PROSPECT 8586

CSR LIMITED

MINERALS EXPLORATION AND DEVELOPMENT GROUP

EXPLORATION LICENCE 4744
FRANCES CREEK, NORTHERN TERRITORY
PINE CREEK 1:250,000 SHEET SD52-8
ANNUAL REPORT
FOR THE YEAR ENDED 22ND APRIL, 1987

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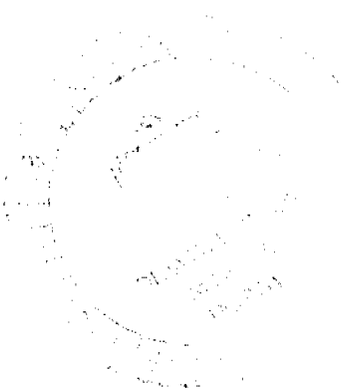

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KEYWORDS

FRANCES CREEK

PINE CREEK

NT

SD 52-8

GEOLOGY

GEOPHYSICS

GEOCHEMISTRY

STREAM SEDIMENT SAMPLING

ROCK-CHIP

MAGNETIC

RADIOMETRIC

GOLD

ARSENIC

1. SUMMARY

CSR Limited conducted at its sole expense an exploration programme for disseminated gold mineralisation within Exploration Licence 4744 (EL 4744), known as the Frances Creek area, under a Joint Venture Agreement with Casey Consolidated Holdings.

During 1985, an airborne geophysical survey was undertaken to delineate the Zamu Dolerite, and to define any alteration features. No significant structures or anomalies were defined within EL 4744.

A soil sampling programme was undertaken on the Frances Creek Mine Grid. Anomalous arsenic and gold values were obtained, but these results were not confirmed by rock-chip analyses results nor by results from channel samples in a trenching programme. However, samples from an altered dolerite adjacent to a brecciated quartz vein exposed by the trenching programme did return low-order anomalous gold values, which will require follow-up work.

No anomalous results were obtained from a bulk stream sediment sampling programme, nor from composite rock-chip samples collected from the altered Zamu Dolerite.

2. INTRODUCTION

Exploration Licence 4744 is located in the Frances Creek area and is subject to a Joint Venture between Casey Consolidated Holdings and CSR Limited dated 18 July, 1985. Pursuant to this Agreement, CSR Limited has earned an 80% interest in the Joint Venture by conducting, at its sole expense, programmes of exploration for gold.

Exploration was carried out in 1985 before the Licence was granted to CSR Limited. That work is reported here in addition to the exploration carried out during the first year of tenure in 1986.

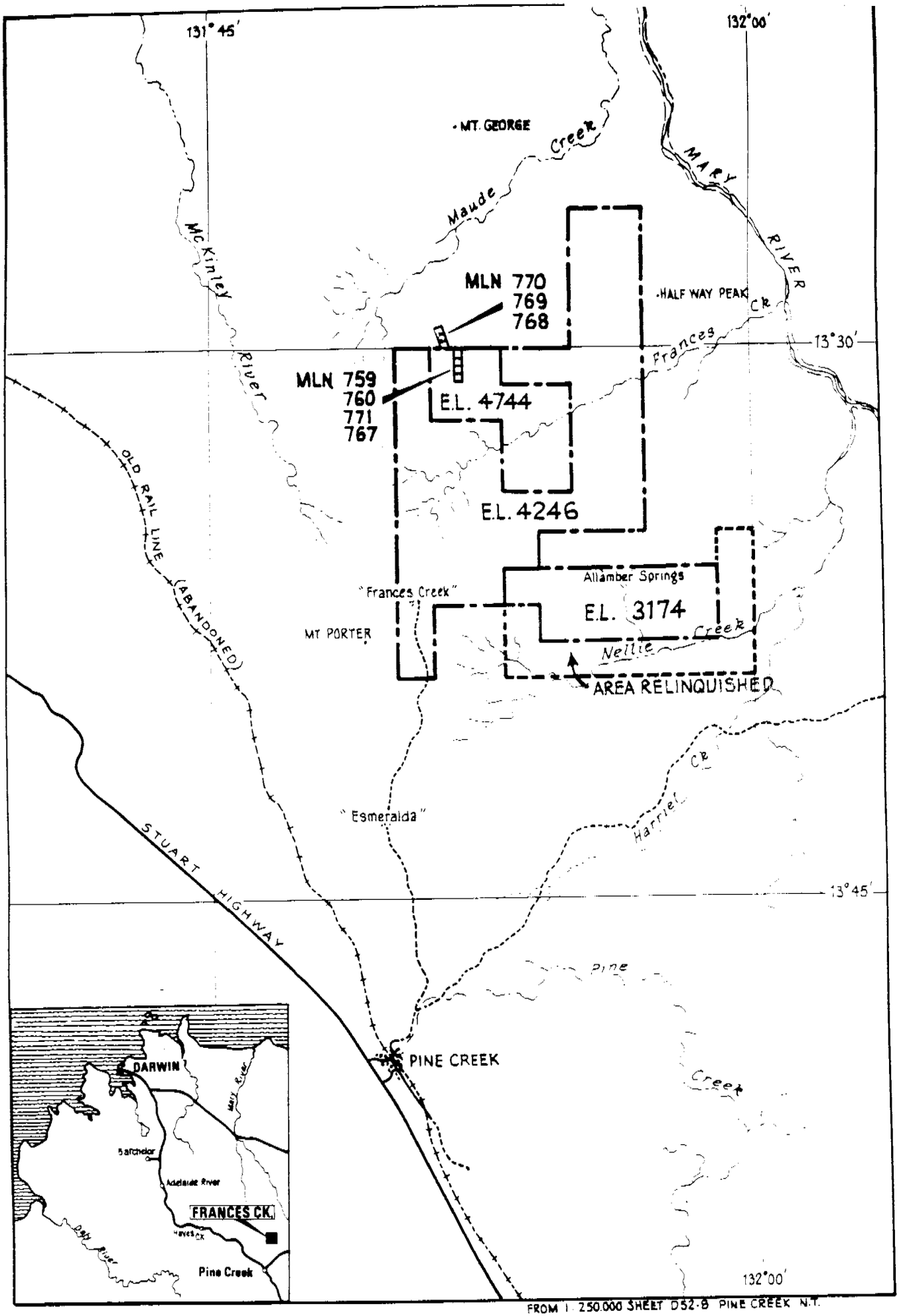


FIG.1 LOCATION MAP E.L's.3174, 4246 & 4744 FRANCES CK. N.T.

3. LOCATION, ACCESS AND TOPOGRAPHY

Exploration Licence 4744 is located 150 km southeast of Darwin and 40 km northeast of Pine Creek in the Northern Territory (**Figure 1**).

Access to the EL is via the Stuart Highway, and then by turning off the Stuart Highway at the Fountain Head road intersection, then via Mount Wells to the Frances Creek gold mine.

The topography of the EL comprises large flat valleys separated by 50 m high ridges of Mundogie Sandstone. Access along the valleys is easy while the sandstone ridges are inaccessible by vehicle. A series of old station and miner's tracks provide good access along the valleys, however, Frances Creek provides a major obstacle. Several bulldozed crossings are often subject to erosion, making them difficult to cross.

Permanent water is available in Frances Creek although this is often fouled by cattle and buffaloes.

4. TENEMENT HISTORY

Exploration Licence 4744 was granted to CSR Limited on April 22nd, 1986. The Licence is subject to a Joint Venture between CSR Limited and Casey Consolidated Holdings. The Licence replaces EL 2047 which was granted to W.E. Casey Consolidated Holdings.

The title comprises 10 blocks covering 32 km^2 and was granted for a period of six years.

5. PREVIOUS EXPLORATION

The area covered by EL 4744 has only been subject to minor exploration in the past.

An exploration programme for gold and tin within EL 4744 was conducted by consultant, G. Eupene, on behalf of Casey Consolidated Holdings and involved mainly stream sediment sampling. These samples were sieved and a heavy mineral fraction was assayed for gold and tin. Anomalous drainage systems were detected on EL 4744 and were attributed to possible alluvial gold and tin.

Minatome Australia conducted an exploration programme for uranium over the Masson Formation. This work involved helicopter and ground spectrometer traverses. Rock-chips were taken from selected traverses and assayed for uranium and thorium. The results from this work were discouraging.

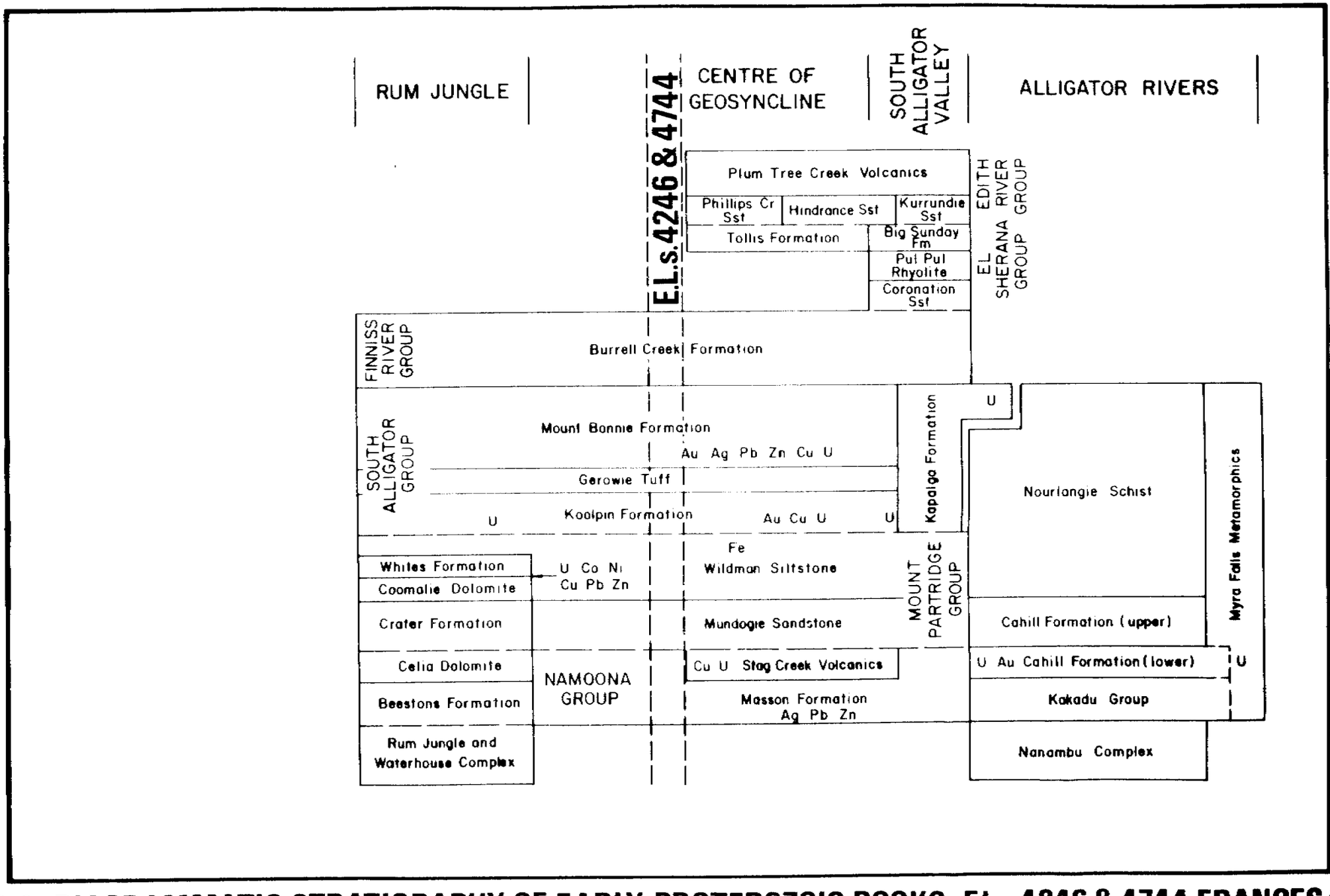


FIG.2 DIAGRAMMATIC STRATIGRAPHY OF EARLY PROTEROZOIC ROCKS-ELs.4246 & 4744 FRANCES CK.

6. REGIONAL GEOLOGY

Exploration Licence 4744 is located in the central part of the Pine Creek Geosyncline, comprising Lower Proterozoic metasediments which outcrop over an area of 40,000 km^2. The Bureau of Mineral Resources has spent considerable time in mapping and correlating the stratigraphy, and in later years, the Northern Territory Geological Survey has continued this task. Walpole et al (1968) were responsible for the most detailed description of the geology of the Pine Creek Geosyncline, and more recently, Needham et al (1980 and 1984) have refined the stratigraphy and correlations of rock units within the Geosyncline.

The stratigraphy is summarised in **Figure 2.**

6.1 Basement Geology

The oldest rocks in the Pine Creek Geosyncline are the Archean granitic complexes which include the Rum Jungle and Waterhouse Complexes in the west of the region and the Nanamabu Complex in the east. Page et al (1986) suggest that the complexes are at least 2400 m.y. old and are typical of the Archean granitic crust as defined by Rhodes (1965).

Since EL 4744 is situated near the centre of the Geosyncline, there are no Archean rocks outcropping within or near the Licence.

6.2 Lower Proterozoic Sedimentary Sequence

The Lower Proterozoic sequence includes a 14 km thickness of sediments and volcanics (Needham et al, 1980) unconformably overlying the Archean basement.

The oldest group of sediments is the Namoona Group. Its equivalents, including the Kakadu Group, comprise mainly carbonaceous and dolomitic pelites deposited in a shallow marine environment which later matured, producing a massive evaporitic and stromatolitic carbonate sequence. These units are known as the Masson Formation and Celia Dolomite respectively.

Needham et al (1984) postulated an hiatus in sedimentation at this time followed by uplift north of the geosyncline which led to a cycle of alluvial sedimentation in a series of large fans. This environment matured and massive evaporitic and stromatolitic carbonate shelf facies deposits were formed. The alluvial deposits are now represented by the Crater Formation, the Mundogie Sandstone and Upper Cahill Formation. The evaporites are represented by the Coomalie Dolomite in the west and the Wildman Siltstone in the centre of the geosyncline. This sedimentary cycle is known as the Mount Partridge Group. The units of this Group form the majority of the rocks within EL 4744 and are described in more detail in Section 7 of this report.

Needham postulated another hiatus in sedimentation, at the close of the Mount Partridge Group before the deposition of the economically important South Alligator Group. Regionally, the South Alligator Group is marked by distinctive iron-rich sediments, carbonates and tuffs. The Koolpin Formation is characterised by carbonaceous mudstones with lesser important iron-rich facies, siltstones and limestones. The Gerowie Tuff comprises beds of chert, and tuffaceous and carbonaceous mudstones. The uppermost unit in the South Alligator Group is the Mount Bonnie Formation which marks the start of the flyschoidal sediments of the Finniss River Group according to Nicholson (1980).

The Finniss River Group is represented by the Burrell Creek Formation which commonly displays turbidite sedimentary features, and which consists of greywacke, conglomerate and siltstone (Needham et al, 1980).

The Lower Proterozoic sedimentary pile was intruded prior to 1800 m.y. by the Zamu Dolerite which mostly formed sills between 10 and 200 m thick. The Zamu Dolerite has been intruded into the South Alligator Group throughout most areas of the Geosyncline.

The sedimentary pile was then folded and metamorphosed to amphibolite facies during 1800-1730 m.y. Granite intrusions are also associated with this event and much of the gold mineralisation within the Pine Creek/Adelaide River area was emplaced at this time. The granites now form batholiths to the south and east of EL 4744. Stuart-Smith and Needham (1984) suggest that the volcanics of the El Sherana and Edith River Groups were associated with the late stage of granite intrusions.

6.3 The Zamu Dolerite

The Zamu Dolerite was named by Ferguson and Needham (1978) and occurs as sills within the South Alligator Group, ranging in thickness from 10 to 200 m. The dolerite is believed to have been emplaced prior to the major regional metamorphic event at 1800 m.y. (Page, 1984), and prior to folding of the South Alligator Group. The Zamu Dolerite is therefore distinguished from other mafic rocks within the geosyncline by the presence of regional metamorphic effects. The Zamu Dolerite outcrops extensively in the Burrundie, Burnside and Frances Creek areas and in the South Alligator Valley.

Ferguson and Needham (1978) divide the Zamu Dolerite into two zones based on metamorphic grades; in the east, high to medium-grade and in the central and western side of the Pine Creek Geosyncline, low-grade metamorphism. The greenschist facies in the central part of the geosyncline has been upgraded in some areas by contact metamorphism by Carpentarian Granite diapirs (Walpole et al, 1968). Shearing could also be related to these Carpentarian intrusions. Ferguson and Needham (1978) note that the apparent contact alteration sometimes falls outside known contact metamorphic aureoles, but they explain this feature by relating such alteration to unexposed granite bodies. The mineralogy associated with the contact aureole metamorphism includes the epidote group minerals, chlorite, quartz, prehnite, biotite and albite/oligoclase, sphene, apatite, ilmenite, pyrite and lesser amounts of chalcopyrite (Ferguson and Needham, 1978). Ferguson also notes that this alteration is associated with Fe and Mg introduction and that there is a depletion of potassium in the higher-grade amphibolites. Although the location of these amphibolites is not given, they are suspected to be in the East Alligator Rivers Uranium Field since sampling was biased towards that area.

Ferguson concludes that the Zamu Dolerite forms a continental tholeiite suite which was intruded into, then metamorphosed with, the enclosing strata and although there would appear to be an increase in Fe and Ti, and a decrease in K with metamorphic grade, he was not able to assess if the variations were produced by original igneous fractionation or metamorphism.

6.4 Cover Rocks

The whole of the Pine Creek Geosyncline was subject to extensive erosion and peneplanation prior to the deposit of Middle Proterozoic sediments. The Carpentarian unconformity is marked by a basal conglomerate and followed by fluviatile sandstones and volcanic horizons. The Middle Proterozoic has been gently folded and remnants, including the Kombolgie Sandstone and Depot Creek Sandstone of the Katherine River Group, occur on both the eastern and western sides of the Pine Creek Geosyncline respectively.

7. DETAILED GEOLOGY OF EL 4744

Exploration Licence 4744 is dominated by northwest-trending structures within the Namoona and Mount Partridge Groups (DRG No. 8586-9). The units which are represented within the EL include the Masson Formation and Mundogie Sandstone, with Zamu Dolerite sills intruding the Masson Formation.

The Masson Formation forms part of the Namoona Group and comprises ferruginous shale, siltstone, minor quartzite, quartz arenite and minor shale. Massive dolomites are present and often give rise to a red-brown clay-rich soil similar to that derived from the Zamu Dolerite. Good examples of this feature are seen on McKiddies diggings where recent trenches reveal the bedrock geology underlying red soils. Much of the Masson Formation is poorly exposed with only the quartzites and quartz arenites forming small rubbly outcrops. In the south, the Masson Formation has been subjected to hornfelsing by the Allamber Springs Granite. The hornfelsing is represented by silification and coarsening of the constituents of the Masson Formation rocks, forming a sugary textured rock.

The Masson Formation is overlain unconformably by the Mundogie Sandstone which forms part of the Mount Partridge Group. The Mundogie Sandstone comprises coarse feldspathic sandstones, conglomerates and quartzites. This unit forms the prominent ridges up to 50 m above the Masson Formation valleys.

The area is structurally complex with prominent northwest-trending faults dominating the area. These faults are responsible for repetition of the stratigraphy across the region. The faults can easily be traced on airphotographs and also on the airborne magnetics.

The Zamu Dolerite intrudes the Masson Formation and forms a series of folded sills between 5 and 100 m thick. Much of the interpretation of the Zamu Dolerite on the regional geology map (**DRG No. 8586-9**) is interpreted from iron and chromium assays of minus 80 mesh soil samples. The Zamu Dolerite forms low hills where there is little alteration, but in areas subjected to carbonate alteration and K-metasomatism, the Zamu Dolerite is only represented by a red brown soil.

Petrographic studies conducted on samples of the Zamu Dolerite outcropping on EL 4744 comprise a suite of orthodox gabbroic to quartz gabbroic rocks (Cowan, Pers. Comm.). Alteration includes uralitic alteration probably related to regional metamorphism. The uralitic alteration is represented by uralitic amphiboles. There was only minor shearing or stress exhibited in the samples. Minor sericite was seen replacing feldspar, but this is probably not significant in the context of the analogy with Kalgoorlie-style deposits. A major difference between the Kalgoorlie alteration mineral assemblage and these samples of the Zamu Dolerite is the lack of sulphide-replaced opaques.

The Allamber Springs Granite outcrops to the south of the EL, and has a metamorphic aureole up to 3 km wide. The general effect of this contact metamorphism is to increase the grain size. In particular, in the Zamu Dolerite, the amphibolites form radiating roses up to 1 cm across. In addition, biotite is often formed in the aureole where K-metasomatism has also taken place.

8. REGIONAL EXPLORATION

8.1 Exploration Concept

CSR Limited directed an exploration programme towards discovery of disseminated gold mineralisation within the Zamu Dolerite. This style of gold mineralisation is best known in Western Australia with the Golden Mile being an example. Many researchers have written papers on this style of mineralisation and generally there are several necessary criteria which need to be met before such gold mineralisation occurs. These types of deposits vary in size, shape, grade, mineralisation style, associated alteration and host rocks.

8.1.1 Host Rocks

Most deposits of this nature are hosted in mafic volcanics with a high iron content. The Zamu Dolerite is chemically such a rock. In WA, BIFs also host gold deposits (only 15% of gold production, Groves et al, 1986).

8.1.2 Mineralisation Style

There is much variation within the deposits of WA, but generally the mineralisation can be related to structural zones, quartz veins, quartz stockworks and breccias. In BIFs, the gold mineralisation is associated with sulphidic layers. In many of the deposits, the mineralisation appears stratiform despite the fact that the mineralisation may occur in shears and veins.

8.1.3 Wallrock Alteration

Generally, the alteration of the wallrock includes carbonate or chlorite alteration haloes around the deposits. Much more restrictive alteration haloes

of K-metasomatism and iron sulphides are always present although they may be very restrictive.

Another feature which appears to be essential is regional metamorphism to the low amphibole facies.

8.1.4 Timing of Mineralisation

The timing of mineralisation appears to be synchronous with metamorphism (Groves et al, 1986) and many writers suggest an epigenetic, hydrothermal origin of the mineralisation. Despite the stratiform nature of BIF-hosted gold deposits, an epigenetic origin is still favoured as they exhibit significant structural control and must either be remobilised syngenetic or epigenetic deposits.

8.1.5 Analogy to the Pine Creek Geosyncline

In some places in the Pine Creek Geosyncline, all these criteria have been met and gold mineralisation occurs within the tholeiitic Zamu Dolerite which is indistinguishable from the greenstone-type disseminated gold of WA. This mineralisation is believed to have formed during the regional metamorphic event at 1800 m.y., which has been associated with the intrusion of the Carpentarian Granites throughout the Pine Creek Geosyncline. The type of deposit would depend on the host rock, nature of fluids and structural preparation.

8.2 Airborne Geophysics

An airborne geophysical survey was completed over the Frances Creek area by Geoterex Pty. Ltd. with data processing undertaken by CSR Limited. The survey comprised both total field magnetic and 4 channel radiometric surveys on east-west flight lines at 200 m spacing with a 90 m terrain clearance. North-south lines were flown at 3 km intervals.

The total magnetic field strength was measured, using a caesium vapour magnetometer at 0.2 sec sampling intervals or 13 m at the average aircraft speed of 220 km/hour. A Nuclear Data 256 channel spectrometer with a 33.1 litre crystal was used to record radiometrics (Total Count, Potassium, Uranium and Thorium). Sampling rate for radiometrics was one second or approximately 65 m.

The survey navigation was by 1:20,000 colour airphotographs. AMG-controlled base maps were produced at a scale of 1:25,000 (**DRG No. 8586-11**).

Engineering Computer Services Pty. Ltd. produced preliminary contour map of magnetic data while final contour plots of magnetics and image processing of magnetics and radiometrics were produced by CSR Limited.

Interpretation of the airborne data (**DRG No. 8586-12**) was directed towards three main criteria (Anderson, 1986, unpublished data).

1. mapping lithological units, particularly in areas of poor outcrop.

2. defining major structures.

3. defining areas of possible alteration within prospective lithologies.

The magnetic relief of the Frances Creek survey is dominated by northwest-trending anomalies parallel to the Pine Creek Shear Zone which probably represent major faults. Northwest-trending highs and lows are also consistent with major parallel folds of a persistent stratagraphic unit. Minor secondary faulting is also inferred to account for terminations of some magnetic features (Anderson, 1986, unpublished data).

A comparison between the radiometric (potassium channel) and the magnetics reflects most structures. In addition, the interpretation of lithologies shows a good correlation to the known geology. An area to the southwest of the centre of the area shows a distinctive magnetic relief which is attributed to folding and faulting of a single magnetic horizon. The amplitude and character of this anomaly would suggest an iron-rich sedimentary unit. This iron-rich unit would appear to be in the Masson Formation underlain by a thin sheet (<100 m) of Mundogie Sandstone.

The Zamu Dolerite can be defined in southern areas, based apon the magnetics, however, some areas of indicated outcropping dolerite are not expressed in the magnetic data (Anderson, 1986, unpublished data).

None of the following geophysically anomalous features, which in adjacent areas may be related to altered Zamu Dolerite, were located within EL 4744. These features include circular magnetic lows and isolated magnetic highs which could conceivably be related to pyrrhotite-rich sources, fold structures in particular anticlines, and potassium channel anomalies.

8.3 Regional Bulk Stream Sediment Sampling Programme

A bulk stream sediment sampling programme was undertaken over EL 4744. The technique involved the collection of 5 kg of dry stream sediment material from a non-trap site. The samples were split and a 100 g sample was sent to Analabs for analysis for total iron, reactive iron, organic carbon, copper and arsenic. These results were used to classify the samples into three types based on reactive iron content, carbon content and percentage quartz. The sample types were:

TABLE 1

BULK STREAM SEDIMENT SAMPLE RESULTS

SAMPLE	Fe% TOTAL	Fe% REACTIVE	Cu ppm	As ppm	ToC %	Au ppb	Cu ppm	Ag ppb
218771	1.0	0.026	15	1	-	0.11	0.03	1.25
218773	0.6	0.014	15	-	-	0.09	0.04	1.00
218774	1.2	0.055	20	6	0.7	0.30	0.05	2.25
218775	0.9	0.055	10	2	0.7	0.19	0.03	1.50
218776	1.1	0.090	10	2	0.7	0.23	0.04	1.50
218777	1.9	0.085	5	6	0.9	0.26	0.07	2.25
218778	1.1	0.045	5	1	0.9	0.30	0.05	1.75
218779	0.5	0.012	-	-	-	0.11	0.04	1.50
218780	0.9	0.075	-	2	1.2	0.30	0.05	1.75
218781	1.6	0.135	5	9	6.3	0.38	0.05	3.00
218782	2.0	0.275	15	6	9.7	0.69	0.26	20.50
218795	0.5	0.040	10	1	1.1	0.08	0.05	1.50
202273	1.4	0.140	15	6	4.20	0.17	0.26	7.25

(a) Stream sediment sample material with a high iron, high carbon and high clay content. The thresholds for the priority of the anomalous gold value was high as gold is more likely to be scavenged in this type of sample.

(b) A sample with lower iron and carbon content but a higher quartz content, i.e. dirty sand material. The threshold for anomalous gold is lower than type (a) above due to the lower likelihood of gold being scavenged into the sample.

(c) Mainly washed quartz sand with no iron or carbon content. Such a sample is typical of that derived from the Mundogie Sandstone in streams of relatively high energy.

This classification of samples was determined after an orientation sampling programme in other areas of the Pine Creek Geosyncline. In addition, the orientation survey indicated that -20 mesh material would enhance the gold value and was still cost-effective to obtain in the field.

The 5 kg samples were subjected to a cyanide leach to extract the gold. The pregnant solution was mixed with zinc powder (3 g) to precipitate the gold, and the zinc powder was then assayed for Au, Cu and Ag. Each assay result was normalised to the original sample, giving the metal content (in ppm or ppb) of the original sample.

The sample results were assigned an order of priority (decreasing from 1 to 4), depending upon the sample type, with a different threshold for each sample type. No follow-up of priority (4) anomalies was required and priority (3) anomalies were followed-up only if the drainages were in areas of favourable geology.

The results are presented in **Table** 1 and plotted on **DRG No. 8586-14.**

The results in the Frances Creek area were generally low due to the swamping of the sample by quartz derived from the Mundogie Sandstone. In addition, the topography away from the Mundogie Sandstone ridges is fairly flat so that there is not much active sediment in the creeks.

None of the thirteen samples taken from creeks draining EL 4744 were considered anomalous. The samples had only 3 and 4 priority ratings and a maximum assay of 0.38 ppb Au.

8.4 Regional Rock-chip Geochemistry and Petrographic Studies

None of the composite rock-chip samples collected during the regional mapping programme or from the Frances Creek Mine area were anomalous in gold or arsenic (**Table** 2), although samples from the Mine area demonstrated some textures considered favourable for the target sought.

TABLE 2
ROCK-CHIP SAMPLE RESULTS

SAMPLE	Cr (ppm)	Fe%	Cu (ppb)	As (ppm)	Au (r) (ppm)
218772	62	11.3	142	14	0.05
218796	60	44.4	264	81	0.03
218797	47	11.1	132	35	0.03
218798	490	6.53	22	30	0.03
218799	61	39.7	389	7	0.02

Limited petrographic investigations were undertaken on rock-chip samples from the Frances Creek Mine Grid.

Sample 194324 was taken from the main quartz vein outcrop on the Frances Creek Mine Grid from rocks which showed bladed hematite after a carbonate. Cowan (Pers. Comm.) suggests that the bladed feature is derived from oxidised granular pyrite.

A further selection of samples were taken from the outcrop and sent to Mintek Services. Petrographic description of Sample Nos. 277774 to 277779 are presented in **Appendix I.** Borner (Pers. Comm.) suggests the suite of samples is taken from the quartz-vein system within sheared dolerite and is associated with pyrrhotite and pyrite.

9. PROSPECT EVALUATION

9.1 Location 56

Location 56 comprises a gossanous outcrop centred on AMG co-ordinates 8504950mN 81515mE on **DRG No. 8586-16**, just to the east of EL 4744. Only part of the grid is located within EL 4744 and the results of the work conducted on Location 56 are reported in the Annual Report for EL 4246.

9.2 Frances Creek Mine Grid

An area near the old Frances Creek Gold Mine was recognised as having features considered favourable for gold mineralisation within the Zamu Dolerite. The area was subject to detailed exploration including soil sampling, rock-chip sampling and trenching. The results of the mapping are shown on **DRG No. 8586-52** and show a quartz vein centred on the co-ordinates 10100mN 10150mE on the local grid (AMG 8503500mN 811100mE).

The main quartz-vein outcrop has elongated, filled cavities after carbonate or sulphide, and there is associated shearing within the adjacent Zamu Dolerite. Rock-chip samples of the quartz vein did not show any anomalous gold values, however, several minor pits have been excavated on the outcrop at some time in the past. These pits would probably have been excavated in the search for gold.

A soil sampling programme was undertaken to see if the altered dolerite contained anomalous arsenic or gold. The results are plotted on **DRG Nos. 8586-53** to **8586-58**. The soil samples were sieved to -80 mesh and were taken from 5 cm depth and 20 m apart. The samples were assayed for arsenic, iron and chromium initially, and for gold, if the arsenic assay was considered anomalous. Gold assays were conducted on composites of two adjacent samples, i.e. gold assays cover

TABLE 3 : TRENCH CHANNEL SAMPLE RESULTS

SAMPLE NO.	Au (ppm)	Au (r)	As (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
TRENCH SECTION - T1						
A282192	0.04	0.01	650	86	124	40
A282193	0.01		140	120	29	155
A282194	<0.01	<2	128	21	146	
A282195	<0.01	<2	104	33	147	
A282196	<0.01	<2	52	16	152	
A282197	<0.01		-IS-	-IS-	-IS-	-IS-
A282198	0.01		-IS-	-IS-	-IS-	-IS-
A282199	0.01		230	71	11	96
A282200	0.01		-IS-	-IS-	-IS-	-IS-
A282201	0.01		-IS-	-IS-	-IS-	-IS-
A282203	0.02		2730	198	19	23
A282204	0.04		410	18	14	7
A282205	0.06		290	12	10	6
A282206	0.09		320	22	11	12
A282207	0.16		400	23	14	18
A282208	0.12		320	22	13	20
TRENCH SECTION - T2						
A282209	0.03		-IS-	-IS-	-IS-	-IS-
A282210	<0.01		<2	53	10	124
A282211	0.01		<2	70	15	115
A282212	0.01		<2	52	12	133
A282214	0.02		<2	144	11	143
A282215	0.03		<2	113	11	120
A282216	<0.01		<2	122	9	120
A282217	<0.01		<2	115	11	119
A282218	0.02		<2	116	17	111
A282219	<0.01		<2	94	10	120
A282220	<0.01		<2	140	9	100
A282221	0.02		<2	101	11	121
A282222	0.01		<2	155	8	119
A282223	0.02		<2	145	11	107
A282225	0.03		<2	397	12	127
A282226	0.01		<2	392	10	119
A282227	0.01		-IS-	-IS-	-IS-	-IS-
A282228	0.02		<2	137	9	124
A282229	0.01		<2	126	8	120
A282230	0.01		<2	44	14	62
A282231	0.01		<2	64	9	66
A282232	0.01		<2	35	11	74
A282233	0.02		<2	37	8	103
A282234	0.01		<2	65	9	118
A282236	0.02		<2	44	8	122
A282237	0.05		<2	114	10	163
A282238	0.05		-IS-	-IS-	-IS-	-IS-
A282239	0.01		-IS-	-IS-	-IS-	-IS-
A282240	0.04		-IS-	-IS-	-IS-	-IS-
A282241	0.01		-IS-	-IS-	-IS-	-IS-
A282242	0.03		-IS-	-IS-	-IS-	-IS-
A282243	<0.01		-IS-	-IS-	-IS-	-IS-
A282244	<0.01		-IS-	-IS-	-IS-	-IS-
A282245	0.04		-IS-	-IS-	-IS-	-IS-

a 40 m interval. An anomalous gold zone was defined adjacent to the quartz vein and along strike. This anomalous zone was further investigated by trenching. Two trenches were excavated using a backhoe with a 4 m depth capability and were channel sampled.

Frances Creek T1 trench is located on 10100N to the north of the quartz ridge. The geology and geochemistry are presented on **DRG No. 8586-60** and results are shown in **Table 3.** The trench intersected a brecciated quartz vein along strike from the main quartz vein and intruded into altered and sheared dolerite. The geochemistry of the horizontal channel samples were not encouraging. The gold results were low with a maximum of 0.16 ppm Au. The arsenic assays were high (2730 ppm As) and indicate the presence of sulphides within the vein system, supporting the petrological conclusions.

Frances Creek T2 was excavated on the south side of the main quartz vein and the geology and geochemistry are presented in **DRG No 8586-61.** The trench intersected altered and sheared Zamu Dolerite with low geochemistry (maximum 0.05 ppm Au and 15 ppm As). The trench failed to locate the source of the anomalous gold within soil samples.

Profiles from the ground magnetic survey are presented on **DRG No. 8586-59.**

10. CONCLUDING REMARKS

An area of anomalous gold in soil samples has been defined overlying the Zamu Dolerite. This area is related to a quartz-vein system with associated high arsenic values. Further investigation by channel sampling in two trenches did not confirm the soil gold anomaly. However, of the two trenches excavated, the northern trench intersected a brecciated quartz vein with adjacent altered dolerite which returned low-order gold assays.

Further work within EL 4744 should concentrate on further investigations within the Frances Creek Mine Grid. Such work should include shallow percussion drilling to test the altered dolerite adjacent to the brecciated quartz vein.

11. REFERENCES

ANDERSON, C.G. (1986)
Interpretation of Airborne Geophysical Survey Results, Frances Creek Area, NT.
EMR 14/86. CSR Limited, Mineral Exploration and Development Group (unpublished report)

BARTRAM, G.D. and MCCALL, G.J.H. (1971)
Wall-rock Alteration Associated with Auriferous Lodes in the Golden Mile, Kalgoorlie.
Special Publication. Geological Society of Australia, pp 191-199

COLVIRE, A.C., ANDREWS, A.J., CHERRY, M.E., DUROCKER, M.E., FYON, A.J., LASVIGINE, J., SOUSAN MARMONT, POUSEN, K.H., SPRINGER, J.S. and TROOP, D.G. (1984)
An Integrated Model for the Origin of Archean Lode Gold Deposits.
Ontario Geological Survey, Open File Report 5524

FERGUSON, J. and NEEDHAM, R.S. (1978)
The Zamu Dolerite. A Lower Proterozoic Pre-orogenic Continental Tholeiitic Suite from the Northern Territory, Australia.
Journal of the Geological Society of Australia, Vol. 25, pp 309-322

GROVES, D.I., PHILLIPS, S.F., HENDERSON, C.A., CLARK, M.E. and WOOD, G.M. (1982)
Controls on Distribution of Archean Hydrothermal Gold Deposits in Western Australia in Gold 82, pp 689-711

GROVES, D.I., HO, S.E., HOUSTON, S.M., PHILLIPS, G.N. (1986)
A review of Gold Deposits in the Archean Greenstone Belts of Western Australia.
13th CMMI Congress Proceedings, Volume 2, Singapore

NEEDHAM, R.S., CRICK, I.H. and STUART-SMITH, P.G. (1980)
Regional Geology of the Pine Creek Geosyncline in Uranium in the Pine Creek Geosyncline, Proceeding Series, IAEA, Vienna, pp 1-22

NEEDHAM, R.S. and STUART-SMITH, P.G. (1984)
The Relationship between Mineralisation and Depositional Environment in Early Proterozoic Metasediments of the Pine Creek Geosyncline in Darwin Conference, 1984. The Aus.I.M.M., pp 201-211

NICHOLSON, P.M. (1980)
The Geology and Economic Significance of the Golden Dyke Dome, Northern Territory in Uranium in the Pine Creek Geosyncline, Proceeding Series, IAEA, Vienna, pp 319-334

PAGE, R.W., COMPSTON, W. and NEEDHAM, R.S. (1980)
Geochronology and Evolution of the Late-Archean Basement and Proterozoic Rocks in the Alligator Rivers Uranium Field, Northern Territory, Australia, Proceeding Series, IAEA, Vienna, pp 39-68

PHILLIPS, G.N., and GROVES, E.I. (1984)
An Epigenetic Origin for Archean Banded Iron Formation - Hosted God Deposits.
Economic Geology, Vol. 79, 1984, pp 162-171

RHODES, J.M. (1965)
The Geological Relationships of the Rum Jungle Complex, Northern Territory.
Rep. Bur. Miner. Resources Geo. Geophys. Aust. 89

STUART-SMITH, P.G. and NEEDHAM, R.S. (1984)
Hydrothermal Mineral Deposits and the Association with Granitoids in the Cullen Mineral Field, Northern Territory in Darwin Conference, 1984.
Aus.I.M.M., pp 329-338

WALPOLE, B.P., CROHN, P.W., DUNN, P.R. and RANDALL, M.A. (1968)

Geology of the Katherine-Darwin Region, Northern Territory.

Bull. Bureau Mineral Resources Geol. Geophys. Australia 82

DSH/SGL
May 1987

APPENDIX I

PETROGRAPHIC DESCRIPTIONS

CENTRAL MINERALOGICAL SERVICES

Date 5th November, 1984

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
194324
Quartz Vein with Goethite

Job No. CMS 84/10/21 Date Received: 22.10.1984

Reference Purchase Order No. 43333

Sample No. 194324

Nature of Sample: Hand Specimen

DESCRIPTION **SECTION No.** T.S., P.S. 51781

a. Hand Specimen:

Quartz vein with goethite patches, veins.

b. Microscopic:

The sample is a simple vein quartz assemblage traversed by younger goethite-quartz veins; there is no indication of dolerite or other host rocks.

The quartz is typical vein material, with coarse columnar crystals merging into finer quartz mosaics, devoid of other features or minerals. The goethite veins, which contain minor quartz and are generally edged with quartz (some of which contains minute carbonate inclusions), consist of cellular and colloform-banded material; the cellular goethite represents oxidised granular pyrite, and the colloform-banded goethite, with possible lepidocrocite, is redeposited material derived from elsewhere.

No gold was detected either in the polished section or the rock chips (which were carefully examined under the stereobinocular microscope); however, gold could be present elsewhere and would need to be proved by assay before a detailed mineralogical investigation is justifiable.

H.W. Fander, M. Sc.

Mintek SERVICES
27 Burma Road Lesmurdie Western Australia 6076
PO Box 242 Kalamunda Western Australia 6076
Telephone: (09) 291 7491

3rd December, 1986

Messrs D. Heyworth & K. Hamilton
CSR Limited
PO Box 39318
WINNELLIE NT 5789

Mineragraphic Reports IL 24570 - IL 24574

Sample Numbers 277774
277775
277776
277778
277779

Petrographic Report IL 24575

Sample Number 277780

Purchase Order 45534
Sample Despatch Sheet 17719
10th October, 1986

J.E. Borner

MINTEK SERVICES

MINERAGRAPHIC DESCRIPTION

Sample No. 277774 CSR Registered No. IL 24570
Polished section

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: Small rock sample from vein system within a dolerite.
Minerals Visible: Goethite and/or hematite, and minor quartz.
Texture: Cellular and sponge textured.
Colour: Dark brown and reddish brown.
Grain Size: Very fine-grained.
Other Comments: This finely porous ferruginous rock appears under a binocular microscope to be predominantly composed of indigenous goethite and/or hematite derived from a massive sulphide mineral with the composition of pyrite or pyrrhotite, that exhibits very fine crinkly cellular boxwork textures, and sponge textures typical of both iron sulphide minerals.

MICROSCOPIC CHARACTERISTICS

MINERAGRAPHY

Constituents: (Percent visual estimate)

40% Indigenous goethite and hematite occur in about equal abundance as very fine interlocking granular aggregates derived from oxidized massive primary pyrite, or pyrrhotite derived secondary pyrite, or marcasite, that exhibit the diagnostic crinkly cellular boxwork textures, and thin and thick walled sponge textures of these common iron sulphide minerals. No particles of supergene native gold, silver halides, or boxwork patterns after other sulphide minerals are exposed in interstitial or intergranular sites. Masking by copious exotic goethite could have obscured the finer grained sulphide textures once present.

60% Exotic goethite, and minor associated hematite, occur abundantly as granular and colloform banded aggregates that enclose no supergene Au particles. Anomalous Cu and Zn values could be present in the Fe-oxides. Very little quartz is enclosed.

Texture: Finely cellular and sponge textured.
Surficial Alteration: Weathering and oxidation (ferruginization).

Morphology: A weathered and ferruginized, pyrite-?pyrrhotite gossan.

.../2

Sample No. 277774 CSR
Polished section

Remarks: Since pyrrhotite derived secondary pyrite often exhibits no relic basal cleavage traces after pyrrhotite, and develops identical cellular boxwork and sponge textures as primary pyrite, it can only be assumed that pyrrhotite could have been associated with the pyrite prior to oxidation. No supergene Au particles are exposed in the Fe-oxides.

ROCK NAME: WEATHERED & FERRUGINIZED, PYRITE-?PYRRHOTITE GOSSAN.

MINTEK SERVICES

MINERAGRAPHIC DESCRIPTION

Sample No. 277775 CSR Registered No. IL 24571
Polished section

MEGASCOPIC CHARACTERISTICS

Field Name: Probably a dolerite.
Nature of Sample: Small rock sample from dolerite flanking the vein system.
Minerals Visible: Fine oxide and sulphide minerals, and silicate minerals.
Texture: Finely granular.
Colour: Yellowish white, and grey.
Grain Size: Very fine-grained.
Other Comments: This weakly sheared mafic igneous intrusive exhibits under a binocular microscope discrete grains and clusters of pyrrhotite or secondary (supergene) pyrite, and oxidized secondary pyrite replicas composed of indigenous goethite or hematite. The essential and primary silicate minerals will not be described in these mineragraphic reports since only reflected light will be used.

MICROSCOPIC CHARACTERISTICS

MINERAGRAPHY

Constituents: (Percent visual estimate)

1% Pyrrhotite remnants and secondary pyrite occur as fine, discrete, often oriented subhedral and euhedral grains and clusters of the former, and as replicated forms of the latter after pyrrhotite that exhibit all phases of oxidation to indigenous goethite, and minor hematite. Primary pyrite grains are rare. No native gold inclusions are exposed in the po, py or Fe-oxides replicas. Trace chalcopyrite is present as two blebs.

2% Indigenous goethite and minor hematite occur as fine, subhedral and euhedral replicas after oxidized pyrrhotite, that occasionally exhibit very fine cellular boxwork and sponge textures, and "birdseye" textures that are typical of secondary pyrite, ex-pyrrhotite. These replicated shapes often enclose very fine secondary pyrite and pyrrhotite remnants, but no supergene gold particles.

10% Titanite (sphene) ex-titanomagnetite and ilmenite occurs as very fine anhedral to euhedral grains and clusters, and granular aggregates locked in the silicates.

87% Silicate minerals occur as interlocking aggregates of pyroxene and plagioclase.

.../2

Sample No. 277775 CSR
Polished section

Texture: Finely granular.
Supergene & Near Surface Alteration: Pyrrhotite to pyrite, and secondary pyrite to indigenous Fe-oxides.

Morphology: Minor fine disseminated, fresh and oxidized pyrrhotite and pyrite in weakly sheared mafic intrusive (?quartz dolerite).

Remarks: The pyrrhotite and supergene pyrite grains are seen to have been partially to almost completely oxidized to indigenous Fe-oxides replicas. No particles of gold are present in the py, po, or oxidized replicas of these two sulphide minerals.

ROCK NAME: MINOR FINE DISSEMINATED, FRESH & OXIDIZED PYRRHOTITE & PYRITE IN WEAKLY SHEARED MAFIC INTRUSIVE (?QUARTZ DOLERITE).

MINTEK SERVICES

MINERAGRAPHIC DESCRIPTION

Sample No. 277776 CSR Registered No. IL 24572
Polished section

MEGASCOPIC CHARACTERISTICS

Field Name: Vein quartz.
Nature of Sample: Small sample of vein quartz from a vein system in dolerite.
Minerals Visible: Quartz, and minor dusty opaques.
Texture: Finely granular.
Colour: Minor brown.
Grain Size: Very fine-grained.
Other Comments: The only opaque mineral visible under a binocular microscope appears to be goethite and/or hematite as interstitial anhedra and clusters that exhibit no relic sulphide textures. No discrete particles of native gold, or sulphide or arsenide minerals can be seen in interstitial or intergranular sites.

MICROSCOPIC CHARACTERISTICS

MINERAGRAPHY

Constituents: (Percent visual estimate)

(Trace) Pyrite occurs as one interstitial subhedral grain locked in the fractured vein quartz. No native Au, Au-Ag-Pb-Hg-Bi telluride minerals, silver sulphosalts, base metal sulphide minerals, stibnite, arsenopyrite, or loellingite particles are exposed. This was confirmed with the SEM. Molybdenite is not exposed.

(Trace) Exotic goethite occurs as very fine granules and clusters in the vein quartz, particularly along microfractures and grain boundaries. Sulphide derived indigenous Fe-oxides replicas are not exposed.

99% Quartz, variety vein quartz, occurs as macrocrystalline mosaic textured aggregates dusted in places by exotic goethite. It was weakly fractured, but contains no hydrothermal silicate minerals, or carbonate minerals, or later introduced quartz phases.

Texture: Finely granular.
Near Surface Alteration: Slight oxidation.

Morphology: Trace interstitial pyrite in weakly fractured and oxidized vein quartz.

.../2

Sample No. 277776 CSR
Polished section

Remarks: Despite the absence of optically and SEM detectable particles of native gold, and often associated sulphide and arsenide minerals, unexposed Au and sulphide particles could still be present in the vein quartz. Dolerite and gabbro hosted auriferous quartz lodes often contain minor base metal sulphide minerals, tetrahedrite, and arsenopyrite in proximity to gold concentrations.

ROCK NAME: TRACE INTERSTITIAL PYRITE IN WEAKLY FRACTURED & OXIDIZED VEIN QUARTZ.

MINTEK SERVICES

MINERAGRAPHIC DESCRIPTION

Sample No. 277778 CSR Registered No. IL 24573
Polished section

MEGASCOPIC CHARACTERISTICS

Field Name: Not given.
Nature of Sample: A ferruginous rock sample.
Minerals Visible: Goethite and/or hematite, and minor silicate minerals.
Texture: Finely cellular boxwork and sponge textured (semi-massive).
Colour: Dark brown and reddish brown.
Grain Size: Very fine-grained.
Other Comments: This porous ferruginous rock appears under a binocular microscope to be a gossan, since very fine cellular boxwork and sponge textured aggregates of sulphide derived indigenous goethite or hematite can be seen. Pyrite of either primary or secondary origin was probably dominant as the sponge textures suggest.

MICROSCOPIC CHARACTERISTICS

MINERAGRAPHY

Constituents: (Percent visual estimate)

30% Indigenous goethite and hematite occur in about equal abundance as very fine interlocking granular aggregates that exhibit the diagnostic crinkly cellular boxwork textured, and thin and thick walled sponge textured aggregates of oxidized primary or secondary pyrite, with the latter ex-monoclinic or hexagonal pyrrhotite. The indigenous Fe-oxides have been rimmed by very fine granular and colloform banded aggregates of exotic goethite and hematite that enclose no supergene Au particles, Ag-halide minerals, or secondary Pb, As or Zn minerals.

60% Exotic goethite and hematite occur as very fine colloform banded and granular aggregates that rimmed and often masked the indigenous Fe-oxides. Anomalous Cu and Zn values could be present due to the effects of scavenging during precipitation processes.

10% Quartz occurs as fine anhedra and clusters locked in the indigenous and exotic Fe-oxides.

Texture: Finely cellular boxwork and sponge textured.
Surficial Alteration: Weathering and oxidation.

.../2

Sample No. 277778 CSR
Polished section

Morphology: A weathered and ferruginized (oxidized) pyrite gossan.

Remarks: The indigenous and exotic Fe-oxides are seen in reflected light to be devoid of supergene gold inclusions. Primary or secondary pyrite was the only sulphide mineral present in any abundance prior to oxidation. The quartz contains no gold or sulphide inclusions.

ROCK NAME: WEATHERED & FERRUGINIZED (OXIDIZED) PYRITE GOSSAN.

Sample No. 277779 CSR
Polished section

Remarks: The prismatic and bladed indigenous Fe-oxides replicas after oxidized crystalline pyrite clusters and aggregates exhibit the typical crinkly cellular boxwork and thin and thick walled sponge textures of that common iron sulphide mineral. No primary or supergene gold particles are exposed.

ROCK NAME: WEATHERED & FERRUGINIZED, SILICEOUS CRYSTALLINE PYRITE GOSSAN.

E.L. 4729

E.L. 4744

E.L. 4246

E.L. 3174

RUN 13-25

RUN 13-10

RUN 13-07

RUN 3

Frances Creek

gossan

Fe

Kp

Ppm

Ppw

Pdz

Pdz1

Pgc

Qa

8 508 000mN

8 500 000mN

8 495 000mN

8 490 000mN

802 000mE

807 000mE

812 000mE

817 000mE

822 000mE

827 000mE

LEGEND

ALLUVIUM
Qa — Silt, sand, clay, black soil plain.

PETREL FORMATION
Kp — Fine to course sandstone, siltstone and conglomerate.

CULLEN GRANITE
Pgc — Fine to course grained, pink-green hornebende-biotite granite.

ZAMU DOLERITE
Pdz — Mainly massive, green, fine to medium grained dolerite-quartz dolerite.
Pdz1 — Quartz-biotite monzonite Pdz differetiate?

WILDMAN SILTSTONE
Ppw — Ferruginous siltstone, shale and fine grained quartzite. Minor carbonate lenses.

MUNDOGIE SANDSTONE
Ppm — Medium to course grained quartzite, sandstone and arkose.

MASSON FORMATION
Pnm — Siltstone and shale (variably carbonaceous and ferruginous) with minor quartzite and sandstone.

Vein or dyke, filling unknown.

Quartz vein or blow.

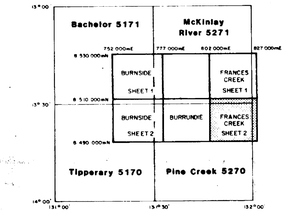
Fault or sedimentary ferruginous quartz and/or siltstone breccia.

GEOLOGICAL BOUNDARIES
Alluvium contact
Geological contact, approximate
Geological contact, inferred
Unconformity

STRUCTURE
Fault, position approximate
Plunging anticline
Plunging syncline
Airphoto lineament
Strike and dip of strata
45 Measured
Shallow, moderate, steep

MISCELLANEOUS
Road
Vehicle track
Old mine
Prospect, little or no production
Landing ground
Railway line, disused
RUN13-28 Photo centres
Drainage
Fence

0 0·5 1·0 1·5 2·0 2·5
Kilometres



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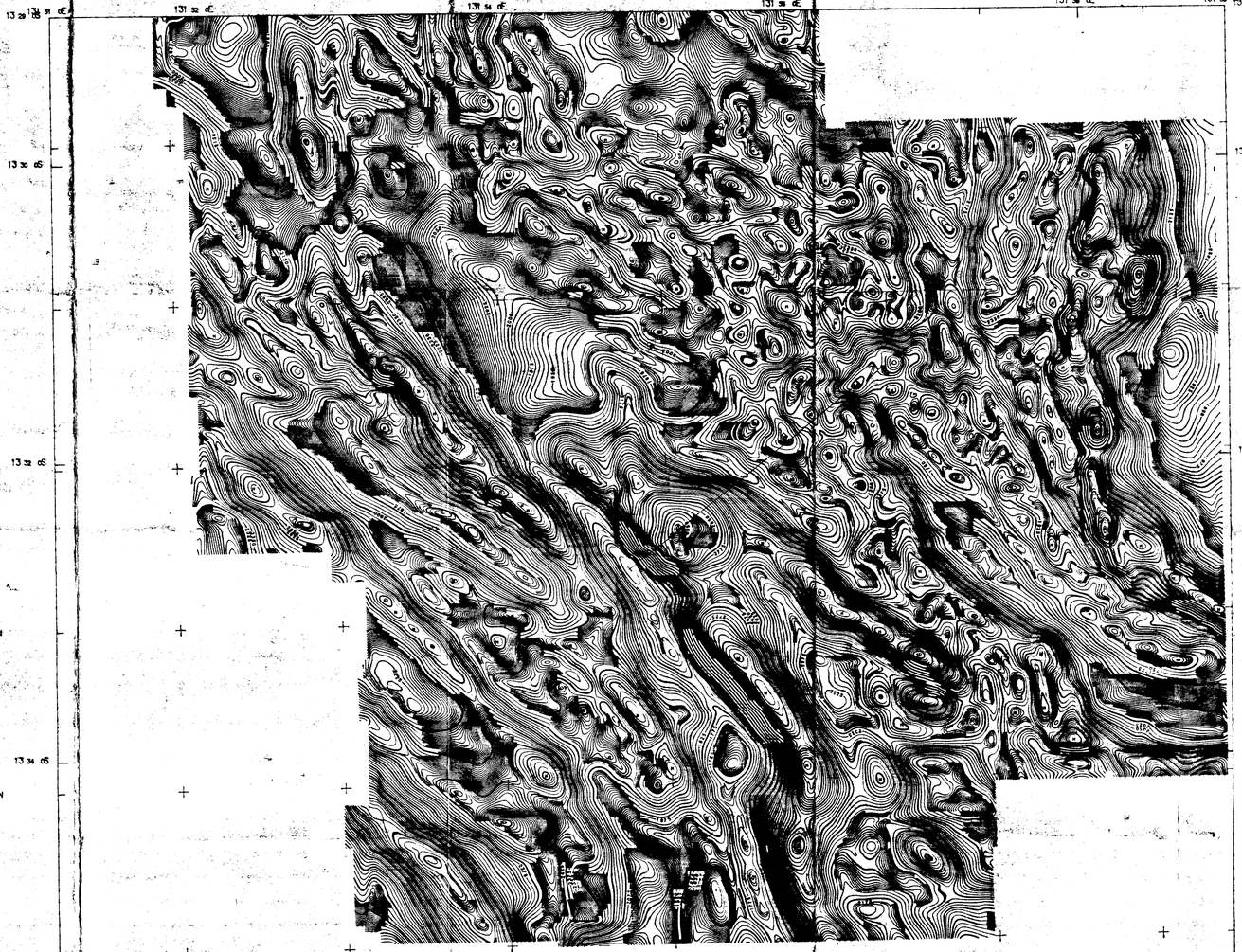
FRANCES CREEK SHEET 2
GEOLOGY

AUTHOR M. IONS	MAP REF
DATE MAY 1986	
DRAWN C.S.D.S.	REVISED T.JUST MAY 1986
SCALE 1:25 000	PLAN No. 8586-9

CR87/160



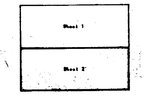
AIRBORNE SURVEY SPECIFICATIONS

FLOWN BY	: Geoterrex for CSR Limited
DATE FLOWN	: April, 1985
FLIGHT LINE ORIENTATION	: East-West
FLIGHT LINE SEPERATION	: Traverse lines at 200 metres Tie-lines at 3.0 km
RECORDING INTERVAL	: 1.0 sec (approx. 60m sampling) at mean ground speed of 220 km/hour
NOMINAL TERRAIN CLEARANCE	: Both detectors at 90 m in aircraft
FLIGHT PATH RECORD	: Geocam 35mm tracking camera
FLIGHT LINE RECOVERY	: Visually to 1:20,000 colour enlarged low level photography
MAGNETOMETER	: Geotron vapour optical absorption Sensitivity of 0.04 nT
RECORDING INTERVAL	: 0.2 sec (approx. 13m sampling)
SPECTROMETER	: Nuclear Data 256 channel ADC Volume of 33.1 litres
TOTAL COUNT WINDOW	: 0.8 - 3.00 MeV
AUX. URANIUM WINDOW	: 1.048 - 1.21 MeV
POTASSIUM WINDOW	: 1.36 - 1.56 MeV
URANIUM WINDOW	: 1.66 - 1.86 MeV
THORIUM WINDOW	: 2.42 - 2.82 MeV

DATA PROCESSING

Sheet 2 of 2
Grid notation refers to Australian Map Grid Zone 52
Digitised from 1:20000 colour photography enlargements

Data reduction	:	CSR Minerals, E & D Group
Plotted	:	Calcomp 960
Grid Mesh Size	:	50 x 75 m
Grid Filter	:	Polynomial, radius 125 metres
TORF(1980.0)	:	Removed, Datum 2000 nT added
Contour Intervals	:	5,25,100,500,1000,2500 and 5000 nT



0 0.5 1.0 1.5 2.0 Km
SCALE 1:25000

CSIRO

CSR LIMITED - MEDG	
FRANCES CREEK N.T.	
Sheet 2 of 2 AEROMAGNETIC DATA CONTOUR INTERVAL = 5 nT	
SCALE : 1:25000 AUTHOR : DATE : 17-JUL-85 REVISED :	DRG No. 6586-11

CR87/160

SHEET 2

810000E

814000E

818000E

8516000N

8512000N

8508000N

8504000N

8500000N

8496000N

131°59'E

13°30'S

13°34'S

"GEORGETTE"

"F5"

"F6"

"F2"

"F3"

"F4"

"F1"

F2

F1

B

L2

L5

L6

L1

L4

L3

A

C

D

ZONE OF CONTACT METAMORPHISM

FRANCES CREEK

LEGEND

- Interpreted fault (Major)
- " " (Secondary)
- Fault or Discontuity — Parallel to "Shoebridge — Sleisbeck Lineament."
- Magnetic Zone Boundary
- Major magnetic horizon within Masson Formation
- Area of secondary magnetic relief, including Zamu Dolerite, with positive magnetic axis position
- Positive magnetic feature, compatible with pyrrhotite source.
- Magnetic low, compatible with alteration effects.
- Linear magnetic low, possibly reflecting shearing
- Area of anomalous positive radiometric response
- Ground Magnetic Traverse.

0 1000 2000 Metres

CSR LIMITED — MEDG

FRANCES CREEK

INTERPRETATION OF DETAILED AEROMAGNETICS

Geo: C.G.A.	Scale, 1:25,000	Dwg N°: 8586-12
Date: Feb. 1986	FIGURE 7	

GR 87/100

E.L.4729

E.L. 4744

E.L. 4246

E.L. 4246

E.L.3174

RUN 13-25

RUN 13-28

RUN 1-10

RUN 13-07

RUN 2-113

RUN 2-116

RUN 3-11

RUN 3-08

202329 0·19

202330 0·07

202332 1·01

202331 0·36

202335 0·01

202334 0·30

218381 0·41

218382 0·04

218383 <0·01

202338 0·06

202339 0·86

202341 0·11

202342 0·08

202336 (0·01)

202335 (0·01)

218771 0·11

218713 0·09

202274 0·09

218785 0·08

202276 SAMPLE LOST

202199 1·09

202196 (0·01)

201939 0·49

201936 (0·01)

201939 0·39

201941 0·26

201942 0·88

202275 0·09

218774 0·30

218775 0·19

218782 0·33

218796 0·30

218784 0·39

218794 0·39

218776 0·23

218779 0·11

218777 0·28

218778 0·50

202273 0·17

201998 0·06

201949 0·51

201995 (0·01)

201997 0·15

201996 (0·01)

201944 (0·01)

218792 0·81

218791 1·05

201945 0·28

200946 0·06

201943 0·26

201948 (0·01)

201947 0·06

218769 0·11

218786 0·19

218787 0·32

218785 0·19

218795 0·09

8 510 000mN

8 505 000mN

8 500 000mN

8 495 000mN

8 490 000mN

802 000mE

807 000mE

812 000mE

817 000mE

822 000mE

827 000mE

13°30'

13°00'

132°00'

LEGEND

- Watercourse
- Graded road
- Track
- Railway, disused
- Landing ground, disused.
- Fence
- No. Au 202104 1·50 — Bulk gold sample location, sample number, value in ppb and priority.
- 218383 — Follow up sample location and number.

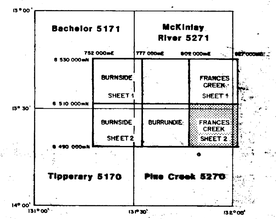
PRIORITY RATING

SAMPLE CLASS	A	B	C
1 (HIGH)	>6·5	13·5	>1·3
2 (MEDIUM)	3·0-6·4	1·5-3·4	1·2-0·4
3 (LOW)	1·5-2·9	0·7-1·4	0·2-0·3
4 (NOT SIG.)	0·9-1·4	0·3-0·6	N.A.

SAMPLE CLASSIFICATION

COLD EXTRACTABLE Fe	POINT SCORE	ORGANIC MATTER	POINT SCORE	VISUAL QUARTZ CONTENT	POINT SCORE
0 - 0·5%	3	0 - 3·5	3	>80%	4
0·5 - 1·0%	2	3·5 - 7·0%	2	40 - 80%	3
>1·0%	1	>7·0%	1	20 - 40%	2
				<20%	1

TOTAL POINTS	CLASSIFICATION
3 - 7	A
8 - 9	B
10	C



CSR LIMITED - MEDG

FRANCES CREEK SHEET 2

BULK STREAM SEDIMENT SAMPLE LOCATIONS

AUTHOR	T. JUST	MAP REF	
DATE	DEC. 1986	CHECKED	DSH FEB 1987
DRAWN		REVISED	
SCALE: 1:25 000		PLAN No. 8586	

EN87160

LEGEND
218798 Composite rock chip sample location & No.
P194257 Petrological sample number
Cr/Fe/Cu/As/Au/Au (repeat) ppm % ppm ppm ppm ppm
— Element not assayed
< Below detection limit
Prospect, little or no production
Creek
Track
Airstrip, disused.
TRENCH LOCATION
FRANCK T-5 TRENCH NUMBER
400 N
200 N
000 N
200 E
ANOMALY 'B'
GROUND MAGNETIC GRID WITH LOCAL CO-ORDINATES WITH NAME ANOMALY
EL 4246
EXPLORATION LICENCE BOUNDARY AND E.L. NUMBER
REGIONAL SOIL LINES
TRAVERSE NUMBER
POSITION OF TRAVERSE
DISTANCE ALONG TRAVERSE
SOIL SAMPLE NUMBER
McKeddies Diggings
ANOMALY 'B' GRID 6
EL 4729
EL 4246
EL 4744
Batchelor 5171
McKinlay River 5271
BURNSIDE SHEET 1
BURNSIDE SHEET 2
BURRUNDIE
FRANCES CREEK SHEET 1
FRANCES CREEK SHEET 2
Tipperary 5170
Pine Creek 5270
800 0 200 400 600 800m
CSR LIMITED - MEDG
FRANCES CREEK
LOCATION OF:
—ROCK CHIP AND PETROLOGY SAMPLES—
—SOIL AND GROUND MAGNETIC LINES—
—GROUND MAGNETICS GRIDS—
AUTHOR : T.JUST
MAP REF :
DATE : Dec, 1986
DRAWN : AD. REP
REVISED : DSH APRIL '87
SCALE : 1 : 10 000
PLAN No 8586-15

CR87/160

812 000mE
814 000mE
816 000mE
818 000mE
820 000mE
822 000mE
8 512 000mN
8 510 000mN
8 508 000mN
8 506 000mN
8 504 000mN

ANOMALY 'B'
GRID 6

F16/700
302422
F15/700
302410
F15/500
302400
F6/700
255962
F2/2500
256819
F2/000
256694
F3/1200E
255725
F3/2000W
255595
F3/000E
255785
F7/1000E
255720

X 218384 35/27-2/251/6/0-11
X 218389 11/21-0/123/8/0-09/0-08
X 218388 14/20-2/352/4/0-08
X 218386 11/30-8/570/12/0-54/0-50
X 218387 18/31-7/378/12/0-22
X 218385 19/36-7/359/12/0-10
X 218391 53/7-25/34/40/0-04
218392 16/4-10/38/6/0-07
X 218393 7/19-7/209/4/0-07
P 194265
X 194264 65/4-8/40/11/-0-005
X 218417 74/4-85/70/6/0-03
218418 104/5-70/49/21/0-01
X 218419 63/3-97/34/139/0-03
X 202217 540/9-0/60/-/-0-002
P 194267
P 194268
194269
X 218420 91/4-75/50/17/0-02
70/5-5/30/15/0-01
X 194269 45/61/40/11/-0-005
X 218398 128/26-6/362/6/0-06
218399 84/27-0/388/11/0-16
218400 144/10-0/18/12/013
X 218394 246/12-8/22/8/0-04
218395 81/24-0/117/6/0-13
X 218396 33/13-0/454/8/0-37
P 194271
X 194270 45/4-5/64/4/0-010
X 218404 122/12-0/28/12/0-07
P194279 X 218417 160/8-35/45/6/0-07
X 218403 80/27-0/242/12/0-29/0-26
X P 194280
X 218412 18/2-00/16/12/0-03/0-03
218405 54/10-9/14/12/0-07
218406 56/204/208/12/0-32/0-47
X 194281 170/198/290/7/0-30
218414 162/32-0/374/12/0-16
X P 218131
218130 186/15-5/43/18/0-04
218132 107/30/275/12/0-07
218415 620/6-85/45/12/0-06
218416 590/9-55/27/29/0-03
X P 218128
218127 35/39-0/1250/4/0-06
X 218129 62/29-4/265/18/0-04
X P 194282
218408 282/4-05/48/12/0-03
X 218409 110/7-2/58/6/0-04/0-06
X 218411 48/25-0/557/4/0-03
194283 75/8-8/40/9/0-015

LOCATION 56 NORTH (Magnetics)
LOCATION 56
BASELINE
LOCN 56
0055AN
10 000N
10 000E
See item for details
X P 194273
194273 & 45/7-4/10/11/0-075
P 194275
X 194274 85/20-1/270/290/6-47/5-00

EL 4729
EL 4246
EL 4744

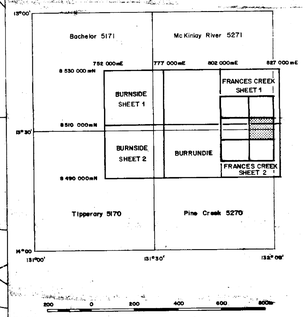
1700 E
1600 E
1500 E
1400 E
1300 E
1200 E
1100 E
1000 E
900 E
800 E
700 E
600 E
600N
400N
200N
000N
2000 N
1800 N
1600 N
1400 N
1200 N
1000 N
800 N
600 N
400 N

LEGEND

218398 X — Composite rock chip sample location & No.
P194279 — Petrological sample number
Cr / Fe /Cu / As / Au / Au(repeat)
ppm % ppm ppm ppm ppm
— Element not assayed
< Below detection limit.
Creek
Track
Fence
3 000E
400N
200N
000N
ANOMALY 'B'
GROUND MAGNETIC GRID WITH LOCAL CO-ORDINATES WITH NAME ANOMALY
EL 4246
EXPLORATION LICENCE BOUNDARY AND E.L. NUMBER

REGIONAL SOIL LINES

TRAVERSE NUMBER — F9/000
POSITION OF TRAVERSE
DISTANCE ALONG TRAVERSE — F9/2600
253693
SOIL SAMPLE NUMBER

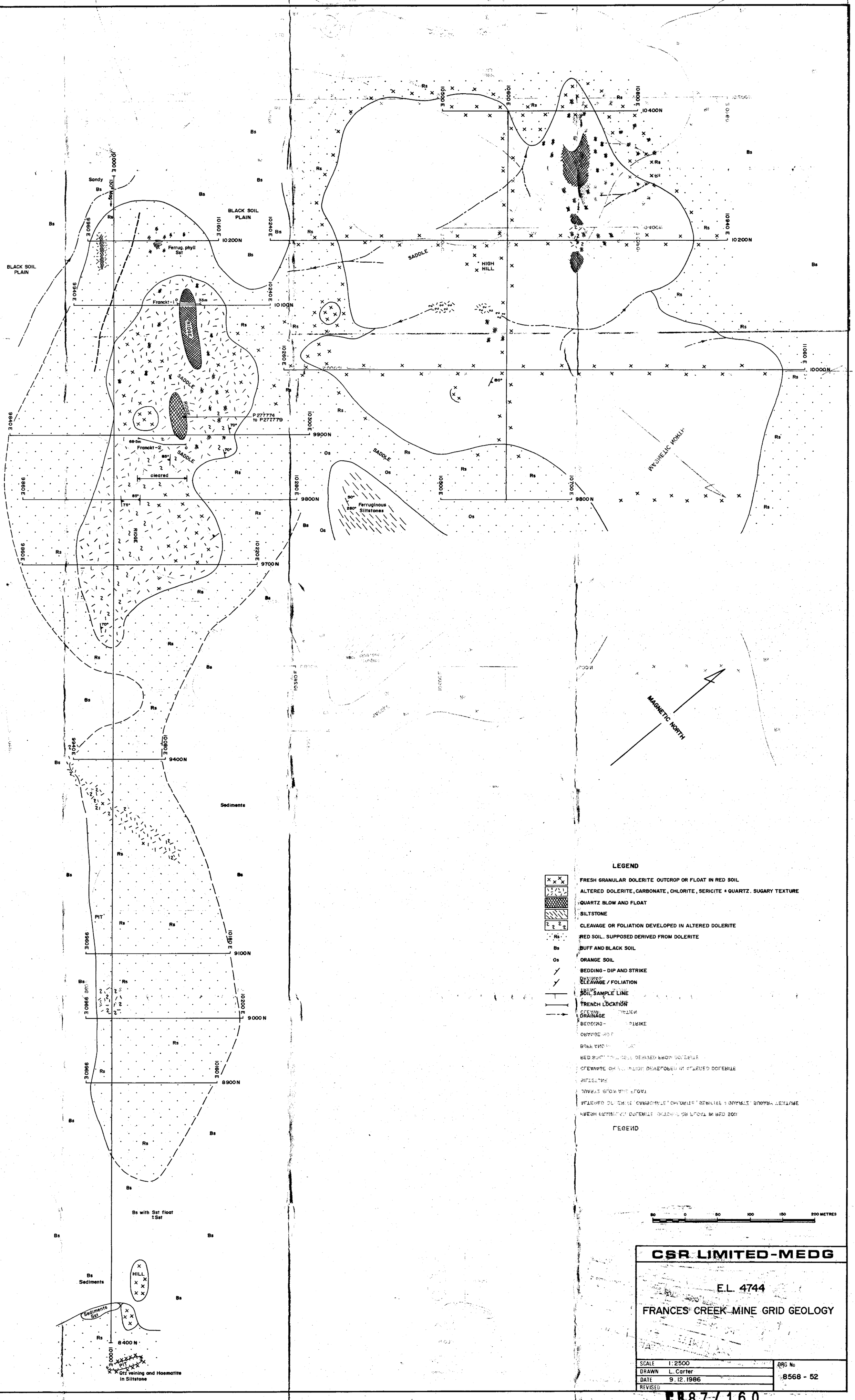


CSR LIMITED - MEDG

FRANCES CREEK
LOCATION OF:
—ROCK CHIP AND PETROLOGY SAMPLES—
—SOIL AND GROUND MAGNETIC LINES—
— GROUND MAGNETICS GRIDS.—

AUTHOR :	T. JUST	MAP REF:	
DATE :	DEC, 1986		
DRAWN :	AD. REP	REVISED : DSH	APRIL 1987
SCALE :	1 : 10 000	PLAN No:	8586-16

CR87/160



LEGEND

- FRESH GRANULAR DOLERITE OUTCROP OR FLOAT IN RED SOIL
- ALTERED DOLERITE, CARBONATE, CHLORITE, SERICITE ± QUARTZ. SUGARY TEXTURE
- QUARTZ BLOW AND FLOAT
- SILTSTONE
- CLEAVAGE OR FOLIATION DEVELOPED IN ALTERED DOLERITE
- Rs — RED SOIL. SUPPOSED DERIVED FROM DOLERITE
- Bs — BUFF AND BLACK SOIL
- Os — ORANGE SOIL
- BEDDING - DIP AND STRIKE
- CLEAVAGE / FOLIATION
- SOIL SAMPLE LINE
- TRENCH LOCATION
- DRAINAGE

80 0 50 100 150 200 METRES

CSR LIMITED-MEDG

E.L. 4744

FRANCES CREEK MINE GRID GEOLOGY

SCALE	1:2500
DRAWN	L. Carter
DATE	9.12.1986
REVISED	

ORG No 8568 - 52

CR 87/160

811000E
811250E
811500E
811750E
8504500N
8504250N
8504000N
8503750N
8503500N
8503250N
8503000N

0 50 100 150 200metres

SCALE 1:2500

CSR LIMITED
MINERALS EXPLORATION & DEVELOPMENT GROUP

CSR LIMITED - MEDG

FRANCES CREEK, N.T. - EL 4744

FRANCES CREEK MINE GRID
SOIL SAMPLE LOCATIONS

SCALE : 1: 2500
AUTHOR :
DATE : 12-MAY-87
REVISED :

DRG No.
8586-53

CR87/160

811000E
811250E
811500E
811750E
8504500N
8504250N
8504000N
8503750N
8503500N
8503250N
8503000N

0 50 100 150 200metres
SCALE 1:2500

CSR LIMITED
MINERALS EXPLORATION & DEVELOPMENT GROUP

CSR LIMITED -. MEDG

FRANCES CREEK. N.T. -. EL 4744

FRANCES CREEK MINE GRID
SOIL Cu RESULTS (ppm)

SCALE : 1: 2500	DRG No.
AUTHOR :	8586 - 54
DATE : 13-MAY-87	
REVISED :	

CR87/160

811000E 811250E 811500E 811750E

8504500N 8504250N 8504000N 8503750N 8503500N 8503250N 8503000N

0 50 100 150 200metres

SCALE 1:2500

CSR LIMITED
MINERALS EXPLORATION & DEVELOPMENT GROUP

CSR LIMITED - MEDG

FRANCES CREEK, N.T. - EL 4744

FRANCES CREEK MINE GRID

SOIL Fe RESULTS (%)

SCALE	1: 2500
AUTHOR	
DATE	13-MAY-87
REVISED	

DRG No. 8586 - 55

CR87/160

811000E
811250E
811500E
811750E
8504500N
8504250N
8504000N
8503750N
8503500N
8503250N
8503000N

0 50 100 150 200metres

SCALE 1:2500

CSR LIMITED
MINERALS EXPLORATION & DEVELOPMENT GROUP

CSR LIMITED - MEDG	
FRANCES CREEK, N.T. - EL 4744	
FRANCES CREEK MINE GRID SOIL Cr RESULTS (ppm)	
SCALE 1: 2500 AUTHOR DATE 13-MAY-87 REVISED	DRG No. 8586-56

811000E
811250E
811500E
811750E
8504500N
8504250N
8504000N
8503750N
8503500N
8503250N
8503000N

0 50 100 150 200metres

SCALE 1:2500

CSR LIMITED
MINERALS EXPLORATION & DEVELOPMENT GROUP

CSR LIMITED - MEDG

FRANCES CREEK, N.T. - EL 4744

FRANCES CREEK MINE GRID

SOIL Au RESULTS (ppm)

SCALE	1: 2500
AUTHOR	
DATE	13-MAY-87
REVISED	

DRG No. 8586 - 57

CR87/160

811000E
811250E
811500E
811750E
8504500N
8504250N
8504000N
8503750N
8503500N
8503250N
8503000N

0 50 100 150 200 metres
SCALE 1:2500

CSR LIMITED
MINERALS EXPLORATION & DEVELOPMENT GROUP

CSR LIMITED - MEDG

FRANCES CREEK, N.T. - EL 4744

FRANCES CREEK MINE GRID
SOIL Au RESULTS (ppb)

SCALE : 1: 2500
AUTHOR :
DATE : 13-MAY-87
REVISED :

DRG No.
8586-58

CR87/160

N

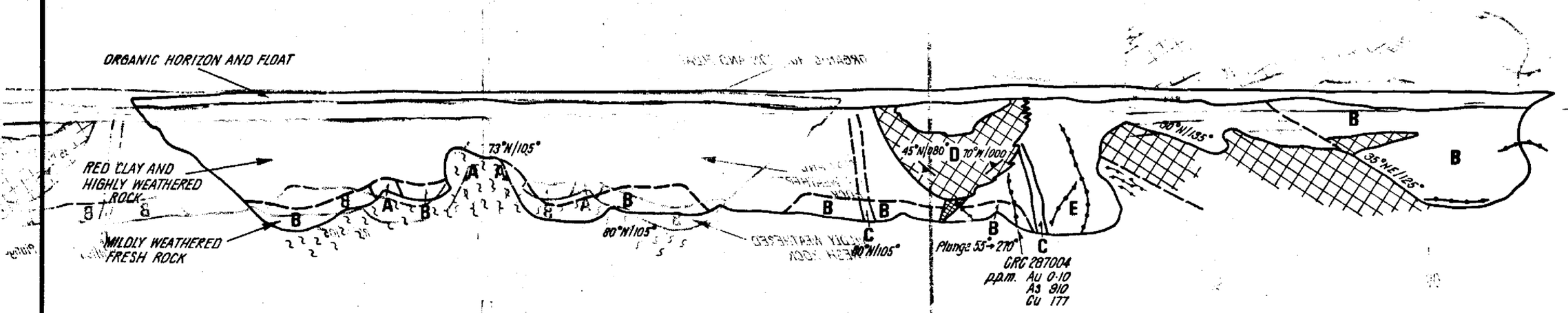
47200.0
47100.0
47000.0
46900.0
46800.0

METRES

CSR Limited AM & C Division

FRANCES CREEK, NT
GROUND MAGNETICS
FRANCES CK MINE GRID

SCALE:	1:5000	DATE:	9 SEPT 86
DRAWN:	GMH	REVN	PLAN NO
CHECKED:			8586-59
APPROVED:			



SAMPLE No.	A282192	A282193	A282194	A282195	A282196	A282197	A282198	A282199	A282200	A282201	A282203	A282204	A282205	A282206	A282207	A282208
Au p.p.m.	0·04	0·01	<0·01	<0·01	<0·01	<0·01	0·01	0·01	0·01	0·01	0·02	0·04	0·06	0·09	0·16	0·12
As p.p.m.	650	140	<2	<2	<2	I.S.	I.S.	230	I.S.	I.S.	2730	410	290	320	400	320
Ag p.p.m	<1	<1	<1	<1	<1	I.S.	I.S.	<1	I.S.	I.S.	<1	<1	<1	<1	<1	<1
Cu p.p.m.	86	120	128	104	52	I.S.	I.S.	71	I.S.	I.S.	198	18	12	22	29	22
Pb p.p.m.	124	29	21	33	16	I.S.	I.S.	11	I.S.	I.S.	19	14	10	11	14	13
Zn p.p.m.	40	155	146	147	152	I.S.	I.S.	96	I.S.	I.S.	23	7	6	12	18	20
Fe %	10·50	11·60	12·06	12·50	13·60	I.S.	I.S.	12·90	I.S.	I.S.	9·50	3·00	3·51	5·44	10·53	10·51

LITHOLOGY

A Fresh green foliated (sheared) silicified altered dolerite. Groundmass of chlorite, sericite and actinolite + carbonate wraps around quartz carbonate and relict feldspar grains.

B Phyllitic foliated (sheared) altered dolerite. Foliation wraps around quartz and weathered feldspar porphyroblasts.

C Creamy clay with gritty quartz fragments.

D Wedge shaped brecciated quartz body plunging 55→270° in trench wall. Clear slightly milky quartz and minor gossanous material. Inclusions of fine grained fibrous siliceous rock.

E Mica rich clay and thin quartz veins.

——— Lithological boundary, definite
– – – Lithological boundary, approx.
Foliated / sheared
Dip and strike of foliation / shearing
Brecciated quartz vein
Thin quartz vein

NOTE : FOR LOCATION REFER DRG. No. 8586-17

CSR LIMITED-MEDG

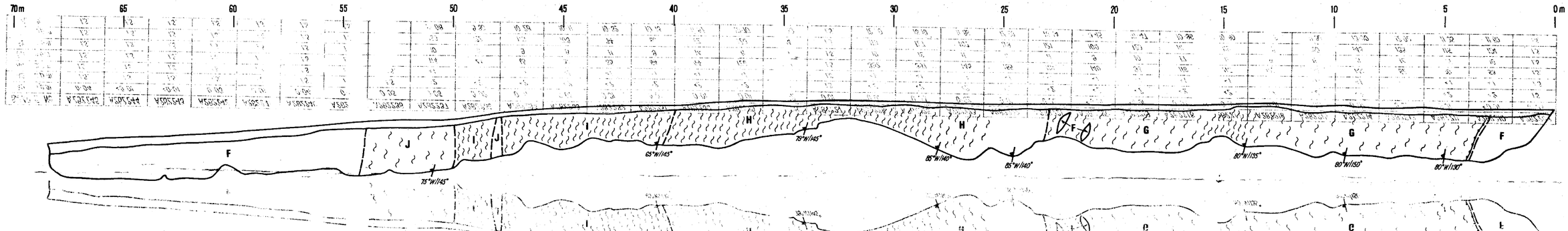
E.L. 4744 FRANCES CREEK N.T.
CASEYS J/V

TRENCH SECTION – FRAN CK T1

SCALE	1:100 V/H = 1
DRAWN	T.J./
DATE	Dec '86
REVISED	May '87

DRG. No. **8586-60**

CRC 87/160



SAMPLE No.	A282245	A282244	A282243	A282242	A282241	A282240	A282239	A282238	A282237	A282236	A282234	A282233	A282232	A282231	A282230	A282229	A282228	A282227	A282226	A282225	A282223	A282222	A282221	A282220	A282219	A282218	A282217	A282216	A282215	A282214	A282212	A282211	A282210	A282208
Au p.p.m.	0·04	<0·01	<0·01	0·03	0·01	0·04	0·01	0·05	0·05	0·02	0·01	0·02	0·01	0·01	0·01	0·01	0·02	0·01	0·01	0·03	0·02	0·01	0·02	<0·01	<0·01	0·02	<0·01	<0·01	<0·05	0·02	0·01	0·01	<0·01	0·03
As p.p.m.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	<2	<2	<2	<2	<2	<2	<2	<2	<2	I.S.	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	I.S.
Ag p.p.m.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	<1	<1	<1	<1	<1	<1	<1	<1	<1	I.S.	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	I.S.
Cu p.p.m.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	114	44	65	37	35	64	44	126	137	I.S.	392	397	145	155	101	140	94	116	115	122	119	144	52	70	53	I.S.
Pb p.p.m.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	10	8	9	8	11	9	14	8	9	I.S.	10	12	11	8	11	9	10	17	11	9	11	11	12	15	10	I.S.
Zn p.p.m.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	169	122	118	103	74	66	62	120	124	I.S.	119	127	107	119	121	100	120	111	119	120	120	143	133	115	124	I.S.
Fe %	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.	12·08	9·30	10·28	10·11	10·32	10·13	11·57	10·70	11·90	I.S.	12·80	18·10	11·86	12·20	10·14	9·45	10·47	10·96	10·80	11·16	11·30	13·00	12·00	11·35	11·80	I.S.

LITHOLOGY

F *Medium-coarse grained granular dolerite. Mainly green fibrous amphibol with minor feldspar and quartz.*

G *Foliated medium grained altered dolerite. Groundmass of chlorite sericite and amphibole enveloping quartz and feldspar grains.*

H *Very strongly foliated/sheared medium-fine grained altered dolerite. Groundmass of chlorite sericite and minor amphibole enveloping angular feldspar quartz and carbonate ? grains.*

I *Highly altered dolerite. Fine grained sericite, chlorite, quartz ± talc schist.*

J *Silicified fine grained altered dolerite.*

Lithological boundary, definite.

Lithological boundary, approx.

Dip and strike of shearing/foliation.

Sheared/foliated. Density of symbols indicates degree of shearing/foliation.

Thin quartz vein

NOTE : FOR LOCATION REFER DRG No. 8586-17

CSR LIMITED-MEDG

E.L.4744 FRANCES CREEK N.T.
CASEYS J/V

TRENCH SECTION – FRAN CK T2

SCALE	1:100 ½H=1
DRAWN	T.J.
DATE	Dec. '86
REVISED	May '87

DRG. No. **8586-61**

C.R. 87/160