



DUNDAS (WILLIAMSFORD) EL 11/2002
PARTIAL RELINQUISHMENT REPORT
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CONTENTS

1102_200610_02_MainReport

1. SUMMARY	1
2. INTRODUCTION	2
2.1 Attribution	2
3. LAND TENURE	3
4. GEOLOGY	3
5. PREVIOUS EXPLORATION.....	5
6. WORK COMPLETED ON THE RELINQUISHED PART OF EL 11/2002	7
6.1 Data Compilation	7
6.2 AEM anomaly D13.....	8
6.2.1 Partial leach soil sampling.....	9
6.2.2 Geological Mapping	9
6.3 AEM anomaly D11.....	12
6.3.1 Partial leach soil sampling.....	13
6.4 AEM anomaly D15.....	14
6.4.1 Partial leach soil sampling.....	16
6.4.2 Geological Mapping	16
6.4.3 Rock Chip sampling	17
6.5 AEM anomaly D7.....	17
7. CONCLUSIONS & RECOMMENDATIONS.....	19
8. KEYWORDS & LOCALITY.....	20
9. REFERENCES	21

LIST OF TABLES

Table 1	Previous exploration over the area of EL 11/2002 Dundas
Table 2	Previous Exploration by Pasminco on the area of EL 11/2002 Dundas
Table 3	Previous Exploration over the area of Anomaly D13
Table 4	Previous Exploration over the area of Anomaly D11
Table 5	Previous Exploration over the area of Anomaly D15
Table 6	Previous Exploration over the area of Anomaly D7

LIST OF FIGURES

Figure No.	Title	Scale
<i>1102_200607_03_fig1.pdf</i>	Tenement Location Diagram	1:500,000
<i>1102_200607_04_fig2.pdf</i>	Regional Geology and prospect locations	1:60,000
1102_200610_05_Fig3.pdf	Anomaly D13 - Partial leach soil sampling - sample locations	1:5,000
1102_200610_06_Fig4.pdf	D13 - Partial leach soils - Raw Cu data gridded	1:5,000
1102_200610_07_Fig5.pdf	D13 - Partial leach soils - Raw Pb data gridded	1:5,000
1102_200610_08_Fig6.pdf	D13 - Partial leach soils - Raw Zn data gridded	1:5,000
1102_200610_09_Fig7.pdf	D13 - Partial leach soils - Raw Ag data gridded	1:5,000
1102_200610_10_Fig8.pdf	D13 - Partial leach soils - Raw As data gridded	1:5,000
1102_200610_11_Fig9.pdf	D13 - Partial leach soils - Raw Au data gridded	1:5,000
1102_200610_12_Fig10.pdf	D13 - Partial leach soils - Raw Ba data gridded	1:5,000
1102_200610_13_Fig11.pdf	D13 - Partial leach soils - Raw Bi data gridded	1:5,000
1102_200610_14_Fig12.pdf	Anomaly D13 - Outcrop geology	1:2,500
1102_200610_15_Fig13.pdf	Anomaly D13 - Interpreted Geology	1:5,000
1102_200610_16_Fig14.pdf	Anomaly D11 - Partial leach soil sampling - sample locations	1:5,000
1102_200610_17_Fig15.pdf	Anomaly D11 - Partial leach soils - Raw Cu data gridded	1:6,000
1102_200610_18_Fig16.pdf	Anomaly D11 - Partial leach soils - Raw Pb data gridded	1:6,000
1102_200610_19_Fig17.pdf	Anomaly D11 - Partial leach soils - Raw Zn data gridded	1:6,000
1102_200610_20_Fig18.pdf	Anomaly D11 - Partial leach soils - Raw Ag data gridded	1:6,000
1102_200610_21_Fig19.pdf	Anomaly D11 - Partial leach soils - Raw As data gridded	1:6,000
1102_200610_22_Fig20.pdf	Anomaly D11 - Partial leach soils - Raw Au data gridded	1:6,000
1102_200610_23_Fig21.pdf	Anomaly D11 - Partial leach soils - Raw Ba data gridded	1:6,000
1102_200610_24_Fig22.pdf	Anomaly D11 - Partial leach soils - Raw Bi data gridded	1:6,000
1102_200610_25_Fig23.pdf	Anomaly D15 - Partial leach soils - Raw Cu data gridded	1:5,000
1102_200610_26_Fig24.pdf	Anomaly D15 - Partial leach soils - Raw Pb data gridded	1:5,000
1102_200610_27_Fig25.pdf	Anomaly D15 - Partial leach soils - Raw Zn data gridded	1:5,000
1102_200610_28_Fig26.pdf	Anomaly D15 - Partial leach soils - Raw Ag data gridded	1:5,000
1102_200610_29_Fig27.pdf	Anomaly D15 - Partial leach soils - Raw As data gridded	1:5,000
1102_200610_30_Fig28.pdf	Anomaly D15 - Partial leach soils - Raw Au data gridded	1:5,000
1102_200610_31_Fig29.pdf	Anomaly D15 - Partial leach soils - Raw Ba data gridded	1:5,000
1102_200610_32_Fig30.pdf	Anomaly D15 - Partial leach soils - Raw Bi data gridded	1:5,000

LIST OF PLANS

1102_200610_33_Plan1.pdf	Partial leach and rock chip sampling - Anomaly D15	1:2,500
1102_200610_34_Plan2.pdf	Outcrop Geology - Anomaly D15	1:2,500
1102_200610_35_Plan3.pdf	Interpreted Geology - Anomaly D15	1:5,000

LIST OF APPENDICES (Digital Copy Only)

1102_200610_36_App1a.txt	Soil samples - Previous Exploration data – 2003 Compilation
1102_200610_37_App1b.txt	Wacker samples - Previous Exploration data
1102_200610_38_App1c.txt	Rockchip samples - Previous Exploration data
1102_200610_39_App1d.txt	Soil samples - Previous Exploration data – 2005 Compilation
1102_200610_40_App1e.txt	drill hole collars - Previous Exploration data
1102_200610_41_App1f.txt	Drill hole surveys- Previous Exploration data
1102_200610_42_App2a.txt	Partial leach sampling (DL42) - Assay Results D13 Area
1102_200610_43_App2b.txt	Partial leach sampling (DL42) - Assay Results D11 and D15
1102_200610_49_App3.txt	Partial leach sampling (DL43) – Assay Results
1102_200610_50_App4.txt	Rock Chip sampling - Assay Results

1. SUMMARY

This report details exploration work undertaken on the relinquished part of EL 11/2002 Dundas (Williamsford) during the period 31st July 2002 to 31st July 2006. Work completed during this period comprised:

- Compilation of previous exploration data;
- Cutting of 17.55 line km of new gridlines across three areas (D11, D13 and D15 AEM anomalies);
- Geological mapping and selected rock chip sampling (39 samples) across the D13 and D15 anomaly grids;
- Partial leach soil sampling (672 samples) across the three gridded areas;

Whilst this work has identified several geochemical anomalies within areas of historic workings, Zinifex Australia Ltd are focusing exploration toward higher-priority Cambrian VHMS mineralisation and the western half of EL11/2002 is therefore being relinquished.

2. INTRODUCTION

This report details exploration work undertaken on the relinquished part of Dundas (Williamsford) EL 11/2002 during the period 23 August 2002 to 30 September 2006.

Zinifex's main targets on this part of EL 11/2002 was Devonian Pb-Zn vein style mineralisation of the type found at the South Comet Mine.

Zinifex planned to systematically explore the EL using a combination of reviewing previous exploration data, geological mapping and partial leach soil geochemistry, followed-up by ground time-domain EM, then drilling of areas of interest.

The Dundas licence covers a mountainous and heavily forested area extending from the north slopes of Mount Dundas (1143m ASL) to near the township of Rosebery (155m ASL). The western half of the license is to be relinquished (Figure 1). Access to the area is via the sealed Zeehan and Murchison highways to the north and west. The central part of the tenement has poor access – largely from the old NE Dundas tramway formation with old pack tracks and some rough 4WD tracks heading to the north and south.

2.1 Attribution

The following personnel were responsible for the work carried out by Zinifex Rosebery Mine on the EL 11/2002 Dundas (Williamsford) licence area during the period:

Senior Geologist:	Andrew McNeill – Zinifex Rosebery Mine
Contract Geologist:	Roger Poltock - Poltock Geological Services
Senior Exploration Geologist	Mick Skirka – Zinifex Australia Ltd.

3. LAND TENURE

EL 11/2002 Dundas (41 sq km) was granted to Pasminco on 23 August 2002 for a period of 5 years as a result of a competitive tender for ETA 562. The location of the tenement is shown on Figure 1. EL 11/2002 covers ground that fell vacant on the relinquishment of EL 21/96 (Pasminco) in October 2001. On 5th April 2004, a refloat of some assets, including the Rosebery Mine and Exploration Licences, of the failed Pasminco was completed and the assets are now owned by Zinifex Australia Limited. The area to be relinquished (21 sq km) is located in the western half of the license.

EL 11/2002 excludes approximately 600 ha of Mining Leases including 19M/1994, 21M/1994, 16M/2000 and 12M/2001.

Other land tenures within the tenement area include State/Multiple Use Forest, Un-allocated Crown Land, part of the Mount Dundas Regional Reserve and some private property all of which are available for exploration under the Mineral Resources Development Act 1995.

4. GEOLOGY

The geology of EL 11/2002 is summarised on Figure 2 and below, taken, with modifications, from Crossing & Halley (1990):

Oonah Formation:

- Proterozoic.
- Poorly sorted, carbonate-rich, matrix supported conglomerate, overlain by micaceous quartzite, grey to black graphitic siltstones & shales, often intensely sheared (≡ Concert Schist).

Crimson Creek Formation:

- Cambrian.
- Turbiditic volcanoclastic lithicwackes, derived from the erosion of mafic volcanoclastics, massive siltstones, mudstones and basaltic lava flows. Numerous gabbros intrude this sequence near Renison Bell and occasional impure dolomite horizons have been recorded.

Dundas Group:

- Cambrian.
- Mixed epiclastic and minor volcanoclastic sediments including the White Spur Formation (WSF) in the east of the tenement and the Curtin Davis Volcanics in the centre of the tenement. The group is dominantly comprised of turbiditic to shallow water sediments with immature conglomerates, monotonous siltstones and shales containing some sandstone and grit interbeds. Towards the top of the sequence felsic to intermediate tuffs, related volcanoclastic sediments and minor lava flows (or intrusions) occur. These volcanic units generally show marked variations in facies and thickness over short distances and often appear to interfinger with one another making correlations very difficult.

Ultramafic Complexes:

- Cambrian.
- These outcrop at a number of locations throughout the licence area and have been intersected by drilling at depth. They typically show strong serpentinite alteration and exhibit a high degree of internal deformation. The only exception to this is in the Serpentinite Hill area where pockets of un-serpentinised dunite and pyroxenite have been intruded by gabbro dykes.

Pine Hill Granite:

- Devonian.
- The south eastern ‘tail’ of this intrusion occurs on the mid-western side of the Dundas licence. The intrusion is described as a porphyritic adamellite and is thought to consist of a series of intrusions. Locally it exhibits early silica and sericite alteration of the both the granite and country rocks, followed by later boron metasomatism.

Glacial

- Quaternary
- Glacial gravels occupy a N-S zone in the NE quadrant of the EL.

The Dundas licence area is one of structural complexity, making the determination of age relationships between the various stratigraphic units difficult, with most of the geological units appearing to be faulted against each other. Shearing and faulting is often preferentially taken up by the more mafic and shale dominated units, thereby complicating stratigraphic relationships. The main folds generated during the Devonian include the Huskisson Syncline north west of the Dundas licence. The Renison Anticline lies to the west of the Dundas licence, and the Dundas Anticline is located to the northwest of Mount Dundas where it folds the Oonah Formation.

Faulting appears to be closely associated with most of the mineralised systems. Generally there are two prominent groups of faults, a NNW trending steeply dipping set with limited dip slip to oblique slip movement and a steeply dipping NE trending set with more significant displacement. A true estimate of the amount of displacement along these NE trending structures is difficult to quantify mainly due to a lack of recognisable marker beds. The NE faults often occur along margins of the mafic-ultramafic complexes, whereas the NNW faults are more generally confined. These faults and the Cambrian thrusts (including the Rosebery Fault) also acted as zones of structural weakness during the Devonian, which resulted in a secondary period of mineralisation and partial remobilisation of Cambrian ore.

5. PREVIOUS EXPLORATION

The area of EL 11/2002 has a prolonged exploration history for base metals, tin and more recently gold. It is estimated that well over 100 surface drill holes have been collared on the EL at a variety of geological, geochemical and/or geophysical targets. Modern exploration commenced in the 1930s and Ellis (1983), Crossing and Halley (1990) and Weber & Murphy (1997) provide comprehensive summaries of previous exploration on the tenement area. Table 1 gives an overview of work until 1996 and Table 2 details work conducted between 1996 and 2001.

There are numerous historical workings dating back to the turn of last century, and many more prospects developed since, in the Dundas mineral field. Mineralisation styles range from Devonian Pb-Zn-Ag veins (Comet, Kosminsky), Devonian Sn-Cu-As veins (Greens, Frazer), Late Devonian replacement zones of Sn-Cu-As-W (Clifton, Colebrook Hill Skarn) to Quaternary placer Au-Sn (Laffer's Workings, Cornish Workings).

The principal mineralising event in the Dundas area was associated with the hydrothermal fluids that accompanied the Devonian granite intrusions. Mineralisation in the Dundas field is patchy and low grade. The occasional ore shoots are erratically distributed within the controlling structural features, are small and alternate with low grade or barren sections. Despite intensive exploration since the 1930s, only small resources have been located. The largest of these were the Kosminsky – South Comet mines which contained up to 60,000t @ 8.4% Pb, 7.4% Zn and 248 g/t Ag. The mineralisation at South Comet comprises a series of lenses within a well-defined shear zone, with true widths ranging from 0.75 – 2.5m thickness.

TABLE 1: Previous work on the area of EL 11/2002 Dundas (after Crossing & Halley 1990)

COMPANY	PERIOD	PROSPECT/ COMMODITY	METHODS	RESULTS
BHP	1959/60	Razorback Grand Prize (Sn)	Turam, SP and Magnetics	Inconclusive except over known mineralisation.
PLACER	1964/66	Razorback Grand Prize (Sn)	Underground Drilling & Mining	No new orebodies found. The prospects are not connected.
NCGF	1966/71	N Dundas (Montezuma) (Sn)	Magnetics, VHEM, Mapping, Geochem	Coincident Magnetic and Tin-in-Soil anomaly on Montezuma Fault. Not considered worth drilling
GEOPHOTO	1968/74	Dundas (Pb Zn Ag)	IP, REM, SP, Mag, Mapping, Geochem & 79 Drill Holes	Intensive drilling located Pb Zn Ag in several thin fissure veins separated by barren host rocks. Didn't meet corporate objectives.
COMSTAFF	1970/85	E Renison Godkin (Sn)	IP, Input, Mag, Mapping & 58 Drill Holes	Intensive drilling defined: Fenton's Sn Vein; 0.43Mt @ 1% Sn, 0.2% Cu; Salmon Vein; 0.83Mt @ 3% Pb, 2% Zn; Godkin; 0.3Mt @ 0.9% Sn
EZ/GETTY EZ/CSR	1978/86	Colebrook Hill Ring River Mt Dundas Montezuma (Sn Cu)	Input, Dighem, Turam, IP, Mapping, Geochem & 28 Drill holes	Several encouraging Sn and/or Cu intersections as Colebrook Hill (23 holes). Only minor Sn, Pb intersections on Montezuma Fault (5 holes). Deep hole proposed - not completed.
MINOPS P/L	1979/84	Godkin Prospect (Sn)	Gridding, soil geochem, geophysics, drilling	Comstaff and Paringa JV into Godkin area outlined inferred resource 300,000t @ 0.9% Sn.
RENISON LTD	1971/87	Grand Prize (Fault), North Dundas Grid, Commonwealth Hill, Razorback Grid, Kapi, Carbine Hill, Serpentine Hill, (Sn Cu Asbestos, PGM)	Gridding, mapping, Airborne EM, drilling. Soil/rock geochem. IP, Dighem.	Extremely deep diamond drilling on the Kapi Fault returned in S 652, 313.4-313.9m 0.5m @ 2.14% Cu. Grand Prize Fault: S 947A @ 534.8m tourmaline alteration zone. S 969: 406.8-409.8 - 3m @ 5.21% Sn, 0.23% Cu, 13 g/t Ag 408.4-409.8 - 1.4m @ 10.93% Sn
ROGER POLTOCK GEOLOGIC AL P/L	1986/88	Colebrook Hill (Au Cu W)	Stream Sediments	Concluded Colebrook Hill was a thin skarn alteration system.
RGC EXPL. P/L	1987/95 1988/95 (Dundas & Moores Pimple)	Montezuma Grid Ring River Wallace Prospect Greens Prospect (Sn Au)	Gridding, prospect mapping, rock chip sampling, IP	MZ 004 182.1-183.7 1.6m @ 19.25% As, 725ppm Sb and 0.54 g/t Au.

TABLE 2: Previous Exploration by Pasminco on the area of EL 11/2002 Dundas

PERIOD	METHODS	RESULTS
1996-1997 Weber and Murphy (1997)	Reconnaissance mapping and a review with subsequent compilation of historical data (GIS format).	
1997-1998 Murphy (1998)	Reconnaissance work and mapping by Dave Selley (PhD thesis).	Work identified that the nature of the boundaries with the Precambrian need to be considered for their potential as growth faults and potential mineralising structures. This geometry impacts on modelling fluid flow regimes associated with mineralisation.
1998-1999 Parfrey and Simpson (1999)	Identification of priority prospect areas through the completion of an airborne EM Survey.	A suite of anomalous conductive responses were delineated in the EM data, however most of these were interpreted as being directly related to shallow glacial cover. Several more discrete anomalous responses were also identified - these are worthy of further investigation.
1999-2000 McNeill and Simpson (2000)	Interpretation of the 1999 Airborne EM survey.	
2000-2001 Briggs and McNeill (2001)	Detailed interpretation of 1999 Airborne EM survey	Five anomalies warranted further follow-up. However, there was no indication of a Pasminco sized (10 mt @20% Pb+Zn) deposit in Dundas area. Tenement can be relinquished.

6. WORK COMPLETED ON THE RELINQUISHED PART OF EL 11/2002

6.1 Data Compilation

Compilation of previous exploration data, commenced during the life of EL 21/1996, continued during the tenure of EL11/2002. Soil, Wacker and rockchip data from the Geophoto (EL 7/1968) Ainslie and Carbine grids, the CSR (EL 15/1976) Howards Rd and Carbine grids and RGC's (EL 101/1987) Ring River, Montezuma, Howards East grids and regional sampling of old workings. All data collected and digitised is included as Appendix 1a, 1b and 1c (digital copy only). Note that some datasets, in particular the Geophoto grids, were not located in AMG space. For these data the map sheets were registered using topographic features and there is potentially a higher than normal error in sample locations.

Soil data from the Godkin grid (ML 62M/1975) and the RGC Carbine grid (EL 42/1971) and Geophoto/Texins drill hole data from the Ainslie prospect (EL 7/1968) were compiled. All data collected and digitised is included as Appendix 1d, 1e and 1f (digital copy only). Note that collar coordinates given in the MRT drill hole database for the drill holes at Ainslie are incorrect and all collars were re-located and surveyed with DGPS.

6.2 AEM anomaly D13

Dauth (in McNeill and Simpson, 2001) describes anomaly D13 as being a 1.4 km long feature with sharp edges, suggesting a possible lithological source, which straddles the northern margin of the Pre-Cambrian – Dundas Group contact.

As an initial stage in the follow-up all previous exploration data was reviewed (see Table 3) and, where necessary, the data was digitally captured (see section 6.1). After completing the review and data compilation it was decided to cut a new 3.2 km grid, using the Carbine Hill pack track from the Dundas area for access, over the D13 anomaly.

Table 3 Previous exploration over the area of Anomaly D13 (the ‘Carbine Grid’ area).

PERIOD	RESULTS
1970-1971 Johnson (1971)	Initial grid cut, geologically mapped and VLF-EM survey completed. Gossans and old workings sampled. Recommend infill gridding and detail soil sampling program.
1971-1973 Thigpen (1972); Discala (1974)	Infill gridding, orientation soil sampling then soil sampling (1816 samples) and rock-chip sampling (71 samples) of entire grid; geological mapping and ground magnetics. Two diamond drill holes (CW1&2; 308m total) to test VLF-EM and soil geochemical anomalies; no significant results from drilling and “temporarily downgraded area”.
1977-1978 McNamara (1979a)	Follow-up of stream sediment anomaly 1 located anomaly 3, anomalous in Pb and Zn. Recommended follow-up by close spaced soil sampling.
1982-1983 McNamara and Ellis (1983)	DIGHEM II survey flown over licence area. Report on survey included – several anomalies identified.
1984 Ellis (1984)	Follow-up anomalies from 1982 DIGHEM survey; VLF-EM traverse, ground magnetics and rock-chip sampling of the Carbine Mine (anomalous As, Pb and Zn).
1985 Ellis (1985)	Re-open part of Geophoto grid, ground magnetics, VLF-EM; DIGHEM anomaly not explained so further follow-up recommended.
1986 Ellis (1986)	Soil sampling on Geophoto grid lines 72, 52 and 40N; located anomalous base metals parallel to VLF-EM trend. Re-log and re-sample DDH CW1 & 2; graphitic shales have high base metals (to 940 ppm Pb and 3950 ppm Zn). IP survey to follow-up DIGHEM anomaly; located significant anomaly. Concluded that conductive graphitic shales and minor base metal veining (in CW1&2) were sufficient to explain soil geochemical and geophysical results.
1990-1991 Crossing (1991)	Geological mapping to locate carbonate units capable of hosting replacement Sn deposits. Carbonates located but, no significant alteration or elevated Sn values in rock-chips (but some elevated base metals from Manganiferous gossan and sulphide veining).

6.2.1 *Partial leach soil sampling*

Partial leach soil sampling was completed on the new grid with 137 samples (including duplicates) submitted for assay as part of a single batch (SDS 4536).

Randomised sample numbers were used in partial leach sampling to reduce the effect of analytical variations. The partial leach soil samples were generally collected at 25m intervals, at or near a grid peg, and involved digging a hole with a pick, removing the organic rich A-horizon and collecting approximately 500g of sample from the nominal B horizon. The samples were then placed in ziplock plastic bags and, once returned to the field office, the bags were stored open to prevent anaerobic reactions. When a batch of 300 samples was collected, the sample bags were sealed and the samples despatched to Amdel in South Australia for analysis by partial leach technique DL42. Elements determined were Ag, As, Au, Ba, Bi, Cd, Cu, Co, Mo, Ni, Pb, Ni, Y, Zn, Zr and the rare earth elements Ce, Eu, Gd, La and Sm. The pH of the leachate, after digestion, was also determined. Results are included as Appendices 2a and 3 and sample locations are shown on Figure 3.

Three duplicate and two standard samples were collected per 100 samples. The field duplicates were also analysed in duplicate to allow assessment of both the sample and laboratory variance. Additionally at each sample site a small amount of soil was collected and stored in a chip tray for reference and to allow soil colour to be recorded. Soil colour was assigned from a Munsell Colour chart with 19 colours and was then assigned to one of six colour groups.

Only one sample had a low post-digest pH (358860) and this sample was therefore re-analysed. The re-assay had a pH of 8.45 and in the interpretation discussed below the low pH sample from the original dataset has had its assay results replaced by the re-assayed data.

Images of the gridded raw data are presented as Figures 4-11. The major feature in these images is anomalous Cu, Zn, Ag, As and Bi associated with the mapped workings. A Pb anomaly is offset to the east and Ba anomaly offset to the west of the workings. There are spotty Au anomalies throughout the grid, one of which is coincident with the workings. There are no obvious features coincident with the trace of the D13 EM anomaly.

6.2.2 *Geological Mapping*

The new grid was geologically mapped by Roger Poltock. An outcrop geology plan is included as Figure 12 and an interpretation shown on Figure 13. Previous mapping by Blissett and Guilline (1962) and Brown (1986) has been used as a basis for district stratigraphic units. Two units outcrop within the grid; Precambrian Oonah Formation quartzite and slates, and Dundas Group mass flow/turbidite style sediments. Thick scree deposits blanket the steep slopes.

The Precambrian Oonah Formation comprises grey–dark grey, slightly micaceous, clean siltstone/ slate and quartzites and crop out in the eastern part of the grid. The quartzites are brittlely fractured with irregular quartz +/- limonite veining.

It was difficult to map trends/units in the Dundas Group due to structural complexities and the lensoidal (scour and fill?) nature of units. Hornfelsing and(or) weak silicification is more or less pervasive. The main lithotypes include:

- fine to medium grained, well bedded, frequently calcareous (primary or alteration?) siltstone–greywacke.
- feldspathic wacke and siltstone; these may represent a transition between greywackes and felsic volcanics.
- pebble conglomerate, composed of well rounded dark grey chert clasts.
- medium grained felsic volcanic derived mass debris flow sandstone, some chlorite flecks may have been glass or pumice.

Extensive scree deposits of angular greywacke fragments blanket bedrock on the steeper slopes. The scree may have a significant masking effect on the soil geochemistry.

All Dundas Group lithologies are variably hornfelsed or silicified; the greywackes and siltstone having a flinty welded appearance with a conchoidal fracture, which is independent of cleavage and bedding. Hornfelsing is associated with the Devonian granite and magnetic highs over the Dundas Group in the area are interpreted to reflect this hornfelsing, “skin effect” recognized by Leaman and Richardson (1989).

However, at Carbine Hill the hornfelsing does not reflect the modelled gravity shape for the Pine Hill Granite (Leaman and Richardson 1989) and may represent fracture/lithology controlled “hornfelsing”. A similar style of hornfelsing has been mapped as a halo around the Grand Prize vein located 3.5km to WNW (Poltock in Crossing and Halley, 1990).

Carbonate in greywackes may be primary or an alteration product associated with hornfelsing. Mn wad and some Fe-Mn gossan like deposits may be associated with the carbonate.

A shaft and drive at 5364800N 371275E have been developed on a steep dipping, 020° magnetic trending, approximately 10–20cm wide vein of siderite, pyrite (arsenopyrite), galena and chalcopyrite. This prospect is most likely CSR’s Carbine Mine (Ellis, 1984) but detailed descriptions of the workings have not been located in the literature to date (note that two un-named workings are shown in this area on the Mirloch database – these are most likely the same workings). 35m west of the shaft, quartz carbonate veining outcrops, the exposure is not extensive enough to determine the orientation. A gossan at 5364700N, 371320–371370E has probably developed on a sulphide quartz veined zone, outcrop is poor but the trend is approximately 330° magnetic. A second gossan at 371475E on this line may be associated with weathered carbonatized greywacke.

The vein and gossan occurrences are within or adjacent to a regional scale NNW trending fault and hosted in the contact zone between Oonah Formation and the overlying Dundas Group a commonly mineralised position in the Zeehan area.

Overall, lithologies dip to the NNW at shallow to moderate dips, with the Oonah Formation exposed in the SE, topographically lower section of the grid. The upper slopes of the grid are dominated by the overlying Dundas Group. The dominant structures are two parallel faults trending NNW. These faults may not have been mapped before at Dundas. To the north the Pine Hill Granite apophysis and the associated dyke are interpreted as having been emplaced within the structure. Both mineral occurrences located within the grid are associated with the western fault.

Five rock-chip samples were collected from old workings and gossans located during the mapping program. Results and sample locations are included in Appendix 4.

6.3 AEM anomaly D11

This suite of anomalies is coincident with a small portion of the Montezuma Fault, and is located at an inferred triple junction in the regional geology (Briggs and McNeill, 2001). Anomalous surface geochemistry has been recorded and numerous Late Devonian Vein deposits are known, e.g., Wallaces Prospect produced 20t of high-grade ore @ 2%Cu, 41.7%Pb, 1%Zn, 0.09%Sn 2.17%Sb and 5.3g/tAg. Drilling, by EZ, has intersected replacement style mineralisation as well as vein / stringer intervals with grades including 1m @ 7.5%Pb + 1.95%Zn + 670g/tAg within a sedimentary breccia, and 3.3m @ 1.17%Zn + 7.11%As + 0.11%Sn within a volcanoclastic debris flow breccia. This anomaly had the second highest amplitude in the survey area, after Colebrook Hill, and was recommended for follow-up by Briggs and McNeill (2001).

As an initial stage in the follow-up all previous exploration data was reviewed (see Table 4) and, where necessary, the data was digitally captured (see section 6.1).

Table 4 Previous exploration over the area of Anomaly D11 (the ‘Montezuma Grid’ area).

PERIOD	RESULTS
1966-1967 Elders (1967)	Construction of access roads, Commenced gridding 92,000 ft cut, geological mapping of grid. Completed western area and only approaching the more interesting Godkin Ridge.
1967-1968 Forsythe (1968)	No further gridding; geological mapping, commenced soil and rock-chip sampling completed, Described old workings, ground magnetics. Recommended extending the grid, further mapping, soils and geophysics.
1968-1969 Forsythe (1969)	First generation Montezuma Grid, from Severn Creek in east to Wallace’s tram in west, completed. Gridding of 50,580 ft; 20,400 ft cleared along major creeks; 64,800 ft of old foot tracks cleared. Located, geologically mapped and described old prospects and workings. Soil sampling completed over majority of grid (original data not presented, only contoured plans). Ground magnetic survey of grid. Concluded that soil results do not provide encouragement to follow-up Pb-Zn anomalies, but, concentrate on Sn anomalies where more follow-up is recommended.
1971-1974 Clarke (1972)	Re-pegged area of SPL20. followed up NCGFA’s anomaly A by costeaning, mapping and sampling (all work completed north of AEM anomaly 11). Some further follow-up recommended.
1972-1974 Layden (1974)	Followed up Anomaly A at north end of NCGFA Montezuma grid by geological mapping, costeaning, EIP and diamond drilling: targeting Sn (all work completed north of AEM anomaly 11).
1977-1978 McNamara (1979a)	Regional stream sediment sampling; defined Anomaly (anomaly 1) in area of interest; strongly anomalous In Sn; follow-up stream sampling also anomalous (draining carbine Hill). Work hampered by poor access to Anomaly 1.
1977-1978 McNamara (1979b)	Review known prospects/old workings; Summarise previous stream sediment sampling. Commenced re-clearing and surveying the NCGFA grid – renamed as Fraser Grid. Soil sampling and ground magnetics completed to follow up drainage anomalies and relocate the NCGFA +30 ppm Sn soil anomaly. Only one line of sampling completed due to access problems. Reconfirmed soil anomaly; recommended completing re-opening of the grid with intermediate infill lines followed by soils, rock chip sampling, magnetics and VLF-EM.

Table 4 Previous exploration over the area of Anomaly D11 (the ‘Montezuma Grid’) cont..

PERIOD	RESULTS
1982-1983 Sainty (1983a); Sainty (1983b); Sainty (1983c)	DIGHEM 2 survey, review of open file data, photogrammetry, re-establishment of vehicular access, re-cut old NCGFA grid, cut new lines, soil sample 13 line km, geological mapping. DIGHEM anomalies B, E, F partially coincident with AEM 11; and coincident with Sn anomaly in NCGFA soils. Work quickly focussed on the Duck Creek area – infill Sn soil sampling, minor rock chip sampling, recut old NCGFA grid; geological mapping, ground magnetics, infill lines cut, Genie-EM survey completed over entire grid; some responses over current area of interest. 680m drilling at Duck Creek prospect with further costeaning and mapping.
1983-1984 Sainty (1984a), Sainty (1984b)	Pit sampling over anomalous areas – as Sn may be dispersed in soil profile allowed more accurate targeting of DDH also removed 2 anomalies from testing list. Helipads cut for drill sites; Drilling of 2 holes (MZP258 and 261) for 513m to test Sn soil anomaly on lines 10 and 9.
1988-1989 Cartwright (1989)	32 km of grid cutting (re-opening of Montezuma grid) and re-opening walking tracks and helipads (5). Grid and old prospects and mines geologically mapped. 1110 B/C horizon soils collected from grid. Analysed for Cu, Pb, Zn, Ag, As, Bi and Sn. 250 rock-chip samples assayed. Ground magnetics over 27 km of grid; Helimagnetics over entire licence. Soils over Montezuma Fault strongly anomalous in Sn, As, Pb (and Ag). Particularly high at Duck Creek Prospect, Curtin Davis Consols and Greens Prospect. Cu and Zn also anomalous with other elements, but, tend to be less indicative of the mineralising structures. Magnetics; D11 AEM over Greens-Frazer. Recommended follow-up over Frazer-Greens area; re-log core from Frazer, Curtin Davis consols and deep EM survey.
1989-1990 Crossing and Halley (1990)	Work (rock-chip and wacker sampling, IP survey and diamond drilling) concentrated on the Greens-Frazer area north of D11.

6.3.1 Partial leach soil sampling

A total of 9.1 km of new grid was cut over the D11 anomaly (a reconnaissance visit had indicated that the old Montezuma grid was largely overgrown). The grid was surveyed with GPS and partial leach soil sampled. Standard sampling and analytical procedures were followed (see section 6.2 above) and 321 samples (including duplicates and standards) were been analysed as part of four batches (SDS 4539, 4544, 4545 and 4550). Sample locations are shown on Figure 14 and results are presented in Appendices 2b and 3 and on Figures 15-22. In this dataset 26 samples with post-digest pH of <8.0 have been redigested and analysed by method DL43 and these DL43 results have been used or the interpretation (see section 6.2 above).

One obvious feature in the data is a batch effect for Au (SDS4550 appears to be high), which makes interpretation of the Au data difficult. A lesser batch effect is apparent in the regionally levelled Ag data (but, not particularly obvious in the

raw data). Overall, metal levels appear to be lower than those from the D15 or D13 grids, but three anomalous zones are apparent:

- A coherent Ag+Pb+As anomaly overlying the Curtin Davis Consols workings and the eastern AEM conductor, in the NE of the grid
- Two patchy Bi+Cu+/-Ba anomalies to the west, partly coincident with the western AEM conductor and over the Evenden and Lower Ramsdale Adit.

Both these anomalies require further follow-up by geological mapping and rock chip sampling.

6.4 AEM anomaly D15

The D15 anomaly was initially described as an ovoid feature, not associated with a magnetic structure or anomaly, that warranted further follow-up (Briggs and McNeill, 2001).

The anomaly overlies a block of Oonah Formation, bounded to the south by a fault along South Comet Creek (shown on Blissett and Guilline [1962] and in mapping by Geophoto and CSR) and is underlain by three areas of historical workings; two (Ainslie and Banner Cross) are hosted by Oonah Formation correlates, and one (King Dundas) is in Crimson Creek Formation correlates immediately south of the South Comet Creek Fault. There is some confusion as to the location of the first two workings.

The Ainslie mine comprised three adits on a vein located by W. Ainslie. Reid (1925) visited the prospect and considered it worthy of further attention. Turner (1971) relocated some workings and describes the vein as having a NNW strike and a galena-sphalerite-jamesonite mineralogy (Note that Reid did not record the presence of jamesonite – describing it only from Banner Cross).

Reid (1925) describes Banner Cross as being immediately west of Ainslie, having a galena-sphalerite-pyrite-siderite-jamesonite mineralogy. The vein was described as being 0.3-1.0m wide and of considerable length, but, adits driven beneath the outcropping lode did not intersect any significant mineralisation.

The King Dundas prospect (not mentioned by Reid, 1925) was located by Turner (1971) who described it as being Pb-Zn mineralisation, without Jamesonite. Herrmann and White (1989) located a trench and rock face in the King Dundas area and collected one sample of silica-pyrite-galena-sphalerite, which assayed 23.6% Pb, 0.85% Zn and 40 g/t Ag.

Texins/Geophoto commenced modern exploration in the area in 1970-71 as part of a major exploration effort in the Dundas area. AEM anomaly 15 occurs on two grids; the Kosminsky Hill East section of the Comet-Kosminsky grid and the Ainslie grid. Previous exploration completed over the area of interest is summarized in Table 5.

Table 5. Previous exploration over the area of Anomaly D15 ('Kosminsky Hill Grid')

PERIOD	RESULTS
1969 EL 7/1968 Ratigan and Paterson (1969); Discala (1974)	Regional scale photogeological interpretation of tenement with production of 1:25,000 interpretative plans. Kosminsky Hill East - gridding, geological mapping, sampling of gossans, SP and ground magnetic surveys and a single line of VLF-EM.
1971 EL 7/1968 Turner (1971); Richardson (1971); Discala (1974)	Ainslie Grid – gridding (24.1 line km), mapping, rock chip sampling (36 samples) and soil sampling over VLF-EM anomalies and outcropping gossans (615 samples). Recommend further work including drilling. Kosminsky Hill East – rock chip sampling, soil sampling (lines 20&26S) and orientation soil sampling project by Simon Gatehouse. Regional – fly aerial photography and complete VLF-EM on existing grids.
1972 EL 7/1968 Thigpen (1972); Discala (1974)	Bulldozing of 1.9km of access tracks and drilling of 8 Holes at Kosminsky Hill East and Ainslie prospects (for 1,213m) to test geochemical and VLF-EM anomalies. Only minor mineralisation was intersected and two further holes proposed for the Ainslie area (Juillard, 1971) were not drilled.
1973 EL 7/1968 Howland-Rose (1973); Anon (1973)	Completion of a Turair airborne electromagnetic and magnetic survey over parts of EL 7/1968. No “primary targets” were located in the area of interest. Completion of a photogrammetric survey of the entire Dundas tenement and production of topographic map sheets.
1974 EL 7/1968 Discala (1974)	Compilation of all exploration on EL 7/1968 completed. Recommend that no further work be completed in the Kosminsky Hill East and Ainslie areas as results of drilling had not been encouraging and there was a “lack of sound geological and geophysical evidence” for strongly mineralised zones.
1976-1978 EL 15/1976 Macnamara (1978)	Regional drainage sampling (panned concentrate, -80#, -20# and rock-chip samples). Delineated Area 5, anomalous Pb-Zn draining leases held by other parties, in area of interest.
1982 EL 15/1976 Ellis and Macnamara (1983)-	Further drainage sampling completed after recognition of “unreliability” of some previous sampling. No mention of results from Area 5. DIGHEM survey completed – anomaly 31CX over area of interest but no work recommended.
1982-1983 EL 15/76 Macnamara (1984)	Further detailed stream sediment sampling (-20# and panned concentrate) – report anomalous Pb-Zn from area of interest, but CSR programme largely directed at Au and Sn; no follow-up of Pb-Zn anomalies recommended.
1989 EL 101/1987 Hermann and White (1989)	Located the King Dundas prospect but failed to relocate the Ainslie and Banner Cross mines as part of a survey of known mineralisation in the Dundas Mineral Field. No further work completed.

During the period of tenure, previous exploration data was collected (see section 6.1), a 5.25 km grid, including 0.25km of access lines, was cut and surveyed with GPS and 5 km of partial leach soil sampling completed. The area was also geologically mapped and rock-chip sampling of old workings and gossans completed.

6.4.1 *Partial leach soil sampling*

A total of 214 samples were collected (including standards and duplicates) and analysed as part of three batches (SDS 4544, 4545 and 4546) using the sampling protocols and methods as described in section 6.2.1; results are included as Appendices 2b and 3 and sample locations are shown on Plan 1.

No samples are obviously contaminated, however, 15 samples, 7% of the data set, have a low (pH<8.0) post-digest pH. The samples with low post-digest pH, were re-assayed by method DL43 with the result that all but three had post-digest pHs of >8.0. In the interpretation discussed below the low pH DL42 samples from the original dataset have had their assay results replaced by the re-assayed data.

Images of the gridded raw data are presented as Figures 23-30. It can be seen that there are no obvious coherent multi-line anomalies but, rather spotty highs concentrated in the northern part of the grid, for Cu, Pb and Zn, and in the southern part of the grid, for Bi and Ag, whereas Au and As highs seem to be randomly distributed across the grid. Based on this initial interpretation no further follow-up can be recommended, although a more detailed analysis of the data will be completed in the next reporting period.

6.4.2 *Geological Mapping*

The new grid and existing access tracks were geologically mapped. Fact geology is shown on Plan 2 and a geological interpretation is shown on Plan 3.

Stratigraphically the area can be divided into two main units, the Oonah Formation sediments in the central part of the grid in faulted contact with ?Cambrian sediments to the west and south/southeast. The Oonah formation comprises two main facies:

- Interbedded grey micaceous sandstone/quartzite and dark grey to black shales. These are the dominant lithologies in the mapped area.
- Dolomitic units ranging from impure dolomitic siltstones to medium to coarse grained dolomites, with rare breccia units. Two E-W trending dolomite units have been defined in the northern part of the grid and are associated with float of gossanous material.

The ‘Cambrian’ lithologies comprise interbedded green-grey-purple shales, sandstones and lithicwackes, that may be correlates of the Dundas Group (Corbett, 1986; Corbett and McNeill, 1988), the Stitt Quartzite (Corbett, 2002) or the Crimson Creek Formation (Blissett and Guilline, 1962; Turner, 1971). Unfortunately the maps of Brown (1986) and from D. Selley’s PhD thesis do not extend far enough south to shed light on this problem, however, on the basis of the lithologies observed in the current mapping programme a correlation with the Crimson Creek Formation is favoured.

All the significant mineralisation (Ainslie, Banner Cross and King Dundas) is interpreted to occur in the Oonah Formation or at the contact of the Oonah and Crimson Creek (note that the start of the King Dundas is in Crimson Creek, but

Mineralised samples from the mullock heap appear to be in black shales of the Oonah).

6.4.3 Rock Chip sampling

In the process of geological mapping samples of outcropping gossan, mineralised and altered rocks (mostly dolomites), and mineralised dump samples from old workings were collected and 34 samples (including a standard) were submitted for assay. Sample locations are plotted on Plan 1. Minor elevated base metal values were returned from most of the samples (generally <1% Zn and Pb) with some high-grade dump samples returning up to 25% Pb.

Results are tabled in Appendix 4.

6.5 AEM anomaly D7

Anomaly D7 is a N-S to NE striking anomaly with a strike length of 2.5 km lying parallel to a prominent fault, on the eastern side of a high amplitude magnetic lineament with the same strike orientation. The EM anomaly has no real associated magnetic anomaly and the magnetic lineament is interpreted to be buried ultramafics (intersected by drilling). The strike length of the anomaly suggests a lithological source, however, a detailed assessment of all historical work in the area surrounding the D7 anomaly was recommended by Briggs and McNeill (2001).

Previous drilling has largely intersected broad graphitic shears caused by the faulting of a sequence of carbonaceous and variably calcareous siltstones & shales. The area of the anomaly is predominantly underlain by turbiditic sediments. Historical workings and prospects in the area (including Frazer's, Greens, Montezuma & Godkin) have uncovered Devonian vein systems of variable metal association (varying from Sn to Ag-Cu-Pb-Zn to Fe).

A summary of all previous exploration, compiled during the current reporting period is presented as Table 6.

Table 6. Previous exploration over the area of Anomaly D7

PERIOD	RESULTS
1966-1967 Elders (1967)	Construction of access roads, Commenced gridding 92,000 ft cut, geological mapping of grid. Completed western area and only “approaching the more interesting Godkin Ridge”.
1967-1968 Forsythe (1968)	No further gridding; geological mapping, commenced soil and rock-chip sampling completed, Described old workings, ground magnetics. Recommended extending the grid, further mapping, soils and geophysics.
1968-1969 Forsythe (1969)	First generation Montezuma Grid, from Severn Creek in east to Wallace’s Tram in west, completed. Gridding of 50,580 ft; 20,400 ft cleared along major creeks; 64,800 ft of old foot tracks cleared. Located, geologically mapped and described old prospects and workings. Soil sampling completed over majority of grid (original data not presented, only contoured plans). Ground magnetic survey of grid. Concluded that soil results do not provide encouragement to follow-up Pb-Zn anomalies.
1971-1974 Clarke (1972)	Re-pegged area of SPL20. Followed up NCGFA’s anomaly A by costeaning, mapping and sampling. Some further follow-up recommended.
1972-1974 Layden (1974)	Followed up Anomaly A at north end of NCGFA Montezuma grid by geological mapping, costeaning, EIP and diamond drilling (136.5m in 2 holes): targeting Sn near the Godkin Mine. One hole (SS1) intersected anomalous Sn.
1982-1983 Komyshan and Roberts (1983)	Established Carbine Hill Grid on EL 42/1971, immediately west of area of interest to cover gaps in geological, geochemical and geophysical coverage.
1979-1980 Orr and Thynne (1980)	Geological mapping, soil and rock chip sampling (some from old workings), and ground Pulse EM defined two targets recommended for follow-up by drilling. Minor petrology.
1981-1982 Various	5 hole Diamond drilling program (GDK3-GDK8) that intersected Sn-mineralisation (see; Wilding et al., 1982; Yardley and Crimeen, 1982; and Pigott, 1983).
1983 Thynne and Shaw (1983)	Reviewed previous drilling, geology, geophysics and geochemistry from the Godkin Prospect on ML 62M/1975. A resource was estimated and further drilling recommended. There is no evidence that this drilling was completed.
1983-1984 Komyshan and Roberts (1984)	Completion of soil geochemistry, geological mapping, ground magnetics and VLF-EM on Carbine Hill Grid (EL 42/1971). Outlined two areas of interest; Great Northern Mine area and South Confidence Saddle. Recommended infilling grid and completing ground EM surveys.
1984-1985 Komyshan (1985)	EM-37 surveys completed on EL 42/1971. These located an approx. 1.2 km long zone of anomalies corresponding with a magnetic anomaly. Follow-up by diamond drilling was recommended.
1985-1986 Cartwright (1986)	Diamond drilling, 469m, failed to intersect the EM anomaly, due to excessive flattening, however, the results of a DHEM survey were interpreted to indicate the source was a buried ultramafic and not mineralisation. No further work was recommended.
1988-89 Cartwright (1989)	Assessment and compilation of previous exploration data over ELs 101/1987 and 13/1988. 32 km of gridding (Montezuma Grid); geological mapping, mapping and sampling of old workings (Frazer and Green’s), C Horizon soil sampling and ground magnetics. Entire licence flown with Heliborne magnetics, review of work at Godkin prospect. Results encouraged follow-up work in the Green’s Prospect-Frazer Mine area for Sn mineralisation.
1989-1990 Crossing and Halley (1990)	Existing access tracks upgraded and repaired; Detailed mapping and wacker sampling; rock-chip sampling on the Montezuma Grid. Three lines of IP completed to follow-up EZ DIGHEM anomaly. Four diamond drill holes, for 1094m, at Green’s Prospect. Work identified a major NE trending structure that warranted further follow-up.

Table 6. Previous exploration over the area of Anomaly D7 (cont...)

1990-1991 Crossing (1991)	Regional gravity survey; no further field work on Montezuma grid area; conclude that NW structures have potential for Sn mineralisation and recommend some follow-up of the NE structure.
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7. CONCLUSIONS & RECOMMENDATIONS

The relinquished area of EL11/2002 was explored by Pasminco/Zinifex for Devonian Pb-Zn vein style mineralisation. Work completed comprised compilation of previous exploration data, 17.55line km of gridding, geological mapping and selective rock cgip sampling (39 samples) and partial leach soil sampling (672 samples).

Areas that require further exploration include the D11 area which is recommended for geological mapping and rock chip sampling.

Whilst this work has identified several geochemical anomalies within areas of historic workings, Zinifex Australia Ltd are focusing exploration toward higher-priority Cambrian VHMS mineralisation and the western half of EL11/2002 is therefore being relinquished.

8. KEYWORDS & LOCALITY

Keywords

Geology, geochemistry–soil, geochemistry–Partial leach, previous exploration, Dundas, Carbine Hill, geophysics–EM, geophysics – DHEM, track cutting, Montezuma Grid, Kosminsky Hill, diamond drilling, geological mapping.

Locality

1:250,000 QUEENSTOWN SK 55-5

1:100,000 PIEMAN 7914, SOPHIA 8014

1:25,000 DUNDAS 3636, ROSEBERY 3637

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