought to be moderately acidic, and kaolinite alteration often occurs in stratabound zones of fluid focusing where carbonates are dissolved. The generation of secondary porosity and hence permeability by dissolution of carbonate is characteristic of large, gold-rich, Carlin-type stratabound gold deposits. A connection between Carlin-type deposits and magmatic-hydrothermal fluids that may be related to porphyry Cu-Au mineralization in some districts was suggested by Sillitoe and Bonham (1990).

Heinrich (2005) conducted closed system reaction modelling to show that a sulfur-rich, contracted magmatic vapor (i.e. a vapor that remains at pressures above the 2-phase field throughout its entire cooling and ascent history and that contracts to a liquid of higher density upon ascent) would provide an ideal ore fluid to generate Carlin-type gold deposits. For intrusions that penetrate into carbonate-bearing cover rocks, most copper from magmatic fluids is precipitated in close proximity to the intrusions, within a high-temperature skarn that often comprises clinozoisite-anhydrite-chalcopyrite-bornite, resulting in cooler and distal fluids being highly depleted in Cu (Heinrich 2005). The depletion in Cu will suppress enargite and covellite precipitation and favor Au and As enrichment in fluids that form arseniferous pyrite. Stepwise chemical reaction between a cooling and contracting magmatic vapor with carbonate-bearing sedimentary rocks show that a Cu-depleted

but arsenic, sulfur and gold-rich solution will be retained at low temperatures (Heinrich 2005). The presence of extensive Au and As soil anomalies over the carbonate sequences at Agata (Figure 34 - East and West Limestone Au anomalies; and Figure 35) and the restriction of Cu in soils to the near intrusion environment (Figure 33) is consistent with all of the above observations.

Two of several key factors proposed by Heinrich (2005) for the efficient transport of Au away from centres of porphyry ore formation and into the epithermal environment, and into the distal Carlin-type ore environment are:

a) The magmatic fluid contains an excess of H_2S over (Cu + Fe) on a molal basis. This is favored by a high sulfide content in the initial magmatic fluid. Once Fe and Cu are depleted from the fluid by combining with reduced sulfur to precipitate pyrite, chalcopyrite and bornite, excess reduced sulfide (HS^- ligands) exist to transport Au as stable Au bisulfide complexes.
i.e., in the reaction $\mathbf{H_2S \leftrightarrow H^+ + HS^-}$, the consumption of a small fraction of the total available HS^-, by Cu and Fe fixation, leaves excess HS^- for Au transport as bisulfide complexes. This is also favored by the preferential partitioning of sulfur into a low salinity vapor and the removal of Fe (as Fe-chloride complexes) in residual hypersaline magmatic liquids.

b) Neutralisation of acidic magmatic fluids by formation of clay-alteration of feldspars (i.e. consumption of H^+ ions during formation of hydroxyl groups [-OH] in hydrous alteration phyllosilicates) forces the reaction shown in a) to the right, thus facilitating continued generation of HS^- that is available for Au transport. In porphyry systems, the pyrite-chalcopyrite-sulfate veins with sericitic selvedges may be the acid-neutralising channelways along which gold transport is optimized by maximizing the concentration of the HS^- ligand through acid neutralization (Heinrich 2005).

c) Acid neutralization by carbonate-bearing rocks may be an excellent alternative to feldspar destruction in the consumption of H^+ ions that maximizes concentrations of the HS^- ligand, and which inturn is needed to maintain a sulfide-rich fluid over a long flow-path, at near-neutral conditions, required for Au transport to distal, Au-rich Carlin-type deposits (Heinrich 2005). Furthermore, carbonates typically have lower total Fe contents, so carbonate sequences have a lower capacity for de-sulfidising a H_2S-rich fluid, and so optimize Au transport.

In contrast, the presence of Fe-rich wall-rocks in areas of poor fluid focusing will force rapid Au precipitation over a narrow interval by de-sulfidation reactions in close vicinity to the contact

between intrusions and Fe-rich cover-rocks. The high-grade but narrow Au intersections that are encountered along the contract between monzonites and ultramafic rocks (pyroxenites and peridotites) at the American Tunnels prospect (Section 9.4.3) may be a consequence of rapid de-sulfidation of the magmatic fluid as it egresses from a cooling magmatic stock and interacts with Fe-rich wall-rocks.

The northern IP chargeability anomaly (North Target in Figures 30 and 37a) defines a convex-to-east anomaly that mimics the convex-to-east oxbow of the Tubay River. It also lies in an area where variably fractured ultramafic rocks are cross-cut by dense fracture networks of serpentine, serpentine ± chrome spinel ('magnetite') veinlets and rare though intense patches of silica microveinlets. The core of the Northern IP anomaly (Figure 37a, North Target, white area >25 msecs) is a northeast-trending zone in the unmodelled data which coincides with the eastern annular margin of the northern chargeability anomaly B (Figure 37b). This area also coincides with the northeast sector of an area mapped as comprising altered harzburgite with minor pyrite (Figure 30). Very locally, fine silica meshworks are observed in the ultramafic rock. These silica microveinlets form fine, interlocking hairline fracture meshworks that give the ultramafic rock a sintery appearance once surface oxidation and leaching has left a residual silica meshwork. More work is required on this northern target to ascertain and verify if the broad target region fits a porphyry model whereby dense fractures containing serpentine, chrome spinel, and silica observed at surface represent a crackle-fractured ultramafic carapace to a deep underlying porphyry system associated with an annular zone of IP chargeability. IP chargeability anomalies can be generated by several minerals, these being sulfides, some clays, graphite, and serpentine as well as water. Serpentine is a chargeable mineral phase that can generate IP chargeability anomalies in some metamorphic rocks. However, the chargeability anomalies observed at Agata do not evenly cover the entire mapped ultramafic unit. Furthermore the good spatial correlations between mapped intrusions at surface and underlying zones of IP chargeability (Figure 40) suggest that many of the IP anomalies may be caused by disseminated sulfide within and along the margins of intrusive bodies, and as such, have exploration potential as porphyry-Cu-Au targets.

Exploration recommendations are made in Section 18 of this report.

18. RECOMMENDATIONS

Exploration on the three (3) Surigao properties in the past has involved regional geochemical assessment and some semi-detailed prospect assessment. Preliminary drill testing was conducted on two prospect areas (Assmicor and Lao-Limestone) on the Agata property. In late 2004 and early 2005 MRL undertook the first episode of concerted prospect-scale and semi-regional-scale electrical geophysical surveys over known prospects and their potential areal extensions. The newly

acquired electrical geophysical data has enabled a re-interpretation of existing data, and an improved understanding of regional geology and potential mineralization.

Recommendations for exploration activity that should be considered by MRL and Panoro for incorporation into their future exploration programs on the Tapian-San Francisco, Tapian Main and Agata properties are discussed below.

18.1 Recommendations: Tapian-San Francisco

The following steps are recommended to further progress exploration on the Tapian San-Francisco property. The principal target is porphyry Cu-Au mineralization.

a) Reconnaissance geological mapping needs to be conducted over the northern portion of the Tapian-San Francisco property, especially around the periphery of the northern intrusive body. This area lies in close proximity to the Masgad porphyry system. An extensive area of hornblende andesite porphyry has been identified in this region (Figure 8). The intrusion that is mapped in the northern portion of the property is likely to be related to the intrusions that generated mineralization at Masgad and Mayad (Figure 5 and Section 7.2). The margins of the body are known to be prospective, especially in light of the altered rocks that are observed along Masgad Creek (Plate 2). The stream sediment coverage is scanty in this region, so the northernmost claim blocks should be mapped in greater detail than the current state of mapping. Reconnaissance rockchip sampling, additional stream sediment sampling and general prospecting is required in this region.

b) The soil sampling grid should be extended southward from 10,000mN to 8,500mN to cover the Canaga prospect area. Presently the Au and Cu soil anomalies are open to the south, and appear to form a broad half-crescent shape (Figure 11). This implies that a significant fraction of the surface geochemical expression of the Tapian-SF-Canaga hydrothermal system lies to the south.

c) Detailed mapping and regional rockchip sampling should be conducted over the Canaga region in concert with the soil sampling.

d) IP survey should be further extended to test for possible extension of the C5 and C6 anomalies towards the Canaga region.

e) Confirm the alteration mineralogy along the full length of the Canaga “phyllic” alteration zone using PIMA analyses. Analyses of white mica spectra (illite-sericite-muscovite)

acquired by PIMA can be used to aid the determination of the locus of higher temperature fluids along the structurally-controlled Cantikoy alteration zone.

f) There are a number of potential drill targets on the southern portion of the Tapian-San Francisco property based on the data presented in this report. However, it is the author's view that additional work is best carried out upfront, before drill testing, in order to optimize the siting of drill holes to test a range of targets on the Tapian-SF-Canaga prospects. This additional work is listed as items b) c) and d) above. Although the siting of individual drillholes is best left to those who are working permanently on the ground, and best conducted after additional soil sampling, mapping and IP surveying over the Canaga region, there are a number of general targets that can be flagged for drill testing. These include:

1) The C6 chargeability anomaly that underlies the Cantikoy phyllic alteration zone.
A 400 to 500 metre deep diamond drillhole should be sited to drill down the axis of the Cantikoy phyllic alteration zone to test the deep underlying high chargeability anomaly. Given the high cost of such a drillhole, optimization of the drill collar site for this test hole should await the completion of programs b), c), d) and e) above.

2) The C5 chargeability anomaly (and R2d resistivity anomaly).
A second 400 to 500 metre diamond drillhole should be sited to test the C5 chargeability anomaly. The siting of this hole should also await the outcome of proposed programs b), c) and d) above. The hole could be sited to test both the C5 chargeability anomaly at depth and the R2d resistivity anomaly at shallower levels, near 10,000mN 10,000mE, where there are coincident Cu, Au, Zn and Pb anomalies at surface.

3) At Riverside, the C1 chargeability anomaly and the R2a resistivity anomaly should also be drill tested. The modelled chargeability data suggest that there may be a second hydrothermal system in this region which is distinct from that observed to the south over the Cantikoy-Mina-Canaga area (see Figures 16 and 17).

g) Trenching across the Gold Hill prospect may be a useful way of assessing the continuity of Au mineralisation at surface in the area of coincident Au, Cu and As soil anomalies and in the vincity of a spot-high rockchip sample of 20.82 g/t Au. Alternatively, a mechanized auger drill may be a cost effective alternative as a first pass test of the surface potential in the area of the Gold Hill Cu and Au soil anomaly.

h) Three diamond drillholes to depths of ~300 metres are recommended to test additional chargeability anomalies that may be generated during extension IP surveying and any additional untested chargeability anomalies that exist in the survey area.

18.2 Recommendations: Tapian Main

The following steps are recommended to further progress exploration on the Tapian Main property. The principal targets are epithermal Au and porphyry Cu-Au mineralization.

a) The northern portion of the Tapian Main property should be mapped in greater detail than the present level of mapping depicted in Figure 21. This northern region of the Tapian Main property directly adjoins the Canaga region which contains the southern portion of the magmatic-hydrothermal system on the Tapian-San Francisco property. This mapping should attempt to identify any areas of alteration that may be related to the hydrothermal system on the Canaga prospect to the north, and should be conducted together with regional prospecting and rockchip sampling in areas of interest.

b) The IP geophysical data acquired from Tapian Main should be modelled, using inversion modeling, to more accurately define the position and strength of the defined IP chargeability anomalies.

c) The soil Au anomalies at the Mt Tapian prospect over the Rosario Zone are open to the north (Figure 23) and should be closed off with several additional east-west soil lines beyond the northern edge of the current soil grid. The soil Cu anomalies are open to the north, south and west. Some of the existing soil lines should be extended further to the west. Two additional east-west soil lines should also be completed to the south of the present soil grid to close of the southernmost Cu soil anomaly (Figure 24). The soil Au anomaly over the Rosario vein system should be closed off to the north prior to any further work along this trend.

d) Once this is done, a series of east-west trenches across the Au-anomalous Rosario trend and across the Au-anomalous Samson trend could be conducted, with samples along the trench analysed for Au, and other metals of interest. This program would test the continuity of mineralisation at surface and define the position of Au-enriched zones, so forming the basis for subsequent reverse circulation (RC) drilling or diamond drilling to undercut the zones of surface Au-enrichment.

e) The chargeability anomalies (raw unmodelled data) defined by the IP survey on several levels shown in Figure 25 are open to the north and south, and locally to the northwest (N=1, 2 and 3) and southeast (N=1 and 2). If these anomalies in the unmodelled raw-data remain open

along the edge of the survey area after inversion modeling, then the IP survey should be further extended to test for stronger chargeability anomalies that may lie beyond the current survey area.

f) The deep chargeability anomaly that lies on the western to southwestern side of the Rosario and Samson areas should be tested by one (1) or two (2) drillholes (diamond drilling). However, any drill holes that are sited to test this deep IP chargeability anomaly should rely on inversion modelled data and take into account any possible extension of the anomaly off the margins of the completed IP survey area.

18.3 Recommendations: Agata

a) IP should be conducted over the claim block of Bautista.

b) The area of phyllic alteration that is defined by reconnaissance mapping in the Southern Target zone should be mapped in greater detail.

c) In-fill soil samples should be acquired over areas to the southwest of the mapped phyllic alteration zone where there is a large gap in the soil sample coverage (Figure 32). A smaller gap in the soil sample coverage also occurs immediately southwest of the Assmicor-Lao-Limestone prospect area and should be infilled if access can be gained to these areas.

d) The source of the southern-most extensive Cu anomaly (Figure 32) needs to be understood through more detailed mapping and targeted surface rock-chip sampling.

e) The chargeability anomaly C (Figure 36b; > 30 msecs) at the northern end of the IP survey area should be closed off with additional east-west-oriented IP lines to the north.

f) Two or three east-west-oriented IP lines should be extended to the east of the Assmicor prospect, over parts of the alluvial flood plain of the Tubay River, to close off the resistivity anomaly that lies to the east of the Assmicor prospect along the eastern margin of the completed IP survey area.

g) A distinct arsenic (As) soil anomaly that lies on the northern margin of Agata Creek, between the American Tunnels and Assmicor prospects (Figure 35), coincides with a strong and shallow IP chargeability anomaly that extends from the southern portion of the American Tunnels intrusive complex to approximately half way to the northern end of the Assmicor prospect, covering a distance of ~400 metres (Figure 36a and 36b – anomaly A). This IP chargeability anomaly (>22 msecs) should be drill tested in areas of strongest chargeability.

h) The chargeability anomaly B (northern target) and chargeability anomaly E (southern target) shown on Figure 37b should be drill tested with 2 deep diamond drill-holes in areas of strongest modelled chargeability. Chargeability anomaly A may also be tested. The depths of the drillholes are dependant on geophysical modeling of the identified IP anomalies.

i) An assessment to drill other chargeability anomalies should await the results of the drillholes planned to test anomalies A, B and E (Figure 37b).

j) Two (2) contingent diamond drillholes to ~400 metres depth should be budgeted in this phase of exploration: one to allow for a deep test of the area east of the soil Cu and Au anomalies at Assmicor (Figures 33 and 34); and another contingent hole to test any additional IP chargeability anomalies that may be located with extension IP surveying and soil sampling (items a, c and e above).

18.4 Recommendations: Regional

a) Regional prospecting and reconnaissance-scale mapping is required over the Tapian extension and Agata extension areas (Figure 1).

b) Structural interpretation of a digital terrain model (DTM) over the portion of the Western Range, that covers the properties of interest, should provide a more detailed understanding of the structures within the district compared to prior interpretations conducted on other data-sets such as radar imagery.

18.5 Contingent Drilling

a) The three properties of the MRL-Panoro joint venture contain a range of exploration targets for both deep porphyry-style Cu-Au mineralization and shallow epithermal-style Au mineralization. The first-pass drilling program that is recommended in Sections 18.1 (f and h), 18.2 (d and f), and 18.3 (h and j), following completion of the other recommendations, is designed as a limited first-pass test of a range of targets on each property. Any identification of potentially economic or sub-economic mineralization in the first-pass drilling may trigger further interest on the behalf of the joint venture partners. Consequently from a logistical point of view, the joint venture partners may wish to follow up with additional drilling while the drill rig is in the region. Hence a <u>CONTINGENT</u> drilling budget may be considered by MRL and Panoro to cover the possibility that significant mineralisation is encountered during drill testing of one or more of the proposed drill targets defined above. A contingency budget for 3000 metres of additional diamond core

drilling may be considered by the joint venture partners provided a significant intersection of mineralization, or other geological indications that significant mineralisation has a high probability of lieing in close proximity, is encountered in the first pass drilling proposed in the preceeding sections.

b) The contingency budget (above) will also require a contingency amount for earthworks to establish access to the drill sites and to create drill pads.

18.6 Exploration Expenditures (Philippine pesos)

TAPIAN-SAN FRANCISCO

Extend the IP survey into the Canaga area: 13 line km @ 50,000p/km	650K
Reconnaissance geological mapping: 100 man-days @ 3000p/day	300K
Rockchip sample analysis: 120 @ 1000p	120K
Stream sediment sampling: 100 man-days @ 1500p/day	150K
Stream sediment analyses: 200 samples @ 1000p	200K
Soil sampling - Canaga (8,500mN to 10,000mN): 100 man-days @ 1500p/day	150K
Soil analyses: 200m x 50m, 8 lines x 31 samples (+ duplicates) = 270 @ 1000p	270K
Brushing of existing IP gridlines for soil sampling: 12 km	60K
Sample freight	200K
PIMA analyses of clays along the Cantikoy alteration zone + interpretation	400K
Access Road	3,000K
Diamond drill C1 chargeability anomaly and R2a resistivity anomaly (~400 m)	
Diamond drill C5 chargeability anomaly and R2d resistivity anomaly (~500 m)	
Diamond drill C6 chargeability anomaly (~500 m)	
Contingent DDH (3 x 300m = 900 metres @ 11,000p/metre total cost – not itemized)	
Total drilling – 2300 metres (11,000p/metre total cost - not itemised)	25,300K
Trenching / mechanized augur drilling at Gold Hill (300 man-days @ 1000p/day)	300K
Geological Supervision: 20 days @ 15,000p/day	60K
Technical projects (petrography, external reports, assessments)	200K
10% Overhead	3,136K
Total	**pp34,496,000**
(~55pp/US$)	**US$627, 200**

TAPIAN MAIN

Undertake inversion modelling of the IP data from Tapian Main. Already budgeted	
Reconnaissance mapping (northern part of property). 100 man-days @ 3000p/day	300K
Rockchip sampling: 120 @ 1000p	120K
Cutting lines (for soil and IP extensions): 18 km	90K
Soil sampling north, south and west of existing survey. 100 man-days @ 1500p/day	150K
Soil analyses: 200m x 50m, 10 lines x 21 samples (+ duplicates) = 230 @ 1000p	230K
Trenching at Rosario and Samson: (500 man-days @ 1000p/day)	500K
Extend the IP survey area to close off existing anomalies: 8 line km @ 50,000p/km	400K
RC drilling at Rosario or Samson (contingent): 800m @ 8000p/metre)	6,400K
Two diamond holes (~450m; incls. 1 contingent) to test deep chargeability anomaly	9,900K
Sample freight	140K
Access Road	1,200K
Geological Supervision: 20 days @ 15,000p/day	60K
Technical Projects (petrography, external reports, assessments)	160K
10% Overhead	1,965K
Total	**pp21,615,000**
(~55pp/US$)	**US$393, 000**

AGATA

Mapping of phyllic zones and southern Cu soil anomaly. 100 man-days @ 3000p/day	300K
Cutting lines (for soil and IP extensions): 14 km	70K
Infill soil sampling: 100 man-days @ 1500p/day	150K
Soil analyses: (200 x 50m) 230 samples @ 1000p	230K
Surface rock-chip sampling: 120 @ 1000p	120K
Follow-up IP surveying. 10 line km @ 50,000p/km	500K
Diamond drillhole to test chargeability anomaly A (~300 m).	
Diamond drillhole to test chargeability anomaly B (~500 m).	
Diamond drillhole to test chargeability anomaly E (~500 m).	
Contingent DDH (2 x 400m = 800 metres @ 11,000p/metre total cost – not itemized)	
Total drilling – 2100 metres (11,000p/metre total cost - not itemised)	23,100K
Sample freight	200K
Access Road	2,000K

Geological Supervision: 20 days @ 15,000p/day	60K
Technical Projects (petrography, external reports, assessments)	200K
10% Overhead	2,693K
Total	**pp29,623,000**
	US$538, 600

CONTINGENT DRILLING (Contingent on economic or sub-economic intersections)

(8 x 300m [or equivalent] = 2400 metres @ 11,000p/metre total cost – not itemized)	26,400K
Access Roads	6,000K
10% Overhead	3,240K
Total	**pp35,640,000**
	US$648, 000

REGIONAL

Regional prospecting and reconnaissance-scale mapping: 100 man-days @ 3000p/day	300K
Structural interpretation of DTM data.	600K
Geological Supervision: 10 days @ 15,000p/day	150K
Technical Projects (petrography, external reports, assessments)	80K
10% Overhead	113K
Total	**pp1,243,000**
(~55pp/US$)	**US$22, 600**

Total - **US$1,581,400**
Contingent Drilling - **US$648,000**

Grand Total - **US$2,229,400**

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20 DATE AND AUTHORS CERTIFICATE

Bruce David Rohrlach
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Valley View 5093, Adelaide, South Australia.

Certificate of Author and Qualified Person

I, Bruce David Rohrlach of 10 Wahroonga Avenue, Valley View 5093, South Australia, hereby certify that:

1. I am a Professional Geoscientist employed as a private consultant under a sole trader business registered under the same name, and A.B.N (Australian Business Number) 98 652 506 754.

2. I am a member in good standing of the Australian Institute of Mining and Metallurgy (AusIMM), membership number 207261, and I am a member of the Geochemical Society (GS).

3. I am a graduate of the University of Adelaide, South Australia with a B.Sc. degree (1986) and an Honours degree (1987) in geology. I am a graduate of the Research School of Earth Sciences (RSES), Australian National University, Canberra, Australia (2002) with a Ph.D in the field of economic geology.

4. I have practiced my profession continuously since my initial graduation in 1986. I have been involved in mineral exploration on properties in Australia and the Philippines, and undertaken project generation activity for areas in Chile and Argentina. I have completed consulting activity for projects in the Philippines, Mongolia, Turkey, Iran, Armenia and Azerbaijan. I conducted my Ph.D research on the Tampakan porphyry Cu and high-sulfidation epithermal Cu-Au deposit, Mindanao, Philippines.

5. I was employed for 14 years by Western Mining Corporation Ltd in Australia and in the Philippines (1988 to 2001). I currently work as an independent geological consultant.

6. Based on my experience and academic history, I am a "qualified person" as defined in National Instrument (N.I.) 43-101. I am an independent qualified person as defined by N.I. 43-101 and by the companion policy 43-101CP to National Instrument 43-101.

7. It is my professional opinion that the Surigao group of properties are of good merit, and that further exploration of these properties is warranted.

8. This technical report is based on my review of available published data and company reports, and my personal inspection of the geology on the Surigao group of properties that are the subject of this report during a field visit between 19th and 27th October 2004 and between 7th and 11th February 2005.

9. I have read N.I. 43-101 and Form 43-101F1. The technical report has been prepared in compliance with both of these documents.

10. I, Bruce David Rohrlach, do not own or expect to receive any interest (direct, indirect or contingent) in the properties described herein, nor in the securities of Panoro Minerals Ltd nor Mindoro Resources Ltd., or any of their affiliates. I have not undertaken any previous work for Panoro Resources Ltd and Mindoro Resources Ltd.

11. I am not aware of any material fact or material change with respect to the subject matter of this technical report which is not reflected in this report, the omission to disclose which would make this report misleading.

Signed at Legazpi City, Philippines, this 25th day of April, 2005.

Signed by and Sealed: Dr Bruce D. Rohrlach, B.Sc. (Hons), Ph.D.

21. ADDITIONAL REQUIREMENTS FOR TECHNICAL REPORTS ON DEVELOPMENT PROPERTIES AND PRODUCTION PROPERTIES

The Tapian-San Francisco, Tapian Main and Agata properties that are discussed in this report are at the exploration stage of assessment, and have not reached the development nor production stage. Consequently, no additional data is furnished here in regard to factors pertaining to development and production properties.