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SUMMARY

EL.2654 is situated in the Mount Skinner area of Central Australia, and this report details exploration by Alcoa of Australia Limited during the first year of tenancy ended 23 January 1982.

This area contains Upper Proterozoic sediments of the Georgina Basin which were deposited in a graben-like re-entrant on the southern margin of the basin, and sediments within this structure are regarded as potential hosts of stratiform base metal mineralisation.

Exploration during the first year has involved detailed airborne magnetics. Data from this survey suggests the presence of sub-basins within the graben, which may constitute exploration targets worthy of follow-up drilling.

Diamond exploration, under the terms of a joint venture agreement with Western Mining Corporation, has also been undertaken in EL 2654.

Expenditure on exploration during the year has amounted to $27 722.

Keywords: EL.2654, MOUNT SKINNER, NT, SF5310, BASE METALS, GEORGINA BASIN, PROTEROZOIC, AERIAL MAGNETIC SURVEYS.
1. INTRODUCTION

Mount Skinner is located approximately 170km north-north-east of Alice Springs (see Figure 1.1). Alcoa of Australia Limited made application for an Exploration Licence in this area in mid-June 1980, and EL.2654, of 954km$^2$, was granted to the company on 24 January 1981.

Since that time an exploration programme for sediment-hosted base metals has been under way; this report documents the activities and expenditure of this programme during the first year to 23 January 1982.

2. GEOLOGY

The Mount Skinner area contains sediments of the lower Georgina Basin sequence which unconformably rest on much older (Archaean to Lower Proterozoic) crystalline metamorphic rocks of the Arunta Complex.

The outcropping Georgina Basin sequence in this area consists of a lower unit of siliclastic sediments (Grant Bluff Formation) overlain by a widespread sequence of "red-bed" sandstones and siltstones (Central Mount Stuart Beds). These sequences are probably middle to upper Adelaidean in age.

In the area of EL.2654 these sediments appear to occupy a fault-bounded graben or half-graben (shallowing eastwards) which constituted a structural re-entrant of the early Georgina Basin into its southern shoreline.

Previous drilling in the area has indicated the presence of comparatively thick sequences of grey dolomitic and evaporitic pelitic sediments underlying the Central Mount Stuart Beds within the graben.

The surface geology of the lease area is shown on Figure 2.1.
E.L. 2654
"MT. SKINNER"
(951.0 km²)

Mt. Skinner

"Woodgreen"

To Alice Springs

Mollie Bluff

To "Utopia"

ALCOA OF AUSTRALIA LIMITED
EXPLORATION DIVISION

LOCALITY MAP
E.L. 2654

SCALE — 1:250,000

Fig 1.1
3. **EXPLORATION TARGETS**

3.1 **Base Metals**

The main target of this exploration programme is a large-tonnage sediment-hosted base metal deposit containing zinc-lead-(silver) -copper). Such deposits occur elsewhere in Proterozoic and Palaeozoic marine sediments, and major controls appear to be syn-sedimentary fault-bounded sub-basins within larger marine sedimentary basins. Such sub-basins offer potential sites of accumulation of exhalative metal-rich fluids.

The regional setting of the Mount Skinner graben and the nature of the pre-Central Mount Stuart Beds sediments appear to be favourable for exhalative base-metal mineralisation.

3.2 **Diamonds**

Alcoa of Australia Limited and Western Mining Corporation are involved in a joint venture agreement which allows Western Mining Corporation to undertake regional exploration for diamonds on certain Alcoa Exploration Licences in Central Australia. EL.2654 is one such Licence, and stream sediment sampling for diamonds has been undertaken on this tenement during the year under review. This work is carried out by Western Mining Corporation.

3.3 **Previous Exploration**

The Mount Skinner area has undergone previous exploration for base metals. Secondary copper mineralisation was discovered by J. Nelson and S. Griffiths in early 1965; the copper was seen to occur in grey siltstone horizons in the predominantly red sandstones of the Central Mount Stuart Beds.

During 1965 and 1966, Kennecott Explorations (Australia) Pty Ltd explored the Central Mount Stuart Beds for stratiform copper mineralisation, and three percussion drill holes totalling 600m were put down in the Mount Skinner area. Weak stratiform copper mineralisation of the "red-bed copper" type was located within thin, unoxidised green siltstone horizons.

In 1968, four diamond drill holes totalling 596m were drilled by Mines Branch, Northern Territory Administration, but failed to prove any economic mineralisation. The log of the deepest hole, DDH3, appears in Appendix 2.

Centamin Limited drilled four diamond drill holes in the Mount Skinner graben in the early 1970s to explore for stratiform copper deposits in sediment-filled depressions in the basement beneath the red-beds. These holes proved the existence of a prospective sequence of marine sediments below the Central Mount Stuart Beds, and also demonstrated the great thickness of the basal Georgina Basin sequence in the graben. However, no economic mineralisation was discovered and the area was eventually relinquished.

Centamin and Mines Branch drill holes are plotted on Figure 2.1.
4. EXPLORATION ACTIVITIES

As the target of this programme is assumed to be hosted by the basal non-outcropping section of the Adelaidean sequence, and because surface and some sub-surface geological information is available from previous exploration programmes, no additional geological field work has been undertaken during the first year of tenancy. The aim of this programme has been instead to attempt to elucidate the structure and sub-surface nature of the graben and its sediments.

4.1 Map Compilation

As an aid to planning exploration, a geological base map of the EL.2654 and surrounding areas has been produced. This map is at 1:50 000 scale, and can be found at the rear of this report as Figure 2.1. This map has been compiled from Centamin base maps, 1:80 000 government aerial photography, and 1:250 000 Bureau of Mineral Resources geological mapping (Alcoota Sheet).

4.2 Aeromagnetic Survey

An airborne magnetic survey was carried out over the Mount Skinner graben area in an effort to provide a means of determining the depth of the graben, and if possible, mapping the surface of the basement - Georgina Basin unconformity.

4.2.1 Technical details of survey

The aeromagnetic survey was carried out by Aerodata Services Pty Ltd of Perth in October 1981, and consisted of a total of 1303 line kilometres. The survey area is plotted on Figure 2.1, and details of the survey appear below:

- **Equipment**:

  - **Aircraft**: Cessna 206
  - **Magnetometer**: Geometrics G813
  - **Altimeter**: Sperry AA100 Radar
  - **Recorded**: Y.E.W. 3 channel 10" analog, and Hewlett Packard Computer 9825 Computer (digital record) with HP9075 Cassette Tape Unit

- **Specifications**:

  - **Navigation**: 1:20 000 photographic enlargements
  - **Line orientation**: 235°
  - **Line spacing**: 500m
  - **Sensor height**: 100m (mean terrain clearance)
  - **Air speed**: 90 knots
  - **Resolution**: 0.05nT
  - **Cycling rate**: 1.32 seconds
Specifications (continued)
Noise envelope       less than 0.5nT
Data collection      digital and analog

Flight path plots appear on Figure 4.1 and 4.3, and the contoured magnetic data on Figures 4.2 and 4.4.

4.2.2 Interpretation

The aeromagnetic data has been interpreted by consultant geophysicist John Ashley, whose report is contained in Appendix 1. Depth to magnetic basement determinations using graphical measurements and modelling techniques have provided sufficient data to construct the depth-to-basement contours shown on Figure 4.5.

4.3 Regional Stream Sediment Sampling Survey

26 x 20kg stream sediment samples have been collected in EL.2654 during the year under review as part of the regional diamond exploration programme being undertaken by Western Mining Corporation. This programme is the subject of an Alcoa-WMC joint venture agreement in EL.2654.

Figure 4.6 shows the location of samples collected to date. No results from the laboratory processing of these samples are available.
SAMPLE SITE LOCATION MAP
EL 2654
(Sample No. Prefixed by AA755..)

SCALE - 1:250 000

Western Mining Corporation Limited

Fig 4.6
5. **EXPENDITURE**

Details of expenditure during the first year of tenancy are listed below:

<table>
<thead>
<tr>
<th></th>
<th>24.1.81- 23.7.81</th>
<th>24.7.81-23.10.81</th>
<th>24.10.81-23.1.82</th>
<th>Total</th>
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<td>3803</td>
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<td>6109</td>
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<tr>
<td>Operating supplies</td>
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<td>29</td>
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<td>Miscellaneous purchased services</td>
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<td>80</td>
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<td>Geophysics</td>
<td></td>
<td>14007</td>
<td></td>
<td>14007</td>
</tr>
<tr>
<td>Diamond JV</td>
<td></td>
<td></td>
<td>6763</td>
<td>6763</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>2335</td>
<td>25307</td>
<td>27722</td>
</tr>
</tbody>
</table>

6. **FUTURE EXPLORATION**

EL.2654 was renewed for a second twelve-month period of tenancy on March 1, 1982. The boundaries of the Licence remain unaltered, and the expenditure covenant is $50,000.

It is proposed that as an initial step in the appraisal of the pre-Central Mount Stuart Beds sediments, the core from Centamin drill holes C/MS/1 to C/MS/4 will be re-logged in detail and geochemically sampled over prospective intervals.

As a follow-up to the aeromagnetic survey, an attempt at refining the structural elements of the graben will be made using a study of computer-generated lineaments from Landsat data.

At this stage it is envisaged that one or more cored drill holes will be drilled during this term to test specific environments within the graben.
APPENDIX I

Interpretation of Aeromagnetic Data,
Mount Skinner Area, NT, by J. Ashley

Interpretation of Aeromagnetic Data,
Mt. Skinner Area, N.T.

by

J. Ashley

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2. Discussion
3. Conclusions
4. Appendix - Drillhole logs

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Basement (sheet A)
Fig 2. Contour Map of Depths to Magnetic
Basement (sheet B)
Fig 3. Magnetic Model for Line 10182
Fig 4. Magnetic Model for Line 10110
Summary

An interpretation of aeromagnetic data in the Mt Skinner area has been made to determine the configuration of the magnetic basement surface as an aid in exploration for stratiform base-metal mineralisation.

Archaean basement rocks crop out on the southwest, north and eastern margins of the area; in the southwest the basement is downfaulted along a northwest fault and, in a general sense, shallows towards the northeast. Maximum estimated depth to basement is \( \approx 1400 \text{m} \) within a 'basin' adjacent to the fault in the southwest of the area.

Three additional basins are inferred with depths ranging up to \( \approx 700 \text{m} \). Potential source rocks for base-metal mineralisation are considered to be present within the area.
1. Introduction

An area of outcropping Pre-Cambrian rocks in the vicinity of Mt Skinner, north central part of the Alcoota map sheet, was covered by aeromagnetic survey to determine the configuration of the crystalline (magnetic) basement. The exploration target in the area is stratiform base-metal mineralisation in the Proterozoic sediments overlying the basement.

The aeromagnetic survey was carried out on the flight lines oriented 235° and spaced 500m apart; the magnetic sensor was at height 100m (mean terrain clearance). Data are presented as contours at scale 1:20,000, with contour interval of 10nT, and as profiles at scale 1:20,000 (magnetic scale 1cm to 20nT; profiles are spaced 10cm apart to avoid confusion of data).

Interpretation of the data is presented at scale 1:20,000 (in Fig 1 and 2) and overlays the contour maps.

Subsurface information is available from 3 holes drilled by Centamin Ltd and from a N.T. Mines Dept. drill-hole. Summary geological logs are given in the Appendix.

Surface geological data are available from mapping by Centamin Ltd (at scale 1:50,000) over the southern half of the survey area and from the BMR 1:250,000 scale mapping (Alcoota, N.T.).

2. Discussion

Drillholes C/MS/2, C/MS/3 and C/MS/4 penetrated crystalline basement rocks after passing through the Mt. Stuart Beds. The latter are sediments (shales, sandstones, siltstones and dolomites) and, although hematitic in part, there is no indication of any magnetic rocks within the sediments. Accordingly the observed magnetic anomalies are attributed to sources within the crystalline basement or to detrital magnetic minerals at the ground surface.

Magnetic relief ranges up to ~1000nT; short wavelength anomalies due to outcropping and sub-outcropping basement rocks are obvious features in the contour maps, particularly in the southwest of the survey area. Some low-order anomalies
(less than 10nT) are not evident in the contour presentation.

Depth estimates on the magnetic data have been made using graphical methods (ie 'slope' measurements and the 'inflection-tangent-intersection' technique) and have been supplemented by two-dimensional modelling along sections through C/MS/1 and C/MS/2 (presented in Figs 3 and 4). Both models indicate an increasing depth to basement from east to west with an up-faulted basement block in the west. This fault (F1) is more or less coincident with that indicated on the geological maps. A relatively steep basement slope, midway between C/MS/2 and F1, (Fig 4) could be represented as a series of step-faults. Precise modelling of the shallow basement at the eastern and western ends of the sections has not been attempted.

The models are quite complex and the observed magnetic field is attributed to the combined effects of variable basement composition, depth and depth extent. The major anomaly on line 10110 is largely due to a synclinal (?) basement structure containing rocks of mean susceptibility of 0.003 cgsu. These could include meta-volcanics and are possible source rocks for base-metal mineralisation. This fold structure decreases in depth extent to the northwest.

The basement depth estimates have been contoured at 100m interval and are shown on Figs 1 and 2. The accuracy of the depth estimates is considered to be ±20% (the flight height should be added to the values to determine the range of the depth value eg an estimate of 20m relative to ground surface indicates basement at 0 to ±50m below ground surface).

Basement rocks are at surface to the west of F1 in the southwest of the area, in the central eastern part and on the central northern margin of the area.

In general the basement surface increases in depth from east to west. A major basin occurs between C/MS/2 and DDH 3 and the sediments attain their greatest thickness (+1000m) within this basin adjacent to the fault F1.
Basement depressions are also inferred SW of F3 and in the central west part of the area (Fig 1). Magnetic relief is very low in these areas and the depth estimates are less reliable than elsewhere. A small trough is inferred on the NE of the fault F2 (Fig 1).

The fault F1 cannot be traced into the northern half of the area; if it continues to the NW then it is presumed to be some distance to the west of the surveyed area. A zone of thick sediments may therefore lie to the west of the northern half of the survey area.

Some low-amplitude magnetic anomalies (~20nT), in the SW of Fig 1 and NW of Fig 2, are due to surface magnetic sources and are attributed to detrital magnetic mineral accumulations.

3. Conclusions

The magnetic data indicate a basement surface generally dipping from east to west and reaching a maximum depth of +1000m adjacent to a NW fault in the SW of the area. Several basement 'highs' and depressions or troughs have been located.

Modelling indicates that potential base-metal source rocks occur in the area. Substantial pyrite mineralisation is likely to be associated with base-metal mineralisation and Induced Polarisation survey is suggested prior to drilling.
4. **Appendix - Drillhole Logs**

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Approx. Depth Interval (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C/MS/1</td>
</tr>
<tr>
<td>Upper Central</td>
<td></td>
</tr>
<tr>
<td>Mt Stuart Beds</td>
<td>0-360</td>
</tr>
<tr>
<td>Middle Central</td>
<td></td>
</tr>
<tr>
<td>Mt Stuart Beds</td>
<td>360-570</td>
</tr>
<tr>
<td>Lower Central</td>
<td></td>
</tr>
<tr>
<td>Mt Stuart Beds</td>
<td>570-760</td>
</tr>
<tr>
<td>Basement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>530-545</td>
</tr>
</tbody>
</table>
† G E O L O G I C A L L O G O F D I R L E E H O L L

DESCRIPTION OF CORE

<table>
<thead>
<tr>
<th>R.L. DEPTH</th>
<th>LOG</th>
<th>REMARKS</th>
<th>ASSAYS</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>250</td>
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<tr>
<td>500</td>
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<td></td>
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<tr>
<td>1000</td>
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<td>1250</td>
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<td>1750</td>
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<tr>
<td>2500</td>
<td></td>
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</tr>
</tbody>
</table>

SH, and iron-oxide stained, and SS, quartz lithic, interbedded

Carbonate present from 200' and increasing content from 550'

More SS from 240'

2' grey bed 528-530'

4 narrow grey lithic SS and quartz SH beds

STSE, green-grey dolomitic

DOL, pale grey sandy
STSE, dolomitic hemitite, with anhydrite
DOL, pale grey sandy, with anhydrite
SH and STSE, iron-stained, minor SS bands, dolomitic
DOL, pale grey sandy, with anhydrite
SH and STSE, iron-stained, minor SS bands, dolomitic
DOL, sandy with anhydrite, predominant, with some dolomitic STSE and SH sections

STSE, dolomitic, and DOL with anhydrite
SH, hematitic, and STSE, green-grey

SH, quartz grey with pyrite, and STSE, greyish

SS, feldspathic
SH, black pyritic, and STSE, pale quartz also pyritic

SH, black pyritic, and STSE, pale quartz, with sections of green quartz SH
SH, black pyritic, and STSE, pale quartz, believed pyritic - pyritic too fine grained to determine accurately in logging.

X's 0-5°

758-760°
772-773°
786-789°
792-795.5°

X's 0-5°

Traces sulphides
Anhydrite replacing dolomite
X's 0-5°

X's 10-20°
X's 5-10°

End of anhydrite
X's 0-5°

X's 0-5°

X's 0-10° - very distorted in places especially the STSE layers
**Geological Log of Drill Hole C/MS/2**

<table>
<thead>
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<th>Description of Core</th>
<th>R.L.</th>
<th>Depth</th>
<th>Casing</th>
<th>Size of Core</th>
<th>Log</th>
<th>Remarks</th>
<th>Assays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil and Screen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SS, interbedded lithic, and STSNE, hemitite; generally poorly sorted.</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>SS, calcareous lithic poorly sorted</td>
<td></td>
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<tr>
<td>STSNE and SS, micaceous and hemitite</td>
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<td></td>
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<tr>
<td>SS, calcareous micaceous lithic</td>
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<td>STSNE and SS, micaceous and hemitite</td>
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</tr>
<tr>
<td>STSNE, pale dolomitic, and SH, green grey</td>
<td></td>
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<tr>
<td>STSNE, black, and STSNE, dolomitic</td>
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<tr>
<td>DOL, white, silt in places</td>
<td></td>
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</tr>
<tr>
<td>STSNE - SS, calcareous hemitite</td>
<td></td>
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<tr>
<td>STSNE, green-grey, calcareous, grey</td>
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<tr>
<td>SS, calcareous, and STSNE, red-green</td>
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<tr>
<td>SS, calcareous grey, and STSNE, red-green, also slightly grey, interbedded</td>
<td></td>
<td></td>
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<tr>
<td>STSNE, oxidized, faintly grey with grey</td>
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<tr>
<td>STSNE, calcareous grey, with secondary calcite veins and filling</td>
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<td>DOL, vuggy</td>
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<tr>
<td>STSNE, vuggy, hemitite</td>
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<tr>
<td>DOL, vuggy with silt layers</td>
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<td>DOL, vuggy</td>
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<td>STSNE, dolomitic vuggy, DOL, and STSNE, hemitite</td>
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<td>STSNE, green and red slightly calcareous</td>
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<td>SH, green grey - traces pyrite</td>
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</tr>
<tr>
<td>STSNE, quartz, and SH, black ? pyritic, increasing black SH with depth</td>
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<tr>
<td>Traces OP</td>
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<tr>
<td>SS, calcareous tetrach na pyrite</td>
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<tr>
<td>SH, black pyritic, with STSNE bands - quartz</td>
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<td>Quartz STSNE, and SH, black pyritic</td>
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<td>Increasing irregular quartz size quartz gneisses with depth</td>
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<td>STSNE, green grey ? chloritic, with quartz and feldspar fragments increasing with depth</td>
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<td>Increasing chlorite, with quartz and feldspar fragments</td>
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**Remarks**

- Core very due to the removal of anhydrite that was apparently present as in hole C/MS/1

**Assays**

- 78-82° Grey bed
- 5.5 0-10°
- 5.5 overall 3-5°
- Angle of contact 20° and sharp
GEOLOGICAL LOG OF DRILL HOLE

PROJECT: MOUNT SKINNER
HOLE No.: G/MS/3
LOCATION: 24,000 feet East of Ansheba, Traverse 1

DESCRIPTION OF CORE | R.L. DEPTH | LOG | SAMPLES | REMARKS | ASSAYS
---|---|---|---|---|---
Weathered limy oozy sand | | | | | |
SILTSTONE | 100 | | | | |
Fine to medium grained, demarke, 
eliptic, slightly micaceous 
SANDSTONE | 200 | | | | |
Limonite, SILTSTONE | | | | | |
Laminated, poorly sorted limy 
micaceous, silky SANDSTONE 
with beamish siltstone band 
within | 300 | | | | |
Gray, highly calcareous SILTSTONE | | | | | |
with Dolomite | | | | | |
Pale, light gray sandy SANDSTONE 
with laminae SILTSTONE 
black Siltstone with pale calcareous 
SILTSTONE | 400 | | | | |
GRANITE GNEISS | 497 | | | | |
quartz, calcite 
GRANULITE | 585 | | | | |
END OF HOLE | 585 | | | | |
**Geological Log of Drill Hole**

**Location:** 1.50 ft. N.W. of baseline. Traverse 1.

**Description of Core**

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<th>R.L.</th>
<th>Depth</th>
<th>Casing</th>
<th>Log</th>
<th>Size of Core</th>
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<th>Remarks</th>
<th>Assays</th>
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**Remarks:**

- Weathered sandy partly sulfur Siltstone
- Weathered micaceous Siltstone & Sandstone
- Poorly sorted, clastic & hemiitic & hemihalitic
  - Shaly in part
- Silt-sized, brown, contorted, hemihalitic Siltstone
- Poorly sorted, silty, micaceous, hemihalitic calcareous Sandstone
- Hemihalitic Shale with interbedded poorly sorted calcareous, micaceous, fine-grained Sandstone
- Intercalated calcareous, hemihalitic, micaceous, lime Sandstone and hemihalitic Shale
- Intercalated hemihalitic Sandstone, siltstone and gray-black Shale
- Black, silty & Shale & minor pale gray calcareous, fine-grained Sandstone
- Sand, silty Dolomite
- Hemihalitic calcareous - shaly
  - with Sandstone and argillite section
- Gray Siltstone
  - Sandy Dolomite
  - Interbed Dolomite & gray Siltstone
  - Pale gray & pink Dolomite
  - Hemihalitic, poorly sorted Sand, Siltstone & Sandstone
  - Gray Silt Dolomite
  - Pale silty Dolomite
  - Pale red-orange & pink silt Dolomite
- Granite End of hole
CENTAMIN LTD

MOUNT SKINNER AREA

Stratigraphic Correlation of Central Mount Stuart Beds in diamond drill holes

DDH 3
C/M5/1 - 4
C/MS/3
C/MS/4
DDH - 3
CIMS11
CIMS12

LOWER
CENTRAL MOUNT
STUART BEDS

MIDDLE
CENTRAL MOUNT
STUART BEDS

UPPER
CENTRAL MOUNT
STUART BEDS

986'
585'
497'

Scale 1" = 250'
Date 16.1.74

Geology and Interpretation J.S.C.