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RENISON LIMITED

PROGRESS REPORT ON SOUTH DUNDAS - S.P.L.27 TASMANIA

1967/68 & 1968/69 FIELD SEASONS

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16/1/70

OPEN FILE

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INTRODUCTION

This report covers work done to date on South Dundas S.P.L.27. The bulk of the work was carried out in field season 1967/68, 1968/69 and early 1969/70, by Renison Ltd.. Geologists A.J. Woodward, R.A.Shakesby, and K. McI. Ferguson. Earlier intermittent work on the area by Renison geologists J. Emberton, and J. Elders is also included.

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S.P.L. 27, see Fig. 1 covers the area from Commonwealth Hill and Pine Hill in the north to Mt. Razorback and the site of Dundas in the south and reaches the Murchison Highway in the west and Confidence Saddle and Carbine Hill in the east. The lease is of 3920 acres is held by Renison Ltd.. It is due for renewal on 19/1/70.

ACCESS

Excellent access to four-wheel drive vehicles is provided, in the northern part of the lease by the North East Dundas Tram, from the Murchison Highway to Confidence Saddle. From this access to the north is achieved by a grid of cut lines which extends as far as the tops of Commonwealth Hill and Pine Hill.

Vehicular access to the southern part of the lease is more restricted and is confined to a track running east from the Murchison Highway towards the Grand Prize workings. A branch of this track follows the northern slope of Mt. Razorback south to the Razorback Mine and thence to the site of Dundas itself. This branch was not passable to vehicles when most of the work on the southern part of the lease was done, but served as a baseline for a grid east-west lines.

All work was done from the office of Renison Ltd., at Renison Bell and no camps had to be set up in the lease.

TOPOGRAPHY AND SOIL

The area is dominated by the mass of Black Hill and Carbine Hill across its centre rising to 2,200 ft.. To the south of this the long sharp ridge of Mt. Razorback rises to 2,000 ft.. To the north-west of the central mass water drains to the west via the braod swampy valley of Melba Creek. Kapi Creek drains to the north from Black Hill in a valley which opens out and becomes very swampy north of the tram where it meets creeks coming south from Commonwealth and Pine Hills and west from Confidence Saddle. At the confluence of these creeks they become the Argent Creek and cut north-west in a steep gorge between Serpentine Hill and Commonwealth Hill. South of Black Hill a system of creeks drains south into Dundas Rivulet while the west slopes are drained by the Nevada Creek which eventually joins the Melba.

Soil is generally shallow with much exposed outcrop over the areas of the ultrabasics and the Serpentinite. The Melba Spilites, however, have been more deeply weathered and a red iron rich soil has developed. The siltstones of the Crimson Creek formation are rarely exposed and are covered by a fairly well developed soil up to 3 - 4 ft. deep on the slopes of Commonwealth Hill. In the south the Dundas Group Sediments have a similar soil cover. Soil over the Pine Hill Quartz porphyry is usually poorly developed and the north slopes of Pine Hill are covered by an area of quartz porphyry scree boulders.

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VEGETATION

Heavy rain forest covers most of the area. The area of the Serpentine Hill ultrabasics and the Melba Spilites, however, is picked out quite clearly by the absence of thick tree cover and is replaced by button grass, (especially in the swampy areas) and low scrub. The area around Pine Hill was recently burnt off and is also covered by low scrub. The old site of Dundas is covered by low secondary scrub.

RECENT ACTIVITIES IN S.P.L. 27

The major field work done in the lease is separated into that done in the south on the Razorback Grid by A.J. Woodward, and that done in the north on the Pine Hill Grid by R.A. Shakesby and the author.

A.J. Woodward worked for 6 months in the 1968/69 field season, while on the Consolidated Gold Fields Graduate Training Scheme, and was aided by four students and 2 field assistants. R.A. Shakesby worked intermittently in the winter of 1969, /The author has worked in the lease since October 1969 aided by two to four field assistants, and students on summer vacation. He has also brought together and interpreted the results of all the previous work done on the lease by Renison Ltd.

SURVEYING

The accompanying plates are based on 200 ft. topographic plans issued by the state survey. These were supplemented by tape and compass surveying of lines on the Razorback Grid and a stadia survey of the Razorback baseline.

LINE CUTTING

In spring of 1968, a grid of 800 ft.east-west traverses were cut using the Razorback track as a baseline. This can be seen in Fig. 2 and will be referred to as the Razorback Grid. In late winter of 1968, in the northern part of the lease, a baseline was cut running 85° east of Mine Grid north from the Murchison Highway, between Pine Hill and Confidence Saddle to the eastern boundary of Renison Mining Lease. 800 ft. traverses were cut to the north of this up the slopes of Commonwealth and Pine Hills and to the south as far as the N.E. Dundas Tram. The intervening 400 ft. traverses were added to the grid later. Just prior to the writing of this report 7, 200 ft. traverses were cut to 800 ft. north of the baseline between 4700 ft. and 2300 ft. west. Also the southern traverses were extended to the east of the Pine Hill track into S.P.L. 20. This grid is also seen in Fig. 2 and will be referred as the Pine Hill Grid.

GEOLOGICAL MAPPING

In the area of the Razorback Grid detailed geological mapping was carried out along traverses, stream beds and old tracks.

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Mapping of the 800 ft. traverses on the Pine Hill Grid was commenced by R.A. Shakesby, Renison Chief Geologist, and completed by the author who also mapped the latter 400 ft. traverses. Mapping along streams and tracks was carried out where necessary. Mapping of the N.E. Dundas tram was carried out by J. Emberton and the north slopes of Pine Hill were mapped by J. Elders. Representative samples of the rocks were collected and were sent for examination to H.W. Fander, Central Mineralogical Services, South Australia. Detailed mapping and sampling of old workings in the vicinity of Pine Hill are at present in progress.

GEOPHYSICS:

All traverses were surveyed with Renison Ltd's. McPhar portable magnetometer measuring the intensity of the vertical component of the earth's field. Readings were taken at 25 ft. intervals along lines. Corrections were made for diurnal variations.

GEOCHEMISTRY

Traverses were sampled at 50 ft. intervals by means of 3 inch diameter hand augers. Samples were, where possible of residual soil though some were composed of alluvium, gossan material and bedrock. These were assayed by X-ray fluoresence by Renison Ltd. Assay Department for tin, copper, nickel, arsenic and lead.

Sampling has been completed in the Razorback Grid and on the 800 ft. traverses of the Pine Hill Grid and is being completed on the 400 ft. traverses. Previous to the sampling of the Pine Hill Grid all creeks north of the N.E. Dundas tram were sampled for copper and nickel to check distribution trends.

Geology, Geophysics and Geochemistry were all plotted on 200 ft. to the inch scale maps.

OBSERVATIONS AND RESULTS

GEOLOGY - PREVIOUS REPORTS

Previous works on the area are summarised and supplemented by A. McIntosh Reid, "The Dundas Mineral Fields", Geological Survey Bulletin No. 36, and by A.H. Blissett, Geological Survey Exploration Report on the Zeehan sheet.

GENERAL GEOLOGY

Plate II is a geological plan of the S.P.L. on 400 ft. - 1 inch including the work of A.J. Woodward, R.A. Shakesby and K. McI. Ferguson. Other intermittent mapping is also included.

The rock types in the S.P.L. fall into five major units which may be expressed thru stratigraphically: -

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Devonian		5. Pine Hill Quartz Porphyry.
	Dundas Group	4. Shales siltstones and conglomerates.
		3. Melba Spilites.
Cambrian		2. Serpentine Hill Comples and Razorback Serpentinite.
	Crimson Creek Fin	1. Argillites.

CRIMSON CREEK FORMATION

The oldest rocks in the area are shales siltstones, brecciated siltstones and tuffs of the Crimson Creek Argillites i.e., the top of the Crimson Creek formation. These are found only in the northern part of the lease, north of the ultrabasic belt, on the slopes of Commonwealth Hill. Exposures of these rocks are rare and are best seen in the deeply incised valley of the Argent Creek. The most common rock is a light to dark grey, fine grained siltstone with very poor banding. Well banded shales are found along with sandy siltstones. Interbedded with the siltstones are lithic tuffs but their extent is not known due to their similarity in appearance to the siltstones, and have only been identified in thin section.

Towards the Pine Hill quartz porphyry intrusion these siltstones have been hornfelsed and have lost any clear bedding or lamination. This aureole of contact metamorphism can be seen to extend three to four thousand feet to the south-west and west of the porphyry mass. In the immediate vicinity of the mass the sediments have been metasomatised by tourmaline rich fluids emanating from the mass giving hard black tourmaline rich rocks.'

The Argillites show little signs of mineralisation in their exposure. Slight disseminated sulphide mineralisation and float of quartz vein material have been observed, however much of the extent of this gourp is hidden by over-burden.

SERPENTINE HILL ULTRABASIC COMPLEX

The Serpentine Hill ultrabasic mass consists of layered pyroxenites, pyroxenites-norites, gabbros, hypersthene gabbros and other less clearly defined transitional rock types. These have been serpentised to varying extents and much of the mass consists entirely of massive serpentinite.

The original igneous pyroxenites, pyroxenite-norites, and gabbros are best exposed near the Murchison Highway. These rocks are coarsely layered with bands up to twenty feet in thickness and down to a matter of inches. The layers vary both in coarseness and in their composition, grainsize and composition being constant with in each layer. The pyroxenites are primarily composed of enstatite and are green on fresh surfaces. On exposed surfaces layers tend to stand out due to various factors such as grainsize and differences in serpentinisation. Within the layers prismatic pyroxeues may be sometimes seem to have a planar orientation. The layered texture of the rocks with this planar orientation of prismatic crystals indicates crystallisation in a magma chamber under the influence of convection currents.

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The pyroxene norites and gabbros contain enstatite, hypersthene, augite, and plagioclase, An_{50-60} approximately. The hypersthene gabbros are often porphyritic especially south of Pine Hill and also show some very coarse almost pegmatitic layers.

A large part of the eastern extension of the mass is taken up by a medium to fine grained basic igneous rock with no observed layering which is composed of Tremolite. Tremolite is seen in most of the igneous rocks in the mass, in varying amounts, as an alteration product and it is believed that this tremolite rock is the result of metamorphism of the original basic and ultrabasic rocks. Traces of altered gabbros and basic breccia can be found within the mass of tremolite rock.

All these igneous rocks are veined by late stage pegmatitic norites and gabbros and also by many dykes and sills of a basic rock now consisting mainly of amphibole and prehnite. These are fine grained and black in hand specimen.

At present a post-graduate study of the Serpentine Hill Mass is being carried out by M.J. Rubenach at the University of Tasmania and acknowledgement is made to him for thin section information on many of the rock types and discussion about the mass in general.

The serpentinites have been produced by alteration and recrystallisation of the basic igneous suite under cooling and movement. Taylor (1955) and Rubenach recognise two types, one produced by alteration during shearing movements, and the other by slower changes in pressure - temperature conditions. This is confirmed by the authors own experience in the field where the first type of serpentinite is recognised by a sheared glassy green appearance, often very bright green in fresh exposure. This rock breaks up very easily due to numerous slickenside shear planes. The second type of serpentinite has a more massive appearance and when broken is dark green-black. Often faint traces of the original igneous texture can be seen in hand specimens. In the field the fresh igneous rock can be seen to grade into this type of serpentinite with finer grained layers often being preferentially serpentinised. Pods or cores of pyroxenite or pyroxenite-norite can be found in the serpentinite often surrounded by a mass of concentric veins of cross-fibre asbestos (chrysotile). The serpentinites are also veined by magnetite which occurs in narrow lenses. Asbestos and magnetite are much more common in the sheared types of serpentinite. Chromite is also found often in the form of stichtite-chrome serpentinite. The nickel sulphides millerite (N.S.) and pentlandite ((Fe, Ni) S) have been seen in specimens of the serpentinite studies by H.W. Fander. These will be discussed in relation to theresults of soil sampling.

The southern Razorback Serpentinite seems to be more or less similar to that at Serpentine Hill apart from the fact that no sign of the original igneous rocks remains. Chrysotile, magnetite, pentlandite, millerite bravoite ($(FeNi)S_2$) and chromite have been observed.

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GABBRO MASSES OUTWITH THE SERPENTINITE

These medium to coarse grained gabbro masses are found in irregular, some possibly sill-like masses within the Crimson Creek Argillites and also in the Dundas Group Sediments, i.e. not a statigraphic position between the two sedimentary sequences as the Serpentine Hill Complex is. These were studied by Solomon (1964) and Rubenach and are predominantly augite-albite rocks with much seconday alteration and uralitisation. Rubanach (pers. comm.) having seen the Cuni mineralised gabbro sill to the west of S.P.L. 27 believes that these gabbros may be associated with it. Samples of these gabbros are being examined at present.

MELBA SPILITES

This little studied sequence of volcanic intrusive, extrusive and sedimentary rocks lies above the Serpentine Hill Complex but it is not yet known if the two are associated. The sequence, extensively exposed along the N.E. Dundas Tram is difficult to study due to excessive weathering which obscures structures and trends and makes petrological examination difficult. The typical rock has a brown-yellow, very oxidised, sandy appearance and is usually quite soft. Specimens studied have shown to be volcanic breccias, altered andesites, devitrified basic extrusives, altered basic flows and some oxidised chlorite schist, all showing oxidation, silicification chloritisation. Sharp angular volcanic breccias are common. Rubenach has identified lavas of spilitic composition even showing possible pillow structures. It is difficult, however, to trace marker horizons through the sequence or to estimate the extent of each rock type. Intrusive rocks are also found within the sequence. They are generally fine grained meta-dolerites and microgabbros through petrographic work is still in progress on these. Due to poor outcrop and weathering their exact relation to the volcanic sequence is not yet clearly understood.

DUNDAS GROUP SEDIMENTS

This sequence of alternating, shales and conglomerates was interpreted by Blissett and earlier workers on the assumption that the individual sequences were continuous i.e., with no horizontal facies variation. Thus the sequence was divided into Hodge Slate, Razorback Conglomerate, etc.,. However the boundaries and even rock types bear little relation to those given by Elliston (1954) and differ considerably from Blissett. Emberton and Elders, who mapped some of the central and northern part of the lease for Renison Ltd., believed that these earlier workers were mislead by the similarity and lens like character of the conglomerates. Woodward's later, more comprehensive mapping supports this statement and indicates that many of the conglomerates beds lens out towards the east. Presumably indicating deposition from the west.

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The boundary between the Melba Spilites and the Dundas Group sediments is nowhere clearly exposed. The lowest stratigraphic group in the sequence appears to consist of dark shales and siltstones with interbedded bands of chert and grit. These are exposed in the N.E. Dundas Tram, where they are much altered and appear to have been serpentinised. This serpentinisation has increased towards the fault where mineralisation associated with the fault has taken place. To the west this group of siltstones and cherts lenses out against the contact with the Melba Spilites and conglomerates are found on the contact. This group of rocks consists of coarse sandstones grading up to conglomerate with pebbles up to 6 inches in diameter. The basal conglomerate band contains fragments of the underlying spilites indicating a probable slight non-conformity between the two. To the east this conglomerate lies above the cherts and siltstones and is probably faulted by the Kapi Creek fault. Just east of this it lenses out in siltstones. The conglomerate bands are composed of sub-rounded to rounded pebbles of quartz, chert, micaceous sandstone and siltstone in a matrix of chlorite and quartz. Much of the conglomerate is haematitic. Next above this in the succession are greenish grey banded siltstones with interbedded coarser, probably tuffaceous sandstones. To the northwest they become more dark grey laminated siltstones and mudstones and are in contact with the ultrabasics. This is probably the Hodge Slate of Blissett but it contains within a conglomerate formation similar to that already described which lenses out to the east near the Kapi Creek fault. Above this is a thick succession of greywacke conglomerates similar to those already described. This is the only conglomerate horizon which does not lens out within the area studied and is probably equivalent to the Razorback conglomerate of Blissett. This horizon includes aranaceous greywackes, purple and green conglomerates with angular to rounded pebbles of shale, chert, micaceous sandstone and quartzites. North east of Confidence Saddle the base of the conglomerate sequence is occupied by a micaseous quartzite, the conglomerate itself having a silty matrix and rounded fragments of chert and micaceous sandstone.

The top of this thick conglomerate sequence interfingers on a large scale with the next formation which is principally made up of dark grey and grey laminated siltstones and black shales and can probably be correlated with the Brewery Junction formation of Blissett. A further lens of conglomerates is seen within this lensing out to the east.

Many of these formations then are seen to lens out and vary horizontally on a large scale but this is also seen on a small scale giving an extremely complex detailed picture. For example the base of the Razorback? Conglomerate where it cuts the N.E. Dundas Tram just east of Kapi Creek is completely interfingered with shales, siltstones and sandy siltstones.

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DEVONIAN QUARTZ PORPHYRY

This outcrop is in the south eastern corner of Renison Mining Lease and appears to be a complex sill-like body intruding the Crimson Creek Argillites and the Serpentinite Hill Ultrabasic complex.

Evidence for the probable sill-like nature of the mass is seen in the change of grain size form the base of the mass to the top of Pine Hill. Medium to fine grained at the base it coarses upwards and then becomes fine grained again towards the top of the hill. This could indicate relatively chilled margins and together with the general concordance of the base of the mass with the bedding of the Argillites, suggests sill-like form. It is probable, however, that a pipe or feeder is concealed beneath the mass providing a source for the mass itself and for the dykes.

Numerous dykes of quartz porphyry are seen to radiate from the main mass. The most prominent strikes NNW and cuts the Murchison Highway in a road quarry near the old mill of Renison Associated Tin Mines. Another prominent dyke strikes S.S.E. through the gabbro mass and is seen cutting Razorback conglomerate on the N.E. Dundas Tram just east of Confidence Saddle.

The quartz porphyry phenochrysts are of quartz and orthoclase in a quartz feldspar ground mass. Where late stage fluids have affected the mass cassiterite and tourmaline can be seen pseudomorphing the felspar. These late fluids have also affected the surroundingcountry rocks and hard indurated slates with tourmaline and magnetite and black tourmaline rich rocks are produced by metasomatism. Numerous transitional rock types are produced close to the contact. Late fluids have also effected the sediments in the form of quartz-tourmaline, cassiterite bearing veins. Also as previously mentioned the surrounding shales and siltstones have been hornfelsed in a wide aureole by the intrusion.

The disseminated cassiterite found within the quartz porphyry gives the mass assays of up to about 0.2% tin patchily developed. In the marginal veins, however, tin values can be very high, up to 8%, though it is not known yet how persistent these high values are.

STRUCTURE AND THE RELATION OF THE VARIOUS ROCK TYPES TO EACH OTHER

The ultrabasic masses of N.W. Tasmania all show similar layered ultrabasic and basic rock types ranging through dunites, peridotites, pyroxenites, pyroxenite-norites, norites and gabbros, generally following a classic fractionation trend towards more acidic rock types. In the individual masses, parts of this sequence are obscurred due to serpentinisation or absence, although at Bald Hill a large part of the sequence is present. However, if all the masses are considered together the complete sequence and fractionation history can be built up and it becomes evident that they were all originally part of the same mass, in one magma chamber, which has been broken up post crystallisation.

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The Serpentine Hill mass is thus one of these fragments of the original mass which has cooled and been partly serpentinised then has been moved through the crustal sediments whth much shearing and serpentinisation at its margins lubricating the movement. The contact of the mass with the Crimson Creek sediments is highly sheared and is thought to be a slide. This can clearly be seen where it is exposed on the Murchison Highway. The mass seems to have been moved up from the south at a shallow angle on to the top or near the top of Crimson Creek sequence possibly being exposed at the sea floor. Volcanic action on the sea floor giving a spilitic sequence with pillow structures closely followed this and was probably associated with it. Following this there seems to have been some uplift with erosion of part of volcanic sequence. Then further submergence gave deposition of the base of the Dundas group with fragments of spilitics in the first few feet.

Folding and faulting in the area seem to have a roughly N.S. - S.S.W. trend in agreement with Blissetts Taberabberan structures in this area and thus are past the emplacement of the Serpentine Hill mass. The slide boundary between the Serpentine Hill ultrabasics and the Crimson Creek Argillites is folded in this' direction giving its complex appearance on the geological map.

The Razorback serpentinite seems to occupy the core of a southward pitching antic line in the Dundas Group which may or may not be Taberabberan. This serpentinite, then, seems to have been intruded after the deposition of the Dundas Group, i.e. later than the Serpentine Hill Complex. The mode of emplacement by sliding and shearing, however is similar and a highly sheared zone is certainly known along the margin of the Serpentinite at the Razorback Mine.

The final major event in the area is the Devonian intrusion of the Pine Hill quartz porphyry with its radiating dykes. This may also be associated with the Taberabberan orogeny.

OLD WORKING IN S.P.L. 27

Sources	Waller	(1902)
	Ward	(1909)
	Conder	(1918)
	McIntosh Reid	(1925)
	Blissett	(1962)

RAZORBACK MINE

This is situated on the north east slopes of Mt. Razorback on the contact of the Razorback Serpentinite and the Dundas Group Sediments. The mining lease is held by T. Hodge of Zeehan and is of 65 acres.

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Drilling by Placer Prospecting Pty. Ltd. indicated a sulphide lode in a mass of dolomite between the serpentinite and the Dundas Group rocks, Razorback conglomerate and Brewery Junction shales and siltstones. Mineralisation is thought to be associated with faulting and shearing along the margin of the serpentinite.

The serpentinite is typical antigorite with veinlets of asbestos and is of ultrabasic origin. Bravoite may be present but could not be definitely identified. The carbonate rock or dolomite in which the lode is found is well crystallised and medium grained. The original texture and structure have been obscured by recrystallisation so that it is dirficult to give an origin for this rock. However the lack of any observed carbonate rock elsewhere in the Dundas group, and also the presence in this rock of what may be bravoite suggests an igneous origin. Blissett believes the rock to be produced by dolomitisation of serpentinite altered to ferruginous talc.

The lode itself consists mainly of tabular pyrrhotite marginally altered to pyrite and marcasite. Chalcopyrite and stannite are also seen. The tin bearing mineral is cassiterite. Gangue minerals are stressed quartz and interstitial carbonate.

Drilling has indicated the lode and the carbonate rock to be in a band up to 200 ft. wide on the contact of the serpentinite. This pinches out to the north and is terminated to the south by a change of facies to massive tuffaceous sandstone. Near the surface the lode is in the dolomite and on the contact with grits in a transition zone of finely laminated shales. Here it is up to 60 ft. wide with average values up to 1% tin. It is in two elongated lodes which seem to coalesce and narrow at depth to the south. One drill hole indicates 10 ft. of 0.72% tin at R.L. 300, 600 ft. below the surface but this is in the Dundas Group grits and may not be continuous with the lode nearer the surface.

In general an estimated reserve of up to 200,000 tons of 0.7% tin is present but it is noted that the lodes where they have been worked are less continuous than indicated by drilling and are nowhere as persistent as those found in Renison Ltd's. tin mine.

GRAND PRIZE MINE

A lode similar to that at the Razorback Mine is worked here on a Mining Lease of 40 acres held by C. Smith and others. The lode occupies a NNW trending tear fault entirely within the Dundas Group Sediments and is about 25 ft. wide. It has been oxidised to a considerable depth and the gossan can be traced in trenches and pits 800 ft. north of the main workings. Average tin contents of the ore is approx. 1.5%.

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KAPI CREEK

Just north of the N.E. Dundas tram along Kapi Creek black slates of the Dundas Group are faulted against heavily serpentinised cherts, grits and siltstones of the basal formation of the Dundas Group. Small veins of galena were explored and worked here on a small scale in the 1890's by various companies. Some lead was also extracted around 1911. An estimated total of 30 tons of galena has been extracted containing 4000 ozs. of sliver and 18 tons of lead.

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The veins are principally quartz and galena with some sphalerite in a gangue of siderite or dolomite. Arsenopyrite, crocoite, and malachite have also been found.

Drilling of the fault by the Dept. of Mines in 1958 on account of its supposed similarity to the Razorback Mine showed no cassiterite but some pyrite and pyrrhotite were found with traces of nickel.

MELBA MINE

This is situated in sheared serpentinite in the upper reaches of Melba Creek and was worked early in the 1980's. A four ft. lode containing galena, jamesonite and sphalerite was followed 72 ft. to the N.W. where it pinched out. To the S.E. only narrow straingers of mineralisation were found. Drilling by the Mines Department in 1958 below the stoped outcrop showed only slight mineralisation.

TIN WORKINGS ASSOCIATED WITH THE PINE HILL QUARTZ PORPHYRY.

Intermittent activity in this area from 1890 to about 1928 has been centred on cassiterite, quartz, tourmaline veins formed during the late stages of the intrusion. These are found in the hornfelsed siltstones of the Crimson Creek Argillites.

PENZANCE WORKINGS

This is the main mine in the area. A number of adits and trenches have explored a vein over 15 ft. wide, striking NE dipping 50° SE, in the saddle between Pine Hill and Commonwealth Hill. The vein is not continuous but irregular and complex in detail. Tin values however were very high.

MT. LYELL COPPER ESTATES LTD. WORKINGS

These occur on the eastern slope of Commonwealth Hill above the Penzance workings. Just south of one of the larger dykes of quartz porphyry a large gossan blow attracted attention and was worked below the surface. Close to the contact with the dyke the country rocks were found to be decomposed and contained much gossanous material with seams of tin through it. Beyond this the country rock was hard indurated slate highly impregnated with tourmaline and magnetite. To the north this lode was again seen on the surface where it consisted of tourmaline slate with much vein quartz, some of it very rich in tin, and gave the body a strike of about 20° West of north and a dip of 50 to 60° to the east. Work seems to have stopped before the extent of the lode could be ascertained.

Other minor workings have explored the numerous tin bearing veins in this area and are at present being studied and sampled in detail by M. Wooley a 3rd year Geology student in vacational employment with Renison Ltd.

GEOPHYSICS

Plate III shows the results of the magnetometer survey carried out on the traverses. The principal anomalies observed can, with one exception, be seen to be caused by the serpentinite which contains much magnetite throughout it. These anomalies plot almost exactly over the observed positions of the serpentine masses on the ground and were very useful in mapping the serpentinite where exposure was poor.

The type of anomaly is very distinctive and reflects wildly fluctuating magnetism with very high and low values. This is thought to be due to the occurence of the magnetite in thin veins and lenses in the serpentinite. Interpretation of the results seems to show long lensoid anomalies within the serpentinite roughly following the long axis of the intrusion. Due to complexity of the anomalies it is not possible to correlate them with any soil anomalies within the serpentinite except in the area of the Razorback Mine where a long anomaly of over - 5000 gammas over the serpentinite contact may partly reflect the pyrrhotite lodes of the Razorback Mine. This is magnetic anomaly I.

The grid only covered the extreme south end of the Grand Prize lode so that the magnetic reaction over this is difficult to compare with that over the Razorback lodes. A detailed magnetic study by the Bureau of Mineral Resources, however did reveal a strong magnetic anomaly over the southern part of the Grand Prize lode.

Strong magnetic anomalies were observed on 9000 and 9400 ft. W on the Pine Hill Grid over the area of pyroxenites and pyroxenite-norites. This is presumed due to the fact that many of the layers in these rocks have been totally serpentinised. Thus the anomalies are interpreted parallel to the strike of the layering.

The most interesting anomaly, or set of anomalies produced by the work is that marked as anomaly II. The magnetics here are wildly fluctuating and are very similar to those over the serpentinites. However this very strong anomalous region is found over poorly exposed hornfelsed Crimson Creek Argillites, The anomaly is not typical of the more regular and lower anomalies produced by lodes rich in pyrrhotite. This anomaly is thought, due to its orientation and complexity, to be associated with the quartz porphyry but this will be discussed in the Geochemistry section.

In general magnetics have been found to be a very useful tool in this area for mapping and locating mineralisation on Commonwealth Hill. Pyrrhotite is suspected on the Kapi Creek fault but there is no sign of it on magnetics, partly due to the lack of traverse cover.

...../13

GEOCHEMISTRY

Plates IV,V and VI show the results of residual soil sampling for tin, nickel and copper respectively. These three minerals proved to be most significant in this area.

A significant tin anomaly occurs over the position of the Razorback Mine following the position of the known lode. The extent of this anomaly is not clear to the west as it cuts the end of three of the grid lines but values up to 3400 ppm are found. This is close to the position of magnetic anomaly I and presumably represents the Razorback Lode. The anomaly continues with slightly decreased values to the north west following roughly the serpentinite - Dundas Group contact, presumably being caused by further pyrrhotite, cassiterite mineralisation along the contact, continuous with but of lower grade than the mineralisation in the Razorback Mine. This continues to the north west extremity of the serpentinite. High tin values at the west end of traverse 444N (up to 2400 ppm) may be a further continuation of this shear zone mineralisation north of the serpentinite or may be shed from the Grand Prize area to the north east. The relatively high values for tin over the serpentinite to the east and north east of the Razorback Mine are probably due to alluvial tin washed from the Razorback Lode, through there may be minor mineralisated sheers within the serpentinite. A rather isolated minor high at the eastern end of T412N, in Brewery Junction slates, may be due to a minor mineralised shear.

Another very high grade tin anomaly occurs on the southern extension of T 2900 W on the Pine Hill grid with values up to 2% tin in soil. The anomaly occurs close to the position where the Kapi Creek fault brings serpentinite, Melba Spilites and Dundas Group siltstones up against undifferentiated ultrabasics and Dundas group shales. It seems that the cause of the anomaly is mineralisation along the Kapi Creek fault. The typical mineralisation at Kapi Creek is of the lead zinc type, however, a Department of Mines drillhole did encounter pyrrhotite on the fault through it contained no cassiterite. This drillhole was however, to the south of the anomaly and it is possible that in the region of the anomaly substantial cassiterite is associated with the pyrrhotite.

The most substantial tin anomaly in the area occurs around the west and south west margins of the quartz porphyry. This of course is due to the presence of disseminated cassiterite in the quartz porphyry and to the cassiterite bearing quartz tourmaline veins which surround the mass in the country rock. The anomaly is well displayed around the largest working at the Penzance and Mt. Lyell Copper Estates mines. The broad area of high tin values to the south and south west of the mass, down towards the baseline, is probably due to soil movement from above and to washing of the element down the slope. To the south east, however high tin values indicate the Curtin I and Curtin 2 cassiterite vein workings.

The most interesting part of the anomaly extends westward from the mass through the general position of the Penzance and Mt. Lyell workings and contains a further 2000 to 3000 ft. to the west with very high values of tin, up to 2%. This could not be caused by downhill wasting of the element as the anomaly strikes up the slope of Commonwealth Hill away from the known position of mineralisation associated

.../14

with the quartz porphyry. The exact extent of this anomaly north of the present grid is not clear but sampling on an ajoining grid to the north of Commonwealth Hill should clarify this. This anomaly occupies almost exactly the same position as magnetic anomalyII and it seems that both must be caused by the same mineralisation. No pyrrhotite is known to be associated with the quartz porphyry cassiterite, however, so that it cannot be the cause of the magnetic disturbance. As previously mentioned, however, the anomaly has the same complex configuration as those associated with magnetite lenses in the serpentinite. So it is possible that magnetite associated with the quartz tourmaline veining causes the magentic anomaly. Rock exposure over the two anomalies is very poor and no indication of the mineralisation has yet been observed on the surface. It is thought, however, that the anomalies probably represent an extension to the east, of the type of gossanous lode of complex veining seen in the Mt. Lyell Copper Estates mine which contains lenses rich in cassiterite and which shows tourmaline and magnetite in the surrounding country rock. This may be associated with a dyke of quartz porphyry trending west. The very high soil assays here could only be supported by this type of vein mineralisation.

Other small isolated tin anomalies, especially in the Melba Flats and in the valley of the Argent Creek, are probably alluvial in origin. In an area where much working of the tin deposits have taken place it is necessary to be very suspicious of small anomalies isolated from the main mineralisation. An example is seen on the southern extension of T 500 W where a tin anomaly of 3500 ppm seems to be associated with the old pack track from the Penzance workings and is probably due to accumulated spillage on this track.

Nickel and copper soil anomalies observed in the S.P.L. are associated with the ultrabasic intrusions, the serpentinite in particular. Copper tends to follow nickel but is much less extensive and gives lower percentages.

There are two notable nickel anomalies in the Serpentine Hill complex, I & II. Anomaly I closely follows the outcrop of serpentinite as seen on the ground and gives values of up to 2300 ppm.. Specimens of the serpentinite have been studied by H.W. Fander who saw small amounts of pentlandite and millerite. The presence of these minerals, presumably, is the cause of the anomaly but the extent or the development of these minerals is not known at present. A distinct rise in nickel values can also be seen over the narrow lens of serpentinite exposed on the southern extension of T 900 W.

Nickel anomaly II occurs over the large mass of serpentinite at Serpentine Hill. Values of up to 1850 ppm. are recorded here. The anomaly here is intersected by road cuttings at the Murchison Highway and sampling here gave values of up to 0.4% Ni on the fresh rock.

A series of narrow lenticular anomalies in the Razorback serpentinite seen to follow the axial trend of the serpentinite as expressed by magnetics.

...../15

These show values up to 2680 ppm.. A larger more interesting anomaly occurs in the nose of the serpentinite south of the Grand Prize area where values range up to 3180 ppm. Ni. Drilling by the Dept. of Mines in this area encountered serpentinite with nickel values between 0.3 and 0.4%. Bravoite has been observed in these rocks and is also seen in the serpentinite at the Razorback Mine.

Arsenic values show little that is anomalous with values reaching about 300 ppm.. A slight high of 300 ppm. is observed on the southern extension of T2900 W on the Kapi Creek Fault.

Lead values have been plotted on the Razorback Grid and show a high south of the Razorback Mine with values up to 2% but these samples were taken near the Dundas Rivulet which contains tailings washed from the Comet silver-lead workings. High lead values on line 380 N may be due to small amounts of galena associated with the Razorback lodes.

The results of soil sampling have thus been of great value in this study and have indicated areas of interest beyond the areas where old workings are found.

CONCLUSIONS AND RECOMMENDATIONS:

Work to date on S.P.L. 27 has indicated a number of very interesting areas which require more detailed study. A great improvement has been made in the understanding of the geology of the area. Study of the Dundas group sediments in the southern part of the S.P.L. has shown that when considered in detail, the group cannot be made to conform to the strict succession set up in the past. The use of grid lines has also greatly improved the mapping of the Serpentine Hill complex and allowed the complex set of igneous rock types to be more clearly differentiated.

Coupled with geology, magnetics and geochemistry have been valuable tools in isolating and narrowing down the areas of economic interest which require further more detailed study.

Lead-zinc mineralisation in the area seems to be developed only on a small scale at Kapi Creek and any further study of this is not recommended. However, soil sampling has indicated that the Kapi Creek fault may carry some tin along its length and detailed sampling of exposed rock and soil along the whole length of the fault is recommended to establish the extent of tin mineralisation. Due to the orientation of the fault relative to the grid lines, few intersection of it have been obtained. It may be useful to cut a set of traverses across the fault parallel to the Pine Hill baseline for detailed magnetics and soil sampling.

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At present a road is being planned over the area of magnetic anomaly II, i.e. the interesting tin anomaly striking westwards from the Penzance workings. It is planned to contour around the southern slopes of Pine Hill from the Pine Hill track to the Penzance workings and then to progress around the south and west slopes.of Commonwealth Hill. It is hoped that this will give a good section of rock exposure over the present anomaly and assist in selecting drill sites to determine the extent of ore at depth. It is thought that a detailed comprehensive study of the Pine Hill quartz porphyry intrusion and all its effects on the surrounding rocks would greatly assist evaluations of the mineralisation associated with it.

Follow-up work is also under way on the nickel anomalies associated with serpentinite in the two ultrabasic masses. A road has been cut from the N.E. Dundas Tram at 5700 W to 3500'W along the Pine Hill baseline and the grid line interval has been reduced to 200' over the known extent of nickel anomaly I in preparation for an Induced Polarisation study to be undertaken under contract in March 1970 by the Companie Generale de Geophysique. It is hoped that this method will help indicate the extent of sulphide mineralisation and assist in the choice of a first drill site. A similar survey is also planned on the present grid over the whole extent of the Razorback serpentinite for the same purpose. To this end the Razorback baseline has been opened to four-wheel drive vehicles.

K. McI. Ferguson
SURFACE GEOLOGIST

Scale 1:15,840

5 cm

1482

1482

Location. I

032020

RB 1

70-608

1483

COMMONWEALTH HILL

PINE HILL

EMU BAY RWY

MURCHISON HWY

N. E. DUNDAS TRAM

Pine Hill Track

McLeod's Extended Workings

Benjamin Workings

Argent Ck.

Kohi Ck. Fault

Kohi Ck.

Madam Malta Workings

Malta Ck.

Grand Prize Fault

Grand Prize Workings

Kohi Ck. Workings

CONFIDENCE SADDLE

N.E. Dundas Tram

Wallace's Team (disused)

BLACK HILL

CARBINE HILL

MT. RAZORBACK

Razorback Ridge

55,000' N

50,000' N

45,000' N

40,000' N

3,000 E

3,000 E

3,000 E

G

P

I

N

LEGEND.

DEVONIAN

PINE HILL QTZ. PORPHYRY

DUNDAS GP. SHALES & SILTSTNS.

CONGLOMERATES

SILTSTNS., GRITS & CHERTS

CAMBRIAN

Ultrabasics

MELBA SPILITES

TREMOLITE ROCK

LAYERED GABBROS

LAYERED PYROXENITES & PYROXENITE-NORITES

SERPENTINITE WITH RELICT IGNEOUS TEXTURES

SERPENTINITE

CRIMSON CK. ARGILLITES

DUNDAS (sic)

5 cm

Geological Boundaries

Faults

Lease Boundaries

Tracks

Strike and dip of bedding and of layering

70-608

DATE	
DRAWN	K.M.S.F.
SCALE	400'=1"

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SURFACE GEOLOGY. II 1483

1484

COMMONWEALTH HILL

PINE HILL

EMU BAY RWY

Pine Hill Track

CONFIDENCE SADDLE

55,000' N

Argent Ck.

MURCHISON HWY

Kobi Ck.

N.E. Dundas Tram.

Wallace's Tram (Disused)

Melba Ck.

N.E. DUNDAS TRAM.

50,000' N

BLACK HILL.

CARBINE HILL.

MT. RAZORBACK

DUNDAS

45,000' N

40,000' N

3,000'E

LEGEND.

CONTOUR SEQUENCE

-5	-5000γ
-3	-3000γ
-2	-2000γ
+3	+3000γ

5 cm

032022

70-608

DATE	
DRAWN	K.M.S.F.
SCALE	400'=1"

RENISON LTD.

GEOPHYSICS. III

1484

1485

COMMONWEALTH HILL

PINE HILL

Pine Hill Track

EMU BAY RWY

55,000' N

Argent Ck

CONFIDENCE SADDLE

MURCHISON HWY

Kelly Ck

N.E. Dundas Tram

Wallace's Tram (Disused)

Melba Ck

50,000' N

N.E. DUNDAS TRAM

55,000' E

BLACK HILL

CARBINE HILL

45,000' N

MT. RAZORBACK

DUNDAS

40,000' N

LEGEND

0 - 100ppm.	
101 - 300ppm.	
301 - 1000ppm.	
1000+ppm.	

5 cm

032023

70-608

DATE		RENISON LTD.
DRAWN	K.M.F.	GEOCHEMISTRY PPm. Sn. IV 1485
SCALE	400'=1"	

1486

COMMONWEALTH HILL

PINE HILL

Pine Hill Track

EMU BAY RWY.

Argent Ck.

CONFIDENCE SADDLE

MURCHISON HWY.

Melba Ck.

N. E. DUNDAS TRAM.

Kobi Ck.

Wallace's Tram (Disused)

N.E. Dundas Tram

BLACK HILL

CARBINE HILL

MT. RAZORBACK

DUNDAS

55,000' N

50,000' N

45,000' N

40,000' N

55,000' E

50,000' E

45,000' E

40,000' E

455N

430N

420N

372N

LEGEND

0 - 100ppm.

101 - 300ppm.

301 - 1000ppm.

1000+ ppm.

5 cm

032024

70-608

DATE		RENISON LTD.
DRAWN	K.McL.F.	GEOCHEMISTRY. PPm. Ni. V
SCALE	400'=1"	1486

1487

COMMONWEALTH HILL

PINE HILL

EMU BAY RWY.

Pine Hill Trail

55.000° N

Argent Ck.

CONFIDENCE SADDLE

MURCHISON HWY.

Kelvi Ck.

N.E. Dundas Tram.

Wallace's Tram (Disused)

Melba Ck.

N.E. DUNDAS TRAM.

50.000 N

55,000° E

BLACK HILL

CARBINE HILL.

45.000' N

MT. RAZORBACK.

DUNDAS.

40.000' N

40,000 E

45,000 E

50,000 E

LEGEND.

1000 + ppm.

300 - 1000 ppm.

100 - 300 ppm.

5 cm

032025

70-608

DATE		RENISON LTD.
DRAWN	K.M.I.F.	PPM. Cu. VI
		1487
SCALE	400'=1"	