AQUITAINE AUSTRALIA MINERALS PTY. LTD.

E.L. 1708, MILLIGANS LAGOON

ANNUAL REPORT FOR THE YEAR ENDING 7TH FEBRUARY, 1979

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By: P. d'Auvergne
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A B S T R A C T

Exploration on E.L. 1708, "Milligans Lagoon", during 1978 was closely guided by results obtained during several years of extensive exploration throughout the Bonaparte Gulf Basin.

The E.L. covers an area of poor outcrop with outcrops being restricted to a very limited stratigraphic range.

For preliminary investigations deep stratigraphic core drilling was planned. Two non-core holes totalling 140 metres were completed as precollars for core drilling. Both encountered extremely difficult overburden conditions and only one hole was successfully cased off and cleaned out ready for coring.

No core rig was available to deepen this hole before the onset of the wet season. It is proposed that deepening of this hole be completed early during the 1979 field season.

Expenditure on the property for the period 1st February, 1978, to 31st January, 1979, was $14,545.04.

C O N T E N T S

A P P E N D I X

F I G U R E S

		DWG. NO.
FIG. 1	Location and Regional Geology, Scale 1:50,000 approximately	16552

1. INTRODUCTION

Aquitaine Australia Minerals Pty. Ltd. has been extensively exploring for base metal deposits associated with carbonate sediments in the Bonaparte Gulf Basin since 1971 when numerous small secondary lead and zinc showings were discovered.

Exploration License E.L. 1708 was granted on the 8th February, 1978. The tenement lies in the Northern Territory adjacent to the Western Australia - Northern Territory border, approximately 14 kilometers south of where the border crosses the Kununurra - Legune road (for location see Fig. 1). Access is by track to Milligans Lagoon along the border fence, or by track to Milligans Lagoon from Kununurra via Martin Gap.

Much of the E.L. is covered by black soil which supports strong cane grass growth during the wet season and stunted light tree growth. Heavy timber occurs along the banks of the numerous branches of the Keep River, the deeply incised channels of which hinder off-road access around the E.L. Locally heavy timber is found on sand accumulations associated with outcrops or subcrops of sandy lithologies.

The Paleozoic stratigraphy of the Bonaparte Gulf Basin is now well understood and certain stratigraphical levels have been proved to be favourable locations for basemetal concentrations. An exploration decline is currently being driven into the Sorby Hills lead-zinc-silver prospect in Western Australia, approximately 15 kilometers north-west of E.L. 1708 and numerous other non-economical sulphide occurrences have been found scattered throughout the Basin.

Slightly different paleogeographical conditions existed between the rather closed province of the Sorby Hills area and the more open provinces along the eastern and western basin margins. Similarities in geology are evident, but lithostratigraphical correlation between Sorby Hills and outlying areas has proved

difficult. With a closer correlation between the sediments of the Northern Territory province and Sorby Hills, a greater understanding of the Northern Territory mineral occurrences would result and further occurrences may be anticipated.

E.L. 1708, situated virtually on the axis of the Bonaparte Gulf Basin, is considered to lie in a position critical to this solution.

2. GEOLOGY

Outcrop within E.L. 1708 is poor and is restricted to a very limited stratigraphic range, generally much younger than the lithologies of interest.

The older formations expected to lie beneath the alluvial cover outcrop in the Enga Ridge - Burt Range area some 8 - 10 kilometers south of the E.L. Figure 1, modified from Veevers and Roberts (1968, Figure 39) shows their outcrop distribution.

2.1 Stratigraphy

Veevers and Roberts (ibid.) outline the general stratigraphy of the Bonaparte Gulf Basin. A summary of the Paleozoic Formations pertinent to exploration within E.L. 1708 follows:-

(a) Antrim Plateau Volcanics

A series of basic to intermediate volcanics extruded over a undulating Proterozoic basement during the rifting period heralding the subsidence of the Bonaparte Gulf Basin. Dated lower Cambrian. Now eroded and of limited outcrop around the Basin.

(b) Cockatoo Formation

The quartz arenites of the Cockatoo Formation were initially deposited in a shallow sea during the Upper Devonian. They covered the irregular post Antrim Plateau Volcanics surface and eventually built up a large flat sand platform.

(c) Jeremiah Member

A carbonate member developed at the top of the Cockatoo Formation. This is effectively a transitional sequence between the pure quartz arenites of the Cockatoo Formation and the overlying carbonate sediments. The Jeremiah Member characteristically has an anomalous zinc background and is the site of several secondary occurrences.

(d) Ningbing Limestone (Buttons Beds equivalent)

Deposition of the Ningbing Limestone probably started in the late Famennian and continued into the Tournaisian. This Formation varies in thickness around the basin and locally is absent. In the Burt Range/Milligans Lagoon area silty to sandy cyclic carbonates occur at the base of the flat lying younger carbonates of the Burt Range Formation.

(e) Burt Range Formation

A thick sequence of rather impure lower to mid Tournaisian carbonates and carbonate sandstones which occurs throughout the eastern basin margin and into the axis, but does not appear to occur on the western margin beyond the Sorby Hills area.

The upper contact of these carbonates with the Enga Sandstone has been found to be strongly lead and zinc anomalous and several sulphide occurrences are known. Many of the secondary occurrences which created early interest in the Basin occur near to this contact.

(f) Enga Sandstone

A sequence of lower to mid Tournaisian sandstones, locally carbonate cemented, with interbedded siltstones, and minor shales. Typically strongly bioturbated. Appears to thicken to the south, reaching its greatest thickness in the Enga Ridge. Also restricted to south-western and eastern basin margins.

(g) Septimus Limestone

A highly fossiliferous impure limestone of limited areal extent. Occurs in the Burt Range/Enga Ridge area, but appears to extend along the basin margins for limited distances only. Dated late Tournaisian to early Visean.

(h) Zimmerman Sandstone

Unconformably overlies the Septimus Limestone and restricted to the Central Burt Range. Dated late Tournaisian to early Visean. Probably overlain by the Milligans Beds, but there may be some time equivalence.

(i) Milligans Beds

A series of dark grey siltstones and shales found only in stratigraphical holes drilled during Petroleum investigations. Probably a lateral equivalent of the black shale sequence of the Basin centre. Expected to be of limited extension into the axis of the Basin, not reaching the central Burt Range area, and probably not extending much further south than the Milligans Lagoon area. Dated lower to mid Visean.

(j) Burvill Beds

A characteristically highly fossiliferous sandy limestone with interbedded sandstone and siltstone. Found along the western basin margin and into the axis, but only

tentatively recognised to date along the eastern margin. In Milligans No.1 Bore overlies the Milligans Beds with a considerable hiatus. Of low potential, for convenience is now included in the informal "Weaber Group" sediments. Outcrops in Milligans Hills within E.L. 1708.

(k) Border Creek Formation

A thick sequence of quartz sandstones, conglomerates and siltstones of upper Carboniferous age. In the vicinity of E.L. 1708 these sediments take the form of an elongated channel deposit, deposited from the south, overlying with pronounced unconformity many of the older formations. Also of low potential. Included in the informal "Weaber Group" sediments. Outcrops within E.L. 1708 in the Western Spirit Hills and in the Milligans Hills in contact with the Burvill Beds.

2.2 Structure

As E.L. 1708 lies in the axis of the Bonaparte Gulf Basin, tectonism is not anticipated to have greatly influenced sedimentation.

Movements associated with the Cockatoo Fault System of the eastern basin margin have resulted in local unconformities. Extension of several of the Formations recognised in the Burt Range area as far north as E.L. 1708 are doubtful, but this is likely to be due to facies variation rather than direct tectonic control.

3. EXPLORATION

Because of the limited outcrop, exploration during 1978, the first year of tenure, was directed towards the establishment of the stratigraphy within the E.L.

3.1 Drilling

Two holes were drilled during the year, but neither hole was successfully completed. A total of 140 metres of non-core drilling was realised.

Reverse circulation drill hole NBS 5001 (see Fig. 1 for location) was drilled to 90 metres as a precollar for a deep stratigraphic core hole. Due to mechanical problems no suitable coring rig was available until approximately one month after completion of the precollar. During this delay the hole collapsed at the base of the P.V.C. casing and the core rig was not able to clean out the hole because of very high water and sand inflow. After an unsuccessful attempt to clean out the hole by using foam additives and air with the high capacity Schramm KT64 rig from the Sorby Hills project, the hole was abandoned.

NBS 5002 was drilled nearby as an alternative precollar for core drilling. Extremely high water and sand inflows made casing difficult and the P.V.C. casing could not be set. It was attempted to run the casing behind the drill stem by continuing the hole by hammer drilling, but the contamination could not be sealed off. The hole was successfully cased with 5 inch steel to within one metre of the bottom of the hammer hole at 50 metres.

With the onset of the wet season, no attempt was made to core this hole during 1978.

4. RESULTS

NBS 5001 passed through a thin sequence of Weaber Group sandstones and carbonates overlying approximately 50 metres of dark grey siltstones and shales which are probably equivalent to the Milligans Beds from the Milligans No.1 Bore approximately 2 kilometers to the north. The lowermost 10 metres of the hole encountered calcareous sandstones and sandy carbonates which are considered to be equivalents of the Septimus Limestone.

The Milligans Beds have thinned from approximately 120 metres in the Milligans No.1 Bore to approximately 50 metres in NBS 5001 and are expected to pinch out just to the south of NBS 5001.

Drill cuttings were collected at 2 metre intervals from NBS 5001 and assayed by atomic absorption for lead, zinc, and silver after treatment with perchloric, nitric and hydrofluoric acid. Only one interval assayed in excess of 10 ppm. lead or zinc (140 ppm. zinc) and only one silver assay exceeded 1 gram/Tonne (2 gram/Tonne). No geochemical contrast between the Milligans Beds and the Septimus Limestone is evident.

NBS 5002 passed through Weaber Group sandstones and carbonates and stopped approximately 30 metres into the Milligans Beds. No samples were collected for analysis because extreme sand contamination would have made any results meaningless.

Drill logs and assay results are presented as an appendix to this report.

5. CONCLUSIONS AND RECOMMENDATIONS

NBS 5002 has been cased off and cleaned out ready for deepening. A deep core hole should be drilled through this hole to examine the stratigraphy beneath the dark siltstones. If possible this hole should be continued into the Burt Range Formation. A minimum of 250 metres of coring is envisaged.

A follow-up core hole in the triangle bounded by NBS 5002, NBS 1002 (drilled during June 1976 - see d'Auvergne 1976), and the southeastern corner of E.L. 1708 should be considered if lithostratigraphical correlation between NBS 5002 and NBS 1002 still proves difficult.

Many of the mineral occurrences throughout the basin have been shown to have a strong structural control, generally being closely associated with faulting. Only when the stratigraphy of the E.L. is better understood and the distribution of favourable lithologies outlined, can geophysical prospection for favourable structural controls be recommended.

6. REFERENCES

d'AUVERGNE, P., (1976) - E.L. 246, Spirit Hill, Annual Report for the Year Ending 29th June, 1976. (MG: 709).

VEEVERS, J.J., & ROBERTS, J., 1968 - Upper Paleozoic Rocks, Bonaparte Gulf Basin of Northwestern Australia. Bur. Miner. Resour. Aust. Bull. 97.

7. EXPENDITURE

Expenditure as recorded for the period 1st February, 1978, to 31st January, 1979, is as follows:-

Description of Expense	$
Supplies & Consumables	1,217.99
Repairs & Maintenance - Vehicles	535.77
Repairs & Maintenance - Buildings & Other	260.06
Travelling Expenses	413.57
Mineral Drilling	8,711.00
Assays & Other Analysis	114.92
Phone, Telex, Radio etc.	235.23
Minerals Salaries	1,768.00
Administration & Base Expenses	1,288.50
TOTAL	$14,545.04

APPENDIX

DRILL LOGS AND ASSAY RESULTS

NBS 5001 AND NBS 5002

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DRILLING LOG

hole no.	NBS 5001	location	0500120E - 8268300N	drillers	DAVIES - KT1
permit	E.L. 1708	azimuth	-	duration	14/7 - 15/7/78
state	N.T.	declination	VERTICAL	logged by	P. BENJAMIN

depth	description	Pb %	Zn %	Ag gr/T
0 - 4	OVERBURDEN			
0 - 2 2 - 4	Medium brown soil. Composed of clay, 70% and 30% fine sand. Minor calcrete nodules.			
4 - 32	WEABER GROUP			
4 - 6 6 - 8 8 - 10	Yellow-brown, sandy soil. Medium-fine grained, 60% sand and 40% clay.			
10 - 12	Yellow-brown sand. Sandy component 70 - 90% with 10 - 30% clay. Some weathered sandstone pebbles.			
12 - 14 14 - 16	Yellow-brown clayey sand. Sand component 60%, clay 40%.			
16 - 18	(a) Sandy limestone (60%). White, medium grained massive limestone. Quartz 20 - 40%, well washed subrounded clear grains in calcareous matrix/cement. Quartz is medium to coarse. (b) Unconsolidated sand. Yellow-brown, medium grained and well washed.			
18 - 20	Sand-limestone. Basically the same as for 16 - 18m., but quartz content 50%. Limestone may be stained a yellow hue by iron. One well washed quartzite pebble recovered from washing, 2 x 2 cm.	L	L	1
20 - 22	Unconsolidated sand. Some 10 - 20% clay clasts in washings, Dark grey-brown, very fine grained.	L	L	L
22 - 24	Unconsolidated sand: Some quartzite pebbles, 2 x 2 cm in washings.	L	L	L
24 - 26	(a) Clay 60%. Dark-brown to grey clay clasts. (b) Unconsolidated sand 40%. (c) Minor quartzite pebbles.	L	L	1
26 - 28	(a) Clay 90%.	L	L	1
28 - 30	(b) Calcareous : quartz sandstone	L	L	1

hole no. NBS 5001	location	drillers
permit	azimuth	duration
state	declination	logged by

depth	description	Pb %	Zn %	Ag gr/T
	Grey-white, fine to medium grained. Quartz 90%, sub-rounded, clear grains, moderately sorted. Calcareous cement, 10%. Some samples covered by pyrolusite dendrites.			
30 - 32	(a) Bioclastic Sandy Limestone: Varies from yellow-brown (weathered) to grey-white (fresh) and medium grained. Quartz content, 50 - 60%, sub-rounded to sub-angular fragments. Bioclasts, 20%, mainly brachiopod shells and some spines. Some shells, > 1cm in diameter. Calcareous cement, ~ 20%. (b) Calcareous Quartz Sandstone. (c) Clay clasts and fine unconsolidated sand.	L	L	1
32 - 80	BLACK SHALES			
32 - 34	Argillaceous calcareous siltstone. Dark grey to dark brown, very fine grained and finely laminated. Silt content 50 - 70%. Calcareous cement. Most of the sample in the form of very fine powder; no chips.	L	L	1
34 - 36	Calcareous siltstone. Black to dark brown May be fissile. Strongly weathered.	L	L	1
36 - 38	Argillaceous calcareous siltstone. Very fine black laminae, slightly wavy. Argillaceous matrix.	L	L	1
38 - 40	Black shale.	L	L	1
40 - 42	Black, very fine grained, fissile shale.	L	L	1
42 - 44	Calcareous cement 10%. Soft and partly	L	L	2
44 - 46	weathered. Sample mostly powder.	L	L	1
46 - 48	(a) Black shale. (b) Silt-calcisiltite. Dark grey to brown, very fine grained. Argillaceous matrix. Finely laminated. Quartz, 50 - 60%. Calcareous cement.	L	L	1

hole no. NBS 5001	location	drillers
permit	azimuth	duration
state	declination	logged by

depth	description	Pb %	Zn %	Ag gr/T
48 - 50	(a) Argillaceous calcareous siltstone. (b) Black shale. Fossil shell fragments found in washings, mainly brachiopods (< 10%). (c) Calcareous quartz sandstone.	L	L	1
50 - 52	Black shale.	L	L	1
52 - 54		L	L	1
54 - 56	(a) Black shale.	L	L	1
56 - 58	(b) Argillaceous grey shale.	L	L	L
58 - 60	Grey-brown, massive, very fine grained,	L	L	L
60 - 62	strongly laminated, many black wavy forms. Rock has sub-conchoidal fracture and unlike black shale, it is not fissile.	L	L	1
62 - 64	Black shale.	L	L	1
64 - 66	(a) Argillaceous grey shale. (b) Black shale. (c) Calcareous quartz sandstone. Minor disseminated pyrite (< 5%).	L	0.014	1
66 - 68	Black shale.	L	L	1
68 - 70		L	L	1
70 - 72	(a) Black shale. (b) Grey shale.	L	L	1
72 - 74	(a) Black shale.	L	L	1
74 - 76	(b) Calcareous quartz sandstone. Disseminated pyrite, 1%.	L	L	1
76 - 78	Black shale.			
78 - 80	(a) Black shale. 5 - 10% pyrite, massive and very fine grained. (b) Argillaceous grey shale. Verges on a siltstone. Very fine grained quartz 50 - 60%.	L	L	L

AQUITAINE AUSTRALIA MINERALS PTY LIMITED

DRILLING LOG

hole no. NBS 5001	location	drillers
permit	azimuth	duration
state	declination	logged by

depth	description	Pb %	Zn %	Ag gr/T
80 - 88	UPPER FORMATION			
80 - 82 82 - 84 84 - 86	(a) Calcidolomitic quartz sandstone. Medium to coarse grained, grey-white to light brown. Quartz 60 - 80%, moderate to well rounded with fair to moderate sorting. Calcidolomitic cement. Contains massive pyrite, 1 - 5%. (b) Black shale.	L L L	L L L	1 L 1
86 - 88	(a) Dolomitic quartz sandstone. Medium grey, fine grained. Quartz 60 - 80%. Well rounded and fair to moderate sorting. Argillaceous material <10%. (b) Sandy dolointrasparite. Grey white to light brown. Quartz 30 - 40%, very fine grained, sub-angular to sub-rounded. Sparry matrix.	L	L	L
88 - 90	As for 86 - 88m.			
	HOLE COMPLETED AT 88m AS PRECOLLAR FOR CORE DRILLING			

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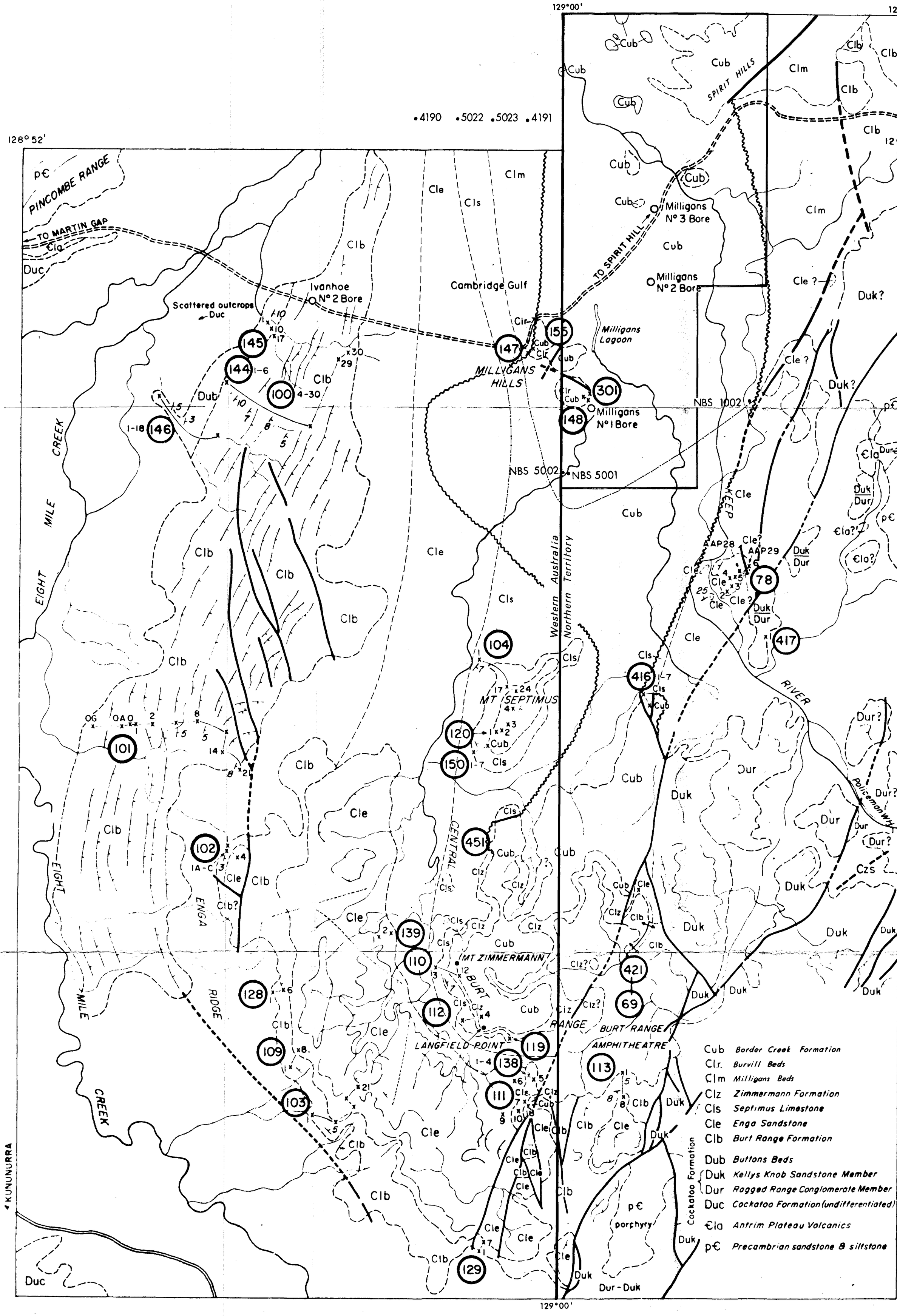
DRILLING LOG

hole no. NBS 5002	location 0400005E - 8268335N	drillers DAVIES - KT 1
permit E.L. 1708	azimuth -	duration 2/10 - 6/10/78.
state N.T.	declination VERTICAL	logged by D. BAY / P. D'AUVERGNE

depth	description	Pb %	Zn %	Ag g/T
	0 - 18m. drilled with drag bit. 18 - 50m. hammer.	No samples collected for analysis.		
0 - 4	ALLUVIUM			
	0 - 4 m: Brown soils.			
4 - 22	WEABER GROUP ?			
	4 - 6 m: Brown sand-soil, possibly after a disagregated friable sandy carbonate lithology.			
	6 - 8 m: Bleached grey-white soil with calcrete.			
	8 - 10 m: Yellow-white coarse grained sand.			
	10 - 22 m: Fine yellow sand with calcrete. Abundant water.			
22 - 50	DARK GREY SILTSTONE (BLACK SHALE EQUIVALENT)			
	22 - 36 m: Fine yellow sand with calcrete and abundant water. Although no grey dolomitic siltstone was noted until approx. 37 m., gamma logging once hole had been cased off, shows the upper contact of the siltstone unit is at approx. 22m.			
	36 - 38 m: As above. Occasional chips of dark grey slightly carbonaceous weakly dolomitic siltstone.			
	38 - 50 m: Dark grey carbonaceous dolomitic siltstone as above. Extreme contamination by sand and calcrete.			
	Hole cased to 25 m. in 5½" P.V.C. Hole cased to 49 m. in 5" steel.			
	Steel casing has successfully cased off water and sand, and hole is now clean and able to be deepended either by reverse circulation or coring.			



MODIFIED FROM VEEVERS & ROBERTS (1968) p 68

SUBOUTCROPPING CONTACT (INFERRED)

SUBOUTCROPPING UNCONFORMITY AT BASE OF BORDER CREEK FORMATION (INFERRED)

CONTACT BENEATH UNCONFORMITY (INFERRED)

NBS 5001 • DRILL HOLE

SCALE: APPROX. 1:50,000
(slight distortion due to photographic enlargement)

Aquitaine Australia Minerals Pty. Ltd.

MILLIGANS LAGOON - E.L. 1708

LOCATION & REGIONAL GEOLOGY

Author: P. d'Auvergne	Date: JAN. '79	Dwg. No: 16552	FIG. 1
Drafting: J.C.	Report No: MG 984	Base Plan:	