

Exploration and Prospecting of Tape Lake North area

Work carried out by

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On behalf of

**Landore Resources**

## Note

Exploration was carried out from the 20<sup>th</sup> July to August 22<sup>nd</sup>

Several topographic features were identified from the air by Joy Lester, and these served as initial targets for exploration.

It was decided - for several reasons - that the work would focus on prospecting and not mapping. Firstly, a broad geological map (Pye, 1968) already existed of the area, which has thus far proved to be accurate. Secondly, accessing the area of interest is difficult and has proved time consuming, so it was considered that the time was best spent prospecting.

The difficult access has also precluded exploring the 3<sup>rd</sup> priority area, south of Tape Lake, as was the original plan. This will be accessed from the Junior Lake camp.

## Lithology

### **Amphibolite**

As noted by Pye the principle lithology in the north Tape Lake area is amphibolite. In the main, the amphibolite encountered has been moderately to strongly sheared. The intensity of shearing is typically schistose or gneissic, but in restricted areas is only weakly deformed. The strike of shearing is roughly consistent at around 080 – dipping from subvertical to 70° towards the south.

A common feature of the lithology is elongate feldspar crystals – probably indicating a gabbroic protolith. These feldspars are stretched from a few centimetres long and grade into gneissic banding. The intense shearing is everywhere associated with pervasive silicification and frequently with sulphide mineralisation. A low level of pyrrhotite and pyrite mineralisation is present throughout much of the lithology. However, the strongest mineralisation is found in discrete bands of intense, pervasive silicification. These vary from a few centimetres up to 2m wide, and can be traced for several hundred metres in some cases – limited largely by exposure.

Mineralisation – typically pyrrhotite with lesser pyrite – is finely disseminated in bands within this. 10-15% disseminated sulphides, predominantly pyrrhotite, is common in intervals of up to 40cm. Smaller intervals – up to 5cm - of 30 and 40% sulphides have been noted [433747, 5593333], and in one instance a 1.5cm wide band of solid pyrrhotite [434203, 5593101].

Rusting of the weathered surface is the surest indicator of sulphides. However, strong rusting occasionally yields no, or only minor, sulphides on fresh surfaces (possibly indicating the presence of very fine sulphides). Conversely, in places there is no visible rusting and/or only minor silicification, yet up to 10% disseminated pyrrhotite and pyrite.

### **Minor, contemporaneous mafic lithologies**

Interspersed within the sheared amphibolite are blocks of less deformed mafic volcanics. Basaltic pillow structures - amphibolitised and elongate, but still easily recognisable as such – were noted at [432052, 5592396], continuing at least 20m to the south. Elsewhere small, weakly deformed gabbroic units were noted within the schistose amphibolite. At [434023, 5592645] schistose amphibolite contacts a massive, amphibolite lithon, which continues for 20-30m to the south, bisecting the shearing which continues to the south. The massive amphibolite displayed a very coarse, relict texture that most likely indicates a gabbroic protolith. Mineralised bands were found within the sheared rock at both sides of this. Smaller, gabbro and leucogabbro units were also observed within the shear zone. Few samples were taken of lithologies other than the sheared amphibolite, but there were two exceptions:

- Sample 991755: Leucogabbro exhibiting 2-4% disseminated pyrrhotite.
- Sample 991758: Fine, sheared gabbro. Silicified and quartz veined. 5% disseminated pyrrhotite with traces of fine, pyrite and tentatively identified arsenopyrite.

## **Dolerite dyke**

A dolerite dyke, approximately 50m wide, unmapped by Pye, was noted at [433867, 5592716 – *east-edge of dyke*]. It seems that this unit corresponds to the north-south trending, linear structure identified as the focus for priority area 1. The dyke is massive, except for jointing at the contacts; fresh and unaltered and likely of an age with the younger dolerite dykes mapped elsewhere in the general area by Pye.

A smaller (3m wide) dyke as also noted at [433890, 5592512], also trending north-south and similarly fresh and undeformed. A further, small outcrop of dolerite was noted elsewhere with 5% disseminated pyrite and sampled [below]

- Sample 991771: Fresh, unaltered dolerite. Shear fabric evident only in weathered surface. 5% disseminate pyrite throughout.

## **Metasediment**

Metasediment was encountered at two locations in the exploration area.

A narrow tongue of metasediment – quartz-biotite gneiss – mapped by Pye, protrudes into the area from a larger body to the west. Although most of this appears to have been inferred by Pye, it does outcrop in a few places on the edge of ridges in this area. The lithology is composed of quartz and biotite and exhibits tight, small-scale fold structures.

Similar quartz-biotite sediment is found at the centre of a large ridge at the southern edge of exploration area. The ridge has been previously mapped as entirely amphibolite. The metasediment is patchily exposed and variable in character from gneissic quartzite to mica schist. The southernmost outcrop of the sediment was noted at [433074, 5591908]. This was predominantly quartzite with boudinaged quartz veins up to 10cm across and up to 1% disseminated pyrite [sample 991833]. To the north the unit becomes more micaceous. Shearing was noted at [433099, 5591965] with around 5% disseminated pyrite with silica and carbonate [Sample 991834].

## **Pegmatite Granite Dykes**

Two pegmatite granite dykes were discovered in the tape lake area.

The first of these was discovered at [432073, 5591868]. The dyke runs approximately E-W, dipping shallowly to the east. It outcrops at the base of a ridge of vertically dipping, sheared amphibolite. The dimensions of the dyke are difficult to ascertain due to obscured contacts but it is approximately 5m wide, striking 157 and dipping steeply to the east.

The dyke principally comprises coarse to pegmatitic quartz, feldspar, and muscovite. Several rare-element ore minerals were noted including fluorapatite (fluorine), spodumene (lithium), and columbite-tantalite (niobium and tantalum), tourmaline. The proportion of these minerals is very

difficult to gauge at this early stage due to the heterogeneity of the rock. However, to have found a large crystal of columbite-tantalum (coltan) - 2.5cm long – in addition to several spots of finer-grained material, at first-pass, is very promising.

A second pegmatite dyke was found to the south and east of the first. It is exposed in sheared amphibolite, cutting it obliquely at 140. The dyke emerges from lowland at the south edge of the ridge [433212, 5591364] where it is 2.5m wide, and continues to the south where it divides into two narrow, 50cm wide fingers which persist until [433185,5591430] before pinching out.

The dyke exhibits a weak planar fabric aligned with the ENE (070) foliation of the amphibolite. However, as the dyke does not appear to be significantly distorted this would indicate that it was emplaced sometime close to the end of shearing in the amphibolite.

The dyke is finer-grained than the previous one, though compositionally it appears to be very similar. A higher proportion of spodumene was noted (30% in some samples), and a semi-metallic mineral tentatively identified as cassiterite, in addition to tourmaline and fluorapatite.

#### **Recommendations for further work**

Mineralisation in the Tape Lake property is predominantly in two styles.

Firstly, disseminated pyrrhotite in sheared amphibolite. Mineralisation is consistent over at least 600m of stratigraphy, and was followed for 2km along strike. Samples were taken from all across the extent of the observed mineralisation. Further work would have to be contingent on assay results. If positive results are returned, the target is a large one and may warrant further work. There is sufficient outcrop in the area that a focussed mapping campaign should be capable of delineating the body. Trenching will be possible in ridges, but several sections of the stratigraphy are hidden by lowland and would require drilling to investigate. Minor magnetic anomalies – identified by disturbance of the compass - were noted in places, which may indicate high-grade pyrrhotite and would suggest that magnetic surveying could be a useful tool in further exploration here.

Secondly, pegmatite dykes. The two dykes discovered in the area bear potentially economic mineralisation. The second dyke was identified from the air by helicopter. If favourable results are obtained from the samples already sent off, further mapping would be greatly aided by access to a helicopter.

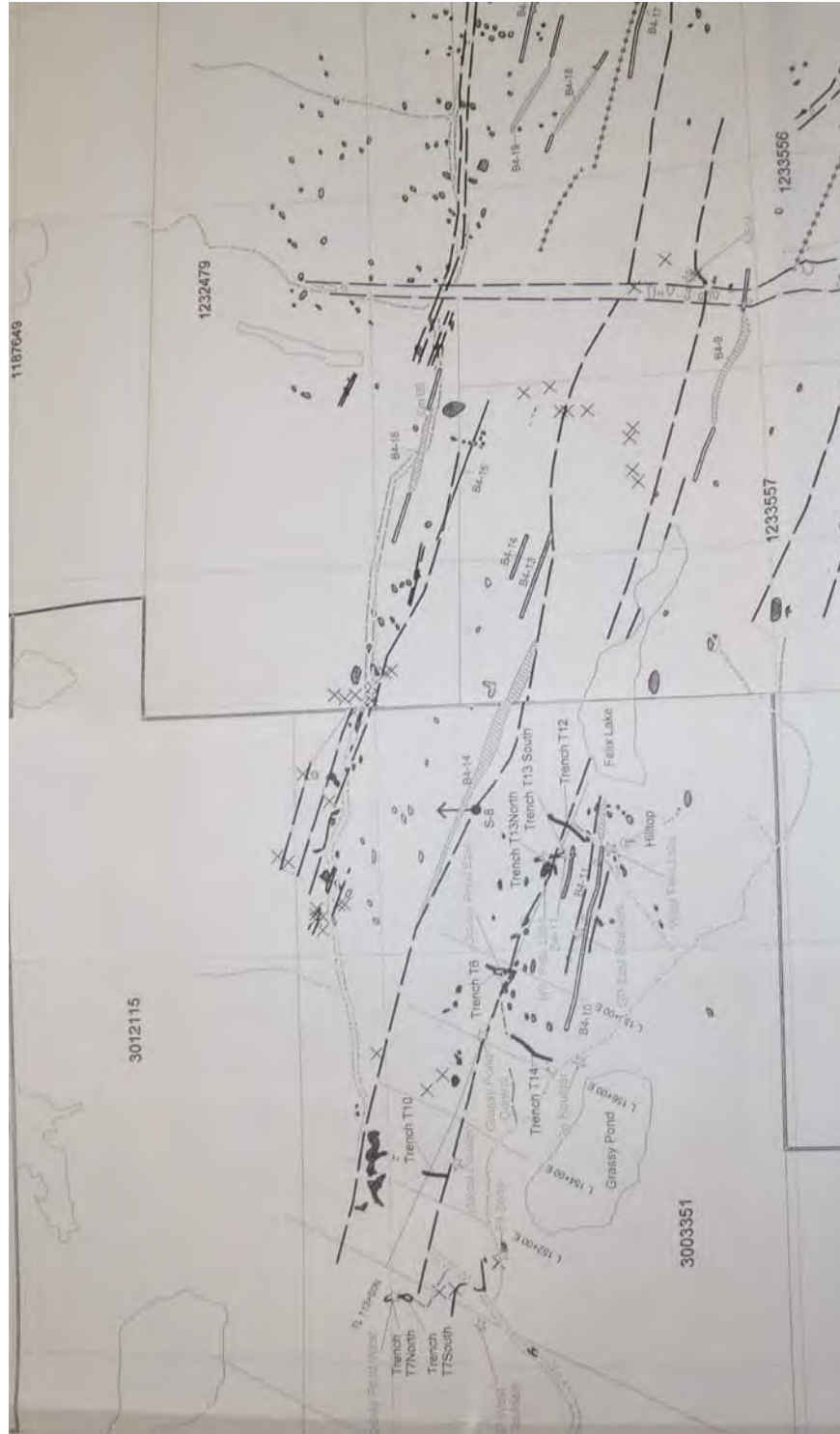
## **Grassy Pond and BAM-West Prospect**

### *Focus of Exploration:*

The purpose of exploration within the Grassy Pond and BAM-West Prospects was to evaluate the exploration potential of several EM conductors as well follow up on favorable results that were determined by the earlier work of McTavish, (2001). A secondary purpose of the exploration was to constrain the geology of the host rocks (lithologies, structure, alteration, mineralization, etc.)

### *Location and Access:*

The entirety of the Grassy Pond and BAM-West prospect is transected by the Jackfish/East Road from roughly kilometer 99 to kilometer 105. Numerous side roads and small cut roads branch of the main road and provide excellent access the upper and lower extremities of the properties. In addition, the entire prospect has been extensively logged providing easy walking to the majority of outcrops. Most outcrops occur as small humps of exposed bedrock or as flat lying panels where regolith has been removed. Numerous previously exposed trenches provide excellent exposure of major lithologies and structures.



Map of Grassy Pond and BAM-West prospect showing road network, locality names and EM anomalies.

*Basic Geology:*

The geology of the grassy pond prospect can be broken into five main and conformable units. They include:

1. Megacrystic anorthosite
2. Varied textured gabbro to leucogabbro
3. Pillowed to massive mafic volcanic rocks
4. Sulphidized banded oxide-facies iron formation with locally interbedded chert and grey wake
5. Late stage felsic intrusive dikes

The greenish-grey volcanic mafic volcanic rocks are variably massive to pillowed and where pillowed they have well preserved selvages and range in size from thirty to fifty centimetres with way up indicators (vesicles, triple points) indicating a younging direction roughly to the north. Commonly the mafic volcanic suite is coarse grained with actinolite/tremolite porphyroblasts up to 1 cm making the rock reflect a more gabbroic parentage. It is important in the field to recognize, though difficult, the difference between the primary igneous plutonic textures of the gabbro (cumulate to porphyritic primary mineralogy or replaced primary mineralogy) from the metamorphosed recrystallized textures which can be present in both the gabbro and basalts. The difference can be extremely difficult, especially when observing plagioclase feldspar phenocrysts up to 3.5 cm within the basalt suite; however these are interpreted to be the

products of metasomatic alteration. The basalts which bound the Grassy Pond sill to the north and the south are largely conformable along strike over great distances (>20km) and reflect parentage to either the Marshall Lake group or the Toronto Lake group, respectively (details of which have been described in Pye, 1965).

Gabbroic rocks, which intrude the pillowed mafic volcanics along selvages and through massive sections, generally lack well defined chill margins. These gabbroic rocks, which are composed primarily of coarse grained mafic to ultramafic minerals (altered pyroxene and amphibole) contain locally megacrystic plagioclase either porphyroclasts or porphyroblasts. The gabbroic rocks have a weathered surface greenish grey to greenish white in colour depending on the concentration of plagioclase. Sulphide staining is abundant throughout the blebby textured gabbros with visible disseminated pyrite and chalcopyrite generally less than 5%. These gabbros grade into massive megacrystic plagioclase anorthosites. The gabbroic rocks have been interpreted based on field relations and geochemical signatures to reflect common parentage to the anorthositic rocks of the Grassy Pond sill are inferred to be a more evolved constituent of the same plutonic event.

The anorthosites (or plagiophyric to glomerophyric leucogabbro) are characterized by individual and cumulate textured plagioclase, as well as locally semi-cumulate to semi massive and massive plagioclase. Individual feldspar crystals can be as large as fifteen centimetres in diameter within a fine to coarse grained mafic matrix. The contact between the anorthosites and the gabbro is generally gradational though some

sharper contacts do exist. The nature of these contacts can vary on a centimeter scale. The contact between the anorthosite and mafic volcanic rocks is generally strongly sheared.

Interbedded within the southern mafic volcanic package is sulphide-bearing clastic and sulphide-rich chemical metasedimentary. These rocks are strongly deformed, sulphidized, oxide facies iron formation containing up to 50% disseminated, stringered, banded, and semi-massive pyrite and minor chalcopyrite, and locally 3-5 cm bands of massive pyrrhotite. These units are strongly oxidized on the weathered surface are distinctly noticeable by their rusty appearance. These units while sheared are broadly conformable over long strike lengths are generally reflected in the east-west EM anomaly trends.

Lastly, cross cutting all major lithologies and sub parallel to cross cutting (varied) major structures are tonalite-trondhjemite dikes. These leucocratic dikes are sharp contacted and vary in thickness from 20 cm to 15m. They composed nearly entirely of alkali feldspar, (albite-anorthite and microcline?) with up to 30% biotite and amphibole. These dikes do not appear to be related, either genetically or spatially, with mineralization in the other units. These dikes appear to be cross cutting, (late stage) all observed mineralized structures.

*Structure:*

Two main shears are distinct through the entirety of the prospect. The first shear is distinct and strongly deformed up to 12 metres wide and propagates along the contact of the plutonic rocks (anorthosite and gabbro) and mafic volcanic rocks. This shear, which has dextral sense of movement, is traceable through outcrop and trenches over a strike length of 2 km. The second main shear runs through the sediment-iron formation unit. This shear has varied thickness from 3 to 10m, and varying degrees of intensity; locally more brittle deformation (folds and broken bedding planes) though generally strongly plastic planer deformation is observed. The volcanic package between the sediment and sill units (i.e. between the two main shears) acts a relative lithon to these shears, and only secondary and tertiary narrow splays are visible within.

Where the two shear zones appear to intersect (western edge of Felix Lake) there appears to be a great deal of structural thinning as the volcanic package between the units seems to go from 50-70 m thick to 10-20 m thick (this effect could also result the geometry of emplacement of the sill).

The sulphidic sediment-iron formation, which is broadly continuous over great strike lengths (>2 km) is actually broken into smaller discontinuous units which are roughly parallel along strike. While it is possible to have these units in a boudinage formation it is far more likely (based on the nature of slightly more brittle deformation)

that they form a weakly oblique en echelon stack which is consistent with dextral strike slip deformation.

*Prospecting Results (Mineralization):*

Prospecting in the vicinity of trench T12 and T13 yielded the discovery of the “T12 zone,” the West Felix Lake occurrence. This is a series of patchy exposed outcrop which straddles the B4-10 anomaly. The rocks consist of strongly sheared greywacke-to-sub iron formation sediments and mafic volcanic rocks. The entire area is highly gossanous with disseminated sulphide, generally pyrrhotite greater than chalcopyrite and pyrite, up to 8%. Locally there are thick (5 cm) bands of massive pyrrhotite. Also within the package is a 8-10 cm quartz vein which contains seams of pyrrhotite with chalcopyrite up to 12%. This occurrence, while not only being a potential source for Cu and Ni, is likely a good Au target as well.

Investigation into the mag and EM anomalies along the western bank of Felix Lake has revealed an outcropping of sheared micaceous rusty stained gabbro. The gabbro is medium grained and strongly oxidized with disseminated pyrite and pyrrhotite up to 3%. This could possibly be an along strike extension of the B4-11 anomaly.

Examination of the B4-16 anomaly discovered roughly 80m of intermittently exposed mafic volcanic rock (pillowed to locally massive basalt) of the Marshal Lake Group which had been extensively sheared (over 5m) and is filled with massive quartz

veining (up to 2 m thick), both with a strong gossanous rind (Figure below). Exposure is a small road side scraping along the edge of the Jackfish- East road at km 102. Wall rock inclusions within the quartz vein contained disseminated to veined sulphide up to 12 % locally, average 5-8%, pyrrhotite greater than pyrite. Strongly silicified sheared mafic volcanic rocks within the anomaly contained disseminated pyrrhotite and pyrite up to about 5% throughout. The nature of this shear and the geology that constrains it (as well as continuation with mag and EM anomalies) suggests this occurrence is possibly a continuation of the BAM zone and will most likely reflect similar mineralization and hopefully comparable ore grades.

Examination of B4-14 and B4-9 EM anomalies revealed that the anomalies were well beneath regolith cover, and followed the drainage creeks of Felix Lake. Around the B4-11 occurrence however numerous “rusty” boulders were observed, especially around the lake shore and creek bottom, with up to 5% disseminated to small blebby pyrite, pyrrhotite and chalcopyrite. These boulders could possibly be representative of the rocks comprising the B4-11 anomaly.

Examination of the B4-19 anomaly revealed that exploration trenches T31, T32, and T33 were located to far north to actually cross cut the anomaly. The anomaly itself is well buried beneath regolith but down strike was two locations of boulders to sub outcrop which were very “rusty” and moderately sheared mafic volcanic rocks with 3-5% disseminated pyrite with lesser amounts of pyrrhotite and chalcopyrite. These boulders

are possibly a continuation of the B4-16 Trend, which appears to be similar to that of the BAM occurrence.

Prospecting of the B4-18 EM anomaly encountered little exposure with high amounts of overburden. One exposed till mound was over 8 metres in height and was composed of poorly sorted sediment that included boulders up to 3 metres. Along strike however, notable boulder trains to sub outcrop were observed (30 to 85 meters) composed of sheared mafic metavolcanic rocks which have been weakly to moderately silicified and were extremely rusty. Fresh surface revealed 3-5% pyrrhotite with pyrite and lesser chalcopyrite.

Prospecting of the MEM occurrence (located 650 m east of Felix Lake and 1950 m northwest of the B4-7 Deposit) revealed the contact of cumulate anorthosite of the Grassy Pond sill and medium grained gabbro (basalt?) roughly 35 meters east of an elongate north striking diabase dike. Locally the contact is quite sharp and fracture plane contained disseminated pyrrhotite and chalcopyrite up to 3%. Contact however was not observed to be sheared but is being interpreted as an along strike extension of the Grassy Pond zone and likely reflects mineralization similar to it.

Exploration in the vicinity of trench T14 and T10 yielded the discovery of the “K zone” roughly 120 m south of trench T10. The “K Zone” is a series of small outcrop exposures within abundant gravel and sand. Both the boulder and the outcrop are extremely rusty and moderately sheared. Disseminated sulphide is abundant throughout

up to 10% (pyrrhotite, pyrite and chalcopyrite). Locally there is sub outcrop with 8-10 cm massive quartz vein with seams of pyrrhotite with pyrite up to 12%. The host rock is strongly sheared and difficult to discern exact parentage, but is likely mafic metavolcanic rocks or sediments derived from mafic metavolcanic rocks. This occurrence could possibly be an extension sheared sediment formation in the south end of trench T14 or even further speculating- the same quartz vein and host rock from exposure at the “trench T12 south” zone. This occurrence is likely to also host Au values in addition to Cu and Ni mineralization.

Exploration of the B4-1 anomaly at the T-junction between the Jackfish/Airport/East road and the camp road revealed exposed bedrock of moderately sheared coarse grained leucogabbro with locally rusty sulphide “burns.” Thick till overlies much of the area up to 1.5 metres thick and contains abundant rusty boulders of sheared sediments with disseminated pyrrhotite and pyrite up to 8%.

Little to no exposure of bedrock is available over the B4-3 and B4-2 EM anomalies. Exposure that is available is comprised solely of medium grained unmineralised gabbro. Exploration trench T27 cross cuts the center of the EM anomaly but contains only weakly sheared gabbro with trace to 1% disseminated sulphide (pyrite with minor pyrrhotite).

### *Sampling:*

Samples were collected from every occurrence which had exposed bedrock. Samples were collected by selectively choosing well mineralized segments as well as less altered wall rock. Primarily grab samples were collected using the hammer and chisel method, though where access was feasible a rock saw was used to acquire less weathered samples.

### *Results:*

Assay and ICP results from surficial grab samples returned a highest value of 0.3% Cu and 0.2% Ni from sample 597527. This sample was a channel cut from the sheared mafic volcanic rocks of the B4-16 anomaly. All other samples contained only anomalous values ranging between 0.016% - 0.0362% Cu and 0.009% - 0.062% Ni. No significant Au values were observed.

### *Conclusions and Recommendations:*

Exploration efforts should be focused on the central Grassy Pond area, km 100 access road west to km 103, and south of the Jackfish/Airport/East road and north of the Grassy Pond/Juneau Lake access road; essentially encompassing an area surrounding Felix Lake. Continued prospecting/trenching should continue in order to determine the extent, continuity and geometry of lower contact of the Grassy Pond sill which has already been

proven Ni-Cu and PGE values. Trenches further to the west (T7 north and south) show anomalous values which should be assessed a lower exploration priority. This area will however become important for prospecting and as a potential for mineralization when determining the upper contact and of the Grassy Pond sill. Completing the follow up trenching of EM anomalies as well as exposing the sheared contacts of the sill and sediment-iron formation along strike will help to determine continuity of mineralization. Concentrating on these efforts will most likely yield the highest value of return.

### **Tape Lake Pegmatite Prospect**

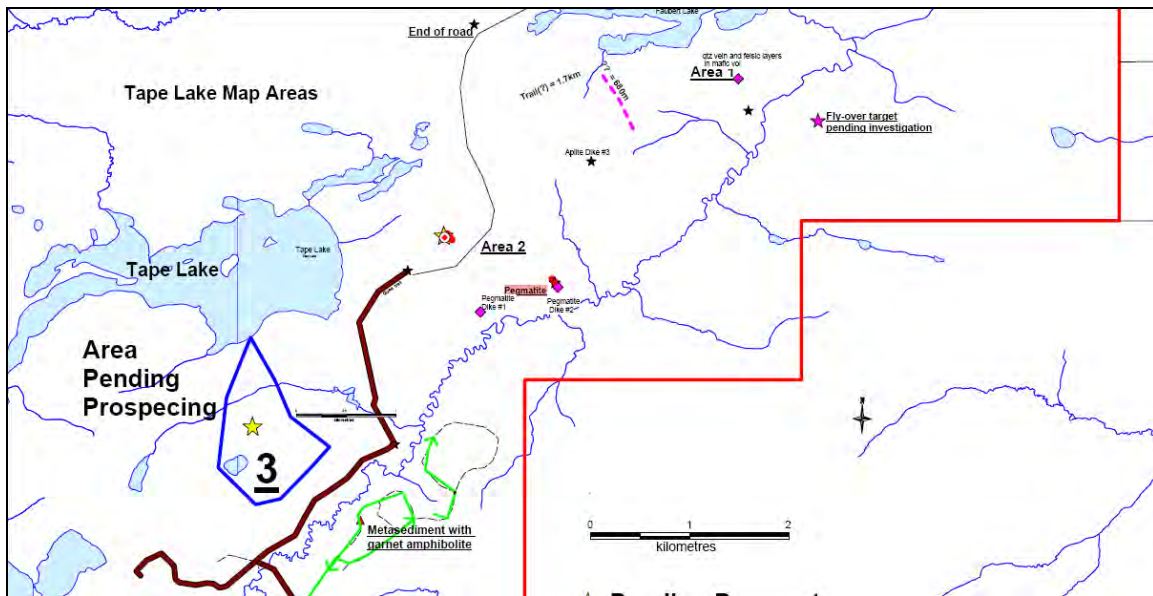
#### *Focus of Exploration:*

The primary focus of the surficial exploration in and around the vicinity of the Tape Lake Pegmatite Dikes was to follow up on prospecting-mapping performed by Lumb (2010). This follow up included examining the geology and the nature of mineralization though its primary focus was to collect samples in order to decide whether or not further exploration trenching and/or drilling is required.

#### *Location and Access:*

The Tape Lake Pegmatite dikes consists of three granitic pegmatitic dikes observed to be cross cutting gabbroic rocks in the north end of the property. Access to each dike is available by foot from the extension of a quad trail which was cut north from a logging road which intersected the Jackfish/East road at roughly km 101. Dike 1 is

located 840m north of the end of the quad trail, dike 2 is located approximately 1.6 km east north of the end of the quad trail, and dike 3 is located 1.3km north of dike 2. Terrain is composed of mostly blow down and burned mixed forest with small ridges and hill and low-lying mostly dry swamps. Helicopters were used to transport crew for sample cutting and retrieval.



Map of Tape Lake pegmatite and aplite dike locations.

*Basic Geology, Prospecting Results and Mineralization:*

The geology of the Tape Lake pegmatite dike prospect was described in detail by Lumb (2010) a brief discussion is presented below. The geology of the pegmatite dikes and surrounding host rocks are limited to 3 main units.

1. Dike 1 and 2 (relatively similar composition) granitic pegmatitic dikes
2. Dike 3, coarse grained to pegmatitic aplite dike, and

3. Fine to coarse grained amphibolitized mafic volcanic wall rocks.

Dike 1 is approximately 5-8m in width and striking east-west. It outcrops at the base of a steeply dipping elongate ridge of altered amphibolite altered mafic volcanic rocks. The dike dimensions are well constrained but it was difficult to determine the exact nature of the contacts. Dike 2 was observed

These dikes are composed of very coarse grained and pegmatitic quartz (40%) plagioclase feldspar (albite-microcline; 45%; locally trace to 1% orthoclase also observed) and thick books of muscovite (1-5 cm; 15%). These three mineral phases are relatively homogeneously distributed throughout the entirety of the dike and vary little compositionally. Heterogeneously distributed accessory minerals do not exceed 5% throughout but can be found locally up to 15% in small patches or clusters. These minerals include but are not limited to: fluoroapatite, spodumene, columbite-tantalite, cleavelandite, amblygonite, and tourmaline. Fluoroapatite forms small (1-5mm) rounded light bluish-green crystals disseminated locally up to 2%. Spodumene forms elongate whitish-yellow crystals which distinct form (2-4cm; max 10%, average trace to 1%). Spodumene was observed in dike 2 up to 30% locally. Columbite-tantalite forms black stubby crystals generally with well defined habit up to 3cm in size though generally forming small crystals locally disseminated throughout. Distribution of columbite-tantalite is highly irregular and locally only forms less than 2%. Cleavelandite forms with albite and quartz as irregular clusters and small masses up to 3cm but not more than 5% locally. Amblygonite form small grayish white massive disseminated grains forming

interstitially to feldspar and quartz. Tourmaline, variety schorl, forms the most abundant accessory mineral locally up to 15%. It forms shiny black triangular prismatic crystals which are locally isolated as well as forming bands and patches of cumulates. Locally, less than 1% overall is a yellowish-brown interstitial weakly altered mineral, possibly triphylotie. Another possible mineral occurrence is audularia, which is pinkish brown and forms interstitially to orthoclase feldspar. A sample from dike 2 contained a metallic grey blue mineral up to 2 cm which has been tentatively identified as cassiterite.

Dike 3 was substantially different from dike 1 and 2. Dike 3 is an aplite dike composed nearly entirely of coarse grained orthoclase feldspar. Lesser accessory minerals included up to 10% quartz as well as trace to 2% biotite and trace amphibole. The contacts of these dikes were relatively sharp to the amphibole altered mafic volcanic host rocks.

*Structure:*

Though the contacts of the dikes are poorly constrained the attitude of intrusion suggest that the units are in fact intrusive dikes and cross cut, not conformable to, original deposition of the host units. A very weak planar fabric is pervasive through each dike, though often difficult to observe due to the coarse grain size. The fabric is roughly east north east and is parallel to sub-parallel to the strongly foliated regional fabric observed within the host rock amphibolites. This suggests that the dikes were possibly emplaced later in the deformation history or more likely the deformation of the dike mineralogy just

does not reflect the same level of deformation, though is still under the same strain, as the surrounding volcanic units.

### *Sampling:*

Sampling of dike 1 was undertaken by foot carrying of sampling equipment and samples, and all three dikes were sampled using helicopter based sampling. In addition to grab samples from surface, several channel samples were cut ranging from 40 cm to 1m in length. All samples were collected from exposed areas transecting the strike of the dike. No removal of overburden was undertaken in order to collect samples. Samples were cut using a standard rock saw cutting roughly 5 cm deep and 5 cm wide.

### *Results:*

Results from grab samples returned maximum values for dike 1 and for dike 2 at contained above anomalous at 0.275%  $\text{Li}_2\text{O}$  and 0.191 %  $\text{Li}_2\text{O}$ , respectively. Samples from dike 3 contained maximum values of 0.005%  $\text{Li}_2\text{O}$ . There is a very limited data set for these dikes.

### *Conclusions and Recommendations:*

Complete analyses of returned samples to determine viability of results. Only Li values were analyzed. It is imperative to conduct ICP analyses to determine rare earth

element abundances as well as tin and tungsten. This can be easily done by rerunning pulps or rejects from samples already collected and processed. An investigation into the continuity and distribution of mineralization throughout the dike needs to be undertaken. Decide on merit of striping and trenching and evaluate the necessity of diamond drilling. Dike 3 based on mineralogy and preliminary results should likely be abandoned as a potential target, but should still be included when developing a genetic model. It is important to delineate and define a genetic model for the generation of these pegmatite dikes. This genetic model must address the geometry of these dikes in order to determine whether or not there is viability with regards to the actual pegmatite within the gabbroic bodies. It might be of interest to claim parts of the surrounding granite. Or, at the very least perform some geochemical (soil sampling?) or geophysical assessment to try and narrow down potential pegmatite mineralization.

## **Swole Lake**

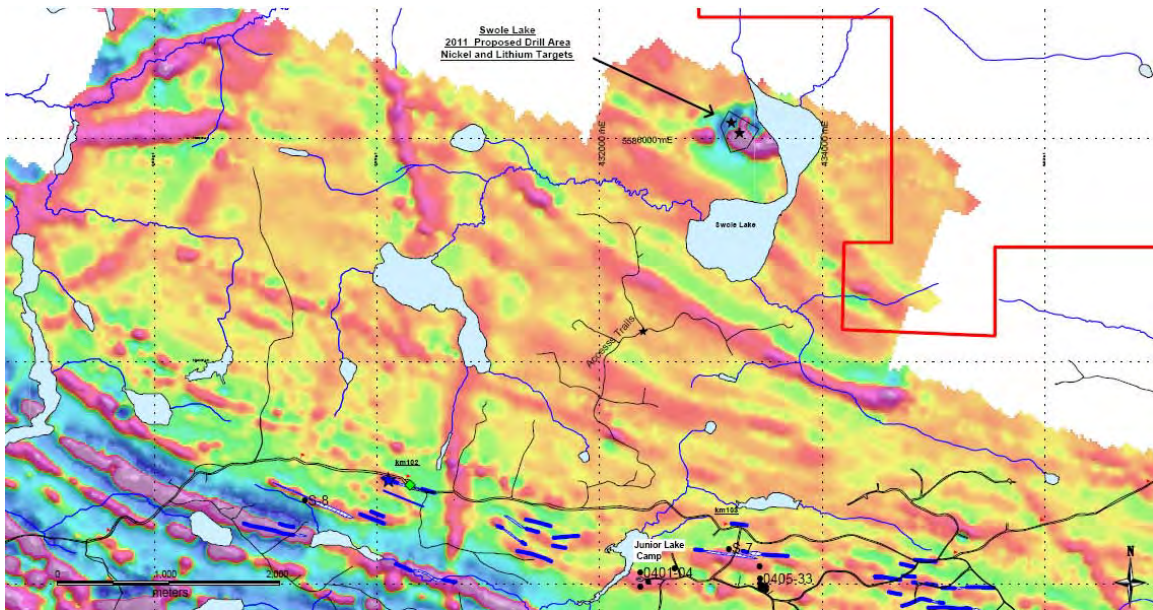
### *Focus of Exploration:*

The purpose of exploration of the Swole Lake prospect was to conduct sampling of known pegmatite boulders in order to expand the surficial data sets prior to drilling.

### *Location and Access:*

The Swole Lake prospect is located roughly 4 km due north of the Junior Lake field camp. Access is available by a trail to within 800 m of the prospect. The trail is an unmaintained logging road which branches off the Jackfish/East road at approximately

km 103. There is a creek with and drainage system for Swole Lake itself which must be traversed. Helicopters were used for the transporting of sampling crews and tools for the purpose of this exploration.



First derivative magnetic map showing location of Swole Lake prospect.

### *Basic Geology:*

The Swole Lake Prospect compromises a series (12) of large (2m x 2m) angular-sub angular boulders of pegmatitic granite proximal to the western shore of Swole Lake. These boulders are composed of coarse to pegmatitic granite in contact with metasedimentary rocks.

The pegmatite contains up to 40% alkali feldspar, white to light grey (likely albite or microcline or a mixture of the two) with up to 25% purple fine to coarse grained lepidolite. Spodume is observed up to 10% forming stubby white well cleaved crystals. Muscovite and quartz are observed interstitially to feldspar up to 10% each. Columbite-tantalite has been observed up to forming as small tabular crystals less than 1% overall. The metasedimentary host rocks to the pegmatite are medium grey, medium grained sugary textured and composed primarily of quartz and amphibole.

Other local geology, surrounding the boulder field, include mafic-ultramafic intrusive rocks comprised of melagabbro and pyroxenite. Melagabbro outcrops on the western shore of Swole Lake are composed of coarse grained pyroxene up to 75% with 25% interstitial plagioclase. Pyroxenite outcrops are exposed further west are comprised chiefly of coarse to medium grained pyroxene with 5-10% interstitial plagioclase. Both units have been moderately altered to lower amphibolite grade, containing variable amounts of actinolite-tremolite.

*Sampling:*

Samples were cut from pegmatitic boulders and wall rock using a channel saw. Helicopters were used to transport sampling equipment and crews.

*Results:*

Samples returned average values of 0.41 %  $\text{Li}_2\text{O}$  with maximum values up to 0.717%  $\text{Li}_2\text{O}$ . Values like these are above anomalous and should be considered promising for future exploration.

*Conclusion and Recommendations:*

Like with the Tape Lake pegmatites, it is imperative to conduct ICP analyses to determine rare earth element abundances. This can be easily done by rerunning pulps or rejects from samples already collected and processed. Building a road to access the prospect will require a creek crossing which would require a bridge and permitting the temporary bridge used to access isolated Lamaune gold drill holes could possibly be remobilized. Winter access would be the easiest and cheapest way of accessing the prospect. Drilling and trenching of Swole Lake prospect will be difficult because of the bouldery nature of the occurrence but must be undertaken to determine if there is

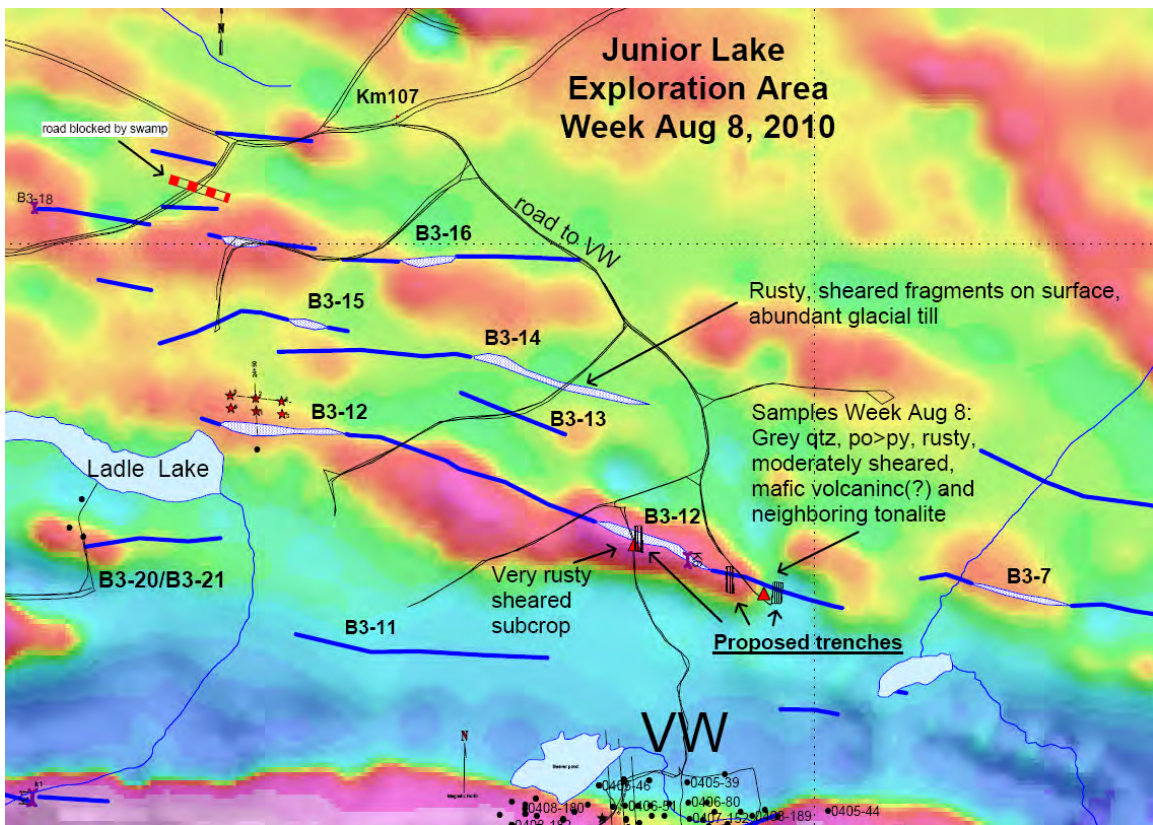
**Ladle Lake-VW North**

*Focus of Exploration:*

The purpose of exploration in the Ladle-Lake VW North area was to determine, if any, the extent of outcrop exposed along major and minor EM conductors.

*Location and Access:*

The area surrounding the locations of Ladle Lake-VW North exploration are located roughly 5 km west of Junior Lake camp and is accessed via a branch off of the main Jackfish/East Road (at km 107.5) to a side logging road known as the Ketchikan Road. There are multiple roads which branch of the Ketchikan Road providing great access throughout the property. Additionally the prospect area has been extensively logged allowing for excellent visibility and traversing.



First derivative magnetic map of Ladle Lake-VW North prospecting area. Note EM anomalies and extensive road networks.

*Basic Geology:*

The geology of the Ladle Lake-VW North area is difficult to ascertain as there is very limited exposure. The entirety of the prospect is covered in thick beds of glacial till sometimes up to 8-10 m thick. Locally there were few outcrops which were used to determine geology and basic lithological relationships. The observed geology is limited to 6 lithologies.

1. Gabbro
2. Mafic volcanic rocks
3. Metapelitic rocks
4. Metaconglomerate
5. Tonalite dikes
6. Gabbroic dikes

Gabbroic rocks form small outcrops and hummocks throughout the southern portions of the property. They are medium green, medium grained and weakly to non foliated. They are composed primarily of coarse grained amphibole (tremolite) with equal parts plagioclase. Accessory minerals include quartz-carbonate, muscovite, and epidote. The entirety of the unit has been extensively altered to chlorite.

Mafic metavolcanic rocks are found throughout the prospect. Their exact geometry is difficult to ascertain from just prospecting alone but structure observations suggest that

these rocks form long continuous belts in a roughly east-west orientation up to several hundred meters in thickness. These rocks, basalts, are fine grained, very green and strongly foliated. Noticeable separate flows have been observed with sharp flow tops forming individual and massive flows ranging from 60 cm to 50m (observed). Locally in the northwest section of the property is strongly foliated tuffaceous mafic volcanics unit. No Pillowed basalts were observed within the prospect.

Metapelitic rocks outcrop in one location only observed within the prospect, an area encompassing the eastern B3-12 EM anomaly. The metapelitic rocks form medium grey, fine grained, laminated to thinly bedded, moderately foliated clastic sedimentary rocks. They contain abundant 15-20% fine to medium grained biotite on foliation. The metapelite can contain 1-5% quartz-carbonate stringers and veining on the up to 10 cm in width. The metapelitic rocks are observed to a maximum thickness of roughly 25 m, the along strike continuation is poorly exposed and therefore difficult to determine.

Gradationally in contact with the metapelitic rocks is a 20 m thick unit of coarse grained metaconglomerate. The conglomerate forms relatively massive package with nearly equal distribution of clasts. The groundmass is a strongly foliated (sheared? bedded?) metapelite, similar to the metapelitic rocks in contact to the north, however is they are much darker in colour and moderately more chlorite altered. The clasts are rounded and distorted east-west ovate boulders and fragments granitic, dioritic, and granodioritic in composition. The largest observed were up to 50 cm, average were 20-30 cm. The total amount of boulders was up to 30% throughout the entirety of the

conglomerate. The southern boundary of the metaconglomerate was truncated by the intrusion of gabbro.

Observed in the northern parts of the prospect and cross cutting the host rock mafic volcanic units were tonalite-trondhjemite dikes. These leucocratic dikes are sharp contacted and vary in thickness from 20 cm to 15m. They composed nearly entirely of alkali feldspar, (albite-anorthite and microcline?) with up to 30% biotite and amphibole. Fine grained, black, sharp contacting mafic dikes, or gabbro dikes, were found cross cutting mafic volcanic and sedimentary units. These dikes were on average 30-50 cm in thickness and trended roughly east-west. These dikes, though cross cutting, were often discontinuous along strike (boudinaged?).

*Structure:*

Evidence of shearing is observed along the northern and southern boundaries of the prospect and is likely reflected in the geometry of the EM anomalies. These shears when outcropped are 40 cm to 2 m zones of intense brittle to moderately ductile deformation with dextral sense of movement. The shear zones appear to generally propagate along competency boundaries associated with lithological contacts, though second and third order shears and splays are often observed well within the confines of a particular unit. The lithostratigraphy suggests a series of steeply dipping (N) east-west striking mafic volcanic succession consisting of mafic flows and tuffs bounded to the south by clastic and chemo-clastic metasedimentary rocks. These rocks then have been

intruded by granitic dikes and small sills, all part of a larger intrusive even likely related to the emplacement of the grassy pond sill. Felsic (tonalite) dikes appear to be final lithology emplaced, cross cutting all known lithologies. The strike slip faulting however post dates these felsic dikes, as they are often entrained in shearing, but their shared geometry suggests that they both reflect large scale periodic movement over several km of strike length.

*Prospecting Results and Mineralization:*

Prospecting of EM anomalies within the Ladle-Lake-VW North prospect proved to be quite difficult with regards to great deal of glacial till in the area. Only the eastern edge of the B3-12 anomaly had any exposed outcrop. This area is accessed by a small cut road 300 m south of the Ketchikan road and is a small hummock which has had a patch of exposure scraped off by logging operations. The occurrence is comprised of moderately sheared somewhat gossanous metapelite in contact with mafic flows. The shear is approximately 30-60 cm wide and is filled with quartz. Sulphide mineralization is abundant throughout the quartz, shear, and proximal wall rock up to 35%. Sulphides are primarily disseminated to massive and locally veined pyrite with lesser pyrrhotite and chalcopyrite. Bounding the metapelitic rocks is the metaconglomerate unit to the south. This contact is also weakly sheared but appears unmineralized.

*Sampling:*

Samples were collected using hammer and chisel for accessible grab samples  
Where a rock saw to maximize the sample volume from where exposure less available.

*Results:*

Values returned for base metals and Au, contained only anomalous values.  
However, this should be taken lightly as lack of actually exposure limited sampling  
options and availability. No direct EM anomaly we directly and thoroughly sampled.

*Conclusions and recommendations:*

Stripping of viable ground in the vicinity of the eastern B3-12 anomaly, the only  
location where surficial exposure, will be the only way to examine the surface expression  
of the EM anomalies. Drilling of the remainder anomalies will likely be the simplest,  
quickest, and cheapest method for unearthing the vast number of unexposed EM  
anomalies. To narrow drill targets, soil sampling or some other type of surficial  
geochemical study could be used, though all EM anomalies should be explored in detail.

## **Lamaune Gold**

### *Focus of Exploration:*

The purpose of exploration at the Lamaune Gold prospect was to generate a detailed surficial geology map. The purpose of mapping was to infill gaps in the data set with regards to inferred surficial geology. A secondary purpose was to conduct grab sampling of various known gold hosting rocks and any other samples which appeared to be containing promising gold values.

### *Location and Accessibility:*

The Lamaune Gold prospect is accessed by a small service trail roughly at km 95 on the Jackfish/East Road. The overall depth of the prospect is roughly 1km and length of roughly 4 km. A grid has been cut on nearly the entirety of the prospect yielding easy access throughout. Mapping was performed by two Lakehead University summer students and managed by the senior project geologist and exploration geologist.

### *Basic Geology:*

The geology of the Lamaune Gold prospect is defined by 8 primary lithologic units; including:

1. Ultramafic talc schist

2. Mafic metavolcanic rocks
3. Metaamphibolite- often garnitferous
4. Magnite facies iron formation; banded chert-magnetite
5. Silicate facies iron formation; amphibole-biotite-garnet
6. Sulfide facies iron formation; pyritic graphitic metapeliteic rocks
7. Metapelitic rocks
8. Gabbro

The talc schist rocks out crop in southern extremities of the mapping area. It forms small sub ovate outcrops which are medium grey, fine to very fine grained and strongly foliated to sheared with often weakly magnetic. Locally there is abundant chlorite and/or sericitic alteration with up to 40% quartz and/or carbonate veining. Veining can range from mm to cm scale and is often weakly altered to talc and chlorite on the margins. Locally the talc schists have been weakly altered (15%) with disseminated ankerite, whose weathered surface provides a rusty stain on the surface of the rocks. The magnetism is mostly attributed to disseminated magnetite likely associated with serpentised olivine but also disseminated pyrrhotite. The ultramafic schists are in 3-5 m thick packages with exposure limiting knowledge of continuity across the Lamaune property.

The mafic volcanic rocks are found in the central units within the mapping area. They are observed to be medium green, fine grained, and are weakly to moderately foliated. Locally these rocks contain quartz-carbonate veining up to about 5% overall. The veining

is light to medium grey quartz generally with secondary carbonate on the margins as well as forming small inclusions. These veins usually form on the mm to cm scale. These mafic volcanic rocks form variably thick (30 cm to 50 m) yet which are relatively conformable packages along strike.

The amphibolite is similar to the mafic volcanic rocks in colour and mineralogy except for the strongly schistose nature due to the abundance of oriented tremolite. The amphibolite is medium green to dark medium green, medium to coarse grained, well foliated. The unit can be locally biotitic with up to 60% fine to medium biotite. More commonly the unit is garnetiferous with medium to coarse grained garnets up. The concentration of garnets can be trace to up to 70% locally that can reach sizes of 1.2 cm in diameter. This garnetiferous amphibolite has been determined by diamond drilling to host grade gold values, especially when associated with arsenopyrite mineralization. The arsenopyrite generally forms metallic silver color, fine grained, subhedral to anhedral blades or disseminated single grains which are usually concentrated along the margins of quartz carbonate stringers and veinlets. The arsenopyrite is sometimes associated silica flooding/alteration halos along veining. These units are broadly continuous over the entire strike length of the Lamaune Gold prospect and can form packages between 50 and 100 meters thick.

Interbedded within the volcanic-amphibolite package is a unit, or rather several intersections, of banded magnetite iron formation with locally interbedded types 1 and 2 magnetite and amphibolized chert. The type 1 magnetite consists of mm to cm (rarely

dm) sized bands of nearly pure, very fine grained magnetite. Type 2 magnetite is a light to dark grey mixture of magnetite, chert and amphibole. The type 2 magnetite bands are often the more common. Both types of iron formation are cross cut by quartz-carbonate stringers, which can carry sulfides (Pyrrhotite is most common). The magnetite is interbedded with chert ranging from light grey to light brown, mm to cm bands, often with minor pyrrhotite on the margins. The iron formation is strongly magnetic, weathered to a dark purplish brown or rusty brown at surface. Due to the strong weathering it can be difficult to give a percentage of magnetite content where types are difficult to distinguish, especially in the case of weaker type 2 magnetite bands. Folding in this unit can be quite extensive and elaborate. The banded chert magnetite iron formation is the most abundant lithology in the Lamaune trenches, continuous over almost 3 km in packages up to 30 meters thick.

Flanking and locally interbedded to the banded iron formations is garnetiferous amphibolite and chert. The garnetiferous amphibolite is medium green, well foliated, medium to coarse grained often with 5-10% pyrrhotite as stringers or disseminations and trace chalcopyrite. Chert forms medium grey, crystalline and in mm to cm scale lenses parallel to locally folded bands often with fine grained amphibole. The pyrrhotite stringers tend to be concentrated more along the margins of the chert bands. At surface this unit can be quite rusted and weathered to a dark purplish brown or rusty brown, dependant on the abundance of sulfides. In this unit the amphibolite is the main lithology with chert being minor and sometimes not even present. The unit can have up to 30% garnets in the mm to cm size range. And due to preferential weathering can have much

higher relief than the host rock amphibolite giving the weathered surface a stark bumpy appearance.

The metapelitic rocks form medium grey, fine grained, laminated to thinly bedded, moderately foliated clastic sedimentary rocks within the broader package of chemo-clastic sedimentary rocks. They contain abundant 15-20% fine to medium grained biotite on foliation. The unit has been found to be locally garnetiferous with up to 20% fine grained garnets up to 2 mm in diameter. The metapelite can carry 1-5% quartz-carbonate stringers and veining on the mm to dm scale. On surface the pelites weather to a light rusty brown color. The metapelites can be up to 30 meters thick with an observed strike length of several hundred meters.

The sulfidic pelite is medium to dark grey (black where intensely graphitic), fine grained, and moderately to strongly contorted/folded. This unit can be weakly to intensely graphitic, well foliated to weakly sheared with up to 15% sulfides (Pyrite dominated with minor pyrrhotite and chalcopyrite). The pelite has abundant stringers and veinlets of light to medium grey chert with carbonate. On surface the pelite weathers to a medium rusty beige/brown color. This unit was only observed out cropping is a few of the metapelitic exposures in the southern parts of the mapping area.

The sulfide facies iron formation with banded chert sulfide consists of interbedded chert bands and sulfide stringers. The chert is light to medium grey, finely crystalline, in mm to cm bands. The sulfides are in parallel stringers and veinlets up to 1 cm thick. The

sulfides are dominated by pyrrhotite with minor chalcopyrite and pyrite giving the unit weak to moderate magnetism. The unit is strongly weathered and heavily rusted; often only recognizable on fresh cut surfaces. This unit is often in packages less than 5 meters thick and continuity along strike is often ambiguous.

Gabbroic intrusions are abundant throughout the mapping area and their direct geometry is difficult to determine. They form as large (10-300+ m) cross cutting bodies which are medium to dark green, fine to medium grained, unfoliated to moderately foliated with white to light grey quartz and carbonate veining. Veining is mm to cm scale, often epidotized to a medium yellowish green and can often be concentrated at the contacts of the gabbro. In outcrop the unit is weakly weathered, sometimes with a light color to differentiate from the mafic volcanic and amphibolite units.

*Sampling:*

Sampling methods were limited to grab samples and selective float samples from throughout the prospect.

*Results:*

The highest grade sampled returned a value of 3.43 g/t. This sample was from a quartz vein float on line 1800. It however is probably a reflection of the high grade veins which have been noted in the area.

*Conclusions and Recommendations:*

Extensive drilling and mapping has developed a large database and geologic understanding for the rocks of the Lamaune gold prospect. Encouraging results from the float samples suggests there is elevated gold within lode systems. Future exploration should focus on the along strike extensions of the mineralized host rock (garnetiferous amphibolite) for Au mineralization and banded iron formation for Fe mineralization.

Drilling and trenching directly in the vicinity of the Lamaune Au prospect, has unearthed a great amount of detail about geology and grade. Exploration efforts however, should be focused well outside this area where information is less abundant.

Exploration of Toronto Lake, southern shores.

**Reconnaissance stage mapping and prospecting of the southern shores of Toronto Lake.**

Work carried out for:

Landore Resources plc

By

Richard Lumb, Mineral exploration consultant

And

Ben Kuzmich

25<sup>th</sup> June 2010

## Toronto Lake, southern shores, Mapping and prospecting

Field work was undertaken during the period of May 15<sup>th</sup> – June 24<sup>th</sup>. The aim of the campaign was reconnaissance mapping and prospecting with the intention of identifying areas of interest for further work. Gold and nickel mineralisation were the principal targets, but all potential economic mineralisation was investigated.

### Previous work

- Pye (1968)
- Berger (1992)

### Historic showings

Several historic showings have been recorded previously within the mapping area.

1. Gold within the granite batholith at the south-east end of Toronto lake.
2. Gold at the north-eastern end of Joy lake.
3. Nickel and asbestos by the south-western shores of Toronto lake.

In addition to these, a wider area of the south-west shores of Toronto lake was flagged for mapping and prospecting, due to the previously recorded conjunction of mafic and ultramafic lithologies alongside granitic intrusives.

## Study areas

The larger area of southern Toronto Lake was divided into the following six blocks of interest which were variably mapped and prospected, or just prospected.

- Southern shores of Toronto lake
  - western
  - central headland
  - eastern
- Joy Lake
  - south-west
  - north-east
- Roadside of 801

Mapping was undertaken on all but two of the above areas. *Joy Lake north-east* and the *central headland* of the Toronto lake southern shores, due to limited time, were only prospected.

This report will describe the geology and economic prospectivity of these areas individually, before outlining recommendations for further work.

## Toronto Lake, south-east shore

The south-east shores of Toronto Lake have been mapped previously as a massive, granitic batholith with lensatic amphibolite xenoliths. The historic gold showing – on these maps - is located in one of these lenses.

On the ground the geology is more complex. Rather than simple lenses of amphibolite in undeformed granite we found two shear zones. These shear zones, striking at around 070, are approximately 200m apart, though they become closer together to the east. As a consequence of the poor exposure of the area, the relationship between the two shears was not established – however it seems probable that they are part of a larger structure. Berger noted five, distinct, mafic lenses – if these all prove to be shear zones, then this opens up the possibility of a much wider structure.

The shear zones consisted of two lithologies. These we mapped as ‘granodiorite’ and ‘mafic’, but not without qualification.

- ‘Granodiorite’ – schistose in the main, but massive or weakly deformed in places – cut across the batholith (striking around 064-082).
- ‘Mafic’ - schistose, strongly biotitic and chloritic rock.

These are field terms and are open to reinterpretation – the ‘mafic’ unit consists largely of biotite, with some chloritic alteration and silicification. The ‘granodiorite’ likewise contains a lot of biotite. The granodiorite noted here may well be a product of sheared granite, contaminated by entrained mafic rock. Oriented samples of both lithologies have been taken for further study.

## **Mineralisation**

Sulphide mineralisation was found to occur principally in the granodiorite and in direct proportion to the extent of silicification of the host rock. The most impressive mineralisation was noted in several historic dynamite pits [see *appendix*]. Several dynamite pits were noted, three of which were strongly mineralised. Dynamite pits 1 and 2 sit on the northern of the two identified shear zones. Dynamite pit 3, which was discovered towards the end of our time in the area and was not fully explored, sits on the southern shear zone.

Unfortunately, the extent of the blasting means that it is difficult to gauge the dimensions of the mineralised zone. At best approximation, at pits 1 and 2, the wider area of intense silicification is several metres wide, with strong mineralisation over a metre and massive sulphides over few centimetres.

The mineralised zones comprise coarse quartz veining accompanied by intense, pervasive silicification. Arsenopyrite, pyrrhotite and pyrite were present at the three noted blast sites in varying proportions (pit #1 was predominantly arsenopyrite, pit#2 pyrrhotite), with chalcopyrite and molybdenite present, but less common. Small quartz veinlets with arsenopyrite, pyrrhotite and molybdenite were found elsewhere, indicating that the prospective chemistry persists along strike even where strong mineralisation was not found. The southernmost shear was explored and

mapped, but not exhaustively – strong mineralisation was found south-west, along strike of pit 3 [sample 991605/6], but no massive sulphides. Nevertheless, the structure, lithology and chemistry are very similar to the shear zone with blast pits 1 and 2, and clearly warrants further work.

Due to the poor exposure and the narrowness of the shear zones [both around 20m wide], these structures were difficult to follow – it seems very likely that they extend much further than we have mapped them. Furthermore, it is very likely that additional shears exist that were not discovered by our reconnaissance mapping – Berger noted 'mafic lenses' further to the south and west of our mapping area.

## Toronto Lake, south-west shore

Lithologies encountered in the mapping area:

- Gabbro
- Mafic volcanic
- Ultramafic
- Quartz-mica mylonite
- Granodiorite

**Gabbro** – typically massive to weakly foliated, medium crystalline, with chlorite replaced amphiboles. Occurs primarily in the western part of the mapping block. Although the lithology is only weakly deformed – particularly relative to the neighbouring rocks – silicification – pervasive and with veinlets – is common. A low level of sulphides of up to 1% (pyrrhotite and pyrite) is commonly present. The strongest mineralisation (2-3% in places and up to 5% pyrite, pyrrhotite and occasional traces of chalcopyrite) occurred in and disseminated around quartz veinlets [**EXAMPLE SAMPLES**]. Carbonate veining (sometimes with pyrite, pyrrhotite and lesser chalcopyrite) is common only on a prominent ridge of gabbro at the south-west end of the mapping block, in contact with a unit of talc schist. The gabbro here was variably fine to medium crystalline with bands of coarse amphibolite – likely due to the proximity of the ultramafic.

Of particular note

- Sample 991567 - Rusted quartz-carbonate veins carrying blebs of pyrite, arsenopyrite and chalcopyrite.
- Sample 991570 – 25cm quartz vein carrying 1% pyrite, with 5% pyrite and chalcopyrite in the surrounding wallrock.
- Sample 991542 – Amphibolitised gabbro cut by carbonate veins – 5% sulphides, pyrite, arsenopyrite and chalcopyrite.

### **Mafic volcanic**

The field term ‘mafic volcanic’ was applied to fine grained, heavily chloritised greenstone. In places deformed pillow structures are identifiable, but for the most part poor exposure precludes this. The lithology is in all cases at least moderately foliated [060] and in most places strongly. Mineralisation is typically associated with quartz veining – with up to 1-2% pyrite and pyrrhotite in and around quartz veinlets.

### **Ultramafic**

Ultramafic lithologies were encountered in two locations. Firstly, running along the northern edge of a mainly gabbroic ridge, at the south-west edge of the mapping block. The unit outcrops as talc schist at the base of the ridge – to the north – but in places, closer to the contact with the gabbro, exhibits relict spinifex texture. Its strong magnetism is a useful distinguishing feature from the non-magnetic gabbro. A sample [991569] was taken with 1% pyrite and chalcopyrite.

Serpentinised peridotite outcrops at a headland on the lakeshore. The unit is fine-grained, and often strongly serpentinised. In places it is cut by magnetite and later asbestos veinlets. Sulphides – principally pyrite and pyrrhotite, with traces of chalcopyrite – were noted with carbonate veining in the fine ultramafic (possible cusp mafic/ultramafic).

### **Quartz-mica mylonite**

This lithology has been previously mapped as metasediment (Pye) and felsic tuff (Berger).

A sequence of felsic, siliceous rocks with a strong, mylonitic shear fabric [060]. The sequence can be broadly divided into two units:

- Fine quartzite with a variable amount of biotite (up to 10%) in shear-aligned laths
- Fine quartzite with fine muscovite in the matrix and up to 15% coarse, rounded quartz eyes.

The unit is commonly, though not strongly, mineralised, with up to 2% pyrite and pyrrhotite in some samples. Sericitisation is variably present..

Points of particular interest are:

- Quartz-biotite mylonite interposed with fine, mafic volcanics exposed at east edge of the headland directly south of Turtle Island, and again on the near edge of the larger headland to the east. Mineralisation was noted at the contacts, in both lithologies.

### **Granodiorite**

A granodioritic dyke [uncertain width, but in the range of 25-50m wide] was also noted – previously described as granite. Minor pyrite was found and sampled.

### Toronto Lake, central headland, southern shore

Although mapping was planned for this area, we were unable to cover it thoroughly in the allocated time. Instead, a brief reconnaissance trip was made. A day and a half was spent prospecting along the shore. The lithologies encountered did not differ greatly from those found to the west; gabbro, schistose mafic volcanics, fine ultramafic/mafic cusp, and quartz-mica mylonite. Several samples were collected [991723-991729, 991742-991745], principally from mafic lithologies and quartz veining.

The geology is complex, with frequent contacts between fine mafic rock and quartz-mica mylonite. Shoreline exposure was around 25%, the remaining 75% being largely covered in boulders. It should be possible to map the shoreline from the boat, without having to walk far inland to find outcrop.

### Joy Lake North-East

The north eastern shores of Joy Lake were considered prospective due to a grab sample by Berger (1992) that recorded 314 ppb gold. Our prospecting in the area did not uncover any mineralised dykes in the vicinity of Berger's gold sample. However, the point on his map denoting the sample does not fall on any of the marked outcrops, but on the shore. Taken with the wording of his sample description (which doesn't mention the dyke width, or host rock) this seems to suggest that it was taken from a boulder, rather than outcrop. By the shore at noted the location we found many boulders of amphibolite, many of which included felsic dyke material. The clustering of boulders of similar lithology indicates very local provenance.

As previously mapped, the lithology of north-east Joy lake consists primarily of fine to medium amphibolite, variably weakly to strongly sheared [strike 050; dip near vertical]. Small but frequent felsic dykes cut the mafic rock. The dykes were typically small – widths from 1cm up to 2m were uncovered. Texturally the dykes were typically fine-crystalline, but several coarser dykes were observed. Composition varied slightly, but was principally quartz and feldspar with occasional, minor biotite. The majority of the dykes found were not mineralised, but the exceptions included a small dyke (3-10cm) with 5% molybdenite and 1% pyrite [#991678]. Another, wider (~30cm), coarse granitic dyke was noted with a trace of molybdenite, yellow mica, and occasional crystals of amethyst [#991682].

Any dyke with traces of sulphides was sampled. However, more prospective-looking than the dykes were the quartz veins in the sheared amphibolites. Notably, several small, closely spaced quartz-carbonate-sericite veins [#991714-991717] carrying up to 10% pyrite and chalcopyrite. Sulphides were unevenly distributed through the veins; veins that appeared barren, often turned up sulphides along strike.

From the existing exposure and the outcrops we uncovered it was not possible to determine the relationship between the veining and the felsic dykes. However, Berger's gold sample carried 3210 ppm copper, so the presence of chalcopyrite in the veins is very promising and could indicate that the veins are cogenetic with the dyke intrusion and, therefore, potentially gold-bearing.

## Joy Lake South-West

The Joy Lake south-west mapping block was partially mapped, but was not completed, due to time restraints.

As previously mapped, amphibolite – massive and schistose – is the principle lithology. A unit of quartzite, similar to that noted in the Toronto Lake south-west shore block was noted in small bands towards to the south of the area. It was not mineralised in these outcrops.

The amphibolite in places exhibits relict pillow structures and from this it can reasonably be inferred that the whole unit was pillowed or massive flows. Amphibolitisation is frequently very pronounced, often with bands of coarse, chloritised amphiboles – and likely developed due to proximity with the granite to the north.

A strong NNE shear fabric has been imposed on both the amphibolites and the quartzite. Although undeformed outcrops occur, the amphibolite is, in the main, schistose and in places banded by boudinaged quartz veins. The shearing was followed by the intrusion of a granite batholith to the north, accompanied by granitic and aplitic dykes, which cross-cut the foliation and quartz veining. The relationship between the shearing, quartz boudins and aplite dykes is particularly well displayed on a roadside outcrop halfway up the mapping block. Six channels were cut here [Samples 991736 – 991741], revealing a pervasively silicified amphibolite with up to 5% pyrrhotite and pyrite.

## Roadside shear

A sequence of silicified mafic volcanics and amphibolite (often with garnet) with interposed sections of very fine, intensely silicified rock. The protolith of the latter lithology is difficult to determine due to the fine grain size and the intense and pervasive silicification. The shear zone was noted over a width of 20m, but may be wider, and runs ~070 – although foliation varies locally from 065-080. The entire section, excluding a small band of relatively undeformed gabbro, is strongly sheared and is extensively, albeit weakly for the most part, mineralised. Mineralisation consists principally of pyrite, but with pyrrhotite, arsenopyrite and chalcopyrite in places. The strongest mineralisation (5% coarse, disseminated pyrite) occurs in a metre-wide band of intense silicification [991640/1]. Elsewhere strong mineralisation – up to 10% pyrrhotite and pyrite – occur in much narrower bands of a few centimetres [991692].

Carbonate veining is patchily present in the shear and very strongly present in one unit, approximately 2m wide and continuing along strike, on and off, for 50m. The original lithology is difficult to determine due to brecciation by carbonate and replacement by carbonate minerals. The carbonate does not seem to carry more than a trace of pyrite, though higher grades were noted in the adjacent, silicic wall rock and silicic fragments entrained by the carbonate [991591].

Structurally, the potential of the shear zone is increased by its position and strike, relative to the demonstrably gold-bearing shear zones noted at the south-eastern shores mapping block. The lithologies change along strike and the fluid chemistry evidently differs (sulphide mineralisation was predominantly pyrite and pyrrhotite by the road, as opposed to the arsenopyrite to the east). However, if it is indeed a continuous structure then there is great potential for the gold values to be repeated in the intervening kilometres of strike.

### Garnet- amphibolite shear

Although not highlighted as a priority, a prospective-looking shear zone was identified approximately 500m to the east of the Joy Lake NE mapping block, striking at 060-065.

The zone is around 15m wide, intensely sheared and traceable over several hundred metres. The zone sits within a larger area of less intensely sheared mafic volcanics. The lithology is primarily garnetiferous amphibolite and, to the south, grades into weakly sheared mafic volcanics. To the north the zone is intruded by a felsic dyke (subsequently deformed, now principally recrystalline quartz with 30% biotite).

A total of 15 channels were cut across the shear [991642-656]. Aside from the felsic dyke - which exhibited minor pyrite – every sample contained at least 1% and commonly up to 5%, very finely disseminated pyrrhotite.

A band of garnetiferous amphibolite was also noted close to the lakeshore in the south-west mapping block, 2km away. The strike of the shear zone appears to connect the two locations.

### Areas not covered

Joy lake – the South west side was mapped, and a set of channels were cut, but the entire area was not thoroughly covered, the contact into the granite at the north was not quite reached.

North-East Joy lake was prospected for three days. As noted above some promising mineralisation was discovered. The area, however, warrants further exploration as only a fraction of the ground was covered in this time.

The large, central headland was only briefly touched upon at the end of our time. We prospected and took several promising samples from the lakeshore.

## Recommendations for further work

On the basis of this short project, several areas have been identified for follow-up exploration.

**South-east shear zone in granite batholith.** Several features of this area make it particularly prospective: intensity of shearing, strong, associated silicification, and favourable sulphide mineralisation. Arsenopyrite, which is strongly associated with gold-bearing silica fluids, was noted in high grades at 3 historic, dynamite pits. It was also found in veins elsewhere in the shear, suggesting that the favourable chemistry persists along strike. Previously, high gold grades were noted here, though the follow up drilling was inextensive and quickly abandoned. A contributing factor to the abandonment of the project was likely the interpretation that the gold was confined to xenolithic, mafic lenses. This, as discussed earlier, can be seen as misinterpretation in the light of advances in plate tectonic theory. With a better understanding of shear zones, and the inconsistent distribution of gold within them, further exploration should allow a more thorough understanding of the area.

Poor exposure, however, hampers exploration here as it seems likely that much of the geology is hidden, or not expressed at the surface. Therefore, a fence of diamond drillholes may be the only way elucidate the whole story.

**Roadside Shear.** The interest in this area is at least partly dependent on the results of the south-east shear zone. If the former continues to demonstrate potential, then this area may be interesting as a possible extension. The results of channel sampling here will establish whether it warrants further work on its own merit.

**Joy Lake, north-east.** The gold potential of the area has already been hinted at by Berger's sample. This area was only briefly touched in this project, yet several very interesting samples were taken. Regardless of the results of these samples, I would suggest that the area warrants more thorough mapping and prospecting. Again, poor exposure and the small size of the mineralised dykes and veins, may require drilling at a later stage to fully understand the extent of mineralisation here.

**Garnet-amphibolite shear.** The across-strike extent of pyrrhotite mineralisation here and the length of the shear zone (which seems to reach the lake shore), give this area high potential for nickel mineralisation. If sample results return good values then the next step would be to map the length of the zone. Furthermore, as much of the area surrounding the discovery is clearcut, trenching would be relatively easy, and will allow more extensive channel sampling.

**Toronto Lake, south-west shores.** This is the most thoroughly covered of all mapping areas of the project. The author would recommend that further work is concentrated on the areas surrounding any favourable assay results. Of particular interest are the rocks contacting ultramafic lithologies.

**Toronto Lake, central headland.** This area was not mapped and only briefly prospected. However, the samples taken were promising and the area certainly warrants mapping. This, as noted earlier, would best be achieved by boat as no roads come close to the shore at this point.

**Joy Lake, south-west.** Mapping in this area was not completed. It will require, at the very least, a few days to finish mapping completely. Initial channel sampling here looked promising, and if the assay results confirm this, mapping could be supplemented by further channelling.

**Richard Lumb,**

Exploration geologist, consultant

25.06.2010

## Appendix

### Dynamite pits

1. 0443408mE; 5576608mN
2. 0443478mE; 5576627mN
3. 0443538mE; 5576431mN

July 2010  
2010 Grassy Pond Prospecting summary  
Scott Secord

*Overview:*

The Grassy Pond Prospect (See attached map) contains a diverse assortment of supracrustal rocks (basalts and sulphide rich sediment-iron formation) which have been intruded obliquely by a coarse to pegmatitic mafic sill (gabbro and anorthosite) of which have been extensively sheared. These rocks, which represent a dynamic geologic history have been recently extensively re-investigated which has generated several locations which are promising for future continued exploration. These recent investigations include regional mapping, trench mapping, and prospecting geophysical anomalies (Mag and EM). Using these tools has given new insight into targeting parameters for potential mineral exploration.

*Basic Geology:*

The geology of the grassy pond prospect can be broken into four (4) main and conformable units. They include:

1. Megacrystic anorthosite
2. Varied textured gabbro to leucogabbro
3. Pillowed to massive mafic volcanic rocks
4. Sulphidized banded oxide-facies iron formation with locally interbedded chert and grey wacke

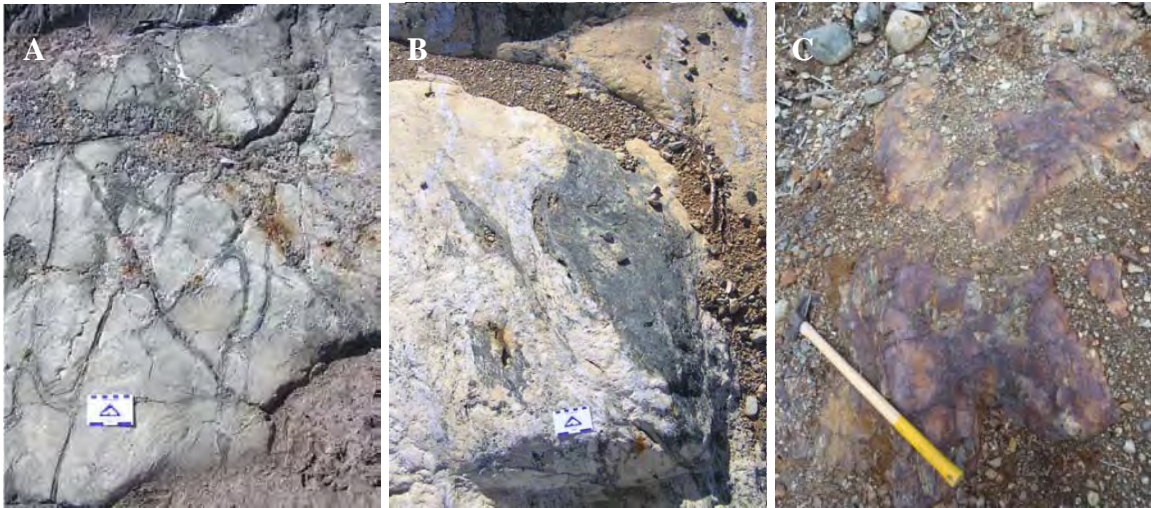
The greenish-grey volcanic mafic volcanic rocks are variably massive to pillowed and where pillowed they have well preserved selvages and range in size from thirty to fifty centimetres with way up indicators (vesicles, triple points) indicating a younging direction roughly to the north. Commonly the mafic volcanic suite is coarse grained with actinolite/tremolite porphyroblasts up to 1 cm making the rock reflect a more gabbroic parentage. It is important in the field to recognize, though difficult, the difference between the primary igneous plutonic textures of the gabbro (cumulate to porphyritic primary mineralogy or replaced primary mineralogy) from the metamorphosed recrystallized textures which can be present in both the gabbro and basalts. The difference can be extremely difficult, especially when observing plagioclase feldspar phenocrysts up to 3.5 cm within the basalt suite; however these are interpreted to be the products of metasomatic alteration. The basalts which bound the Grassy Pond sill to the north and the south are largely conformable along strike over great distances (>20km) and reflect parentage to either the Marshall Lake group or the Toronto Lake group, respectively (details of which have been described in Pye, 1965).

Gabbroic rocks, which intrude the pillowed mafic volcanics along selvages and through massive sections, generally lack well defined chill margins. These gabbroic rocks, which are composed primarily of coarse grained mafic to ultramafic minerals

(altered pyroxene and amphibole) contain locally megacrystic plagioclase either porphyroclasts or porphyroblasts. The gabbroic rocks have a weathered surface greenish grey to greenish white in colour depending on the concentration of plagioclase. Sulphide staining is abundant throughout the blebby textured gabbros with visible disseminated pyrite and chalcopyrite generally less than 5%. These gabbros grade into massive megacrystic plagioclase anorthosites. The gabbroic rocks have been interpreted based on field relations and geochemical signatures to reflect common parentage to the anorthositic rocks of the Grassy Pond sill are inferred to be a more evolved constituent of the same plutonic event.

The anorthosites (or plagiophyric to glomerophyric leucogabbro) are characterized by individual and cumulate textured plagioclase, as well as locally semi-cumulate to semi massive and massive plagioclase. Individual feldspar crystals can be as large as fifteen centimetres in diameter within a fine to coarse grained mafic matrix. The contact between the anorthosites and the gabbro is generally gradational though some sharper contacts do exist. The nature of these contacts can vary on a centimeter scale. The contact between the anorthosite and mafic volcanic rocks is generally strongly sheared. Genesis of the Grassy Pond anorthositic rocks has been discussed by Secord (2007). The formation of the Grassy Pond sill anorthosites most likely formed from a two-stage process of mantle magmatism. Firstly accumulation of typically iron, calcium and aluminum rich basaltic parental magmas at sub-crustal sites, followed by magma differentiation and emplacement of plagioclase-rich mushes into the crust at different tectonic settings or events. A key requirement of this model however is the assimilation of continental crust by the parental melts of the anorthosites during differentiation and emplacement. Since the parental melts of Archean anorthosites contained a significantly high mafic content, then some mechanism for physical fractionation or separation of the earlier crystallized mafic fractions or later crystallized gabbro-basalt fractions must have occurred. A possible mechanism for the emplacement of the Grassy Pond sill involves high pressure crystallization and accumulation of mafic silicates from primary mafic melts which ponded near the crust-mantle boundary. Successive accumulations of plagioclase accompanied by residual melts were then carried upward to produce flows, sills, and dikes with variable amounts of plagioclase phenocrysts. Regarding such emplacement would require a largely mafic (olivine-pyroxene) derived melt which would be spatially and temporally related to the emplacement of the anorthositic rocks essentially forming a differentiated or bi-modal intrusive complex. Systems like these have traditionally been world class hosts to PGE and Ni mineralization (e.g. Bushveld's Merensky Reef, the Still Water Complex, and the Duluth complex; and even to a lesser extent Lac Des Iles).

Lastly, interbedded within the southern mafic volcanic package is sulphide-bearing clastic and sulphide-rich chemical metasedimentary. These rocks are strongly deformed, sulphidized, oxide facies iron formation containing up to 50% disseminated, stringered, banded, and semi-massive pyrite and minor chalcopyrite, and locally 3-5 cm bands of massive pyrrhotite. These units are strongly oxidized on the weathered surface are distinctly noticeable by their rusty appearance. These units while sheared are broadly conformable over long strike lengths are generally reflected in the east-west EM anomaly trends.



Photographs of key lithological units. A: pillowed basalts with intrusions of gabbro along selvages. B: cumulate to semi massive anorthosite. C: rusty weathered sulphide-bearing clastic to chemical metasedimentary rock.

*Structure:*

Two main shears are distinct through the entirety of the prospect. The first shear is distinct and strongly deformed up to 12 metres wide and propagates along the contact of the plutonic rocks (anorthosite and gabbro) and mafic volcanic rocks. This shear, which has dextral sense of movement, is traceable through outcrop and trenches over a strike length of 2 km. The second main shear runs through the sediment-iron formation unit. This shear has varied thickness from 3 to 10m, and varying degrees of intensity; locally more brittle deformation (folds and broken bedding planes) though generally strongly plastic planer deformation is observed. The volcanic package between the sediment and sill units (i.e. between the two main shears) acts a relative lithon to these shears, and only secondary and tertiary narrow splays are visible within.

Where the two shear zones appear to intersect (western edge of Felix Lake) there appears to be a great deal of crustal thinning as the volcanic package between the units seems to go from 50-70 m thick to 10-20 m thick (this effect could also result the geometry of emplacement of the sill).

The sulphidic sediment-iron formation, which is broadly continuous over great strike lengths (>2 km) is actually broken into smaller discontinuous units which are roughly parallel along strike. While it is possible to have these units in a boudinage formation it is far more likely (based on the nature of slightly more brittle deformation) that they form a weakly oblique en echelon stack which would be consistent with dextral strike slip.

### *Possible Commodities:*

MacTavish (2004) has speculated that most mineralization associated with the Grassy Pond sill concentrates proximal and within the contact of the sill and the mafic metavolcanic rocks they intrude. It is noted however that as the intrusive nature can vary slightly (i.e. as irregular pods, veins, and along pillow selvages) where mineralization is trace to 2% finely disseminated pyrrhotite and minor chalcopyrite.

Careful note should be taken however, when examining the idea of a PGE commodity at the lower contact of the Grassy Pond Sill. Since the entire system (GP sill and associated volcanics/seds) has undergone metamorphism to lower to mid amphibolite grade it is important to think about the mobility or rather the immobility of PGE elements in those conditions. PGE's in the 400-550 °C temperature range remain relatively immobile (with the exception of iridium which is slightly more mobile with respect to other PGEs), mineralization is most likely a reflection of primary mineralogy. Thus these elements were likely not concentrated during shear hosted deposition along fluid pathways, like gold would be in a similar setting, but concentrated during original deposition of the units. The values observed, (e.g. Grassy Pond Central Occurrence: 1323 ppb Pd, 452 ppb Pt), though in proximity to the sheared contact are likely reflective of the contact itself and not the shear systems. The shear manifests along the contact due to rheologic differences in the competency of the different rocks; the mineralization likely manifests self along the contact due to chemical contrast in the host rocks as well as using the volcanic rocks and a location for induced sulphidation. The sill, as it obliquely cross cuts sulphide rich iron formation, could easily source enough sulphur to present observed mineralization.

A copper-nickel resource would likely be easier to constrain and would likely reflect mineralization within and proximal to the shear zone through the gabbro/volcanic and anorthosite/ gabbro contacts.

The BIF formations throughout the Grassy Pond prospect are too low of a quality to be considered for an iron resource but the high amount of sulphide and silica flooding could be potential for copper-nickel or nickel-zinc and even more so, Au values.

Shear zones which are reflected in EM anomalies in the northern end of the prospect (hosted in mafic metavolcanic rocks) could be potential Au targets along strike continuations of the BAM zone.

Discussions and occurrences of all known commodities are discussed below.

*Previous and New Work Summary:*

Previous work by MacTavish (2004) has divided the Grassy Pond Prospect area into eleven (11) individual occurrences, each of which will be summarized below, attached map shows locations of occurrences and trenches:

1. Grassy Pond East Occurrence

*Location and exposure:* Trench T6. Located roughly 350 m west of trench T13 and 80 m north east of trench T14.

*Geology:* Mafic metavolcanic rocks (pillowed to massive basalt) intruded by coarse grained to pegmatite leucogabbro which grades into pegmatitic anorthosite. Contacts between intrusive and extrusive rocks are varied and irregular and are deformed by narrow but distinct shear zones.

*Mineralization:* Mineralization at the Grassy Pond East Occurrence consists of 1 to 4% disseminated, patchy, and blebby chalcopyrite and pyrrhotite, generally occurring within the varied texture gabbro and within zones of deformation. The cumulate to semi massive anorthosite contains trace to 2% very finely disseminated pyrrhotite and minor chalcopyrite. The mafic volcanic rocks contain trace disseminated pyrite locally.

*Previous Results:* Returned values of 371 ppb Pd, ppb Pt, 1452 ppm Cu/2.15m and 317 ppb Pd, 103 ppb Pt, 1610 ppm Cu/2.59 m as well as 964 ppb Pd, 209 ppb Pt, 3704 ppm Cu, and 2026 ppm Ni.

2. Grassy Pond Central Occurrence

*Location and exposure:* Located approximately 140 m northwest of the Grassy Pond East Occurrence.

*Geology:* The mafic metavolcanic rocks in contact with anorthositic and gabbroic rocks of the Grassy Pond sill including pegmatitic, mafic to ultramafic intrusive pods and veins. Locally there occurs narrow shear and faults.

*Mineralization:* Mineralization consists of 1 to 3% disseminated to blebby, locally finely stringered pyrrhotite and chalcopyrite,

*Previous Results:* Norcal (2000) sampling contained values up to 1323 ppb Pd, 452 ppb Pt, and 2541 ppm Cu, and, 1426 ppm Ni. A sample taken from a limonitic pod containing 2% disseminated chalcopyrite contained 504 ppb Pd, 113 ppb Pt, and 7419 ppm Cu.

3. Grassy Pond West Occurrence

*Location and exposure:* Trench T7 north and T7 south. Located 700 m west-northwest of the Grassy Pond Central Occurrence and 160 m northwest of the Jackfish/Airport/East road.

*Geology:* Exposed rocks are composed of mafic metavolcanic rocks (pillowed to

massive basalts) intruded by medium grained gabbro. The contact has been sheared and small secondary shears are common throughout.

*Mineralization:* Mineralization consists consist of trace to 1% finely disseminated pyrrhotite and chalcopyrite with a few localized concentrations containing 2 to 3% chalcopyrite and pyrrhotite.

*Previous Results:* Two of the highest grade samples came from within a mafic schist which contained 344 ppb Pd, 52 ppb Pt, 1716 ppm Cu and 258 ppb Pd, 96 ppb Pt, 4360 ppm Cu.

#### 4. North West Felix Lake Occurrence

*Location and exposure:* Trench T13 north. Located 310 m southeast of the Grassy Pond East Occurrence, 250 m northwest of Felix Lake.

*Geology:* Exposed rocks include moderately foliated, varitextured, plagiophyric gabbro that which grades into coarse grained cululate to semi massive anorthosite. The sill sharply contacts basaltic rocks and is locally sheared along the same contact.

*Mineralisation:* Mineralization within the sill consists of 1 to 3% finely disseminated to patchy chalcopyrite and pyrrhotite

*Previous Results:* Returned samples contained values up to contains up to 573 ppb Pd, 191 ppb Pt, 1998 ppm Cu, and 1092 ppm Ni.

#### 5. B4-11 Occurrence

*Location and exposure:* Trenches T12 and T13 south. Located 55 m south of the NW Felix Lake Occurrence.

*Geology:* Composed of massive to pillowed basalt with inter formational strongly sheared sulphidized, banded oxide-facies iron formation unit up to 12 m in thickness.

*Mineralisation:* Mineralization consists of disseminated, stringered, banded, and locally massive pyrite up to 30% and associated chalcopyrite.

*Previous results:* Two low-grade samples contained up to 1184 ppm Zn, 1119 ppm Cu, and 111 ppb Au. Trench samples returned values of 3885 ppm Cu and 623 ppm Co and a single grab sample at 6806 ppm Cu.

#### 6. West Felix Lake Occurrence

*Location and exposure:* West Felix Lake Occurrence is located 100 m south of the B4-11 Occurrence.

*Geology:* Composed of strongly deformed, sulphidized, oxide facies iron formation within a finely bedded clastic metasedimentary sequence of fine wacke, siltstone, and pelite which has been exposed of 50m.

*Mineralisation:* Beds and bands of up to 3cm of disseminated, stringered, banded, and semi-massive pyrite and minor chalcopyrite.

*Previous results:* A surficial grab sample returned values of 1896 ppm Cu, 202 ppm Co, and anomalous As.

7. B4-11 West Occurrence

*Location and exposure:* Trench T14. Located roughly 70 m south west of trench T6.

*Geology:* Exposed rocks consist mainly of massive basalts locally cross cut by lesser amounts of gabbros. The southern part of the strip zone contains strongly sheared sulphidized banded iron formation comparable and along strike to the West Felix Lake occurrence.

*Mineralization:* Disseminated pyrite through BIF sequence up to 30% locally.

*Previous results:* Channel samples returned values of 3431 ppm Cu and 1716 ppm Cu and 440 ppm Co.

8. Norcal Occurrence

*Location and exposure:* Located 400 m west-southwest of the Grassy Pond West Occurrence GP East Boulder Cluster.

*Geology:* Small exposure of medium to coarse grained gabbro.

*Mineralisation:* Contains 1% disseminated chalcopyrite and pyrrhotite.

*Previous results:* Grab sample returned a value of graded 471 ppb Pd, 155 ppb Pt, and 2506 ppm Cu.

9. GP Boulder Clusters

*Location and exposure:* Two boulder clusters, east and west. East is located 200 to 250 m down-ice, to the west-southwest, from the NW Felix Lake Occurrence. West is located approximately 235 m south-southwest of the Grassy Pond West Occurrence, between Trenches T10 and T7 North.

*Geology:* Both clusters are composed of medium- to coarse-grained to varitextured, gabbro.

*Previous results:* Samples from the east boulder cluster contained 788 ppb Pd, 251 ppb Pt, and 4168 ppm Cu, and samples from the west boulder cluster contained 195 ppb Pd, 60 ppb Pt, and 2797 ppm Cu.

10. Norcal Boulder Occurrence

*Location and exposure:* Located approximately 40 m southeast of the southern end of Trench T10.

*Geology:* Medium grained sub rounded gabbro boulder, strongly weathered rusty surface.

*Mineralisation:* Contains of up to 5% disseminated chalcopyrite and pyrrhotite.

*Previous results:* Grab sample values were 1356 ppb Pd, 533 ppb Pt, 400 ppb Au, 7452 ppm Cu, and 1483 ppm Ni.

#### 11. MEM Occurrence

*Location and exposure:* Located 650 m east of Felix Lake and 1950 m northwest of the B4-7 Deposit.

*Geology:* Strike extension to the base of the Grassy Pond Sill, 30 m east of a north-south-striking diabase dyke and directly adjacent to the gabbro-mafic volcanic contact. Exposure includes coarse cumulate textured anorthosite overlying medium grained gabbro (basalt?).

*Mineralisation:* Locally trace to 3% disseminated pyrrhotite and some chalcopyrite.

*Previous results:* Prospecting samples contained up to 2200 ppm Cu and 630 ppb Pd and anomalous Ni and Cu.

#### *Current Prospecting:*

Prospecting in the vicinity of trench T12 and T13 yielded the discovery of the “T12 zone,” the West Felix Lake occurrence. This is a series of patchy exposed outcrop which straddles the B4-10 anomaly. The rocks consist of strongly sheared greywacke-to-sub iron formation sediments and mafic volcanic rocks. The entire area is highly gossanous with disseminated sulphide, generally pyrrhotite greater than chalcopyrite and pyrite, up to 8%. Locally there are thick (5 cm) bands of massive pyrrhotite. Also with in the package is a 8-10 cm quartz vein which contains seams of pyrrhotite with chalcopyrite up to 12%. This occurrence, while not only being a potential source for Cu and Ni, is likely a good Au target as well.



Photograph of quartz vein from B4-10 EM anomaly. Note visible seams of pyrrhotite with in bulk of vein.

Investigation into the mag and EM anomalies along the western bank of Felix Lake has revealed an outcropping of sheared micaceous rusty stained gabbro. The gabbro is medium grained and strongly oxidized with disseminated pyrite and pyrrhotite up to 3%. This could possibly be an along strike extension of the B4-11 anomaly.



Photograph of the exposure of the rusty sheared gabbro along the western edge of Felix Lake, likely along strike continuation of B4-11 EM anomaly.

Examination of the B4-16 anomaly discovered roughly 80m of intermittently exposed mafic volcanic rock (pillowed to locally massive basalt) of the Marshal Lake Group which had been extensively sheared (over 5m) and in filled with massive quartz veining (up to 2 m thick), both with a strong gossanous rind (Figure below). Exposure is a small road side scraping along the edge of the Jackfish- East road at km 102. Wall rock inclusions within the quartz vein contained disseminated to veined sulphide up to 12 % locally, average 5-8%, pyrrhotite greater than pyrite. Strongly silicified sheared mafic volcanic rocks within the anomaly contained disseminated pyrrhotite and pyrite up to about 5% throughout. The nature of this shear and the geology that constrains it (as well as continuation with mag and EM anomalies) suggests this occurrence is possibly a continuation of the BAM zone and will most likely reflect similar mineralization and hopefully comparable ore grades.



Photograph of: A- shear zone with quartz vein as it outcrops of the B4-16 anomaly. And, B- fresh cut surface of channel sample across main quartz vein showing wall rock inclusions with seams of sulphide up to 12%

Examination of B4-14 and B4-9 EM anomalies revealed that the anomalies were well beneath regolith cover, and followed the drainage creeks of Felix Lake. Around the B4-11 occurrence however numerous “rusty” boulders were observed, especially around the lake shore and creek bottom, with up to 5% disseminated to small blebby pyrite, pyrrhotite and chalcopyrite. These boulders could possibly be representative of the rocks comprising the B4-11 anomaly.



Photograph of typical *exposure* of B4-14 and B4-9 EM anomaly.

Examination of the B4-19 anomaly revealed that exploration trenches T31, T32, and T33 were located to far north to actually cross cut the anomaly. The anomaly itself is well buried beneath regolith but down strike was two locations of boulders to sub outcrop

which were very “rusty” and moderately sheared mafic volcanic rocks with 3-5% disseminated pyrite with lesser amounts of pyrrhotite and chalcopyrite. These boulders are possibly a continuation of the B4-16 Trend, which appears to be similar to that of the BAM occurrence.



Photograph of the exposure of trench T32 at B4-16 EM anomaly. Whitish coloured rocks are sharp contacting tonalite dikes, greenish coloured rocks are pillowed to massive basalt.

Prospecting of the B4-18 EM anomaly encountered little exposure with high amounts of overburden. One exposed till mound was over 8 metres in height and was composed of poorly sorted sediment that included boulders up to 3 metres. Along strike however, notable boulder trains to sub outcrop were observed (30 to 85 meters) composed of sheared mafic metavolcanic rocks which have been weakly to moderately silicified and were extremely rusty. Fresh surface revealed 3-5% pyrrhotite with pyrite and lesser chalcopyrite.



Photographs of sheared oxidized boulder trains and sub outcrop along strike to strike to B4-18 EM anomaly.

Prospecting of the MEM occurrence (located 650 m east of Felix Lake and 1950 m northwest of the B4-7 Deposit) revealed the contact of cumulate anorthosite of the Grassy Pond sill and medium grained gabbro (basalt?) roughly 35 meters east of an elongate north striking diabase dike. Locally the contact is quite sharp and fracture plane contained disseminated pyrrhotite and chalcopyrite up to 3%. Contact however was not observed to be sheared but is being interpreted as an along strike extension of the Grassy Pond zone and likely reflects mineralization similar to it.



Photograph of contact between cumulate anorthosite and gabbro (basalt?) at MEM occurrence. Hammer handle marks sharp contact.

Exploration in the vicinity of trench T14 and T10 yielded the discovery of the “Kenny Zone” roughly 120 m south of trench T10. The “Kenny Zone” is a series of small outcrop exposures within abundant gravel and sand. Both the boulder and the outcrop are

extremely rusty and moderately sheared. Disseminated sulphide is abundant throughout up to 10% (pyrrhotite, pyrite and chalcopyrite). Locally there is sub outcrop with 8-10 cm massive quartz vein with seams of pyrrhotite with pyrite up to 12%. The host rock is strongly sheared and difficult to discern exact parentage, but is likely mafic metavolcanic rocks or sediments derived from mafic metavolcanic rocks. This occurrence could possibly be an extension sheared sediment formation in the south end of trench T14 or even further speculating- the same quartz vein and host rock from exposure at the “trench T12 south” zone. This occurrence is likely to also host Au values in addition to Cu and Ni mineralization.



Photograph of rusty sheared mafic metavolcanic rocks exposed at the “Kenny Zone.”

Exploration of the B4-1 anomaly at the T-junction between the Jackfish/Airport/East road and the camp road revealed exposed bedrock of moderately sheared coarse grained leucogabbro with locally rusty sulphide “burns.” Thick till overlies much of the area up to 1.5 metres thick and contains abundant rusty boulders of sheared sediments with disseminated pyrrhotite and pyrite up to 8%.



Photograph of exposed sheared coarse grained leucogabbro with sulphide burns proximal to B4-1 EM anomaly.

Little to no exposure of bedrock is available over the B4-3 and B4-2 EM anomalies. Exposure that is available is comprised solely of medium grained unmineralised gabbro. Exploration trench T27 cross cuts the center of the EM anomaly but contains only weakly sheared gabbro with trace to 1% disseminated sulphide (pyrite with minor pyrrhotite).



Photograph of exploration trench T27 (view to the south), rocks are composed of weakly sheared gabbro.

*Currently Planned New Trenching:*

B4-16 anomaly; Strip and trench exposed shear and quartz vein along strike where exposed on the north eastern side of Jackfish/East road and strip and trench likely continuation of occurrence on the south west side of road where anomaly and rock are both covered by overburden.

Expand exposure of Felix Lake West occurrence by stripping south of trench T12 pyrrhotite showing. Minimal required exposure is entirety of sulphide iron formation plus shoulders (likely mafic volcanic rocks) in the hanging wall and footwall as well as along strike minimum ten metres (10 m) preferably expose along strike up to fifty metres (50m), as exposure is available.

Expose B4-11 EM anomaly by stripping a trench just west of Felix Lake. This trench would likely be along strike to the soon to be stripped South T12 strip zone.

Expand trench T 32 southwards minimum fifty metres (50 m) (either making an entirely new trench further south or expanding current trenching) in order to try and

expose the B4-19 EM anomaly. Trend of mag and Em anomalies suggest a shear system similar to BAM zone.

Expose “Kenny Zone” to as much as exposure as possible (limited by road). Test along strike (eastern) to try and determine continuity of zone as well as determine possible if same host unit to trench T14 occurrence.

Create new exploration trench cross cutting EM anomaly B4-18 at end of short access road to gain exposure. Problems in this are might occur due to high amounts of regolith and overburden, locally up to 1.5 metres. Overburden however is generally dry could be easily moved. Location as planned is in area of thickest part on anomaly and relatively thin overburden (possibly less than ½ m).

*Recommendations for future work:*

Ground truth sample locations from MacTavish (2004) and re-tag sample IDs as necessary.

Re-sample as necessary previously exposed trenches in order to complete data sets and to fill gaps in sampling continuity.

Re-sample or extend sampling to determine whether bulk anorthosite is mineralized for PGE +/- Cu Ni or if mineralization is only limited to deformation zone.

If bulk anorthosite is mineralized, then grab or channel sample anorthosite and contact with gabbro from MEM occurrence to determine PGE +/- Cu Ni content.

Review all B4-7 mineralization for comparison study. Look into what samples have been prepped for thin section petrographic work and decide what criteria should be evaluated for future SEM work.

Investigate using SEM to determine if PGE content in Grassy Pond sill is a result of sequestration in coarse feldspar crystals or if a mineral component of the mafic groundmass. This will help to determine the viability as a resource for the prospect.

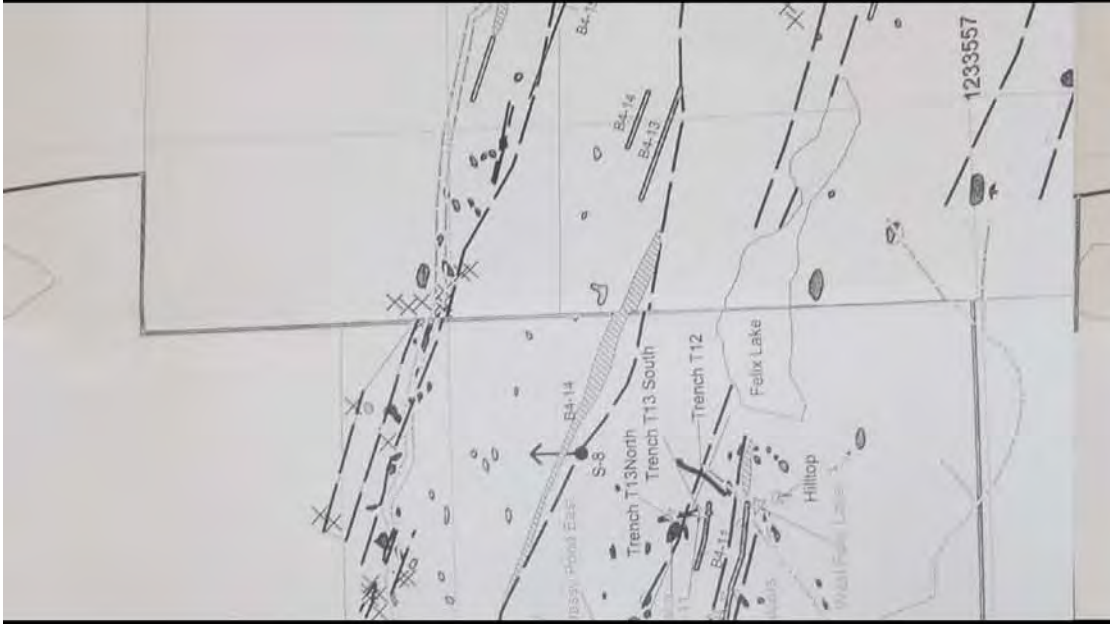
*Recommendations for future exploration:*

Drill two to three “exploration holes” through thickest part of both B4-14 and B4-9 EM anomalies to check target. Drill holes are necessary to compensate for lack of exposure. Drill direction should be to the south because regionally structures dip to the north. Topography in both localities should be inconsequential to potential locations for drill holes. Both sites have recoverable road access and a water supply. Sumps or cutting pumps or both should be used to avoid affluent from contaminating Felix Lake or its drainage streams.

*Summary:*

The Grassy Pond Prospect primarily contains the Grassy Pond Sill, a laterally continuous mafic sill that ranges from 100 to approximately 600 m in thickness which can be traced using geophysics for nearly 30 km whose lower contact in the southern part of the prospect contains 6 known PGE-Cu-Ni occurrences and 1 Cu-Ni-PGE-Au occurrence (Mac Tavish, 2004). The Grassy Pond prospect also contains 5 potential Au targets through BAM like altered shear zones in mafic metavolcanic rocks in the northern parts of the prospect.

Exploration efforts should be focused on the central Grassy Pond area, km 100 access road west to km 103, and south of the Jackfish/Airport/East road and north of the Grassy Pond/Juneau Lake access road; essentially encompassing an area surrounding Felix Lake. Continued prospecting/trenching should continue in order to determine the extent, continuity and geometry of lower contact of the Grassy Pond sill which has already proven Ni-Cu and PGE values. Trenches further to the west (T7 north and south) show anomalous values which should be assessed a lower exploration priority. This area will however become important for prospecting and as a potential for mineralization when determining the upper contact and of the Grassy Pond sill. Completing the follow up trenching of EM anomalies as well as exposing the sheared contacts of the sill and sediment-iron formation along strike will help to determine continuity of mineralization. Concentrating on these efforts will most likely yield the highest value of return for immediate drill targeting.





## Toronto Lake Trenching Program

Work carried out on behalf of **Landore Resources**

By **Richard Lumb**

06.09.2010 - 14.10.2010

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## Background

The south-eastern Toronto Lake gold prospect in the Robinson Batholith was first identified in the 1950's by the prospector Zmudzinski (Berger, 1992), following deforestation of the area.

In 1960 Kerr Addison mines Ltd., collected the following samples:

Grab (Au)	0.42 oz/ton over 2.7m
	0.23 oz/ton over 2.4m
Drill (Au)	0.02 oz/ton over 0.6m
	0.03 oz/ton over 1.5m

However, as the drilling failed to match the success of the surface grab samples the project was abandoned.

In 1983 Sogemines development company Ltd. Reported gold values of over 10,000 ppb, copper up to 3700 ppm, as well as low zinc and molybdenum. No follow up drilling was reported.

The larger Toronto Lake area, including the gold prospect, was first mapped in 1968 by Pye, and later in 1992 by Berger. The dynamite pits created by the previous exploration were marked as being located on several lensatic xenoliths of amphibolitised mafic rock.

In May 2010 exploration of the area was reinitiated by Landore Resources. The author carried out reconnaissance mapping and prospecting in the area, identifying several of the historic dynamite pits and mapping two bands of sheared mafic and intermediate rocks. Grab samples of intensely silicified granodiorite with massive arsenopyrite and pyrrhotite were taken, along with similarly mineralised veins elsewhere on the prospect. Several of these returned elevated gold values.

Table 1 [see appendix], documents the most significant results of the recent prospecting. It should be noted that there is a very strong, positive correlation between the gold and arsenic values. For this reason arsenopyrite was considered the primary indicator in the follow-up trenching. Nickel (carried by pyrrhotite) and molybdenum (molybdenite) also correlate positively, though less strongly with gold.

## Objectives

Previous work had revealed significant gold showings, and early stage mapping and prospecting tentatively identified the lithologies. However, due to poor exposure the structure of the area was known only from inference between small, widely separated outcrops.

The trenching program was designed to maximise understanding of the geology and the continuity of elevated gold values between showings, focussing on the area of most significant prospecting samples [listed in **table 1, appendix**]. Trenches were closely spaced (50 to 140m apart). The objective was to concentrate on developing a thorough understanding of this area rather than attempting to chase the mineralisation along strike thus spreading the trenches out to the point where inference between them becomes less reliable.

## Lithologies

### *Felsic*

#### Quartz Monzonite (Robinson Batholith)

The batholith that encompasses the mapping area and the following lithologies is variable in composition within the definition of a quartz monzonite porphyry. In trenches where a large panel of the batholith is uncovered (notably trench 0410-64T) different phases of quartz monzonite intrusion are in evidence, marked by slightly variable crystal size and proportion of mafic minerals [fig.1].



**Fig.1**

Compositional banding within the quartz monzonite. The lower band comprises a higher proportion of biotite and is slightly finer grained.

Camera case used for scale is 10cm long. [0410-65T]

In general the quartz monzonite comprises a coarse groundmass of plagioclase, quartz and biotite, with porphyritic potassium feldspar phenocrysts (up to 4cm long). Plagioclase and potassium feldspar – in approximately equal parts – account for 75-80% of the rock mass, along with 10% quartz and 10-15% biotite.

A weak foliation of around  $74^{\circ}$  is commonly present, denoted by a weak alignment of the feldspar phenocrysts. Narrow bands (5-10cm across) of finer crystalline rock - wavy in character and varying up to  $10^{\circ}$  either side of the foliation indicated above - may represent stronger shearing. These bands, where present, appear in close proximity (within 20m) to the zone of more noticeably sheared granodiorite and mafic lithologies, and may indicate increasing strength of shear. However, the fabric of the quartz monzonite, as indicated by the alignment of phenocrysts, is subtle and if a gradation exists towards the target zone it is not sufficiently apparent to be noticeable in outcrop.



**Fig.2** Bands in quartz monzonite of finer crystal-size aligned with the foliation probably indicate discrete areas of stronger shear fabric. Camera case used for scale is 10cm long. [0410-66T]

A consistent feature of the quartz monzonite are xenoliths. These vary in size from less than 5cm to around a metre in length. They are invariably prolate, aligned with foliation, and have an aspect ratio ranging from 5:1 to 6:1. Due to the thorough recrystallisation associated with entrainment the protoliths can only be inferred. However, it seems very likely that they are of granodiorite, mafic volcanic and/or microgabbro, and a felsic rock that is probably an earlier phase of the batholith intrusive.

The xenoliths are typically diffusely spread out in the quartz monzonite, accounting for 1-5%, and not always present. However, in places up to 10% xenoliths are present and one 1.5m wide band of 30% xenoliths was observed in trench 14a. This band was moderately sheared and cut by 2% pyrite veinlets.

#### Aplite dykes

Aplite dykes were a common feature in the trenches. The dykes are more evolved offshoots of the quartz monzonite batholith and in some trenches (notably trench 0410-70T) they were observed branching off from the quartz monzonite at the contact into the granodiorite and mafic lithologies.

The dykes vary in composition and texture and were mapped as either coarse (phaneritic) or fine (aphanitic) aplite. The major variable compositionally is proportion of biotite – which ranges from

non-existent (or at least undetectable without a microscope) to around 15%. In width they ranged from a few millimetres to close to a metre. There does not seem to be a relationship between the width and the crystal size of the dykes, which may indicate that the relationship is either temporal – the earlier dykes being coarser – or related to the distance that the dyke has travelled from its source in the batholith.

Dykes were occasionally weakly mineralised – typically with pyrite, but occasionally with arsenopyrite [sample **013700, 0410-61T**] or molybdenite [sample **013794/5, 0410-76T**]. Cross-cutting relationships indicate that dyke emplacement post-dates mineralisation so it is possible that arsenopyrite mineralisation therein was simply remobilised by the granitic fluids.

In general, the dykes follow the foliation of the host rock (granodiorite and mafic units). However, the smaller dykes seem more constrained by it and the larger dykes more often cross-cut foliation.

#### Porphyritic k-feldspar-chlorite-plagioclase dyke

The youngest lithology in the sequence is a narrow, coarse dyke found only in trench 0410-73aT. The dyke consists of up to 30% porphyritic k-feldspars (up to 4cm long) set in a coarse groundmass of chlorite, plagioclase with lesser quartz and accessory coarse magnetite (5%).



**Fig. 4** Strongly foliated dyke of porphyritic k-feldspar-chlorite-plagioclase. The dyke cuts the quartz monzonite at a steep angle to the foliation. [0410-73aT]



**Fig. 5** Close up of fig.4. The sinuous foliation – deflecting at the contact with the quartz monzonite – indicates that it was deformed by the sinistral movement of the host rock relative to the dyke. The large phenocrysts are potassium feldspars.

The dyke is slightly sinuous and strikes approximately 130 through the quartz monzonite. The phenocrysts are aligned with a strong but variable foliation 072-080. The foliation is deflected at both contacts with the host rock indicating sinistral movement of the host rock relative to the dyke. A sample was taken for assay and another for petrographic study.

### *Mafic*

Two distinct mafic lithologies were mapped. Microgabbro and mafic volcanic pillow lavas. In several instances in the field, a lithology has been mapped as 2A/9C in these cases the rock in question is so thoroughly recrystallised and/or foliated that the protolith cannot be discerned. However, circumstantial evidence will often indicate which lithology is most likely, and on the map the interpolation between trenches this has been taken into account.

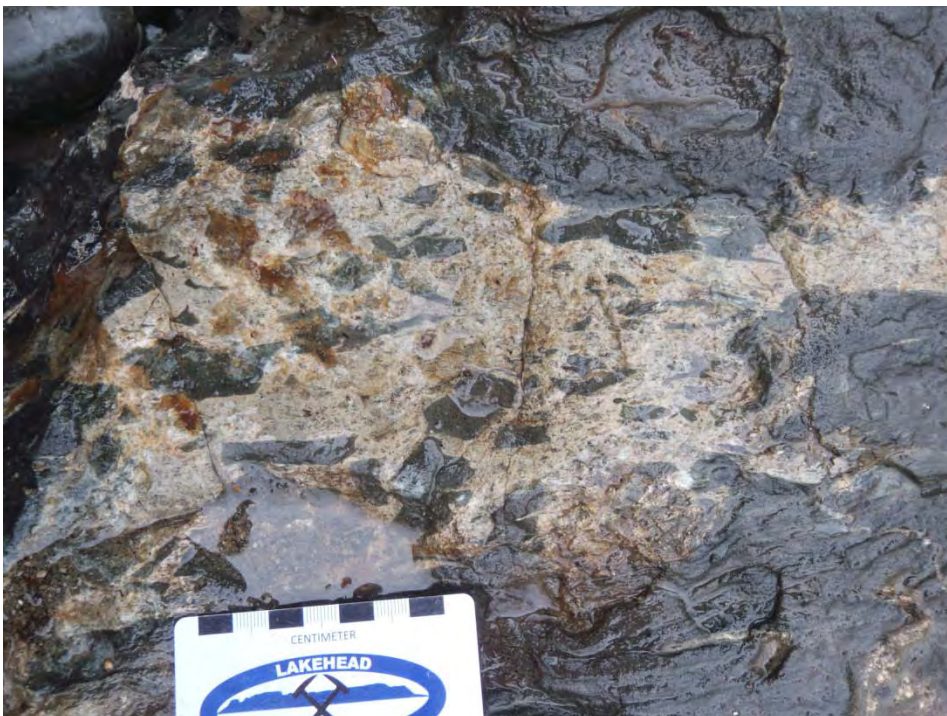
## Microgabbro

This occurs in several of the north western trenches (from trench 0410-62T to 0410-63T). It is in all cases medium crystalline, with slightly acicular plagioclase and moderately to strongly chloritised groundmass. It is massive and indurated to the point hornfelisation. The latter may have been caused by the emplacement of the batholith, although if this is the case then it remains to be explained why the other lithologies were not similarly affected.

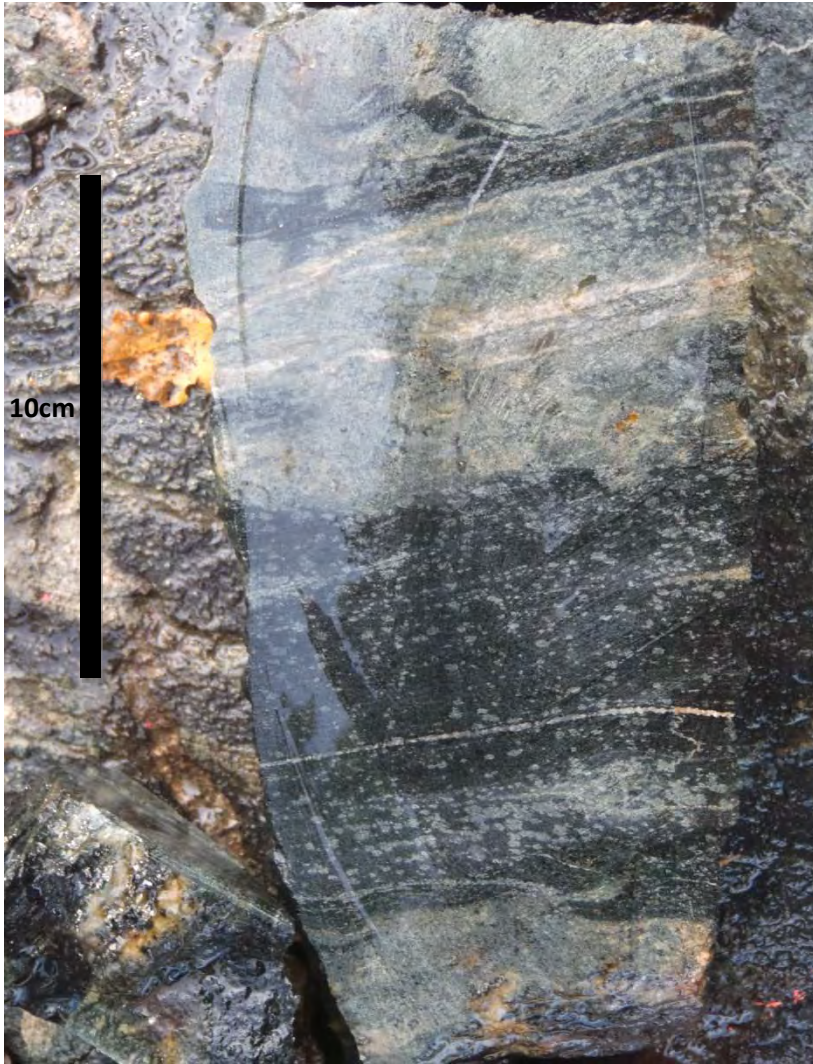
## Mafic volcanics

The dominant mafic lithology. Pillow structures are evident in several of the southern trenches. The lithology, being the least competent is also typically the most strongly foliated. Foliation (060-070 in the southern band and 070-080 in the northern band) varies within each trench to around  $5^{\circ}$ , and between trenches to up to  $10^{\circ}$ . The dip of the foliation is around  $70-85^{\circ}$  in the northern trenches, however this changes in trenches 0410-67T - 0410-70T for a dip of around  $75^{\circ}$  to the south.

The strength of fabric is likewise variable. In places it is largely undeformed (e.g. trench 0410-69T). Gradation in strength of shear is evident in the deformation of the pillow structures in which even weak shearing produces notable elongation. This is particularly evident in trench 0410-69T where little deformation is evident at the northern end of the trench but becomes increasingly pronounced to the south, so that by the final 3 metres the pillow structures are entirely obscured. The effect of this is difficult to separate from that of contact metamorphism which may also play a part in obscuring pillow structures in proximity to the granodiorite.



**Fig.6** Quartz-epidote band with brecciated fragments of the mafic volcanic host rock. 0410-66T



**Fig.7** Sheared mafic volcanics with pods of quartz-epidote and fine, disseminated pyrrhotite. Note the pyrrhotite mineralisation with silica in the lower left corner of the photo.

[sample 013642, 0410-66T]

Epidote alteration, which is common in this lithology, is occasionally associated with weak pyrrhotite mineralisation. Epidote occurs in fine veinlets with quartz [fig.7] (e.g. trench 0410-73bT), as well as patchy development unrelated to veining [fig.6]. Occurrences of the latter become increasingly common towards the contact with granodiorite and sometimes with the quartz monzonite, indicating that its development is caused, or at least aided, by contact metamorphism.

*Intermediate*

Granodiorite

A medium-crystalline, igneous rock comprising quartz, white feldspar, biotite and minor muscovite.



**Fig.8** Typical 'granodiorite', fresh surface. Medium recrystalline texture with small rusty patches surrounding finely disseminated sulphides. Note the veinlet, at the top of the photo, comprising a fine, dark mineral (likely biotite or epidote) accompanied by a wider selvage of silicification. This latter is difficult to discern in the rock, but is marked by its prominence at weathered surfaces (circled area) and often forms a stockwork of 25% over up to 10m. Likewise, foliation which is often difficult to discern in fresh surfaces, can be measured in weathered surface.

[Sample 013808, 0410-70T]

It is variably weakly to strongly foliated. Strike ranges in the order of  $5^\circ$  within each trench, and more dramatically between trenches, from 060-080 with no apparent general east-west trend. Dip is subvertical, typically around  $70-85^\circ$  to north.

The granodiorite typically occurs within the mafic volcanic unit as an intrusive of variable width. Typically the contact follows the general foliation, is sharp and even, and has no smaller offshoot

dykes branching from it. Trench 0410-68T is the exception to this rule – a dyke of granodiorite 1-1.5m wide intrudes the mafic volcanics at a steep angle to the trend of the main body of the unit.

The granodiorite also includes xenoliths of older mafic lithologies, notably in trench 0410-68T. These are prolate, aligned with foliation, and vary from less than 5 to up to 60 centimetres. In outcrop they are preferentially weathered into pot holes, but when cut reveal fine, chloritised rock.

## Chronology of lithologies

By examining contacts, xenoliths and cross-cutting relationships it is possible to establish the relative ages of the lithologies present. In order of ascending age these are: mafic volcanics; granodiorite; microgabbro; and quartz monzonite with its accompanying aplite dykes.

The mafic volcanics are demonstrably the oldest lithology present, having been intruded by the granodiorite and the quartz monzonite. Xenoliths of mafic rock occur in both the granodiorite and quartz monzonite, although these are completely recrystallised so the protolith could be any mafic lithology.

The granodiorite intrudes the mafic volcanics, and is intruded by quartz monzonite.



**Fig.9** Intrusive contact. Microgabbro (top) intruding and sending small, chloritic dykes into granodiorite (bottom).

The timing of the microgabbro is the least certain due to the fact that it is only observed in contact with the granodiorite. However, in this case (trench 0410-60T) the microgabbro intrudes the granodiorite. This particular contact is small, however, and the host/intrusive relationship somewhat equivocal. In several trenches small mafic lenses or dykes intrude granodiorite (e.g. 0410-62T, 0410-68T, 0410-70T). However these are all strongly sheared and chloritised and the narrowness of the body is the only clue that it is intrusive.

Quartz monzonite is the youngest unit. It intrudes all of the above, either at the contact of its main body, or with aplite dykes.

K-feldspar porphyritic dyke. This was only found in one trench, within the quartz monzonite. As such it is the youngest unit identified in the area.

## Structure

The target zone of the trenching is broadly defined as the sequence of mafic and intermediate rocks within the quartz monzonite batholith. The zone occurs in two sub parallel bands 300m apart at the western end, converging to a little over 100m apart at the eastern end. The southern of these two bands branches at a point between trenches 0410-68T and 0410-70T, so that by trench 0410-73a and 0410-73c 100m of quartz monzonite separates the two smaller bands. The two larger bands also approach each other towards the east where it seems they may converge, possibly as little as 500m east of trench 0410-66T.

A persistent foliation exists to a degree in all lithologies mapped. Foliation is typically strongest within the mafic volcanic and granodiorite, the quartz monzonite and the wide microgabbro unit in the north-western trenches are only weakly foliated. Foliation ranges from 060-070 in the southern band and 070-080 in the northern band. It is largely consistent to  $5^{\circ}$  within each trench but varies more wildly between trenches. This abrupt variation in strike between trenches may be the effect of the unevenly intruding front of the batholith forcing the shearing around the protruding lithons.

The dip of the foliation planes is likewise variable – typically around  $70-85^{\circ}$  to the north. In trenches 0410-67T to 0410-70T the granodiorite deviates from this norm, dipping to the south around  $75^{\circ}$ .



**Fig.10** Quartz-monzonite intruding mafic volcanics. The former exploits the pre-existing foliation in the latter, prying it apart to create islands of the mafic volcanics. This may be analogous to the batholith intrusion at a greater scale. For example the branching of the southern band of mafic volcanics and granodiorite is likely due to an intrusive wedge of the batholith [see map, trenches 1410-68T, 70T, 73bT and 73cT].

Two features noted at outcrop scale bear particular significance for their implications relating to the larger scale. These are as follows:

At outcrop scale the quartz monzonite batholith can be seen to exploit the foliation in the mafic volcanics, intruding and prying apart the host rock along these well developed planes. It seems likely that a similar scenario is being played out at the larger scale with the target zone bands being split apart by the batholith. If the foliation in the mafic volcanics and granodiorite was imposed before the emplacement of the batholith, then the manipulation of these units by the intruding fingers of batholith may go some way to explain the inconsistent strike of foliation.

Another common feature in both the mafic volcanics and granodiorite is the boudinaging of veins and dykes, both in the horizontal and vertical planes of foliation [**fig.11**]. The interpretation between trenches [**see map**] reveals inconsistencies in the width and persistence of the mafic and intermediate lithologies between them. For example, the microgabbro unit is over 30m wide in 0410-60bT, yet in the adjacent trenches to the east and west it narrows to less than 10m over 100m and does not outcrop at all in the trenches beyond. Likewise, the granodiorite in trench 0410-68T is around 35m wide, yet narrows considerably along strike in both directions.

This indicates that boudinaging as seen at outcrop scale may be occurring at the larger scale between trenches. This has implications for mineralisation which will be discussed later.



**Fig.11** An aplite dyke intruding mafic volcanics, boudinaged in the vertical plane of foliation. [0410-66T]



**Fig. 12** Above. Ptygmatic folding of small, fine aplite dyke indicating string shearing. [0410-66T]



**Fig. 13** Right. Tight folding in the vertical plane of quartz-epidote bands in the mafic volcanics. [0410-67T]

## Ore Mineralisation

Several different ore minerals were noted within the prospect. These are the sulphides arsenopyrite, pyrite, pyrrhotite, chalcopyrite and molybdenite, and the oxide magnetite. Although not observed in the field, the presence of gold has been confirmed by assay of the early prospecting samples, in addition to previous work. Ore mineralisation will be here divided into two groups; the first being those minerals that are thought to be directly associated with gold mineralisation; the second, those which are thought to be incidental.

*Arsenopyrite, pyrite, pyrrhotite and chalcopyrite.* These occurred together in various proportions in the mineralised zone - invariably with quartz.

Chalcopyrite was not commonly noted, occurring in small quantities in a few samples (e.g. # 013588-590, 0410-63T).

Pyrite is ubiquitous, being observed with almost every occurrence of sulphides, and except in a few instances, at higher grades. The pyrite is typically fine crystalline, but also occurs – probably at a later stage – as a coarse, fracture fill.

Arsenopyrite, unlike the other sulphides, predominantly occur as coarse, euhedral disseminations in both the styles described below.

Notable occurrences include :

- #013811-814, 0410-71T;
- #013527,523, 0410-60T;
- #013537,555,556 and 563, 0410-62T;
- #013662,664, 0410-68T

Occurrences are invariably accompanied by strong, pervasive silicification, sericitisation and sometimes secondary potassium feldspar.

Pyrrhotite is invariably fine grained and occurs in both the styles described below. It was often noted mixed with a quantity of pyrite, although due to the similar appearance of the two sulphides the proportions could not be determined in the field. Pyrrhotite also occurred as low grade disseminations in mafic volcanics, usually with epidote alteration. This latter style of occurrence is expected in mafic lithologies and is not necessarily related to the other mineralisation. Notable occurrences of pyrrhotite mineralisation include:

- #013621/622, 0410-64T;
- #013638, and 641/2, 0410-66T

The above sulphides were observed principally in two styles of mineralisation:

### *Disseminated in the silica selvages*

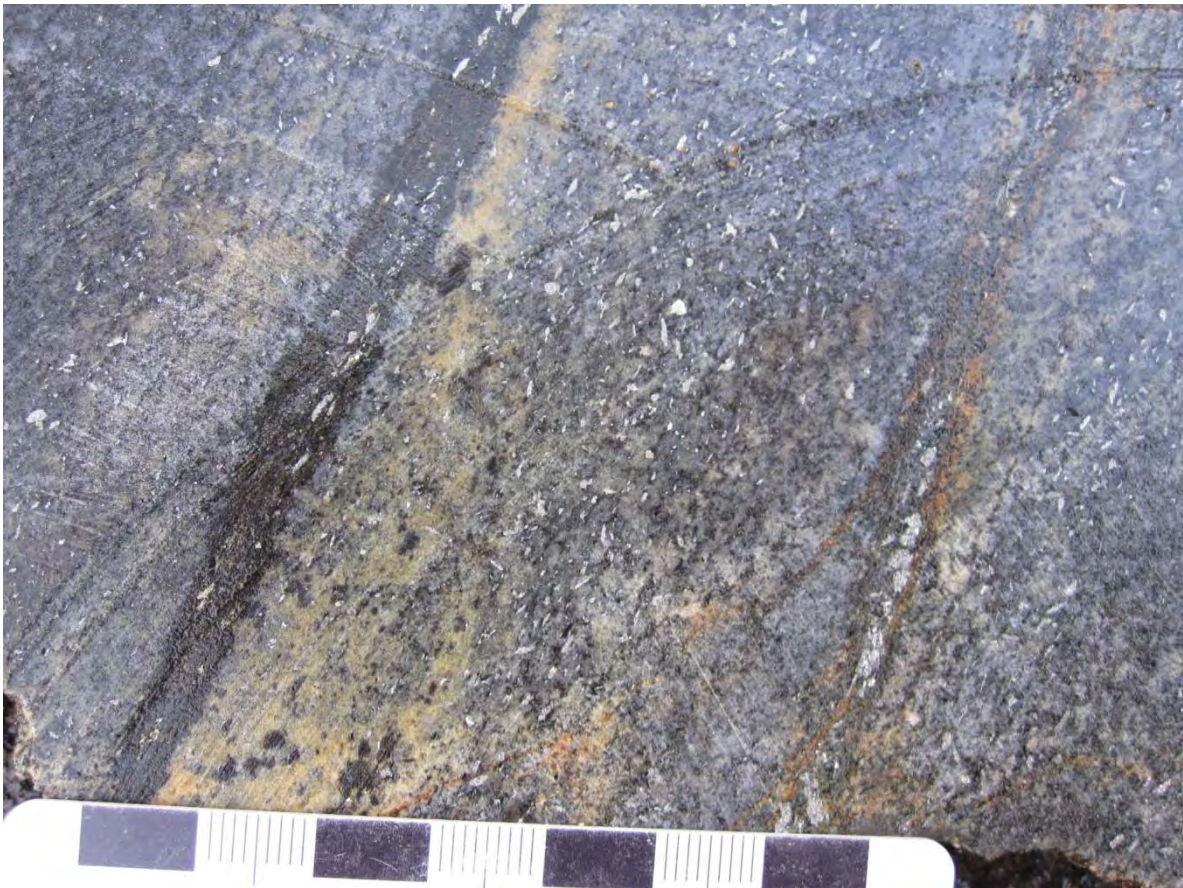
Within the granodiorite, veinlets of a very fine, dark mineral (likely either biotite or epidote) so narrow (often less than a millimetre wide) as to be only discerned by their relatively wide quartz or quartz-sericite selvages (up to 10cm across). These veins are a common feature of the granodiorite and, with the broad selvages, create a stockwork commonly of 25% of the rock and sometimes more, over up to 10m wide. Mineralisation is not consistently present in these veinlets and it is not apparent at this stage whether multiple phases of veining occur, in which some are mineralised and

some or not, or whether there is only one phase, throughout which sulphide mineralisation is unevenly distributed.

*In quartz-sulphide veinlets*

This is the most common form of sulphide mineralisation. It occurs as veinlets (from stringers up to 2cm wide) of massive, fine sulphides with little quartz. Pyrrhotite is mostly found in this style, usually mixed with pyrite. Alternatively they occur as wider bands of quartz, or intense silicification with more diffusely disseminated sulphides. Arsenopyrite is most commonly found in this style, as coarse, euhedral crystals with lesser pyrite and sometimes minor amounts of chalcopyrite and pyrrhotite.

Both of these styles of mineralisation occur in the granodiorite and the mafic volcanic lithologies. In the granodiorite, low grade mineralisation over a several metres is common, sometimes with a band of intense mineralisation over a few centimetres. However, in the mafic volcanic unit mineralisation mainly occurs as a small band of intense silicification with high grade mineralisation (e.g. trench 1, 5, 8).



**Fig.14**

**Fig. 14 and 15.** Coarse, euhedral arsenopyrite controlled by small veinlets, occurring with the fine, dark mineral noted previously (biotite and/or epidote) as well as in accompanying pervasive silicification. [0410-71T]



**Fig. 15**



**Fig. 16** Quartz-arsenopyrite vein in granodiorite. One of several similarly sized veins cutting the trench – semi-massive or massive arsenopyrite over 1 to 3cm, with a wider selvage typically around 10cm (and up to 30cm) carrying about 10% disseminated arsenopyrite. 0410-62T, 013543

It should be noted that mineralisation is inconsistent along strike. A particularly good example of this is found in trench 0410-67T. A historic blast pit is located around 5m to the west of the trench. In it a sample was taken of silicified mafic rock with a 20cm band of 85% arsenopyrite. The blast pit corresponds to a 70-80cm band of intense silicification in the mafic volcanics and two parallel channels were cut in it, 50cm apart. In the easternmost sample [013733] there was 15-20% sulphides (a mixture of arsenopyrite, pyrite and pyrrhotite). In the western sample [013734] there was around 6% of the same sulphides.



**Fig. 17** Boulder of massive (~85%) arsenopyrite from a dynamite blast pit 5m to the west of trench 0410-67T, along strike from samples 013733/4. The boulder was cut and taken as a grab sample 013765. The compass used for scale is 10cm long.

Veinlets of a fine, dark, hard mineral with silica selvages of up to 5cm were commonly present in both the granodiorite and mafic volcanics. The dark mineral could not be identified in the field, but is likely to be biotite and/or epidote. The veinlets followed the foliation and, with the wide selvages, formed a stockwork commonly of 30% in places over as much as 6m. The veins were inconsistently associated with sulphide mineralisation, and they were often barren of sulphides – however, where sulphides are present they are typically controlled by these veinlets [see fig. 14 and 15]. The relationship is difficult to ascertain as the veinlets are often only visible due the slight prominence on weathered surface of the silicified selvages [fig. 16].



**Fig. 16** A particularly strong stockwork of veinlets with strong silica selvages in mafic volcanics. Bands of stockwork veinlets such as this occur in both the mafic volcanics and the granodiorite and indicating the large volume of silica fluids that have passed through the system. Typically the majority of the veinlets occur with foliation, with a lesser number cross-cutting it.  
[0410-67T]

#### Incidental Ore Mineralisation

Molybdenite. This was found principally in aplite dykes (most notably in samples 013794/5, trench 0410-76T) and less often in quartz veins or pervasive silicification (e.g. #013518,520, 0410-60T; #013546, 0410-62T). It occurs as coarse flakes and would, therefore be useful as a tool for dating the rock. It's presence in the dykes may indicate an economic source in the batholith, but no evidence for this has been noted.



**Fig.17** Aplite dyke with disseminated coarse molybdenite. 0410-76T

Magnetite. This was noted in trenches 0410-60T and 0410-76T within the granodiorite unit. In the former it occurred as fine, euhedral disseminations around a single quartz veinlet. However, in 76T it occurred at around 1% over 6m of granodiorite as coarse disseminations.

5% coarse, disseminated magnetite was also noted in the narrow porphyritic k-feldspar-chlorite-plagioclase dyke in 0410-73aT (sample 013835).

### **Timing of mineralisation**

Mineralisation of arsenopyrite, pyrite, pyrrhotite, chalcopyrite all occur together at various points and in different proportions, but can safely be assumed to belong to the same mineralisation event. It occurs in both the granodiorite and mafic volcanic units with quartz veining and bands of silicification. Although the strongest bands of silicification are sometimes oblique to strike (e.g. 0410-64T), the majority follows foliation and likely occurred synchronously. This foliation is thought to have been developed after emplacement of the quartz monzonite batholith. However, in at least one clear instance an aplite dyke cross cuts a sulphide mineralised vein (0410-74T). In addition, some aplite dykes were noted to carry minor sulphides, including pyrite, pyrrhotite, arsenopyrite and molybdenite. Therefore the balance of evidence suggests that mineralisation occurred during a shearing event sometime after the initial emplacement of the batholith, with an additional phase or phases of quartz monzonite and associated dykes coming at a later stage, remobilising some sulphides and offsetting older quartz veins.

### **Interpretation**

The Toronto Lake gold prospect system is a long, narrow sequence of mafic and intermediate lithologies included within the Robinson batholith. The intrusion of the batholith caused the sequence of older rocks to be divided into at least 3 branches. The regional shearing, which is only weakly expressed in the batholith, has a far more pronounced effect on the less competent rocks included within it. Thus a strong shear developed in the narrow band. Off-shooting fingers of the quartz monzonite batholith, which exploited pre-existing weaknesses in the older rocks, acted as relatively undeformable lithons around which the less competent rocks were sheared. Continued shearing also led to the development of boudins, a feature whereby the rock is attenuated at intervals, sometimes to the point of pinching-out entirely. Mineralisation occurred sometime during shearing. Siliceous fluids, which may have been totally, or in part, derived from the batholith, followed the foliation caused by shearing.

## **Recommendations for further work**

Trenching has provided an image of the behaviour of the system at the surface. However, the target zone is open along strike in both directions. There is also the possibility of additional zones, or branches of identified zones, to the south.

The system is also completely unexplored at depth. Previous drilling by Kerr Addison used inadequate equipment – narrow gauge drills known to deviate quickly at depth – and made only two, short holes. This was a cursory effort at best and, unsurprisingly, did not repeat the success of surface sampling.

However, as can be seen from the interpretation [see map], the zone is highly variable in width. The target zone lithologies bottle-neck in places along strike and occasionally one or both may not be present at all at intervals. In addition, mineralisation is not distributed consistently across or along strike. A quartz vein may sport massive sulphides at one side of a trench and be barren at the other. It is also not unreasonable to assume that a similar scenario is played out in the vertical plane.

With the above taken into consideration a sensible next step in the project would involve probing at depth the target zone in the area covered by trenching. This should allow a 3D model of the system to be developed. If drilling produces favourable results and continuity at depth, then a program of mapping and prospecting should be carried out to identify further targets along strike.

A fence of diamond drill holes may be used to find unidentified parallel zones, however the discontinuous nature of the zones already mapped shows that this method is not without risk of missing the target where the drill falls between boudins. Prospecting should be the first line of exploration, where not precluded by deep overburden.

Appendix

Table 1. Significant results of prospecting. Note the very strong correlation between gold and arsenic.

Sample	Au_PPB	Ag_PPM	Co_PPM	Cu_PPM	Ni_PPM	As_PPM	Mo_PPM	Description
991581	<b>2112</b>	2.28	168	393	149	>8000	5	Dynamite pit #1. Silicified granodiorite. Massive sulphides with coarse quartz veining - mixture arsenopyrite-pyrite-pyrrhotite, plus a trace of fine malachite
991582	<b>818</b>	1.33	10	447	12	2723	5	Rusted, strongly leached, silicified-sericitised granodiorite 10m west along strike from dynamite pit #1.
991583	<b>885</b>	1.55	83	649	74	>8000	42	Dynamite pit #1. Silicified granodiorite. Massive sulphides with coarse quartz veining - mixture arsenopyrite-pyrite-pyrrhotite, plus a trace of fine malachite
991584	<b>3214</b>	1.82	44	299	20	>8000	7	Quartz vein at batholith/granodiorite contact. Strong arsenopyrite with quartz (40% arsenopyrite; 60% quartz in 1-3cm wide vein)
991587	<b>9891</b>	5.73	112	646	81	>8000	3	Dynamite pit #2. Granodiorite adjacent to mafic volcanics, within quartz monzonite batholith. Massive arsenopyrite with quartz-biotite veining.
991605	<b>2167</b>	4.37	42	883	19	7751	3	Heavily silicified and veined granodiorite. Massive sulphides po-apy-py
991606	<b>1761</b>	2.76	372	885	191	>8000	2	Heavily silicified and veined granodiorite. Massive sulphides arsenopyrite > pyrite with lesser pyrrhotite
991618	<b>125</b>	<1	19	26	9	4279	175	Quartz vein (4-10cm wide) in sheared granodiorite. Up to 10% sulphides (arsenopyrite and pyrite)
991619	<b>628</b>	1.2	77	214	12	>8000	12	Wall rock of 991618 - sheared, silicified granodiorite. Up to 15% disseminated arsenopyrite and pyrrhotite with trace molybdenite.
991620	<b>1697</b>	1.08	27	143	14	3281	2	Sheared granodiorite. 10% disseminated arsenopyrite and pyrite.