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EL 1657

NILPENA HILL

PROGRESS AND FINAL REPORTS TO LICENCE SURRENDER FOR THE PERIOD 15/11/1993 TO 14/11/1994

Submitted by
Aztec Mining Co. Ltd
1992

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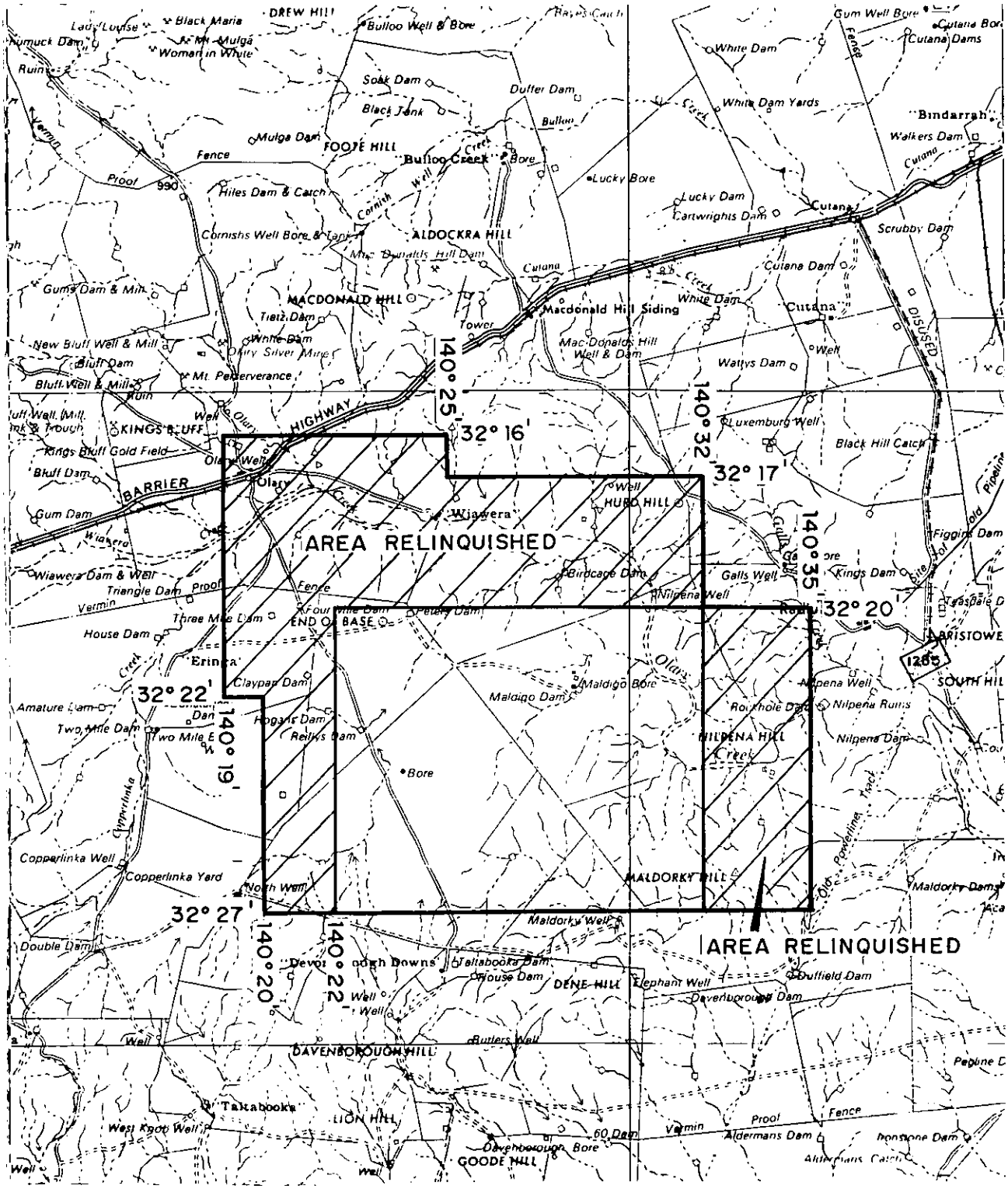
Government of South Australia
Primary Industries and Resources SA

SCHEDULE A



SCALE 1:250,000

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

APPLICANT: AZTEC MINING COMPANY LIMITED

DME 443/89

AREA: ~~440~~ 203 square kilometres (approx.)

1:250000 PLANS: OLARY

LOCALITY: NILPENA HILL AREA - Approx. 10 km southeast of Olary

DATE GRANTED: 17-5-90 DATE EXPIRED: 16-5-~~91~~92 EL No: 1657

ENVELOPE 8325

TENEMENT: EL 1657, Nilpena Hill

TENEMENT HOLDER: Aztec Mining Company Limited

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MINERALS EXPLORATION REPORT

EXPLORATION LICENCE 1657
NILPENA HILL AREA
ADELAIDE GEOSYNCLINE, SOUTH AUSTRALIA

1st Quarterly Report
for the Period ending 16 August 1990

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DATE: 27 August 1990

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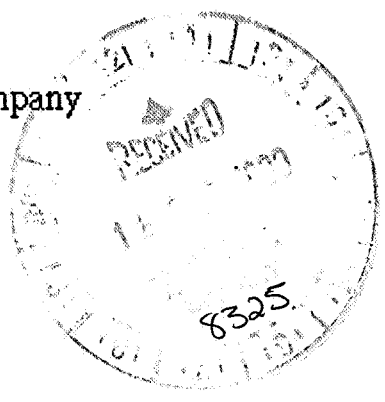

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First Quarterly Report
for the period ending 16 August 1990

Nilpena Hill Area
Exploration Licence 1657
Adelaide Geosyncline, South Australia

SUMMARY

The Nilpena Hill area (EL1657) was granted to the company on 17 May 1990 following a reconnaissance examination of the region of interest and discovery of several anomalous gold occurrences.

This report includes Geologic Mapping Observations (Appendix A), Geochemical Sampling Results (Appendix B) and a working geologic map (Plan 02).

Work during the current quarter has aimed at defining the extent and degree of gold mineralization in the Maldorky Gold Anomaly area, one of the auriferous anomalies located during the late 1989 reconnaissance survey.

Work has involved geologic mapping at a scale 1/10,500 and associated rockchip and stream sediment sampling.

The geologic setting developed thus far involves supergene copper-gold-silver mineralization concentrated in tensional fractures with best showing found in the axial zone of a southerly plunging anticline. The anomalous ground is at least 250 metres in length parallel to old mine workings and up to 500 metres in width as shown in adjacent stream drainages.

Additional work here will involve finalisation of the geologic mapping and sampling program followed by a soil orientation survey. The latter work will entail a single line of sampling run normal to known mineralization trends.

INTRODUCTION

The Nilpena Hill area (EL 1657) was selected for examination under EL tenemency following a regional reconnaissance survey of the north-eastern terminus of the Adelaide Geosyncline. Initial work carried out in late 1989 located at least three gold-bearing areas that deserved more thorough investigation as encouraged by their regional structural setting and anomalous geochemical sampling returns.

LOCATION: EL 1657, generally referred to as the Nilpena Hill area, is located at the northeasterly most extension of the Benda Ranges about 110 kms southwest of Broken Hill. The nearest town is Olary, a rail-head comprising a pub and post office on the Barrier Highway (Fig 1).

ACCESS: Vehicle travel is provided by the Barrier Highway (*32) linking Adelaide 392 km to the south and Broken Hill 110 km to the north. Shire

FIGURE 1

EL 1657

Aztec Mining Company Ltd

NILPENA HILL PROJECT

EL 1657
TENEMENT LOCATION PLAN

Scale 1:250 000 — Author : F. Greene

Date 26 August 1990 — Figure 1

council and station roads provide easy vehicle travel throughout most of the Licence area. A well-maintained and frequently used (Royal Flying Doctor Service) airstrip is located at Wiawera Station in the north central portion of the tenement.

TENEMENTS: Exploration Licence 1657 was initially granted to Aztec Mining Company Limited on 17 May 1990 for a period of one year. It covers an area of 440 sq km in moderately hilly terrain in the northeasterly portion of the Benda Ranges which include the Maldorky Hills. Principal commodities sought are the base and precious metals, particularly gold.

FIELD DATA

This document's basic data includes: Geologic Mapping Observations (Appendix A), Geochemical Sampling Results (Appendix B) and a Working Geologic Map (Plan 02, 1/10,500 scale).

The geologic map, although preliminary and lacking in unit descriptions and explanatory details, does provide essential observation and sampling location information. The map will be progressively up-graded during each quarterly reporting period.

Geochemical sampling has involved both rockchip and stream sediment sampling. Analytical work is carried out by Classic Laboratories Limited (Adelaide). A summary of this data is presented in Appendix B.

GOLD ANOMALIES

MALDORKY GOLD ANOMALY: The bulk of this report is concerned with the Maldorky Gold Anomaly, one of several gold-bearing areas situated within the greater Nilpena Hill tenement. Initial reconnaissance work here in late 1989 identified very high gold values (to 32 g Au/t) in densely fractured sandstone associated with supergene copper mineralization.

The current Quarter's field work has aimed to identify the extent of the auriferous ground and its structural setting. Geologic mapping, including geochemical sampling, on a scale of approximately 1/10,500 is in progress. The work utilizes an enlarged color aerial photo-derived base map for control.

Physiographically, the area of interest lies in an erosionally depressed area southwesterly of the Maldorky Hills. The terrain is moderately hilly

with ephemeral streams draining easterly. Best mineralized ground occupies a northerly descending ridge crest where silicification appears to have contributed to its erosional resistance.

Old mine workings here comprise several linear cuts and prospect pits aligned down the ridge over a distance of 250 metres. The deepest dig is a single compartment, vertical shaft down about 7 metres. A search through SADME open file records failed to identify the camp. It could be a late 1800's operation if old bottle design and discoloration is an indication.

Sandstone, probably subgraywacke, is the principal rock type. Presumably a unit of the Wilyurpa Formation (Sturtian), its composition is lithic with less (?) amounts of feldspar and variable amounts of quartz. Graded bedding is the most conspicuous primary structure being amplified by light quartz sands at the base becoming progressively darker and finer upwards. In the mine area, silicification along with pervasive iron oxide impregnations have contributed to the rocks' dark color and toughness.

Mineralization, at least visibly identifiable, comprises the carbonates and oxides of copper. Malachite along with minor azurite occur as selvages on fractures and as open space fillings, in the latter often as well-developed crystals. A deep ruby-red mineral, possibly cuprite, is found along with irregular bodies of a dense, blue-black, copper oxide resembling tenorite. This mineral is also intimately associated with gold and silver as shown in Table 1.

SAMPLE	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
NH 06R	32.00	600	40	47.4	82	70	Tenorite, blu-blk, dense
MD 18R	4.21	760	88	45.3	340	75	Tenorite, malachite, CuO
19R	4.13	480	36	37.5	32	66	Tenorite, sandstone
20R	0.79	550	78	26.8	70	135	Sandstn, argillic, CuO
21R	0.64	8	150	0.79	64	22	Sanstn, silicic, FeO, CuO
22R	0.41	20	72	0.66	28	20	Sandstn wall rk, silicic
23R	7.88	9	210	1.05	230	370	Sandstn, silicic, diss CuO

* * All elements reported in ppm excepting copper being reported in percent * *

Table 1. Analysis results for rockchip samples cut from veins (06R, 18R and 19R) and altered sandstone wallrock (20R thru 23R) at the old mine workings of Sta 97.

As currently mapped, total width of exposed mineralization and alteration is at least 500 metres. Altered sandstone hosting multi-directional quartz veins have been found in adjacent stream channels (Sta's 95 and 106) and as resistant, silicified, linear outcrops (Sta 108 and sample site 25R) that barely break through the ubiquitous soil cover.

Regionally, the area lies on the southern flank immediately south of the easterly-most limits of the Ulupa Syncline, a regional downwarp extending from about Hallett in the south thence some 180 kms northeasterly to Olary. Many of the State's most productive gold mining camps are situated on paralleling anticlinal structures flanking the Ulupa Syncline.

Geologic mapping in the area of interest is also revealing an anticlinal setting, a fold structure at least 100 metres in wave length with a small southerly plunge. Best supergene mineralization, as revealed by old mine workings, occupies the intensely fractured axial zone of the fold.

Work during the forthcoming weeks will aim to complete the geologic mapping and related sampling program. It is also intended that a soil sampling program will be carried out. The work will be of an orientation type involving at least one line of sampling normal to the known trend of mineralization.

APPENDIX A

GEOLOGIC FIELD NOTES

APPENDIX A

GEOLOGIC FIELD NOTES

1990 FIELD EXAMINATION; MALDORKY GOLD ANOMALY,
NILPENA HILL AREA, ADELAIDE GEOSYNCLINE, SOUTH AUSTRALIA

01 452880/6410780. Hill top. Siltstone, gry-grn, "peppery" m/m tex (amphibolite facies) well-devel'd fract cleav: 255/80SE. Joints: 20/80 SE approx 2/m Wilyerpa Fm.

02 453055/6410655. Prominent linear o/c, sub-graywacke, dk gry-brn on exposed, gry-blk on fresh surfaces. Shows fine laminar bedding with local convolute structure, highly indurated, tough. Attitude: 100/76SW. Jointing: 30/90. Fract cleav: 75/85SE. 2nd bed measured approx 20 m to SE: 125/25SW (II). Bed approx 3 m wide av expanding to 5 m. Adjacent rock is meta siltstn, gry-grn, tends to show greater decomp'n due weathering. Expansion of sub-graywacke bed to 5-6 m may be in part function of minor displacements along fract cleav.

03 45235/6410605. Gully. As above, sub-graywacke (linear) o/c. Forms prominent ridges to 1-2 m relief, well shown on aerial photo. Brownish discolor'n of exposed surfaces due finely diss FeO in matrix originally mafic constituents. Joints: 5/85SE approx 5/m. Adjacent rk is gry-grn siltstn, weathered, fract cleav: 65/90NW.

04 453615/6410470. Sub-graywacke displaced parallel to joint: 20/75SE approx 5/m. Bed: 90/255 (III). Approx 50 m SE (on strike) bed: 85/55SE (I). Fract cleav: 80/85SE. Approx 120 m SE (on strike) bed: 90/40S (I) as shown by very fine bedding laminations.

05 454040/6410290. Sub-graywacke (as above), expanding to 30 m. Bed: 95/60SW (I). Appears there are now several sub-graywacke beds here to 3 m thickness with 6-10 m interstitial siltstone. Joint: 170/80NE approx 5/m. Locally sub-graywacke grades to grit (1-1.5 mm diam) beds and may show cross-bedding. Approx 150 m SE (on strike) find boulder biotite granite, very coarse grained, decomposed = drop stone in sub-graywacke.

06 454735/6410405. Sub-graywacke, very homogenous tex, tough. Faint bedding laminations 75/75SE often grading to coarse sandy beds (1-4 mm) poorly sorted, in places show well-devel'd graded structure. 2nd bed: 85/70SE. Joints: 20/85SE, sheeted 50/m. Adjacent (north) rk is siltstn, amphibolite facies, surface expression smooth relief, decomposed. Includes reddish qtzose sandstns (2-3 m thick). Abundant qtz gravels on surface derived from local, large linear qtz "blows", milky-wht.

07 454730/6410545. Sandstn, coarse-grained, graywacke, m/m, exhibits a peculiar spotted alter'n (?) on weathered surfaces, ox'd felds clots (?). Bed: 120/35SW (I) approx 2 m thick with good cross-bedding also locally massive, prominent relief (1-3 m) hosted by gry-grn, fn'ly lam'd meta siltstn. Sample **MD01R** from siliceous bed 0.5-1.0 m thickness directly underlying above coarse-grained graywacke, excessively pitted with ochres limonite fillings including trace amts hematite. Underlained by siltstn, gry-grn.

08 454400/6410565. Sandstn, spotted (as above), spots are light colored, bleached, semi-circular or lensoid to 5 mm diam, m/m origin. Hosts fault breccia, well-healed, approx 50 cm thck. Sample **MD02R,** fragments comprise qtzite, felsite, siltstn with silica cement, well-rounded, felsite, pyritic (formerly ?) to 15 cm diam = pebble dike ? Attitude: 80/70SE. Attitude of spotted sandstn host: 100/30SW (I). Joint: 30/60SE approx 20/m.

09 454325/6410610. Igneous rock, intermediate comp, dike, comprising >qtz/felds <dk mm's (altered to limonite), fine to med grained, equi-granular. Excessively pitted, leached ferromags with trace remnant chlorite. Qtz phenos (0.5-1.5 mm) exhibit faint milky-wht translucence typical of secondary or additive qtz. Pits with limonite to 2 mm diam. Dike appears to be (at least partly) controlled by spotted sandstn which it tends to parallel. Sandstn either side of dike appear to be affected by contact m/m, obviously toughened as shown by greater resistance to decomp'n. Dike rock shows consistently but obviously easily weathered leaving dis-continuous exposures where more siliceous. Width approx 4 m.

10 453395/6411475. Ridge. Quartzite, lithic, well-indurated, forms prominent linear o/c. Dk-gry on fresh surfaces due 10-15% finely diss'd amphibole (R m/m); trace amts diss limonite. Approx 3 m thickness. There are several resistant beds of this nature in gen vicinity, are interbedded in gry siltstn, a very easily decomp'd rk. Bed: 65/65SE. Joint: 15/85NW approx 5/m. Some inter-sandstn bed rk is quite sandy, weathers buff yel, quite porous, locally gritty.

11 453825/6411560. Qtzt, lithic. Approx 40 m north of sta find coarse-grnd sandstn, bed: 75/60SE. Area occupies high plateau setting with much qtz gravels on surface. Joint: 15/90, approx 10/m unusually large amt separation (30-60 mm) along joint planes.

12 454150/6411475. Graywacke, very tough dk to med brn-gry. Bed: 80/75SE. Joint: 10/80SE.

13 454300/6411380. Igneous, intermediate comp'n, dike, approx 5 m wide. Rock is med grnd, equi-gran, felds (20-30%) A clays and mafics totally A chlorite. Two types qtz phenos 1) very faint bluish pastel translucent to 1 mm diam, exhibit thin "glassy" rims, 2) relatively clear translucent, sub-angular to very irreg'r, <1 mm but good interstitial relationship with other min's. North side of dike walled by coarse granular to pebbly sandstn, tough, approx 3 m thick, clasts to 5 mm, angular, poorly sorted, matrix appears to be a dense, shreddy mass of amphibole, overall gives arkosic appearance (C m/m).

Approx 30 m to SE of dike, prominent quartzite bed stands 2-3 m relief, approx 3-4 m thickness. Bed: 65/80SE, also includes "arkosic gravel horizons", gradational with fine grained sections, 30-50 cm thick.

14 454480/6411425. Igneous (?), on strike with Sta 13 igneous rk. Here thoroughly A decomposed lithics, FeO, limonite, very friable, prominent relief to 3 m. Fract cleav: 70/90. Joint: 5/90, sheeted. O/c pattern fairly persistent along strike (N80E) but thickens and thins. Fresh specimens of the dike exhibit a faint foliation.

15 454725/6411470. Igneous (?). Thoroughly A by normal weathering with most of felds and mafic constituents leached. Fract cleav: 85/70NW. Joint: 15/85SE.

Approx 20 m to south, prominent linear o/c of sub-graywacke, coarse sand interbeds, very tough, resistant to erosion. Bed: 75/75SE (III). Joint: 160/90, sheeted; 70/90, sheeted.

16 454435/6411150. Granite, coarse gran'r, bleached (white) micas, erratic in gray sandy siltstn to 40 cm diam. Bed: 275/80NE (I)›

17 453900/6411030. Quartzite, occupies prominent hill to 15-20 m relief. Inspection of photo bedding-trend lineaments and results of mapping so far, appears qtzte hill is loc'd w/in central portion of

fairly broad syncline. Very massive, weathering to large (1-3 m), rounded smooth o/c's. Laced with numerous quartz/hematite veins to 5-15 cm thickness, very irregular, pinch out. Sample **MD03R** is qtz-hem mixture from vn to 15 cm thickness, est 30% hem in part altered to dk rd ocherous limonite. Jointing: 70/65SE, traces into faint linears resembling bedding! (parting on bedding planes ?). Joint: 160/90 approx 5/m.

18 453295/6411175. Quartzite, nose of syncline. Bed: North/55W (?). Joint: 20/85SE. 2nd bed: 110/60SW (I).

19 453420/6411180. Qtzite, very massive, tough, smoothly weathered producing large rounded tor-like exposure. Bed: 80/60SE (I). Joint: 10/90 approx 10/m.

20 454070/6411225. Dike rock, intermediate comp'n, equi-gran. Two types qtz: 1) faint pastel translucence, 2) clear, glassy type. No remaining mafics other than FeO alter'n products. Sample **MD08R**, hand specimen very tough, diss specks may include some former pyrite. Joint: 110/75NE; 10/85SE. Str'ly m/m aureole in host sandy siltstns. Attitude of beds on W: 40/20SE dipping in towards igneous body. On NNW side of igneous body bedding: 55/40SE.

21 454120/6411915. Quartz "blow" approx 15 m length N70E/80NW. Rock types comprise sequence qtzite beds to 1 m thickness, coarse qtzo-felds sandstn including gritty sandstn beds to 50 cm. Bed: 95/85SW (III); Joint: 25/75SE.

22 454375/6412040. Hill top (site of an old shepherd's ring or keep). Quartzite, broken into large rectangular boulders. Fract cleav: North/75E; older fract cleav: 70/70SE. Bed: North/85E (II). Considerable qtz veining, that derived from host seds: 70/80SE. Sample **MD04R** from qtz vein, 40 cm thickness, milky-wht, well-crackled with ocherous lim, few cavities appear to have sulphide origin.

23 454575/6411660. Quartzite or well-indurated quartzose sandstn, approx 1 m thick, alternates with more easily erodible lithic sandstns. Bed: 90/55S (I). Joint: 20/75NW approx 5/m.

24 455235/6411950. Ridge crest comprised of qtzite, gry-brn on exposed surfaces, very massive. Fract cleav: 80/90. Joint: 30/85SE approx 5/m. Bed: 30/70SE; 45/30SE (I).

25 455460/6411730. Hill side. Rock o/c appear to exhibit curve, meta-siltstn (amphibolite facies), dk metallic-gry on fresh surfaces,

very resistant, occur in several parallel beds to 2 m thickness. Interstitial rk is coarse grained silty-sandstn, shows prominent fract cleav: 70/85SE. Bed: 70/85SE ? Joint: 25/90 sheeted.

26 455500/6412015. Meta siltstn exposed in creek bed, str amphibolite facies alter'n, abundant (80%) fine amphibole leaves rock with shiny lustre. Bed: 85/65NW (I); 85/70NW (I). Prominent fract cleav: 80/85SE.

27 452970/6411105. Graywacke, matrix str'ly ferruginous with FeO concentrating on bedding plane fracts and joints. Bed: 100/40SW. Joint: 165/90; 25/90 well-devel'd. Bed: 90/35S (I).

28 453015/6410990. Graywacke, relatively thin bed approx 1 m thickness, several such beds interbedded in gry siltstn. Bed: 100/60SW. Joint: 20/85SE well-devel'd, approx 5/m, 3-5 cm parting.

29 453580/6410730. Graywacke on joint planes with FeO-stained walls. Locally exposed small-scale cross bedding. Bed: 115/35SW (measured approx 50 m NW of sta). Joint: 10/80SE. Bed: 110/35SW (I). Joint: 20/85SE approx 5/m.

30 453440/6410945. Sandstn, qtzose with lithic fraction, rd-brn on exposed surfaces. Here excessively broken and fract'd leaving bouldery "outcrops". Joint: 5/80SE; 280/40NE. Note numerous small (3-5 mm) pits, elongate with FeO halo. Bed: 270/75S. Sandstn beds are interbedded in gry-grn siltstn, here str'ly weathered.

31 453360/6410985. Graywacke, exhibits much (60-70%) fine blk amphibole. Bed: 105/55SW (I). Joint: 20/90.

32 452660/6411100. Erosional gully, exposes gry-grn siltstn (looks like Tapley Hill rocks). Highly devel'd fract cleav: 70/85SE. Following gully SE find coarse, equi-granular sandy beds, excessively broken with fracts filled with calcrete-like substance. Bed: 195/85NW (II).

Approx 110 m brg S52E, creek channel, blk mudstn approx 3 m interbedded with sandstn, local deformation. Bed: 115/50SW. Cut by ferruginous/siliceous impregnated fract filling, est 10%+ pyrite now completely ox'd. Productive appearing limonite/goethite, attitude: 155 30 cm width. Sample **MD16R** comprises rd-brn limonitic fract filling, with dk rd-brn clots former suphides, quartz

(broken vein) clasts. Host rk is shale, dk gry-blk, very decomposed.

33 452540/6411215. Erosional gully (as above). Siltstone, gry-grn. Fract cleav: 75/70SE wel-devel'd. Joint: 10/90. Appear to be str'ly sheared on fract cleav. Bed: 125/35SW (II); 130/40SW (I). Joint: 30/85SE approx 5/m. Fract cleav: 70/85SE.

34 452560/6411545. Siltstn, lt gry-grn (Pft ?) alternating with thin sandy siltstn. Bed: 10/35NW. Fract cleav: 45/85SE. Beds exhibit considerable distortion. Bed: 105/75NE.

35 452515/6411720. Hill top. Sandstn, coarse (1-3 mm), gritty, rd-brn, appear to have been leached, much limonite and FeO occupying matrix and fracts. Bed: 80/65SE. Well-devel'd cross-bedding. Fract cleav: 50/85SE. Bed: 55/40SE (III) cross-bed ?

36 452800/6411740. Ridge crest. Siltstn (Pft ?) alternating sandy facies well-indurated, gry-brn, dk gry on fresh broken surfaces. Rocks highly broken. Fract cleav: 70/80SE. Joint: 15/90. Bed: 75/65SE (II).

37 453075/6411810. Ridge crest. Abundant bull qtz "blows" with predominant trend 55/80NW gen shows well-preserved fract cleav: 175/85SW. Siltstn, gry-grn (Pft ?) also reddish silty sandstn and coarse sandy beds. Joint: 150/90 approx 5/m. Quartz blow, 40 cm, 60/80NW. Bed; 65/40SE (I). Quartz blow, 1 m, approx 70 m length 75/80NW.

38 452780/6410775. Graywacke bed, med gry on fresh break, equi-gran, shows good bed: 105/35SW. Fract cleav: 80/85SE. Joint: 35/85SE approx 5/m, 2-3 cm separation along joint planes. Bed: 110/40SW, graded bedding.

39 452875/6410610. Graywacke, well-bedded, lt brn-gry on exposed surfaces forms prominent linear o/c's (see aerial photo), gen 1-2 m thickness. Bedding locally shows intricately folded laminae. Bed: 110/30SW (I); 115/45SW (I). Joint: 20/80SE approx 5/m. Siltstone between graywacke beds gen shows good fract cleav: 80/90. Find excellent small-scale cross-bedding in graywacke.

Immediately SE of sta approx 30 m find dike, 60-70 cm thickness, intermediate comp'n, str'ly weathered, matrix mod responsive to HCl, attitude: 15/85NW. Sample **MD05R** from dike rk, med grained, equi-granular, inclusions of siderite (responsive to HCl), minor calcite small irregular fillings, mod broken brecciation, open

spaces with dk rd limonite. May not be igneous! Shows very well as linear feature on aerial photo. Ancient fault?

40 452880/6410275. Hill top. Pick up southerly continuation of dike-like str. Very prominent surface expression, slight but obvious. Attitude: 05/85NW. Thickens and thins between 40 and 60 cm. Adjacent wall rks (siltstn) show marked resistance to erosion about 1 m either side of dike. Contact itself very sharp, on dike side very fn grained, siliceous with minor thin parallel qtz vns, on siltstn (host rk) side rk is brownish (FeO) also siliceous with numerous limonite-filled cavities (productive appearing). Sample **MD06R**.

41 452805/6410255. Dike-like rock, another occurrence, pinches and swells 10-40 cm, 15/85NW; 05/75NW. Sample **MD07R**, comprises a dense, med brn, siliceous, aphanite, laced with numerous fine siderite and calcite veinlets. Host siltstn rich in fine amphibole. Fract cleav: 70/80SE. Bed: 75/65SE (I); 80/70NW adjacent to large (1 m) qtz blow. Ridge crest N65E. Fract cleav does not show in dike-like rock.

42 452695/6410720. Granite, coarse-granular, str'ly weathered but locally shows slt relief over host siltstn, gry-grn. Contact on SE side (centre) very sharp, granite does show somewhat finer grain and more resistant to erosion. Siltstn shows a fairly uniform line of o/c about 1 m width along contact with granite (N25E). Fract cleav: 75/80SE. Granite also shows same fract cleav: 70/85SE. Siltstn exhibits considerable convolute bedding. Bed: 105/50SW (II) measured on SE side of large (73 m - N20E x 30 m normal to elongation, tapering at each end) granitic, erratic. NW granite/siltstn contact also shows a finer grained granite compared with the same rk in its central exposures, sharp contact 90-85E.

43 452580/6410905. Sandstn, quartzose with minor felds and lithic fraction. Laced by numerous fine milky-white qtz veins. Fract cleav: 95/80SW poorly devel'd. Jointing: 25/90 approx 5/m. Bed: 95/65NE (III). Trend of o/c 145°.

44 453990/6411385. Graywacke, str amphibolite facies alter'n, beds 1.5-2 m thick, well-devel'd bed: 85/75SE. Jointing: 10/90 approx 2/m.

45 452475/6411105. Graywacke, dk rd-brn on exposed surfaces, fairly massive beds to 2 m thickness in gry-grn siltstn. Trend of beds: 150. Jointing: 25/80SE 20/m. Fract cleav: 60/90.

Graywacke exhibits convolute bedding and locally good cross-bedding. Bed: 140/60SW (II).

46 452185/6411450. Sandstn, coarse grain, good cross-bedding. Bed: 45/65SE. Fract cleav: 50/80SE. Jointing: 150/80NE.

47 452075/6411610. Graywacke, coarse-grained, exhibit well-devel'd light and dk bedding laminae due to graded str, locally str'ly convolute laminae. Bed: 10/35NW (I). Jointing: 100/90 approx 3/m. Following beds southwesterly note that dip changes from NW to SE quite frequently - probably function of soft rk deformation and perhaps cross-bedding. Bed: 30/65NW; 10/35NW (II).

48 451700/6412075. Sandstn, med to coarse grained, cross-bedded, graded bedding as shown by light and dark banding. Bed: 85/45SE. Jointing: 30/90 approx 3/m; 20/85NW approx 20/m tight with bleached walls.

49 451320/6412600. Sandstn, coarse-grained, exhibiting rhythmic light and dark banding due to graded nature of sand/silt constituents. Bed: 170/25SW. Jointing: 60/80SE. Fracture cleav: 80/80SE in siltstn.

50 451145/6412490. Conglomerate, prominent o/c, highly sheared and broken, 5-6 m thick, comprising rounded to sub-rounded pebbles and cobbles gry felsite, reddish shale, biotite granite, finer grained granitic, gry quartzite. Fract cleav: 75/80SE, appears to show minor displacements. Tracing cgl northwesterly, becomes wider (30-40 m). Find large (2-3 m diam) blocks granite and meta siltstn.

Approx 120 m brg 330° on strike with cgl note bed: 255/70NW! More large granitic blocks some 8-10 m length. Bed: 80/75SE.

51 450930/6412775. Graywacke, rich fine-grained amphibole. Bed: 10/30NW (II). Jointing: 10/75SE. Bed: 05/40NW (II). Bedding shows soft-rock deformation.

52 452100/6412120. Graywacke, coarse sandy, dk gry-brn on weathered surfaces. Bed: 55/40SE. Fract cleav: 50/90. Bed: 65/55SE (II). Fract cleav highly devel'd. Bed: 70/55SE (I).

53 451195/6412965. Sandstn (graywacke), coarse granular, diss limonite specks. Good cross-bedding. Bed: 180/35W (I). Jointing: 90/90 approx 3/m. Fract cleav: 80/90.

54 451080/6413215. Sandstn, very coarse, gritty, predominantly large (2-4 mm) qtz clasts, very dense and heavy rk, micaceous. Bed: 355/35SW (I). Occurs in beds approx 10 m with gry siltstn to east, gry sandy siltstn to west. Bed in gry siltstn: 10/40NW (I). Fract cleav: 80/90. Sample **MD09R** from coarse gritty bed compose mostly of angular qtz clasts with siliceous cement, some open spaces (leached cavities) with FeO staining or infilled with dk rd-brn limonite, mafic constituents altered to chlorite.

Approx 120 m North in creek bed, good grit horizon. Bed: 20/30NW (I). Horizon has thinned to approx 2 m.

Approx 250 m NNE (on strike) grit horizon now approx 1 m thick. Bed: North/35W (I). Fract cleav: 55/85NW shows minor but consistent displacement contributing to dialation of grit horizon.

55 451080/6413210. Gritstn (marker bed) appears to have thinned out. Here rk is finely lam'd gry-grn siltstn. Bed: 05/25NW (I). Fract cleav: 75/80SE.

Approx 50 m brg 335°, in creek bed, good sandy siltstn exposed, med gry, finely bedded exhibiting rhythmic light and dark gry banding (light colored 10-20 mm thick darker to 60 mm) some darker layers show convolute str and good micro-cross bedding.

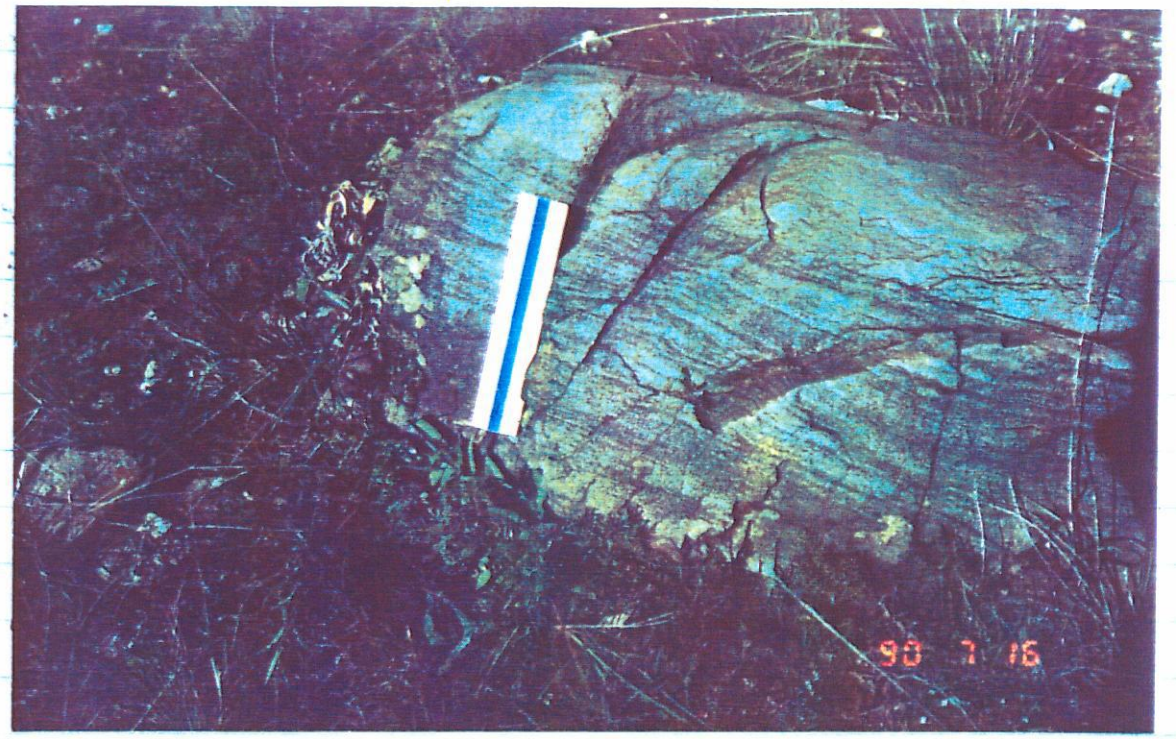
56 451230/6413840. Creek bed. Siltstn, sandy, gry. Bed: 60/50NW (III). Fract cleav: 80/80SE. Beds distorted, convolute, laminae. Considerable breakage including displacement of fract cleav. Bed: 170/25SW (II).

57 451070/6414000. Stream channel, drains 100°. Quartzite, forms prominent bed, 8-10 m wide, slightly lithic, grading to sandy grit beds to SE. Bed: North/20W. Jointing: 10/80NW approx 20/m. Fract cleav: 75/90.

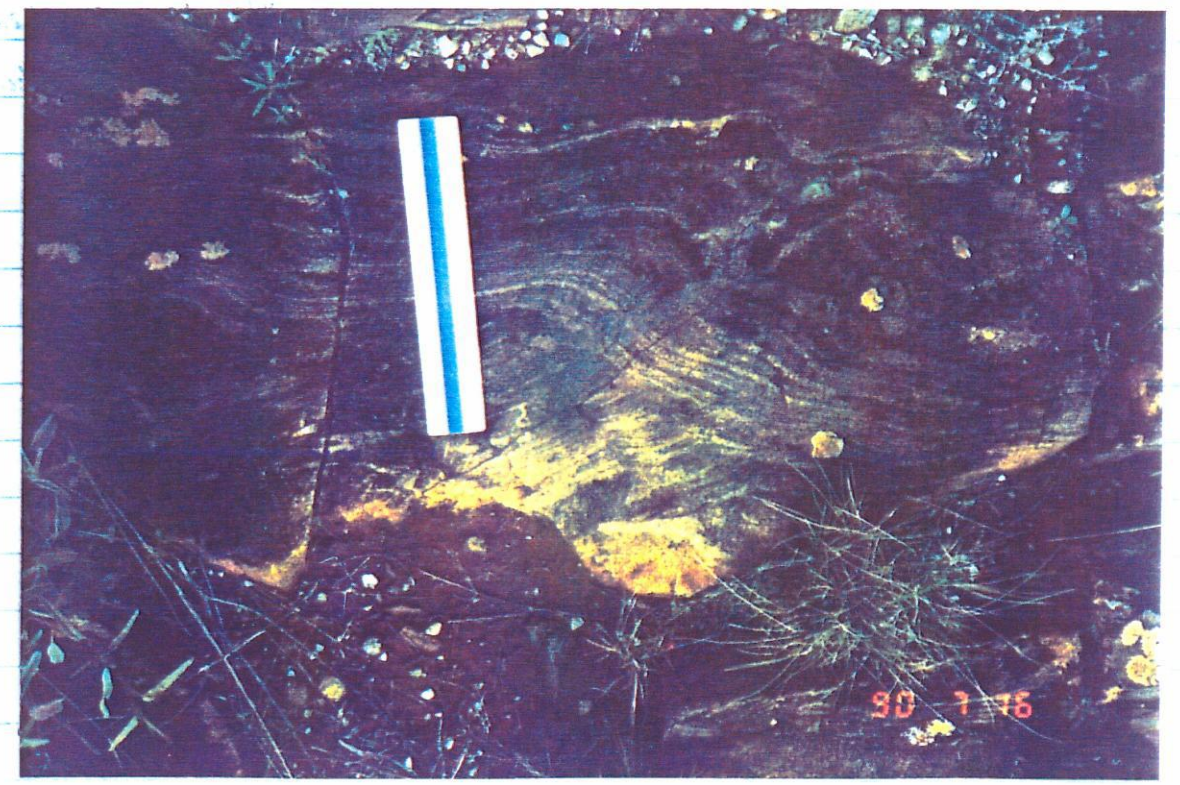
Approx 70 m brg 280° upstream. Sandstn, silty finely lam'd with interbeds sandsn, gry-grn, shows light and dk gry banding. Bed: 40/40NW. Joint: 15/75SE often sheeted with minor displacement.

58 450790/6414085. Creek bed. Siltstn, gry to dk gry-brn, fairly decomposed. Bed: 35/30NW. Fract cleav: 85/75SE has been locally buckled due to tectonic activity. Jointing: 185/90, sheeted also shows slight twisting of strike.

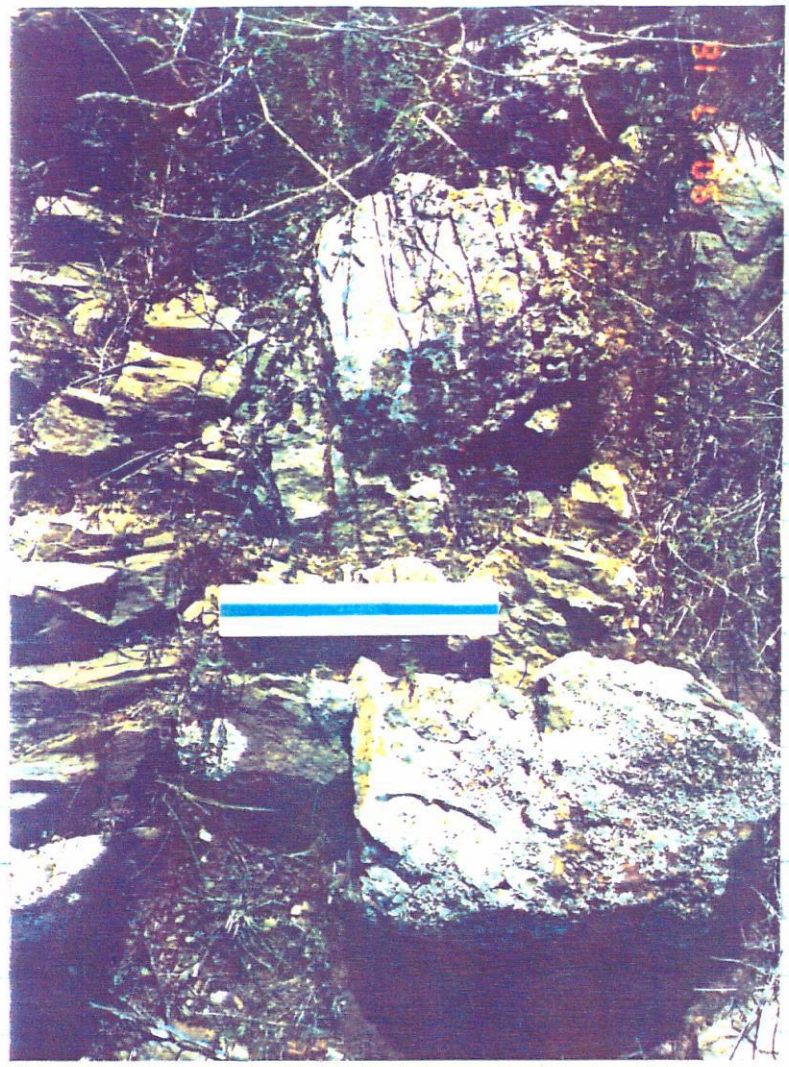
Approx 100 m NW (upstream), sandstn, pebbly and coarse sandy. Constituents comprise lt gry felsite, quartzite, meta sandstn, granite



Sta. 38. Graywacke sandstone exhibiting characteristic light and dark gray banding. Basal portion of band is usually quartz grading (fining) upwards to darker minerals (mostly amphibole and minor magnetite) of m/m origin. Sorting is generally constant suggesting sorting developed in a waning shallow-water current as opposed to a turbidity environment. View 165°

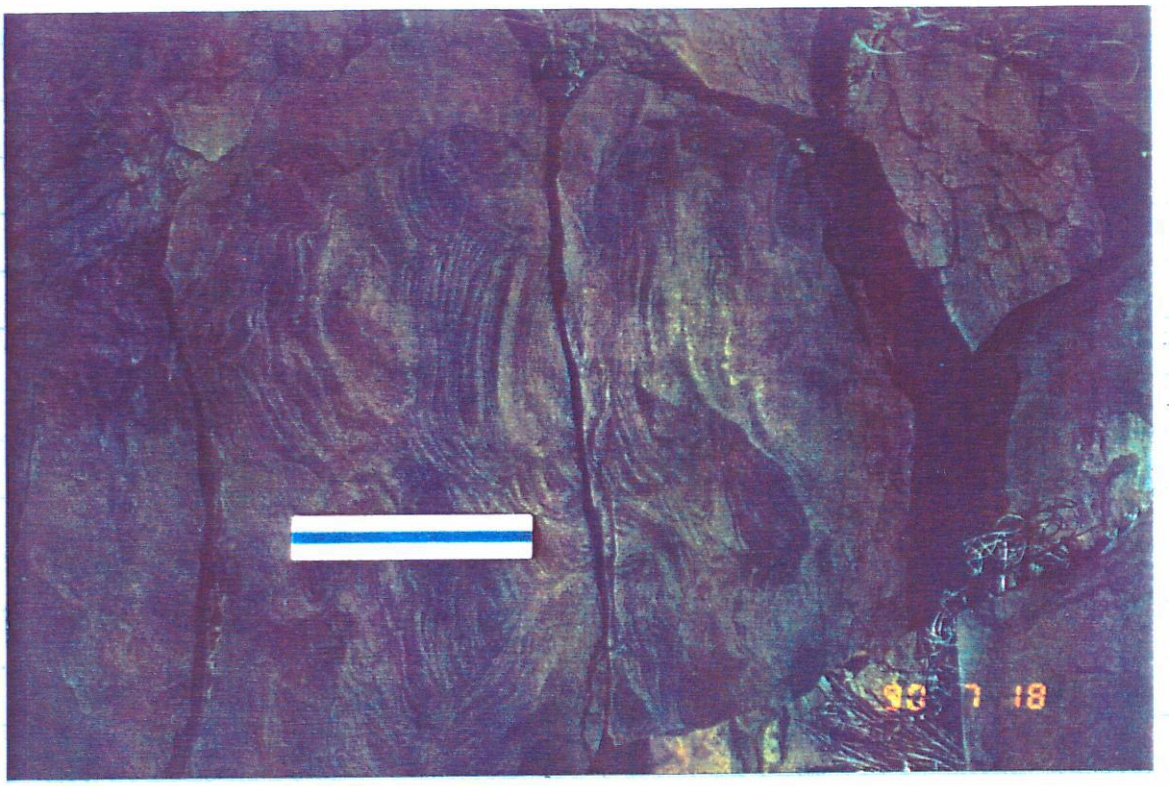


Sta. 39. Graywacke sandstone exhibiting cross-bedding and wavey stratification. Grading from light (qtz) to dark (fine amphibole) upwards. View vertical, top is 20°



Sta. 40. Intermediate dike intruding siltstone 40-60 cm thickness, 05/85NW. Sample MO 05R (Au .002 ppm, Cu 65, Pb 52, Zn 22, Ag <1). View 165°

Sta 40. Quartzite dropstone in siltstone. View vertical.



Sta. 55. Graywacke sandstone exhibiting rhythmic light and dark gray banding, convolute bedding and graded bedding. Vertical view (top is 70°) of bedding plane (05/25NW). In places slightly weathered relief features resembling asymmetrical ripple marks recognized trending (direction of development) 350°.

Sta. 62. Siltstone with interbedded sandstone gently flexed forming an anticline. Axial trace plunges ~15° @260°. Hammer occupies crest of fold which is densely fractured: 260/90. Width between bedding attitudes ~ 5m.

fine grained, cobble dimension. Fract cleav: 85/60SE. Bed: 75/65SE (II). Find several large (50-70 cm) boulders biotite granite.

Approx 150 m brg 325° (upstream) quartzite bed crosses creek, very "wavy" trend to o/c. Bed: 60/30NW (I).

59 450820/6414365. Ridge crest (saddle point). Siltstn exhibits the characteristic light (1-2 cm wide) and dk (3-5 cm) bedding laminae. Bed: 45/45NW (I). Jointing: 35/90 approx 5/m. Adjacent beds comprise gry-brn sandy siltstns, bed: 40/40NW (I). Fract cleav: 85/80SE.

Approx 200 m brg 350°, sandy siltstns. Bed: 40/30NW (I). Rocks are slt'ly rd-gry containing a gritty fraction. Fract cleav: 90/75S. Widespread massive qtz veining: 654/75SE retain fract cleav: 95/80SW, gen 10-30 m length pinch and swell to 1.5 m thickness.

60 450925/6414395. Creek bed. Quartzite interbedded in siltstn (to north) and pebbly sandstn (to south) with sub-rounded to angular pebbles and cobbles set in brn-gry sandy matrix. Bed (contact): 90/60S (?). Fract cleav: 90/60S. Bed: North/55W as shown by fine lam'r banding. Find erratic of coarse-grained biotite granite, roughly 3 m in length by 2 m width. Down stream approx 10 m (in creek bed) good bed in gry siltstn: 80/80SE (I) in contact with pebbly sandstn. Fract cleav: 95/75SW.

61 451190/6414325. Sandstn, coarse granular, slightly pinkish to med brn, overlies pebbly sandstn. Bed: 40/60SE (II). Jointing: 15/85SE approx 4/m. Pebble elongation: 70/50SE. Fract cleav: 80/85SE.

Approx 150 m brg 170°, creek bed. Siltstn, showing lt and dk gry bedding laminae. Bed: 45/30NW (I). Fract cleav: 95/80SW. Jointing: 120/90 poorly devel'd.

62 451220/6414205. Creek bed. Silty sandstns exposed in well-developed anticline: Axil trace plunges -15 @ 260°, central section marked by highly devel'd fract cleav: 260/90, attitude on north flank 240/35NW, south flank: 260/20SE, a 20-30 cm qtz vein has been caught up in the fold.

63 451390/6413750. Graywacke, gry-brn on exposed surfaces, dk gry on fresh. Bed: 350/25SW (II). Fract cleav: 75/75SE. Jointing: North/70E approx 3/m. Well-devel'd cross-bedding.

Sta. 68. Anticline developed in black siltstone. View 245°. Hammer located approx 1 m to right (NW) of axial plane. Attitude of NW flank: 270/25 N; on SE flank: 30/35 SE, distance between measured attitudes ~3 m. Well developed fracture system occupies axial trace: 70/60 SE.

Sta. 68, approx 165 m upstream on SE bank. Parallel faulting over approx. width 5 m. Attitude: 210/90 with right lateral displacement. Drag structures either side of fault produce pseudo-tipi structures. Bed: 240/20 NW. View 140°.

Approx 150 m brg 10°, graywacke, bed: 355/25SW (I). Fract cleav: 85/90.

64 451280/6413520. Graywacke, coarse, sandy, weather out as large (3-5 m) rounded, linear o/c's. Bed: 105/35SW (I). Jointing: 345/80NE approx 3/m, 2-5 cm separation between joint planes.

Approx 70 m brg 190°, graywacke, well-bedded, exhibits alternating light and dk gry bedding laminae. Bed: 130/45SW (I).

65 450910/6410835. Creek channel, 6-8 m wide. Sandstn, quartzose. Bed: 60/30SE. Much cross-bedding. Jointing: South/90 approx 5/m. Fract cleav: 55/65SE. In places sandstn thoroughly decomposed, friable.

Continuing down creek channel (SSW) sandstn overlain by gry-grn siltstn with well devel'd fract cleav: 55/70SE. Sandstn grades into very coarse gritty bed (1 m wide). All rocks highly sheared: 65/40SE.

Approx 150 m down stream, sandstns becoming dk gry, silty. Bed: 45/45SE. Shearing continues: 50/45SE with broken qtz vein clasts dragged along shear planes.

66 450660/6410790. Large stream channel draining 125°. Good o/c's on SW side only overlain by gravel soil horizon 1.5-2 m thick. Siltstn, thoroughly sheared: 55/75SE fracts infilled with characteristic clay gouge, width of shear zone 40 m. Interbedded sandstn.

Approx 50 m upstream 290°. Siltstn, nearly blk with fine amphibole. Fract cleav: 65/70SE; old fract: 160/80SW.

Continuing upstream approx 80 m brg 290°, good bedding: 65/80SE.

67 450335/6411125. Sandstn, quartzose wirh minor lithic fraction, exhibits str amphibolite facies m/m. Cross-bedded. Bed: 50/20NW. Jointing: 20/90 approx 3/m.

68 450025/6411205. Creek bed. Siltstn, dk gry to blk, exhibit considerable small-scale folding. Central portion of creek (rock) strongly sheared: 290/85SW. Well-exposed anticline in creek.

Approx 40 m upstream (245°), well-displayed fault: 165/NE, gouge zone approx 20 cm, appears to be left lateral displacement as

indicated by drag structure. Fract cleav: 70/70SE.

Approx 120 m upstream (240°), another fault zone, approx 40 cm gouge zone, attitude: 75/75SE, wall-rock (siltstn) 1 m either side of fault mod silicified with str ferruginous impregnations. Sample **MD10R** material sampled from centre gouge zone, contains elongated cavities (parallel to shearing) gen filled with limonite, good cellular cavities, however, do not appear to be of sulphide origin. Bed: 35/50SE, very "wavy" bedding this area.

Approx 150 m upstream, silty sandstns, rd-brn, bed: 70/10NW (I).

Approx 165 m upstream, on SSE bank, faulting over width approx 5 m, attitude: 210/90, displacement is right lateral.

69 450045/6411475. Small tributary stream channel. Graywacke exposed in linear pattern across channel. Bed: 90/35N. Very old (well-healed) fract system: 20/85SE, adjacent host rk very resistant, wkly silicified.

70 451425/6400940. Maldorky Creek. Good o/c's on SW bank, graywacke, dk-gry to nearly blk, due to rich amphibole content. Faulting: zones to 6 m width with strong breakage and mylonitization, rotated clasts, str FeO, attitude: 55/75SE. 2nd fault loc'd 8 m brg 15°, right lateral displacement attitude: 80/60SE, gouge here characterised by typical bleached argillic material that infills along all fracts and cavities. Bed: 70/35SE. Jointing: 25/90 approx 5/m.

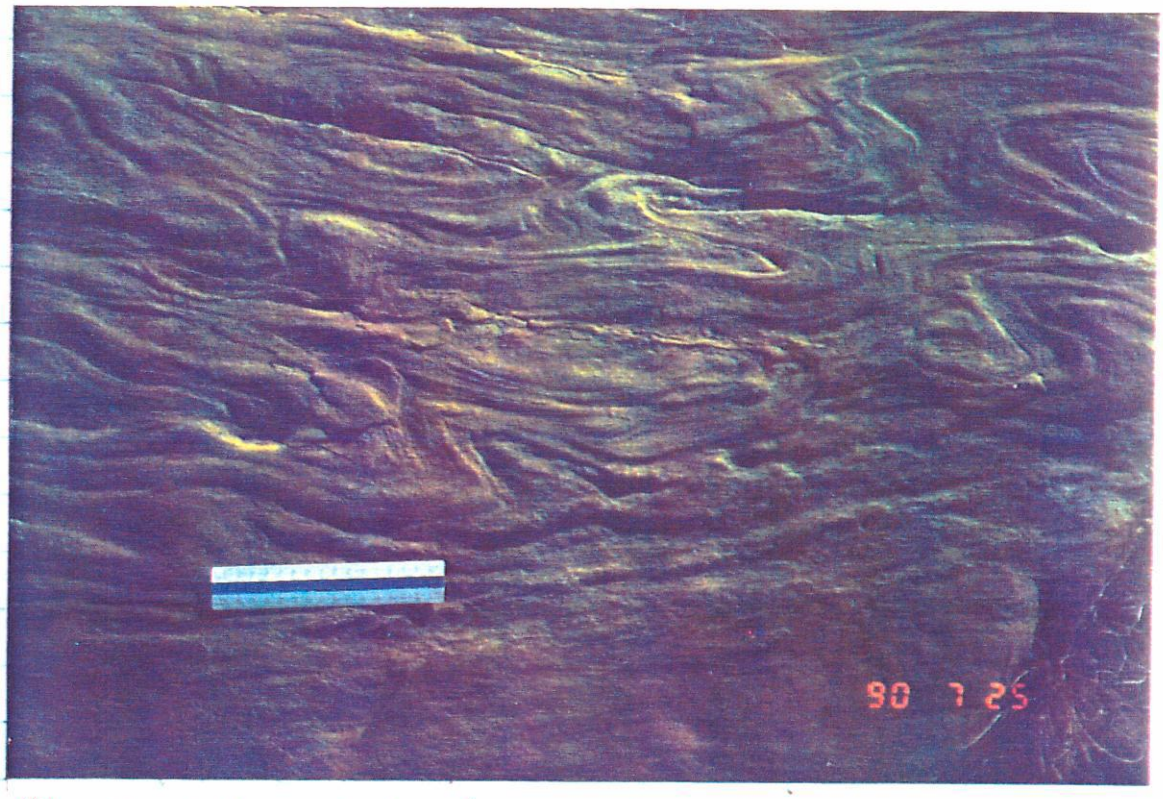
Approx 150 m S70W, graywacke, med to dk-gry, str amphibole devel't. Fract cleav: 70/50SE. Jointing: 20/80SE, approx 5/m.

71 451195/6400925. Graywacke, well-bedded, show very distinctive lt and dk gry laminae banding. Darker bands show a fining upwards to lighter colored material. Bed: 65/75NW (I). Jointing: 155/80NE, approx 5/m. 2nd bed measured approx 15 m upstream: 60/85NW (I).

72 451125/6410180. Maldorky Creek. Graywacke exposed in SSW bank, overlain by 1.5 m gravel soil. Appears to have suffered str amphibolite facies m/m. Rks are dk gry to blk. Bed: 60/40SE (I). Convolute bedding. Well-devel'd fract cleav: 60/80SE. Jointing: 170/80NE approx 5/m.

Approx 65 m upstream, fault crosses thru blk amphibolite facies rk and qtz veins (1 m): 30/85NW gouge zone approx 30 cm wide, displacement is right lateral as illustrated by displaced qtz vein.

Sta. 68, approx. 250 m up-stream. Classic imbricate stacking of flattened cobbles in Maldorky Creek. View looking North. Stream drains 75° on slope ~ 5%. According to Pettijohn (EJ, 1975) the mean upstream inclination in fluvial deposits is 15-30° with best inclination developed in larger sizes. Attitude of the cobble to left of hammer (35 cm length) is close to 80°.



Sta. 72. Maldorky Creek. Convolute lamination in calcareous graywacke sandstone. View vertical, top of photo 330°. Bed: 70/255E.

Approx 120 m upstream. Graywacke showing alternating light and dk gry laminae. Bed: 55/50NW.

73 451640/6410245. Gully. Graywacke, silty, highly broken, friable. Fract cleav: 60/80SE, invold with movement (amt ?), probably right as indicated by bedding-drag structure. Fract cleav: 60/85SE, measured 10-20 m to SE. Jointing: 10/80SE, approx 3/m gen with 5-10 cm parting along joint planes. Bed: 70/45SE (?).

74 451970/6410390. Graywacke, brn-rd on exposed lighter brn on fresh. Fairly massive with well-defined linear o/c N50E, 3-4 m width. Abundant fine, shiny blk amphibole (25-30%) minor amts of which have altered to limonite. Jointing: 10/70SE approx 10/m. Attitude: 50/70SE (?). Beds well-fractured, crackled, often filled with ›FeO‹MnO. Bed: 30/75SE.

75 452205/6410760. Gully. Graywacke, highly broken and sheared: 50/85SE. Much fine amphibole, locally punky, soft. Jointing: 10/85NW approx 3/m. Area thoroughly impregnated with the typical bleached argillaceous/calcareous material derived from comminuted rock.

Approx 110 m brg 310° from steel (?) gate in creek channel, graywacke, med to dk gry. Fract cleav: 70/80SE.

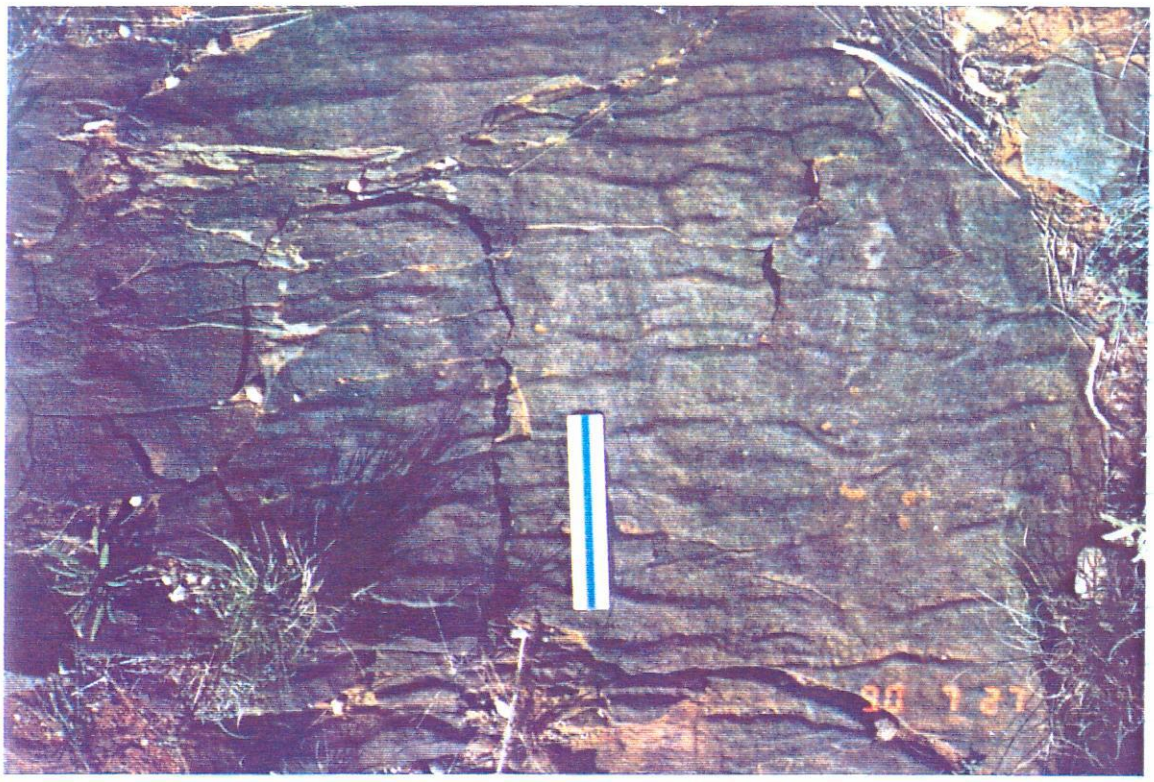
76 451825/6410990. Graywacke, coarse, dk gry-brn on exposed surfaces. Well-devel'd fract cleav: 65/85SE. Relatively massive and homogeneous producing broad (1-3 m) rounded o/c's. Transitional with coarse (0.5-1.0 mm) sandy facies. Distinct foliation (remnant bedding ?): 60/80SE. Jointing: 10/85NW; 160/80 NE approx 5/m.

77 451515/6411060. Ridge. Quartzite, lt brn (FeO) slt'ly reddish, very massive, approx 3 m width, trending 55/80NW (dip ?), cross-bedded. Bed: 45/35NW (II); 40/30NW (II); 40/30NW (I). Jointing: 25/85SE, tight, 3/m.

Approx 220 m brg 55° (at point on aerial photo where o/c exhibits curvature). Very massive qtzite. Bed: 65/35SE (I). Jointing: 15/85NW, 15-20/m. Curvature in line o/c a function of shallow bedding attitude, topographic loc'n (ridge crest) and erosion.

78 451165/6411605. Graywacke weathering produces sub-rounded o/c's 2-3 m diam. Bed: 135/35SW; 60/20SE difference in attitude due to wavy nature of bedding also probably cross-bedding. Joints:

Sta. 80. Qtzite erratic in pebbly sandstn. View 160°.



Sta. 91, approx. 70 m brg. N80E. Asymmetrical ripple marks developed in fine graywacke. Direction of development: 160° Attitude of bed: 25/15 NW (I). View vertical, top of photo is 70°.

25/85NW. Bed: 90/30S. Fract cleav: 80/85SE poorly devel'd. Bed: 95/20SW.

79 450765/6412180. Graywacke, lt to med gry-rd-brn, coarse grained, locally very coarse (2-3 mm). Fract cleav: 85/85SE. Bed: 170/15SW.

Approx 110 m brg 345° top of ridge, find large erratic of granite, med-grained, equi-granular, relatively fresh as compared to most erratics of this nature, no mafics other than FeO remnants. Measures approx 2 m diam, oval-shaped, jointed: 20/90; 5/m. Host is coarse pebbly cgl, coarse (0.5-1.0 mm) sandstn and typical graywacke. Bed: 80/80SE. Numerous erratic cobbles to 1 m diam mostly lt gry, hard qtzite, rounded cobbles graywacke (amphibolite facies m/m). Find interbedded dol limestn layers: 80/40SE (II), 2 m wide.

80 450555/6411895. Sandstn, pebbly comprising gry qtzite, med-grained granitic, lithic sandstn, sub-rounded to angular, very poorly sorted. Fract cleav: 75/85SE. Massive with thin dol interbeds to 60 cm: 70/75SE (II); 60/40SE (III). Est approx 20% pebbles with rare cobbles, tendency for elongated pebbles to parallel bedding.

81 450195/6412395. Gully, recent erosional. Siltstn, olive-grn. Fract cleav: 65/85NW. Traversing between Sta's 80 and 81 note numerous cobbles gry qtzite and med-grained granitics.

Approx 110 m @ N65W, tillite comprising cobbles of dolomite, lt gry-grn felsite (angular), pinkish med-grained granite. Bed: North/15W (I). Fract cleav: 65/85NW.

82 450000/6412060. Creek chanel with 1-1.5 m gravelly o/burden. Siltstn, lt grn. Fract cleav: 10/85SE, probably local tectonic, beds excessively broken and disrupted (minor rotation and displacement). Bed: 65/65SE (II). Abundant bleached, comminuted rock products filling fracts, joints, etc.

83 450040/6411580. Stream channel. Tillite comprising in sandy matrix. Fract cleav: 65/80SE, well-devel'd. Bed: 70/60NW (I).

84 451890/6411640. Creek channel. Siltstn, sandy with numerous interbedded sandstn layers (qtzose, lithic). Fract cleav: 65/65SE. Jointing: 10/85SE approx 3/m. Find str'ly ferruginous bed, excessively sheared, lies on SE margin large, linear qtz body 50 cm thickness, 10 m length: 40/75NW. Ferruginous bed: 60 cm wide,

40/75NW. Sample **MD11R**, comprises siliceous/FeO-rich mixture with abundant cavities formerly pyrite, non-calcareous, silky sheen (fine sercite), definitely hydrothermal limonite, matrix dense maroon-rd, pyrite to 1 mm diam, to 2 m thickness, at least 8 m exposed length. 2nd sample **MD12R**, from siliceous section of fract filling, two types silica, pervasive impregnations and angular clasts, milky-white. Minor pyrite clasts except those preserved in siliceous material.

Possible bedding in ferruginous shear zone. Bed: 80/50SE (?), parallelled by str shear structures. Jointing: 120/80NE surfaces heavily saturated with FeO causing slt'ly greater resistance to erosion.

Approx 100 m @ 250° (downstream) find large boulder (stream float), str'ly FeO-stained, crackled, carries sericite, red-orange limonite, slt greasy lustre to qtz. Sample **MD14R**.

85 451770/6411340. Broad topo rise. Sandstn, qtzo<felds, exhibits pervasive FeO-staining with dk limonite smears on fracts, joints, etc. Some ocherous-rd specks diss throughout rk (former pyrite). Find trace amts thin qtz veining, broken, disrupted. O/c forms slt topo relief, 50 cm with linear trend: 30. Fract cleav: 55/90. Find associated tillitic beds supporting pinkish qtzite boulders and cobbles, also granitic types with faint gneissic tex. Fract cleav: 65/80SE.

86 451725/6411705. Gully. Sandstn, pyritic, highly sheared, qtzo-felds comp'n, locally coarse sands gradational with finer horizons, light-gry often mudstn-like. Local tectonic activity responsible for rk deform'n. Shear zone approx 8 m width (sides concealed by o/burden). Sample **MD13R** from sheared sandstn, includes displaced siliceous/FeO impregnated sandstn, broken qtz vein products. Shearing: 95/70SW.

Approx 110 m @ N50E, sandstn, massive, very homogeneous weathering to large (1-3 m) rounded o/c's. Boulders , these rocks exhibit excellent small-scale cross-bedding. Bed: 120/15SW; 130/20SW (II); 120/20SW. Rocks have slight ferruginous matrix which contributes to brick-red soil horizon. Str'ly reactive to HCl.

Approx 220 m @ N15W, calcareous sandstns. Bed: 90/55S (I).

Approx 220 m @ N15E, calcareous sandstns. Bed: 75/55SE (I).

Approx 200 m @ N50E, calcareous sandstns and siltstns. Bed: 95/55SW.

87 450830/6411635. Conglomerate, with coarse sand matrix, minor cobbles. Jointing: 280/80NE. Arkosic tex and comp'n. Two qtz grain types: dull milky wht and clear translucent. Constituents comprise qtz, siltstn, felsite, biotite-bearing rk, qtzite cobbles, coarse-grained granite. Fract cleav: 85/80SE. Jointing: 30/85SE 5/m, planes with 3-5 cm separation.

Approx 60 m @ N50E, conglomerate, grades with coarse sandstn interbedded with siltstn. Bed: 55/55SE (III); 75/55SE (II). Occasional dol beds.

88 450510/6411525. Gully. Sandstn, calcareous, med grained, equi-grained. Carries diss pyrite (1-2%) in places quite fresh. Sample **MD15R**. Fract cleav: 75/80SE. Jointing: 20/85NW approx 5/m. Fairly massive o/c's. Bed: 95/65SW (III). Fault: 50/75SE, approx 60 cm gouge zone, sample MD15R was taken from hanging wall of this structure.

89 452450/6412475. Hill top. Graywacke, massive, carries about 20% fine, blk, shiny amphibole, o/c's weather to dk gry-brn, lt gry-brn on freshly broken surfaces, non-reactive to HCl. Convolute bedding. Fract cleav: 75/80SE. Jointing: 20/90 very tight. General area supports an abundance of massive, linear qtz bodies, 15-30 m length, to approx 1 m thickness. Bed: 35/10SE (III); North/15E (II).

90 452260/6412645. Small creek. Sandstone, lt gry, friable, graded bedding with dark mins at base becoming lighter upwards. Bed: North/20W (I). Fract cleav: 75/70SE. Find pinkish sandstn flt in creek, med grained, surfaces coated with FeO, carries limonite pseudo-morphs after pyrite to 2 mm, euhedral xtls. Non-reactive to HCl.

Approx 200 m @ S65W (upstream), good o/c well-bedded sandstn characterised by alternating lt and dk gry banding. Bed: 35/50NW (I).

91 451975/6412480. Saddle point between two opposite-draining creeks. Sandstn, lt and gry banded. Bed: 55/70NW (II). Considerable amts massive linear qtz bodies this area. Bed: 30/30NW, ripple marks, direction of devel't: 215°. Fract cleav: 270/75S.

Approx 70 m @ N80E, well-exposed o/c med gry-brn graywacke, carries diss pyrite (0.5-1.0%), auhedral weakly reactive to HCl.

92 451620/6412655. Creek channel. Graywacke, med-grained, exhibits characteristic lt and dk gry banding related to graded bedding. Beds slt'ly flexed. Gen bedding attitude: 50/70NW (I). Fract cleav: 70/75SE. Bed: 15/30NW.

93 451280/6413310. Ridge crest. Sandstn, quartzose in 3 m thick beds, interbedded with gry-brn graywacke, slt'ly reactive to HCl. Bed: 20/25NW (I). Fract cleav: 85/80SE West devel'd in graywacke. Jointing: 5/70SE, often occupied by thin (1-10 mm) qtz vns, walls frequently FeO-stained. Bed: 330/30SW (measured approx 30 m southerly of first measurement). Numerous massive linear qtz bodies, 1-2 m thick 30-60 m length gen: 60/80NW.

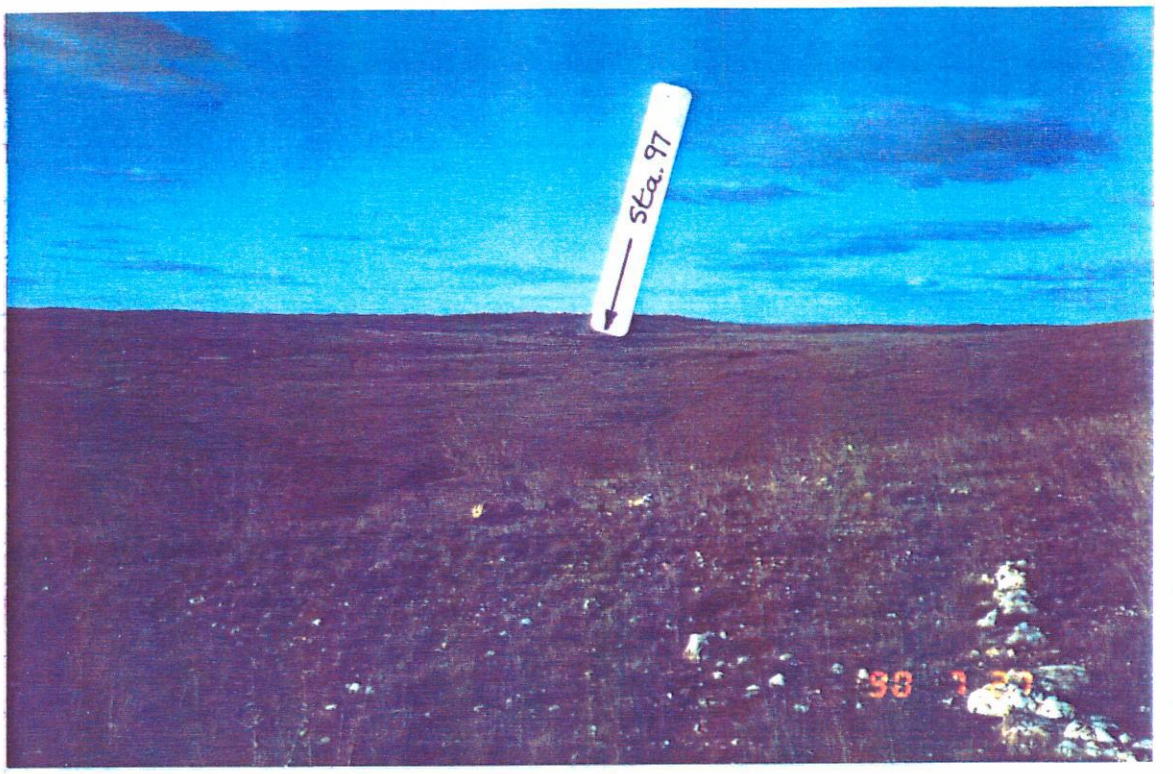
94 451435/6413540. Creek channel. Graywacke, str'ly weathered, decomposed. Fract cleav: 75/85SE, well-devel'd. Jointing: 10/85NW, 5/m.

Approx 80 m @ N28E (downstream), creek bed. Find large erratic granite, coarse granular, biotite-bearing. Fract cleav: 65/90. Bed: 60/15SE (?). Jointing: North/65E carries thin (2-3 cm) qtz veins. Fairly massive gry-grn graywacke.

Approx 350 m @ N30E (downstream), creek bed. Nick point as result faulting. Rock is graywacke, med to lt gry, NE side of fault graywacke more completely decomposed. Fault: North/80E, gouge zone approx 45 cm wide comprising comminuted graywacke, argillic products and wk FeO-staining. Displaced qtz vein indicates right lateral displacement.

Approx 450 m brg N40E (downstream), greenish siltstn with interbedded sandstn. Bed: 80/40NW (I); 65/55NW (I). Qtz veins to 30 cm thickness parallel bedding. Note locally str FeO-staining of siltstn where proximal to qtz veins containing limonite cavities, 50 cm thickness, highly crackled. Stream sediment sample **MD01S** comprises med-brn qtz sands and fine lithics and minor amts blk angular magnetic particles. Some adhering to qtz (vein) and FeO-stained rk, minor limonite, all weakly reactive to HCl. Overburden, as exposed in creek banks gen well saturated with yellowish FeO stain.

95 451700/6413990. Creek (as above). Siltstn, sandy, laced by numerous thin qtz veins: 350/70NE, 3-5 cm thickness, contribute str FeO staining to adjacent wall-rock. Bed: 115/40SW. Much



Sta 93. View from, looking 45°. Center of photo covers area of old copper mine (Sta 97)

Sta. 97. View south. Mullock heap to right accumulated through hand sorting, possibly some screening, of copper/gold ore. It is inconceivable to think that the miners here were unaware of the high gold and silver values associated with these copper ores.

SAMPLE No	Au.	Ag	As	Cu	Pb	Zn	
NH 06R	32.0	600	40	47.4	82	70	Tenorite, CuO
MD 18R	4.21	760	88	45.3	340	75	Tenorite, malachite
19R	4.13	480	36	37.5	32	66	" "
20R	0.79	550	78	26.8	70	135	Wall rock; CuO
21R	0.64	8	150	0.79	64	22	Silic'd sandstn
22R	0.41	20	72	0.66	28	30	"
23R	7.88	9	210	1.05	230	370	silic'd sandstn, malachite

Sta 97. South end of old copper mines. View 185°. Shows highly fractured sandstone with CuO staining derived from quartz veins and disseminated copper (chaleopyrite?). Fracture filling at

shearing this area: 75/70SE. Rockchip sample **MD17R** from 2 cm thick qtz vein, thoroughly fract'd and well-cemented by FeO and limonite. Bed: 40/40NW (I); 75/50NW (I).

Approx 40 m downstream find another str'ly FeO-saturated siltstn, also numerous fine qtz veining also limonite-bearing, most veins 1-2 cm: 350/75NE, highly crackled and FeO-stained.

Approx 110 m N25W in main creek, med to lt gry silty sandstn. Bed: 5/20NW (III). Fract cleaav: 80/75SE, well devel'd. Bed: 55/55NW (I); 105/40SW (I), appears creek development influenced by dense axial fract system of an anticline.

96 451880/6414035. Creek channel, drains due North, 3-4 m wide. Graywacke gen med gry-brn, locally slt'ly maroon color. Fract cleav: 65/80SE, well-devel'd. Jointing: 10/85SE. Bed: 45/35NW (I). Approx 1 m lithic/qtz gravel o/burden. Float cobbles in creek comprise: bull quartz, graywacke, granite, dk reddish mica-bearing igneous type with abundant FeO. Large erratic med-grained granite, bleached mica. Bed: 85/65SE (?).

97 452035/6413845. Copper mine, occupies broad hill crest. Principal rock type is sandstn, quartzo-feldspathic, med grained, very tough. Overall length comprises mostly carbonates and oxides of copper: malachite frequently filing cavities with well develop'd crystalline form, azurite, rare (red) cuprite and a black copper oxide resembling tenorite. The latter mineral occurs as relatively large (8-10 cm) irregular clots haloed by green copper oxide staining to several cm width. It is associated with high values of gold and silver.

Sample **MD18R** - Tenorite, dk blu-blk, dense, occuring as irregular clots to 17 cm width in shear zone to 30 cm and probably wider (2-3 m), 350/65SW. Entire face of workings (127 cm at south end), CuO stained.

Sample **MD19R** - from fracture filling comprising malachite less azurite, disseminated FeO/CuO specks and tenorite hosted by densely fractured sandstn. Argillic products occupy fracts along with CuO smears and pervasive staining. Several qtz veins: 355/55NE, 3-4 cm; 15/50SE to 5 cm; 160/45NE to 3 cm. Quartz often shows pyrite euhedral, 1-2 mm also cavities filled with ocherous limonite.

Sample **MD20R** - from west wall of workings, densely fractured sandstone with malachite, azurite, rare tenorite. Moderate

Sta 97. View 190°. Silicified fracture zone shows lower right. Attitude: 15/805E, about 3 m wide.

silicification and str argillization. All fracts stained with CuO.

Sample **MD21R** - silicified sandstn (mullock) laced with thin (1-3 mm) quartz veins, carries limonite-filled fracts and cavities, rare CuO.

Sample **MD22R** - silicified sandstn (wall rock), fractured but well-rehealed by silica, limonite and clays minor CuO staining, disseminated green (CuO) and black (chalcocite ?) specks throughout.

Sample **MD23R** - silicified sandstn (wall rock), highly fract'd with mod to str silicification, less FeO/CuO fract fillings, trace malachite, numerous multi directional quartz veinlets, strongly reactive to HCl (calcite and siderite veins and clots).

Fracture zone exposed between workings: 15/80SE, to 3 m width, tends to pinch out approx 125 m to North, approx 65 m to South. Best (most productive) ground occupies crest of hill. Regional fracture cleav: 75/80SE. N15E fracture zone exhibits bleaching, minor argillization with associated FeO-staining and str silicification as shown by hardness and resistance to erosion.

Sample **MD26R** from representative wall-rock, qtzo-felds sandstn, most rk contains at least trace amts CuO specks. Lt to med gry, even-grained sandstn, str'ly silicic. Most fracts carry thin smear malachite and/or CuO, also leached cavities filled with productive-appearing goethite.

98 Creek channel. Graywacke, exhibiting lit and dk gry banding. Bed: 15/20NW (I). Fract cleav: 90/85S, well-devel'd. Bedding wavy. Bed: North/20W (I). Gravelly soil overburden 1-1.5 m thick.

99 Graywacke, convolute bedding. Bed: 70/70SE (?). Jointing: North/65W, walls with FeO coatings. Cross-bedding. Rocks have slt gry-grn color on exposed surfaces. O/burden 50-150 cm thick.

Approx 15 m upstream. Bed: 45/50NW (II).

100 Gully. Graywacke, very massive. Attitude: 75/20SE based on remote measurement. Fract cleaav: 80/90; 85/80SE. Jointing: 20/80SE approx 3/m. Numerous massive linear qtz veins cut thru this area: N60E.

Approx 120 m upstream (S45W), alternating lt and dk gry banded

graywacke, very good bed: 80/20SE (I). Fract cleav: 90/80S well-devel'd.

101 Saddle point between two drainages. Graywacke, coarse grained with slt lt and dk gry banding. Bed: 20/40NW (I). Jointing: 35/85NW 10/m. Fract cleaav: 70/85NW. Bed: 125/30SW (measured at a point 20 m brg 205° from first measurement). Find large erratic granite, coarse granular, 1.5 m diam, well-rounded, several large granitic erratics found. Fract cleav: 80/80SE. Find pebbly sandstn layers. Bed: 50/80NW (measured at a point approx 25 m brg 80° from first bed attitude) (I).

102 Graywacke, med grained, fairly massive, producing well-exposed linear o/c's. Med to dk brn on exposed surfaces, lt gry brn on fresh. Bed: 05/75NW (?). Fract cleav: 75/85SE. Jointing: 05/50SE approx 2/m; 115/90 approx 5/m. Remote bed measurement: North/55E, tendency for massive linear qtz bodies to parallel this attitude.

Approx 70 m brg N30W (opposite side of creek) well-defined linear o/c graywacke. Bed: 30/50NW (I). Jointing: 10/80SE approx 10/m. Fract cleav: 95/85SW. Well exposed convolute bedding structures.

Approx 100 m brg S65W, good linear o/c graywacke. Bed: 15/10NW (I). Fract cleav: 80/85NW. Rocks are very finely laminated amplified by lt and dk gry banding, str'ly reactive to HCl. Bed (approx 60 m southerly): 10/25NW (I).

Approx 110 m brg S40E. Graywacke, coarse-grained with well-devel'd lt and dk gry bedding laminae. Bed: 05/30NW (I). Fract cleav: 70/90. Jointing: 05/85SE approx 5/m, paralleled by qtz veining (3-5 mm). Bed: 10/30NW (I).

103 Ridge crest. Sandstn, coarse grained alternating with finer grained facies, minor dolomite beds, all units str'ly reactive to HCl. Bed: 100/40NE (I). Finding large (5-6 m) blocks dolomite, obviously erratics along with gry qtzite boulders to 50 cm diam and granitic debris.

Approx 40 m brg 145° find large body dolomite, imbedded in siltstn, med gry. Fract cleav (silstn): 95/80SW. Bed in dolomite body (4 m diam): 140/15SW. Some qtzite cobbles exhibit gneissic structure. Large massive linear qtz vein: 60/80NW, about 1 m width at centre thinning both ends, 20 m length. Cuts through dolomite erratics.

Approx 310 m brg N20E, fine to med grained silty sandstns. Bed: 10/35NW (I). Fract cleav: 75/85SE. Massive linear qtz body, 10 m length, central portion to 60 cm width: 60/80NW.

104 Sandstn, med to coarse grained, exhibit considerable convolute distortions. Bed: 05/10NW (I). Fract cleav: 70/80SE. Jointing: 10/80SE approx 3/m.

Approx 350 m brg N40W (along fence line) good o/c fine silty sandstn interbedded in gry-grn siltstn. Bed: 25/35NW (I). Fract cleav: 95/70SW well devel'd.

105 Limestn, sandy, pebbly, relatively fresh. Contains round pebbles, small shale partings (mud clasts ?). Sequence of beds comprise reddish shale, highly calcareous with frequent pebbly and coarse sandy limestone: 30/75SE. Fract cleav: 100/85SW.

106 Gully, small (loc'd approx 110 m east of Sta 97). Siltstn, exhibit fairly pervasive FeO-staining, dk rd-brn to blk-brn on exposed surfaces. Fract cleav: 75/80SE. Bed: 50/75SE (II). Jointing: North/85W approx 10/m, walls with limonite smears also thin (1-3 mm) qtz veins showing sulphide casts. Quartz vein, highly crackled, str FeO with limonite fillings, 5 cm thick: 55/75SE. Stream sediment sample **MD02S** comprises reddish-brown silts, sands of angular ironstn (slt'ly magnetic), magnetite, FeO-stained qtz and lithics, lithics with attached quartz. Most joint planes exhibit considerable bleaching and locally silicification.

Approx 90 m brg S40E, hill side, resistant o/c silty sandstn, mod FeO and multi-directional qtz veining. Sample **MD24R**. Cross-bedded. Bed: 80/50NW (III). Fract cleav: 80/90. Jointing: 355/85NE, paralleled by thin qtz veins.

Approx 65 m brg S40W, silty sandstn, hydrothermally altered, saturated with yel-brn FeO, qtz veinlets. Sample **MD25R** quite porous, siliceous, sulphide cellular network. Two types qtz: milky white and greasy lustered type and a dk gry to smoky qtz type. No good o/c here, the thought occurs that this "exosure" may have been dumped! The 10,000 ppm As is anomalous for the type mineralisation found so far. Fract cleav: 95/80SW.

107 Gully (same as Sta 106). Sample **MD03S** comprises FeO-stained sand size qtz, some with remnant limonite after sulphides, magnetite including angular pieces ironstn with attached (vein) quartz. Rock is lt to med gry sandstn. Non-reactive to HCl. Fract

cleav: 85/85NW. Jointing: 10/85SE frequently occupied by thin (2-3 mm) qtz veinlets.

108 Sandstn, silicified, cut by quartz vein, good FeO and limonite. Rockchip sample **MD27R** comprises silicified qtzose sandstn, o/c stands slt relief (10-20 cm) due silicification trend: North. Qtz vein associated with o/c: North/85E. Gen blk-brn color, fresh breaks show trace amts diss specks CuO.

APPENDIX B

SUMMARY OF GEOCHEMICAL SAMPLING

APPENDIX B

SUMMARY OF GEOCHEMICAL SAMPLING
EXPLORATION LICENCE 1657 SOUTH AUSTRALIA

ROCKCHIP SAMPLES
(Gold reported in ppb other elements in ppm unless otherwise shown)

SAMPLE	STATION	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
MD 01R	07	8	<1	7	145	12	10	Siliceous sandstone, limonitic
02	08	4	<1	<2	34	10	22	Fault breccia, silicic, pyritic
03	17	2	<1	4	62	18	8	Vein qtz/hematite, limonitic
04	22	6	<1	32	35	30	30	Vein qtz/limonite, crackled
05	39	2	<1	3	65	52	22	Igneous, intermediate, siderite
06	40	<2	<1	<2	9	8	16	Dike siltstone wallrock, qtz veins
07	41	<2	<1	<2	9	14	8	Igneous siliceous, siderite/calcite
08	20	<2	<1	3	22	10	14	Igneous, FeO, pyritic
09	54	4	<1	3	220	15	14	Coarse sandstn, limonitic
10	68	10215	28	380	2100	710	105	Fault gouge, limonitic, 40 cm
11	84	110	<1	13	44	140	11	Ferruginous bed, silicic, limonitic
12	84	18	<1	10	54	115	17	Siliceous fracture filling, limonite
13	86	16	<1	18	38	110	16	Sheared sandstn, SiO_2/FeO
14	84	14	<1	<2	14	15	10	Stream float, crackled cericite
15	88	<2	<1	3	13	22	22	Sandstn, diss pyrite (1-2%)
16	92	30	<1	60	175	210	88	Fractured filling, pyritic, limonite
17	95	110	<1	96	88	120	280	Qtz vein, fractured, limonitic
18	97	4215	760	88	45.3%	340	75	Shear zone, tenorite, CuO/FeO
19	97	4130	480	36	37.5%	32	66	Shear zone, tenorite, diss FeO/CuO
20	97	795	550	78	26.8%	70	135	Sandstn, fract'd, tr tenorite, CuO
21	97	640	8	150	7900	64	22	Sandstn, thin qtz vns, tr CuO
22	97	410	20	72	6600	28	20	Sandstn, silicic, diss CuO/FeO
23	97	7880	9	210	1.05%	230	370	Sandstn, silicic, diss FeO/Cuo
24	106	4	1	28	95	22	64	Sandstn, qtz vng, mod FeO
25	106	5105	20	1.0%	450	1.5%	330	Sandstn, rich FeO, coarse veinlets
26	97	300	3	410	1350	770	12	Sandstn, silicic, diss CuO, goethite
27	108	32	1	40	3600	60	12	Sandstn, silicic, tr diss CuO

STREAM SEDIMENT SAMPLES
(Gold reported in ppb other elements in ppm unless otherwise shown)

SAMPLE	STATION	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
MD 01S	94	24	<1	40	190	72	92	Qtz sands, FeO-stained, magnetite
02	106	14	1	86	100	100	100	Qtz sands, FeO-stained, ironstone
03	107	12	1	110	130	150	100	Qtz sands, FeO-stained, limonite

APPENDIX B

SUMMARY OF GEOCHEMICAL SAMPLING
EXPLORATION LICENCE 1657 SOUTH AUSTRALIA

ROCKCHIP SAMPLES
(Gold reported in ppb other elements in ppm unless otherwise shown)

SAMPLE	STATION	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
MD 01R	07	8	<1	7	145	12	10	Siliceous sandstone, limonitic
02	08	4	<1	<2	34	10	22	Fault breccia, silicic, pyritic
03	17	2	<1	4	62	18	8	Vein qtz/hematite, limonitic
04	22	6	<1	32	35	30	30	Vein qtz/limonite, crackled
05	39	2	<1	3	65	52	22	Igneous, intermediate, siderite
06	40	<2	<1	<2	9	8	16	Dike siltstone wallrock, qtz veins
07	41	<2	<1	<2	9	14	8	Igneous siliceous, siderite/calcite
08	20	<2	<1	3	22	10	14	Igneous, FeO, pyritic
09	54	4	<1	3	220	15	14	Coarse sandstn, limonitic
10	68	10215	28	380	2100	710	105	Fault gouge, limonitic, 40 cm
11	84	110	<1	13	44	140	11	Ferruginous bed, silicic, limonitic
12	84	18	<1	10	54	115	17	Siliceous fracture filling, limonite
13	86	16	<1	18	38	110	16	Sheared sandstn, SiO_2/FeO
14	84	14	<1	<2	14	15	10	Stream float, crackled cericite
15	88	<2	<1	3	13	22	22	Sandstn, diss pyrite (1-2%)
16	92	30	<1	60	175	210	88	Fractured filling, pyritic, limonite
17	95	110	<1	96	88	120	280	Qtz vein, fractured, limonitic
18	97	4215	760	88	45.3%	340	75	Shear zone, tenorite, CuO/FeO
19	97	4130	480	36	37.5%	32	66	Shear zone, tenorite, diss FeO/CuO
20	97	795	550	78	26.8%	70	135	Sandstn, fract'd, tr tenorite, CuO
21	97	640	8	150	7900	64	22	Sandstn, thin qtz vns, tr CuO
22	97	410	20	72	6600	28	20	Sandstn, silicic, diss CuO/FeO
23	97	7880	9	210	1.05%	230	370	Sandstn, silicic, diss FeO/Cuo
24	106	4	1	28	95	22	64	Sandstn, qtz vng, mod FeO
25	106	5105	20	1.0%	450	1.5%	330	Sandstn, rich FeO, coarse veinlets
26	97	300	3	410	1350	770	12	Sandstn, silicic, diss CuO, goethite
27	108	32	1	40	3600	60	12	Sandstn, silicic, tr diss CuO

STREAM SEDIMENT SAMPLES
(Gold reported in ppb other elements in ppm unless otherwise shown)

SAMPLE	STATION	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
MD 01S	94	24	<1	40	190	72	92	Qtz sands, FeO-stained, magnetite
02	106	14	1	86	100	100	100	Qtz sands, FeO-stained, ironstone
03	107	12	1	110	130	150	100	Qtz sands, FeO-stained, limonite

APPENDIX C

EXPENDITURE STATEMENT

EXPENDITURE STATEMENT
NILPENA HILL PROJECT 179

PERIOD 17.5.1990 TO 16.8.1990

	$
Personnel	1,415
Drafting	150
Assaying	1,096
Consultants - Geological	8,150
Motor Vehicles	1,630
Tenement Costs	1,190
Field Costs	462
GROSS EXPLORATION EXPENDITURE	$14,093

6418000mN
6417000mN
6416000mN
6415000mN
6414000mN
6413000mN
6412000mN
6411000mN
6410000mN
650000mE
651000mE
652000mE
653000mE
654000mE
655000mE
656000mE
657000mE
658000mE
659000mE
660000mE

Olary Creek

Rockhole Dam

MALDORKEY HS

REFERENCE

- Contact. Dashed where inferred.
- Fault. Showing attitude and relative displacement. Dashed where inferred.
- Anticline. Showing direction of plunge.
- Syncline.
- Strike and dip of inclined beds.
- Strike of vertical beds.
- Strike and dip of inclined fracture cleavage.
- Strike of vertical fracture cleavage.
- Strike and dip of inclined jointing.
- Strike of vertical jointing.
- Massive linear quartz veins.
- Strike and dip of inclined mineralized structures.
- Strike and dip of dike, intermediate composition.
- Geologic station and number.
- Sample location and number (R-rock, S-stream sediment, L-soil)
- Shaft.
- Prospect.

USER NOTES:

1. This plan is to be regarded as a preliminary document; the primary purpose of which is to locate geologic observation and sampling points. A final plan, complete with standard unit descriptions and explanatory details, will be prepared on completion of field studies.
2. AMG co-ordinates have been scaled from the OLARY 1:250 000 (SI54-2) sheet and therefore may be considered approximate only.

0 500 1000m

Aztec Mining Company Limited

NILPENA HILL PROJECT

EL 1657

MALDORKY GOLD ANOMALY (PRELIMINARY)

Scale:	1:5,000	Map reference:	OLARY 1:250 000
Author:	F. Greene	Sheet	of
Drawn:	F. Greene		
Date:	September 1990	Plan No.	179-02

8325-1

8325

048

MINERALS EXPLORATION REPORT

EXPLORATION LICENCE 1657
NILPENA HILL AREA
ADELAIDE GEOSYNCLINE, SOUTH AUSTRALIA

Combined Second and Third Quarterly Reports
for the periods ending 16 November 1990 & 16 February 1991

Aztec Mining Company Limited
99 Shepperton Road
Victoria Park, Western Australia, 6100

AUTHOR: Frank F Greene, Consulting Geologist
Oxford Resources Pty Limited, 9 MacPherson Street
Cremorne Junction, New South Wales 2090

EXPLORATION MANAGER: Aztec Mining Company Limited
99 Shepperton Road, Victoria Park, Western Australia 6100

DATE: 4 March 1991

DISTRIBUTION: Dept of Mines and Energy(1), Aztec Mining Company Limited (2), Oxford Resources Pty Limited (2).

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Combined Second & Third Quarterly Reports
for the periods ending 16 November 1990 & 16 February 1991

Nilpena Hill Area
Exploration Licence 1657
Adelaide Geosyncline, South Australia

SUMMARY

This report comprises exploration results covering EL 1657 for the six-month period 17 August 1990 through 16 February 1991. Basic data, presented in a number of appendices, originated with reconnaissance work covering the entire Nilpena Hill area and detailed work relating to the Maldorky Special Area.

The tenement is located in the Olary Province, roughly one hundred straight-line kilometers southeast of Broken Hill, NSW. The Barrier Highway, connecting Adelaide with Broken Hill, passes through the tenement's northwest corner.

EL 1657 was granted to Aztec Mining Company Limited on 17 May 1990 for a period of one year. It covers 440 sq km. Principal commodities sought are the base and precious metals.

Maldorky Hills are the principal topographic feature, they represent a moderately rugged assemblage of hills occupying the northeasterly extent of the Benda Ranges. Remainder of the land is gently undulating plains.

Olary Province supports a predominantly pastoral industry. However, mining during the period from about 1872 through the 1930's is responsible for much of the area's early development. Mineral exploration activities remain aggressive to the present day.

All rocks exposed in the area belong to the Adelaidean sequence. They comprise formations ranging upwards from Upper Sturtian through Lower Marinoan. The Wilyerpa Formation is the most predominant, thickest and supportive of small precious metal mines and prospects. Intrusive rocks comprise several sets of northeasterly trending lamprophyric dikes.

The area's structural setting is extremely complex having been shaped by at least five deformational episodes. Faulting tends to be dominated by northeasterly trends which closely parallel that of diking activity and mineralization. Folding includes large regional synclines through small drag folds. The latter structures have been carefully sought out and investigated for their mineral-trapping capability.

Reconnaissance study of the Nilpena Hill tenement, was initiated by an aerial observation survey aimed at spotting structurally anomalous land forms. Completion of this work and a subsequent ground reconnaissance eventuated in the selection of a number of smaller areas where detailed investigations are still in progress.

The Maldorky Special area covers some 80 sq km of the tenement's southeast corner. It supports a number of small Cu/Au/Ag mines and prospects that lie within a northeast-trending zone roughly one kilometre in width by about six kilometres in length. Two anomalies, Teague's Fork and Junction Creek, are currently under detailed investigation for their gold/silver mineralization.

A 54% area relinquishment has been recommended. Ground to be retained (203 sq km) includes the Maldorky Special area and eluvial covered lands occupied by the eastern terminus of the Ulupa Syncline.

INTRODUCTION

This report brings together basic data and results of exploration activities obtained for EL 1657, the Nilpena Hill area (NH) and for a select study area within the tenement, the Maldorky Special area (MDS). The report covers the two quarterly reporting periods commencing 17 August 1990 through 16 February 1991.

It comprises three main sections, narration of results, a number of appendices including geochemical data summaries, and functional plans.

LOCATION and ACCESS: The 440 sq km tenement lies within the Olary Province (Fig 1) about 100 straight-line kilometres, S65°E of Broken Hill, NSW. The nearest trading post is Olary[1], comprising a railway station, hotel and small store with post office and fuel.

The Barrier Highway, national route 32, passes through Olary on its way from Adelaide to Broken Hill and points east. Although sealed and generally well-maintained, its relatively narrow width, heavy, high-speed truck traffic and itinerant kangaroo population can make night-time driving dangerous.

The Indian-Pacific railway, a transcontinental, standard gauge route, has been considerably upgraded since being acquired by the Australian National Railways. Although there is no regular service provided for Olary, the station does include a siding that is frequently used by track maintenance crews.

There are numerous private station airstrips in the vicinity of Olary. The best is probably at Wiawera homestead, located 7.5 km southeast of the post office where the Royal Flying Doctor makes fortnightly medical calls. Owned and maintained by Keith Treloar (Ph 080-911 526), the earth strip regularly services light twin-engine aircraft.

Station tracks are extensively developed throughout most of the Olary

[1] Olary (32°17' S Lat/140°20' E Long. Elev approx 300 m) with a current population of six, was once an important commercial centre catering to both mining and grazier industries. Principal goldfields included New Luxemburg, Kings Bluff, the Macdonald Hill mines area and literally hundreds of other base and precious metal workings scattered within a 30-km radius of the old town.

EL 1657

Aztec Mining Company Ltd

NILPENA HILL PROJECT

EL 1657

TENEMENT LOCATION PLAN

Scale 1:250 000

Date 26 August 1990

Author : F. Greene

Figure 1

Province. Their owners and managers rarely object to their use by explorationists except immediately following heavy rainstorms. Vehicles fitted with 4WD are useful in negotiating sandy drainages and their steep, often undercut, embankments.

Exploration traverses have been facilitated by the use of agricultural motorcycles. The use of tyre linings to minimise punctures, a carrying rack for samples, etc and leggings to protect against bush abrasions are useful additions. Handheld UHF transceivers are carried for reasons of safety and to enhance field operations.

TENEMENTS: Exploration Licence 1657 was initially granted to Aztec Mining Compamy on 17 May 1990 for a period of one year. Its total area is 440 sq km and the principal commodities sought are the base and precious metals, particularly gold.

PHYSIOGRAPHY

The gross terrain of the region, of which Olary province is a part, conspicuously reflects Delamanan geological structure within a sinuous structurally high zone incorporating the Mt Lofty Ranges to the south, the Benda Range and the Barrier Range in the north-east. This zone separates the Frome Embayment on the north from the Murray Basin to the south (Fig 2).

LAND FORMS: Set within this structurally high zone, the tenement's most impressive topographic feature is the Maldorky Hills, an isolated, moderately rugged assemblage of differentially weathered and eroded land forms that owe their relief and unique shape to a highly distorted and varied Adelaidean lithology. The two prominent peaks are Maldorky (AMG 457 529.3/6 411 225.0) topping at 412.7 m and Nilpena Hill (AMG 455 705/6 422 920) at 317 m.

Most of the western half of the tenement is a gently undulating plain, moderately dissected and supporting extensive grass and blue bush growth. Slight relief features, best identified on aerial photographs, are often the sinuous reflection of underlying stratigraphic grain and/or linear geologic features[2].

[2] Basic dikes with case-hardened wall rocks and massive, elongate quartz bodies often form modest linear or lumpy relief features. In some places, mineralized trends are marked by faint alignments on aerial photgraphs.

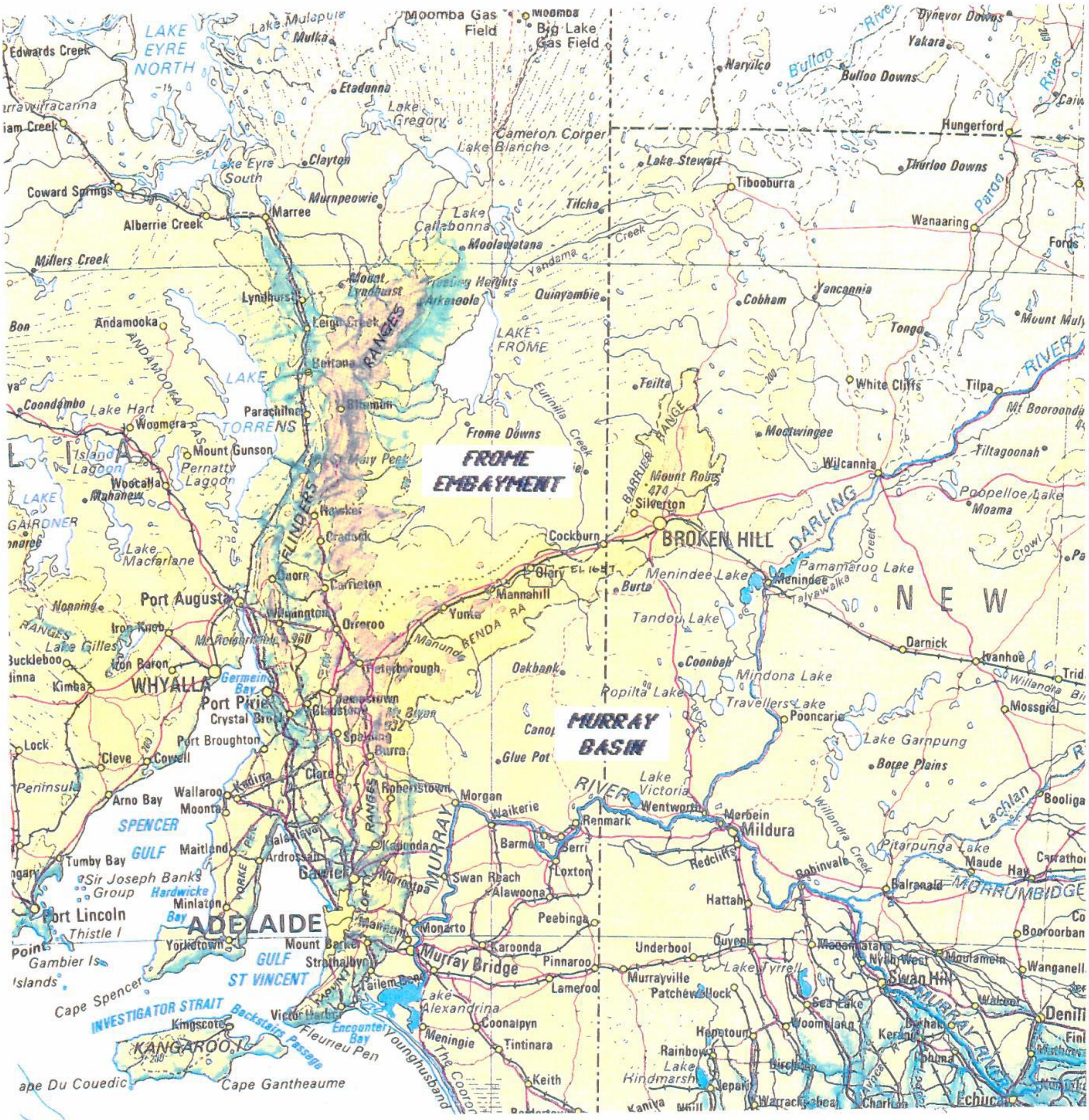

Figure 2. Topography of the Mount Lofty, Benda and Barrier Ranges, and adjacent regions of South Australia and New South Wales.

Olary Creek is the principal fluvial system. Draining southeasterly, it has a total gathering ground, or watershed, of some 195,000 hectares. Like the hills through which the creek cuts, its course is in large part controlled by the bedrock structure . On expansive flats and lowlands the drainage fragments into a braided system of broad, gravel-choked channels.

CLIMATE: The region's semi-arid weather pattern is gradational with typically hot summers and mild winters with few frosts. Rainfall records for the 50 years to 1977 (Table 1) suggest that annual precipitation becomes progressively less proceeding easterly from Yunta to Cockburn (146 km). This observation, according to local graziers, may be inversely applied to temperatures.

Table 1. Average rainfall statistics for four meteorological stations between Yunta and Cockburn, SA. Values to nearest millimetre. (Australian Government, 1977).

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Yunta	20	21	15	16	22	22	16	19	18	21	20	19
Mannahill	20	18	14	14	19	20	14	17	15	20	17	18
Mingary	19	20	16	13	19	15	13	13	12	18	16	15
Cockburn	19	18	15	16	23	19	13	15	14	19	18	16

Unofficial rainfall records for the four-year period, 1987-1990, obtained from local pastoralists (Sawers, Thomas and Francis, 1991) show a 5 percent increase over the averages given in Table 1. This latter data also indicate March, April and May as the principal rainy months.

HISTORICAL SKETCH

Historically, the Olary province has been a pastoral domain with the earliest pioneers or "run hunters" arriving in the early 1840's. Testimony of these early sheepmen can be found in the tenement area in the form of relic shepherd's huts and sheep enclosures. Their camps were often located in the vicinity of naturally occurring waterholes, sites also favoured by the indigenous land owners, the Wiljakali aborigines.

Pastoralists are renown for being the first to "stumble across" the valuable ores of a given mining district. In such a way in 1872, it was a shepherd who discovered the richly auriferous, stratabound lodes at Waukaringa (Brown, 1908).

This discovery attracted more experienced prospectors who found gold-bearing reefs at Mannahill in 1885, the Teetulpa alluvial goldfield the following year, Kings Bluff and New Luxemburg goldfields and Mutooro copper mine in 1887 and the Wadnaminga lodes in 1888. The Olary

province continued to produce new, small base and precious mines up to the end of the 1800's.

Opening of traffic on the Terowie-Cockburn railway link in 1887 was an added boon to the prospering towns of Yunta, Mannahill and Olary. For local mining, the route contributed to, if not sustained, the operation of many small base metal mines.

Although most of the mineral fields and their respective mines were abandoned by 1930, the province continues to attract the nation's most aggressive mining and exploration companies.

Radium Hill, located immediately east of the tenement area, produced low grade uranium ores from 1954 to 1961, Mount Mulga low grade barite since 1962 and at Waukaringa and Mannahill gold from leaching operations since 1988.

GEOLOGY

Exploration Licence 1657 lies within the northeasterly-most portion of the Nackara Arc (Fig 3), a province of the Adelaide Geosyncline noted for its multi-episode (Delamerian) arcuate folding (Preiss, 1987) and the fact that it supports most of the State's larger reef and alluvial gold fields (Morris and Horn, 1990).

STRATIGRAPHY: The Adelaidean sequence in the tenement area is represented by the upper Sturtian Pualco Tillite, Benda Siltstone with interbedded Braemar ironstone facies, a thick section of the Wilyerpa Formation and the Tapley Hill Formation including its basal Tindelpena Shale member.

Lower Marinoan formations, Tarcowie Siltstone and Enorama Shale, are found only along the western edge of the tenement where they are exposed in the trough of the Ulupa Syncline.

The Wilyerpa Formation is the dominant stratigraphic unit in the tenement area. It has the largest surface expression, the greatest thickness and is the principal host to gold mineralisation. It has been described as a flysch-like sequence deposited in a subsiding marine trough during the second glacial stage of the Sturtian Period (Preiss, 1987). Reported thickness is up to 2,500 m in the vicinity of Nilpena Hill, thinning westerly to 115 m in parts of the Benda Range.

Lithologies encountered during mapping include calcareous siltstones with interbedded quartzose sandstones often occurring as prominent

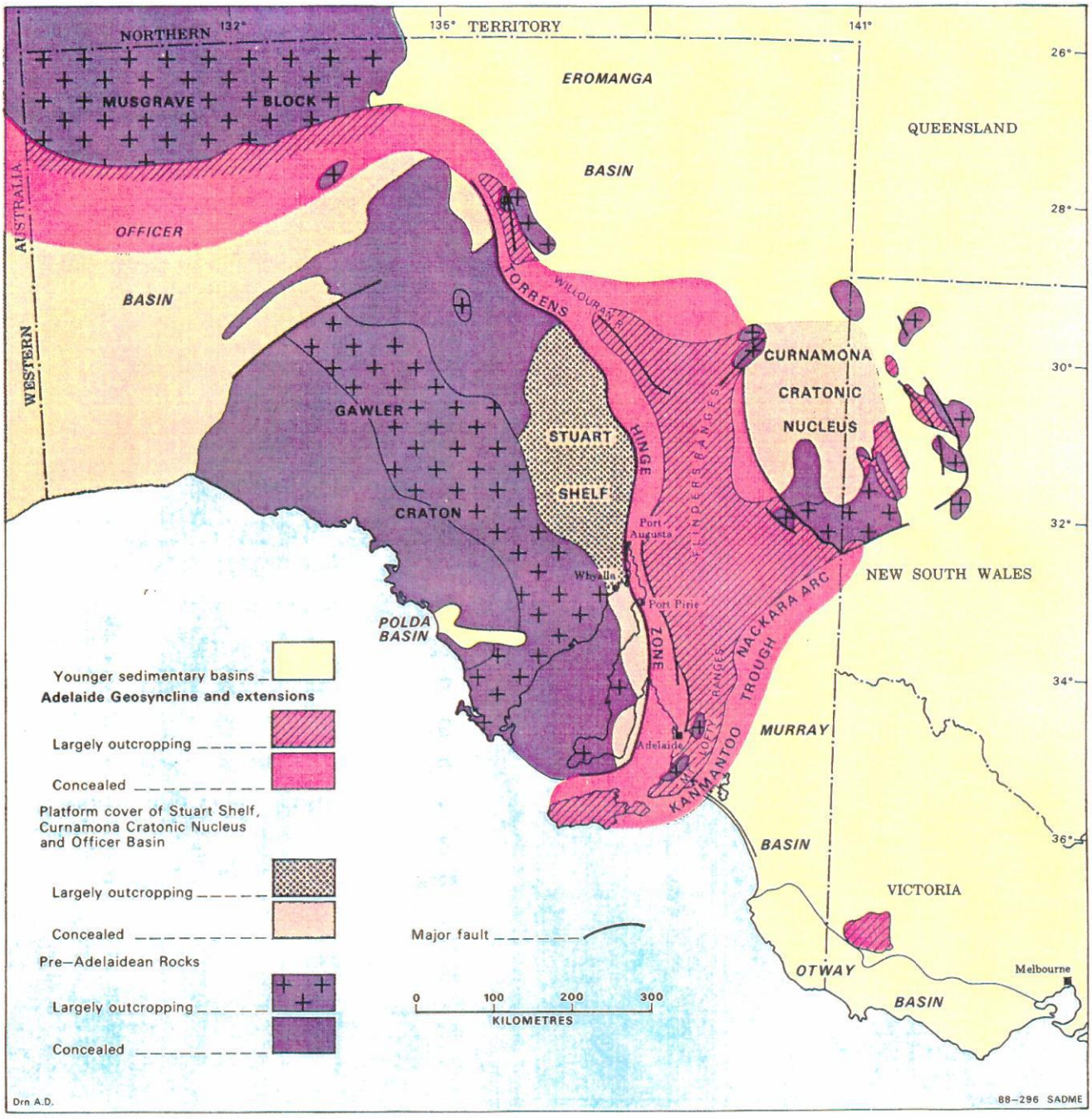

Figure 3. Tectonic provinces of South Australia, western New South Wales and Victoria. After Johns, RK, 1988.

linear outcrops to several kilometers length, graywacke with sparse but ubiquitous dropstones, arkosic beds, quartzite, pebbly sandstones, grits and conglomerates.

A sinuous mass of slump breccia, or what appears to be such, has been mapped in the south central portion of the Maldorky special area (MDS, Sta 50). Characterized by poor sorting and random fabric, it comprises a chaotic mixture of sub-rounded to sub-angular cobbles and blocks of pink felsite, grey quartzite, reddish shale and mudstone, silicified limestone(?) and at least two types of granite. Its strike conforms to that of the country rock, a graywacke exhibiting small scale cross-bedding and locally extensive intraformational deformation.

A large lens-shaped body of coarse-granular granite measuring 73 m N20E by 30 m in width was found in the southwest corner of the Maldorky Special area (MDS, Sta 42). Implanted in grey-green siltstone of the Wilyerpa Formation, its axis of elongation lies normal to local bedding with the contact being marked by a slight case hardening of the bordering siltstone.

Traversing easterly, up-section in the Wilyerpa Formation, from Nilpena Hill to its contact with the Tapley Hill Formation near Maldigo Bore, the sequence shows a fairly gradational change from predominantly coarse arenaceous sediments through graywacke and calcareous siltstones. Calcareous, and to less extent, conglomeratic and gritty units tend to predominate towards the top of the formation.

INTRUSIVE ROCKS: Several lamprophyric dike sets strike northeasterly through the tenement. Most are of the biotite-rich type, kersantite, characterized by a coarse porphyritic texture with an abundance of large titanium-biotite phenocrysts. Alteration is regarded as deuteric and there is no indication of post-crystallization stress (Appendix E).

A hornblende-rich lamprophyre (spessartite) dike has been mapped out on the alluvial plain west of Maldigo Bore (NH, Sta 126). Occupying a northeasterly-trending ridge, the intrusive is about a metre in width by some 1150 m in length. The rock's fabric is dominated by a coarse, multi-directional assemblage of prismatic hornblende crystals with intergrown calcic plagioclase and minor olivine.

Generally diking is concordant, or very nearly so, exhibiting sharp contacts with, and slight case-hardening of, the host wallrock. Although thoroughly decomposed and often exhibiting negative relief (MDS 127), the intrusives are clearly visible on aerial photographs as long, straight, N25E-trending lineaments. On the ground, however, individual dikes are

often found to deviate slightly along zones of weakness originating with jointing, regional fracture cleavage and massive, linear quartz bodies.

Emplacement of the basic dikes post-dates all fold deformation in the area. For the Olary Sheet, Forbes and Pitt (1980) show that the dikes follow emplacement of the Anabama Granite and Morris (1977) suggests that, at Anabama Hill, they were intruded around 450 Ma.

STRUCTURE: The structural setting at Nilpena Hill and environs is complex, occupying a wedge-like pocket enclosed by pre-Adelaidean basement inliers to the east, the regional, Ulupa Syncline to the west and the Anabama Granite to the south. Chapman and Ryan (1988) attribute the structural complexity of this area to intense ptygmatic folding.

Five deformational episodes have contributed to the area's structural composition, three are pre-Adelaidean and two are Delamerian (Berry et al, 1978). The two Delamerian events are responsible for the overall shape and metamorphism of Adelaidean rocks and include such features as the broad Ulupa Syncline and deformation associated with the regional Anabama Fault and MacDonald Shear Zone (Forbes and Pitt, 1980).

Planar structures measured during the current study include regional fracture cleavage, jointing, faulting, massive linear quartz emplacements and bedding.

Fracture cleavage, essentially a shear phenomenon, usually conforms with the axial trace of local folding. The inclination of such cleavage, however, is less conformable. In the tenement area, the cleavage-fold relationship is remarkably well-displayed (Plate I) by a broad arching fracture cleavage-trend, concave to the south, that conforms to the axial-trend of major and minor folding.

Jointing appears to be insensitive to any relationship with folding. Jointing has a fairly consistent N05-15E trend in the western half of the tenement area with slight deviation to N20-30E in the eastern half. However, joint attitudes do exhibit a close conformity with fissure vein mineral-isation.

Faulting exhibits a preferred northeasterly trend through most of EL 1657. Northwesterly breaks are less evident and appear to be more localised.

In the southwest corner of the Maldorky Special area there are at least three, sub-parallel, N55E-trending lineaments. They are conspicuous on aerial photographs for their marked tonal changes, truncation of stratigraphy, and control of drainage. On the ground they are

distinguished by zones of dense fracture cleavage, mylonitization and as preferred sites for rabbit warrens.

The "structures" can be detected on Landsat imagery (ACRES 96-82) as a single linear some 20 km in length, ie, from the homestead at Devonborough Downs thence N55E to the old homestead (ruins) at Nilpena.

Only the most westerly of the three lineaments appears to be associated with mineralisation, and the relationship is speculative at this time. It involves Teagues Fork anomaly, a system of gold bearing fractures and shears which cut across a N70E-trending, D5 generation anticline.

In addition, results of an earlier geochemical survey indicate that this area is anomalous for its arsenic and base metal content (Chapman and Ryan, 1988).

A N15W-trending lineament is postulated as truncating the eastern limits of the "ptygmatically" folded section of the Maldorky Hills. Sediments from streams draining the "structure" were tested for base and precious metals with discouraging results.

Anticlinal folds are prime exploration objectives in that they may well constitute natural traps for both epigenetic and supergene mineralisation. The most obvious of these (MDS Sta 316 and 335, NH Sta 7) have been investigated and found to be non-productive.

Two small, but less well-defined, folds similar to that at Teague's Fork have been found at Jim's Well (MDS Sta's 120, 119) and Junction Creek (MDS Sta's 97, 108, 136, 137), where small copper-gold showings were exploited by early miners.

Massive, linear quartz bodies are well represented throughout the tenement area with a particular preference for the Wilyerpa Formation. Like jointing, they bear no relationship to either one of the later Delamarian deformational phases. In fact, they have been found to be caught up in minor, fifth generation folding and are every where sliced by the regional fracture cleavage as well as ore-bearing fissures.

EXPLORATION PROGRESS

Exploration within EL 1657 has satisfied the objectives of a geologic-geochemical reconnaissance survey and defined an area of special

interest where considerable detailed work has been carried out. Remainder of the area is recommended for relinquishment (Fig 4).

RECONNAISSANCE PROGRAM: Initially an aerial "JETREX[3]" observation/ photographic survey was carried out to quickly locate special areas exhibiting structural settings favorable to the localisation of near-surface gold-bearing ores.

The eastern-most section of the Ulupa Syncline was selected for its historically productive stratigraphic section. Reconnaissance traverses were recommended westerly down the structure's axial trace to locate gossanous beds bearing supergene gold.

The area about Nilpena Hill was another regionally attractive reconnaissance target possibly attributable to a large domal structure. Its internal structure is consistent with compression from the northeast to produce tight northwest trending folds on the northeast flank and thrust faulted imbricate displacements on the southwest flank. There was a possibility that the area could contain an intrusive at depth.

Results of the Nilpena Hill (NH) reconnaissance are compiled on Plan 01, field notes in Appendix A and geochemical data in Appendix B.

MALDORKY SPECIAL AREA: Results of reconnaissance work have highlighted an 80 sq km area for more detailed study. Located in the southeast quarter of EL 1657 its outstanding features included:

1) a physiographic setting implying widespread, deep erosion, and supergene enrichment potential,

2) a structural environment with a variety of potentially ore-trapping and/or -concentrating anticlines together with several emplacement and associated hydrothermal precious metal mineralisation.

3) an igneous component in the form of intermediate and basic dikes plus features intimating stock-dimension intrusive centres from which ore-bearing emanations may issue, and

4) several precious metal geochemical anomalies detected in rockchip and stream sediment sampling.

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[3] JETREX is a registered (NSW) company experienced in airborne geologic observation and oblique photographic surveys. Its principal is: JE Thompson, Geologist, 101 Eastwood Ave, Epping, NSW, 2121. Phone: (02) 869 8095.

A number of Cu/Au/Ag prospects, small mines and anomalies have been located. All lie within a N30-35E-trending zone about 1000 m in width by six (6) km in length. Two areas of interest within this zone, Junction Creek and Teague's Fork, have been recommended for additional study.

Results of current field work is presented on Plan 02. The relevant field notes occur in Appendix III and geochemical data in Appendix IV.

AREA RELINQUISHMENT: Following appraisal of EL 1657 exploration reconnaissance results, it is recommended that 380 sq km of the original be relinquished and 60 sq km be retained as shown in the following plan (Fig 4).

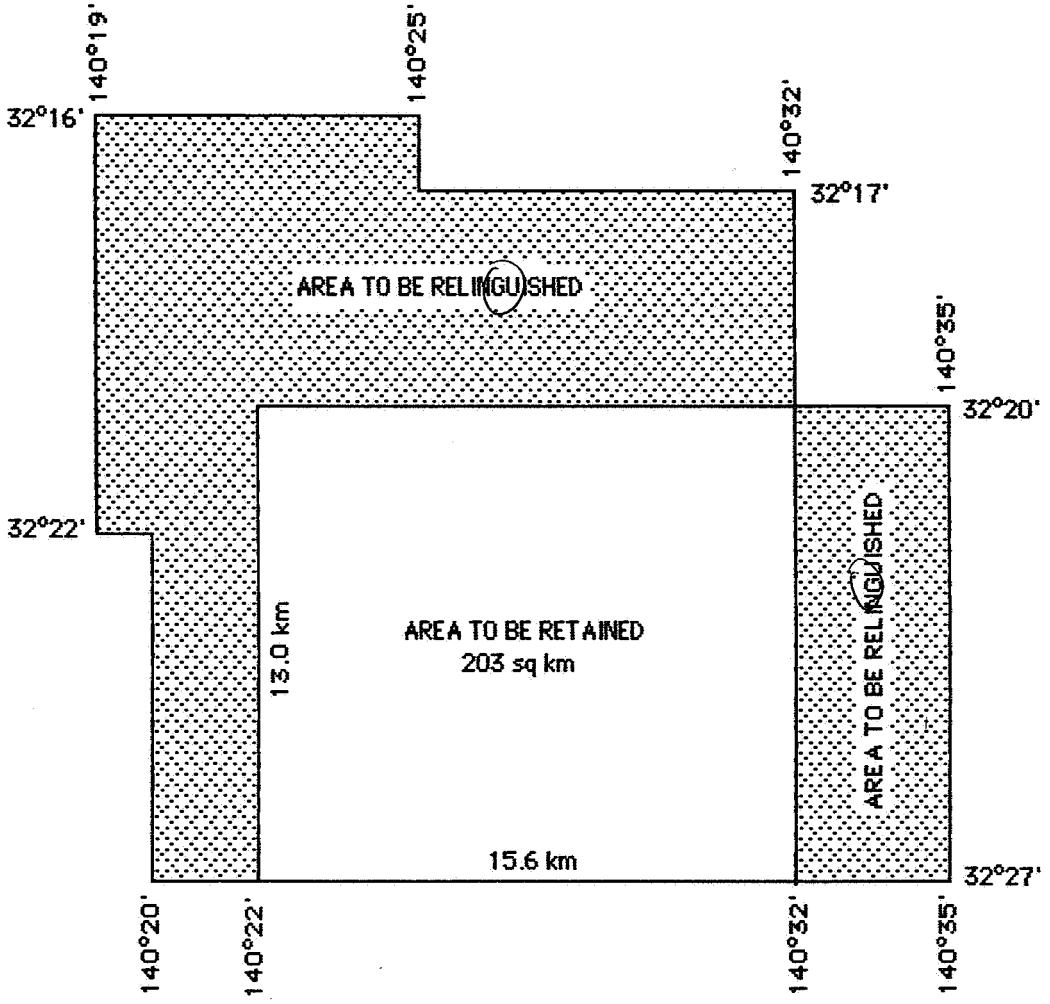

Figure 4. Plan of Exploration Licence 1657 showing area to be relinquished (237 sq km) and retained (203 sq km).

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APPENDIX A

NILPENA HILL
1989-1990 GEOLOGIC FIELD NOTES

CONTENTS

APPENDIX A

1989-1990 GEOLOGIC FIELD NOTES

NILPENA HILL AREA, EXPLORATION LICENCE 1657
OLARY PROVINCE, SOUTH AUSTRALIA

01 454965/6416350. Quartzite, massive, tough, lt gry on fresh breaks. Forms prominent o/c's 8-12 m width producing system of resistant linear o/c's. Interbedded silty sandstn. Fracture cleavage: 275/85SW. Joint: 195/80SE, 10/m.

02 456235/6416465. Quartz vein to 2 m width, milky white, attitude: 65/75NW approx 30 m in length, pinching out at both ends. Host rock is a hornfelsed sediment (siltstn/sandstn).

Hand lens inspection reveals fine-grained metacrystalline, non-foliated rock, dark gry, dense and very hard. Hornblende crystals are fine (.5-1 mm), randomly distributed and constitute 40-50% of rock. Slightly reactive to HCl. Remnant bedding faintly visible: 45/50NW. Fracture cleavage: 265/85SE. Joint: 10/80NW, 5/m; 305/60NE. Disseminated limonite specks.

125 m upstream (N55°W) in creek, find large erratics (30-40 cm) of two-mica granite. Host rock is conglomerate, poorly sorted. Pebbles, cobbles, etc sheared and drawn out parallel to fracture cleavage: 275/85NE. Constituents include black hornfelsed siltstn, granitic cobbles, light colored fine-grained sandstn. Sandy matrix. Fracture: 210/85SE, walls stained with FeO. Some pebbles show very fine laminar structure (Photo 01):

Stream sed sample **NH02S**, material comprises silts and sands quartz derived from quartzite and veins, generally with FeO coatings and/or limonite inclusions, minor ferruginous clasts, hornfelsed siltstn, magnetic fraction includes minute, euhedral cubes limonite, magnetite and lithics with dark ferruginous attachments. Brown dolomitic limestn bed: 285/60SW (III). Joint: 25/85NW, 10/m. Bed: 285/60 SW (I), 70 cm thick. Stretched conglomerate lies south of dolomite with hornfelsed siltstns to north.

03 456560/6416100. Hornfels (siltstn/sandstn) dark gry to black, fine metacrystalline texture. Fracture cleavage: 290/80SW. Faint

foliation (relic bedding ?): 245/70NW. Fracture cleavage: 270/40S, well-developed.

Photo 01. Station 02. View S05°W shows sheared conglomerate in creek bank. Fracture to left of hammer: 210/85SE, wall rock slightly FeO-stained.

04 457375/6416245. Hornfels. Dark gry to black, strongly reactive to HCl. Fracture cleavage: 120/75SW, well-developed. Joint: 220/85SE, 5/m. Faint foliation: 65/35NW. Abundant white quartz chips scattered about surface.

05 458680/6417085. Creek, exposes conglomerate, grn-gry, strongly sheared. Joint set: 210/90, 5/m, mod FeO-staining. Fracture cleavage: 112/85SW, coincides with plane of shearing (Photo 02). Pebbles consist of lt gry silstn, med grained granitic, lt gry to off-white sandstn. All constituents exhibit hornfelsic alteration. Massive sandstn bed o/lying conglomerate hornfelsed, faint foliation (former bedding): 95/20NE. Sheet jointing (in sandstn): 25/85SE. Hand specimen marked "NH05" (oriented).

06 459100/6416615. Olary Creek, north side, prominent cliff-forming o/c, 8-10 m relief. Quartzite, lt gry with faint greenish tint (chlorite ?) an alteration product of sparse mafic grains. Bed: 65/15NW (I). Exhibit good small scale cross-bedding. Joint: 345/85NE, 10/m. Fracture cleavage: 105/85NE, well-developed.

Interbedded conglomerate beds, 10-50 cm thickness, less resistant to erosion producing marked scour channels. Some constituents to 10 cm diameter, considerable amounts granitic type with large muscovite phenocrysts. Sandy matrix often black but minimal magnetic. Shows hornfelsic alteration.

Photo 02. Station 05. View vertical. Top of photo S60°E. Shows sheared conglomerate, hammer parallels jointing: 210/90, 5/m. Fracture cleavage coincides with shearing: 112/85SW.

07 458350/6417345. Hornfels, exhibits disseminated cubic cavities (to 1 mm) former pyrite (5%). Foliation (former bedding ?): 85/15NW. Joint: 30/85NW, 5/m. Rock highly schistose, conglomerate horizon. Fracture cleavage: 305/85SW, coincides with plane maximum shearing. Joint: 20/85NW, weak FeO-staining, 5/m. Cut by quartz veins that pre-date shearing as shown by their displacement etc, drawn-out parallel to fracture cleavage, often as isolated clasts (5-8 cm thickness), sample **NH01R**.

08 454685/6416270. Olary Creek. Quartzite bed, gry-grn, extremely hard, 3 m thick. Carries disseminated limonite specks (1-3%) former pyrite. Bed: 120/40SW. Joint: 5/90, 5/m. Small scale folding outlined by resistant quartzite bed (Photo 03). Bed (NE side of creek): 115/45SW. Fracture cleavage:185/70SE.

09 458575/6417470. Creek bed (same as that for Sta 07). Strongly hornfelsed sandstn/siltstn, disseminated limonite specks. Foliation (remnant bedding): 115/30SW (II). Joint: 215/85SE, 10/m.

10 458270/6417765. Creek. Hornfelsed sediments. Fol: 125/55NE; 100/65SW (small fold). Joint: 25/90, 10/m.

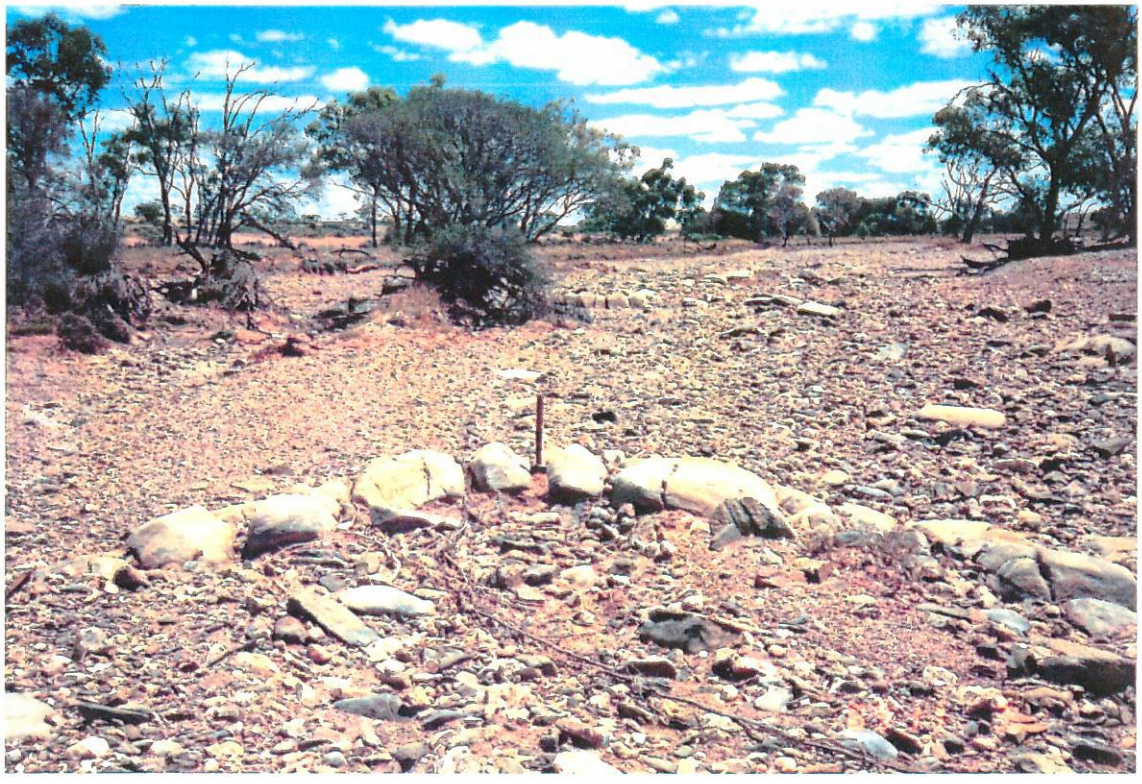

Photo 03. Station 08. View N80°W shows crest of small anticline marked by resistant quartzite bed. Structure plunges -30° N80°W. Left flank: 95/35SW, right flank: 85/15NW. Jointing: 280/85SW.

11 459190/6418040. Quartzose sandstn, well-oxidised and slightly friable. Reddish FeO streaks throughout. Bed: 110/50NE. Joint: 210/90, 10/m. Fracture cleavage: 150/85SW.

12 459295/6418550. Creek confluence. Hornfels, dark gry-grn, highly crystalline. Fracture cleavage: 115/85SW. Joint: 210/90, 5/m. Fol: 115/55NE (I); 110/65NE (I); 110/75NE (I). Joint: 205/90, 20/m. Fol: 105/65NE, all four foliation measurements taken 25 m separation traversing upstream. Numerous quartz emplacements to 1 m width 8-15 m length, parallels foliation.

13 459140/6418870. Creek bed. Hornfelsed sandstn, well-preserved bed: 285/55NE (I). Joint: 205/90, 2/m. Well-developed graded bedding amplified by light and dark grey banding (Photo 04).

Approx 200 m bearing 235°, tributary drainage, well-preserved bed: 280/60NE (I). Thoroughly hornfelsed siltstns. Joint: 300/85NE, 5/m.

Photo 04, Station 13. View N80°W shows sandstone with light and dark banding (graded bedding) produced by coarse quartz-rich and fine-grained lithic clasts respectively, grades up from light to dark with new cycle generally commencing with sharp contact cut into dark band. Light quartz-rich base of cycle often with slight relief.

14 454955/6413420. Quartzite 15-20 m thickness, one of several resistant beds, trend 160°. Fracture cleavage: 75/85NW.

15 455340/6412600. Hornfelsed sediments, interbedded sand/pebble laminae. Dark mineral appears to be biotite. Fol: 280/55SW. Joint: 200/90, 30/m.

16 455875/6411820. Old mine workings. Open cut, 50 m length, 2 m width, ~3 m deep. Develops 15 cm quartz vein: 70/15SE, carries CuO, malachite, good ocherous discoloration. Quartz has greasy lustre. Sample **NH02R**. Second vein 5 cm thick parallels first vein within 10 cm separation. Host rock is hornfelsed sandstns/siltstns. Fol: 115/30SW, wavlength=2 m. Principal vein: 195/85SE.

Miners appear to have removed all of this vein for treatment. Hanging wall is tough gen non-altered hornfels, footwall

considerably broken, rotated clasts, rehealed with calcrete. Joint: 20/85SE. Sample **NH03R** from rare remaining quartz vein material. Hand specimen labeled NH16. Outcrop to immediate south of open cut: 60/55SE (II), quartzite. Joint: 20/90, 10/m.

17 456780/6410900. Hornfelsed sandstns/siltstns, sugary texture, fine to med grained, dark gry. Fol: 85/30SE. Several large, massive quartz emplacements, lens shaped to 10-20 m length by 1 m thickness.

18 455575/6411270. Hornfelsed sediment (siltstn ?). Fracture cleavage: 105/90, well-developed. Fol: 75/60NW. Wide spread irregular quartz veining, pinkish, greasy lustre, generally paralleling foliation.

19 454945/6417445. Olary Creek. Hornfelsed sandstns/siltstns, exhibit wavy foliation (former bedding) as well as what appears to be soft rock deformation and cross-bedding (Photo 05). Foliation (bedding): 20/20NW. Joint: 285/90, 5/m.

Photo 05. Station 19. View N55°W shows linticular bedding (flaser bedding) and cross stratification in alternating sandstone and siltstone. Note domal feature (left side of photo), resembles a soft rock piercement structure.

20 456900/6417615. Small tributary creek. Quartzite, lt pinkish with argillic blebs presumably derived from alteration of feldspar and

lithics, extremely hard, massive. Fracture cleavage: 270/70N. Joint: 355/65SW, 10/m. Faint foliation (former bedding ?): 255/65NW; 270/50N, both poor measurements.

21 456900/6417655. Quartzite, pinkish gry, extremely hard. Bed: 95/70NE. Joint: 200/90, 5/m. Few scattered quartz veins to 3 mm thickness, milky-white, non-productive. Fracture cleavage: 105/75SW. Cross-bedding noted.

22 456800/6417010. Creek bed. Hornfelsed sediments, very contorted and weathered (friable), grn-gry. Faint fol: 95/50NE, looks like cross-bedding. Fracture cleavage: 105/85NE. Joint: 30/85NW, walls show preferred resistance to decomposition suggesting therm alteration.

Stream sed sample **NH01S** consists of silts and sands of quartz derived from quartzite, quartzose sandstone and veins, usually with FeO-stain, hornfelsed siltstn, mag, amphibole and ferruginous clasts. Magnetic products include euhedral cubes (.5-1 mm) pseudomorphs limonite after pyrite, abundant schistose lithics, silts reactive to HCl.

23 456355/6417025. Igneous type, thoroughly hornfelsed originally intermediate composition, exhibits lumpy (5-10 mm) texture esp on weathered surfaces resembling mineral aggregates, quartz phenocrysts, sub-rounded (2 mm diameter), minor yel-org limonite specks, slight gneissic structure, feldspar appear to be somewhat drawn out or stretched.

Sample **NH04R**. Joint: 195/85NE. Float cobbles exhibit characteristic hypidiomorphic granular texture, biotite in part altered to chlorite, bleached (semi translucent) muscovite, suspect this rock an erratic. **NH05R** from contact zone within igneous rock, abundant hornblende, very fine grained, argillic clots (3 mm), FeO.

24 453300/6414440. Creek bed. Hornfelsed sediments, lt to med gry, abundant fine, shiny black amphibole. Fol: 325/5SW (III). Fracture cleavage: 275/70SW. Stream sedimentary sample **NH03S** comprises silts and sands quartz from veins and quartzose sediments, abundant off-white schist clasts, greenish schistose clasts and ferruginous grains or shot, relatively large amounts magnetite and small (.5-1 mm) euhedral limonite cubes. Fol: 320/25SW (I).

25 453415/6413715. Creek bed. Hornfelsed sediments, well-developed fracture cleavage: 275/75SW. Joint: 5/85SE, 5/m.

26 452720/6413765. Hornfelsed sediments. Fracture cleavage: 280/90. Fol: 270/55N, paralleled by numerous, massive bull-quartz veins .5-1 m thickness 20-30 m length. Joint: 10/90, 5/m.

27 452060/6413825. Old copper mine workings. Comprises an open cut 16 m length bearing 185°, 2 m wide, originally 3-4 m deep. Vertical shaft sunk at south end of cut, down ~8 m. Host is lt lt gry quartzose sandstn, well-indurated, massive, bed: 5/65SE (III). Highly fractured: 5/85SE. Joint: 85/85NW, 5/m. Mineralisation comprises malachite and a dense steel blue sulphide resembling tetrahedrite, occurs as fault filling: N/75W.

Rockchip sample **NH06R** from main vein. Hand specimen marked NH27. Width of vein 14 cm, pinches out in places. Second fracture filling on west wall, fault 180/85W, hanging wall saturated with CuO, malachite and minor azurite, minor quartz veining. Second hand specimen marked NH27 includes quartz, tretrahedrite, malachite. Wall rocks are light brown sandstn laced with numerous multi-directional veinlets filled with malachite. Two additional prospect pits occur 26 and 54 m respectively 05° from north end of open cut. Well-developed fracture cleavage on periphery of workings: 265/90.

Workings occupy crest of small ridge paralleling strike of open cut. Minor prospecting on strike with main workings carried out to south, 22 m from south end of cut. Fracture cleavage: (SE side of workings): 260/90. A third small open cut located 86 m north of north end of main workings, highly sheared hornfels, saturated with FeO, less CuO.

28 452350/6414600. Creek bed. Quartzite, massive. Quartz vein trend: 355/85NE, several very straight, thin (3-8 cm) quartz veins. Fracture cleavage: 270/90, carry minor amounts quartz filling.

29 452620/6409935. Maldorky Creek. Quartzite, common interbedded rock type of Wilyerpa Fm, lt to med gry. Fracture cleavage: 20/85SE. Joint: 290/86NE, 10/m well-developed. Approx 70 m southeasterly (down stream): same rock type, fracture cleavage: 60/70SE, well-developed. Bed: 40/30NW (II).

30 452385/6408140. Tillite (Pualco Tillite), dark to black on exposed surfaces (dark color a function related to hornfelsic m/m).

Numerous pebbles and cobbles (to 40 cm diameter) comprise biotite granite, a fine grained felsite (volcanic ?), lt gry quartzite. Foliation relates to planes of pebble elongation/flattening: 115/70SW.

31 452590/6406955. Siltstn (hornfelsed). Fracture cleavage: 65/70SE. Gry-grn on exposed surfaces. Widespread quartz veining, lt blu-gry 30-40 cm thickness: 70/80NW, highly crackled and rehealed. Approx 200 m down stream (south) take stream sed sample **NH04S** from magnetite concentrate (75% mag, 25% quartz sands with FeO coatings).

32 452535/6406696. Stream confluence. Quartzite interbedded in Pualco. Tillite, lt gry-brn. Laced with quartz veins, discontinuous, white sweated from host quartzite. Bed: 80/45SE. Joint: 25/80NW, 10/m. Faint indication of cross-bedding.

33 451450/6407000. Erosional gully. Siltstn, calcrete coated, sandy, non-reactive to HCl. Fracture cleavage: 85/80SE. Approx 150 m N25E: Bed: 105/85SW, represents plane of elongated and flattening of pebbles.

34 450450/6407245. Pualco Tillite, siltstn, yel-grn. Fracture cleavage: 105/35SW, suspect this is a bedding attitude. Joint: 20/85NW, frequently bearing thin (3-5 mm) quartz veinlets. Fracture cleavage: 65/60NW. Approx 30 m N25W large quartz vein 2 m thickness, 20 m length: 80/45NW. Hosted by siltstn, yel-grn. Cut by fault: 40/85SE, 40 cm breccia (quartz clasts in ferruginous-siliceous cement). Sample **NH07R** from fault breccia. Found old (1969-70) survey (geophysical) stake.

35 449515/6406480. Dozer cut exposing large quartz vein, cut trends 265°, 30 m. Vein 2.5 m thickness at max pinches out within 50-60 m: 85/65SE, also bedding attitude. Second small dozer cut located 20 m to 335° from main cut. Host rock is tillite, gry-grn. Bed: 75/45SE (I).

According to Maldorky station manager, David Teague, there was considerable interest in good quality (non-stained) quartz which was exploited from this area for several years.

36 454280/6407775. Maldorky Creek, 20 m in width. Rock o/c on SW bank is tillite, lt gry-grn, wavy bedding: 80/55SE. Hornfelsic m/m. Fracture cleavage: 85/80SE, well-developed. Joint: 25/85SE, 10/m, often with calcrete fillings.

37 455055/6407870. Quartzite, lt rd-brn due FeO in cementing medium. Joint: 345/90. Quartz veins to 60 cm width: 35/80NW 25 m in length.

Sample **NH08R** from brecciated zone, comprises angular quartz clasts embedded in a tough, siliceous/ferruginous cementing medium, matrix also contains hydromica, euhedral flakes to 1 mm diameter, translucent. Hand specimen NH37.

38 455250/6408355. Large quartz vein to 3 m width: 75/85SE well-developed fracture cleavage: 5/85NW. Joint: 275/80NE, 20/m. Quartz exhibits greasy lustre with FeO-stain throughout. Host is tillite (Pualco Tillite), strongly hornfelsed, massive, contains granitic cobbles, quartzite. Foliation (elongated pebbles): 95/70SW; 90/85S, a well-displayed sandstn bed. Larger vein cut by small brecciated quartz vein: 190/85NW.

Sample **NH09R** of brecciated quartz in silicic/ferrug cement. Ferruginous material locally spongey, resembles alteration, product of siderite.

39 456340/6409400. Tillite, med to dark gry-brn on weathered, gry on fresh surfaces. Strongly recrystallized and calcareous. Fol: 60/70NW (II). Two large quartz bodies, each 1 to 2 m width, strike length <20 m: 65/75NW. Fracture cleavage: 30/85NW, well-developed. Interbedded dolomitic limestn, to 1 m thickness. Bed: 45/55NW (II). Tillite sandstns show graded bedding commencing with coarse quartz grains fining upwards to dark silts, cycles are 2-3 cm width. Locally find flaser bedding structure.

40 455865/6409820. Creek drains small canyon formed by tightly folded quartzite ridges. Siltstn, highly recrystallized, exhibit light and dark banding (Photo 06). Bed: 245/90, slight tendency for beds to dip to NW. Fracture cleavage: 275/80SW; 235/90, slight off-set of beds. Beds right side up.

41 456335/6410460. Small creek, drains another closed canyon (to west) produced by tight east-west folding. Quartzite forms ridges either side. Creek bed exposes highly fractured tillite. Fracture cleavage: 85/90. Suspect faulting has been recurrent on quartzite/tillite contact: 65/70SE, width of gouge zone 2 m. Bed: 100/85NE (I).

42 458045/6410375. Small creek, exposes quartzite (part of ridge-forming lithology to NE). Massive, lt to med brown on exposed surfaces. Fracture cleavage: 75/85SE. Joint: N/80E, 3/m.

43 458060/6411325. SE draining valley bound on either side by quartzite ridges. Sandstn, fine to med grained, reddish, highly ferruginous.

Sample **NH 10R** comprises ferruginous, slightly spongey replaced with minor fractured quartz clasts. Find numerous granitic cobbles, dropstones weathered from tillite. Fracture cleavage: 280/85NE.

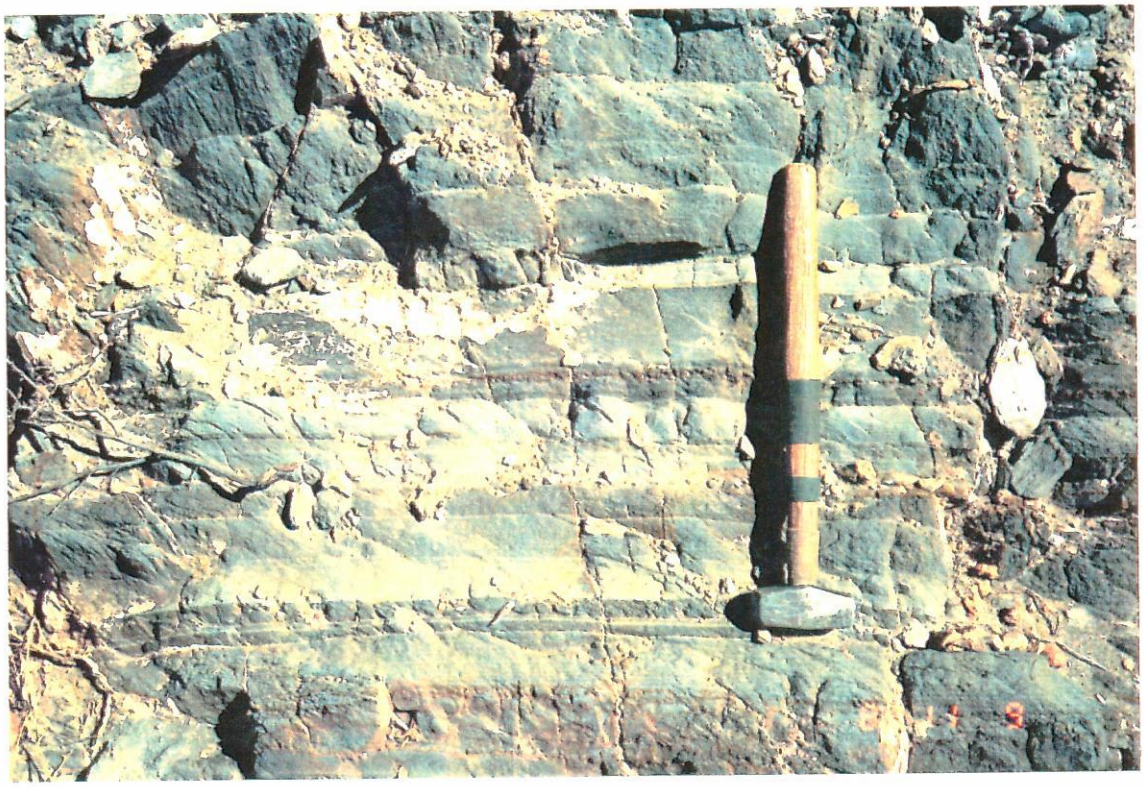

Photo 06. Station 40. View vertical. Top of photo S50°E showing alternating light and dark grey banding (graded bedding) in siltstone. Bedding: 245/90. Fracture cleavage: 275/80SW; 235/90. Latter fractures offset bedding.

44 458580/6411500. Quartzose sandstn/silty sandstn, ferruginous, highly fractured and broken. **NH 11R** from gossanous outcrop, laced with numerous limonite veinlets: 165/85SW. Rock o/c's either side bleached and leached, possibly transported limonite into open fractures. Fault gouge, highly crushed on rotated clasts. Fine hydro mica gives surface sheen-like lustre.

Observation: Abrupt termination these imbricate quartzite ridges suggest that they have been cut off by faulting. Other than the current station, little other evidence indicating displacement. Aerial photo study shows faint lineament passing thru Sta 44 (trend N10W).

45 457325/6413465. Fault zone, well-defined by excessive bleaching and leaching of crushed/rotated gouge in white quartzose sandstn: 170/85NE, about 3 m wide. Bed: 140/50SW (III). Appears to be very old workings here, either prospecting or highly selective erosion along fault zone where laced with ferruginous quartz veins.

Sample **NH12R** from quartz in fault zone. Veins slightly broken due to recurrent displacement.

46 458105/6414490. Stream channel, exposes highly crystalline sandstns/siltstns, med to dark gry-grn. Fol: 55/45 well-defined, probably former bedding. Joint: 25/85SE, gen filled with quartz, white, 2-5 mm width. Finding large (1.5-2 m) blocks ironstone float in creek, Braemar Ironstone.

47 458350/6414215. Ironstone, Braemar Ironstone, appears to be replaced tillite (Pualco Tillite), metallic black on fresh surfaces, due to extremely fine crystalline texture.

Sample **NH13R**. Fol: 85/65SE, defined by stretched/flattened pebbles. Joint: 5/90, 3/m. Tillite includes abundant granitic dropstones, quartzite.

48 459210/6414985. Near confluence two large creeks. Tillite, Pepuarta Tillite, dark gry to gry-blk on weathered surfaces. Well-developed fracture cleavage: 90/80S. Joint: N/90, 10/m. Rocks have been recrystallized. Fol: 145/20SW, measured 100 m southerly up-stream, (I); 65/35NW (I). Fracture cleavage: 95/85SW.

49 459840/6413370. Tillite, dark gry to nearly black on exposed surfaces. Strongly recrystallized. Fol: 90/80S. Joint: 10/85SE, 10/m.

50 461280/6411620. Old mining tenement (monument labelled: 11.9.71 MR A14321. Distance between pegs ~50 m). Claim covers large quartz vein: 260/90, 2 m thick, about 40 m length. Host rock is sandstn, flaser bedded. Fracture cleavage: 280/80SW, well-developed.

51 461920/6411020. Dozer cut, exposes large quartz body, white, slight greasy lustre, trend of cut: 80 for 40 m. Attitude of quartz vein: 120/60SW. At intersection of vein and cut quartz is full 4 m wide. Host rock is siltstn, med rd-brn, slightly ferruginous. Fracture cleavage: 85/55SE. Bed: 320/75SW (I).

52 462290/6411805. Creek bed (north bank find survey monument: Dept of Lands South Australia Bench Mark 52). Rock exposed in creek is black, finely crystalline meta sedimentary, extremely hard. Remnant bed: 105) 40SW (I), measured on south side of creek; 50/35NW (I), measured on north side. Joint: 10/85NW, 5/m. Fracture cleavage: 285/65SW. Bed: 295/55SW, measured approx 40 m southerly of station, fairly consistent. Numerous quartz veins to 50 cm thickness, milky-white, 15-20 m strike length 295/50-70SW.

53 462465/6412295. Slight topographic relief, ridge: 285. Supports highly ferruginous beds over width 40 m for 200 m. Fracture cleavage: 285/80SW. On west side of rd concrete power line pole felled across what appears to be old prospect pit. Material in mullock is schistose sedimentary, bleached, hydrothermally altered, abundant hydromica.

Sample **NH14R** from quartz vein, greasy lustre, slightly pinkish due finely disseminated hematite, most FeO appears to have been derived from schistose wall-rock, some of the quartz has a distinctive gray tint.

Sample **NH15R** from highest point on ridge (south side of rd) where ferruginous o/c is well-exposed, comprises dark rd-brn ocherous discoloration, some parts exhibit botryoidal-like form suggesting a transported product. Outcrop shows selective FeO replacement.

Approx 200 m bearing N15E along road (next topographic rise to NE) rocks are quartzite, lt lt brown, relatively clean (>95% quartz). Fracture cleavage: 270/90. Fol:270/80S (II). Considerable bulldozing about area, exposing quartz clast surface, white, very non-productive appearing. Fol: 285/80SW (II). Joint: 200/90, 5/m. Fracture cleavage: 250/85NW.

54 462400/6414390. Hill top. Open (dozer) cut, develops large quartz vein, 2 m thick, hosted by strongly recrystallized sediments. Hand sorting of cobble-size quartz, milky-white, locally vuggy with euhedral quartz crystals lining walls. Cut is 55 m in length: 260°, mullock dozed out at west end. Wall rock carries selvedges of muscovite, 3-5 mm, subhedral. Host rock is tillite, dark gry-brn on exposed, black on fresh surfaces, highly crystalline, very fine grained. Quartz vein: 260/85NW. Fol (stretched/flattened pebbles, etc): 280/75 SW. Country rock often with veins, 3-5 cm, massive muscovite. Workings located on prominent hill at the east end of

tightly folded anticline. Mineral claim notice reads: MR 9156 15/6/78.

55 462900/6414050. Ironstone, hematite with minor quartz veining, bed ~3 m thick, fracture cleavage: 310/90. Joint: 35/70NW, 10/m. Trend of ironstn: 250/40SE, a well-defined foliation developed in ironstn. Thin quartz veins multi-directional. Find large (to 2 m) semi-rounded granitic erratics. Fol (based on stretched/flattened pebbles): 285/80SW (I). Bed: 270/55S (I). Sample **NH16R**. Hand specimen marked NH55.

56 461765/6414570. Prominent tillite o/c. Abundant pebbles and cobbles consisting mostly granitic composition, dark gry gneiss, gry quartzite. Fol (based on pebble elongation/stretching): 285/65SW. Joint: 25/85SE, 5/m, influences erosion channels. Fol (as previous): 290/70SW. Multitude of white quartz veins to 1 m thickness, 20-30 m length: 290/80SW.

Approx 200 m bearing 240°, top of ridge. Dozer cut: 260°, 45 m length, down 3 to 4 m, ~4 m in width. Some quartz vein material exhibits bluish tint. Joint: 15/85SE, 15 m. Bed: 90/20S, measured on south side of cut; 100/20NE on north side. Sample **NH17R** from bluish quartz vein: 85/80SE 7 cm thick. Host rock to vein has slight blue-gry color which may have contributed to vein color. Spec hematite as hair-like veins lace larger quartz body.

57 461750/6413400. Tillite, strongly recrystallized. Fol (pebble elongated/flattening): 85/85SE. Joint: 30/85NW. Fracture cleavage: 100/80SW.

58 461600/6413160. Quartzite bed, 4 m thickness, prominent ridge former. Attitude: 290/80NE. Joint: 5/80NW, 20/m. Fracture cleavage: 50/55SE. Quartzite beds occur in the axial zone of the tightly folded anticline. Bed: 285/85NE (I).

59 461600/6412750. Quartzite/tillite contact: 275/45SW. Tillite highly recrystallized, dark gry-grn.

60 460585/6414560. Quartzite. Bed: 90/90; 95/75NE (I); 90/70S (I), variation in dip due to cross-bedding.

61 460000/6415560. North flank of tightly fold east-west anticline. Quartz veining: 290/90, 2 m wide, broken by fracture cleavage: 295/80SW. Joint: 35/90, 10/m minor displacements. Fol (pebble elongated/flattened): 295/80NE. Host rock is tillite with numerous granitic cobbles.

Basic dike, trachytoid texture, feldspar phenocrysts non-oriented, 3-4 mm length, dense, fine grained dark grn-blk matrix. Appprox 2 m wide: 35/90. Hand specimen marked NH61.

62 460400/6415780. Creek bed. Rock type exposed is tillite, dark gry-brn, strongly reactive to HCl. Bed: 100/55NE. Fracture cleavage: 295/65SW. Joint: 25/90, 10/m.

63 461735/6412900. Quartzite, 8 m thick, prominent ridge former, shown on aerial photo as lt colored streaks. Massive. Fracture cleavage: 95/40SW. Joint: 215/65SE, 10/m.

463150/6422250. Radium Hill Reserve. Willama Complex gneiss derived from mining operations (1914,1954-1961) litter surface, some resemble gneissic granite, porphyritic; dark gry hornblende gneiss.

Ore-bearing mineral is davidite confined to steep shears in gneiss and amphibolite of Willyama Complex. Produced 954,000 tonnes ore averaging 1.2 kg U_3O_8 per tonne (Forbes and Pitt, 1980).

64 452900/6409570. Tillite with interbedded dolomitic limestn, strongly reactive to HCl, a calcareous sandstn. Bed: 75/55NW (I). Fracture cleavage: 75/90; 15/85NW, 20/m, well-developed. Calcareous sandstn very crystalline. Minor quartz veining, mostly around 50 cm, often exhibiting rd-brn limonite-goethite filling small (3-4 cm) vugs and fractures.

Sample **NH18R**, quartz vein as described, shows euhedral quartz crystals in vugs, inclusions of hydromica and trace amounts dense ferrug/silicic material. Attitude: 85/85NW, slightly displaced along joint planes: 290/90. Bed: 75/65SE (I); 75/60NW (I) due to small-scale folding. Quartzite beds, joint: 25/90, 5/m.

65 453375/6411180. Granite, leuco, comprising 15 % mafics (biotite ‹hornblende), 60% feldspar and 25% quartz. Locally mafics altered to chlorite and much limonite, med grained, equi-granular. Quartz occurs as largest phenocrysts to 1 mm. Some quartz vein cutting tonalite, contain productive-looking ocherous limonite fillings.

Sample **NH19R** from quartz vein described. Sample **NH20R** from granitic host, minor disseminated limonite specks derived from alteration of mafics. Locally exhibits a distinctive flow-banding accentuated by dark minerals and limonitic alteration products, attitude: 260/40SE. Jointing: 5/90, 10/m. Some of the coarser-

textured rock, especially where strongly weathered, resembles an arkose. Jointing: 25/85SE, very dense.

66 453000/6411375. Siltstn/sandstn. Highly developed fracture cleavage: 60/80NW. Jointing: 325/90, 5/m, often with FeO-stained walls. Quartz vein, 11 cm thick, 60 m length: 55/85SE-90. Contains limonite/goethite fillings. Host sediments are strongly recrystallized, exhibits fine grained crystalline texture. Bed: 55/75NW (I) well-laminated lt and dark bands. **NH2 1R** from quartz vein.

67 453100/6410635. Ridge crest: 245°. Calcareous silty sandstn, strongly recrystallized. Bed: 140/40SW. Fracture cleavage: 65/85NW, well-developed. Outcrop pattern exhibits wavy strike. General attitude: 120/30SW.

68 452620/6410575. Calcareous sandstn, very massive, med gry on fresh surfaces, highly reactive to HCl. Attitude: 105/75SW. Paralleled by granitic dike, 18 m wide.

69 4538935/6410700. Granite dike, traces along NE margin of ridge. Fine grained, phaneritic, produces spheroidal weathering features (so also typical of the massive calcareous sandstn).

70 453880/6411945. Biotite porphyry dike, 4 m wide, 15/90. Hand specimen marked NH70.

71 452565/6411040. Sandstn, calcareous, recrystallized, strongly reactive to HCl, gry-brn on exposed surfaces, med gry on fresh. Fracture cleavage: 60/85NW, well-developed, jointing: 35/90, 10/m.

72 452540/6411530. Ridge crest: 30°. Sandstn, calcareous. Bed: 30/60NW (II), minor cross-bedding, produce prominent resistant o/c's. Fracture cleavage: 80/75SE, exhibits minor displacements. Some beds with grain sizes 0.5 to 1 mm, coarse calcarenite. Joint: 340/90, 15/m.

73 451800/6412190. Ridge crest, numerous quartz bodies, gen attitude: 60/70SE. 2 m in thickness but some appear to have been enlarged by minor displacements along fracture cleavage: 190/70NE. Host rocks are calcareous sandstones or med to coarse calcarenites. Fracture cleavage: 65/80SE. Approx 120 m bearing N55E prominent o/c calcareous sandstn. Fracture cleavage: 75/80NW. Numerous quartz bodies, parallel, 10 to 20 m length,

attitude 75/90, often with minor displacements along 65/80SE fractures.

74 452815/6412790. Sandstn, calcareous. Old mining cut: 20/85SE, 60-105 cm wide. CuO-staining on both foot- and hanging walls, very clean. A large, non-productive, quartz vein cuts diagonally across workings 65/80SE, 1 m wide, 50 m in length, cut by the copper-bearing vein: 185/70SE, 35 cm width thru massive quartz body.

Sample **NH22R** taken from gossanous portion of productive vein, comprises very tough, aphanitic mixture silica, iron oxide, trace hem, cavities with ferruginous fillings. North end of main cut approx 7 m deep with walls smooth and clean, width of cut varies from 60 to slightly >1 m. Bed: 25/10NW. Length of main cut 32 m. Additional prospect trenches on strike and at either end of main cut.

Sample **NH23R** from quartz vein material found in mullock, 20 cm thickness, highly fractured but well-healed, carries very productive looking ferruginous fillings, rd-brn, with malachite and CuO. Walls of vein carries selvages of altered wall-rock and chlorite, very greasy lustre, good cellular structure from former sulfides. Host rock often very crystalline, blu-gry on fresh surfaces, exhibit very fine laminar bedding structure, best described as sandy limestone.

Approx 100 m bearing S20W from main linear cut on ridge crest find highly crackled and FeO-rich quartz vein, about 60 cm width expanding to 1 m where limonite-goethite content diminishes. Attitude: 60/85SE. Sample **NH24R**. Host rocks are sandy limestn. Fracture cleavage: 75/90.

Approx 150 m N75E small erosional gully find another highly ferruginous-rich quartz vein, greasy lustre very productive appearing. Hosted by finely laminated calcareous sandstn belonging to Wilyerpa Fm. Quartz vein 20 cm thick, attitude: 60/80SE. Beds: 55/25NW (I).

Sample **NH25R** from quartz vein, cavities with ocherous rd limonite/ goethite fillings frequently with fine cellular structure. Most productive-appearing portions of these veins found on and within 2-3 cm of walls with central portion of vein becoming very white.

Approx 200 m bearing N40E from Sta 74, saddle in ridge. Siltstn,

finely laminated, gry-grn. Bed: 65/65NW (I) exhibit broad, wavy strike of bedding planes; 20/30NW.

75 452535/6413150. Another mining cut, estimate originally 3 m deep, 11 m in length, trending S20W, 80 cm in width. Walls mined to clean, smooth surface. Host rocks, sandstn, non-reactive to HCl, lt gry-grn. Bed: 75/70SE, bedding distorted, wavy. Material in mullock includes ferruginous-bearing and FeO-stained quartz. Attitude of productive vein: 15/85SE, 60-70 cm width (also mining width).

Sample **NH26R** mostly greasy-lustered quartz with CuO and much malachite. Very little productive-appearing rock left in mullock. Appears best ore developed on hanging wall, less on footwall. Several large bull quartz veins bodies in area, one at south end of cut: 60/85NW, pre-ore.

Approx 120 m bearing N40W from Sta 75, narrow gully draining N35E cuts through finely laminated silty sandstns and siltstns, bleached on exposed surfaces, gry-grn on fresh. Very attractive quartz vein, thoroughly impregnated with FeO, limonite/goethite, cellular structure from former sulfides, 15 cm thick: 250/75SE. Bed: 50/20NW (I). Jointing: 280/90, 10/m. Vein frequently incorporates black wall rock pieces, exhibits a distinctive sheen produced by sericite in fractures. About 40 m in length.

Sample **NH27R**. Find second similar quartz vein located 20 m to south, attitude: 70/85SE, 40 cm thick, very productive appearing, greasy lustre. Find third similar type quartz vein located 30 m southerly from first vein, exhibits good limonite/goethite inclusions, FeO-staining, greasy lustre, sericite: 70/85SE, about 40 cm thick. Fracture cleavage: 170/90 tends to slightly displace veins. Wall rocks strongly altered with chlorite selvages, limonite-bearing, unusually dense and heavy, tough.

Sample **NH28R**. Considerable amounts this productive-appearing wall rock material occurring as float on this north-facing slope, very pyritic siltstn found as well, original pyrite content to 15% now mostly limonite, euhedral to 1 mm.

Sample **NH29R** from quartz vein best described as system densely packed veins, 15-20 each to 1 cm thickness, resembles gneissic texture, total width of productive zone 13 cm, 50/80NW. Overall width of productive zone could be to 10 m, surface talus conceals most of area. Hand specimen of NH29R labelled NH75.

Approx 200 m bearing S25W from Sta 75 prominent o/c on nose of ridge. Siltstn/sandstn, hydrothermally altered, disseminated pyrite casts (3-5%), silicic, ferruginous. Fracture cleavage: 295/85SW. Incorporates fine (0.5-3 cm) quartz veining, multi-directional, often limonite-goethite-filled cavities, preferred attitude: 190/75SE, 3-4/m, with very productive-appearing ocherous limonite fillings and cellular structure. Structural setting of outcrop appears to be nose of tight fold (anticlinal), axial trace: 10°, about 7 m in width, extensive fracturing precludes identification of former bedding.

Sample **NH30R** from south end of structure, exhibits granitic texture, may be remnant of erratic inclusion; doubtful to siliceous, contains limonite/goethite-filled cavities, very productive appearing, red ocherous limonite, hematite, sericite.

76 452170/6412940. Limestone, sandy, dark brown on exposed surfaces, med to dark blu-gy on fresh, highly reactive to HCl. General area exhibits sink hole development (karst topography) with some solutional/collapse features large enough to crawl in, some obviously carrying meteoric run-off, here they may be fault enhanced, such structure would trend 155 thru three sink holes. Fracture cleavage: 80/55SE, well-developed.

Numerous bull quartz veins striking thru this area, at least 20 within radius of 300 m. Jointing: 170/85SW, 5/m. Quartz veins: 245/80NW, gen cut by fractures: 100/85SW. Host limestn quite massive producing large, 2-3 m diameter, spheroidal weathering features, may be cut by few small (1-5 mm) quartz veins. Bed: 65/65NW (I).

Approx 50 m bearing N70E find more densely compacted quartz vein material (ie, that resembling gneissic texture). Sample **NH31R**, originally quite pyritic (15-20%) large (1-2 mm) euhedral limonite cubes, exhibits definite foliation; or gneissic as result FeO and thin quartz banding, much sericite, found as float only.

77 451400/6412920. Rock is probably a recrystallized quartz-rich arkosic type with considerable silicic enrichment, numerous small (1-5 mm) cavities, presumably in part derived from decomposition and solutional leaching of form feldspathic constituents. However, some cavities filled with very productive-appearing ocherous rd-brn limonite/goethite/hematite with cellular structure. Rock is dense, heavy, trace sericite occurs in a persistent bed (mappable) up to 2 m thickness. Host rock is mostly tillitic silstsn and sandstn, exhibiting definite pyritic alteration leaching/bleaching.

Sample **NH32R** from very coarse (to 10 mm) granitic type, additive silica developed about original quartz phenocrysts, feldspar phenocrysts gen bleached white, all former mafics altered to chlorite and sericite, hand specimen labelled NH77, probably altered pegmatite or similar granitic occurring as dropstone in tillite.

Approx 120 m bearing due North along strike of altered arkosic (?) horizon. Sample **NH33R** as described for this material above. Second hand specimen labelled NH77 distinguished by med dark rd-brn color, cavities with limonite/goethite, cellular structure, sericite, very productive appearing. I suspect a selectively replaced bed: N/30W (I), beds here are generally wavy, locally quite twisted.

Entire area complexly folded with attendant N70E faulting. Northern-most of three lineaments (faults ?) may have acted as mineralizing conduit as suggested by density of old workings and productive-appearing quartz veining in its vicinity.

78 452110/6410135. Creek bed. Sandstn, dark gry grn, recrystallized, fine biotite (8-10%) that lends distinct foliation. Fracture cleavage: 5/80SE. Several quartz veins, large milky-white emplacements, to 20 m length by 1 m width pinching out at both ends: 235/80NW. Bed: 60/60SE, slightly wavy; 60/70NW (I). Thick calcrete coatings, highly broken and fractured, some bedding: 55/80NW plane displacements. Large quartz body: 65/50NW, 10 m length by 60 cm thickness, highly broken.

79 452035/6410750. Sandstn, tillitic, lt gry brown. Well-developed fracture cleavage: 65/80SE. Jointing 345/85SW, 5/m. Beds have suffered considerable deformation, breakage, bedding plane displacements, distortions. Bed (gen): 70/90. Jointing: N/85W, 20/m. Milky-white quartz vein: 65/70SE, 20 m length by 60 cm thickness. Second quartz vein: 55/65NW, 20 m length by 80 cm thickness, displays fracture cleavage: 160/80SW along which displacements have taken place. Third quartz vein: 50/85SE exhibits considerable breakage and displacements on fracture cleavage: 355/85NE up to 3 m, 50 m length by 50 cm thickness.

Approx 100 m northwesterly find resistant o/c gry-brn dolomitic limestn, strongly reactive to HCl, exhibits faint bedding structure: 65/85SE. Hosted by massive calcareous sandstn, faint bedding structure: 65/75NW (II). Jointing: 5/85SE, 10/m.

80 451210/6411650. Sandstn, calcareous, dark gry brown on exposed surfaces, lt gry brown on fresh. Fine granular, recrystallized texture, small scale bedding crenulations (measurable in 1-5 m), massive, produces relatively large (1-3 m) spheroidally weathered o/c's. Bed: 95/45SW (I), contains sandy horizons, thin (20-30 cm) illustrate highly "squirrelly" due to compressional deformation. Jointing: 20/85NW, 10/m. Second bed: 325/35SW (I); 315/45SW (I).

81 450220/6411385. Relatively large stream channel, tributary to Maldorky Creek. Exposes blu-gry calcareous sandstn, highly reactive to HCl, massive, faint bedding laminations which show considerable distortion, most consistent: 240/70NW; 255/75SE (I) neither dip reliable for regional attitude. Jointing: 355/80SW, 5/m. Traversing between Stations 80 and 81 find atypical tillitic sediments with granitic cobbles and boulders to 2 m diameter.

82 451160/6413390. Sandstn, calcareous, bly-gry, highly reactive to HCl, produces spheroidal weathering o/c's. Bed: 75/60SE (I). Jointing: 15/85NW, 20/m.

83 450975/6413480. Sandstn, calcareous, strongly recrystallized. Bed: 345/20SW (I), prominent bedding o/c's; 355/15SW (I), some small-scale bedding distortions. Jointing: 260/85SE, 5/m, 50/m. Fracture cleavage: 185/90.

84 450935/6413840. Sandstn, very coarse, bed: 15/25NW. Fracture cleavage: 80/80SE. Second bed: 175/35SW (I).

85 450215/6414725. Tillite, highly calcareous with multitude of small pebbles, angular to sub-angular, foliation (pebble elongation and flattening): 275/90, definitely not the bedding!! Bed: 20/30NW (I), very finely laminated. Some beds coarse, dense pebbly (conglomeritic), calcareous to 2 m thickness alternating with blu-gry silty sandstn, calcareous, finely laminated.

86 450760/6415740. Conglomerate bed, comprising densely packed pebbles and grit, components including granitic and lithic angular to sub-angular clasts. Exhibits recrystallized texture forming prominent o/c's that exhibit broad (20-30 m), wavy strike by 5-6 m width. Bedding: 30/50NW (I). Poorly defined fracture cleavage: 260/70SE. Jointing: 290/80NE, 10/m. Conglomerate horizon hosted by siltstn, fine grained, strongly recrystallized, strongly reactive HCl.

87 451700/6417250. Creek bed. Exposes siltstn, blu-gry, highly calcareous. Bed: N/55W (I). Fracture cleavage: 105/40SW; 15/65SE.

88 452175/6417290. Siltstn, very fine laminar bedding amplified by alternating lt and dark bands. Bed: 340/45SW (I). Fracture cleavage: 290/65SW. Very weakly reactive to HCl. Jointing: 10/80SE.

89 458970/6421125. Mildaltie Mine located on a S20°E descending ridge of low to med relief. Rock is siltstn, gry-brn, very finely laminated (zebra-like), reactive to HCl, very much resembling Tapley Hill Formation. Rock has suffered fairly thorough amphibolite m/m attested to by silky lustre due to abundant fine, shiny, black amphibole.

Station is located over a 2-compartment vertical shaft (1 x 2 m) estimate 30 m deep. The shaft is sunk on a cupreous line of load bearing 195°, 40-60 cm wide, attitude: 25/85SE over an exposed length of 102 metres. Walls of the former fissure vein have been picked clean with only a smear of malachite and CuO remaining. Vein filling (observed in mullock) comprises a coarse granular mylonite, well-rehealed with a finely comminuted mixture of siltstn, vein quartz, a brown siliceous/ferruginous substance and tough limonite.

Cu and malachite occur throughout as minute fracture and open space fillings. Some post-brecciation leaching evident also some silicic replacement (metoric influence), also find siderite, a blk-brn MnO/FeO substance as coatings on breccia clasts. Siderite and host rock clasts are only constituents reactive to HCl. Wall rocks are highly deformed. This is a pre-mineral bedding gnarling (microfolds, twisting, contortions) resembling soft-rock deformation. Bed: 295/70SW; 295/85SW.

Original fissure has suffered post-mineral deformation as indicated by excessive and extensive breakage, clast rotation and dragging and in places complete mylonitisation. Wall rocks are conspicuously free of hydrothermal alteration, in fact they exhibit a punky appearance typical of normal weathering. However, in undisturbed ground between workings, siltstn outcrops are distinguished by their dark gry-brn color, mod silicification and close-spaced (N20-25E) fracturing. In places the width of these altered rocks is 40 m, mostly around 20 m. This condition is clearly evident on color aerial photography. Also note presence of broken and partially rotated veining quartz in fractured, silicic

outcrops.

Northerly from the shaft there are five prospect and mining pits that exploit the line of lode. To the south there are four small workings (pits shallow trenches) where minor amounts cupreous ores have been recovered. Sample **NH34R** from mullock (main shaft) comprises a coarse granular, well indurated vein breccia with siderite, fine granular vein quartz, limonite-goethite and silicic/ferrug's cementing medium. Exhibits minor CuO-stain.

Sample **NH35R** comprises another rehealed breccia with about 75% crushed vein quartz carrying a black (chalcocite ?) coating with metallic lustre, siltstn fragments with CuO-stain, minor FeO and trace amounts malachite. Cementing medium is rd-brn siliceous substance, glassy lustre. Small cavities and vugs are line with minute euhedral quartz crystals, smoky color. Suspect this as high grade ore.

A second vertical two-compartment shaft is located 34 m on a bearing of 335°. From the size of the mullock heaped about the shaft it would appear this working is the deeper of the two. Estimated depth 60 m. Length of workings 15 m bearing S20W which is also the line of lode as exposed in the first cut to the south of the shaft. The mineral-bearing structure is a post-mineral faulted fissure, 35 cm wide, width of mining 1 m, attitude: 20/75NW. Both hanging and foot-walls carry remnants of poorly indurated wall rock and vein quartz mixture mod indurated with finer mixture of same material. Central 20 cm portion of vein equally brecciated comprising pulverised and reconstituted limonite. Sample **NH36R** from this central limonitic zone. Fractures paralleling the faulted fissure are either joints or point-controlled: 20/90, in mine works show a sheeted character (50 m).

A third line of workings is located practically off the southwest tip of the above elongate mining excavation. Its general trend: 170° for 116 m. Characterised by a zig-zag alignment of connected cuts each 2-3 m in length following the local joints, attitude: 20/90 thence along faulted and sheared bedding planes, attitude: 305/60NE. The latter cut direction exposes a shear zone to 10 cm width (305/60NE) laden with tough (silicic) limonite with CuO-staining. The former joint-controlled cuts also exhibit a mineral-bearing gouge zone to 20 cm width, 25/85SE, comprising a dark rd-brn, brecciated but well-rehealed limonitic gouge. Wall rocks of both trends are thoroughly FeO-stained.

Note a highly developed fracture cleavage: 90/50S, exhibits a tightly wrinkled structure. Second attitude: 100/35SE. Foliation (former bedding ?) amplified by a very fine, uniform light and dark laminae: 125/50NE, further inspection shows this as bedding. Sample **NH37R** from these workings comprise a very dense, siliceous mylonite, tough, laced with rd-brn ferruginous material often supporting chalcopyrite and rare bornite. Hand specimen.

90 458850/6420880. Ridge crest occupied by Dalkey line of lode (Photo 07). Costean cut 110° for 14 m across obviously toughened siltstn. Densely fractured: 110/75SW. Rock is med to dark gry Tapley Hill siltstn which shows a distinctive alteration trend: N20E, at this location about 20 m wide, densely fractured (20/85SE) with occasional CuO staining and limonite impregnations 3-5 cm thickness.

Photo 07. Station 90. View N20°E shows Dalkey line of lode as marked by vegetation alignment and slightly darker tonal contrast. The structure is clearly identified on aerial photographs.

Sample **NH38R** comprises a brecciated fissure vein that occupies 110/75SW fracture system exposed in the costean. Includes well-healed mixture siderite, limonite, CuO and relatively large (2-4 cm), post deformation calcite crystals.

37 m bearing 185°, prospect cut, 4 m length bearing 325°, 1.5 m

wide, originally about 2 m deep. Productive structure is a faulted fissure choked with finely brecciated mixture dark rd-brn limonite, attitude: 335/70NE exposed at northwest end of cut, width of gouge zone 15 cm, wall rocks either side weakly FeO-stained and laced with off-white caliche (crusted calcium carbonate) -bearing fractures and leached cavities. Host rocks are siltstn, gry-grn. Bed: 290/75SW.

Sample **NH39R** comprises a densely rehealed gossanous material with vugs, deep rd-brn streak, fine cellular cavities from former sulphides.

91 459640/6421025. Prospect pit, tests a line of ironstone trending N20E. Rock is siltstn, lt to med gry. No outcrops. Quartz chips, milky white litter surface. Ironstone, very dense, conchoidal fracture, deep rd-brn, with cavities (3-5 mm) filled or lined with calcite, 9 cm thickness. Find second occurrence of ironstone located 36 m bearing N20E. Sample **NH40R**.

155 m at N53E to creek, coarse silty sandstn exposed. Bed: 95/35SW (II). Fracture cleavage: 135/65NE.

92 458975/6421330. Line of shallow mining excavations in form relatively large (2 x 3 m to 3 m depth) pits and cuts trending N30E for 36 m. Rock is calcareous siltstn and limestn, sandy brn-gry on exposed med to dark gry on fresh. Fracture cleavage: 100/90. Bed: 90/45S (I). Also find pinnacle weathering structures in limestn as originally found in Mafeking Zinc (Pitcairn Station) area. Jointing 25/85NW. Limestn occurs as beds in siltstn to 13 m width. Bed: 120/60SW. Another limestn bed to 5 m thick.

Workings comprise two excavation, the most southerly a pit 2 m diameter and down about 3 m originally, the second a more or less interconnected line of pits forming a cut 22 m in length. Surface "scratchings" continue N30E for at least another 100 m following slightly raised ground with siliceous outcrops occasionally Cu)-stained. Productive structure, a fault fissure, attitude: 25/80NW measured from hanging wall. Host rock is lt gry siltstn exhibiting very fine (1 mm) alternating lt and dark laminae. Bed: 120/65SW (I). Sample **NH41R** is a tough, siliceous/ferruginous veining filling with 35% rd-brn limonite occupying cavities, minor calcite (euhedral 3-5 mm), no visible CuO, etc.

A paralleling line of mining excavations located 36 m bearing N708W. Deepest digging 3 m diameter, down about 3 m, probably intended as main vertical shaft. Approx 65 m of cut continues

N20E to intersection with creek, down about 2 m originally, now caved to within 1 m of surface. Country rock is siltstn. Bed: 120/60SW (I), jointing: 25/85NW, 15/m, in places sheeted (50+ m), some joint planes completely healed over by resistant substance leaving slightly raised lines. Fracture cleavage: 100/75SW.

Sample **NH42R** is highly siliceous/ferruginous, dark rd-brn, dense vein filling, cavities with calcite and/or limonite, multi-directional hair-like veinlets with CuO and where fractures larger usually bearing malachite. Fissure occupies former fault, probable recurrent movement, to 50 cm width. Width of cleaved walls 75 cm. Jointing: 25/90, sheeted, parallels fissure. Age these workings around 1905 (Brown, HYL, 1908. The Mines of South Australia). Relics found include horse harness gear and a tin lid with inscription "Conrad's pure beef drippings".

93 459350/6421755. Dalkey Mine. Creek, good outcrops east of Station 93 (situated directly over southerly of two vertical shafts, have defined as "South Shaft"). Rock is med to dark gry siltstn, strongly calcareous with interbedded limestn horizons to 1 m thickness and interbedded calcareous sandstn. Both latter two rocks form resistant linear outcrops along their strike. Siltstn exhibits a silky lustre due to abundant fine mica, has suffered shearing as well as intricate crumpling and folding (doubtful soft rock deformation). Shearing: 110/85SW. Quartz veins (3-10 cm) invariably show stretching and pull-apart breakage where paralleling shear attitude, iron oxide stained, greasy lustre with distinctive yellow color. Jointing: 25/90, 10 m may also incorporate a shearing component. Bed: 125/35SW.

Dalkey Mine located on north side of perennial stream channel 10 m in width, draining (generally) N70E. Principal workings include two vertical shafts aligned N25E on a mutual fissure zone. South Shaft is a two-compartment excavation down (estimate) 50-70 m, at the collar measuring 2.5 m x 1.5 m width. Shaft exploits faulted fissure zone 1.5 to 2.5 m width: 25/85SE. Central gouge, as exposed within top 8 m of S shaft about 40 cm wide, dips vertical (5° from 90°). Both N25E walls of shaft are smooth and smeared with CuO, dipping 85SE. Can observe a drive down about 10-12 m from collar driven N25E.

Overall length (N25E) includes 20 m of opencut from the adjacent stream channel to the S Shaft thence 13 m to the second, or North Shaft, continuing 20 m of opencut thence 17 m undisturbed ground to a prospect/mining cut 4 m in length down about 3 m initially. A

second parallel cut of equal length is located 4 m to SE. Originally down about 2 m.

Principal metal sought was copper with credits in lead and silver (Brown, HYL, 1908, p 167). Sample **NH43R** comprises siliceous siltstn, brecciated and rehealed with silica, supports broken vein quartz and laced throughout by a fine, hair-like, fracture network carrying CuO and FeO. Find a deep rd-brn to red-blk resinous substance resembling limonite pitch, also irregular clots and stringers of anhedral pyrite with preference for rock's bedding planes. Rock is dark gry to black as compared to same rock in non-mineralised ground. Best described as a calcareous silty sandstn. However, where silicic response to HCl is minimal.

56 m bearing 300° note intersecting linear outcrops calcareous silty sandstn with slight relief: 95/80NE a well-defined fracture zone accompanied by weak silicic alteration rendering rocks relatively resistant to normal weathering over 1 m width; cut by 195/85NW fracture system, 70 cm wide, slightly silicic. No mineralisation or prospecting noted.

Mine vintage is 1898-99 (Brown, HYL, 1908). Find relics including pieces horse harness, horse shoes, broken purple bottles.

Outcrops exposed at SW end of workings (in stream channel) include calcareous silty sandstn and calcareous lt gry siltstn. Bed: 120/35SW (I). Fracture cleavage: 110/80SW, well developed. Bedding here characterised by tight folding and micro displacements. Jointing: 25/85NW; N/65E. As previously noted, former quartz veins are highly sheared and broken where hosted by sheared siltstn. Total possible mineralised width, as suggested by FeO/CuO and silicic fractures exposed in stream walls, would be about 10 m, 25/85SE, fractures about 30 m with local heavy shearing to 20-30 cm width, fairly resistant.

87 m bearing S70W (in stream channel) calcareous silty sandstn, med to dark gry, bed: 135/50SW (I). Siltstn member of rock sequence very obviously has suffered much convolute folding. Jointing: 25/85NW, 5 m, walls slightly darker than ordinary, result of silicic alteration. Find well developed fracture zone 2 m width, med to dark gry silty sandstn, densely fractured 25/80NW comprises broken vein quartz which was emplaced parallel to regional fracture cleavage: 95/90. Sample **NH44R** from silicic fracture zone (NW bank of stream channel), exhibits shearing and micro fracturing, calcareous siltstn, minor CuO stain and limonite pitch.

94 458040/6422260. Dike rock, 60 m width, 20/90. Medium grained, dark gry to black, dense, reactive to HCl, minor magnetite. Host rock is gry siltstn. Fracture cleavage: 110/90. Dike post-dates (cuts across) large linear quartz emplacements.

369 m bearing S55W, ridge crest, silty sandstn. Fracture cleavage: 110/90. Jointing: 25/90, 2 m. Rock is med to dark gry strongly reactive to HCl. Bed: 100/70SW (?).

95 457540/6422020. Siltstn, silky lustre due to abundant fine mica. Fracture cleavage: 100/90. Rocks do exhibit a very fine laminar bedding structure. Bed: 95/40SW (III); 100/70SW (II); 105/75SW; 85/75SE (I).

161 m bearing N80W, ridge crest. Prospect pit, originally down about 1 m. Exploits quartz vein, milky white, 90/20S, 15 cm thickness, mod FeO staining. Rock is highly broken, crushed, med to dark gry calcareous siltstn with thin interbeds calcareous silty sandstn. Bed: 100/70SW (I); 120/60SW (I). Fracture cleavage: 95/90. Sample **NH45R** from FeO-stained quartz vein.

96 457060/6421800. Siltstn, med to dark gry, interbeds calcareous siltstn and thin (40-60 cm) limestn. Fracture cleavage: 100/80SW, well developed. Find scattered occurrences granite erratics to boulder dimension, minor rounded quartzite cobbles and a fine-grained m/m rock with faint gneissic texture.

97 456490/6421775. Small gully draining 260°. Siltstn, gry slightly greenish. Bed: 85/30SE (I), slightly distorted (wavy); 105/30NW (I). Stream sediment sample **NH05S**, material slightly damp, taken from fracture partings crossing gulch, comprises quartz with FeO stain, micaceous siltstn, minor magnetite and dk rd-brn ironstn or "shot", non-reactive to HCl.

470 m bearing N45E, small drainage, stream sed sample **NH06S**.

612 m bearing N25E, small drainage, stream sed sample **NH07S** from natural ripples developed across creek bed. Material sampled comprises sand silts, the latter with strong FeO color, particles of micaceous siltstn, FeO-stained quartz, magnetite and ironstn. Outcrop is siltstn with thin beds (to 50 cm) calcareous sandstn. Bed: 90/65S (I).

414 m bearing due north of Sta 97. Sample **NH08S** from fracture cleavage partings at angle to creek bed. Material comprises FeO-

stained clays and quartz grains, micaceous silstn, ironstn and trace amounts magnetite. Rock outcrop is calcareous sandstn and siltstn. Bed: 75/65SE.

98 455965/6422985. Quartzite, well defined belt 40 m width, very massive weathering to large semi-rounded outcrops, some standing to 3 m in height, tor-like outcrops (Photo 08). Exposed surfaces light brown, fresh are lt gry with numerous disseminated limonite specks (suspect sulphide derived).

99 456650/6424240. Headwaters of S35W-draining perennial stream. Rock is a very poorly sorted, multi-compositional conglomerate (diamictite). Constituents cobbles and pebbles include predominantly biotite granite. All constituents stretched, drawn-out with well developed
laminar flowage structure of finer material about cobbles, quartz vein stretched to boudinage (Photo 09).

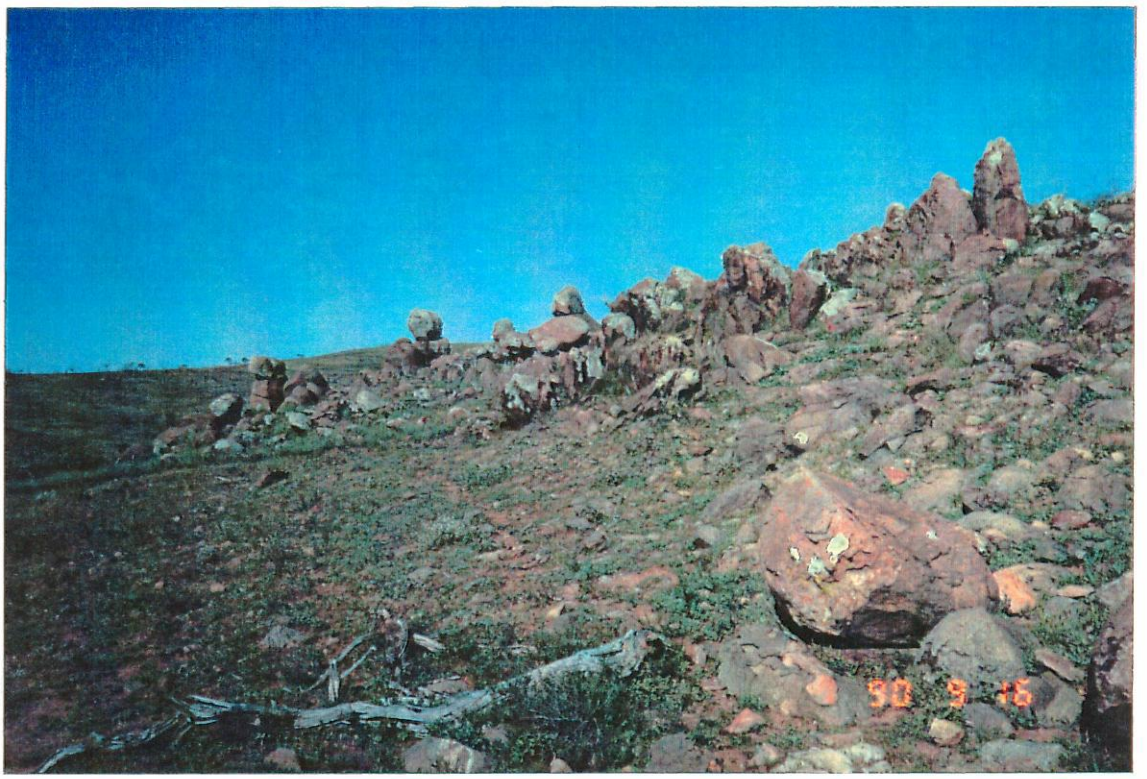

Photo 08: Station 98. View 95° shows the tor-like outcrops. Bed: 60/20SE. Quartzite immediately underlain by a highly drawn, sheared pebbly conglomerate.

100 457680/6420645. Siltstone, dark grey to black (Tindelpena Shale).

101 458240/6420225. Siltstn, med to dark gry, calcareous. Well defined fracture zone 2 m width, N30E. Bed: 110/35SW. Fracture cleavage: 110/90. Jointing: 20/85NW, 10 m, well developed,

locally well healed and infilled with a siliceous/lithic substance. Fracture zone is the westerly-most of two paralleling systems that incorporate the Dalkey and Mildaltie copper mines to the NE. Here rocks within the influence of N30E fracturing are toughened and somewhat darkened by silicification. No visible CuO. However, minor productive appearing limonite. Sample **NH46R** from fracture zone.

235 m bearing N35E (grid north), hill top. Crest occupied by siliceous fracture zone, 2 m wide, N25E (mag). Regional-type fracture cleavage: 110/90. Rockchip sample **NH47R**, comprises a dense, extremely fine-grained silty sandstn, dark gry. Non-reactive to HCl. Carries irregular cavity fillings of sub-hedral calcite.

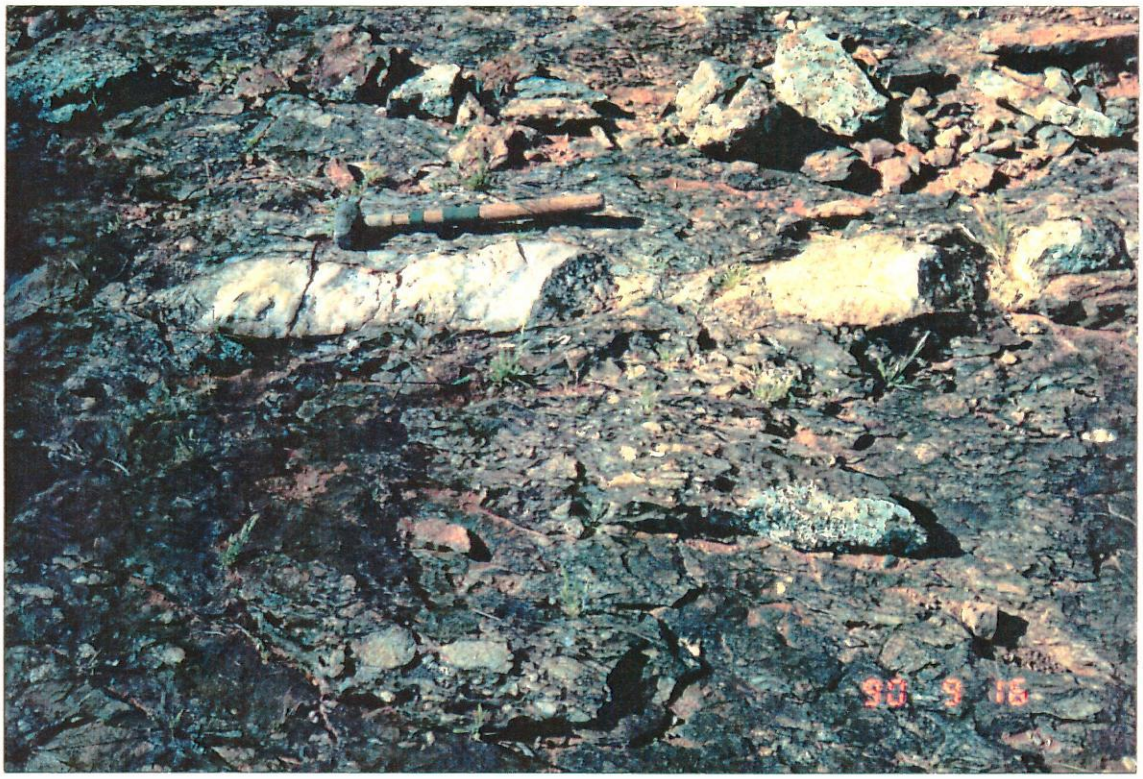

Photo 09. Station 99. View N10E shows a stretched (boudinage) quartz vein, vein attitude: 100/85NE.

102 442365/6423245. Quartz body, large, linear occupies a broad topographic rise of mod relief. Attitude: 75/80SE 6 m wide at centre, 85 m in length, characterised by a concave flexure to south suggesting SE dip. Fracture cleavage: 15/80SE.

103 442900/6424115. Broad topographic rise, semi-circular about 300 m radius. Limestone, sandy, gry-brn on exposed surfaces, med gry on fresh. Bed: 105/SW (I); 75/40SE (I); 90/35S (I)' 80/40SE (I).

Approx 150 m bearing 330, on north side of topographic rise, find coarse sandy, gritty limestone beds. Bed: 85/45SE. Contained clasts include small (1-3 mm) limestn, shale, quartz. Width here about 11 m.

104 443310/6424650. Broad ridge. North margin and break in slope is quartzite to 25-30 m width, overlain by sandy to granular limestone, gry-brn, exhibits excellent bedding laminae. Bed: 90/50S (I). Jointing: 15/80NW, 5/m. Quartzite at western limits this exposure exhibits well developed bedding: 90/25S (I).

105 441000/6423550. Broad topographic rise, 300 m radius. Surface littered with milky white quartz chips derived from several underlying (eluvium) massive quartz bodies. Rock float is sandy limestone, and siltstone.

106 440090/6420310. Ironstn, also dark gry-grn, highly siliceous felsite-like rock. Poor exposure, where found in outcrop shows multi-directional limonite veinlets, general trend of exposure is 125°. Sample **NH48R** is an extremely tough, siliceous rock with numerous limonite veinlets. Hand specimen.

107 443585/6423820. Limestone, sandy, well bedded: 75/45SE; 70/70SE.

108 443460/6422675. Limestone, dark gry, linear outcrop. Bed: 85/80SE.

109 446820/6412020. Small creek. Siltstn, med grained, dark gry-grn. Non-reactive to HCl. Bed: 45/40NW (I). Finely laminated, tend to break parallel to bedding. Jointing: 345/90.

110 447850/6411990. Creek by-pass adjacent to House Dam. Erosional cut, 3-5 m nick-point. Siltstn, lt to med gry-brn, interbedded sandstn horizons to 50 cm (Photo 10). Well developed jointing: 10/80SE, 10 m. Bed: 30/30NW (I). Jointing: 105/85SW.

Stream sed sample **NH09S** from natural riffles developed in joint partings.

111 448250/6412160. Creek. Sandstn, olive-gry, silty. Bed: 50/40NW (I). Jointing: 15/80SE. Stream sed sample **NH10S**.

112 448080/6413185. Small creek. Sandstn, silty, gry-brn, locally olive-gry, very finely laminated with tendency to break along

bedding planes. Interbedded sandy limestn to 50 cm thickness, dark blu-gry. Bed: 05/20NW. Jointing: 105/80NE, 5 m.

Photo 10. Station 110. View 300° shows well developed fracture cleavage developed in silty sandstns between more resistant sandstn. Attitude of the bedding is 30/30NW, that of the interbed fracture cleavage: 300/25SW (measured in second bed down from top).

113 448875/6413500. Limestn, sandy, coarse recrystallisation. Brn-gry on exposed surfaces, lt blu-gry on fresh, show faint FeO-stain streaks parallel to bedding. Bed: 40/30NW (I). Fracture cleavage: 80/80SE.

114 449250/6410325. Creek. Limestn, silty, med gry-brn. Weather out to well-defined linear outcrops. Bed: 20/50NW (III). Stream sed sample **NH11S**. Bed: 30/40NW (I).

207 m bearing N43E, small creek. Stream sed sample **NH12S**.

115 449260/6411900. Hill crest. Graywacke. Fracture cleavage: 90/90. Bed: 30/25NW (III).

116 448875/6412590. Ridge crest. Graywacke, silty, with numerous interbedded limestn beds to 1 m thickness, often with sandy to gritty texture. Bed: 45/60NW; 30/60NW (I). Jointing: 10/80SE.

117 449080/6415315. Small, narrow gully to 2 m depth, 3 m wide. Sandstn, med-gry, calcareous, silty. Float in creek includes ironstn cobbles with ocherous limonite cavity fillings. Bed: 50/35NW (I). Jointing: 10/75SE, 3 m. Stream sed sample **NH13S**.

118 447960/6417125. Ridge, well-defined linear trend N25E. Siltstn, highly calcareous, blu-gry on freshly broken surfaces, silty limestn (?), very finely laminated. Bed: 25/85NW (III); 25/80NW (II).

461 m bearing N32E well-developed linear outcrop calcareous siltstns and silty limestns, finely laminated. Bed: 25/40NW (I).

119 448750/6418450. Ridge as previous. Silty limestn, slightly rd-brn on exposed surfaces, finely laminated. Bed: 25/20NW. Jointing: 20/70SE, 20 m.

120 448545/6419510. Broad topographic rise, oval-shaped. Silty limestn, gry-brn, dark gry to blu-blk on freshly broken surfaces. Bed: 30/35NW (I). Fracture cleavage: 100/75SW. Bed: 45/40NW (I).

121 449230/6420025. Ridge trending N25E. Silty limestn. Bed: 30/40NW (I); 45/65NW (measured approx 20 m N25E from first measured bedding); 40/30NW (approx 50 m N25E).

122 449665/6421000. Ridge. Wilcox Tank. Silty limestn. Bed: 355/SW (II). Outcrop largely overlain by windblown sands and silts. Bed: 10/35NW (I).

123 449900/6419880. Creek. Silty limestn, finely laminated, blu-gry. Bed: 15/45NW, dip is variable up to 30°NW. Stream sed sample **NH14S**. Float in creek includes silty limestn, massive quartz, siltstn.

124 451215/6420100. Creek, relatively large to 20 m width, drains N10E. Minimal outcrop found. Siltstn, gry-grn, highly fractured: 65/65SE, suspect faulting. Stream sed sample **NH15S**.

125 451985/6419790. Limeston, silty, gry-brn on exposed surfaces. Well-bedded linear outcrops. Bed: 350/15SW (II); 10/40NW (I).

126 446655/6414925. Ridge trending 185°. Siltstn, calcareous, med rd-brn on exposed surfaces, lt to med gry on fresh, mod reactive to HCl. Fracture cleavage: 15/85SE. Bed: 50/80NW (II). Dike rock, hornblende-rich, 1 m width, hornblende crystals prismatic, 2-3 mm, multi-directional (turkey track texture) 60%; calcic

plagioclase (An 60), euhedral, in clusters 1-2 mm, 35%; olivine, as euhedral crystals filling cavities (1-3 mm), translucent, lt apple green, also in veinlets, 1-2 mm width, yellow-green, subhedral; trace amounts magnetite. Overall length 1,153 m, terminating to north, concealed by eluvium to south. Rockchip sample **NH49R** is hornblende dike rock (spessartite), hornblende shows mod chloritic alternation. Hand specimen.

692 m bearing S25W along crest of ridge. Rockchip sample **NH50R** from outcrop hornblende dike rock, slightly finer-grained. Find three parallel hornblende dikes, eastern-most is 70 cm thickness, central dike 50 cm and western-most 40 cm. Find coarse quartzite boulder (erratic) faint purplish color, also boulder of gneissic granite, pink potash feldspar, quartz plagioclase, disseminated CuO specks! Very attractive specimen, too bad it is an erratic. Rockchip sample **NH51R** from gneissic granite. Hand specimen. Host rock is siltstn, finely laminated. Bed: 270/40S? Jointing: 20/85NW, 20 m. Bed: 20/25NW (III).

127 445740/6415030. Shale, calcareous, black, finely laminated. Bed: 45/50NW (III). Jointing: 20/90, 10 m. Bed: 45/30NW (I); 35/40NW (I).

346 m bearing N67E, shale, black, calcareous, finely laminated. Bed: 65/55NW (II); 65/70NW (I).

128 446340/6416460. Broad topographic rise, 200 m radius. Shale, dark gry, highly calcareous, finely laminated. Bed: 60/35NW (I); 50/25NW (I). Jointing: 35/80SE, 3 m. Isolated outcrop, about 1.5 m length, black calcareous shale, highly sheared with developed elongate openings with limonite, shearing: N85W. Rockchip sample **NH52R** limonite-filled shear fractures plus calcite and minor siderite.

369 m bearing N43E, black calcareous shale. Bed: 40/30NW. Jointing: 355/70NE, 6 m.

853 m bearing N42E, black calcareous shale. Bed: 45/45NW. Jointing: 10/80SE, 3 m. Find minor amounts ironstn float.

129 447145/6417980. Shale, black, calcareous. Bed: 20/50NW (II); North/30W; 10/30NW (I). Jointing: 05/80SE, 15 m. Fracture cleavage: 80/85SE.

130 446560/6418720. Shale, black, calcareous. Bed: 330/35SW (II); 340/30SW (I).

131 445820/6419760. Shale, black, calcareous. Bed: 345/50SW; 340/50SW (I). Jointing: 80/80NW, 3 m.

423 m bearing S06W, broadly elevated ground, shale, black , soft, calcareous. Bed: 130/45SW; 130/45SW (I). Jointing: 15/80SE, 5/m.

132 445615/6417990. Shale, black, calcareous, finely laminated. Bed: 20/35NW (I); 20/25NW (I).

133 449725/6414880. Limestn sequence in beds to 1 m thickness alternating with calcareous silty sandstn, often gritty. Fracture cleavage: 90/80S, well developed. Bed: 40/40NW (I); 30/30NW (I).

300 m bearing S42E, headwaters of two parallel streams. Limestn beds alternating with calcareous sandstns and siltstns. Bed: 45/30NW. Jointing: 10/85SE, 10 m. Fracture cleavage: 70/80SE. Bed: 25/35NW (I).

623 m bearing S70E, sandy/pebbly limestn beds to 3 m thickness alternating with calcareous siltstns and sandstns to 20 m thickness. Bed: 50/25NW (I).

134 459715/6420360. Copper prospects. Three linear cuts each about 10 m in length with shallow trench lead-ins. Southerly-most cut (Sta 134) trends N30W where it strikes into another cut.

Sample **NH53R** mostly massive vein quartz with irregular clots and gashes of dark rd-brn limonite. Sample **NH54R** predominantly gry-brn calcite and rd-brn limonite with malachite taken from mullock heap in NE workings.

135 446750/6427900. Copper prospects. Broad (900 m), easy topographic rise 2.65 km N52E of Wiawera homestead. Rock is siltstn, micaceous. Find large quartz vein boulders to 1 m diameter. Carry CuO and malachite in association with silicic/ferruginous/siderite veinlets and irregular cavity fillings. Sample **MD97R** from mullock, vein quartz approx 1 m width, carries ocherous gossan fillings. Vein: 75/65SE. CuO noted throughout vein and adjacent siltstn wall rock, highly sheared: 85/85NW. Jointing: 15/80SE, 10 m.

136 447000/6427760. Central portion of broad Topographic doming. Rock includes sandstn, gritty sandstn and micaceous silstn.

Fracture cleavage: 95/85NE. Jointing: 15/75NW, 30 m. Faint FeO discoloration, also minor occurrence clots (3-5 cm) ferruginous fillings. Bed: 85/75NW (II). Find beds ferruginous limestn, very resistant. Find occasional quartz vein bearing limonite fillings. Note that central portion of domal area exhibits moderate depression roughly 60 m radius.

137 446940/6427520. Quartzite, occurring in two parallel linear outcrops 0.5-1.5 m relief, 60 m separation. Quartzo-feldspathic, disseminated FeO specks, locally gritty, 10-13 m width. Bed: 80/90; 80/90.

228 m bearing N88E (along strike of bed), quartzo-felds sandstn, highly indurated, crystalline. Bed: 85/90. Jointing: 05/90, often occupied by thin quartz veins, milky white.

138 439720/6421110. Shale, lt to med gry, minor micaceous fraction, strongly reactive to HCl. Bed: 75/75SE.

139 440000/6421385. siltstn, lt gry-grn, well-developed bed: 75/70SE (I). Joint: 305/80NE. Approx 50 m south: dark gry to black siltstn, calcareous silty sandstn, finely bedded, very homogeneous texture. Bed: 75/60SE; 75/60SE (I). Freshly broken surfaces exhibit reddish-brn spots (1-2 mm) which may represent former disseminated pyrite. Approx 50 m northerly: silty sandstn, bed: 75/60SE (I).

140 441310/6421580. Sandstn, silty, calcareous, black. Bed: 60/60SE (I).

141 442225/6421745. Sandstn, calcareous, dark gry-brn, bed: 90/30S (III); 75/75SE (I). Joint: 5/90. Minor quartz veining, milky-white. Abundant quartz chips on surface. Joint: 360/90, 20/m. Fracture cleavage: 75/85NW, well-developed.

142 443845/6421570. Sandstn, silty, dark gry. Bed: 75/80SE. Joint: 105/85SW.

143 444600/6420800. Alluvial area. Abundant quartz float.

144 442600/6421975. Well-developed linear o/c. Sandstn, black, calcareous. Fracture cleavage: 75/85SE. Very irregular bedding: 65/75SE (III); 75/65SE (I).

145 442520/6421290. Linear o/c. Sandstn, calcareous, black. Bed: 90/75S. Joint: 350/90.

146 441775/6420800. Sandstn, calcareous, bed: 105/45SW; 95/45SW.

147 442105/6420470. Sandstn, silty, lt to med gry, slightly darker gry on freshly broken surfaces. Highly calcareous. Excellent bedding laminations: 285/35SW (I). Joint: 195/75NW. Quartz clasts at surface are rare. Calcrete coating well-developed.

148 441770/6420020. Slight topo rise. Sandstn, dk gry, very calcareous. Calcrete coating on most surface clasts. Rare quartz chips. Bed: 285/25SW; 280/30SW (I). Joint: 205/85NW, 5/m; 195/85NW, 20/m.

149 441350/6420395. Highest point this area, a broad, oval-shaped hill. Good o/c's. Sandstn, silty, black to dark gry-brn, crystalline texture on freshly broken surfaces. Comprises fine grained dark layers alternating with coarser (crystalline) lighter layers lending distinct banding structure. Bed: 280/25SW (I). Joint: 210/90; 205/80NW, 10/m.

150 440730/6420600. High, broad, elevated ground trending 350° mag. Sandstn, silty, very even textured, finely laminated dark gry-brn on exposed surfaces, lt to med gry on fresh. Bed: 255/50SW (I). Joint: 175/80SW. Trace amounts quartz float, milky-white.

151 440085/6421050. Sandstn, silty, highly calcareous, excellent bedding: 265/45SE (I).

152 439870/6418255. Sandstn, dolomitic, highly reactive to HCl. Med gry, homogeneous texture, well-developed ribbon, or even-banded structure, comprising alternating light (2 cm) and dark (1 cm), the latter exhibiting a distinct wavy character. Bed: 150/20SW (I). Joint: 40/80NW, 3/m, often filled with calcite. Marked aerial photo display, due minimal vegetation.

153 439400/6418730. Sandstn, dolomitic, well-bedded, exhibiting ribbon structure, lt gry-brn. Bed: 295/25SW. Joint: 200/80SE, 2/m. Fracture cleavage: 250/75NW, poorly developed. Surface float mostly calcareous sandstn, all with calcrete coatings. Conspicuous absence of quartz float. O/c stands in mod (30-50 cm) relief, 50 m wide.

154 439200/6415950. Southeast limb of syncline. Dolomitic limestn and calcareous sandstn, med gry. Bed: 35/35NW (I). Fracture cleavage: 90/80N. Well-developed ribbon structure. Rock o/c

stands 8-10 m above surrounding lands, 120 m width. Prominent topo feature reflecting the form and shape of the SE limb of the syncline.

155 439650/6416400. Siltstn, dolomitic, very even textured, producing flat, thin plates on weathering, med gry. Bed: 20/45NW (I). Joint: 65/80SE, 20/m; 135/80NE, 20/m.

156 440100/6417185. Keel area of syncline, well-defined by mod elevated terrain. Supports distinctive grassy vegetation. Dolomitic limestn and sandstn. Bed: 10/25NW (I). Fracture cleavage: 75/90.

157 440000/6417520. Dolomitic limestn and sandstn, med gry-brn on exposed surfaces, med-gry on fresh, exhibits even grained crystalline texture. Good ribbon-banding structure, darker bands being slightly more resistant and standing out in small relief, 5-10 mm in widths. Bed: 345/25SW (I). Joint: 50/85SE, 5/m. Drop in slope develops immediately to east of these relatively resistant carbonate beds, rising slightly to west. Width of o/c at least 60 m becoming more lithic westerly. Bed: 45/25SE (I).

158 442595/6418395. Dolomitic limestn, exposed in dry gully. Bed: 15/40NW (I). Joint: 110/90, 10/m.

159 442800/6418975. Dolomitic limestn, lt to med gry on freshly broken surfaces. Bed: 355/20SW. Fracture cleavage: 75/80SE. Trace amounts quartz on surface, milky white.

160 4424480/6420085. Dolomitic limestn, Bed: 320/25SW (I). Joint: 55/80NW, 5/m.

APPENDIX B

NILPENA HILL
1989-1990 GEOCHEMICAL SUMMARY

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APPENDIX B

1989-1990 GEOCHEMICAL SUMMARY

NILPENA HILL AREA, EXPLORATION LICENCE 1657
OLARY PROVINCE, SOUTH AUSTRALIA

ROCKCHIP SAMPLING

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	SAMPLE DESCRIPTION
NH 01R	7	<2	<1	2	22	5	10	Quartz vein
02	16	22	<1	8	130	8	12	Quartz vein, greasy lustre
03	16	600	13	105	3.20%	32	270	Quartz vein
04	23	4	<1	4	200	20	22	Basic igneous rock
05	23	34	<1	7	500	14	32	Contact zone with dike
06	27	32000	600	40	47.4%	82	70	Fissure filling, malachite, CuO
07	34	<2	1	na	30	26	68	Fault breccia, ferrug. quartz
08	37	<2	<1	na	13	5	4	Fault breccia, qtz, ferruginous
09	38	250	<1	na	14	<4	11	Quartz vein, brecciated, siderite
10	43	4	<1	na	13	5	5	Sandstn, ferruginous, quartz
11	44	2	1	na	17	20	1080	Gossan, fine limonite veinlets
12	45	<2	<1	na	140	8	9	Fault zone, quartz, ferruginous
13	47	<2	1	na	9	18	82	Braemar ironstone member
14	53	6	<1	na	8	14	12	Quartz vein, FeO, greasy lustre
15	53	<2	2	na	7	18	32	Ferruginous outcrop
16	55	<2	2	na	12	8	10	Ferruginous outcrop
17	56	<2	<1	na	13	5	3	Quartz vein, specular hematite
18	64	4	<1	na	45	10	10	Quartz vein, ferruginous
19	65	4	1	na	32	6	3	Quartz vein, ocherous goethite
20	65	<2	<1	na	16	8	19	Leuco granite, diss FeO specks
21	66	2	<1	na	92	5	8	Quartz vein, FeO
22	74	5000	14	na	7.40%	14	450	Fissure vein, CuO, goethite
23	74	2800	13	na	3.25%	6	290	Quartz vein, ocherous goethite
24	74	85	<1	na	980	<4	12	Quartz vein, gossanous
25	74	60	<1	na	600	<4	10	Quartz vein, ocherous goethite
26	75	240	11	na	2.15%	12	72	Quartz vein, greasy, malachite
27	75	8	1	na	115	<4	7	Quartz vein, greasy, goethite
28	75	4	<1	na	730	12	5	Sandstone, FeO-stained, argillic
29	75	<2	<1	na	430	42	14	Quartz vein, pyritic siltstone
30	75	<2	<1	na	1020	92	82	Hydrothermally altered sed's
31	76	<2	<1	na	44	24	9	Quartz vein, FeO
32	77	<2	<1	na	46	5	2	Intrusive, acid, diss limonite

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	SAMPLE DESCRIPTION
33	77	2	<1	na	82	20	6	Arkosic sediment, limonite-rich
34	89	10	2	680	180	15	13	Vein breccia, siderite, quartz
35	89	140	12	165	3.70%	12	38	Vein breccia, chalcocite, quartz
36	89	180	3	1420	3100	28	76	Vein breccia, limonite, quartz
37	89	255	4	480	3.80%	30	88	Mylonite, ferruginous, CuO
38	90	16	13	88	4850	26	30	Fissure vein, breccia, CuO
39	90	295	10	1120	9500	145	72	Gossan, cellular structure
40	91	26	2	320	790	22	28	Ironstone, dense, qtz clasts
41	92	405	3	630	9500	30	170	Vein filling, ferruginous, CuO
42	92	160	92	100	4.10%	36	80	Vein filling, limonite, CuO
43	93	160	6	28	3.30%	12	66	Siltstone, silicified, CuO
44	93	4	3	82	2550	15	18	Fracture zone, trace CuO
45	95	8	<1	6	290	5	14	Quartz vein, FeO-stained
46	101	4	1	2	260	5	15	Fracture zone, minor goethite
47	101	2	<1	<2	62	6	7	Sandstone, $CaCO_3$ veinlets
48	106	4	<1	46	44	10	28	Siliceous sed, limonite veinlets
49	126	2	<1	14	35	<5	22	Lamprophyre, hornblende
50	126	3	<1	8	4	5	42	Lamprophyre, hornblende
51	126	<1	<1	2	734	5	12	Gneissic granite
52	128	<1	<1	11	10	5	20	Shear fract's, limonite, siderite
53	134	4	12	460	274	285	144	Vein quartz, limonite clots
54	134	48	13	2300	3.93%	<5	20	Vein filling, ferruginous, CuO

STREAM SEDIMENT SAMPLING

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
NH 01S	22	90	<1	22	350	30	36
02	02	600	11	14	9700	26	42
03	24	10	1	35	150	52	65
04	31	2	2	na	28	34	28
05	97	<2	1	16	50	30	80
06	97	<2	1	25	50	42	84
07	97	<2	<1	14	52	38	68
08	97	<2	1	125	60	68	105
09	110	1	<1	6	28	15	78
10	111	<1	<1	6	30	30	88
11	114	<1	<1	6	30	25	82
12	114	<1	<1	6	22	15	66
13	117	<1	<1	7	28	25	60
14	123	<1	<1	7	26	20	58
15	124	<1	<1	5	14	25	50

APPENDIX C

MALDORKY SPECIAL AREA
1989-190 GEOLOGIC FIELD NOTES

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APPENDIX C

1989-1990 GEOLOGIC FIELD NOTES

MALDORKY SPECIAL AREA, NILPENA HILL EL 1657
OLARY PROVINCE, SOUTH AUSTRALIA

01 452875/6410780. Hill top. Siltstone, gry-grn, "peppery" m/m tex (amphibolite facies) well-devel'd fracture cleavage: 255/80SE. Joints: 20/80 SE approx 2/m, Wilyerpa Formation.

02 453055/641065. Prominent linear o/c, sub-graywacke, dk gry-brn on exposed, gry-blk on fresh surfaces. Shows fine laminar bedding with local convolute structure, highly indurated, tough. Attitude: 100/76 SW. Jointing: 30/90. Fract cleav: 75/85SE.

Bedding measured approx 20 m to SE: 125/25SW (II). Linear graywacke outcrop approx 3 m wide expanding to 5 m. Adjacent rock is meta-siltstn, gry-grn, tends to show greater decomposition due weathering. Expansion of sub-graywacke bed to 5-6 m in part function of minor displacements along fracture cleavage.

03 453245/6410605. Gully. As previous, sub-graywacke (linear) o/c. Forms prominent ridges to 1-2 m relief, well shown on aerial photo. Brownish discolor'n of exposed surfaces due finely diss FeO in matrix originally mafic constituents. Joints: 5/85SE approx 5/m. Adjacent rock is gry-grn siltstn, weathered, fract cleav: 65/80NW.

04 453625/6410465. Sub-graywacke displaced parallel to joint: 20/75SE approx 5/m. Bed: 90/255 (III). Approx 50 m SE (on strike) bed: 85/55SE (I). Fract cleav: 80/85SE. Approx 120 m SE (on strike) bed: (0/40S (I) as shown by very fine bedding laminations.

05 454050/6410295. Sub-graywacke (as above), expanding to 30 m. Bed: 95/60SW (I). Appears there are now several sub-graywacke beds here to 3 m thickness with 6-10 m interstitial siltstone. Joint: 170/80NE approx 5/m. Locally sub-graywacke grades to grit (1-1.5 mm diam) beds and may show cross-bedding. Approx 150 m SE (on strike) find boulder biotite granite, very coarse grained, decomposed, a dropstone.

06 454735/6410410. Sub-graywacke, very homogeneous tex, tough. Faint bedding laminations 75/75SE often grading to coarse sandy beds (1-4 mm) poorly sorted, in places show well-devel'd graded structure. 2nd bed: 85/70SE. Joints: 20/85SE, sheeted 50/m.

Adjacent (to north) rock is siltstn, amphibolite facies, surface expression smooth relief, decomposed. Includes reddish qtzose sandstns (2-3 m thick). Abundant quartz gravels on surface derived from local, large linear quartz "blows", milky-white.

07 454725/6410555. Sandstn, coarse-grained, graywacke, m/m, exhibits a peculiar spotted alteration (?) on weathered surfaces, oxidized feldspar clots (?). Bed: 120/35SW (I) approx 2 m thick with good cross-bedding also locally massive, prominent relief (1-3 m) hosted by gry-grn, finely laminated meta-siltstone siltstn.

Sample **MD01R** from siliceous bed 0.5-1.0 m thickness directly underlying above coarse-grained graywacke, excessively pitted with ocherous limonite fillings including trace amounts hematite. Underlain by siltstn, gry-grn.

08 454400/6410565. Sandstn, spotted (as previous), spots are light colored, bleached, semi-circular or lensoid to 5 mm diam. Fault breccia, well-healed, approx 50 cm thick, attitude 80/70SE. Sample **MD02R,** clasts comprise quartzite, felsite, siltstn with silica cement, generally well-rounded, matrix with spotted pyritic-like alteration. Attitude of spotted sandstn host: 100/30SW (I). Joints: 30/60SE approx 20/m.

09 454320/6410615. Dike, basic, comprising mostly quartz/felds with less dk min's (altered to limonite), fine to med grained, equi-granular. Excessively pitted, leached ferromags with trace remnant chlorite. Quartz phenocrysts (0.5-1.5 mm) exhibit faint milky-white translucence typical of secondary or additive quartz. Pits with limonite to 2 mm diam.

Dike appears to be in part bedding controlled. Sandstn either side of dike appears to be case hardened as shown by greater resistance to decomposition. Dike rock obviously easily weathered leaving discontinuous exposures where more siliceous. Width approx 4 m.

10 453400/6411470. Ridge. Quartzite, lithic, well-indurated, forms prominent linear o/c approx 3 m thick, dk-gry on fresh surfaces due 10-15% finely disseminated (m/m) amphibole; trace amounts diss limonite. Several resistant beds of this nature in gen vicinity, are interbedded in gry siltstn, a very easily decomposition rock.

Bed: 65/65SE. Joint: 15/85NW approx 5/m. Minor inter bedded sandy layers, weathers buff yel, quite porous, locally gritty.

11 453820/6411570. Quartzite, lithic. Approx 40 m north of sta find coarse-grained sandstn, bed: 75/60SE. Area occupies high plateau setting with much quartz gravels on surface. Joint: 15/90, approx 10/m unusually large amount separation (30-60 mm) along joint planes.

12 454155/6411480. Graywacke, very tough dk to med brn-gry. Bed: 80/75SE. Joint: 10/80SE.

13 454305/6411380. Dike, intermediate composition, approx 5 m wide, typically med grained, equi-gran, feldspar (20-30%), interstitial argillic products, mafics totally chloritized.

Two types quartz phenocrysts 1) very faint bluish pastel translucent to 1 mm diam, exhibit thin "glassy" rims, 2) relatively clear translucent, sub-angular to very irregular, <1 mm but good interstitial relationship with other min's. North side of dike walled by coarse granular to pebbly sandstn, tough, approx 3 m thick, clasts to 5 mm, angular, poorly sorted, matrix appears to be a dense, shreddy mass of amphibole, overall gives arkosic appearance.

Approx 30 m to SE of dike, prominent quartzite bed stands 2-3 m relief, approx 3-4 m thickness. Bed: 65/80SE, also includes "arkosic gravel horizons", gradational with fine grained sections, 30-50 cm thick.

14 454485/6411415. Igneous (?), on strike with Sta 13 igneous rock. Thoroughly decomposed lithics, FeO, limonite, very friable, prominent relief to 3 m. Fract cleavage: 70/90. Joint: 5/90, sheeted. O/c pattern fairly persistent along strike (N80E) but thickens and thins. Fresh specimens of the dike exhibit a faint foliation!!

15 454725/6411470. Igneous (?). Thoroughly decomposed by normal weathering with most feldspar and mafic constituents leached. Fract cleavage: 85/70NW. Joint: 15/85SE.

Approx 20 m to south, prominent linear o/c of sub-graywacke, coarse sand interbeds, very tough, resistant to erosion. Bed: 75/75SE (III). Joint: 160/90, sheeted; 70/90, sheeted.

16 454425/6411155. Granitic drop stone (40 cm diam), coarse granular, bleached micas. Gray sandy siltstn host. Bed: 275/80NE.

17 453910/6411025. Quartzite, occupies prominent hill to 15-20 m relief. Aerial photo and mapping shows quartzite hill occupies central portion of broad syncline. Very massive, weathering to large (1-3 m), rounded smooth o/c's. Laced with numerous quartz/hematite veins to 5-15 cm thickness, very irregular, pinch out.

Sample **MD03R** is qtz-hem mixture from vein to 15 cm thickness, estimate 30% hem in part altered to dk rd ocherous limonite. Jointing: 70/65SE, traces into faint linears resembling bedding. Joint: 160/90, 5/m.

18 453305/6411180. Quartzite, bow of syncline. Bed: North/55W (?); 110/60SW (I). Joint: 20/85SE.

19 453430/6411185. Quartzite, massive, tough, smoothly weathered producing large rounded tor-like outcrops. Bed: 80/60SE (I). Joint: 10/90 approx 10/m.

20 454075/6411225. Dike, intermediate composition, equi-gran. Two types quartz: 1) faint pastel translucence, 2) clear, glassy type. No remaining mafics other than FeO alteration products.

Sample **MD08R**, hand specimen very tough, diss specks may include some former pyrite. Joint: 110/75NE; 10/85SE. Strongly m/m aureole in host sandy siltstns. Bedding on W: 40/20SE dipping in towards igneous body; on NNW side: 55/40SE (I).

21 454115/6411915. Quartz "blow" approx 15 m length, N70E/80NW. Rock types comprise sequence quartzite beds to 1 m thickness, coarse qtzo-felds sandstn including gritty sandstn beds to 50 cm. Bed: 95/85SW (III); Joint: 25/75SE.

22 454375/6412040. Hill top (site of an old shepherd's keep). Quartzite, broken into large rectangular blocks. Fract cleavage: North/75E; older fracture cleavage: 70/70SE. Bed: North/85E (II). Considerable quartz veining, sweated from host seds: 70/80SE.

Sample **MD04R** from quartz vein, 40 cm thickness, milky-white, well-crackled with ocherous limonite, few cavities appear to have sulphide origin.

23 454580/6411675. Quartzite or well-indurated quartzose sandstn, approx 1 m thick, alternates with more easily erodible lithic sandstns. Bed: 90/55S (I). Joint: 20/75NW approx 5/m.

24 455240/6411945. Ridge crest comprised of quartzite, gry-brn on exposed surfaces, very massive. Fract cleav: 80/90. Joint: 30/85SE approx 5/m. Bed: 30/70SE; 45/30SE (I).

25 455460/6411730. Hill side. Outcrops appear to curve, meta-siltstn, dk metallic-gry on fresh surfaces, very resistant, occur in several parallel beds to 2 m thickness. Interstitial rock is coarse grained silty-sandstn, shows prominent fracture cleavage: 70/85SE. Bed: 70/85SE (?). Joint: 25/90 sheeted.

26 455505/6412015. Meta-siltstone exposed in creek bed, strong amphibolite facies alteration, abundant (80%) fine amphibole leaves rock with blk, shiny lustre. Bed: 85/65NW (I); 85/70NW (I). Prominent fracture cleavage: 80/85SE.

27 452970/6411100. Graywacke, matrix strongly ferruginous with FeO concentrating on bedding planes, fractures and joints. Bed: 100/40SW. Joint: 165/90; 25/90 well-devel'd. Bed: 90/35S (I).

28 453015/6410985. Graywacke, relatively thin bed approx 1 m thickness, several such beds interbedded in gry siltstn. Bed: 100/60SW. Joint: 20/85SE well-devel'd, approx 5/m, 3-5 cm parting.

29 453595/6410740. Graywacke, locally exposed small-scale cross bedding. Approx 50 m NW of sta. bed: 115/35SW; 110/35SW (I). Joints: 10/80SE; 20/85SE, 5/m, joint planes FeO-stained.

30 453445/6410945. Sandstn, qtzose with lithic fraction, rd-brn on exposed surfaces. Here excessively broken and fractured leaving rubbly "outcrops". Joints: 5/80SE; 280/40NE. Sandstn spotted with numerous small (3-5 mm) pits, elongate with FeO halo. Bed: 270/75S. Sandstn beds are interbedded in gry-grn siltstn, here strongly weathered.

31 453370/6410985. Graywacke, exhibits much (60-70%) fine blk amphibole. Bed: 105/55SW (I). Joint: 20/90.

32 452670/6411110. Erosional gully, exposes gry-grn siltstn (looks like Tapley Hill Fm). Highly developed fracture cleavage: 70/85SE.

Following gully SE find coarse, equi-granular sandy beds, excessively broken with fractures filled with calcrete-like substance. Bed: 195/85NW (II).

Approx 110 m bearing S52E, creek channel, blk mudstn approx 3 m interbedded with sandstn, locally deformed. Bed: 115/50SW. Cut by ferruginous/siliceous-bearing fractures, estimate 10% pyrite now completely oxidized. Productive appearing limonite/goethite, trend: 155, 30 cm width.

Sample **MD16R** comprises rd-brn limonitic fracture filling, with dk rd-brn clots resembling former sulphides, quartz (broken vein) clasts. Host rock is shale, dk gry-blk, very decomposed.

33 452550/6411225. Erosional gully (as above). Siltstone, gry-grn. Fract cleavage: 75/70SE well-developed. Joint: 10/90. Appear to be strongly sheared on fracture cleavage. Bed: 125/35SW (II); 130/40SW (I). Joint: 30/85SE approx 5/m. Fract cleav: 70/85SE.

34 452570/6411550. Siltstn, lt gry-grn (Tapley Hill fm?) alternating with thin sandy siltstn. Bed: 10/35NW. Fract cleavage: 45/85SE. Beds exhibit considerable distortion, twisted and broken. Bed: 105/75NE.

35 452520/6411720. Hill top. Sandstn, coarse (1-3 mm), gritty, rd-brn, appear to have been leached, much limonite and FeO occupying matrix and fractures. Bed: 80/65SE. Well-devel'd cross-bedding. Fract cleavage: 50/85SE. Bed: 55/40SE (III) cross-bed ?

36 452800/6411740. Ridge crest. Siltstn (Tapley Hill fm ?) alternating sandy facies well-indurated, gry-brn, dk gry on fresh broken surfaces. Rocks highly broken. Fract cleavage: 70/80SE. Joint: 15/90. Bed: 75/65SE (II).

37 453080/6411810. Ridge crest. Abundant bull quartz "blows" with predominant trend 55/80NW gen shows well-preserved fracture cleavage: 175/85SW. Siltstn, gry-grn (Pft ?) also reddish silty sandstn and coarse sandy beds. Joint: 150/90 approx 5/m. Quartz blow, 40 cm, 60/80NW. Bed; 65/40SE (I). Quartz blow, 1 m, approx 70 m length 75/80NW.

38 452790/6410780. Graywacke bed, med gry on fresh break, equi-gran, shows good bed: 105/35SW. Fract cleavage: 80/85SE. Joint: 35/85SE approx 5/m, 2-3 cm separation along joint planes. Bed: 110/40SW, graded bedding.

39 452875/6410610. Graywacke, well-bedded, lt brn-gry on exposed surfaces forms prominent linear o/c's (see aerial photo), gen 1-2 m thickness. Bedding locally shows intricately folded laminae. Bed: 110/30SW (I); 115/45SW (I). Joint: 20/80SE, 5/m. Siltstone between graywacke beds gen shows good fract cleav: 80/90. Find excellent small-scale cross-bedding in graywacke.

Approx 30 m SE of sta, find dike-like body, 60-70 cm thickness, intermediate comp'n, str'ly weathered, matrix mod responsive to HCl, attitude: 15/85NW.

Sample **MD05R** from dike rk, med grained, equi-granular, inclusions of siderite (responsive to HCl), minor calcite small irregular fillings, mod brecciation, open spaces with dk rd limonite. Shows very well as linear feature on aerial photo.

40 452885/6410275. Hill top. Pick up southerly continuation of dike-like strong. Very prominent surface expression, slight but obvious. Attitude: 05/85NW. Thickens and thins between 40 and 60 cm. Adjacent wall rocks (siltstn) show marked resistance to erosion about 1 m either side of dike. Contact itself very sharp, on dike side very fine grained, siliceous with minor thin parallel quartz veins, on siltstn (host rock) side rock is brownish (FeO) also siliceous with numerous limonite-filled cavities (productive appearing). Sample **MD06R**.

41 452810/6410265. Dike-like rock, another occurrence, pinches and swells 10-40 cm, 15/85NW; 05/75NW. Sample **MD07R**, a dense, med brn, siliceous, aphanite, laced with numerous fine siderite and calcite veinlets. Host siltstn rich in fine, shiny blk amphibole. Fract cleavage: 70/80SE. Bed: 75/65SE (I); 80/70NW adjacent to large (1 m) quartz blow. Ridge crest N65E. Fract cleavage does not show in dike-like rock.

42 452700/6410725. Large granitic erratic (73 m N20E x 30 m normal to elongation, tapering at each end) . coarse-granular, strongly weathered but locally shows slight relief over gry-grn host siltstn. Contact on SE side (centre) very sharp, granite does show somewhat finer grain and more resistant to erosion.

Siltstn shows a uniform line of o/c about 1 m width along contact with granite (N25E). Fract cleavage: 75/80SE. Granite also shows same fracture cleavage: 70/85SE. Siltstn exhibits considerable convolute bedding. Bed: 105/50SW (II) measured on SE side of large granitic, erratic.

NW granite/siltstn contact also shows a finer grained granite compared with the same rock in its central exposure, sharp contact 90-85E.

43 452590/6410905. Sandstn, quartzose with minor feldspar and lithic fraction. Laced by numerous fine milky-white quartz veins. Fract cleavage: 95/80SW poorly developed. Jointing: 25/90 approx 5/m. Bed: 95/65NE (III). Trend of outcrop 145°.

44 453985/6411385. Graywacke, strong amphibolite facies alteration, beds 1.5-2 m thick, well-devel'd bed: 85/75SE. Jointing: 10/90 approx 2/m.

45 452485/6411110. Graywacke, dk rd-brn on exposed surfaces, fairly massive beds to 2 m thickness in gry-grn siltstn. Trend of beds: 150. Jointing: 25/80SE 20/m. Fract cleavage: 60/90. Graywacke exhibits convolute bedding and locally good cross-bedding. Bed: 140/60SW (II).

46 452205/6411455. Sandstn, coarse, good cross-bedding. Bed: 45/65SE. Fract cleavage: 50/80SE. Jointing: 150/80NE.

47 452075/6411610. Graywacke, coarse, exhibits well-devel'd light and dk bedding laminae due to graded strong, locally strongly convolute laminae. Bed: 10/35NW (I). Jointing: 100/90 approx 3/m. Following beds southwesterly note that dip changes from NW to SE quite frequently - probably function of soft rock deformation and perhaps cross-bedding. Bed: 30/65NW; 10/35NW (II).

48 451700/6412075. Sandstn, med to coarse grained, cross-bedded, graded bedding as shown by light and dark banding. Bed: 85/45SE. Jointing: 30/90 approx 3/m; 20/85NW approx 20/m tight with bleached walls.

49 451325/6412605. Sandstn, coarse-grained, exhibiting rhythmic light and dark banding due to graded nature of sand/silt constituents. Bed: 170/25SW. Jointing: 60/80SE. Fracture cleavage: 80/80SE in siltstn.

50 451155/6412495. Conglomerate or slump breccia, prominent o/c, highly sheared and broken, 5-6 m thick, comprising sub-rounded to sub-angular clasts and cobbles of gray felsite, reddish shale, biotite granite, finer grained granitic, gray quartzite. Fract cleavage: 75/80SE, appears to show minor displacements. Tracing breccia northwesterly, becomes wider (30-40 m). Find large (2-3 m diam) blocks granite and meta-siltstone.

Texturally unit resembles large slump block. Devoid of stratification, sandy lenses, etc.

Approx 120 m brg 330° on strike adjacent to breccia, graywacke bed: 255/70NW! More large granitic blocks some 8-10 m length. Bed: 80/75SE.

51 450930/6412775. Graywacke, abundant fine-grained amphibole. Bed: 10/30NW (II). Jointing: 10/75SE. Bed: 05/40NW (II). Bedding shows soft-rock deformation.

52 452110/6412120. Graywacke, coarse sandy, dk gry-brn on weathered surfaces. Bed: 55/40SE. Fract cleav: 50/90. Bed: 65/55SE (II). Fract cleav highly devel'd. Bed: 70/55SE (I).

53 451200/6412970. Sandstn (graywacke), coarse granular, diss limonite specks. Good small-scale, cross-bedding. Bed: 180/35W (I). Jointing: 90/90, 3/m. Fract cleav: 80/90.

54 451080/6413215. Sandstn, very coarse, gritty, predominantly large (2-4 mm) quartz clasts, very dense and heavy rock, micaceous. Bed: 355/35SW (I). Occurs in beds approx 10 m width, gry siltstn to east, gry sandy siltstn to west. Bed (in siltstn): 10/40NW (I). Fract cleavage: 80/90.

Sample **MD09R** from coarse gritty bed compose mostly of angular quartz clasts with siliceous cement, some open spaces (leached cavities) with FeO staining or infilled with dk rd-brn limonite, mafic constituents altered to chlorite.

Approx 120 m North in creek, good grit horizon, 2 m thick. Bed: 20/30NW (I).

Approx 250 m NNE (on strike) grit horizon thinned to 1 m width. Bed: North/35W (I). Fract cleavage: 55/85NW shows minor but consistent displacement contributing to dialation of grit horizon.

55 451070/6413555. Gritstn (marker bed) appears to have thinned out. Here rock is finely laminated gry-grn siltstn. Bed: 05/25NW (I). Fract cleavage: 75/80SE.

Approx 50 m bearing 335°, in creek bed, good sandy siltstn exposed, med gry, finely bedded exhibiting rhythmic light and dark gry banding (light colored 10-20 mm thick darker to 60 mm)

some darker layers show convolute strong and good micro-cross bedding.

56 451225/6413850. Creek bed. Siltstn, sandy, gry. Bed: 60/50NW (III). Fract cleavage: 80/80SE. Beds distorted, convolute, laminae. Considerable breakage including displacement of fracture cleavage. Bed: 170/25SW (II).

57 451065/6413990. Stream channel, drains 100°. Quartzite, forms prominent bed, 8-10 m wide, slightly lithic, grading to sandy grit beds to SE. Bed: North/20W. Jointing: 10/80NW approx 20/m. Fract cleavage: 75/90.

Approx 70 m bearing 280° upstream. Sandstn, silty finely laminated with interbeds sandstn, gry-grn, shows light and dk gry banding. Bed: 40/40NW. Joint: 15/75SE often sheeted with minor displacement.

58 450795/6414075. Creek bed. Siltstn, gry to dk gry-brn, fairly decomposed. Appears to have suffered local compaction and related breakage. Bed: 35/30NW. Fract cleavage: 85/75SE. Jointing: 185/90, sheeted with slight twisting.

Approx 100 m NW (upstream), sandstn, pebbly and coarse sandy. Constituents comprise lt gry felsite, quartzite, meta-sandstone, granite fine grained, cobble dimension. Fract cleavage: 85/60SE. Bed: 75/65SE (II). Find several large (50-70 cm) boulders biotite granite.

Approx 150 m bearing 325° (upstream) quartzite bed crosses creek, very "wavy" trend to o/c. Bed: 60/30NW (I).

59 450820/6414370. Ridge crest (saddle point). Siltstn exhibits the characteristic light (1-2 cm wide) and dk (3-5 cm) bedding laminae. Bed: 45/45NW (I). Jointing: 35/90 approx 5/m. Adjacent beds comprise gry-brn sandy siltstns, bed: 40/40NW (I). Fract cleavage: 85/80SE.

Approx 200 m bearing 350°, sandy siltstns. Bed: 40/30NW (I). Rocks are slightly rd-gry containing a gritty fraction. Fract cleavage: 90/75S. Widespread massive quartz veining: 654/75SE retain fracture cleavage: 95/80SW, gen 10-30 m length pinch and swell to 1.5 m thickness.

60 450925/6414395. Creek bed. Quartzite interbedded in siltstn (to north) and pebbly sandstn (to south) with sub-rounded to angular

pebbles and cobbles set in brn-gry sandy matrix. Bed (contact): 90/60S (?); North/55W (I) as fine laminar banding. Fract cleavage: 90/60S. Find erratic of coarse-grained biotite granite, roughly 3 m in length by 2 m width.

Down stream approx 10 m (in creek bed) good bedding in gry siltstn: 80/80SE (I) in contact with pebbly sandstn. Fract cleavage: 95/75SW.

61 451195/6414330. Sandstn, coarse granular, slightly pinkish to med brn, overlies pebbly sandstn. Bed: 40/60SE (II). Jointing: 15/85SE approx 4/m. Pebble elongation: 70/50SE. Fract cleavage: 80/85SE.

Approx 150 m bearing 170°, creek bed. Siltstn, showing lt and dk gry bedding laminae. Bed: 45/30NW (I). Fract cleavage: 95/80SW. Jointing: 120/90 poorly developed.

62 451220/6414205. Creek bed. Silty sandstn, med gry, finely laminated, exposed in small, well-developed anticline (Photo 01).

Photo 01. Station 62. View S80°W showing crest of small anticline. Axial trace plunges -15 at S80°W. Central section marked by highly developed fracture cleavage: 260/90. Attitude on north flank 240/35NW, on south flank: 260/20SE. A 20-30 cm thick quartz vein has been caught up and folded in the structure.

63 451390/6413750. Graywacke, gry-brn on exposed surfaces, dk gry on fresh. Bed: 350/25SW (II). Fract cleavage: 75/75SE. Jointing: North/70E approx 3/m. Well-devel'd cross-bedding.

Approx 150 m bearing 10°, graywacke, bed: 355/25SW (I). Fract cleavage: 85/90.

64 451290/6413525. Graywacke, coarse, sandy, weather out as large (3-5 m) rounded, linear o/c's. Bed: 105/35SW (I). Jointing: 345/80NE, 3/m, 2-5 cm separation between joint planes.

Approx 70 m bearing 190°, graywacke, well-bedded, exhibits alternating light and dk gry bedding laminae. Bed: 130/45SW (I).

65 450915/6410840. Creek channel, 6-8 m wide. Sandstn, quartzose. Bed: 60/30SE. Much cross-bedding. Jointing: South/90, 5/m. Fract cleav: 55/65SE. In places sandstn thoroughly decomposed, friable.

Continuing down creek channel (SSW) sandstn overlain by gry-grn siltstn with well developed fracture cleavage: 55/70SE. Sandstn grades into very coarse gritty bed (1 m wide). All rocks highly sheared: 65/40SE.

Approx 150 m down stream, sandstns becoming dk gry, silty. Bed: 45/45SE. Shearing continues: 50/45SE with broken quartz vein clasts dragged along shear planes.

66 450670/6410805. Large stream channel draining 125°. Good o/c's on SW side where overlain by gravel soil horizon 1.5-2 m thick. Siltstn, thoroughly sheared: 55/75SE fractures infilled with characteristic clay gouge, width of shear zone 40 m. Interbedded sandstn.

Approx 50 m upstream 290°. Siltstn, nearly blk with fine amphibole. Fract cleavage: 65/70SE; older fracture: 160/80SW.

Continuing upstream approx 80 m bearing 290°, good bedding: 65/80SE.

67 450335/6411125. Sandstn, quartzose with minor lithic fraction, exhibits strong amphibolite facies m/m. Cross-bedded. Bed: 50/20NW. Jointing: 20/90, 3/m.

68 450025/6411205. Teague's Fork anomaly. Siltstone, dk gry, mottled bleaching and blk shale. Extensively sheared, locally brecciated. Exhibit small-scale folding. All rocks are punky, soft

due deformation and leaching. Bedrock either side of creek overlain by 50-80 cm eluvial deposits.

Central portion of creek strongly sheared: 280/85SW, represents axial plane of well-exposed anticline (Photo 02). Numerous stretched and parted quartz veins (10-30 cm), gossanous inclusions and pervasive FeO-staining.

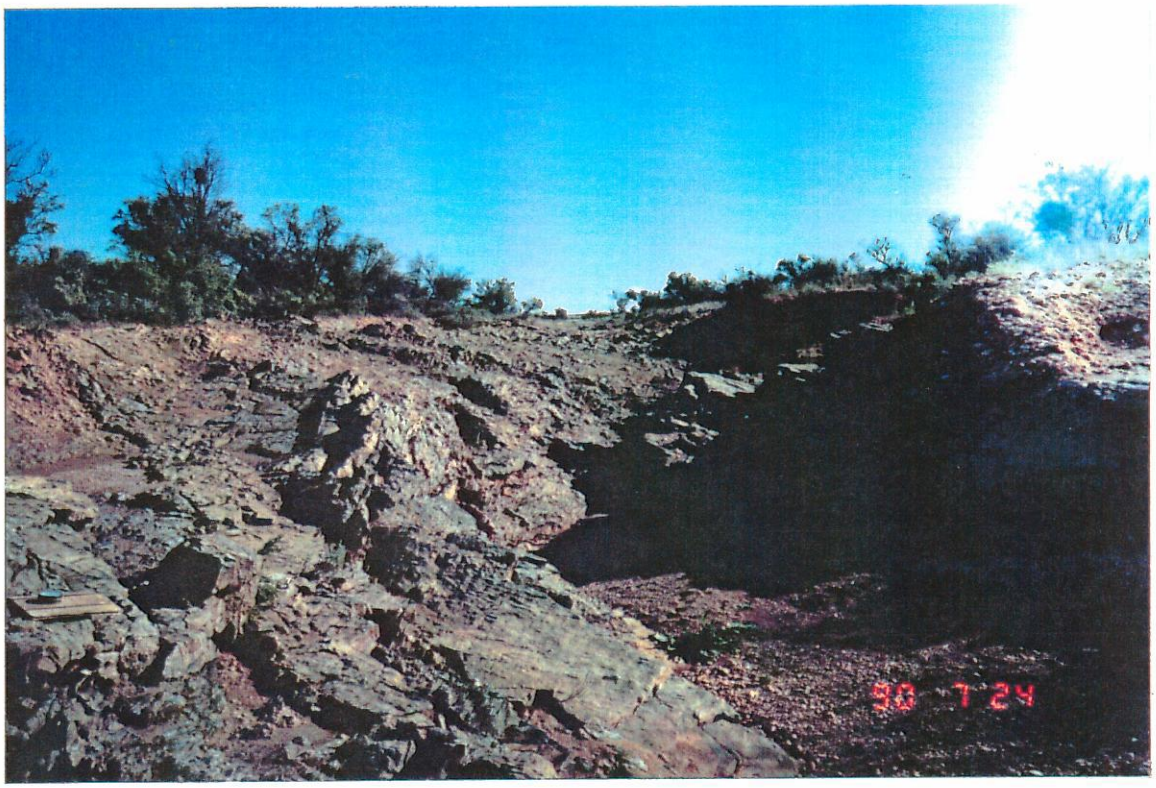

Photo 02. Station 68. View S65°W shows crest of anticline breached by creek. Bedding attitude NW flank 270/25N, SE flank 30/35SE. Axial plane fracturing 70/60SE.

Approx 40 m upstream (245°), well-displayed fault: 165/NE, gouge zone approx 20 cm, appears to be left lateral displacement as indicated by drag structure. Fract cleavage: 70/70SE.

Approx 120 m upstream (240°), another fault zone, approx 40 cm gouge zone, attitude: 75/75SE, wall rock (siltstn) 1 m either side of fault mod silicified with strong ferruginous impregnations.

Sample **MD10R** (10.215 ppm Au, 28 ppm Ag, 380 ppm As, 2100 ppm Cu, 710 ppm Pb and 105 ppm Zn) material sampled from centre gouge zone, contains elongated cavities (parallel to shearing) gen filled with limonite, good cellular structure. Bed: 35/50SE, very wavy.

Approx 150 m upstream, silty sandstns, rd-brn, bed: 70/10NW (I).

Approx 165 m upstream, on SSE bank, faulting over width approx 5 m, attitude: 210/90, displacement is right lateral.

Follow up examination (01/09/90). Between this sta and sta 132 have crossed over numerous northerly striking fractures and fracture zones to 2 m width all of which have suffered bleaching and variable infilling of limonite and siliceous-ferruginous material. One such fracture zone passing thru this sta, attitude: 345/85NE, 2 m wide, central portion about 50 cm wide, densely fractured.

Sample **MD35R** comprise blk siltstn, densely laced with fine (1-3 cm) fractures filled with rd-brn ocherous limonite, very productive appearing, some cavities with limonite probably former sulphides, mod silicification, rock extremely tough, micro-fracts exhibit leaching and bleaching. No CuO or other supergene products observed. Hand specimen.

Approx 9 m bearing 250° from sample site MD35R, another fracture zone characterised by extreme micro brecciation, a mixture of fine and coarse black mylonite with walls standing in slight relief.

Sample **MD36R** comprises dark gry to blk amphibolite-rich siltstn laced with veinlets of siliceous/ferruginous fillings, rock not reactive to HCl, orange-red micro-fracts with limonite strongly reactive. Attitude: 200/85SE.

Approx 25 m upstream bearing 235 Sta 132, fracture zone: 210/80SE, 30 cm wide. Sample **MD37R** from densely ferruginous/siliceous portion of fracture. Wall rock is olive-gry silty sandstn, numerous micro fractures filled with quartz, some siderite and limonite. All exhibit some degree of leaching and bleaching.

69 450040/6411480. Small tributary stream channel. Graywacke exposed in linear pattern across channel. Bed: 90/35N. Very old (well-healed) fracture system: 20/85SE, adjacent host rock very resistant, weakly silicified.

70 451430/6400945. Maldorky Creek. Good o/c's on SW bank, graywacke, dk-gry to nearly blk, due to rich amphibole content. Faulting: zones to 6 m width with strong breakage and mylonitization, rotated clasts, strong FeO, attitude: 55/75SE. 2nd fault located 8 m bearing 15°, right lateral displacement attitude:

80/60SE, gouge here characterised by typical bleached argillic material that infills along all fractures and cavities. Bed: 70/35SE. Jointing: 25/90 approx 5/m.

Approx 150 m S70W, graywacke, med to dk-gry, strong amphibole devel't. Fract cleavage: 70/50SE. Jointing: 20/80SE, approx 5/m.

71 451200/6400930. Graywacke, well-bedded, show very distinctive lt and dk gry laminae banding. Darker bands show a fining upwards to lighter colored material. Bed: 65/75NW (I). Jointing: 155/80NE, approx 5/m. 2nd bed measured approx 15 m upstream: 60/85NW (I).

72 451125/6410180. Maldorky Creek. Graywacke exposed in SSW bank, overlain by 1.5 m gravel soil. Appears to have suffered strong amphibolite facies m/m. Rocks are dk gry to blk. Bed: 60/40SE (I). Convolute bedding (Photo 03). Well-devel'd fracture cleavage: 60/80SE. Jointing: 170/80NE, 5/m.

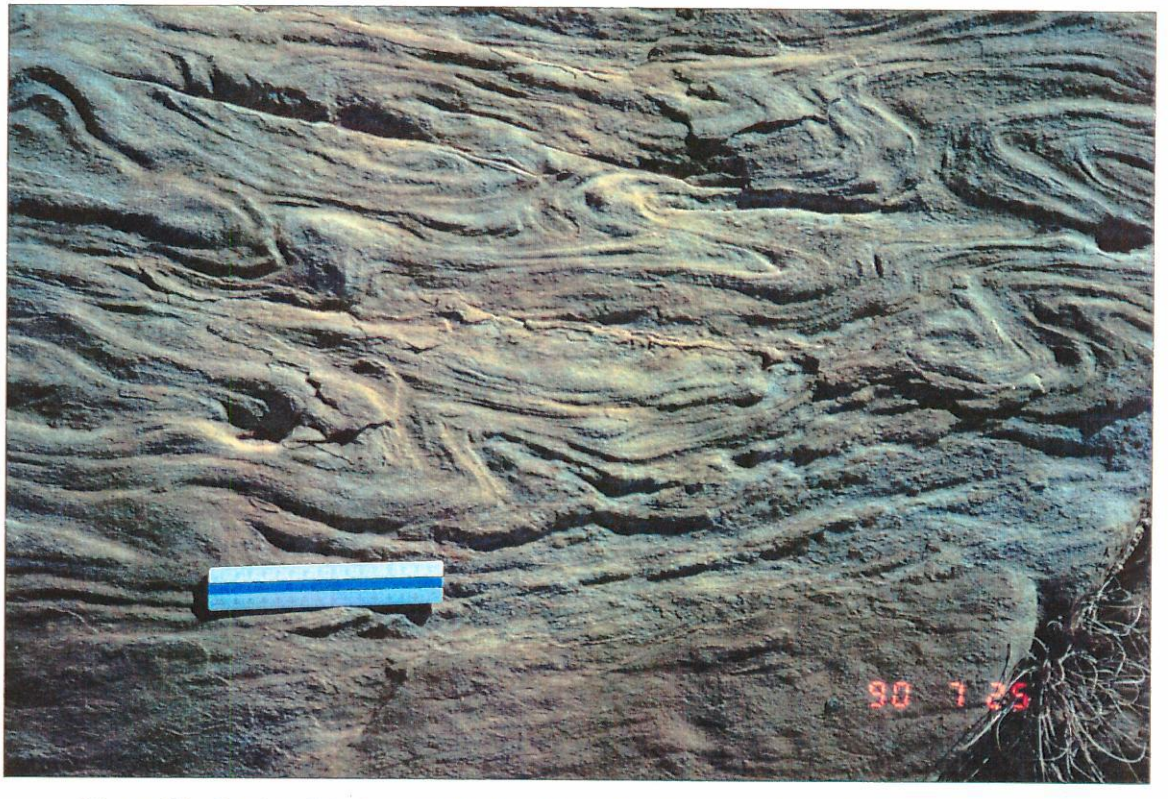

Photo 03. Station 72. Convolute bedding laminations in calcareous graywacke. Bedding attitude: 70/25SE. View vertical. Top of photo N30°W.

Approx 65 m upstream, fault crosses thru blk amphibolite facies rock and quartz veins (1 m): 30/85NW gouge zone approx 30 cm wide, displacement is right lateral as illustrated by displaced quartz vein.

Approx 120 m upstream. Graywacke showing alternating light and dk gry laminae. Bed: 55/50NW.

73 451645/6410245. Gully. Graywacke, silty, highly broken, friable. Fract cleavage: 60/80SE, involved with movement (amount ?), probably right lateral as indicated by bedding-drag structure. Fract cleavage: 60/85SE, measured 10-20 m to SE. Jointing: 10/80SE, 3/m gen with 5-10 cm parting along joint planes. Bed: 70/45SE (?).

74 451975/6410390. Graywacke, rd-brn on exposed lighter brn on fresh. Fairly massive with well-defined linear o/c N50E, 3-4 m width. Abundant fine, shiny blk amphibole (25-30%) minor amounts of which have altered to limonite. Jointing: 10/70SE, 10/m. Bed: 50/70SE (?); 30/75SE (I), well-fractured, crackled, with >FeO<MnO fillings.

75 452215/6410775. Gully. Graywacke, highly broken and sheared: 50/85SE. Much fine, blk shiny amphibole, locally punky, soft. Jointing: 10/85NW, 3/m. Area thoroughly impregnated with the typical bleached argillaceous/calcareous material derived from comminuted rock.

76 451835/6410985. Graywacke, coarse, dk gry-brn on exposed surfaces. Well-devel'd fracture cleavage: 65/85SE. Relatively massive and homogeneous producing broad (1-3 m) rounded o/c's. Transitional with coarse (0.5-1.0 mm) sandy facies. Distinct foliation (remnant bedding ?): 60/80SE. Jointing: 10/85NW; 160/80 NE approx 5/m.

77 451530/6411060. Ridge. Quartzite, lt brn (FeO) slightly reddish, very massive, approx 3 m width, trending 55/80NW (dip ?), cross-bedded. Bed: 45/35NW (II); 40/30NW (II); 40/30NW (I). Jointing: 25/85SE, tight, 3/m.

Approx 220 m bearing 55° (at point on aerial photo where o/c exhibits curvature). Very massive quartzite. Bed: 65/35SE (I). Jointing: 15/85NW, 15-20/m. Curvature in line o/c a function of shallow bedding attitude, topographic location (ridge crest) and erosion.

78 451180/6411610. Graywacke weathering produces sub-rounded o/c's 2-3 m diam. Bed: 135/35SW; 60/20SE difference in attitude due to wavy nature of bedding also probably cross-bedding. Joints: 25/85NW. Bed: 90/30S. Fract cleavage: 80/85SE poorly developed. Bed: 95/20SW.

79 450780/6412140. Graywacke, lt to med gry-rd-brn, coarse grained, locally very coarse (2-3 mm). Fract cleavage: 85/85SE. Bed: 170/15SW.

Approx 110 m bearing 345° top of ridge, find large erratic of granite, med-grained, equi-granular, relatively fresh as compared to most erratics of this nature, no mafics other than FeO remnants. Measures approx 2 m diam, oval-shaped, jointed: 20/90; 5/m. Host is coarse pebbly conglomerate, coarse (0.5-1.0 mm) sandstn and typical graywacke. Bed: 80/80SE.

Numerous erratic cobbles to 1 m diam mostly lt gry, hard quartzite, rounded cobbles graywacke (amphibolite facies m/m). Find interbedded dolomitic limestone layers: 80/40SE (II), 2 m wide.

80 450570/6411900. Sandstn, pebbly comprising gry quartzite, med-grained granitic, lithic sandstn, sub-rounded to angular, very poorly sorted. Fract cleavage: 75/85SE. Massive with thin dolomitic interbeds to 60 cm: 70/75SE (II); 60/40SE (III). Est approx 20% pebbles with rare cobbles, tendency for elongated pebbles to parallel bedding.

81 450200/6412390. Recent erosional gully. Siltstn, olive-grn. Fract cleavage: 65/85NW. Traversing between Stations 80 and 81 note numerous cobbles gry quartzite and med-grained granitics.

Approx 110 m bearing N65W, tillite comprising cobbles of dolomite, lt gry-grn felsite (angular), pinkish med-grained granite. Bed: North/15W (I). Fract cleavage: 65/85NW.

82 449990/6412060. Creek channel with 1-1.5 m gravelly o/burden. Siltstn, lt grn. Fract cleavage: 10/85SE, probably local tectonic, beds excessively broken and disrupted (minor rotation and displacement). Bed: 65/65SE (II). Abundant bleached, comminuted rock products filling fractures, joints, etc.

83 450040/6411585. Stream channel. Tillite comprising abundant rounded pebbles set in sandy matrix. Fract cleavage: 65/80SE, well-devel'd. Bed: 70/60NW (I).

84 451905/6411645. Creek channel. Siltstn, sandy with numerous interbedded sandstn layers (qtzose, lithic). Fract cleavage: 65/65SE. Jointing: 10/85SE approx 3/m. Find strongly ferruginous bed, excessively sheared, lies on SE margin large, linear quartz body 50 cm thickness, 10 m length: 40/75NW. Ferruginous bed: 60

cm wide, 40/75NW.

Sample **MD11R** (0.11 ppm Au, <1 ppm Ag, 13 ppm As, 44 ppm Cu, 140 ppm Pb, 11 ppm Zn) comprises siliceous/FeO-rich mixture with abundant cavities formerly pyrite, non-calcareous, silky sheen (fine sericite), definitely hydrothermal limonite, matrix dense maroon-rd, pyrite to 1 mm diam, to 2 m thickness, at least 8 m exposed length.

Sample **MD12R**, from siliceous section of fracture filling, two types silica, pervasive impregnations and angular clasts, milky-white. Minor pyrite preserved in siliceous material and as indicated by casts.

Bed: 80/50SE (?) in ferruginous shear zone. Jointing: 120/80NE surfaces heavily saturated with FeO causing slightly greater resistance to erosion.

Approx 100 m bearing 250° (downstream) find large boulder (stream float), strongly FeO-stained, crackled, carries sericite, red-orange limonite, slight greasy lustre to quartz. Sample **MD14R**.

85 451775/6411345. Broad topo rise. Sandstn, qtzo < felds, exhibits pervasive FeO-staining with dk limonite smears on fractures, joints, etc. Some ocherous-rd specks diss throughout rock (former pyrite). Find trace amounts thin quartz veining, broken, disrupted. O/c forms slight topo relief, 50 cm with linear trend: 30. Fract cleavage: 55/90. Find associated tillitic beds supporting pinkish quartzite boulders and cobbles, also granitic types with faint gneissic tex. Fract cleavage: 65/80SE.

86 451740/6411710. Gully. Sandstn, pyritic, highly sheared, qtzo-felds composition, locally coarse sands gradational with finer horizons, light-gry often mudstn-like. Local tectonic activity responsible for rock deformation. Shear zone approx 8 m width (sides concealed by o/burden).

Sample **MD13R** from sheared sandstn, includes displaced siliceous/FeO impregnated sandstn, broken quartz vein products. Shearing: 95/70SW.

Approx 110 m bearing N50E, sandstn, massive, very homogeneous, weathering to large (1-3 m) rounded o/c's and huge boulders. Exhibit excellent small-scale cross-bedding. Bed: 120/15SW; 130/20SW (II); 120/20SW. Rocks have slight ferruginous matrix which contributes to brick-red soil horizon. Str'ly reactive to HCl.

Approx 220 m brg N15W, calcareous sandstns. Bed: 90/55S (I).

Approx 220 m brg N15E, calcareous sandstns. Bed: 75/55SE (I).

Approx 200 m brg N50E, calcareous sandstns and siltstns. Bed: 95/55SW.

87 450845/6411645. Conglomerate, with coarse sand matrix, minor cobbles. Jointing: 280/80NE. Arkosic tex and composition. Two quartz grain types: dull milky white and clear translucent. Constituents comprise quartz, siltstn, felsite, biotite-bearing rock, quartzite cobbles, coarse-grained granite. Fract cleavage: 85/80SE. Jointing: 30/85SE 5/m, planes with 3-5 cm separation.

Approx 60 m @ N50E, conglomerate, grades with coarse sandstn interbedded with siltstn. Bed: 55/55SE (III); 75/55SE (II). Occasional dolomitic beds.

88 450520/6411540. Gully. Sandstn, calcareous, med grained, equi-grained. Carries diss pyrite (1-2%) in places quite fresh. Sample **MD15R**. Fract cleavage: 75/80SE. Jointing: 20/85NW approx 5/m. Fairly massive o/c's. Bed: 95/65SW (III). Fault: 50/75SE, approx 60 cm gouge zone, sample MD15R was taken from hanging wall of this structure.

89 452540/6412470. Hill top. Graywacke, massive, carries about 20% fine, blk, shiny amphibole, o/c's weather to dk gry-brn, lt gry-brn on freshly broken surfaces, non-reactive to HCl. Convolute bedding. Fract cleavage: 75/80SE. Jointing: 20/90 very tight. General area supports an abundance of massive, linear quartz bodies, 15-30 m length, to approx 1 m thickness. Bed: 35/10SE (III); North/15E (II).

90 452265/6412650. Small creek. Sandstone, lt gry, friable, graded bedding with dark minerals at base becoming lighter upwards. Bed: North/20W (I). Fract cleavage: 75/70SE. Find pinkish sandstn float in creek, med grained, surfaces coated with FeO, carries limonite pseudomorphs after pyrite to 2 mm, euhedral crystals. Non-reactive to HCl.

Approx 200 m bearing S65W (upstream), good o/c well-bedded sandstn characterised by alternating lt and dk gry banding. Bed: 35/50NW (I).

91 451980/6412485. Saddle point between two opposite-draining creeks. Sandstn, lt and gry banded. Bed: 55/70NW (II). Considerable amounts massive linear quartz bodies this area. Bed: 30/30NW, ripple marks, direction of devel't: 215° (Photo 04). Fract cleavage: 270/75S

Approx 70 m bearing N80E, well-exposed o/c med gry-brn graywacke, carries diss pyrite (0.5-1.0%), anhedral, rock weakly reactive to HCl.

92 451625/6412660. Creek channel. Graywacke, med-grained, exhibits characteristic lt and dk gry banding related to graded bedding. Beds slightly flexed. Gen bedding attitude: 50/70NW (I). Fract cleavage: 70/75SE. Bed: 15/30NW.

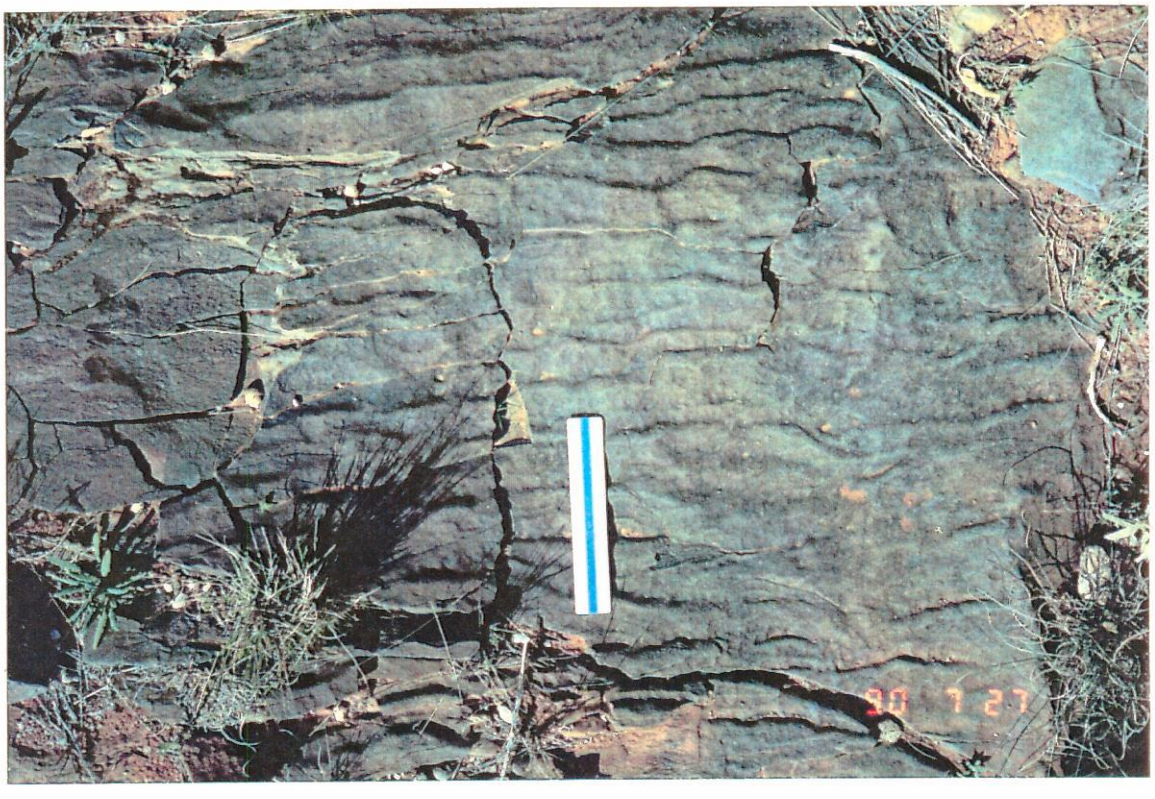

Photo 04. Station 91. View N80°E showing asymmetrical ripple marks developed in finely laminated graywacke. Bedding: 25/15NW. Direction of development: S20°E.

93 451245/6413315. Ridge crest. Sandstn, quartzose in 3 m thick beds, interbedded with gry-brn graywacke, slightly reactive to HCl. Bed: 20/25NW (I). Fract cleavage: 85/80SE West developed in graywacke. Jointing: 5/70SE, often occupied by thin (1-10 mm) quartz veins, walls frequently FeO-stained. Bed: 330/30SW (measured approx 30 m southerly of first measurement). Numerous massive linear quartz bodies, 1-2 m thick 30-60 m length gen: 60/80NW.

94 451445/6413555. Creek channel. Graywacke, strongly weathered, decomposed. Fract cleavage: 75/85SE, well-devel'd. Jointing: 10/85NW, 5/m.

Approx 80 m bearing N28E (downstream), creek bed. Find large erratic granite, coarse granular, biotite-bearing. Fract cleavage: 65/90. Bed: 60/15SE (?). Jointing: North/65E carries thin (2-3 cm) quartz veins. Fairly massive gry-grn graywacke.

Approx 350 m bearing N30E (downstream), creek bed. Nick point as result faulting. Rock is graywacke, med to lt gry, NE side of fault graywacke more completely decomposed. Fault: North/80E, gouge zone approx 45 cm wide comprising comminuted graywacke, argillic products and wk FeO-staining. Displaced quartz vein indicates right lateral displacement.

Approx 450 m bearing N40E (downstream), greenish siltstn with interbedded sandstn. Bed: 80/40NW (I); 65/55NW (I). Quartz veins to 30 cm thickness parallel bedding. Note locally strong FeO-staining of siltstn where proximal to quartz veins containing limonite cavities, 50 cm thickness, highly crackled.

Stream sediment sample **MD01S** comprises med-brn quartz sands and fine lithics and minor amounts blk angular magnetic particles. Some adhering to quartz (vein) and FeO-stained rock, minor limonite, all weakly reactive to HCl. Overburden, as exposed in creek banks gen well saturated with yellowish FeO stain.

95 451710/6413985. Creek (as previous). Siltstn, sandy, laced by numerous thin quartz veins: 350/70NE, 3-5 cm thickness, contribute strong FeO staining to adjacent wall rock. Bed: 115/40SW. Much shearing this area: 75/70SE.

Rockchip sample **MD17R** (0.10 ppm Au, < 1 ppm Ag, 96 ppm As, 88 ppm Cu, 120 ppm Pb, 280 ppm Zn) from 2 cm thick quartz vein, thoroughly fractured and well-cemented by FeO and limonite. Bed: 40/40NW (I); 75/50NW (I).

Approx 40 m downstream find another strongly FeO-saturated siltstn, also numerous fine quartz veining also limonite-bearing, most veins 1-2 cm: 350/75NE, highly crackled and FeO-stained.

Approx 110 m bearing N25W in main creek, med to lt gry silty sandstn. Bed: 5/20NW (III); 55/55NW (I);105/40SW (I). Fract

cleavage: 80/75SE, well developed. Creek development influenced by dense fracture system along axial portion of small anticline.

96 451880/6414030. Creek channel, drains due North, 3-4 m wide. Graywacke gen med gry-brn, locally slightly maroon color. Fract cleavage: 65/80SE, well-devel'd. Jointing: 10/85SE. Bed: 45/35NW (I); 85/65SE (?). Approx 1 m lithic/quartz gravel o/burden. Float cobbles in creek comprise: bull quartz, graywacke, granite, dk reddish mica-bearing igneous type with abundant FeO. Large erratic med-grained granite, bleached mica.

Stream sed sample **MD56S**.

97 452032/6413852. Copper mine, occupies broad hill crest trending N20°E. Principal rock type is sandstn, quartzo-feldspathic, med grained, very tough. Overall length of shallow workings exhibit carbonate and oxide of copper enrichment and staining. Malachite frequently filling cavities with well develop'd crystalline form, azurite, rare (red) cuprite and a black copper sulphide, probably chalcocite. The latter mineral occurs as relatively large (8-10 cm) irregular clots haloed by green copper oxide staining to several cm width; associated with high gold and silver values.

Sample **MD18R** - Chalcocite, dk blu-blk, dense, occurring as irregular clots to 17 cm width in shear zone to 30 cm and probably wider (2-3 m), 350/65SW. Entire face of workings (127 cm at south end), CuO stained, argillic alteration, bleached with mottled FeO-staining.

Sample **MD19R** - Fracture filling comprising malachite less azurite, disseminated FeO/CuO specks and chalcocite hosted by densely fractured sandstn. Argillic products occupy fractures along with CuO smears and pervasive staining. Several quartz veins: 355/55NE, 3-4 cm; 15/50SE to 5 cm; 160/45NE to 3 cm. Quartz often shows euhedral pyrite, 1-2 mm also cavities filled with ocherous limonite-goethite.

Sample **MD20R** - West wall of workings, densely fractured sandstone with malachite, azurite, rare chalcocite. Moderate silicification and strong argillization. All fracts stained with CuO.

Sample **MD21R** - silicified sandstn (mullock) laced with thin (1-3 mm) quartz veins, carries limonite-goethite filled fractures and cavities, minor CuO.

Sample **MD22R** - silicified sandstn (wall rock), fractured but well-

rehealed by silica, limonite and clays minor CuO staining, disseminated green (CuO) and black (chalcocite ?) specks throughout.

Sample **MD23R** - silicified sandstn (wall rock), highly fractured with mod to strong silicification, less FeO/CuO fracture fillings, trace malachite, numerous multi directional quartz veinlets, strongly reactive to HCl (calcite and siderite veins and clots).

Fracture zone exposed between workings: 15/80SE, to 3 m width, tends to pinch out approx 125 m to North, approx 65 m to South. Best (most productive) ground occupies crest of hill. Regional fracture cleavage: 75/80SE. N15E fracture zone exhibits bleaching, minor argillization with associated FeO-staining and strong silicification as shown by hardness and resistance to erosion.

Sample **MD26R** from representative wall rock, qtzo-felds sandstn, most rock contains at least trace amounts CuO specks. Lt to med gry, even-grained sandstn, strongly silicic. Most fractures carry thin smear malachite and/or CuO, also leached cavities filled with productive-appearing limonite/goethite.

Summary of basic statistics for vein sample analytical results. Junction Creek prospect, EL 1657, Olary Province, S A.

STATISTIC	Au	Ag	As	Cu(%)	Pb	Zn
High	32.00	760	210	47.40	340	370
Low	0.410	8	36	0.66	28	20
Mean	7.150	346.71	96.29	22.79	120.85	108.29
Standard Deviation	11.28	323.93	62.73	21.57	118.17	121.66
Covariance	-	1257.37	196.49	125.33	9.60	75.35
Correlation Coefficiet	-	0.34	- 0.28	0.51	0.01	0.05

Statistics for Covariance and Correlation Coefficient pair gold with their corresponding base metals, 7 samples. All values, except Cu (%), in ppm.

Soil sample-line survey (24/09/90). Survey using Ushikata Compass/transit Tracon S-25 and tape (100 m). Assisted by Richard and Peter Teague, lead and tail linemen respectively.

Set up over Initial Point (IP) being marked by an iron spike within circle of stones on main line of lode. Point magnetic north with lower plate set to 360°; magnetic bearing to Sta 97 (itself being located directly over the main vertical shaft) being 186° 35' for measured distance of 28.5 m. Soil sample line passes thru the IP on 90° angle right and 270° plunged respectively; 100 m each direction. Angle right check to Sta 97 is 6°40'.

Soil sampling (5-6 Dec 1990) employed a tractor-mounted power auger with six-inch rock bit. Holes, at 20 m seperation, were carried to bedrock or one metre depth as limited by penetration capability of machine. A 5-kilogram sample was collected from directly above oxidized bedrock, sieved for its -2 mm fraction and submitted for analysis.

Summary of soil sampling at Junction Creek Cu/Au/Ag prospect, Maldorky Special area, EL 1657.

Drill Hole	Co-ords North	East	Depth (cm)	Sample No.	Au	Ag	As	Cu	Pb	Zn
					Values shown in parts per million					
01	5000	5000	43	JC01L	.047	1	<20	130	115	40
02	"	4980	83	02	.003	<1	<20	45	10	50
03	"	4960	80	03	.002	<1	<20	30	5	55
04	"	4940	82	04	.004	<1	<20	60	15	50
05	"	4920	28	05	.006	<1	<20	55	20	45
06	"	4900	42	06	.004	3	20	105	15	65
07	"	5020	81	07	.013	<1	<20	45	10	60
08	"	5040	78	08	.016	<1	<20	55	20	85
09	"	5060	86	09	.009	<1	40	90	20	165
10	"	5080	23	10	.011	<1	120	45	95	185
11	"	5100	64	11	.002	1	40	40	15	335

Summary of basic statistics for soil sample analytical results. Junction Creek prospect, EL 1657, Olary Province, S A.

STATISTIC	Au	Ag	As	Cu	Pb	Zn
High	0.047	3	120	130	115	335
Low	0.002	<1	<20	30	5	40
Mean	0.010	-	-	63.64	30.19	103.18
Standard Deviation	0.01	-	-	31.15	37.20	91.25
Covariance	-	-	(0.14)	0.27	0.38	- 0.29
Correlation Coefficient	-	-	(0.73)	0.67	0.78	- 0.24

Statistics for Covariance and Correlation Coefficient pair gold with their corresponding base metals, 11 samples. Statistics for arsenic (in brackets) used 4 sample pairs only. Values shown in parts per million.

98 451885/6413715. Creek channel. Graywacke, exhibiting light and dark gry banding. Bed: 15/20NW (I). Fract cleavage: 90/85S, well-developed. Bedding wavy. Bed: North/20W (I). Gravelly soil overburden 1-1.5 m thick.

63 m bearing N40E, gully draining N70W heading in vicinity southerly of Junction Creek (Cu, Au, Ag) mine. Stream sed sample **MD55S** taken.

99 451940/6413495. Graywacke, convolute bedding. Bed: 70/70SE (?). Jointing: North/65W, walls with FeO coatings. Cross-bedding. Rocks have slight gry-grn color on exposed surfaces. O/burden 50-150 cm thick.

Approx 15 m upstream. Bed: 45/50NW (II).

100 451451/6413120. Gully. Graywacke, very massive. Attitude: 75/20SE remote measurement. Fract cleavage: 80/90; 85/80SE. Jointing: 20/80SE, 3/m. Numerous massive linear quartz veins cut thru this area: N60E.

Approx 120 m upstream (S45W), alternating lt and dk gry banded graywacke, very good bed: 80/20SE (I). Fract cleavage: 90/80S well-devel'd.

101 450640/6413070. Saddle point between two drainages. Graywacke, coarse grained with slight lt and dk gry banding. Bed: 20/40NW (I); 125/30SW (measured at a point 20 m bearing 205° from first measurement); 50/80NW (measured at a point approx 25 m bearing 80° from first bed attitude) . Jointing: 35/85NW 10/m. Fract cleavage: 70/85NW. Find large erratic granite, coarse granular, 1.5 m diam, well-rounded, several large granitic erratics found. Fract cleavage: 80/80SE. Find pebbly sandstn layers.

102 450760/6413310. Graywacke, med grained, fairly massive, producing well-exposed linear o/c's. Med to dk brn on exposed surfaces, lt gry brn on fresh. Bed: 05/75NW (?). Fract cleavage: 75/85SE. Jointing: 05/50SE, 2/m; 115/90 approx 5/m. Remote bed measurement: North/55E, tendency for massive linear quartz bodies to parallel this attitude.

Approx 70 m brg N30W (opposite side of creek) well-defined linear o/c graywacke. Bed: 30/50NW (I). Jointing: 10/80SE, 10/m. Fract cleav: 95/85SW. Well exposed convolute bedding structures.

Approx 100 m brg S65W, good linear o/c graywacke. Bed: 15/10NW (I). Fracture cleavage: 80/85NW. Rocks are very finely laminated amplified by lt and dk gry banding, strongly reactive to HCl. Bed (approx 60 m southerly): 10/25NW (I).

Approx 110 m bearing S40E. Graywacke, coarse-grained with well-devel'd lt and dk gry bedding laminae. Bed: 05/30NW (I); 10/30NW (I). Fracture cleavage: 70/90. Jointing: 05/85SE, 5/m, paralleled by quartz veining (3-5 mm).

103 450470/6413250. Ridge crest. Sandstn, coarse grained alternating with finer grained facies, minor dolomite beds, all units strongly reactive to HCl. Bed: 100/40NE (I). Finding large (5-6 m) blocks dolomite, obviously erratics along with gry quartzite boulders to 50 cm diameter and granitic debris.

Approx 40 m bearing 145° find large body dolomite, imbedded in siltstn, med gry. Fracture cleavage (silstn): 95/80SW. Bed in dolomite body (4 m diameter): 140/15SW. Some quartzite cobbles exhibit gneissic structure. Large massive linear quartz vein: 60/80NW, about 1 m width at centre thinning both ends, 20 m length. Cuts through dolomite erratics.

Approx 310 m bearing N20E, fine to med grained silty sandstns. Bed: 10/35NW (I). Fracture cleavage: 75/85SE. Massive linear quartz body, 10 m length, central portion to 60 cm width: 60/80NW.

104 450305/6413900. Sandstn, med to coarse grained, exhibit considerable convolute distortions. Bed: 05/10NW (I). Fracture cleavage: 70/80SE. Jointing: 10/80SE, 3/m.

Approx 350 m bearing N40W (along fence line) good o/c fine silty sandstn interbedded in gry-grn siltstn. Bed: 25/35NW (I). Fracture cleavage: 95/70SW well developed.

105 449880/6414255. Limestn, sandy, pebbly, relatively fresh. Contains round pebbles, small shale partings (mud clasts ?). Sequence of beds comprise reddish shale, highly calcareous with frequent pebbly and coarse sandy limestone: 30/75SE. Fracture cleavage: 100/85SW.

106 452145/6413900. Small creek. Sandstn, silty, exhibits pervasive FeO-staining, dk rd-brn to blk-brn on exposed surfaces. Fracture cleavage: 75/80SE. Bed: 50/75SE (II). Jointing: North/85W, 10/m, walls with limonite smears also thin (1-3 mm) quartz veins showing sulphide casts. Quartz vein, highly crackled, strong FeO with limonite fillings, 5 cm thick: 55/75SE.

Stream sediment sample **MD02S** comprises reddish-brown silts, sands of angular ironstn (slightly magnetic), magnetite, FeO-stained quartz and lithics, lithics with attached quartz. Most joint planes exhibit considerable bleaching and locally silicification.

Approx 90 m bearing S40E, hill side, resistant o/c silty sandstn, mod FeO and multi-directional quartz veining. Sample **MD24R**.

Cross-bedded. Bed: 80/50NW (III). Fracture cleavage: 80/90. Jointing: 355/85NE, paralleled by thin quartz veins.

Approx 65 m bearing S40W, silty sandstn, hydrothermally altered, saturated with yel-brn FeO, quartz veinlets. Sample **MD25R** (5.105 ppm Au, 20 ppm Ag, 1% As, 1.5% Pb, 330 ppm Zn) quite porous, bleached, siliceous, sulphide cellular network. Two quartz types: milky white with slight greasy luster and a dk gry to smoky variety.

None of this obviously altered and mineralized material is associated with reliable outcrop. In fact, the occurrence is highly suspect attempt at salting. Both As and Pb are totally out of character for the type mineralisation found in this location so far.

Re-examination (1/9/90) sample site MD25R. Surface littered with bleached, sandstone rubble across irregular width of 1-6 m aligned N35°E, no reliable outcrop beneath this material. Passes directly thru and parallel to long axis of rabbit warren, typical lt gry silty soil with abundant siltstn fragments.

Rock is quartz/feldspar sandstn and sandy siltstn, coarse brecciation, mottled, exhibiting pervasive argillic and weak silicic alteration accompanied by minor FeO staining, thoroughly leached leaving irregular voids particularly where brecciated. No visible CuO staining.

Sample **MD43R** comprises breccia, pervasively ferruginous with leached and intersticial cavities filled with rd-brn ocherous limonite-goethite. Latter very productive appearing. Weak, spotty silicification.

Soils either side of aligned rubble, compatible with other coarse-textured soils derived from silty sandstn country rock. Gry-brn with much fine sandstn clasts.

107 452160/6414035. Small creek (same as Sta 106). Sample **MD03S** comprises FeO-stained sand size quartz, some with remnant limonite after sulphides, magnetite including angular pieces ironstn with attached (vein) quartz. Rock is lt to med gry sandstn. Non-reactive to HCl. Fracture cleavage: 85/85NW. Jointing: 10/85SE frequently occupied by thin (2-3 mm) quartz veinlets.

55 m brg N12E (downstream), stream sed sample **MD51S** taken.

108 451960/6413805. Sandstn, silicified, cut by quartz vein, good FeO and limonite. Rockchip sample **MD27R** comprises silicified quartzose sandstn, o/c stands slight relief (10-20 cm) due silicification trend: North. Quartz vein associated with o/c: North/85E. Gen blk-brn color, fresh breaks show trace amounts disseminated specks CuO. Quartz vein. 2-3 cm thickness, wall rocks mod silicified, carries disseminated CuO, limonite.

109 451730/6413320. Sandstn, silty, light and dark banded. Well-devel'd fracture cleavage: 75/80SE. Bed: 15/20NW. Jointing: 350/80NE, may be occupied by thin quartz veins. Find several large erratics of granite (to 2 m diameter).

110 451720/6413550. Graywacke, locally very massive, producing prominent rounded o/c's with linear trend. Fracture cleavage: 75/80SE. Jointing: 20/90, 5/m locally sheeted. Bed: 15/15NW (II); 10/15NW (I).

111 453180/6414445. Creek channel, about 5 m wide, drains north. Graywacke, massive, producing typical linear o/c's. Bed: 140/10SW. Locally o/c's thoroughly weathered, punky. Fracture cleavage: 85/80SE, well-devel'p. Bed: 125/15SW (II). Approx 150 m downstream bearing 25°. Graywacke, excessively sheared: 265/85SE. Bed: 200/10NW (III).

Approx 175 m downstream. Gouge zone at least 15 m width, rocks thoroughly crushed, mylonitic, abundant clay. Attitude: 60/85SE.

112 453200/6414715. Principal drainage, channel (15 m width) drains 65°. Graywacke, tough, med gry, coarse sandy as well as fine sandy laminae. Bed (north side of drainage): 70/15NW. Jointing: 15/85SE, 10/m, 3-5 cm separation of joint planes. Fracture cleavage: 75/85NW. Bed (south side of drainage): 85/10SE (I). Jointing: 20/85NW, 10/m, walls slightly bleached.

113 453040/6414510: Graywacke, coarse sandy, well-devel'd light and dark banding, amphibole abundant. Bed: 90/25S (III), exhibit wavy trend; 95/25SW (I). Fracture cleavage: 70/80SE. Locally well-devel'd convolute laminae (to 10 cm) between completely undisturbed bedding.

Approx 100 m upstream brg S75W, on north bank, rocks are excesively broken, sheared and infilled with characteristic caliche derived from fault gouge. Attitude of fault zone: 110/90. Bed: 45/35NW.

114 452760/6414425. Small stream channel draining 125. Rocks are strongly sheared and broken over width 5 m: 80/90. Bed: 15/15NW (I).

Sample **MD28R** from locally derived float boulder, highly gossanous, well-indurated with silica, includes angular clasts former quartz veins, yel-brn, red-brn, very tough.

115 452665/6414220. Graywacke, lt to med gry, slightly weathered. Fracture cleavage: 75/75SE well-devel'd. Jointing: 20/85NW, 4/m. Bed: 80/15SE (I). Quartz veining: 05/75SE, 30 cm width, strongly broken with FeO-staining and limonite fillings.

116 452690/6414050. Graywacke, relatively tough. Fracture cleavage: 80/85SE well-devel'd. Jointing: 20/85SE, 5/m locally developing into sheeted structure. Bed: 70/25SE. Jointing: 70/85NW poorly developed. Bed (in creek channel approx 15 m north of previous bed): 75/25NW (I).

Approx 60 m upstream bearing S20W, graywacke. Bed: 20/25SE (I). Fracture cleavage: 80/80SE. Jointing: 10/90, 5/m.

195 m bearing S70W. Stream sed sample **MD52S**. Rock o/c is siltstn, gry-grn. Fracture cleavage: 90/90.

180 m bearing S10W to creek draining S10E, stream sed sample **MD53S**.

117 452545/6413550. Creek channel. Graywacke, lt to med gry, strongly weathered. Bed: North/15W (I). Fracture cleavage: 90/85S. Jointing: 15/85SE, 5/m.

118 452565/6413005. Creek channel. Graywacke, lt to med gry, tough. Find flt cobble, very gossanous, exhibits CuO staining. Fract cleav: 80/60SE. Bed: 35/20NW (I). Jointing: 20/85SE, 10/m.

119 452605/6412910. Old mine workings in form of linear opencut 9 m length trending N08E, 1.2 m wide, originally 2-3 m depth. Wall rock is graywacke, lt to med gry banding, reactive to HCl.

Mineralisation comprises CuO staining, malachite and minor azurite occupying dense fracture system: 18/80SE; 23/80SE; 15/85SE. Adjacent host rock and vein material is dk gry-brn, siliceous, less ferruginous. Angular quartz clasts derived from broken veins. Non-reactive to HCl.

Sample **MD29R** from dk brn silicic/ferruginous material including broken vein quartz. Note small (1-2 mm) euhedral crystals chalcopyrite preserved in quartz and also found as irregular blebs in dense dk-rd-brn silicic/ferruginous material. Find cavities in silicic/ferrug vein material resembling former chalcopyrite blebs. Silicic/ferrug material supports angular clasts (3-5 cm) graywacke. Creek, approx 35 m brg N32W from Sta 119, stream sed sample **MD46S** from natural riffle produced by sandstn ribs. Numerous small FeO-bearing quartz veins. Fracture cleavage: 80/85SE.

110 m bearing N60W, small creek draining N30E. Graywacke, very tough. Bed: 315/15SW. Jointing: 15/90, 10/m.

120 452565/6412790. Mine workings. Sta located where large massive linear quartz vein cuts: 65/80SE thru workings. Mineralisation post-dates massive quartz vein. Host rock is graywacke, lt and dk gry banding. Bed: 40/55NW (I).

Mine workings consist of several aligned, narrow open cuts. Cut located immediately south of sta is 12 m length, southern end approx 2 m wide, walls very smooth, polished. Vein material completely removed but thoroughly stained with FeO and less CuO. Workings narrow to approx 35 cm at north end, est depth to 5 m. Attitude of former lode (measured from hanging wall): 20/85SE.

Small prospect located approx 11 m on strike (S20W) to south. Attitude of footwall: 25/80SE. Workings about 3 m in length, to 2 m depth originally.

Open linear cut located 5 m north (on strike), trend N20E for 7 m then bearing N10E for 7.5 m. North end of cut approx 8 m depth. Footwall: 10/80SE.

Continuing from North end of cut bearing N10E for 10 m find another workings 9.5 m length, 2-4 m depth, trends N10E. Footwall smooth, FeO-stained with less CuO: 05/85SE. Part of vein material still in place, comprises well-healed fracture zone silicic/ferrug, dk rd-brn, to 30 cm width, minor malachite, limonite filling cavities. Wall rock is lt to med gry graywacke exhibiting characteristic lt and dk gry banding.

Sample **MD30R** from vein, comprises dense brownish-red ferruginous material with siderite and clasts broken vein quartz , minor CuO showing.

Continuing northerly 6 m another cut 5 m in length originally

3-4 m deep. Vein material as above, dk rd-brn ferruginous, dense, tough, includes fragments of graywacke wall rock, minor CuO. Footwall: 350/85NE. This working is offset approx 2 m to East from previously described line of working

Another linear cut bearing N75E for 9 m from north end last 5 m cut, shows no mineralisation, 8 m in length, trends N30E. Minor amounts FeO on graywacke host rock. Fracture cleavage: 15/90.

Approx 35 m bearing 120 from south end of main cut. Graywacke characteristic light and dark banding. Bed: 50/45NW. Fracture cleavage: 70/85SE.

Soil sample-line survey (25/09/90). Survey instruments and assistants as at Sta 97 above.

Initial point (IP) located directly over Sta 120 being marked by peg within circle of stones. Instrument set over IP, point magnetic North with lower plate locked on 360°. Soil sample line passes thru the IP on East and West bearings turned angle right 90° and plunged respectively. The east line is 150 m in length with stakes at 20 m intervals. The west leg is 200 m in length with stakes set out at 20 m intervals.

121 452720/6412540. Creek bed. Graywacke, lt and dk laminar banding, moderately decomposed. Bed: 130/20SW (I). Fracture cleavage: 85/85SE. Jointing: 15/85SE, 3/m. Bedding shows convolute bedding structures.

122 453010/6412835. Hill side. Gritstn, very coarse with thin sandy lenses, well-devel'd graded bedding, would make an easily recognized marker bed. Bed: 90/25S. FeO concentrated along bedding planes. Jointing: 15/80SE, 3/m. Fracture cleavage: 80/90 well-devel'd.

123 453245/6413615. Graywacke, massive exposures in otherwise barren terrain. Bed: 35/50SE (III). Fracture cleavage: 90/90.

124 453760/6412205. Siltstn, gry-grn, supports large blocks biotite granite (erratics) up to 7 m diam. Graywacke linear o/c's gry-brn. Fract cleav: 70/85SE. Jointing: 20/85SE, 5/m. Bed: 45/70NW (?).

Approx 80 m bearing 315°, dike rock, med granular, biotite rich, no quartz, 1.5-2.0 m width. Bed: 55/75NW.

125 454210/6413070. Graywacke beds, tough, dk gry-brn on exposed surfaces, 3-4 m width, stand in slight relief over more extensive silty sandstn country rock. Bed: 55/5NW (?). Fracture cleavage: 85/85SE; 25/85NW, post dates previous fracture system, exhibits slight shearing component. Well-developed shear: 30/90, 1 m wide.

Approx 100 m bearing 335, graywacke. Bed: 75/55NW (II). Shearing: 20/90. Bed: 70/60NW.

126 454130/6413640. Dike, an altered mica lamprophyre (kersantite) rock, intermediate to basic composition, biotite-rich, weakly magnetic, persistent attitude: 20/85NW, 110 cm thick hosted by med to dk gry siltstn. Fracture cleavage: 80/90.

Sample **MD31R** (0.085 ppm Au!! 1 ppm Ag, 36 ppm As, 950 ppm Cu!! 25 ppm Pb, 22 ppm Zn) from dike rock. Bed: 15/10NW. Attitude of dike/sandstn contact: 15/85SE, very sharp, clean contact with mod hardening of sandstn walls (5-10 cm).

Analytical results for rock sample MD31R regarded spurious. Check sample (19/09/90) **MD69R** taken from precisely same location as MD31R, a coarse-granular, biotite-rich lamporphyre (0 ppm Au, ppm Ag, ppm As, ppm Cu, ppm Pb, ppm Zn).
<1 9 20 20

127 454195/6413280. Lamprophyre dike. Here, although occupying ridge crest, dike rock eroded to surface level with hardened sandstn wall rock standing slight relief (Photo 05). Attitude: 25/85SE, 90-120 cm wide. Host rock is dk gry finely laminated graywacke. Bed: 70/15NW (I). Jointing: 20/85NW. Fract cleav: 70/90. Quartz vein: 65/80SE, pre-dike, 70 cm thick, 30 m length.

128 454470/6413750. Basic dike hosted by graywacke, med to dk gry-grn. Bed: 160/65SW (I). Fracture cleavage: 85/80SE. Graywacke wall rock highly shattered and silicified producing prominent o/c's. Attitude on dike wall" 15/85NW, 130 cm width.

129 454940/6413480. Ridge crest. Quartzite, 8-10% diss limonite specks, yel-orange also dk rd-brn. Very massive. Fracture cleavage: 95/85SE. Bed: N/65E (?) indicated by faint lineation.

130 454795/6413915. Hill top. Graywacke, cut by basic dike: N/75E, 60-70 cm wide, finer grained than previously observed, most biotite bleached, intruded parallel to massive quartz vein along latter's hanging wall. Beds show fine, consistent lamination: 95/85NE. Jointing: 10/85SE, 5/m.

131 454665/6414160. Basic dike, measures 90 cm wide. Attitude: 15/90. Host rock is very fine-grained, dense siltstn. Jointing: 105/90. 10/m. Igneous/sed contact sharp. Emplacement of dike,

Photo 05. Station 127. View S20°W shows eroded, path-like, depression of lamprophyre dike. Graywacke has case-hardened walls. Width of dike (at hammer) 1 m. Attitude: 25/85SE.

although relatively straight over the greater distance, has been advantaged by zones of weakness (ie, N10-20E jointing and N75-80E fracture cleavage) producing local zig-zag attitudes.

Approx 29 m bearing N10E find fissure, 110 cm width, attitude: 15/80SE. Host rock is graywacke. Fissure filling comprises dense, very hard silicic/ferrug material with embedded broken vein quartz clasts. Cavities and irregular openings about breccia clasts filled with yellowish-orange limonite.

Sample **MD32R** from fissure filling, includes clasts of siltstn, quartz and ferruginous material (2-3 cm) often with dk brn ferruginous rind which may penetrate into fractures of clasts. Note cellular strong within dense dk brn ferruginous matrix. Fissure traced over distance 95 m. In places invades fractures normal to N15E strike.

132 449915/6411160. Maldorky Creek. Vicinity sta 68 where 10.215 g Au/t recovered from limonite fault gouge. Sample **MD33R** from

fault zone, dk rd-brn siliciceous/ferruginous material with cavities carrying ocherous limonite, 20 cm width, several paralleling fractures with limonite. Attitude: 170/75NE. Wall rock is silty sandstn and siltstn, approx 50-70 cm either side of mineralised fault wall rock silicified and impregnated with FeO.

Approx 3 m bearing N17E from MD33R on same structure Sample **MD34R** taken, comprises mostly quartz with a central filling siderite, strongly reactive to HCl, quartz 3 cm thick.

133 449835/6411135. Siltstn, micaceous with silky lustre, thoroughly fractured gen attitude: 30/85SE, N/85E, 20/80SE. Bed: 70/20SE. Fractures carry much limonite-goethite, some siliceous ferruginous material.

Sample **MD38R** from thick (2 m) gossanous strong, attitude: 20/80SE. Appears there is some bedding str control of gossanous material also associated brecciation. Associated qtz veining has suffered brecciation with clasts held in limonite-goethite matrix. Colors range from yel-orange to dk rd ocherous, productive-like.

134 450135/6410895. Sandstn, very coarse, well-defined bedding, supports large erratics of granite to 5 m diameter. Bed: 70/50SE (I). Fracture cleavage: 70/85SE.

Approx 80 m brg 235° from sta (in creek bed) . Siltstn, gry-grn, extremely tough. Multi-directional micro-fracturing carry limonite. Sample **MD39R** from FeO-stained and fract'd siltstn. Fract cleav: 50/80SE, case hardened with FeO, associated with vegetation occurrence. Jointing: 335/90, 10/m, slt bleaching of joint walls.

135 449790/6411110. Maldorky Creek. Siltstn, well indurated (silicified), fractured and FeO-stained. Bed: 65/10SE. Bedding plane partings support dense gossanous material, locally to 30 cm thickness, frequently associated with multi-directional fracturing and brecciation of enclosing siltstn beds. Jointing: 15/90, 5/m. Fracture cleavage: 65/75SE. Dense fracture zone crosses creek with slt (30-40 cm) relief, locally brecciated but well-healed with silica, attitude: 355/85SW, 2-3 m width, walls are case hardened.

Sample **MD40R** comprises silicified siltstn densely fractured with all breaks carrying productive ocherous-rd limonite-goethite and dense ferruginous-siliceous fillings. Slightly bedding: 20SE (I).

136 452110/6413880. Sandstn, coarse grained, limonite cementing medium as well as micro-fract'r fillings. Sample **MD41R** slightly

leached with cavities filled with rd-brn ocherous and yel-orange limonites, some fractures filled with the dense, blood red, pitchy silicic/ferrug material. Alteration and mineralisation concentrated along bedding separations. No well-defined cross-bedding strong. Surface littered with ferruginous impregnated sandstn chips.

Junction Creek Cu/Au mine. Sample **MD80R** from a silicified qtzo-felds sandstn. Careful inspection of the occurrence reveals a 1-3 m width over a strike (N20E) length of 50 m. Exposure comprises a litter of cobble-size angular blocks, resembling altered and silicified wall rock from a larger vein or fissure vein system. The rock exhibits patchy silicification, with disseminated pyrite casts and limonite pseudomorphs after pyrite. It has a distinctive yellowish cast, typical of a pyritic bloom, unlike other alteration types found in the mine exposures. Numerous angular cobbles, but no outcrop. I believe this material is exotic, brought in from elsewhere and strewn out along a N20E trend.

General inspection of the flat, slightly depressed, ground 30-50 m south of Sta 79 is unique for its semi-circular shape (about 20 m radius). This feature plus the presence of fine euhedral tourmaline needles in greisen-like veinlets in the host sandstn suggests according to Thompson (1990), the presence of an underlying acid to intermediate intrusive.

Sample **MD81R** is milky-white quartz that outcrops as small plug-like bodies within the semi-circular area. It carries thin smears of limonite and FeO-stained fracts. Very non-productive appearing.

137 452110/6413855. Sandstn, "peppery" texture due abundant (approx 50%) disseminated m/m amphibole, fine, shiny, blk. Bed: 105/20SW. Jointing: 135/80SW, 20/m, very tight. Rock characterised by disseminated limonite specks (3-5%), hard, surfaces of fractures FeO-stained, reactive to HCl

Sample **MD42R** from ferruginous breccia controlled by bedding plane parting to 20 cm. Hand specimen.

138 452680/6412870. Ridge crest. Prospect pit, 2 m length, originally 1 m deep. Graywacke, med gry, characterised by abundant (50-60%) blk shiny amphibole. CuO-stains and minor malachite pervades graywacke host rock and siliceous/ferruginous vein. Ore is a kernelly tex'd product consisting of dense rd-brn siliceous/ferruginous material. Porous, often cellular cavities filled with productive appearing rd-brn limonite-goethite-malachite.

Sample **MD44R** comprises above oxide products, exhibits micro-brecciation with firm rehealing by FeO. Width of mineralised zone 30 cm, attitude: 05/85SE. The lode pinches and swells (10 cm-150 cm) with some siliceous/ferruginous material penetrating wall rock. Latter exhibits case hardening and slight relief 20-30 cm either side of fissure. Fracture cleavage: 80/85SE. Fractures involved with mineralisation: 05/80SE. Note host rock graywacke incorporates gritty sandstn lenses with gradational contacts.

139 Graywacke, med gry. Quartz vein, 5-15 cm width, wall rocks case hardened to 15 cm, attitude: 05/80SE. Sample **MD45R** from quartz vein, a dense, slight greasy lustre, well-fract'd with irregular limonite fillings, rare occurrence of silvery sulphide (arsenopyrite ?), euhedral sulphide clusters and "slivers" 1-3 mm. Fracture cleavage: 75/90.

140 452760/6413270. Graywacke, med to dk gry. Fissure with accompanied argillisation and bleaching plus silicification, 3 m width, attitude: 05/80SE fairly persistent with minor undulations to strike. Fissure filling is a dense rd-brn, ferruginous/siliceous material. Wall rock often leached and stained yel-brn, relatively resistant, polygonally fract'd with FeO-staining.

Sample **MD46R** from dense dk-rd ferruginous/siliceous fissure filling. Sample **MD47R** from FeO-stained, slightly silicified wall rock which includes productive-appearing limonite-goethite in fractures. Trend of this structure shows an aerial photo as fine dk rd-brn "shadow" (width of lineament includes erosional debris).

Sample **MD48R** taken 20 m northerly from MD47R, comprises strongly silicified graywacke with thin (3-5 cm) veinlets of ferruginous/siliceous material, polygonal fracturing occupied by quartz veins. Fracture cleavage: 80/90.

141 452705/6413400. Narrow gully, relatively straight, continues across valley to align with another straight drainage. Fractures in drainage: 90/85N. Rock on south is massive graywacke, on north side also graywacke well-bedded: 35/25NW (1) exhibits characteristic lt and dk laminae. Fracture cleavage (south side): 75/90. Jointing: 10/80SE, 5/m, planes silicic and/or occupied by quartz veins, slightly bleached.

Sample **MD49R** comprised of float chips of silicic/ferrug material probably derived from small veins, with attached vein quartz, some with rd-brn limonite filling small (3-5 mm) cavities. Entire

south slope this gully littered with such chips.

142 452715/6413505. Hill top. Fracture zone as previous, characterised by silicification of host graywacke, attitude: N05E. Carries disseminated limonite spots (to 5 mm), yel-orange, less dk rd-brn, est 3-5%. Some cavities filled with blk, glassy substance. Width 1.5-2 m. Exhibits sharp contact with host sandstn. Hand specimen. Sample **MD50R**.

143 452815/6413635. Prospect pit, originally about 1 m deep, trends N40E. No well-defined line of lode. Material in mullock includes a very dense, dk rd-brn, siliceous/ferruginous vein filling type. Wall rocks densely fract'd with some rotation of clasts. Minor CuO-stain found on graywacke host rock. Fracture cleavage: 85/80NW.

Sample **MD51R** from vein, comprises dense brownish silicic/ferrug material with incorporated angular clasts graywacke, numerous cavities, some with CuO-staining, trace malachite. Attitude of host fracture system: 20/85SE, heavily FeO-stained. Main vein pinches and swells 5-15 cm, attitude: 15/80SE, with good ocherous red limonite, dense. Rocks exhibit good cross-bedding. Bed: 95/65SW. Most float littering surface discolored by FeO-staining.

144 452910/6413710. Prospect pit, a cut 7 m in length, 120 cm wide, originally about 2 m deep. Graywacke host rock, strongly silicic rendering dk gray to blk color, finely laminated. Bed: 40/15NW. Line of lode 5-20 cm width, attitude: 10/80SE, footwall with smears of silicic/ferruginous material plus minor CuO. Secondary fracture system: 345/85NE, with quartz veins. Sample **MD52R**.

145 452915/6413440. Graywacke, highly silicified, exhibits 15-30% disseminated limonite specks, all fractures filled with limonite and thin (1-3 mm), multi-directional quartz veins. Some limonite grades into a dark grey ferruginous material, may be large erratic? Jointing: 15/85SE, 10/80SE, post-dates massive linear quartz bodies. 5/m. Outcrop is about 6 m diameter. Sample **MD53R**.

146 453330/6412795. Ridge crest, west slope. Graywacke, fairly massive. Fracture cleavage: 75/85SE. Outcrop is broad (10 m wide), flat, smooth surface. Well-devel'd joints: 10/90, 2/m; 280/90, 5/m pre-dates first set.

147 453945/6413225. Altered mica lamprophyre (kersantite) basic dike, biotite-rich, med grained, magnetic, 1 m wide, attitude: 20/85SE. Host rock is graywacke, med gry. Fracture cleavage: 85/85NW. Dike stands in slight relief (40-60 cm), shows on aerial

photo. Hand specimen. Bed: 30/15SE (III).

Sample **MD54R** from biotite-rich dike rock, relatively fresh appearing, 80% biotite

Approx 21 m bearing 105° from sta find another dike, very fine-grained, dk gry, 2 m thick, attitude: 20/90. Contains rare limonite specks. Unlike biotite dike, this intrusive easily eroded, best recognized by presence of case-hardened wall rocks.

148 453705/6413100. Sandstn, coarse grained, lt brn on exposed surfaces, med to dk brn on fresh, comprised of feldspar, quartz, lithics and a blk metallic mineral (magnetite?). Foliation: 55/30SE, amplified by red-brn FeO-staining. Jointing: 20/85SE, 10/m, planes slt'ly bleached. Fract cleav: 85/85SE. Surface littered with ferruginous chips, very dense internally, include attached vein qtz.

Sample **MD55R** of ferrug chips. Numerous cobbles, rounded, normal granite.

149 453695/6412790. Basic dike rock, dk gry matrix, abundant shiny blk biotite to 1 mm diam, 125 cm wide, attitude: 15/85NW. Fracture cleav: 70/80SE, well-devel'd. Jointing: 10/85SE, 5/m.

150 453140/6412695. Arkosic sandstn, comprised of equal amts felds and quartz, less bleached mica (20%), disseminated limonite specks, minute qtz veins (1 mm), est bed at 5 m thickness, appears to have suffered penacontemporanous slumping. Bed: 255/20SE (I). Locally strongly silicic, surface with blk to brick-rd FeO-stain.

Sample **MD56R**. Hand specimen. General inspection these beds indicate they are lens shaped to 200 m length, 5-10 m thickness, pinch out at ends. Hosted by graywacke.

151 453275/6413375. Graywacke, includes thin (50 cm) lenses arkosic beds. Bed: 80/20NW. Jointing: 10/85SE, 5/m. Fracture cleavage: 90/80S well-devel'd. Bed: 70/25NW. Fracture cleavage: 80/85SE. Jointing: 05/90 frequently occupied by thin quartz veins (1-3 cm), discontinuous, 10/m, some joint planes case hardened, minor bleaching.

152 453425/6413280. Dike rock, intermediate composition, 50 cm wide, attitude: 10/85SE, aphanitic, gry-grn on freshly broken surfaces, densely fract'd parallel to strike.

12 m brg N10E dike (on strike) passes through regional fract zone (both dike and fract zone observed on color aerial photo). Width of zone and its alteration influence 2 m, attitude: 135/80SW, laced with numerous silicic/ferrug veinlets and irregular clots to 3-5 cm.

Sample **MD57R**, comprises silicic/ferrug veins, breccia clasts in matrix of silicic/ferruginous material, dk rd-brn, in places black.

153 453715/6413575. Graywacke. Bed: 85/20NW (I). Jointing: 355/90, 5/m. Fracture cleavage: 55/90, poorly developed.

Approx 100 m bearing 270°. Graywacke, bed: 80/40NW (I). Large linear quartz body: 45/85NW. Small quartz vein, 60 cm thickness, attitude: 70/80NW, greasy lustre, highly fract'd but well-healed with limonite and dk rd-brn ferruginous material, about 30 m length, cavities of former sulphides and productive-appearing limonite. Jointing: North/85W, 3/m. Fracture cleavage: 80/90. Sample **MD58R** from quartz vein.

154 453695/6413725. Quartz vein, FeO-stained. Attitude: 70/80NW, 40 cm wide, 40 m length. Sample **MD59R** comprises highly broken and locally brecciated quartz, fracts often smeared with hematite.

155 453685/6415255. Creek bed. Graywacke, highly distorted. Bed: 310/30SW (I). Jointing: 20/85SE, 3/m. Fract cleav: 85/85SE.

156 452940/6414770. Prospect pit. Graywacke, lt and dk gry banded. Workings caved level with surface. Appears miners were prospecting fract zone, 60 cm wide, attitude: 45/90. Material in mullock is highly fract'd and siliciceous sandstn. Fractures carry rd-brn and yel-orange limonite. Sample **MD60R**.

157 453955/6414980. Graywacke. Fracture cleavage: 85/85SE. Jointing: 10/85SE, 3/m. Find large granite erratic measuring 2 x 3 m also coarse grained quartzite boulders to 1 m diameter. Bed: 20/40NW; 120/35SW.

158 454030/6415225. Graywacke, coarse grained, abundant small granules and pebbles. Bed: 280/70SW (II). Fracture cleavage: 265/90. Jointing: 15/85SE, 5/m. Find numerous granite cobbles and boulders embedded in graywacke. Bed: 275/35SW (II).

159 454740/6415990. Sandstn, tough, well-indurated, finely laminated bedding, lt brn on exposed surfaces, gry-brn on fresh. Bed: 290/40SW. Jointing: 10/80NW, 5/M.

Approx 80 m bearing S35E, deeply incised creek. Sandstn as at Sta 159. Very uniformly bedded: 100/50SW (I). Jointing: 355/80NE, 10/m.

160 454590/6415750. Incised creek as previous. Highly deformed graywacke, twisted, broken, micro-folded. Bed: 110/55SW. Includes siltstn and shale, minor resistant quartzose sandstn. Bed: 120/55 SW (I). Width of deformation at least 30 m.

161 454485/6414990. Graywacke, exhibit convolute bedding, lt to med gry, even-textured. Bed: 330/45SW. Fracture cleavage: 95/85SW. Jointing: 340/90, 2/m. Bed: 130/55SW (I). Jointing: 20/80SE, 5/m. Fracture cleavage: 90/85N.

162 453350/6415300. Small creek draining S65E. Graywacke, lt and dk gry banding, mod decomposed. Bed: 120/35SW (I). Fracture cleavage: 95/90, well-devel'd. Jointing: 20/90, 10/m.

163 452825/6415255. Graywacke, lt to med gry-brn on exposed surfaces, minimal outcrop. Well-defined line of fracturing: 15/80SE, about 1.5 m wide, with 30 cm central section filled with silicic/ferruginous material.

Prospect pit, 3 m length parallel to N15E fracture zone, about 1 m deep. Material in mullock is dk gry graywacke with much FeO staining and limonite-filled fractures, also silicic/ferruginous material to 3-10 mm thickness. Some rock strongly brecciated.

Sample **MD61R** is dense silicic/ferruginous fracture filling, rd-brn, dense, to 15 cm thickness.

114 m bearing S15W, prospect pit, probably involved some ore extraction, an opencut 4 m in length, 1 m wide, est originally 2 m deep. Productive structure is a well-defined fissure (remaining walls), attitude: 15/75SE, believe mineralisation extend over width 85 cm with a 30 cm central portion well-mineralised siliciceous and ferruginous material. Host rock is coarse quartzo-feldspathic unit with 15-20% disseminated limonite specks (suspect former mafic minerals).

Sample **MD62R** is kernally gangue of dk brn to blk siderite and FeO/MnO fillings, slightly silicic, vugs with rd-brn ocherous limonite. Minimal outcrop this area. Fracture cleavage: 265/85SE. Jointing: 25/80SE, 5/m, some joint planes filled with quartz, slightly bleached walls.

On strike about 80 m S15W, coarse sandstn continue to support the well-defined fracture zone, 1.5-2 m wide. Adjacent fractures, particularly joints exhibit silicic alteration, bleaching and rehealing. Predominant fracture attitude: 200/80SE, zone of influence here to 30 m. Regional fracture cleavage: 80/90. Fracture zone shows on color aerial photo as faint lineament over 500 m strike length.

164 453030/6415415. Fracture zone, 1 m wide, attitude: North/85E. Graywacke host, olive-gry, originally pyritic indicated by subhedral pseudomorphs limonite after pyrite. Non-calcareous.

Sample **MD63R** from fract zone, comprises silicic graywacke, numerous micro-fracts filled with FeO and limonite, some dk rd-brn, other yel-org. Fracture cleavage: 85/80SE.

105 m bearing 250° find another silicic fracture zone, 3 m wide. Host is graywacke, stands in slight relief, 50-60 cm due silicification. Bed: 335/25SW (I). Jointing: 270/90. Fracture cleavage: 60/80SE. Locally developed convolute bedding structure. Laced with numerous veinlets (1-2 cm) limonite-bearing fractures. Hand specimen. Sample **MD64R.**

165 453110/6415365. Another fracture zone, 60-70 cm wide, trend: 235°. Barely discernible on aerial photo. Structure exhibits slight relief (30-40 cm), either recurrent movement or pre-dates regional fracture cleavage: 90/85N. Does not appear to be as productive as previous (Stations 163, 164) fracture zones. Has suffered minor displacement by regional fracture cleavage.

Abundant fine, shiny amphibole, limonite-filled micro-fracts reactive to HCl. Sample **MD65R** comprises a dense, evenly textured fine to med grained rock, laced with fine FeO-filled veinlets gen parallel to strike of zone. Almost identical to MD64R except for lack of silicification.

166 458550/6411055. Immediately south of high quartzite ridge in the imbricate faulted area of the Maldorky Hills. Ironstn, orange-brown, cut by large, massive, linear qtz vein: 95/55SW, 1 m wide, 25 m length. Ironstn o/c occupies a resistant knob-like relief feature, about 30 m radius. Fracture cleavage: 120/60SW. Probably a sed unit, bed: 95/50SW. Fract cleav: 110/85SW from well-bedded graywacke, bedding conforms to this latter attitude.

Sample **MD66R** from quartz vein, 5 cm thickness, highly fract'd and rehealed with the dense rd-brn siliceous/ferruginous material.

167 458220/6410955. Creek between prominent quartzite ridges. Sandstn, tough (silicic) med to dk gray, non-reactive to HCl. Supports resistant beds 30-40 cm thickness similar but darker sandstn. Bed: 110/55SW. Jointing: 30/90, 3/m.

Stream sed sample **MD04S** comprises 2% calcrete particles, 39% siltstn, 49% quartzite, 8% veining quartz, trace amounts limonite and 2% magnetic products (ironstn, FeO-rich quartzite and magnetite), clay fraction orange-brn, sample gleaned from a natural riffle (fracture cleavage).

168 457830/6410570. Creek, drains SE. Rock outcrop is quartzite, massive, weathering to large, semi-rounded outcrops, conchoidal spalling. Lt to med brn on exposed surfaces, med to light gray on fresh.

Stream sediment Sample **MD05S**, 23% calcrete, 45% quartzite, 3% limonite, 15% siltstn, 4% vein quartz, 2% ironstn. Jointing: 10/70SE, 10/m; 20/75SE, 5/m, well-devel'd

169 458835/6411285. Sandstn, med brn on exposed surfaces, lt brn on fresh, highly broken but well rehealed with limonite (non-productive). Outcrop attracts attention for its mod relief (50-60 cm), width (3 m) and spinal location along a small ridge, color rd-brn, coarse texture. Fracture cleavage: 160/80SW. Sample **MD67R**, laced by a multi-directional, hairline fracture system with FeO fillings. Jointing: 10/70SE, 30/m. Bed: 155/45SW.

Traversing northerly along strike of sandstn bed, unit is arkosic in composition and texture. Also find numerous erratics, cobbles of coarse biotite granite.

170 458700/6411625. Creek, draining NE. Sandstn, gray, well-indurated. Bed: 135/20SW (I). Jointing: 35/90, 5/m, walls strongly FeO saturated.

Stream sed sample **MD06S** from riffle developed in bedding plane partings, comprises: 4% calcrete particles, 37% siltstn, 55% quartzite, 1% vein quartz, trace limonite and 3% ironstn products including magnetite. Clays FeO-stained.

171 458090/6412075. Creek, draining N60E between large quartzite ridges. Rock o/c here is siltstn, gray with wk FeO-staining also same occupying multi-directional fractures. Fracture cleavage: 85/80SE. Jointing: 155/85NE, 15/m, carry Feo-staining. Predominant fracture set: 35/70SE, heavily impregnated with FeO.

Stream sed sample **MD07S** comprises 15% calcrete particles, 31% micaceous silstn, 29% quartzite often heavily impregnated with FeO, 9% fine grained sandstn, 9% vein quartz mostly FeO-stained, some glassy clear, trace limonite and 6% ironstn products, taken from bedding plane partings.

172 457930/6412695. Deeply incised canyon, high-rising quartzite rim rocks either side. Quartzite o/c in creek, massive. Fracture cleavage: 175/75NE. Jointing: 55/75SE, 20/m.

Stream sed sample **MD08S** comprises: 3% calcrete particles, 30% micaceous siltstn, 36% quartzite, 10% sandstn, 15% vein quartz, 2% limonite and 3% magnetic products, mostly heavily FeO-impregnated quartzite.

173 457180/6412890. Narrow, deeply incised canyon between high quartzite ridges. Qtzite, lt brn, massive. Jointing: 25/80SE, 10/m. Fracture cleavage: 90/85N.

Stream sed sample **MD09S** comprises 15% calcrete particles, 12% micaceous siltstn, 69% quartzite with minor orange FeO stain, trace amounts fine grained sandstn, 5% vein quartz, trace limonite, trace magnetic products. Sample **MD10S** a duplicate check sample.

174 457055/6412865. Creek, SW fork, deeply incised in quartzite. Cobbles in creek mostly quartzite with minor siltstn. Note vein quartz float with attractive limonite fillings.

Stream sed sample **MD11S** comprises: 6% calcrete particles, 27% siltstn, 36% quartzite, 17% fine grained sandstn, 16% vein quartz, trace limonite and 1% magnetic particles.

Sample **MD68R** from quartz vein, laced with limonitic veinlets, ocherous red, very productive-appearing, quartz has greasy lustre, 7 cm width. Quartzite very massive, well-jointed: 10/85NW, 5/m; 315/80NE, 4/m.

175 456440/6413400. Creek. Graywacke, very tough, lt to med gry-brn on exposed surfaces, med gry on fresh, non-reactive to HCl. Bed: 95/40SW (I). Jointing: 20/90, 15/m.

Stream sed sample **MD12S** comprises 11% calcrete particles, 27% siltstn, 29% quartzite, 10% sandstn, 18% vein qtz, 3% limonite and 2% magnetic fraction. Clay fraction yel-orange and reactive to HCl.

106 m bearing N80W, small drainage. Graywacke. Bed: 75/70SE. Jointing: 20/90, 10/m, walls faintly FeO-stained also paralleled by minute (1-2 mm) quartz veins.

Stream sed sample **MD13S** comprises 17% calcrete, 30% siltstn, 38% quartzite, 6% sandstn, 5% vein quartz, trace limonite and 4% magnetic products. Sample collected from bedding plane partings normal to drainage.

Creek float in form of cobbles includes vein quartz with silicic/ferrug fillings and strong FeO staining.
Sample **MD70R** from float vein quartz and in place where occurring as pull-apart veins with considerable separation (Photo 06). Beds highly sheared, stretched. Quartz has smokey discoloration. Numerous such pull-apart quartz veins (5-20 cm) this area: 90/80N which conforms to bedding.

176 455895/6413600. Graywacke, bluish-gray, supports numerous pull-apart quartz veins parallel to bedding: 110/50SW. Fracture cleavage: 80/90. Jointing: 20/85NW, 15/m.

Stream sed sample **MD14S** comprises 10% calcrete particles, 18% siltstn, 43% quartzite, 10% sandstn, 16% vein quartz, 2% limonite and 1% magnetic products.

177 455550/6413650. Creek. Graywacke, relatively weathered, med gry with slight lt brn FeO-stain. Finely developed bedding laminae. Bed: 105/80NE (I); 95/80NE (I).

Stream sed sample **MD15S** comprises: 11% calcrete, 26% siltstn, 36% quartzite, 14% sandstn, 6% vein quartz, 3% limonite and 4% magnetic products (small raisin-like, shiny, dk rd-brn, usually sub-rounded), clays yel-orange with FeO-stain. Float in creek include large boulders massive, milky-white quartz plus abundant cobble size vein quartz with much FeO-stain.

178 455185/6413325. Small tributary creek. Quartzose sandstn to 60-70 cm thick layers interbedded in siltstn, med to lt gry. Siltstn relatively sheared. Bed: 105/70SW. Jointing: 10/90, 5/m. All quartz veins (3-20 cm) exhibit pull-apart and necking, strongly FeO-stained, predominant attitude of deformed quartz veins: 80/85NW. Sandstn includes pebbly horizons.

Stream sed sample **MD16S** comprises: 10% calcrete, 16% siltstn, 34% quartzite, 24% sandstn, 11% vein quartz, 2% limonite and 3% magnetic products. Some fractures paralleling shearing (80/85NW)

incorporate a pastel green stain, very localised, believed organic. Bed: 105/55NE (I). Jointing: 10/90, 10/m, often with ocherous FeO-staining same in bedding plane partings.

Photo 06. Station 176. View S60°W shows pull-apart quartz vein in graywacke. Vein attitude: 105/45SW. Bedding attitude: 90/75S. Pull-apart structures often found in apparently undisturbed host graywacke.

179 455355/6413085. Sandstn, silty, med brn on exposed surfaces, med gry on fresh, abundant very fine, shiny amphibole which on weathering lends micaceous-like lustre to rock. Non-reactive to HCl. Fracture cleavage: 80/85SE. Abundant quartz veining (5-30 cm thickness), gen attitude: 75/80SE, highly fract'd, locally necked and pull-apart, carry FeO and limonite fillings (dk red-brn).

Sample **MD71R** comprises vuggy quartz with ocherous rd limonite fillings, very productive appearing, some open spaces with limonite and mats of fine, euhedral, acicular crystals, also the frequently observed dense rd-brn silicic/ferruginous material. Bed: 120/55NE.

51 m bearing N10W in small NW draining creek. Stream sed sample **MD17S** comprises 15% calcrete particles, 20% siltstn, 35% quartzite, 18% sandstn, 6% veining quartz, 3% limonite, 3% magnetic products. Sample from a vegetation trap amongst boulders. Some magnetic material shard-like, metallic lustre.

180 455405/6412725. Tributary creek draining generally west. Graywacke, relatively decomposed (weathered), silty. Fracture cleavage: (0/80N. Stream sed Sample **MD18S** comprises: 5% calcrete particles, 18% siltstn most of which FeO-stained, 40% quartzite at least half of which has a dense rd-brn FeO cementing medium, 21% rd-brn and amphibolite-rich sandstn, 8% vein quartz, milky-white, 5% limonite, yel-brn, 2% magnetic products, clays are yel-brn. Taken from natural riffle produced by fracture cleavage partings.

Find considerable amounts productive-appearing vein quartz (ie, non-massive linear type), very crackled and rehealed with limonite and FeO, probably pull-apart products as indicated by sub-rounded from, fractures exhibit a hematite-red limonite. Sample **MD72R** from this latter vein quartz float.

181 455520/6412375. Creek bed. Sandstn, gry, gritty sandstn as thin (50-70 cm) beds. Bed: 90/55S (I). Jointing: 25/85SE. Stream sed sample **MD19S** comprises 10% calcrete, 17% schistose siltstn, 36% FeO-stained quartzite, 19% fine-grained red sandstn, 10% vein quartz, trace FeO-stain, 6% limonite, dense yel-brn, 1% magnetic products, mostly red-brn sandstn, minor FeO-cemented quartzite and ironstn. Sample taken from depression in stream channel at base of sandstn outcrop. Clay fraction red-brn. Rock outcrops gen carry calachie coatings.

182 455865/6412060. Relatively large creek channel 4-6 m width. Sandstn, quartzose, med grained, equi-gran, multi-limonite specks (1 mm) undulating bedding. Bed: 330/30SW. Jointing: 25/80SE, walls exhibit strong FeO saturation 2-3 cm either side, 5/m, same for cross-fracts between joints.

Stream sed sample **MD20S** comprises 8% calcrete, 22% siltstn, 31% quartzite, 27% sandstn, 9% vein quartz, 2% limonite, 1% magnetic products.

183 456165/6411860. Sandstn, quartzose, med brn on exposed surfaces, gry on fresh. Non-calcareous. Fracture cleavage: 145/75NE. Stream sed sample **MD21S** taken from a tree root alluvial trap, comprises 6% calcrete, 20% silstn, 38% quartzite, 25% sandstn, 7% vein quartz, 3% limonite and 2% magnetic fraction, clays FeO-stained. Most rock float is FeO-stained.

184 456310/6411785. Small creek. Sandstn, quartzose, clay matrix weakly reactive to HCl, disseminated limonite specks and clots. Jointing: 340/90, 10/m. Stream sed sample **MD22S** comprises 6%

calcrete, 12% siltstn, 59% quartzite, 14% sandstn, 6% vein quartz, 2% limonite, <1% magnetic products.

185 455330/6413950. Graywacke, med to dk gry-brn on exposed surfaces, gry on fresh. Non-reactive to HCl, sandy texture comprising extremely fine quartz and nearly equal mats very fine, shiny amphibole. Fracture cleavage: 90/80S. Jointing: 20/80SE, 5/m. Bed: 295/45SW?; 110/30SW (I) measured approx 150 m north of sta; 135/35SW (I). Note interbedded pebbly sandstn to 1 m thickness. Bed: 140/45SW (I).

186 456665/6411670. Narrow canyon draining 250°. Very high walls massive quartzite. Fracture cleavage: 95/40SW. Jointing: 15/60SE. Stream sed sample **MD23S** from approx 30 cm depth between large quartzite boulders.

187 456945/6411325. Narrow canyon draining 210°, vertical walls massive quartzite. Rock outcrop in creek bed is graywacke, exhibits much shearing as evidenced by cataclastic structures and pull-apart quartz veins. Shear zone exposed in creek, 20 cm wide: 25/80NW, silicic alteration, displacement is left-lateral as indicated by drag structures, foot- wall strongly siliceous and calcareous, suspect bedding-plane str. Fracture cleavage: 120/80SW, well-devel'd. Stream sed sample **MD24S** from natural depression produced by outcrops and vegetation.

70 m bearing N50E (upstream) fault zone exposed in creek, approx 70 cm wide, strongly FeO-stained wall rocks, graywacke, attitude of fault: 65/60NW, a bedding-plane str. Fracture: 150/80NE, strongly FeO-stained.

Rockchip sample **MD73R** from fault zone, comprises altered graywacke wall rock, minor vein quartz with leached sulphide cavities stretched parallel to shearing, non-reactive to HCl. Highly developed sheet jointing: 160/80NE. Bed: 45/65NW (I).

Continue 50 m upstream (N6SE). Quartzite exposed in creek, densely fract'd: 160/85NE with vein quartz, thin, discontinuous, leached open spaces. Fractures: 90/70S, incorporates a shear component, strong FeO-stain. Boulders eroded from quartzite all exhibit disseminated FeO specks, FeO-smears on fractures, mod silicic alteration. Bed: 55/60NW (I).

188 457160/6411450. In traversing upstream (N60E) frequently observe well indurated gossanous cobbles. Find boulder to 50 cm diameter, semi-rounded, maroon color, supports angular quartz

clasts, less lithic material, probably fault gouge. 155

Rockchip sample **MD74R** also hand specimen. Outcrop on north bank comprise gry siltstn. Bed: 60/60NW (II). Jointing: 150/80NE, 10/m, gen with FeO-stained walls.

113 m bearing N70E (upstream), north bank exposes lt gry, punky, finely laminated graywacke. Bed: 80/40NW (I).

202 m bearing N68E, east fork of main drainage. Stream sed sample **MD26S**. Sample from shallow depression, small cobbles and pebbles comprise the maroon-colored gossanous material.

237 m bearing N26E, northwest fork, abundant gossanous material. Stream sed sample **MD27S**.

295 m brg N32E, central fork of main drainage, considerable amts FeO-stained float including gossan cobbles. Siltstn o/c, extensively sheared: 45/60SE across full width (3 m) of creek, str'ly bleached with fracts bearing caliche fillings derived from comminuted silstn, also stretched gossans material. Stream sed sample **MD28S**.

189 456790/6411225. Main stream channel draining N50W. O/c comprises quartzose sandstn, med grained, abundant small granules. Fault exposed in SW bank: 145/40SW, approx 70 cm gouge zone, brecciated but well indurated containing vein quartz clasts lithics, strong FeO-staining pervasive. Fracture cleavage: 75/85SE. Jointing: 170/70NE.

Additional exam'n of fault along strike indicates it occupies a bedding plane. Sample **MD75R** from silicic alter'd breccia portion of fault, comprises some vein quartz with intersticial yel-brn limonite and ocherous-red limonite. Fault displacement is right-lateral as indicated by drag structures.

190 457155/6410965. Graywacke, med to dk gry-brn, highly distorted in this location. Fracture cleavage: 80/60SE. Finding small (10 cm wave-length) tight, inclined isoclinal folds. Bed: 85/45SE (III). Fracture cleavage: 160/80NE. Stream sed sample **MD25S**.

191 455930/6411240. Creek channel, probable contact between olive-gry siltstn to south and quartzite to north. Fractures: 75/55SE (possible bedding plane break?). Jointing: 30/90, 5/m with limonite. Stream sed sample **MD29S** from natural depression produced by large tree root.

192 456135/6416195. Siltstn, lt to med gry, finely laminated. Bed: 110/35SW; 105/35SW (I). Fracture cleavage: 95/85SW. Jointing: 30/85NW, 10/m. Stream sed sample **MD30S**.

111 m bearing N48E, small drainage. Float in creek comprises large massive quartz boulders, siltstn, quartzose sandstn and granitic cobbles (erratics) eroded from the Wilyerpa Formation. Stream sed sample **MD31S**.

205 m bearing N75E, small drainage confluence. Outcrop on east comprises sandy limestn, exhibits micro-cross-bedding, recrystallised, occurs in beds to 4 m thickness. Principal country rock is dk gry to blk calcareous sandstn, highly responsive to HCl, exhibits very finely laminated bedding. Bed: 70/45NW (I). Jointing: 30/85NW, 3/m. Bedding this location very wavy. Bed: 10/60NW; 80/35SE probably most reliable; 90/40S (I).

193 456400/6416415. Silty sandstn, finely laminated, lt to med gry, highly calcareous. Fracture cleavage: 80/85SE. Bed: 60/70NW; 55/80NW (I); 70/75NW. Stream sed sample **MD32S**.

70 m brg SW, small creek. Sandstn, calcareous. Bed: N/20W (II).

114 m bearing N45W, small creek. Sandstn, lt to med gry, finely laminated. Bed: 55/50NW (I). Jointing: 20/85SE, 3/m. Stream sed sample **MD33S**.

140 m brg N60W, small creek. Sandstn, silty, lt to med gry, calcareous, very finely lam'd. Bed: 15/40NW (I); 70/40NW (I). Stream sed sample **MD34S**.

194 455865/6416665. Creek, Diamictite, multi-compositional, constituent pebbles and cobbles stretched. Predominant lithology is dk gry to blk felsite, lt gry fine sandstn, minor schist, med grained granite. Fracture cleavage: 90/85N, well developed. Jointing: 05/80SE, 15/m. Stream sed sample **MD35S** taken from fracture cleavage open spaces.

Site previously examined during initial reconnaissance (4 Nov '89. Nilpena Hill Sta 02) where stream sed sample NH02S returned 9700 ppm Cu!!, 11 ppm Ag!! and 0.600 ppm Au!!

195 455785/6416865. Diamictite, highly elongated, drawn-out parallel to predominant fract cleav: 90/85N. Stream sed sample **MD36S**.

47 m brg N62E. Creek, diamictite on NW, calcareous silty sandstn

on SE. Bed (sandstn): 130/50SW (II). Jointing: 15/70SE, 5/m. Stream sed sample **MD37S**. Fract cleav (diamictite): 75/80SE.

196 456235/6417095. Small creek. Sandstn, silty, lt to med gry, exhibits numerous small (3-5 mm) oval-shaped cavities formerly granules an pebbles. Fract cleav: 120/50SW. Bed: 60/35NW.

60 m upstream. Bed: 60/50NW (I). Stream sed sample **MD38S**.

58 m brg S28W, small creek. Sandstn, calcareous, lt gry. Pitted as previously noted at Sta 196. Bed: 75/55NW. Jointing: 35/80NW, 10/m. Stream sed sample **MD39S**. Creek float comprises med gry, calcareous sandstn, massive vein quarts, ferruginous cobbles and FeO-stained sandstn, minor biotite-rich dike rock as at Sta 152.

197 455985/6416990. Arkose, well-defined linear outcrop (N60E), 3 m wide, stands in slight relief (30-50 cm) which may be due to diking activity that parallels the bed on the north. Finding occasional biotite-rich dike rock float along arkosic bed.

Sample **MD76R** is a med granular granitic from the arkosic alignment, very limonite-rich, minor vein quartz pieces.

198 456485/6417090. Sandstn, fine grained, silty, deformed, carries irregular clots ferruginous material to 15 cm diam. Bed: 90/60N. Jointing: 35/90, 10/m. Exhibit slight hint of silicic alteration attitude: 95/70NE, 65 cm wide, very much resembles host pitted sandstn which have been case hardened.

Find coarse granular, dk gry-grn rock. Composition predominantly anhedral biotite and amphibole, dk grn-brn, with less quartz and decomposed feldspar. Excessively broken and sheared, disseminated limonite specks (orange-brn to rd-brn) non-calcareous. Stream Sed sample **MD40S**.

198 m brg S75E small creek. Stream sed sample **MD41S**. Outcrop is lt to med gry silty sandstn. Bed: 80/55NW.

199 456870/6416695. Sandstn, dk gry-grn, calcareous, silty. Abundant small (1-10 mm) ironstone, well-rounded, shiny, rd-brn. Steam sed sample **MD42S**.

Sample **MD43S** is selected collection of the well-rounded, magnetic, ironstn shot particles.

200 456970/6416800. Sandstn, lt to med blu-gry sandstn, silty, massive. Bed: 85/60SE. Jointing: 40/90, 15/m. Second bedding attitude measured approx 20 m upstream: 75/70NW (I). Stream sed sample **MD44S**. Bed (at sta): 80/35NW (II).

201 457090/6416510. Small creek. No o/c. Stream sed sample **MD45S**. Alluvial include an abundance of small ironstone shot.

202 455080/6415650. Olary Creek. Quartzite beds 2-3 m thickness alternating with a blk carbonaceous shale (10 m in thickness). Small anticlinal str. Principal bed: 270/35S (I). Jointing: 10/80SE, 10/m. Note a very old, well-healed line of fracturing: 145/90/ 10/m.

203 450335/6415150. Ridge between two parallel stream. Limestn, gritty/pebbly, forms prominent o/c's to 2 m relief. Bed: 20/30NW (I).

204 450690/6415825. Limestn, dk gry, well-bedded, sandy, silty. Bed: 05/30NW. Jointing North/80E, 3/m. Predominant rock is med gry, silty calcareous sandstn. Bed: 30/45NW (I).

205 451015/6416285. Ridge crest between two parallel streams draining N25E. Sandstn, silty, calcareous and siltstn, gry-brn on exposed surfaces. Limestn beds, coarse sandy, well-bedded forming prominent linear o/c's. Bed: 20/30NW. Fracture cleavage: 85/90.

206 451430/6416505. Creek. Sandstn, silty, highly calcareous. Widespread limonite concentrations along bedding planes, FeO locally pervasive throughout beds. Bed: 355/35NW

65 m brg due North (downstream), shales, blk, strongly calcareous, finely laminated, incorporates highly FeO-rich horizons (20-30 cm). Bed: 135/30SW.

207 451225/6415910. Sandstn, calcareous, silty, strongly FeO-bearing within and along bedding plane partings. Finely laminated, med to dk gry, beds slightly wavy. Bed: 15/35NW.

30 m upstream, blk calcareous sandstns, siltstn and blk shale interbeds. Abundant FeO staining concentrated along bedding planes. Bed: 95/50SW (I). Jointing: 20/60SE, 5/m. Structural setting here involves nose of anticline plunging about S45W. Rockchip sample **MD77R** from north flank comprises heavily FeO-stained and limonite-bearing quartz vein, 30-40 cm, brecciated and

rehealed, tends to conform to bedding, several such veins noted, all thoroughly fract'd. Some sections of vein quartz very "smoky".

208 450930/6415345. Creek. Sandstn, silty, lt to med gry, also locally with strong FeO-staining, pervasive, and as gossanous concentrations along bedding plane partings. Bed: 20/40NW. Jointing: 305/80SW, 20/m.

209 450660/6414955. Sandstn, finely laminated lt to dk gry bands. Bed: 10/35NW (I). Jointing: 70/90, 2/m. Some beds exhibit pervasive FeO-staining with limonite developed on bedding plane partings.

210 451115/6414780. Ridge crest. Sandstn, quartzose and quartzite, the latter weathering to large (1-2 mm relief) rounded o/c's. Bed: 25/30NW (I).

211 451375/6415245. Prospect cut? Very old, cut 10 m in length N70E. Sandstn, calcareous. Bed: 60/25NW. Fracture cleavage: 75/90. Fracture zone: N/85E, 3 m in width, located 15 m west of prospect cut. Find erratics of quartzite, and granite, the latter to 1 m diameter. Bed: 25/15NW (I). Unable to locate any line of lode or other alteration/mineralisation feature in vicinity of prospect cut, same applies to mullock.

212 451760/6415590. Sandstn, quartzose and related quartzite, well-devel'd cross-bedding. Bed: 90/55N (I). Jointing: 345/50NE, 10/m.

213 451815/6416050. Sandstn, calcareous. Bed: 60/55NW (I). Includes siltstns, FeO-stained. Jointing: 30/85SE, 10/m.

50 m bearing 190°, sandstn, med gry, calcareous. Bed: 70/45NW (III). Fract cleav: 100/75SW, well-devel'd. Bed: 65/25NW (I).

214 452015/6416445. Sandstn, silty, calcareous, med to dk gry with sandy limestn interbeds, lt blu-gry, to 2 m thickness. Bed: 40/35NW. Fracture cleavage: 80/80SE, well-developed.

215 451930/6416725. Siltstn, lt to dk gry, calcareous. Fracture cleavage: 85/80SE, well-devel'd. Bed: 35/25NW (I). Jointing: 10/80SE, 5/m.

216 452030/6417305. Creek, 8 m width, draining S20E. Sandstn, silty, finely laminated, lt to med gry, slightly bluish. Bed: 350/35SW.

217 451450/6416985. Shale, relatively decomposed, gry, limestn interbeds, yel-grn discolor'n. Fracture cleavage: 80/85NW. Bed: 70/60SE (II); 100/40SW (II). Jointing: 15/85SE, 3/m. Bedding this area very wavy along strike, include several micro-folds, wavelength = 2-3 m.

218 450935/6417000. Limestn, conglomerate, contains pebbles and cobbles of sub-rounded limestn, siltstn, quartz (vein). Fracture cleavage: 75/80SE. Bed: 85/70SE (II); 115/50SW (I). Est conglomerate limestn to be 80-100 m in thickness.

219 450660/6417020. Siltstn, med gry, highly calcareous, with massive, resistant sandstn interbeds, dk brn-gry, also limestn beds to 1 m thickness. Bed: 155/30SW. Fracture cleavage: 80/85SE. Bed: 55/60NW (I).

220 450680/6416390. Creek. Siltstn, med gry, slt'ly sandy, str'ly calcareous, nearly blk on freshly broken surfaces. Bed: 125/35SW (III). Jointing: N/70E, well-devel'd. Fract cleavage: 80/80SE.

221 450345/6416400. Sandstn, highly calcareous, siltstn. Bed: 15/20NW. Jointing: 350/85NE, 4/m. Fract cleavage: 85/80NW.

222 450190/6415535. Creek. Shale, med to dk gry on exposed surfaces, blk on fresh. Locally thoroughly weathered, str'ly calcareous. Bed: 155/25SW (I). Jointing: 70/85NW, 3/m.

223 449980/6415220. Small tributary creek. Sandstn, silty, highly calcareous, brn-gry on exposed surfaces, dk blu-gry on fresh. Bed: 40/40NW (I). Fract cleav: 295/85SW.

224 451400/6415955. Creek. Sandstn, med gry, calcareous. Bed: 35/40NW (I). Locally well-developed cross-bedding. Bed: 05/35NW (I). Jointing: 355/70NE, 3/m.

225 450135/6416100. Limestn, silty, med to dk gry-brn on exposed surfaces, med to dk blu-gry on fresh, fine, even-textured. Bed: North/30W (I).

226 450500/6416635. Prospect cut, 13 m in length bearing N25E. From inspection of mullock estimated originally 1 m deep, 1.5 m in width. No line of lode or any indication of alteration/minalisation products in mullock. Conceivable this workings and that at Sta 211 were after relatively pure limestn for use in preparing calcium oxide (used in making mortar, plaster and an inexpensive

whitewash). A limestn bed, 1.5 m in width, can be seen at both ends of the cut. Bed: 20/60NW. Fract cleav: 90/85S, well-devel'd.

227 450485/6416985. Small erosional gully. Shale, blk, calcareous, very finely laminated, tends to part along laminations. Bed: 310/30SW.

228 450630/6417305. Limestone, conglomeratic comprising pebbles and cobbles of quartzite, medium and coarse-granular granitics, gritty limestn, limestn, shale. Highly developed shear-fracturing: 80/85SE. Conglomerate underlies a quartzite horizon. Bed (quartzite): 155/30SW. Jointing: North/80E, 2/m. A second older joint system: 85/85SE, frequently occupied by milky-white quartz. Width of conglomerate is 4 to 5 m.

229 451080/6417745. Limestn, well-developed bedding: North/15W (I). Also find minor conglomerate limestn. Fract cleav: 100/90.

163 m bearing S35E, well-developed fracture zone 2-3 m in width: 25/85SE. Rock is silty sandstn, med gry-brn, stands in slight relief due silicic alteration. Tracing the str on strike N25E note width varies to 7 m.

230 451295/6417795. Sandstn, silty, calcareous, dk gry-brn. Cut by above fracture zone, here 2 m wide (well-displayed in small erosional gully), attitude: 10/80SE, cuts across bedding. Bed: 20/40NW; North/25W (III).

147 m bearing N15E, fracture zone starting to "thin out", attitude: 15/85SE. Bed (silty sandstn): 15/30NW.

231 451430/6418250. Limestn, silty and sandy, well-developed fine bedding, gry-brn on exposed surfaces, gry on fresh. Bed: 25/40NW. Eluvials blanket most of area except for occasional carbonate o/c. Fracture zone concealed this location. However, believe this break is sympathetic to a larger, or principal shear zone loc'd to the west (as suggested by an aerial photo lineament).

66 m bearing S55W, principal fracture zone, mostly concealed by eluvials but clearly defined in straight erosional gully where slt'ly silicic gry-grn silty sandstn stands in slight relief (30-50 cm) over 1.5 m width. Inspection of photo shows headwaters of small gully curving around to coincide with the fracture zone. Attitude: 15/85SE. Inspection along strike of break find massive linear quartz vein cut off on footwall and re-appearing 13 m N15E on hanging wall (left lateral displacement).

232 451220/6418445. Station track. Aerial photo shows two distinct sets uniform sequence of arcs concave to the south over 630 m axial trace. Resembles folded bedding beneath thin eluvial cover with east side of easterly-most arc set cut off by the N15E fault zone.

The arcs are systematically plowed ditches in support of erosional control. The apparent cut off on the east arc is a function of the fault's broken and relatively decomposed ground which apparently is incapable of maintaining the plowed ditches. Rock is sandy limestn, med gry-brn. Bed: North/30W (II).

233 450810/6418920. Quartzite, 3 m wide. Bed: 330/20SW (I). Minor displacement of bed by regional fracture cleav: 80/85NW.

234 451655/6418270. Creek. Sandstn, gry, silty. Bed: 270/35S. Stream sed sample **MD47S** aimed at testing any mineralisation associated with the N15E fault zone.

235 451520/6417585. Small erosional gully. Siltstn, gry-grn, calcareous. Bed: North/30W (III). Stream sed sample **MD48S**. Bed: 305/65SW.

236 451980/6417880. Creek. Siltstn, lt to med gry-grn. Bed: 355/40SW (I). Jointing: 15/85SE, 5/m. Stream sed sample **MD49S** and **MD50S** (duplicate).

237 452070/6418280. Sandstn, calcareous, silty. Bed: North/30W (I). Fract cleav: 110/70SW.

238 452600/6417965. Sandstn, quartzose, FeO cementing medium, numerous multi-directional limonite veinlets. Slightly silicified, stand in small relief within well-defined fracture zone: 20/85NW, 2 m width. Rockchip sample **MD78R**.

239 452585/6417645. Creek. Sandstn, calcareous, finely laminated lt and dk gry bands. Bed: 20/30NW (I). Jointing: 345/70NE. Fract cleav: 105/65SW.

240 452985/6414170. Prospect workings. Probably the northeasterly continuation of the Jim's Well fracture zone (Stations 138 thru 144). Sample **MD79R** brecciated qtzo-felds sandstn with disseminated limonite specks and limonite/goethite cement. Non-calcareous, dense rd-brn ferruginous alteration product after pyrite.

Prospect pit trending 6 m @ 220°. Walls of former fissure vein filling: 45/85SE, 30 cm. Host rock is gry grn silty sandstn. Fract cleav: 135/80NE. Bed: 35/20NW. Sample **MD96R** comprises ferruginous vein pieces collected within a 25 m radius of station.

241 452605/6413910. Site of very old loaming prospect, radius of dig about 3 m with mullock stacked on NE east side. Rock o/c is sandstn, gry-grn. Fract cleav: 80/90. Soil sample **MD01L** from screened mullock (2.5 m narrow cut along length of screenings).

Sample **MD 82R** FeO-stained quartz vein, vuggy with limonite fillings.

25 m radius inspection about prospect. Find numerous ferruginous-bearing vein quartz pieces (2-5 cm thickness). Occupies fractures: 355/85NE. Sample **MD83R** comprises ferruginous vein products, float, collected within 25 m radius.

242 452470/6413925. Site of old loaming prospect. Soil sample **MD02L** from mullock as at Sta 241. Soils characterised by yel-rd color including abundant ferruginous-bearing vein quartz. Rock is siltstn med to dk gry. Well-devel'd fracture cleav: 85/90.

Sample **MD84R** comprises a collection of ferruginous quartz vein float from within 25 m radius of loaming operation. Some particles exhibit good sericite, dk rd-brn limonite as well as yel-brn limonite.

100 m bearing 133°, sandstn, silty. Bed: 100/45NE. Jointing: 05/80NW, 10/m.

243 452430/6413825. Loaming prospect, semi-circular 3 m radius. Sample **MD03L** from screening heap. Sample **MD85R** comprise ferruginous vein quartz as float from within 25 m radius of prospect site.

244 452650/6413795. Small creek. Abundant quartz, milky white, litters surface, sandstn float, lt to med gry. Fract cleav: 90/85S. Bed: 80/40NW. Jointing: 15/90, 5/m. Numerous massive linear quartz veins: 85/85NW, gen 1 m thick and up to 30 m length.

245 452480/6413610. Loaming prospect, adjacent to quartz vein with strongly silicified wall rock, 30 cm thick, attitude: 10/85SE. Wall rock is silty sandstn, med gry-brn, dense, tough with pervasive FeO. Width of case hardening 50 cm. Rockchip sample **MD86R**

from vein.

37 m bearing S10W small erosional ditch, stream sed sample **MD54S**.

246 452460/6414190. Relatively large creek, about 15 m wide. Sandstn, silty, lt to medium gry. Jointing: 10/85SE, 5 m, joint wall stained with FeO and bleached, case hardened, may carry thin (1-2 cm) quartz veins. Fract cleav: 90/90. Multi-directional quartz veins (1-4 cm thickness).

247 452375/6414485. Small creek draining S70E, incised 2 m. Sandstn, silty, gry, slt'ly greenish. Bed: 30/40NW. Fract cleav: 95/55SW. Bed: 50/40NW (I). Creek float comprises gry-grn silty sandstn, ironstn, vein quartz with limonite filled vugs.

Stream sed sample **MD58S**. Large massive linear quartz body: 70/80NW, 1 m wide (at centre) tapering at either end, carries regional fracture cleav: 15/85NW.

248 452255/6414585. Sandstn, lt to med gry-grn, very massive. Cut by quartz veins: North/80E, 3-4 cm thickness, wall rock case hardened producing slight relief.

Rockchip sample **MD87R** from contact between quartz vein and sandstn wall rock exhibits variable amounts limonite, note presence coarse, bleached muscovite quartz has yellowish discoloration and greasy lustre.

249 451815/6414765. Small creek. Sandstn, lt to med gry, non-calcareous, supports numerous thin quartz veins which have affected (hardened) the wall rock. Veins: 25/70SE, 3/m to 1 cm thickness, may show leached cavities and limonite (red-brn) filled cavities. Bed: 75/30SE. Fract cleav: 80/65SE.

250 451280/6414750. Creek. Sandstn, lt brn to brn-rd. Bed: 10/25NW (I). Fract cleav: 80/90. Jointing: 20/85NW, 10/m.

251 451540/6415035. Small creek. Sandstn, coarse grained, med gry. Bed: 50/30NW. Jointing: 10/85NW, support thin (1-3 cm) qtz veins, 3/m. Quartz veins are milky white, non-productive appearing.

252 452080/6415340. Creek, draining N25E. Sandstn, lt to med gry. Bed: 10/20NW (I). Jointing: 15/75SE, related shearing, locally sheeted (50/m). Bed: 80/30NW (I); 60/20NW (I). Numerous

milky white quartz veins to 3 cm, very straight, slight FeO-staining: 230/90.

253 452360/6415670. Creek, draining N40E. Shale, well-indurated, fissile, dk gry-brn. Bed: 70/45NW. 5 m due south second bed: 85/40SE, defines small anticlinal crenulation.

Stream sed sample **MD59S**. Jointing: North/85E, 5/m. Considerable amounts ferruginous-bearing vein quartz in creek float. Find pebbly conglomerate beds to 1.5 m thickness.

Rockchip sample **MD88R** from productive-appearing ferruginous float, includes attached quartz, slt'ly brecciated suggesting faulted origin. Numerous cobbles schistose granite.

254 452585/6415920. Sandstn, silty, med gry, well-bedded, contains scattered well-rounded pebbles and gradational with gritty beds to 2 m thickness. Bed: 30/30NW (I). Fract cleav: 85/85SE.

37 m bearing N40W, small creek. Gry sandstn exposed, well-bedded, weathers out as large semi-rounded o/c's. Bed: 20/30NW. Stream sed **MD60S**. Fract cleav: 85/85NW. Float in creek comprises much vein quartz with attached ferruginous clots, coarse sandstn, gritstn. Jointing: 20/80SE, 5/m. Find beds gritstn to 2 m thickness.

255 452860/6416160. Creek, drains N30E. Sandstn, bold o/c protrudes into creek channel, slt'ly silicic, highly fractured but well-healed. Mod FeO-staining and numerous thin quartz veins. Bed: 135/25SW (I). Jointing 10/85NW, 30/m, often occupied by thin quartz veins.

15 m upstream. Bed: 340/50SW (I). Jointing: 10/80SE.

256 453055/6416050. Sandstn, gry-grn. Carries few thin (1-3 cm) quartz veins: 05/75SE, 5/m. Fract cleav: 95/85SE. Bed: 30/50NW (II).

Stream sed sample **MD61S**. Bed: 350/30SW measured 25 m downstream from first bedding measurement.

257 452815/6415395. Creek. Sandstn, silty, lt to med gry. Bed: 30/60NW (I); 50/65NW (I). Fract cleav: 95/85SW.

258 452670/6414960. Prospect workings. Measures 5.5 m N10E. Occupies hill crest. Sandstn, quartzo-felds, excessively sheared:

20/70NW. Mod silicic and argillic alteration over 30 cm width. Sample **MD89R** from silicic wall rock and mylonite, minor FeO, MnO and trace CuO with rare malachite. Originally prospect pit down about 2 m.

16 m bearing S10W, south end elongate prospect cut, 5 m N25E, originally 2 m deep. Sandstn, lt to med gry, slt'ly feldspathic. Vein material comprises highly fractured quartz impregnated with stringers and clots limonite and dense rd-brn ferruginous material with minor MnO, CuO throughout.

Rockchip sample **MD90R** from ferruginous/CuO bearing quartz. Fracturing shows on aerial photo as faint lineation, becomes darker (on photo) where slight (50 cm) relief present. Fract cleav (regional type): 65/85NW, well-developed. Rockchip sample **MD91R**.

150 m bearing S20W, sandstn. Fracture zone: 10/80SE, densely spaced across 1 m width. Older fracture system: 130/80SW, in part rehealed, 20/m. Several erratic boulders (1-2 m diameter) often coarse granular granite. **MD92R** from fracture zone, ferruginous, siliceous, vugs with rd-br limonite.

259 452510/6414680. Prospect workings, two trenches end on end, each 7.5 m length N20E, 2 m separation. Host rock is sandstn, med to dk gry, darkening relates to slight silicic alteration, very fine grained, exhibits CuO smears on fractures along with limonite. Originally 2 m deep, now caved to within 1 m of surface. Mullock shows siderite/quartz/ferruginous vein to 5 cm. Sample **MD93R**.

260 452405/6414330. Sandstn, silty, brick-rd, mod silicic alteration adjacent to 1 m wide fracture zone: 15/85SE. Includes minor quartz veining to 6 cm width. Sample **MD94R** from silicified fracture zone. Fract cleav (regional type): 75/85SE.

261 452360/6413985. Hill crest. Fracture zone as at Sta 260, 1 m wide with parallel sympathetic fracturing across to total width 3 m: N/70E. Old prospect pit straddles fracture zone, exploits quartz-ferruginous vein, 25 cm, 355/85NE, minor CuO esp represented within central portion quartz-bearing fracture zone.

Mineralised fracture system post-dates large linear quartz emplacement: 80/90; 75/80NW. Latter massive quartz bodies gen exhibit regional fracture cleav: 15/80SE. Host rock is quartzo-felds sandstn, shows silicic, argillic less sericitic alteration accompanied by FeO and limonite, sample **MD95R**.

262 452240/6413975. Sandstn, med to dk gry sandstn. Fracture zone: 05/85SE, 1.5 m wide. Calcareous.

Proceeding southerly 80 m, fracture cleav: 75/80SE, well-developed.

263 451765/6413850. Junction Creek Mine camp. Site marked by lone tree 3 m high. 24 m bearing 162°30' mag from base of tree identify what appears to be a child's grave (?). Marked on surface by quartz cobbles. **Photos**: view 135° and 305°.

264 453460/6415545. Sandstn, fine grained, silty, well-indurated. Fract cleav: 100/90. Jointing: 15/90. Rock is non-calcareous. Surface float comprises granite (exotic), milky-wht quartz chips. Several large linear quartz veins: 60/50NW.

265 453550/6415850. Sandstn, fine grained, med to dk gry. Fract cleav: 95/90. Locally with coarse sandy beds. Jointing: 10/85SE, 5/m. Large, linear quartz veins: 65/50NW; 50/75NW to 2 m width, supports regional type fracture cleav: 80/90.

266 453510/6416160. Siltstn, gry-grn, minimal o/c. Some interbedded gry sandstn. Fract cleav: 100/85SW, well-developed. Jointing: 25/90, 3/m. some joint surfaces with mod bleaching. Bed: 30/20NW (III).

267 453925/6416690. Sandstn, cross-bedded, finely laminated. Bed: 145/25SW. Jointing: 15/90.

Downstream N60E about 60 m in Junction Creek. Sandstn, quartzose, very prominent o/c, med gry. Quartz veining, very thin (1-2 mm). Bed: N20W (III).

268 453435/6417205. Sandstn, gry brn. Bed: 75/40SE (II). Jointing: 15/85SE, 30/m. Fract cleav: 85/90.

269 453195/6417225. Sandstn, coarse, gry. Well-devel'd fracture cleav: 90/85S. Bed: N/25W. Jointing: 15/75SE, 10/m.

65 m bearing N60W, linear o/c, sandstn, well-bedded, finely laminated. Bed: 30/25NW (I). Fract cleav: 95/85SW; 05/85SE 20/m may be slt'ly sheared jointing. Find numerous drop stones, cobble dimension: quartzite, fine-grained sandstn, sandy lenses with graded bedding fining upwards.

270 452830/6417100. Sandstn, gry-brn. Fract cleav: 95/85NE. Bed: 15/15NW (III).

145 m bearing N45W, small creek draining 170°. Rock is gry-grn siltstn, well-indurated, produces platy cleavage, several large linear quartz veins: 80/85NW, 60-70 cm thickness, 25 m length. Bed: 80/40SE. Jointing: 05/85NW, 10/m. Stream sed sample **MD62S**. Bed: 335/30SW (I).

271 452405/6417150. Sandstn, gry-grn, finely laminated, silty. Bed: 340/30SW (I). Jointing: 10/85SE, 10/m. Abundant ferruginous material with attached vein quartz sample **MD97R**. Sandstns locally very pebbly and grading to very coarse to gritty sands. Shear fracture: 355/80NE, show wall case hardening, carry finely comminuted rock, bleached, calcareous, to 5 cm thickness. Creek float comprises granite, sandstn, massive quartz. Stream sed **MD63S**.

272 452460/6416710. Sandstn, lt to med gry, tough well-indurated. Bed: 150/40SW (I); 150/45SW (I). Fract cleav: 95/90. Stream sed sample **MD64S**.

273 454490/6416720. Small drainage. Sandstn, coarse, lt gry, slt'ly decomposed. Jointing: 10/80SE, 30/m. Stream sed **MD65S**, contains 30-40% magnetic shot (blk, rounded, shiny pebbles 3-10 mm diameter). Surface densely littered with mag shot.

274 454755/6416965. Sandstn, quartzose. Bed: 110/50SW (I). Jointing: 25/85SE, 5/m. Conspicuous absence of blk mag shot. Abundant quartz chips at surface. Some joint planes carry argillic selvages to 6-8 cm thickness derived from minor shearing. Joints: 05/65SE, 5/m. Stream sed **MD66S**. Westerly, downstream, alluvial cover thickness to 3 m.

275 454925/6417375. Creek, drains N55W. Quartzite, massive, minor feldspathic constituent mostly altered to argillic products. Jointing: 335/80NE, 5/m. Stream sed: **MD67S**. Well-devel'd fracture cleav: 355/55NE, exhibits minor displacement.

276 455330/6417665. Creek, drains 330°. Quartzose sandstn, decomposed, punky, minor limonite on fractures. Fract cleav: 90/85S. Jointing: 10/80SE, 5/m. Faint pinkish discoloration due disseminated limonite specks (former pyrite ?). Stream sed **MD68S**.

277 455950/6417965. Creek, drains 285°. Sandstn, qtzo-felds with much lithics. Fracture zone, 60 cm wide: 175/80NE, rocks dk gry grn, slt'ly silicic, adjacent wall rock equally tough due wk silicic alteration. Second fracture set: 110/90. Bed: 155/SW. Stream sed **MD69S**.

278 455930/6418360. Small creek, drains 270°. Siltstn, gry with interbedded coarse sandstn. Bed: 45/35NW (I). Jointing: 115/85NE, 3/m.

279 456160/6418510. Creek, drains 260°. Stream sed **MD70S**. Quartzite o/c very massive, slt'ly pinkish due disseminated FEO specks. Jointing: 25/90, 30/M; 100/85SW. BED: 20/50SE (?). FRACT CLEAV: 110/80NE.

280 456280/6418890. Sandstn, quartzose and locally tough quartzite lenses, occurs as well defined (aerial photo), linear o/c's, lt gry to slt'ly brown. Bed: 95/45NE (I).

281 Creek. Sandstn, gry and siltstn (olive grn), very finely laminated. Bed: 95/80NE (I). Jointing: 25/85SE*, 30/m. Float in creek comprises quartzite, greenish siltstn. Fract cleav: 100/90 exhibits minor shearing (right lateral). Shear fracture: 105/90, 1 m wide zone with extensive argillic, comminuted rock infillings, minor brecciation.

Upstream 20 m collect stream sed **MD71S**. Find second fault zone upstream 10 m from first zone, attitude N/90, 40 cm wide, right lateral displacement.

282 456960/6419320. Creek, drains 290°. Extensive caliche coatings on all rock surfaces, suspect fault related. Fract cleav: 280/75SW, highly developed, carries caliche and comminuted rock. Jointing: 25/85NW, 3/m. Sandstn, gry grn. Bed: 280/60SW (III). Find numerous granitic cobbles. Bed: 100/45NE (II); 95/35NE (II) both attitudes measured 65 m S of first measurement. Stream sed **MD72S**.

283 456820/6419735. Creek, drains S15W. Stream sed **MD73S**. Sandstn, gry, silty, well indurated. Bed: 275/35NE (II), 275/40NE (II). Find numerous cobbles (surface float) granite weathered from sandstn.

284 456360/6419705. Creek, drains 210°. Sandstn, silty, gry grn. Stream sed: **MD74S**. Sandstn's massive with faint bed: 100/35SW (I).

90 m upstream, bed: 115/35NE; 100/50NE (I). Fract cleav: 100/80SW. Jointing: 20/85SE, 20/m.

285 453090/6417800. Creek, headwaters. Sandstn, saturated with fine, shiny, blk amphibole (m/m), disseminated limonite specks. Bed: 15/15NW. Fract cleav: 80/85NW; 185/80SE; 25/90 well-developed.

286 452915/6417980. Sandstn, lt gry, finely laminated with lt and dk gry banding. Bed: 30/45NW (I). Fract cleav: 95/80SW. Jointing: 05/80SE, 3/m. Well defined lineament (aerial photo) which offsets creeks at point of intersection - an old road!

287 452650/6418370. Sandstn, very prominent o/c, comprises pebbly horizons, grading to quartzite 3-4 m thickness. Fault related fracturing: 275/75SW, left lateral displacement 10-15 m. Sandstn/quartzite underlain by gritstn followed by a blk slaty shale. Bed: 05/40NW (I).

288 452555/6418705. Sandstn, dk gry to blk, silty, finely laminated, excellent slaty cleavage. Fract cleav: 85/80SE, well developed. Bed: 45/30NW (I), lt and dk gry banding, dk bands 1-3 cm, lt bands 3-4 mm wide.

289 452100/6418690. Gully. Siltstn, slaty, gry grn. Bed: 125/35SW (III).

290 452195/6419455. Creek. Sandstn, silty, gry, finely laminated. Bed: 50/60NW (I). Fract cleavage: 80/90. Jointing: 05/75SE, 2/m with minor associated shearing, appears to influence stream channel direction. Abundant quartz float derived from local massive linear emplacements, carries minor ferruginous clots (3-5 cm): 55/70SE; 95/70SW to 30 cm thickness. Stream sed: **MD75S**. Rockchip sample **MD98R** from quartz veins.

291 452460/6419470. Between this and previous sta (290) note presence numerous ferruginous-impregnated quartz veins. Sandstn, med gry, slt'ly yellowish, silty. Bed: 35/75NW (II).

Rockchip sample **MD99R** from productive-appearing quartz veins, highly crackled, rehealed with rd-brn limonite and associated dense ferruginous material. Sandstn and siltstn wall rocks thoroughly saturated with FeO rendering distinctive rd-brn discoloration. Fractures: 35/85NW. Quartz veins have been sheared and pulled apart.

60 m bearing S85W, tributary stream, drains S85E, where stream sed sample **MD76S** was taken. Highly brecciated and rehealed quartz vein: 40/85SE, abundant dense rd-brn ferruginous material which in turn cut by secondary (later) thin quartz veinlets, to 30 cm thickness.

292 453260/6419570. Sandstn, quartzose, lt gry, massive. Fract cleav: 85/85SE. Jointing: 15/85NW, 30/m. Bed: 85/65NW (XX); 145/40NE (III).

293 452505/6419360. Siltstn, highly fissile. Bed: 20/45NW, lt and dk gry banding. Fract cleav: 110/60SW.

294 452985/6419800. Sample **MD04L** comprises sub-rounded blk ferruginous shot and pebbles. Entire area covered with these particles. Occupies slt'ly elevated ground, barren of vegetation.

295 452920/6419515. Broad domal-shaped topo rise, littered with abundant sub-rounded ferruginous pebbles and pisolites, most being magnetic. Sample **MD05L** comprises selected magnetic fraction, well-rounded, shiny, blk-brn, pisolitic particles.

Sample **MD06L** from same locality as MD05L being larger (1-3 cm), non-magnetic particles. Characterised by rounded form, brn-blk shiny to dull lustre. Fresh broken surfaces exhibit faint light red-brown envelope (1-2 mm) followed by dark red-brown interior, generally fine, even texture with rare minute, shiney black specks.

296 453070/6419225. Small creek, drains 90°. Sandstn, lt gry grn. Jointing: 110/80NE, 20/m; 05/85SE, 3/m. Bed: 95/40SW. Rocks produce a distinctive reddish-brn, sandy soil with minor amounts mag shot. Fract cleav: 85/75NW. Stream sed sample **MD77S.**

60 m bearing 150° in stream channel. Sandstn, coarse, gritty, some exhibit a poorly sorted texture. Bed: 135/35SW (I). Fract set confined to creek: 10/80SE.

297 453055/6418950. Small creek, drains N60E. Stream sed sample **MD78S.** Stream sed sample **MD79S** comprises a mag shot concentrate. Bed: 45/25NW (I). Sandstn, lt gry grn.

298 453030/6418390. Creek, headwaters, drains N10E. Sandstn, gry grn, silty, well-developed lt and dk gry laminations. Bed: 45/30NW. Jointing: 15/80SE, 10/m. Fract cleav: 95/85SW.

Stream sed sample **MD80S**.

30 m due east, small drainage. Stream sed sample **MD81S**. Bed: 40/25NW. Jointing: 10/80SE, 20/m, associated shearing with clay gouge, case hardened walls and slt'ly bleached. Fract cleav: 95/85SW, well developed.

299 453555/6418405. Sandstn, well defined linear o/c's with intervening silty sandstn (relatively non-resistant). Brown med to coarse-grained. Bed: 40/35NW (I). Fract cleav: 85/90. Jointing: 15/80SE, 3/m. Bed: 40/25NW, gen exhibit small-scale cross-bedding. Jointing: 15/85SE, 5/m.

300 454990/6418340. Creek, drains 110°. Sandstn, gry grn silty. Fract cleav: 80/90, well-developed. Bed: 05/20SW; 120/35SW (II); 125/60SW. Fract set: 05/85SE, left lateral displacement, 50 cm offset. Massive linear quartz vein: 75/75NW, 40 cm thick.

301 455375/6418255. Olary Creek. Sandstn, coarse, ferruginous. Bed: 135/20SW (I). Jointing: 30/80SE, 3/m.

60 m bearing S75W, small drainage. Stream sed sample **MD82S** comprising -2 mm fraction being representative stream sediments. **MD83S** consists of selected magnetic concentrate from MD82S being mostly small (.5-1 mm), semi-rounded, -angular, brn-blk, shiny Fe_2O_3 particles (pisoliths):

Sample	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
MD05L	<0.001	1.0	120	46	80	102	mag, select 1-3 mm rnd' shot,
MD06L	<0.001	<1.0	62	27	55	82	non-mag, -2 cm, rnd' irreg
MD82S	<0.001	<1.0	10	28	20	44	non-select, -2 cm str'm sed
MD83S	<0.001	<1.0	46	30	100	70	mag-select, 1-3 mm str'm sed

Magnetic pisolites (MD05L) show over 90% greater As and 70% greater Cu content than their non-magnetic (MD06L) equivelents.

Magnetic fraction (MD83S) from ordinary stream sediment sample (MD82S) appears to be even more sensitive with 360% greater As and 400% greater Pb than its representative sample source. Near equivelence in Cu and less so for Zn probably relates to the high mobility of these elements.

Although insufficient samples, results in above table suggest that magnetic fraction of sample medium may be more responsive to presence of chalcophile elements than ordinary representative collections.

302 455090/6418590. Sandstn, coarse to gritty, supports approx 25% disseminated limonite specks (to 1 mm diam), also med grained sandstn with approx 5% disseminated limonite specks, str'ly reactive to HCl. Bed: 155/20NW. Jointing: 25/85SE; 10/m. Fract cleav: 20/75SE. Micaceous sandstn cut by numerous fine (hair-like) veinlets with black, metallic, magnetic material (maghemite?).

303 455060/6418810. Sandstn, quartzo-feldspathic. Bed: 150/30SW (I). Fract cleav: 40/85SE. Md to dk gry brn on exposed surfaces, lt gry brn on fresh, carry 3-5% disseminated limonite specks (to 1 m diam). Well-devel'd cross-bedding. Conspicuous absence of blk-brn mag shot.

105 m bearing S60E, small creek. Stream sed **MD84S**.

304 454430/6419070. Sandstn, med to coarse grained, gry brn, quartzo-felds. Bed: 105/20SW; 145/15SW. Fract cleav: 75/90.

305 453960/6418740. Ridge crest. Graywacke. Bed: 30/15NW. Jointing: 10/80SE, 5/m. Fract cleav: 90/85N. Bed: 45/20NW (I).

306 453940/6419190. Graywacke, forms prominent linear o/c's alternating with less resistant arenaceous rocks including siltstn. Bed: 10/10NW. Jointing: 15/85SE, 10/m. Fract cleav: 90/90.

307 454505/6418860. Graywacke, med to dk gry, well indurated, coarse grained. Bed: N/10W. Fract cleav: 100/90. Bed: 35/15SW. Minor cross-bedding. Bed: 90/45S; 85/45SE (I).

308 454260/6418170. Graywacke, gry brn, coarse sandy, firmly indurated, lt and dk gry banding. Form well defined (aerial photo) linear o/c's 30-60 cm relief, 50-70 cm width. Bed: 60/75NW (I); 55/80NW (I). Fract cleav: 80/90. Locally coarse gritty beds to 10 m thickness. Bed (20 m to SE): 60/40NW (I).

309 453690/6417785. Sandstn, coarse grained, gry brn on exposed surfaces, med gry on fresh. Grades into finer grained sandy facies, non-calcareous. Bed: 45/40NW (II); 30/25NW (I); 10/40NW (I) (measured successively about 20 m separation moving northerly). Fract cleav: 95/75SW, well developed. Jointing: 05/80SE, 5/m.

310 460170/6412225. Sandstn, coarse, calcareous, lt to med brn. Bed: 70/15NW (I). Fract cleav: 100/80SW. Jointing: 25/85NW, 3/m.

311 459715/6412500. Sandstn, coarse, calcareous, cross-bedded. Fract cleav: 80/85SE. Jointing: 120/70SW.

312 459370/6412885. Siltstn. Bed: 115/35SW (I). Fract cleav: 100/75SW.

313 459005/6413210. Sandstn, coarse, much amphibole (m/m origin). Fract cleav: 105/85SW. Bed: 100/35SW (III).

314 459590/6413485. Sandstn, pebbly, dk gry on exposed surfaces, lt gry on fresh, str'ly reactive to HCl. Bed: 115/20SW. Jointing: 25/85NW, 3/m. Fract cleav: 85/85SE. Bed: 100/70SW (I).

315 459143/6413470. Dike rock, predominantly (40-50%) hornblende and calcic plagioclase, probably a spessartite. Host rock is coarse, calcareous sandstn. Fract cleav: 115/85SW. Decomposition and weathering has fairly removed most of the dike leaving only erosional products; width 50 cm. Also finding (float) massive biotite rock, gry grn to nearly black, large biotite knots, another lamprophyre but lacking plagioclase, possibly alnoite.

316 459230/6414085. Sandstn, quartzose and quartzite, massive. Jointing: 10/85NW, 20/m.

317 459015/6414925. Siltstn, lt to med gry, str'ly reactive to HCl. Fract cleav: 90/85S, well developed. Jointing: 5/85NW, 3/m.

318 458620/6415115. Siltstn, blu-gry, calcareous. Fract cleav: 115/70SW. Abundant ironstn float this area.

319 458915/6415635. Sandstn, coarse, feldspathic. Bed: 70/40NW (I). Jointing: 25/85SE, 20/m, carry FeO-stained walls.

320 459895/6415430. Sandstn, pebbly, abundant m/m amphibole. Bed: 90/60S (based on pebble alignment) (III). Fract cleav: 120/90.

321 459990/6415580. Lamprophyre dike, 1 m wide, 30/90. Fine grained matrix, dk gry to blk, plagioclase phenos rendering "turkey track" texture. Host rock is calcareous siltstn. Fract cleav: 110/90, slt'ly wavy. Rockchip sample **MD100R,** biotite-rich lamprophyre. Hand specimen marked MD100R

322 459910/6415870. Quartzite. Bed: 100/65NE (I).

323 459530/6416190. Creek. Sandstn, lt to med gry. Bed: 95/65NE (I).

324 458340/6418465. Quartzite beds with siltstn, gry grn. Bed: 105/70SW (?); 100/70SW (I).

325 458800/6418835. Graywacke. Bed: 105/65NE. Fract cleav: 105/90.

326 452690/6410975 Approx 110 m bearing N50W, small erosional gully, graywacke, med to dk gry. Fract cleav: 70/80SE.

APPENDIX D

MALDORKY SPECIAL AREA
1989-1990 GEOCHEMICAL SUMMARY

CONTENTS

APPENDIX D

1989-1990 GEOCHEMICAL SUMMARY

MALDORKY SPECIAL AREA, EXPLORATION LICENCE 1657
OLARY PROVINCE, SOUTH AUSTRALIA

ROCKCHIP SAMPLING

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	SAMPLE DESCRIPTION
MD 01R	7	8	<1	7	145	12	10	Siltstn, silicic ocherous lim't
02	8	4	<1	<2	34	10	22	Fault breccia, limonitc, silicic
03	17	2	<1	4	62	18	8	Qtz/hematite vein, 15 cm
04	22	6	<1	32	35	30	30	Qtz vein, sulphide cavities
05	39	2	<1	3	65	52	22	Basic dike rk, sid't, limonite
06	40	<2	<1	<2	9	8	16	Siltstn wallrk to basic dike
07	41	<2	<1	<2	9	14	8	Dike rk? sid't & calc veinlets
08	20	<2	<1	3	22	10	14	Basic dike rk, tr diss pyrite
09	54	4	<1	3	220	15	14	Grit bed FeO, limonitic, argillic
10	68	10215	28	380	2100	710	195	Fault gouge, limonite
11	84	110	<1	13	44	140	11	Ferrug/silicious, cavities
12	84	18	<1	10	54	115	17	Silicified sandstn, tr diss pyrite
13	86	15	<1	18	38	110	16	Sandstn, sheared, FeO
14	84	14	<1	<2	14	15	10	Stream boulder, ferruginous
15	88	<2	<1	3	13	22	22	Sandstn, diss pyrite
16	32	30	<1	60	175	210	88	Fract filling, limonitic, wk silic
17	95	110	<1	96	88	120	280	Qtz vn, fract'd, FeO, limonite
18	97	4215	660	88	42.8%	340	75	Fissure filling, chalcocite
19	97	4130	390	36	32.9%	32	66	Fract filling, malachite, azur
20	97	795	500	78	23.9%	70	135	Sandstn, fract'd, weak silic, CuO
21	97	640	8	150	7900	64	22	Sandstn, silic, qtz vns, limonite
22	97	410	20	72	6600	28	20	Sandstn, silic, fract, lim, CuO
23	97	7880	9	210	1.05%	230	370	Sandstn, silic, trace malachite
24	106	4	1	28	95	22	64	Sandstn, FeO, thin qtz vns
25	106	5105	20	1.0%	450	1.5%	330	Sandstn, HT alter'n, FeO, argillic
26	97	300	3	410	1350	770	12	Sandstn, qtz-felds, tr CuO
27	108	32	1	40	3600	60	12	Sandstn, silic, tr diss CuO
28	114	115	1	710	300	160	270	Boulder, gossan's, qtz clasts, silic
29	119	27185	24	1150	4.7%	30	160	Ferrug material, qtz clasts
30	120	635	13	710	2.2%	40	170	Ferrug vn, qtz clasts, tr CuO
31	126	85	1	36	950	25	22	Lamprophyre, biotite-rich

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	SAMPLE DESCRIPTION
32	131	32	1	16	720	125	55	Fissure filling, mixed lithics
33	132	4625	17	1340	1720	750	56	Fault gouge, silic/ferruginous
34	132	44	1	88	70	30	25	Fault gouge, qtz/siderite
35	68	65	1	98	80	52	58	Siltstn, blk, ocherous limonite
36	68	10	1	8	20	32	110	Siltstn, silic/ferrug veinlets
37	68	12	1	10	36	35	19	Silic/ferrug material, siderite
38	133	16	2	22	370	32	56	Bed plane parting, gossanous
39	134	6	1	<2	35	28	68	Siltstn, fract'd, limonitic
40	135	12	2	1040	50	68	350	Siltstn silicic, ocherous limonite
41	136	6	3	360	840	155	910	Sandstn, fract fillings, limonite
42	137	26	4	2800	74	1120	5400	Breccia, ferruginous
43	106	605	25	1.16%	185	8800	320	Breccia, ferrug, cellular str
44	138	230	5	510	2.2%	220	240	Fault fissure, breccia, limonitic
45	139	36	2	200	270	130	24	Qtz vn, greasy lustre, arsenopyt
46	140	6530	7	2300	2450	790	850	Fissure filling, ferrug/silicous
47	140	160	2	490	270	400	320	Graywacke silic, limonitic
48	140	75	3	850	125	840	410	Graywacke silic, ferrug/silic
49	141	42	8	610	550	200	290	Surface float, silic/ferrug/qtz
50	142	36	14	42	770	58	140	Fract filling, diss limonite spots
51	143	11195	15	2500	2.2%	42	390	Vn filling, brn silic/ferrug CuO
52	144	1515	8	640	3.35%	48	440	Qtz vn, silic/ferrug, tr CuO
53	145	85	<1	15	550	18	10	Graywacke, diss limonite, silicic
54	147	48	2	11	460	28	22	Lamprophyre, biotite-rich
55	148	.048	2	15	220	36	72	Surface chips, ferruginous
56	150	.055	1	26	100	30	8	Arkose, silic, FeO
57	152	2.760	7	5500	800	180	4	Vn filling, silic/ferruginous
58	153	.070	<1	18	65	8	7	Qtz vn, greasy lustre, ferrug
59	154	.040	1	16	74	68	115	Breccia, qtz/hematite matrix
60	156	.026	1	670	84	92	145	Graywacke, fract, silic, limonite
61	163	1.940	5	3500	1.19%	110	135	Fract filling, silic/ferruginous
62	163	.885	8	1100	3100	2000	195	Fault gouge, FeO/MnO, silic, sid't
63	164	.022	1	38	140	50	62	Fract zone, silic graywacke clast
64	164	.012	<1	85	115	28	22	Graywacke, limonite fillings
65	165	.012	<1	2	70	18	28	Graywacke, FeO veinlets
66	166	.050	<1	24	115	10	38	Qtz vn, silic/ferruginous
67	169	<.002	<1	19	15	28	135	Sandstn, rd-brn fine fract's
68	174	.010	<1	8	38	12	30	Qtz vn, limonite veinlets
69	126	.008	<1	9	20	20		Lamprophyre. MD31R duplicate
70	175	.004	<1	<2	22	5	7	Qtz vn, sheared, smokey
71	179	.010	<1	13	150	10	280	Qtz vn, vuggy, limonite fillings
72	180	.004	<1	3	34	20	15	Qtz vn, limonite/hematite fill'gs

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	SAMPLE DESCRIPTION
73	187	.004	1	9	50	20	160	Fault gouge, tr qtz, cellular
74	188	.036	1	14	90	14	7	Gossanous cobble, ang qtz clasts
75	189	.006	<1	<2	180	20	10	Breccia, tr vn qtz, limonite
76	197	.006	<1	6	52	14	8	Granite, erratic, limonite rich
77	207	.003	<1	20	240	<5	10	Qtz vn, FeO, limonite, brecciated
78	238	.001	<1	60	30	155	200	Sandstn, limonite veinlets, silic
79	240	1.430	4	190	1.13%	25	314	Sandstn, qtzo/felds, brecciated
80	136	1.350	30	2900	120	7110	72	Sandstn, qtzo/felds, diss pyrite
81	136	.009	<1	82	30	35	4	Vn qtz, milky-white, trace FeO
82	241	.160	4	110	304	60	72	Vn ferruginous, rd-brn
83	241	.038	1	280	356	15	216	Float, ferruginous vein chips
84	242	.003	2	64	646	45	124	Float, ferruginous qtz vein chips
85	243	.012	2	180	184	30	90	Float, ferruginous qtz vein chips
86	245	.043	3	76	200	255	164	Qtz vn, weak pervasive FeO
87	248	<.001	<1	4	78	<5	6	Sandstn, wallrock, trace limonite
88	253	.099	13	190	466	340	254	Float, breccia, silic/ferruginous
89	258	2.040	15	2300	2.18%	1850	152	Sandstn, wallrock, trace CuO
90	258	1.140	3	1600	1.27%	835	256	Ferruginous qtz vn, trace CuO
91	258	.490	46	1200	5.39%	4345	190	Sandstn, qtz malachite
92	258	.370	35	42	3.13%	5810	202	Fract filling, ferruginous
93	259	.009	1	30	712	120	106	Mullock, sandstn, silic, CuO
94	260	.800	16	520	6.85%	55	764	Fract filling, silic sandstn
95	261	.004	<1	360	498	475	194	Fract filling, qtz, sericite, lim
96	240	2.48	7	300	4140	90	304	Mullock, ferruginous vn clasts
97	271	.098	2	130	1405	20	74	Sandstn, ferruginous/qtz vein
98	290	.005	1	22	50	35	100	Float, qtz, diss ferruginous clots
99	291	.17	7	88	300	245	478	Qtz vn, sheared, limonitic, FeO
100	321	.001	<1	<20	16	<5	56	Lamprophyre, biotite-rich

STREAM SEDIMENT SAMPLING

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
MD 01S	94	24	<1	40	190	72	92
02	106	14	1	86	100	100	100
03	107	12	1	110	130	150	100
04	167	<2	<1	6	54	20	36
05	168	4	<1	6	38	20	22
06	170	<2	<1	14	56	24	56
07	171	6	1	48	90	52	105

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
08	172	2	1	18	60	35	90
09	173	8	<1	3	38	18	36
10	173	4	<1	5	36	18	34
11	174	8	1	17	58	38	80
12	175	2	<1	7	56	24	45
13	175	4	1	5	72	30	58
14	176	4	<1	15	68	32	38
15	177	4	1	4	98	90	100
16	178	10	1	17	75	36	58
17	179	4	<1	11	58	36	68
18	180	30	<1	12	60	26	70
19	181	28	<1	7	66	28	58
20	182	42	<1	3	52	18	40
21	183	50	<1	<2	46	20	54
22	184	44	<1	<2	35	16	28
23	186	60	<1	3	34	22	40
24	187	38	<1	5	40	14	18
25	190	22	<1	11	62	35	50
26	188	24	<1	3	28	20	24
27	188	24	<1	3	32	12	14
28	188	24	<1	5	32	22	25
29	191	12	<1	5	56	22	34
30	192	<2	<1	2	28	20	50
31	192	16	<1	13	52	22	46
32	193	<2	<1	<2	35	24	45
33	193	4	<1	8	84	36	42
34	193	6	<1	7	62	32	48
35	194	<2	<1	10	48	25	55
36	195	<2	<1	13	60	28	60
37	195	4	<1	12	48	22	52
38	196	2	<1	16	50	26	64
39	196	<2	<1	8	38	22	32
40	198	<2	<1	<2	36	18	39
41	198	2	<1	9	55	26	46
42	199	<2	<1	7	38	25	32
43	199	8	1	44	44	86	34
44	200	<2	<1	5	28	14	22
45	201	<2	<1	2	34	22	34
46	119	<2	1	110	110	160	240
47	234	<1	<1	24	74	70	84
48	235	<1	<1	6	20	15	48

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
49	236	1	<1	9	34	20	54
50	236	<1	<1	8	26	25	52
51	107	3	<1	91	86	80	102
52	116	<1	<1	76	118	45	94
53	116	<1	<1	46	108	70	130
54	245	1	<1	43	96	90	148
55	98	<1	<1	22	84	35	74
56	96	<1	<1	43	122	85	92
57	244	<1	<1	23	66	35	96
58	247	3	<1	22	106	40	80
59	253	6	<1	62	88	60	112
60	254	<1	<1	62	84	95	162
61	256	1	<1	29	60	60	146
62	270	2	<1	27	80	85	106
63	271	1	<1	14	44	20	64
64	272	<1	<1	53	80	55	128
65	273	<1	<1	16	20	20	36
66	274	1	<1	3	16	<5	22
67	275	2	<1	5	82	25	50
68	276	<1	<1	4	22	5	36
69	277	<1	<1	2	14	5	18
70	279	<1	<1	4	22	10	44
71	281	1	<1	4	26	5	44
72	282	1	<1	4	38	15	54
73	283	<1	<1	5	48	20	74
74	284	1	<1	5	30	10	48
75	290	1	<1	39	28	50	106
76	291	1	<1	19	28	55	80
77	296	<1	<1	16	40	40	72
78	297	<1	<1	13	36	35	70
79	297	<1	<1	52	58	210	330
80	298	1	<1	16	50	35	74
81	298	1	<1	11	46	30	70
82	301	<1	<1	10	28	20	44
83	301	<1	<1	46	30	100	70
84	303	<1	<1	7	44	10	54

SOIL SAMPLING

SAMPLE NUMBER	SAMPLE STATION	Au (ppb)	Ag (ppm)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
MD01L	241	2	<1	19	42	15	72
02	242	2	<1	18	48	10	68
03	243	1	<1	10	48	25	92
04	294	<1	<1	52	24	90	78
05	295	<1	1	120	46	70	102
06	295	<1	<1	62	27	80	82
07	296	<1	<1	130	52	55	52

APPENDIX E

PETROGRAPHIC REPORT

by

David Cowan & Associates Pty Ltd
Petrological & Geological Services

5 Mountford Avenue
Bridgewater SA 5155

David Cowan & Associates Pty. Ltd.

PETROLOGICAL & GEOLOGICAL SERVICES

5 MOUNTFORD AVENUE,
BRIDGEWATER, S.A. 5155
Telephone (08) 339 5560

Mr. Frank F. Greene,
Consulting Geologist,
17/94A Spoforth Street,
CREMORNE NSW 2090.

14th. October 1990.

REPORT DCA 90/10/1.

YOUR REFERENCE	:	Verbal Request, F.R. Greene.
DATE RECEIVED	:	1st. October 1990.
SAMPLE NO'S.	:	MD31R, MD54R.
SUBMITTED BY	:	Frank F. Greene.
WORK REQUESTED	:	Petrology.

DAVID COWAN MAusIMM.

Copy To:

Mr. Frank F. Greene,
c/o Post Office,
OLARY SA 5440.

mu : microns

REPORT DCA 90/10/1.

Two rock chip samples, from the Maldorky area of the Olary province were received for petrological examination. Representative thin sections were prepared, examined in transmitted light and together with respective offcuts, in oblique incident light.

Attached tabulated descriptions summarise the microscopic data and include interpretative comments.

Both rocks may be classified as mica lamprophyric minor intrusives and are similarly textured and unstressed. The MD54R lamprophyre exhibits relatively marked alteration and is disseminated pyritic.

Similar but more typically amphibole bearing lamprophyric intrusives are locally hosts to Au-mineralisation in the Pine Creek Geosyncline (NT) sequence which bears some analogies with the Olary province, and these lamprphyric intrusives may warrant further investigation in this respect.

DAVID COWAN MAusIMM.

mu : microns

SAMPLE NO.: MD31R. (Section No. DCA 0763)

CLASSIFICATION: Altered Mica Lamprophyre.

COMPOSITION: Frequent phenocrysts (mean 500mu diam.) of near-colourless to mid-brown phleochroic biotite in a groundmass of extensively sericitised, untwinned, granular albite (mean 150mu), conspicuously disseminated biotite flakes (mean 50mu), and disseminated fine partly degraded (martitised, ie, hematitised) magnetite.

This rock exhibits disseminated spongy clots (to 2mm, mean 1mm) of degraded/ferruginised poikilitic/anhedral carbonate associated with patches of relatively advanced sericitic alteration of the groudmass.

FABRIC: Strongly porphyritic and incipiently flow-structured with weakly orientated mica phenocrysts. This weak flow fabric predates crystallisation of the granular groundmass.

This rock is essentially unstressed.

ACCESSORIES: Disseminated apatite, partly as inclusions in the phenocrystal mica. Thinly disseminated leucoxenised opaques. Minor traces of biotite-replacive chlorite. minor traces of primary quartz in the groundmass.

COMMENTS: This sample represents an altered and partly weathered mica lamprophyre with characteristic minor intrusive features. On the basis of the primary mineralogy the rock may be specifically classified as a kersantite. Alteration is of deuteric character although finer detail is obscured by the partial weathering and ferruginisation effects.

mu : microns

SAMPLE NO.: MD54R. (Section No. DCA 0764)

CLASSIFICATION: Altered Mica Lamprophyre.

COMPOSITION: Frequent phenocrysts of orange-brown Ti-biotite (mean 400mu diam.) in a groundmass of pervasively sericite-stained untwimnned albite with conspicuos fine (mean 75mu) marginally sericitised biotite flakes, disseminated magnetite, and minor quartz.

This rock exhibits more or less pervasive development of anhedral, weakly poikilitic, grains (mean 500mu) and clusters (to 2.5 mm) of ankeritic carbonate. These are accompanied by sporadic clots of fine grained pale green (?ferroan) muscovite.

FABRIC: Analogous to MD31R, slightly coarser phenocrysts, but with a slightly finer grained groundmass. Similarly weakly flow-structured and similarly unstressed.

ACCESSORIES: Disseminated apatite, rare rutile, minor leucoxenised opaques. Thinly but pervasively disseminated fine grained (mean 50mu, to 250mu) pyrite.

COMMENTS: This altered mica lamprophyre (kersantite) is closely related to that represented by Sample MD31R.

In comparison this rock is relatively altered with relatively abundant carbonate and specifically disseminated patches of pale green muscovite. This may be interpreted as a relatively pneumatolytic style of alteration and is consistent with the disseminated fine pyrite. On these bases analysis for Au may be warranted, particularly with MD31R as a control.

mu : microns

APPENDIX F

EXPENDITURE STATEMENT

EXPLORATION LICENCE 1657

EXPENDITURE STATEMENT

FOR PERIOD 17.8.1990 TO 16.11.1990

Salaries	$805
Administration	$432
Assaying	$2,040
Geological Consultants	$8,400
Motor Vehicles	$3,735
Field Provisions	$968
TOTAL	$16,380

FOR PERIOD 17.11.1990 TO 16.2.1991

Administration	$751
Assaying	$4,367
Contractors (Field)	$1,080
Geological Consultants	$3,150
Motor Vehicles	$882
Field Provisions	$409
TOTAL	$10,639

0630h11/1.179.39

6440000mN
430000mE
440000mE
450000mE
460000mE
470000mE
6430000mN
6420000mN
6410000mN
6400000mN

Mt Perseverance Mine
Two Mile Dam
Well
Olary
Olary Well
BARRIER
Dams
L/G
Railway Res.
Tk
W.H.
Creek
Hardingham Bore (Old)
Two Mile Dam
Triangle Dam
Three Mile Dam
Four Mile Dam
END OF BASE
Peters Dam
Claypan Dam
Hogans Dam
Constance Dam
Reillys Dam
Livelys Dams
Bore, Dam
Trinkaleena Mine
Malcolms Dam
Maldorky West Dam
North Dam
Devonborough Well
Little Well
No 3 Bore
Muster Bore
House Dam
Woolshed & Yds
"Wiawera"
Well Well
Well Tank
Dams
Dam
Birdcage Dam
Wilcox Tank
Big Loan Tk
Crutching Shed & Yard
Maldigo Bore
Maldigo Dam
Bore
House Dam
"Maldorky"
Maldorky Well
Hut & Shed
Taltabooka Dam
"Devonborough Downs"
I.D.
House Dam
Elephant Well
Davenborough Dam
Bore P.D.
Davenborough Dam
Cutana Mine (P.D.) Cu
Dam
Luxemburg Well
New Luxemburg Reservoir
Luxemburg Mine
John Brown Mine
Queen Bee Mine
Luxemburg West Mine (P.D.)
Luxemburg South Mine Cu
New Luxemburg Goldfield
Black Hill Dam
Luxemburg East Mine
Winklers Mine Pb
Bills Hill Mine
330
HURD HILL
Uncle Tom Mine Ag Pb
Dam
Galls
Ky Kakoschke Kyanite Prospect
Sprigg Deposit Ky
Mulga Hill Mine
Galls Bore
Cemetery Prospect
Kings Dam
Cutana Tank
Galls Well
GallsWell East Mine
Well
Radium Hill (aban.)
Nilpena Bore (old)
Tombstone Tank P.D.
Dalkey Mine Cu
Mildaltie Mine Cu
Watkins Shaft
Nilpena Well
Dam
Nilpena (ruins)
Nilpena Dam (old)
MALDORKY SPECIAL AREA
NILPENA HILL
Maldigo Well P.D.
Junction Bore P.D.
Creek
Dam
Maldorky Deposit
Muggs Dam
Rockhole Dam
Duffields Bore P.D.
MALDORKY HILL
411
DENE HILL
Duffields Dams
Maldo

REFERENCE

- Contact. Dashed where inferred
- Fault. Showing attitude and relative displacement. Dashed where inferred
- Anticline. Showing direction of plunge
- Syncline.
- Strike and dip of inclined beds
- Strike of vertical beds
- Strike and dip of inclined fracture cleavage
- Strike of vertical fracture cleavage
- Strike and dip of inclined jointing
- Strike of vertical jointing
- Massive linear quartz veins
- Strike and dip of inclined mineralized structures
- Strike and dip of dike, intermediate composition
- Geologic station and number
- Sample location and number (R-rock, S-stream sediment, L-soil)
- Shaft
- Prospect

RECENT — Unconsolidated Alluvium, shown only in selected areas of map to facilitate interpretation

UPPER PROTEROZOIC
ADELAIDEAN
STURTIAN
MARINOAN
UMBERATANA GROUP
FARIAN SUB-GROUP
- Pfe Enorama Shale
- Pfr Tarcowie Siltstone
- Pft Tapley Hill Formation
- Pfd Tindelpina Shale Member
- ?
YUDNAMUTANA SUB-GROUP
- Puw Wilyerpa Formation
- Pye Benda Siltstone
- Pyp Pualco Tillite

Scale 1:50000
0 1 2 3 4 km
AMG ZONE 54

AZTEC MINING COMPANY LIMITED
NILPENA HILL SA

NILPENA HILL BASE MAP

SAMPLE LOCATION AND
GEOLOGICAL INTERPRETATION

DATE: 28-MAR-91	Compiled by F.F. GREENE
SCALE: 1:50000	Report No.561 Plan No. 01

8325-2
To accompany Rpt for PE 16.2.91

6418000mN
6417000mN
6416000mN
6415000mN
6414000mN
6413000mN
6412000mN
6411000mN
6410000mN
450000mE
451000mE
452000mE
453000mE
454000mE
455000mE
456000mE
457000mE
458000mE
459000mE
460000mE

Clary Creek

Rockhole Dam

MALDORKEY HS

REFERENCE

- Contact. Dashed where inferred.
- Fault. Showing attitude and relative displacement. Dashed where inferred.
- Anticline. Showing direction of plunge.
- Syncline.
- Strike and dip of inclined beds.
- Strike of vertical beds.
- Strike and dip of inclined fracture cleavage.
- Strike of vertical fracture cleavage.
- Strike and dip of inclined jointing.
- Stike of vertical jointing.
- Massive linear quartz veins.
- Strike and dip of inclined mineralized structures.
- Strike and dip of dike, intermediate composition.
- Geologic station and number.
- Sample location and number (R-rock, S-stream sediment, L-soil)
- Shaft.
- Prospect.

0 500 1000m

Aztec Mining Company Limited

NILPENA HILL PROJECT EL 1657

MALDORKY SPECIAL AREA BASE MAP

SAMPLE LOCATION & GEOLOGIC OBSERVATIONS

Scale	1:10,500	Map ref:	OLARY 1:250,000 SI54-2
Author:	F.F. Greene	Report No. 516	Plan No. 02
Drawn:	F.F. Greene		
Date:	March 1991	**Plan No.**	

8325-3

To accompany Rpt No. 516

MINERALS EXPLORATION REPORT

EXPLORATION LICENCE 1657
NILPENA HILL AREA
ADELAIDE GEOSYNCLINE, SOUTH AUSTRALIA

Final Quarterly Report
for the Period ending 16 August 1991

Aztec Mining Company Limited
99 Shepperton Road
Victoria Park, Western Australia, 6100

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Cremorne Junction, New South Wales 2090

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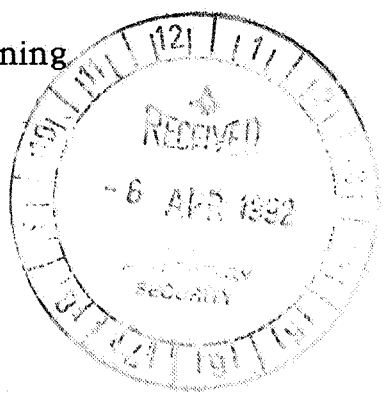
99 Shepperton Road, Victoria Park, Western Australia 6100

DATE: 30 March 1992

DISTRIBUTION: Dept of Mines and Energy (1), Aztec Mining Company Limited (2), Oxford Resources Pty Limited (2).



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PLANS

Final Quarterly Report
for the period ending 16 August 1991

Nilpena Hill Area
Exploration Licence 1657
Adelaide Geosyncline, South Australia

SUMMARY

This Final Report for EL 1657, Nilpena Hill area, concludes 18 months of exploration in the search for sediment hosted "disseminated" gold deposits. Work has involved a comprehensive geomapping/sampling program aided by terrestrial and extraterrestrial remote sensing studies.

Five areas were selected for detailed examination: (1) Junction Creek mine, an abandond copper mine with highly anomalous Au and Ag; Jim's Well mine, another old copper producer with rich Au credits; Teague's Fork a previously undetected altered area with anomalous Au and Ag, Traloar prospect, a copper show with negligible precious metal credits; and the Dalkey-Mildaltie copper mines area with consistent, but low Au.

Two TM structural targets were examined. Both overlie an east-west lineament believed to be a deep crustal corridor.

INTRODUCTION

This is the Final Report for EL 1657, a 203 sq km area located in the Benda Ranges, Olary Province, roughly 110 km southwest of Broken Hill (Fig 1).

The Licence, initially covering 440 sq km, was granted to Aztec Mining Company Limited on 17 May 1990 for a period of one year. Following a 59% area reduction, a two-year extension of term was granted on 5 November 1991. The Licence was surrendered on 15 October 1991.

Exploration objective aimed for sediment hosted "disseminated" gold deposits (Tooker, 1985) situated within an economically open cuttable depth. Geologic factors favoring the area's discovery potential included base and precious metal mines and prospects in its vicinity, complex structural setting, favorable hostrocks and intrusive activity.

Search methodology initiated with a comprehensive reconnaissance geomapping/sampling program designed to locate areas warranting more detailed investigation. The work established 160 geo-observation points and the collection of 54 rockchip and 15 stream

EL 1657

Aztec Mining Company Ltd

NILPENA HILL PROJECT

EL 1657

TENEMENT LOCATION PLAN

Scale 1:250 000

Date 30 March 1992

Author : F. Greene

Figure 1

sediment samples. Control utilized 1/85,000 scale, color vertical aerial photos.

Five areas of interest were located. Their investigation involved the siting of 326 geo-observation points and the collection 100 rockchip, 84 stream sediment and 7 auger soil samples. Control utilized color vertical aerial photos enlarged to 1/10,500 scale.

A thematic mapper study was carried out by Davies (H, 1991) of Remote Sensing & Geological Services. Purpose of the work was to generate a set of stratigraphic and structural maps from which a variety of structural targets were selected.

Items relating to the Licence area's physiography, history and geology have been presented in earlier reports (Greene, 1990 and 1991). This information remains essentially unchanged and will not be further discussed.

The writer gratefully acknowledges the help and friendly hospitality received from property owners of Maldorky and Oulnina stations, Maurice and Janet Francis and son Grant; owner of Devenborough Downs, Glennis Crawford; owners/operators of the Olary Store and Post Office, Jim and Ann Graham and owners of Wiawera station, Keith and Jenny Traloar and son Duncan. Elders Pastoral of Peterborough, manager Bill Napier, for logistical back-up and the Royal Flying Doctor Service of Port Augusta, manager Tony Wade and radio operators, for safety logging and communications, many thanks.

CONCLUSIONS

Although two remote sensing mineral search techniques, terrestrial aerial reconnaissance/photography and extraterrestrial thematic mapper study, were used to augment discovery, the best and likely the most useful technique employed involved the reconnaissance mapping/sampling program. This work was both appropriate and productive because of the area's relatively good outcrop exposure and easily traversable terrain.

Of the five (5) areas selected for follow-up examination, the best in terms of gold potential, included Junction Creek mine, Jim's Well mine and Teague's Fork, all of which are located within the Maldorky Special Study area (Greene, 1990).

The 80 square kilometres comprising this area was regarded as special because it exhibited:

1) physiographic conditions indicating widespread, deep erosion, and the potential for supergene enrichment,

2) structural features with a variety of ore-trapping and/or -concentrating mechanisms together with a number of precious metal mines and prospects,

3) igneous emplacements in the form of intermediate and basic dikes plus features intimating stock-dimension intrusive centres at depth from which ore-bearing emanations may issue, and

4) several precious metal geochemical anomalies detected in rockchip and stream sediment sampling.

JUNCTION CREEK (Cu) MINE (Stations 95-99,106-108, 135-137, 261-263) located on Junction Creek has not, as far as can be determined, been previously recorded. Interest here related to high precious metal values, favorable structural setting, productive host rocks and sufficient width of alteration.

Mine workings comprise a vertical shaft (Station 97) down about 5-8 m followed northerly for some 250 m by shallow open cuts and prospects trending N10-15°E. Copper ores, bearing valuable credits in gold and silver (Table 1), occupy a closely interwoven fissure system about 3 m in width aligned within the axial zone of a small, N15°E-trending anticline.

Table 1. Results of geochemical rockchip sampling at Junction Creek (cu) mine, Maldorky Special Area, Olary Province, South Australia.

SAMPLE	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
NH 06R	32.00	600	40	47.4	82	70	Chalcocite, blu-blk, dense
MD 18R	4.21	760	88	45.3	340	75	Chalcocite, malachite, CuO
19R	4.13	480	36	37.5	32	66	Chalcocite, sandstone
20R	0.79	550	78	26.8	70	135	Sandstn, argillic, CuO
21R	0.64	8	150	0.79	64	22	Sandstn, silicic, FeO, CuO
22R	0.41	20	72	0.66	28	20	Sandstn wall rk, silicic
23R	7.88	9	210	1.05	230	370	Sandstn, silicic, diss CuO

All elements reported in ppm excepting copper being reported in percent.

Follow-up examination involved one line of auger drilling across the main line of lode. Analytical results returned negligible values for all elements (Greene, FF, 1991. pp 80-81).

JIM'S WELL (Cu) MINE (Stations 118-120, 138-140) located in the headwaters of a northerly draining tributary stream to Junction Creek about 1.2 km southeast of the Junction Creek workings.

Old copper mines are strung out on a N20E line over a distance of 200 m. The workings occupy a northerly descending ridge where the drainage (trellis) pattern has been influenced by N80W regional fracturing. Geochemical sampling returned high gold and silver values from copper bearing fissure veins (Table 2).

Follow-up examination in this area involved rockchip and stream sediment sampling within the mining area and surrounding ground. Results failed to indicate the presence of additional mineralisation.

Table 2. Results of geochemical rockchip sampling at Jim's Well copper mine and vicinity, Maldorky area, Nilpena Hill exploration tenement (EL 1657), SA.

SAMPLE	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
NH 22R	5.000	14	-	7.40%	14	450	Gossanous vn, CuO, mine
23R	2.800	13	-	3.25%	6	290	Qtz vn, malachite, mine
24R	0.085	<1	-	980	<4	12	Qtz vn, FeO, limonite
25R	0.060	<1	-	600	<4	10	Qtz vn, limonite
26R	0.240	11	-	2.15%	12	72	Qtz, grsy lustre, prospect
27R	0.008	1	-	115	<4	7	Sndstn, hydrothm alter'n
29R	27.190	24	1150	4.7%	30	160	Silicic/ferrug vn, mine
30R	0.635	13	710	2.2%	40	170	Silicic/frrg/sid vn, mine

Results in parts per million unless otherwise indicated.

TEAGUE'S FORK (Station 68, 132-135) located on Maldorky Creek about 700 m northwest of Maldorky Homestead.

Reconnaissance geologic mapping and sampling delineated a densely spaced fault fracture system over a width 250 m. One of the breaks, trending N75E, is silicified over a width of 2 m and is impregnated, to 40 cm width, with an earthy gossanous material that returned (sample MD 10R) 10.215 ppm Au and 28 ppm Ag.

Follow-up examination and geochemical sampling failed to establish additional mineralisation.

TRALOAR Cu PROSPECT (Stations 135-137), located roughly 3 km northeast of Wiawera homestead, was found and prospected by the Traloar family during the early 1980's.

Several costeans (back filled) were cut by the Traloars to expose a N74E copper-bearing fissure and lesser sympathetic CuO-stained

structures, which according to Duncan Traloar, covered a relatively broad area. Inspection of the prospect and surrounding area failed to reveal any significant mineralization.

DALKEY-MILDALTIE Cu MINES (Stations 91-101, 134) are located in the northeast portion of the Maldorky Special Area about 5 km west of Radium Hill.

Recorded by Brown (HYL, 1908) as bearing copper, silver-lead ores, the workings are believed to be at least 40 m in depth with a black sulfide ore improving in quality and size with depth.

The main ore-bearing fissure strikes S25°W from the Dalkey shaft for about 700 m where it encounters the Mildaltie workings, thence an additional 1200 m before pinching out. At the Mildaltie shaft it varies from 40 to 60 cm in width and dips 85° SE. Host rock is Tapley Hill Formation set within a southeasterly plunging syncline.

Results of sampling returned high copper and arsenic, but only moderately anomalous gold and silver values (Table 3).

Table 3. Results of geochemical rockchip sampling along the main line of lode at Dalkey-Mildaltie Cu Mine area, Nilpena Hill exploration tenement (EL 1657), SA.

SAMPLE	Au	Ag	As	Cu	Pb	Zn	DESCRIPTION
NH 34R	0.010	2	680	180	15	13	Vein breccia, siderite, qtz
35R	0.140	12	165	3.70%	12	38	Vein breccia, chalcocite,
36R	0.180	3	1420	3100	28	76	Vein breccia, limonite, qtz
37R	0.255	4	480	3.80%	30	88	Fault gouge, FeO, CuO
38R	0.016	13	88	4850	26	30	Fissure vein, brecciated
39R	0.295	10	1120	9500	145	72	Gossan, cellular, rd-brn
40R	0.026	2	320	790	22	28	Ironstone, dense, qtz clasts
41R	0.405	3	630	9500	30	170	Ferruginous vein filling
42R	0.160	92	100	4.10%	36	80	Limonitic vein filling, CuO
43R	0.160	6	28	3.30%	12	66	Silicified siltstone, CuO
44R	0.004	3	82	2500	15	18	Fracture zone, trace CuO
45R	0.008	<1	6	290	5	14	Quartz vein, FeO-stained

Results in parts per million unless otherwise indicated.

Careful examination of the surrounding area was carried out, but no important mineralization was found.

THEMATIC MAPPER STUDY. Two structural targets were selected within the Licence area. Both overlie the E4 Lineament believed to be an important deep crustal corridor giving rise to substantial clay

alteration. Structural Plan (1) and TM Image Interpretation Plan (2) are herewith included (pocket).

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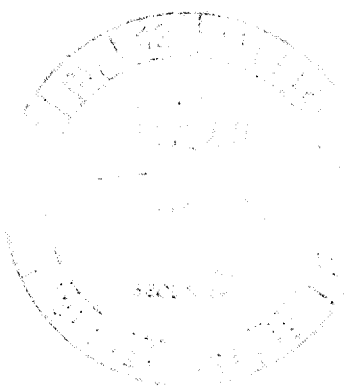
GREENE, FF, 1990. Nilpena Hill area, EL 1657; First quarterly report for the period ending 16 August 1990. By Oxford Resources Pty Limited for Aztec Mining Company Limited, 27 August 1990.

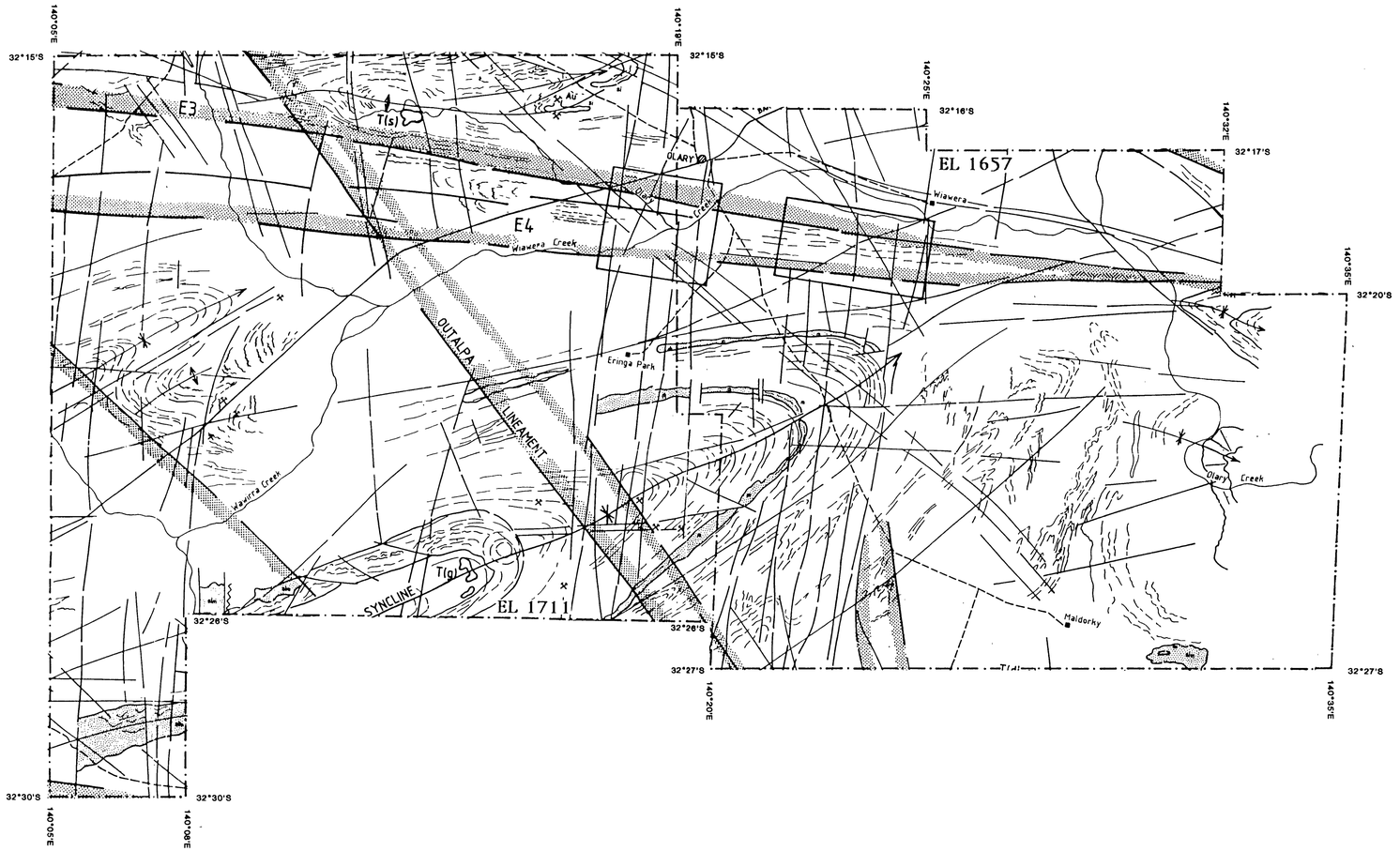
Greene, FF, 1991. Nilpena Hill area, EL 1657; Combined second and third quarterly report for the periods ending 16 November 1990 and 16 February 1991. By Oxford Resources Pty limited for Aztec Mining Company Limited, 4 March 1991.

EXPLORATION LICENCE 1657

EXPENDITURE FOR THE PERIOD 17 MAY 1991 TO 5 NOVEMBER 1991

	$
Salary Allocation	3,937
Consultants	8,781
Geophysics	1,870
Labour (Field Assistants(	1,861
Field Equipment	579
Petrology and Mineralogy	877
Motor Vehicles	1,109
General Expenses	1,353
Administration	1,620
Maps and Publications	992
TOTAL	$22,979





REFERENCE

- stratigraphic trend lines
- dip/strike
- syncline
- overturned syncline
- anticline
- overturned anticline
- F — fault
- fem — ferruginous marker
- sm — siliceous marker
- marker bed
- U — unconformity
- facies change
- hinge zone
- direction of movement
- lineament
  - cratonic
  - major
  - minor
- E4 — lineament name
- HDA — high deformation area
- HDZ — high deformation zone
- HDC — high deformation corridor
- structural targets
- T — targets
  - q — quartz
  - s — spectral
  - g — gossanous
  - fe — ferruginous
  - di — diapiric
- D — domal fold
- D4 — major diapiric structure
- circular traces
- highway
- road
- settlement/town
- homestead
- mine
- river
- tenement boundary

Remote Sensing & Geological Services
Compiled by H Davies Drawn by M G Davies

Scale 1:98583
0 1.97 3.94 5.91 7.89 km

AZTEC MINING COMPANY LIMITED

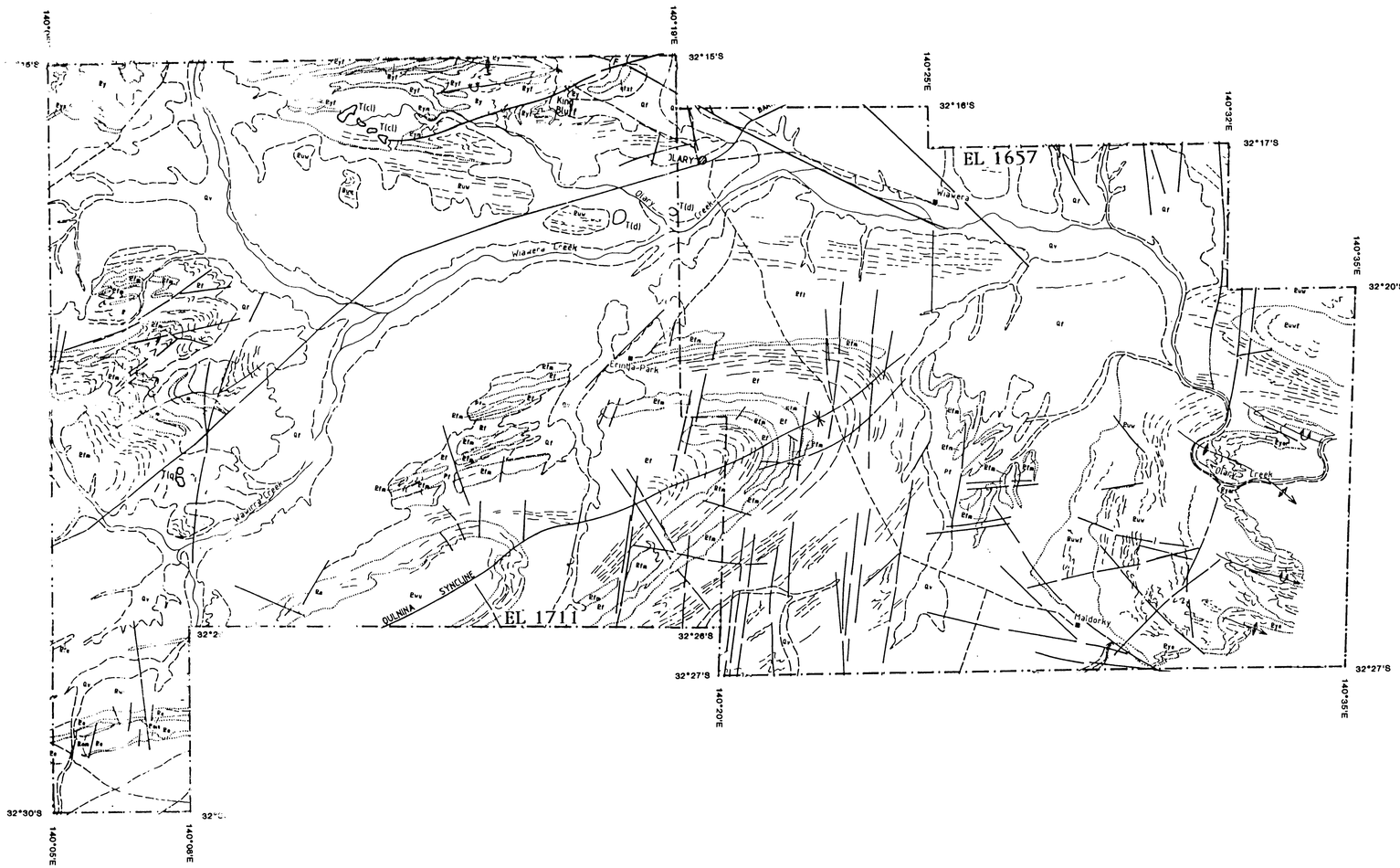
STRUCTURAL MAP

EXPLORATION LICENSES 1657 & 1711

OLARY PROVINCE, SOUTH AUSTRALIA

DATE: 1-APR-92	Compiled by H. Davies	
SCALE: 1:98583	PLAN 1	

8325-4



CAINOZOIC

- Qv alluvium, valley fill
- Qs sand plain
- Qr regolith, shallow soil cover
- Qst broad areas of transported eluvium
- Qsc scree/deltaic fans
- Qh, quartz gravel gilgai fan deposits
- Qh,f as Qh with ferricreted surface

LOWER PALAEOZOIC

- EOy granites

PROTEROZOIC

WILPENA GROUP

- Ewp Pound Quartzite
- Eww Wonoka Formation: banded carbonated
- Ewb Bunyeroo Formation
  - Ewbf ferruginous facies
  - Ewbs siliceous resistant member
  - Ewbsm distinct siliceous/quartzite marke
- Ewu Ulupa Siltstone
  - Ewus siliceous facies
  - Ewum distinct stratigraphic subunit
  - Ewuf ferruginous subunit
  - Ewucb possible carbonaceous facies
- Ews Seacliff Sandstone

UNDIFFERENTIATED

- Ea Yerelina Sub-group: tillite-arkose
  - Eaf ferruginous facies
  - Eas siliceous-quartzitic facies
- Ef Farina Sub-group: mapped as dolomite
  - Eff ferruginous subunit
  - Efm specifically distinct marker bed
- Eft Tapley Hill Formation: siltstones, dolomit-
  - Eftm distinct marker
  - Efts siliceous/quartzite marker
- Eua Appila Tillite
  - Euaf ferruginous subunit
- Euw Wilyerpa Formation
- Ey Yudnamutana Sub-group
- Eye Benda Siltstone
  - Eyes resistant subunit
  - [illegible]
  - Eyqs siliceous: quartzitic member
- Eyf Braemar Iron Formation
  - Eys siliceous member
- Et Belair Sub-group: siltstones, sandstor [illegible] dolomites
- Ebs Saddleworth Formation: shales, siltsto [illegible] carbonaceous member: minor dolomites
  - Ebsm marker bed
  - Ebss siliceous resistant marker
- Ebu Undalya Quartzite
- Ebh Woolshed Flat Shale

- do dolerite plug
- cl clay-rich area

- Ec Callanna Group: carbonate breccias
- Ek Curdimurka Sub-group: siltstones, carbonates, evaporites
- Ea Arkaroola Sub-group

ARCHAEAN/ EARLY PROTEROZOIC

- pE Archaean to early Proterozoic basemer [illegible] of the Olary Inliers
  - pEf ferruginous enclave within baseme[illegible]
  - pEm resistant marker

TARGETS

- T(g) Gossan-like, ferruginous lens
- T(q) Silica-rich area: possible quartz vein/reef
- T(s) Spectral anomaly
- T(d) Circular or concentric structure, poss [illegible] of diat[illegible]

- quat[illegible]
- [illegible] g traces
- [illegible] dip, strike
- syncline
- overturned syncline
- anticline
- overturned anticline
- F fault
- lineament
- U unconformity
- circular traces
- ridge
- ferruginised structures
- highway
- road
- settlement/town
- homestead

Remote Sensing & Geo[illegible] Service
Compiled by H. Davies [illegible]

Scale 1:98583
1.97 3.94 5.9[illegible]

[illegible] MINING COMPANY [illegible] LIMITED

TM IMAGE INTERPRETATION

EXPLORATION LICENSE [illegible] 1711

OLARY PROVINCE, SOUTH AUSTRALIA

DATE: 17-JUN-91	Compiled by H. Davies
SCALE: 1:98583	PLAN 2

8325-5