ASSESSMENT WORK REPORT

CLAIM L 4282142

(Central Cell #126017, and Boundary Claims #155684, 239443, 105615, 151798, and 293947)

Lot 5, Con 7, Township of Lorrain

Larder Lake Mining Division

Claim Holder - Brian Anthony (Tony) Bishop client #108621

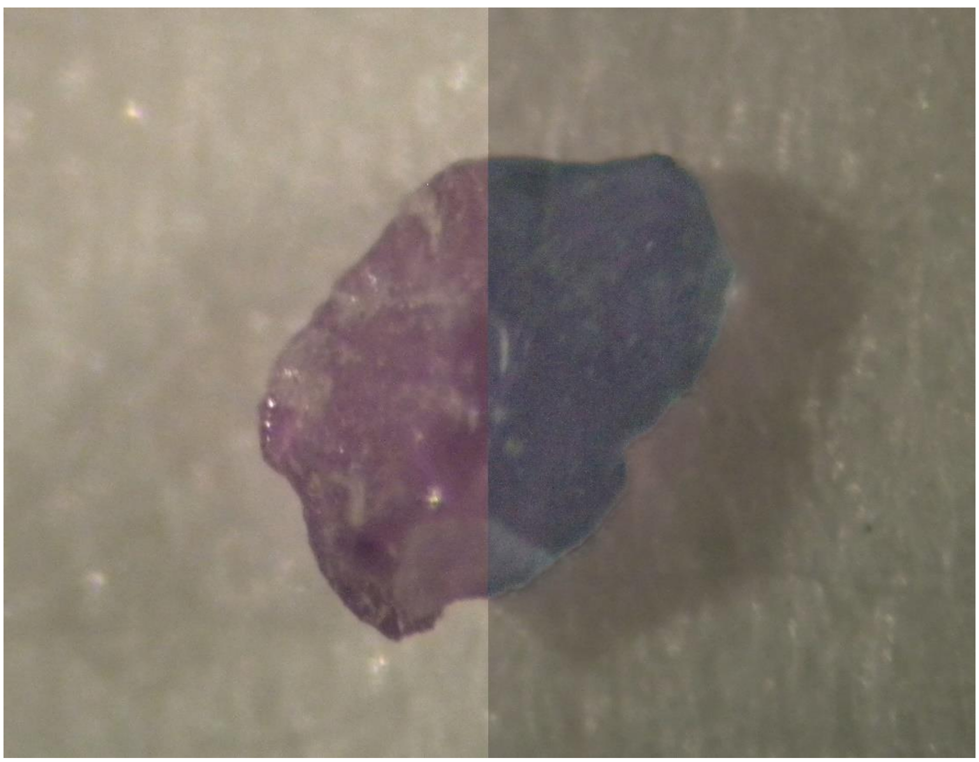

Photo A: Colour change garnet chrome pyrope found ~100m south of Paradis Pond
Microphotograph taken under two different lights – soft white & daylight LED lamps

Report prepared and submitted by Tony Bishop

June 6, 2018

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ASSESSMENT REPORT FOR LEGACY CLAIM 4282142, LORRAIN TOWNSHIP, LARDER LAKE MINING DIVISION (central cell #126017, and boundary claims #155684, 239443, 105615, 151798, and 293947)

Prepared by Brian A. (Tony) Bishop, submitted June 6, 2018

INTRO:

Hereby submitted by Brian Anthony (Tony) Bishop [Client No. 108621, 100% holder on record], on June 6, 2018, an assessment report for Legacy Claim no. L 4282142 (recorded on June 6, 2016). This claim is comprised of 2 units, situated in the N ½ of the S ½ of Lot 5 Con 7, in the Northeast section of Lorrain Township**,** Larder Lake Mining Division [Appendix 4: Map 1, page 38]. The first work on the claim occurred on June 15, 2016, after it had been staked and registered.

As of April 10, 2018, this legacy claim is now comprised of the central cell #126017, and boundary claims #155684, 239443, 105615, 151798, and 293947, located in provincial grid cells 31M05A047, 31M05A046, 31M05A066, 31M05A067, 31M05A048, and 31M05A068.

Work completed to date includes a thorough on-foot observational examination of the claim, a research component, a carefully planned and mapped out series of soil sampling, screening, concentrating, sorting and examining potential kimberlite indicator minerals (KIMs) in the 24 till samples collected, microphotography, and recording these and other findings, as well as an Electron Microprobe Analysis completed on one grain by Geoscience Lab (Sudbury).

Appendices include detailed methodologies for field work and till sample processing (including results of processing efficiency test and flowchart for concentrating), narratives, maps and field notes for 6 traverses, brief narratives on area history and the Nipissing Diamond, notes on structural geology, and discussion points on the importance of non-magnetic signatures and geo-chemical and structural geology for advances in diamond exploration in Canada. A Map Appendix includes general claim location and road access, geological types, faults, glacial directions, magnetics, and Google Earth views of the claim.

PURPOSE:

The purpose of staking claim L 4282142 (registered June 6, 2016) and the goal of the assessment work done to date and included in this report is to look for evidence and test the hypothesis that the claim up-ice may contain a kimberlite pipe which manifests in the post-glacial topography as a small circular lake, named Paradis Pond, aka the target.

ACCESS:

Access to the claims is most easily gained by taking Highway 567, heading East and South from Highway 11B in North Cobalt for 6.5 km to a right turn onto a gated, former logging road, and travelling 14 kilometres to a short spur-skid way where a truck can be parked north of this target [Appendix 4: Map 2, page 39] for access to 4282142. The lake above claim 4282142 lies approximately 500 metres on a mild downgrade through a recently partially logged area, south of the truck parking. When sampling we used a canoe to cross the lake to the south side or walked around the lake on the east side.

As the crow flies, the claim is 2.7 km from the nearest year-round road, 10.5 km from the Cobalt train station, 16 km from the Trans-Canada Highway 11, 120 km from North Bay, and 400 km from Toronto. Lake Temiskaming lies a short distance to the East.

PREVIOUS WORK:

Although there is now an identified kimberlite field in the region, no known pipes have been established in the immediate area around claim L 4282142, and no previous work of any kind on this claim has been recorded to date, according to overlays researched at the Mining Recorder's Office in Kirkland Lake. The nearest diamond exploration work was performed by Tres-Or Resources Ltd. on 2 blocks of claims, examining several magnetic targets as possible kimberlite pipes for KIMs, and reporting a small number of potential indicators including 2 pyropes, a few ilmenites, and some chromites, from large till samples dug with a large hy-hoe, ~1 ½ km south of claim L 4282142, and a silver prospect (Goodwin Lake

Mine) with several cobalt/silver veins approximately 500m to the west of claim 4282142 near the southwest end of Goodwin Lake; however, as described in detail elsewhere in this report, a trench and a small pit were discovered by Graeme Bishop in the southeast quarter of the claim.

The nearest known kimberlite pipes are over 17km northwest of claim L 4282142 and are far off-ice in direction (and far lower in elevation) so cannot conceivably be the source of KIMs found on these claims.

For a brief history of development and abstract of human activity near the claim, please see Appendix 1: History of Development in the Cobalt Area [page 27].

GEOLOGY:

STRUCTURAL GEOLOGY:

This claim is surrounded predominantly by The Lorrain Batholith, with about ⅓ of the west side of the claim lying in diabase [see Appendix 4: Map 3, page 40]. The Lorrain Granite Batholith is known to be intruded by Nipissing diabase dikes and sills forming distinct basins and the NE extent of the Schumann Lake Arch is present in the northern part where it and faulting also intersects the Cross Lake Fault.

It has conjugate, perpendicular structures relating to the Cross Lake Fault and such structures are proven to bear diamondiferous kimberlite pipes in the New Liskeard Kimberlite Field, especially on the east side of the Cross Lake Fault where the pipes are higher in diamond grade in the New Liskeard Area.

For a more detailed write-up on the structural geology, please see Appendix 2 [page 32].

SUPERFICIAL TOPOGRAPHIC FEATURES:

The area in and surrounding claim 4282142 is comprised of some bedrock and thin till covering bedrock. On the OGS Map 2685 (Baker, et al, 2010), Quaternary Geology, this area is identified as Bedrock-Drift Complex: thin drift cover, sufficiently thick in places to subdue the bedrock topography.

From OGS Map 5024 (Roed, Hallett, 1979):

- Bedrock Knob – dominant landform
- Till Ground Moraine – subordinate landform
- Local Relief – mainly moderate local relief, jagged, rugged, clifted
- Drainage - dry

FIELDWORK:

Taking many smaller till samples from various locations down-ice was deemed appropriate to mitigate the extreme nugget effect caused by KIMs potentially being restricted to thin stratigraphic horizons in the till [see Appendix 6: Methodologies for Field Work & Till Sampling, Diagrams I & J, page 70].

24 till samples were collected on 6 traverses. General prospecting and site examination was undertaken on each traverse.

To the east of this area, Lake Temiskaming can be seen in a valley between the large steep hill that parallels much of Hwy 567. I later ascertained that we could see Paradis Bay. This is important because this is a natural drainage feature. A post-glacial map shows drainage from this area to Paradis Bay along this valley where a G10 was found (see OGS Open File Report 6088, Sample 180). By local glacial direction this initially made no sense (it would have had to come from Lake Temiskaming).

This valley would have drained a melting glacier from Claim #4273040 & #4282142 - Paradis Pond, #4282189 - Cedar Pond, or #4281431 - Lightning Lake, all kimberlite targets. Another G10, Sample #181 from the same OGS report, found just north of the other one near Martineau Bay is in the drainage basin from #4282444 - Little Grassy Lake – another of our kimberlite targets. Both of these samples were found in stream samples flowing from the claim areas.

TRAVERSES: **Please refer to Appendix 5 for Traverses for detailed narratives, maps, and coordinates/field notes.**

METHODOLOGIES: **Please refer to Appendix 6 for Methodologies for Fieldwork and Till Processing**

RESULTS:

Geoscience Lab Results from Sudbury (CRT-17-0107-02):

In June, 2017, I sent a number of grains from multiple claims to Geoscience Labs in Sudbury for EMP analysis, including one grain from claim 42822142 which was analysed to be a G9 [see Photo B below].

Sample Label	SiO2	TiO2	Al2O3	V2O3	Cr2O3	Mg0	CaO	MnO	FeO^t	Na2O	K2O	Total
S-G96	41.056	0.202	18.569	0.034	6.389	20.215	5.720	0.376	7.221	0.028	0.000	99.810

Photo B [Photo 3, page 7], G9

MICROSCOPE PHOTOS OF KIMs:


Photo 1 – Picked grains

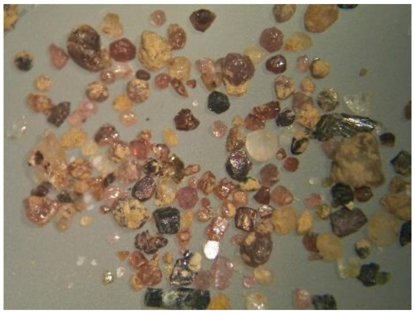


Photo 2 – Some picked grains


Photo 3 – G9 – Cr Pyrope – 0.8x1.2mm

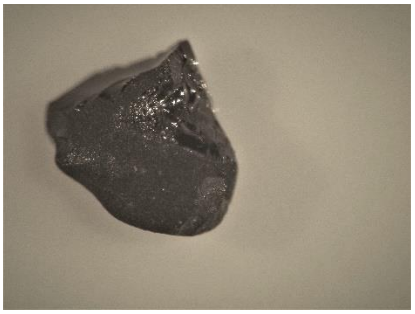


Photo 4 – Ilmenite – 2x2x1.5mm


Photo 5 – Some picked grains

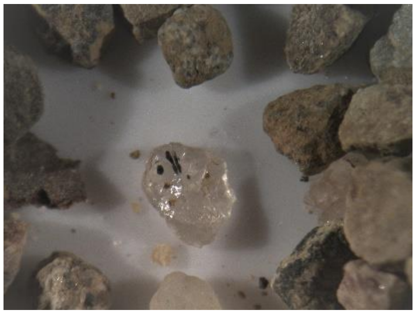


Photo 6 – Grain with inclusions


Photo 7 – 0.5mm stone


Photo 8 – Grain with inclusions


Photo 9 – Orthopyroxene – 1.0-3.0mm – 3BT


Photo 10 – Orthopyroxene – 3BT


Photo 11 – Orthopyroxene – 3BT

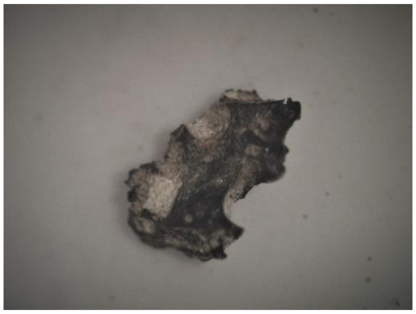


Photo 12– Orthopyroxene – 3BT


Photo 13 – 1.0mm stone – 3BT


Photo 14 – 1.2mm stone – 3BT


Photo 15 – Trench - GLPp – weak mag – 0.9mm

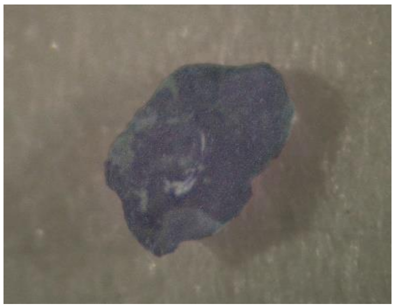


Photo 16 – Trench – GLPp – weak mag – 0.9mm – RL


Photo 17 – Trench – FeO – weak mag – 0.5mm

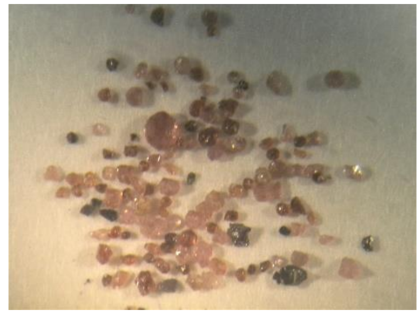


Photo 18 – Trench – somewhat mag – crustal

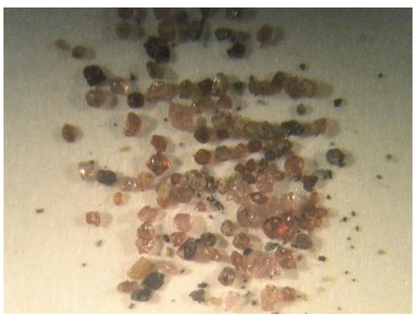


Photo 19 – Trench - weak mag – probable KIMs

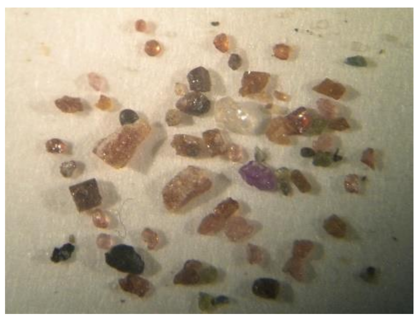


Photo 20 – Trench - weak mag – probable KIMs


Photo 21 – Trench – almost inert – probable KIMs

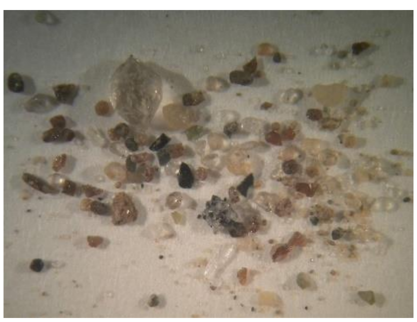


Photo 22 – Trench – inert


Photo 23 – Trench – GO – inert – 0.5-1.0mm


Photo 24 – Trench – GMLo – inert – 1.5mm

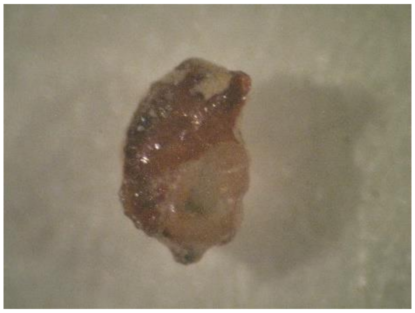


Photo 25 – Trench – GMLo – inert – 1.0mm


Photo 26 – Trench – GMLo – inert – kelyphite rim

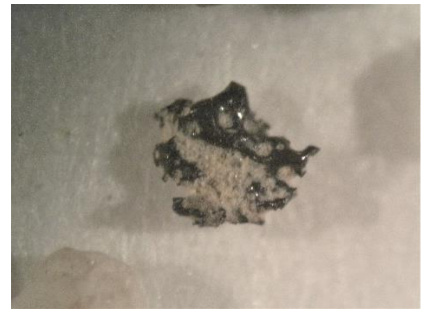


Photo 27 – Trench – OP – inert – 1.2mm

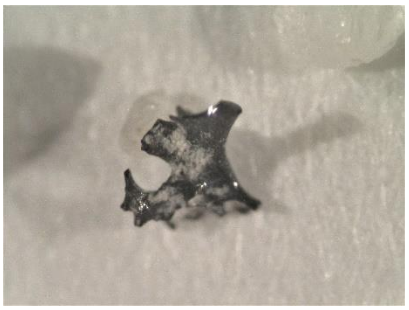


Photo 28 – Trench – OP – inert – 1.3mm


Photo 29 – 3BT – olivines – inert


Photo 30 – 3BT – ilmenite – some mag – 2.0mm

RESULTS:

Traverse 1 – S1

- Photograph 1, page 7: From ~2.0kg till sample from an overturned tree root

Traverse 1 – S2

- Photograph 2, page 7: Picked grains from ~2.0kg till sample taken under an overturned tree root
- Photograph 3, page 7: Large Cr pyrope tested as a G9 by microprobe by Geoscience Laboratories

Traverse 3 – S1 & S2

- Photograph 4, page 7: Big ilmenite showing original and fractured surfaces
- Photograph 5, page 7: Some grains picked from 2.0kg unscreened till sample from under tree root
- Photograph 6, page 7: Grain with unusual black inclusions that almost look like they were liquid when emplaced
- Photograph 7, page 7: 0.5mm stone with what appears to be a triangular face(s), similar to a trigon on diamonds. Most unfortunately, this grain was lost in handling before it could be tested in a lab
- Photograph 8, page 7: Odd red-purple inclusions in this grain

Traverse 5 – S6 (3BT = 3 Bole Tree)

- Photograph 9, page 7: Pristine undamaged orthopyroxene grains taken from ~3.0kg till sample
- Photograph 10, page 7: Close-up of orthopyroxene grain
- Photograph 11, page 7: Close-up of orthopyroxene grain
- Photograph 12, page 7: Close-up of orthopyroxene grain
- Photograph 13, page 8: Crystal with heavy rim/coating
- Photograph 14, page 8: Crystal, partially coated – tested quartz at Geolab

Traverse 5 – pictures taken at a later date

- Photographs 15-16, page 8: Typical Cr pyrope G9/G10 untested from the trench (Photo 1 microphotographed under Jansjö lamps, and Photo 2 with AmScope lamp), displays a dramatic colour change
  – other KIMs do not display this change in colour.
- Photograph 17, page 8: A weakly magnetic FeO grain which suggests Fe(III) and/or Fe(II)

I then used a neodymium magnet to separate various magnetic and finally an **inert non-magnetic (diamagnetic)** fraction. The ferromagnetic fraction had been previously removed.

- Photograph 18, page 8: Somewhat magnetic – probably crustal garnets ~20-40% Fe.
- Photograph 19, page 8: Weakly magnetic grains – probable KIMs
- Photograph 20, page 8: More weakly magnetic grains – probable KIMs
- Photograph 21, page 8: Almost inert, falls off magnet with a light shake – probable KIMs
- Photograph 22, page 8: **Inert, no reaction when pressed to magnet**. This is where the really interesting orange (and sometimes other colour) garnets are found and will be the subject of more research and some sent for microprobe analysis.
- Photograph 23, page 8: **Inert** mag – orange garnets, picked
- Photograph 24, page 8: **Inert** mag – large, lightly sculpted medium-light orange garnet, with black inclusions (definitely not magnetite)
- Photograph 25, page 9: **Inert** mag – two-toned garnet
- Photograph 26, page 9: The bottom shows remnants of kelyphite reaction rim
- Photograph 27, page 9: **Inert** mag – glassy black grain, labelled as orthopyroxene until further testing
- Photograph 28, page 9: Another inert mag – orthopyroxene showing delicate shape, undamaged by transport
- Photograph 29, page 9: **Inert** mag – probable olivines – 3BT
- Photograph 30, page 9: Some magnetism – large ilmenite grain – 3BT

CONCLUSIONS/DISCUSSION & RECOMMENDATIONS FOR FUTURE WORK:

Overall, each sample produced above to well-above numbers of potential KIMs compared to samples taken off-ice (i.e. west of the suspected kimberlite pipe); the north and east directions are affected by other targets to the north of 4282142.

> "To determine priority of targets, sample sites containing more than a dozen indicator minerals typically signify a proximal target. Sites containing more than 100 indicator minerals are of high priority" (Erlich & Hausel, (2002), p 311).

The authors are referring to stream samples: **if till is sampled, the sample size collected in the field should typically be much larger** with much smaller anticipated results. **This enhances the importance of large numbers of KIMs being found in smaller till samples immediately down-ice of a lake (i.e. my targets)**.

A local geologist (PEng), the local "crystal expert", and separately myself have all concluded that many typically labelled 'non-kimberlitic' grains are, by evidence, actually kimberlitic in origin, which in itself will require much more research.

This pattern of finding very unusual non-typical grains (non-magnetic FeO, orthopyroxene, round frosted fluorescent zircons, kyanite, and others) is repeated in the cons of my other 'targets' and are in my samples only found in quantity when large quantities of traditional KIMs are also found. When KIMs are absent, so too are anomalous numbers of these 'non-kimberlitic' grains, which suggests strongly a correlation, many of these non-kimberlitic grains have been found as inclusions in diamonds.

Of great importance are the non-magnetic (inert) garnets (discovered in the Trench samples), especially the light & medium orange garnets. This will be a main focus in future exploration and includes relooking at my previously microscopically picked KIMs for more of these grains to be sent for microprobe analysis.

Sampling on 4282142 is complicated by another important potential kimberlite (Cedar Pond), which is a short distance to the north of Paradis Pond. This means that approximately half the samples down-ice of Paradis Pond could conceivably, in full or in part, come from Cedar Pond, especially in the vicinity of the Trench.

Much of the above paragraphs will be explained to a greater extent elsewhere in this report.

ILMENITES:

Presently, most companies will not consider a diamond prospect/pipe unless the 'chemistry' of the indicators are a certain value. Specifically the chemistry for ilmenite, **although they are not a kimberlite (mantle) mineral**, they are 'picked up' from the country rock by the ascending kimberlite volcano.

Many properties are made or ignored based on this premise. I recently encountered this when a major I spoke with wanted to see the ilmenite chemistry (expensive to test for 15 individual targets at the prospecting level) and from the company's past history, the results are treated as gospel for pipe/diamond content.

However, as quoted below showing various viewpoints on this, perhaps they should reconsider their long ago entrenched beliefs.

> "… the importance of ilmenite composition during the evaluation of a pipe for diamond content may be related to diamond preservation (McCallum and Waldman 1991). … the magma may be subjected to later near-surface oxidizing environments. Such oxidation may show up as high Fe^{3}/Fe^{2+} ratios … in ilmenite. In such cases, it has been suggested that … diamonds in the host magma may be substantially resorbed to produce graphite, CO_2, or CO.

> "Survival of diamond at elevated temperatures … is linked to low oxygen fugacity; elevated oxygen levels favor resorption. Ferrimagnetic ilmenite high in Cr_2O_3 is found in some diamond-poor kimberlites, and these ilmenites characteristically show exsolution texture.

"In contrast, homogenous ilmenites are found in kimberlites that are interpreted to have risen comparatively rapidly. … typically results in later ilmenites that have lower MgO and Cr_2O_3 contents.

"It has been reported that ilmenite in equilibrium with diamond contains almost no Fe^{3+}

"High Cr_2O_3 and MgO components in ilmenite relate to low oxygen fugacity. This association has led to the use of Cr_2O_3/MgO plots to evaluate ilmenite trends for diamond preservation.

"Gurney (1989) and Gurney, Helmstadt, and Moore (1993) report that 'ilmenites with low Fe^{3+}/Fe^{2+} ratios are associated with higher diamond content than those with more Fe^{3+}, whereas **diamonds are not associated with ilmenites of high Fe^{3+} content at all.**'

"**However, this association is not supported by all observations.** As pointed out by Schulze et al. (1995) and Coopersmith and Schulz (1996), on the basis of ilmenite geochemistry, an exploration geologist would be forced to conclude that finding diamonds in the Mir, Frank Smith, DeBeers, Monastery, and Kelsey Lake mines would be unlikely because these kimberlites all have ilmenites with high hematite [Fe(III)] component. Yet, unresorbed diamonds and relatively high ore grades are found in kimberlites at Mir (200 carats/100 tonnes), Frank Smith (known for its sharp-edged octahedrons), DeBeers (90 carats/100 tonnes), and Monastery (50 carats/100 tonnes). Low diamond grades are reported at the Kelsey Lake mine, but the diamonds are excellent and include many spectacular gem-quality octahedrons with little evidence of resorption. The ilmenite geochemistry of Kelsey Lake shows as much as 38% hematite component (Schulze et al. 1995; Coopersmith and Schulze 1996) which would lead to a prediction, based on ilmenite geochemistry, that these kimberlites would be devoid of diamond. However, diamond production at the mine includes a large percentage of high-quality gemstones with octahedral habit indicating that diamond preservation was favorable.

"In all probability, many picroilmenite nodules did not coexist with the magma at the time they were incorporated in to the kimberlite. Therefore, … their oxidation state would have little bearing on the diamond resorption potential" (Schulze et al. 1995; Coopersmith and Schulze 1996).

I'm also investigating the value of using a neodymium magnet to differentiate between 'crustal' ilmenite ($FeTiO_3$) and 'kimberlitic' magnesian ilmenite – geikielite ($MgTiO_3$); however, there is a 'third' ilmenite: pyrophanite ($MnTi0_3$).

To determine oxygen fugacity as previously stated [see page 11], an Fe(III) to Fe(II) ratio should be able to be determined with a similar neodymium magnet test that I'm using for garnets. More results will be forthcoming.

[G10s] "Some diamondiferous pipes, such as the Argyle, contain few (if any) G10 garnets, whereas some barren pipes such as Zero and Buljah, Western Australia, contain abundant G10 garnets." (Erlich & Hausel (2002). p 330-331.) [see Conclusions/Discussion & Recommendations for Future Work: Ilmenites, page 11]

ON FE(II) GARNETS:

As shown in various articles, diamonds with inclusions have been tested in which the original structure/chemistry of the inclusion was maintained under the original pressure conditions inside the diamond (Tschauner et al (2018)). The same could be said, and in fact is documented [see Kiseeva, et al (2018)], so might Fe(II), austenite, a non-magnetic form of iron, be maintained inside a garnet [for details on austenite, see Work Assessment Report 4282172 (p 15/16), (Nov 27, 2017), and Work Assessment Report 4282444 (forthcoming)].

Briefly, there is Fe(I) – very magnetic (ferromagnetic), the iron we use extensively; Fe(III) – weakly magnetic (paramagnetic), hematite; and Fe(II) – (diamagnetic), austenite, totally inert which only (in nature) exists in the mantle at high pressure/temperature and sometimes in meteorites. The importance for this report is that all garnets are accepted in scientific journals as being greater or lesser magnetic. However, I'm finding (totally) inert-magnetically garnets which at first glace should be impossible.

Magnetic Susceptibility Index for Gemstones (Kirk Feral (2010))			
Gemstone	**Response Range**	**SI X 10 (-6) Range**	**Cause of Colour**
Garnet Group **Almandine Garnet**	Picks Up	1926-3094	Iron
Andradite Garnet Demantoid Garnet	Picks Up	2253-2752	Iron, Chromium
Brown Andradite & Topazolite	Picks Up	2559-2907	Charge Transfer Involving Iron
Melanite (black) Garnet	Picks Up	1866 SI	Charge Transfer Involving Iron
Grossular Garnet Hessonite (pale to dark yellow/orange)	Moderate to Strong	91-345	Charge Transfer Involving Iron
Hydrogrossular (green, pink)	Weak to Strong	74-339	Iron, Chromium., Manganese
Green Grossular (including Tsavorite & Merelani)	Weak to Strong	20-309	Vanadium, Chromium, Iron
Pyrope Garnet Standard Pyrope Garnet	Picks Up	1163-1971	Iron, Chromium, Vanadium
Chrome Pyrope	Drags to Pick Up	454-999	Chromium, Iron
Spessartine Garnet Spessartine Garnet	Picks Up	4301-4728	Manganese, some Iron
Uvarovite Garnet	Picks Up	998 SI	Chromium Vanadium

This is especially evident when utilising a very powerful N-52$^+$ neodymium magnet and the very small grains 0.25-2.0mm of KIM size, where all types of garnets will pick up. Larger mass gem size stones might or might not do so (see 'Magnetism in Gemstones' Feral (2011)).

> "For Gem identification a pick up response to a strong neodymium magnet separates garnet from all other natural transparent gemstones" (Feral (2011))

This is utilised by mineral testing labs using various strengths of magnetic fields (ODM and others use a variable electromagnet and different amperages) to remove the ferro, para, and diamagnetic fractions of concentrates. The strongest fields are not used to separate KIMs as all garnets (crustal and kimberlitic) would be removed.

In many 1000s of samples tested by microprobe in OGS and other reports, non-kimberlitic (crustal garnets) vary approximately between 20-40% FeO, others eclogitic and Cr poor megacrysts can be from 10-20%, G9/G10 garnets vary from 5-10% FeO.

However, a while back ago I tested a small group of concentrates picked from KIMs from Little Grassy Lake (claim 4282444) with a very powerful, small neodymium magnet, and **discovered a few inert (diamagnetic) garnets which when microprobed had normal iron levels (two of three G11s are diamagnetic)**. This mystery led me to a type of iron called austenite [see Work Assessment Report 4282444 (forthcoming) for details].

Here is a chart I created to show the temperature in the mantle where austenite is formed/exists next to the generally accepted diamond formation temperature/pressure zone. This is very interesting.

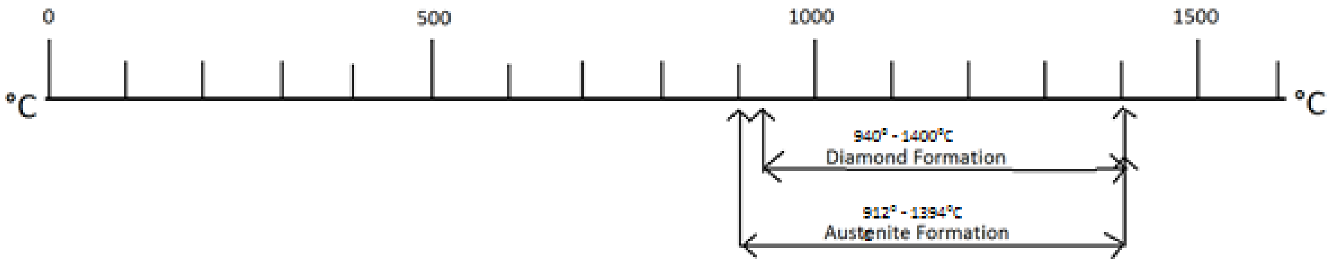


Diagram A: Diamond and Austenite Formation

Then recently, with this information in mind and the Trench sample being of greater importance, I rechecked the concentrates and picked KIMs from the Trench samples to test for the magnetic susceptibility of the garnets.

I then recalled another report that was very useful for a different reason. In several years of extensive research and from conversations with a prominent lab, it appears that **most companies and labs** involved in the quest for **KIMs pick eclogitic garnets** (basically non-Cr pyrope G9/G10s) **based on an orange colour; the deeper, brighter (pretty) garnets were at the top of the picking list**. However, I had found an article titled ‘Garnet xenocrysts from the Diavik mine, NWT, Canada: Composition, color, and paragenesis’ (McLean, Banas, et al. (2007), p 1136, 1138, 1139), which in part I’ve included below. As can be clearly seen, the basically ugly Lo (light orange), MLo (medium light orange), and MDo (medium dark orange) & Do (dark orange) garnets (at least at the Diavik Mine) encompasses the majority of G3 and G4s which have (recently?) become of great interest in diamond exploration.

Diagram B (McLean, Banas, et al. (2007), p 1136)

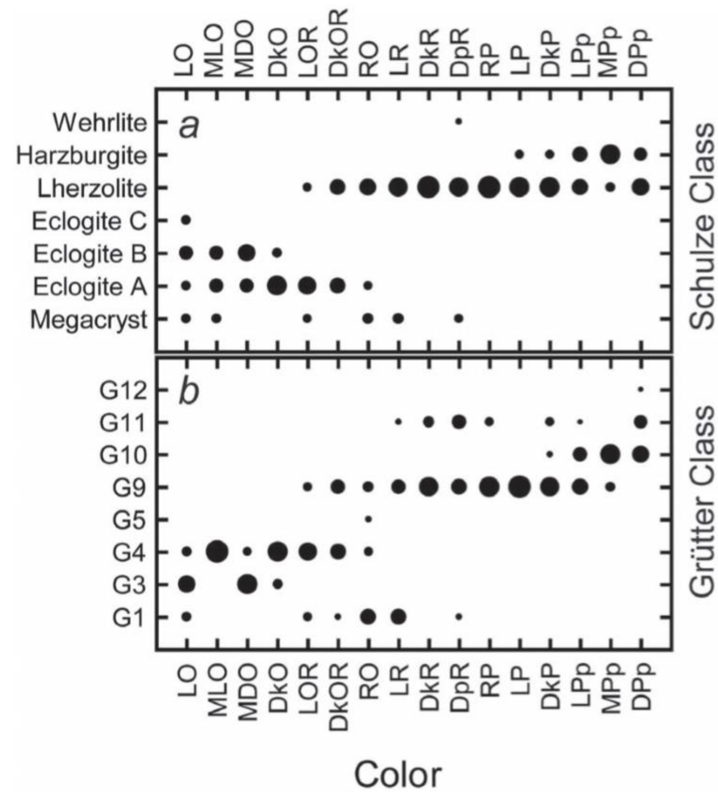


FIG. 4. Correlation diagrams showing garnet classes represented by each color group. Note that most colors are comprised of several types of garnet. (a) Classification scheme of Schulze (2003). (b) Classification scheme of Grütter *et al.* (2004). Grütter classes represented at Diavik are: G1: low-Cr megacrysts, G3: eclogitic (high-Ca), G4: eclogitic (low-Ca), pyroxenitic or websteritic, G5: pyroxenitic, G9: lherzolitic, G10: harzburgitic, G11: high-Ti peridotitic, G12: wehrlitic.

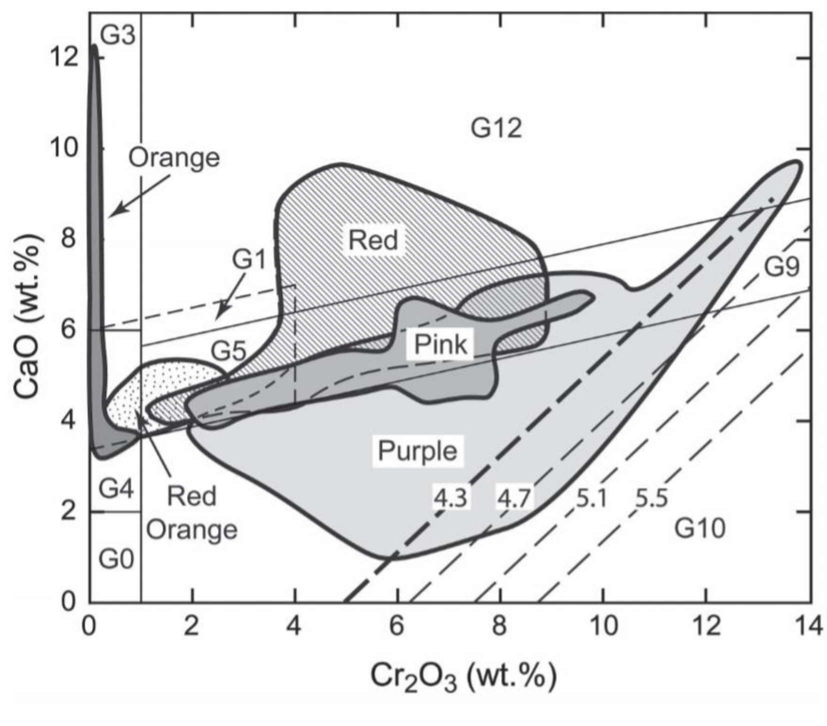


FIG. 5. CaO–Cr_2O_3 diagram, showing the compositional ranges of garnet xenocrysts of different color. For clarity, the classes were consolidated into Orange (LO, MLO, MDO, DkO), Red Orange (LOR, DkOR, RO), Red (LR, DkR, DpR), Pink (LP, DkP), and Purple (LPp, MPp, DPp). Solid lines and fields after Grütter *et al.* (2004). Dashed lines are isobars from the Cr–Ca barometer of Grütter *et al.* (2006). Numbers on isobars are pressure in GPa; the 4.3 GPa isobar is emphasized because it represents the graphite–diamond transition along a 38 mW/m^2 geotherm.

Diagrams C & D (McLean, Banas, et al. (2007) p 1138, 1139)

With that in mind, I repicked the cons and largely concentrated on picking these previously neglected orange shades which I then tested for magnetic response.

As I had hoped for, a large statistical portion produced an inert/diamagnetic response, which traditionally would not be possible unless the iron in the garnet is non-magnetic austenite and the garnet was formed at the same pressure/temperature in the mantle required for diamond formation, from which can be inferred that the kimberlite sampled that zone [see Results: Microscope Photos of KIMs, page 7].

Since this is new and possibly very important research on my part, and although I've found high levels of KIMs in almost all down-ice samples from 4282142 (Paradis Pond), with a significant lack of those off-ice, this section is largely orientated around the trench and nearby samples. This research is also being done on claim 4282444 (Little Grassy Lake), where the non-magnetic garnets were microprobed [see Work Assessment Report 4282444 (forthcoming)].

The next step will be to recheck the cons from other targets/claims for these non-magnetic garnets and send a bunch of them away to be microprobed and categorised in a specific G (garnet) classification.

ON ORTHOPYROXENE:

Orthopyroxene is a common accessory mineral in Diabase (Doug Robinson, PEng – personal conversation) and is honey-brown in colour.

So, when till sampling a number of my potential kimberlites, I was finding, on occasion, very odd, delicate, black, pristine grains unlike any I had come across in three years of diamond/kimberlite research.

Early on I showed a microphotograph of one grain to Mike Leahy (a local, very knowledgeable prospector) and he said it was mafic but again, unlike anything he'd seen before.

Within the last year I acquired a piece of kimberlite that Jack Crouch had collected in the 1980s/90s while working on an article for the Northern Daily News. Jack had recently passed away, but the family knew it came from a Kirkland Lake area kimberlite [see Photo C below].

Photo C: The green Cr Diopside xenocryst at the foreground is ~2.5cm wide

When I recently decided to look closely at it under my Nikon microscope, I could see glassy black grains here and there in a beautiful Cr Diopside xenocryst. These black grains appeared to be identical to those I had picked from my concentrates, but still didn't know what they were. Then, several months later while researching kimberlite related articles, I came across a photograph almost identical to Jack's specimen.

It was labelled as a mantle-peridotite xenolith dominated by green peridot olivine, with rare grass-green diopside and black orthopyroxene [see Photo D below].

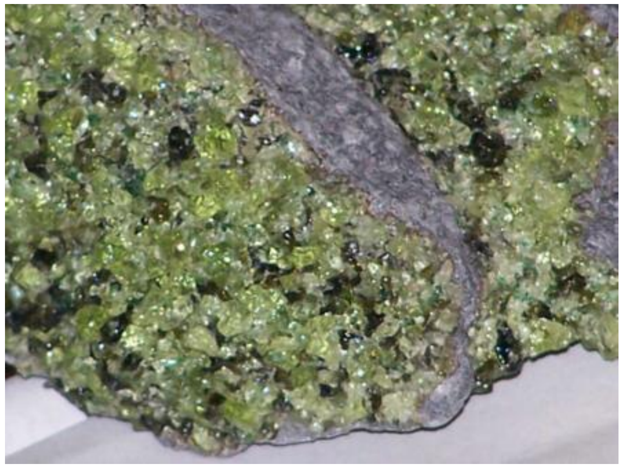


Photo D

This explained a great deal about these delicate black grains as their irregular shape can be explained as basically pseudocrystalline from growing around the Cr Diopside and olivine in a kimberlitic xenocryst.

So, the black grains most likely originated in a piece of kimberlite that has been transported locally from a pipe by glaciation. Kimberlite typically weathers completely away when exposed to the elements. Chrome Diopside will weather to serpentine (mud) in a very short period of time. Orthopyroxene, however, is very stable in the environment, hence if it originated in a Cr Diopside xenocryst it would eventually very gently be deposited in the till in undamaged condition.

From a few till samples from the trench, I found a couple dozen of these odd grains all in pristine condition. One was lace-like and broke in two when I picked it up with tweezers. Also, I discovered these grains are non-magnetic unlike other similar black mineral grains.

Orthopyroxene is a common component of kimberlites. I also found these grains from Sample 6 from Traverse 5 at the 3BT. [see Results: Microscope Photos 27-28, page 9]

ON GLACIATION AND DETERMINING SOURCE OF KIMS:

If only the large-scale Ice Flow Movement map [see Appendix 4: Map 5, page 42] is referred to then it would lead to the conclusion of a northwest – southeast glacial flow when tracing KIMs back to their source, in the whole area of the map.

However, locally I plotted 88 recent glacial striae on a map that takes in an area from the New Liskeard/Haileybury kimberlites to the north and the Bishop Claims to the south. These were utilised to create the Detailed Ice Flow Movement map. Next, utilising Cobalt 31M5 Map, Google Earth, and the Ministry of Natural Resources and Forestry, I shaded in the height of land (i.e. hills) above the 30^{+}M and 60^{+}M as compared to the New Liskeard kimberlites.

As you can see the glacial flow from the striae indicates flowing around the hills the glaciers encountered. On a smaller scale, this is very nicely shown on the 'Nip Hill' in Cobalt, which on the west side, the deep striae are basically to the southwest, and on the hilltop – to the south and on the east side are oriented somewhat to the southeast.

So utilising this map, for claim 4282142 there is a very slim possibility for transport from the distance to the known kimberlites. As well, 4282142 is ~80m uphill from the New Liskeard kimberlites which makes transport from 15+km to the north unlikely. Therefore, it is very probable the KIMs found here are from close by (proximal).

"Basal sliding occurs only where a glacier is at pressure melting point at its base. Most of the fast ice flow associated with ice streams comes about because of basal sliding. Wet glacier ice on a smooth surface is slippery. The sliding at the ice-bed interface is controlled by freezing to the bed, bed roughness, the quantity of water at the bed, and the amount of rock debris in the basal glacier ice.

"Glacier beds are rough [i.e. bedrock], not smooth. Bumps in the surface of the glacier bed cause melting on the upstream side, and re-freezing on the downstream side. This is called regelation, and it occurs because pressures mount up from behind obstacles to ice flow. Ice melts under pressure, and this lubricates the bed of the glacier.

"Meltwater at the ice-bed interface reduces the adhesion of the glacier to its bed, making it more slippery and enhancing sliding. If a glacier is flowing over a rock bed, a water film may enhance sliding and submerge minor obstacles, making the bed smoother." (Davies, B. (2017))

So, as you can see from the Local Glacial Flow Direction map [Appendix 4: Map 6, page 43], **when the glacier encounters a hill**, pressure builds up and the ice will flow much like water in a creek flows around a boulder. This of course forces material in the creek to flow with it. As such, any **heavy materials in the water/ice flow will be forced around the obstacle, not over it**. Ignoring this effect when interpreting a regional or local sampling program will cause misinterpretation of results.

To further complicate KIM emplacement, local to the Cobalt area one must also take into account the final stages of glaciation melt which formed Lake Ojibway/Barlow [see reference (Roy, M. et al (2015). p14-23) for more information]. Basically, 8400 years ago there was a staggeringly huge lake in and around north of the Cobalt area, that rose to 272-299 metres above sea level. Coincidentally, **the Bishop Claims are between 300-394m above sea level** [see Diagram E below]. However, **the kimberlites in the New Liskeard area are 30-60m below** that (230-270m above sea level), so water movement and wave action would have spread out and diluted heavy mineral concentrates disrupting a classic till KIM emplacement profile in the kimberlites in that area. Further, when the 'dam' finally broke when the water level was 250m above sea level, the massive water flow locally followed the Montreal River and Lake Timiskaming/Ottawa River systems, further disrupting KIM emplacement.

From Haileybury Map 5024, claim 4282172 (and to a lesser extent 4282402, Hound Chute Lake) is the only claim in the Bishop Claims group to be affected by glaciofluvial deposits.

So, the point of all this is that it is **highly unlikely** the possibility that the high numbers of KIMs I'm finding on Claim 4282142 and the rest of the Bishop Claims could have originated from the known kimberlites in the New Liskeard area.

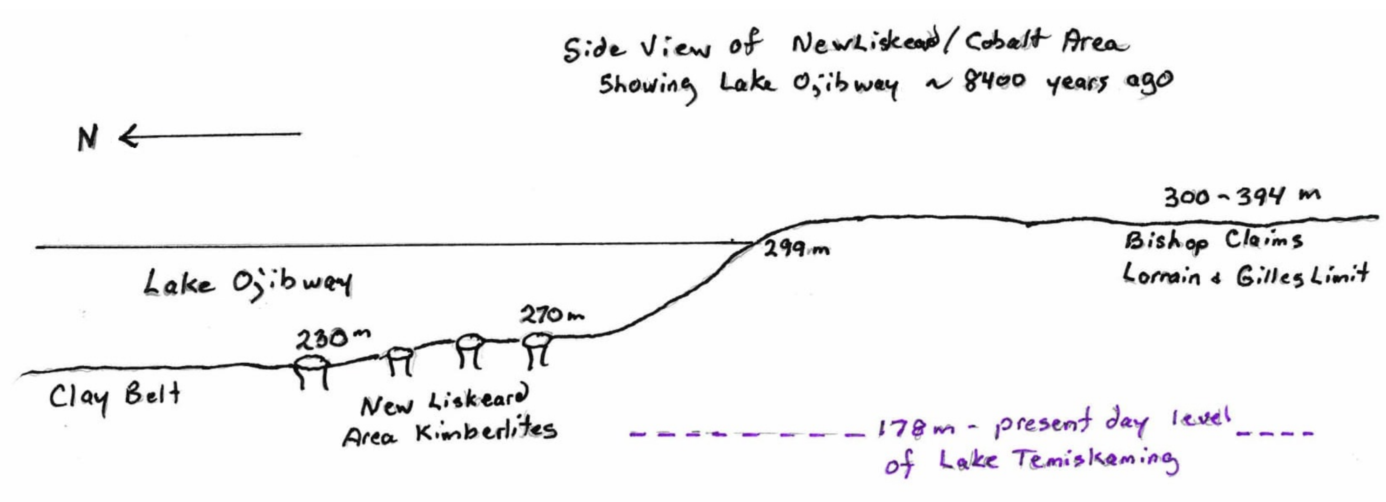


Diagram E – Side view of New Liskeard/Cobalt Area, showing Lake Ojibway ~8400 years ago

What makes the results that I'm finding in my concentrates interesting is that they are taken in till. Most samples weigh from 1-3kg unscreened, as compared to the 10-30kg screened to <5mm samples recommended in OGS-OFR and other reports. This effect makes my typical samples 10-20x smaller when screened to <5mm.
Of five OGS-OFR reports, namely 6060-2001, 6043-2001, 6088-2002, 6119-2004, and 6124-2005, only 6060 took till samples, 400 of them which produced 13 pyrope garnet grains (G9s), recovered from 12 of the 400 samples. 1 in $33^1/_3$, or only 3 in every 100 samples produced a single Cr pyrope.
As such, the other reports relied always exclusively on alluvium (creek) samples, or less so esker or beach deposits. A creek can concentrate heavy minerals 100-1000x+ over unconsolidated till which is why the KIM count increased considerably in the next four OGS-OFR reports. For example, 6043 took 256 alluvium and 2 till; 6088 – 254 alluvium, 14 glaciofluvial, 1 beach, and 8 till; 6119 – 175 alluvium, 6 glaciofluvial, and 2 till; 6124 – 317 alluvium, 22 glaciofluvial, 2 beach, and 6 till. Grand total: 876 pre-concentrated alluvium, etc. samples and 18 till results in 1371(69) and 45(610) or 12 Cr pyropes in every 19 samples. This is 21x higher results than till samples alone.

The till samples for the first three traverses in this report were partially panned in the nearby lake to lighten them for packing out to the truck park location. I now realise from subsequent testing by myself and Doug Robinson (PEng) that KIMs are very difficult to save by panning. Even so, substantial numbers of KIMs were found in these till samples. The next samples taken were carefully wet-screened, run through the GoldCube®, and then very carefully panned under more controlled conditions before microscopic picking.

An interesting read is GSC-Open File 7111-2014. This report's basic premise is

> "indicator minerals break down (comminute) during transport [(glaciation)] as they contact each other or the bed … which causes a decrease in mineral frequency and size … and an increase in mineral roundness downflow in dispersal trains … the larger, more numerous and more angular … the closer the ore body source." (Cummings et al. (2014))

So the investigators tumbled each individual type of KIMs (importantly they were sourced from various kimberlites) with stainless steel shot and at various intervals, checked the results for grain size and mass lost to 'mud'. The KIMs were pyrope, garnet, ilmenite, and Cr diopside. However, chromite and olivine were not tested due to problems related to equipment and test parameters.

The results were surprising as they contradict many previous assumptions (other previous test experiments used **non-kimberlitic** industrial garnets), particularly related to garnet durability. Kimberlitic garnets lost mass and broke into small 'pieces' way faster than other KIMs.

> "The experimental results have several implications for mineral exploration. One of these relates to the use of KIM abundance as an indicator for proximity to source. Kimberlite indicator minerals are typically picked and counted from a portion of the sand fraction … If larger pyrope garnets, such as those analyzed in the experiment, were present in the kimberlite source rock, break down of these grains at the head of the dispersal train could flood the sand fraction with garnet fragments. This could potentially lead to an *increase* in the number of garnet and total KIM fragments moving downflow, with a commensurate increase in angularity of garnet grains [Fig. 7]. In situations where this occurs, **the total mass of KIM fragments in the sand and gravel fraction might serve as a better proxy for transport distance than KIM counts**, given that it should always decrease downflow in dispersal trains due to some combination of comminution, dilution, and/or selective sorting." (Cummings et al. (2014))

In a nutshell, one large KIM grain (especially garnet) is equivalent to many smaller grains and better indicates proximity to a pipe.

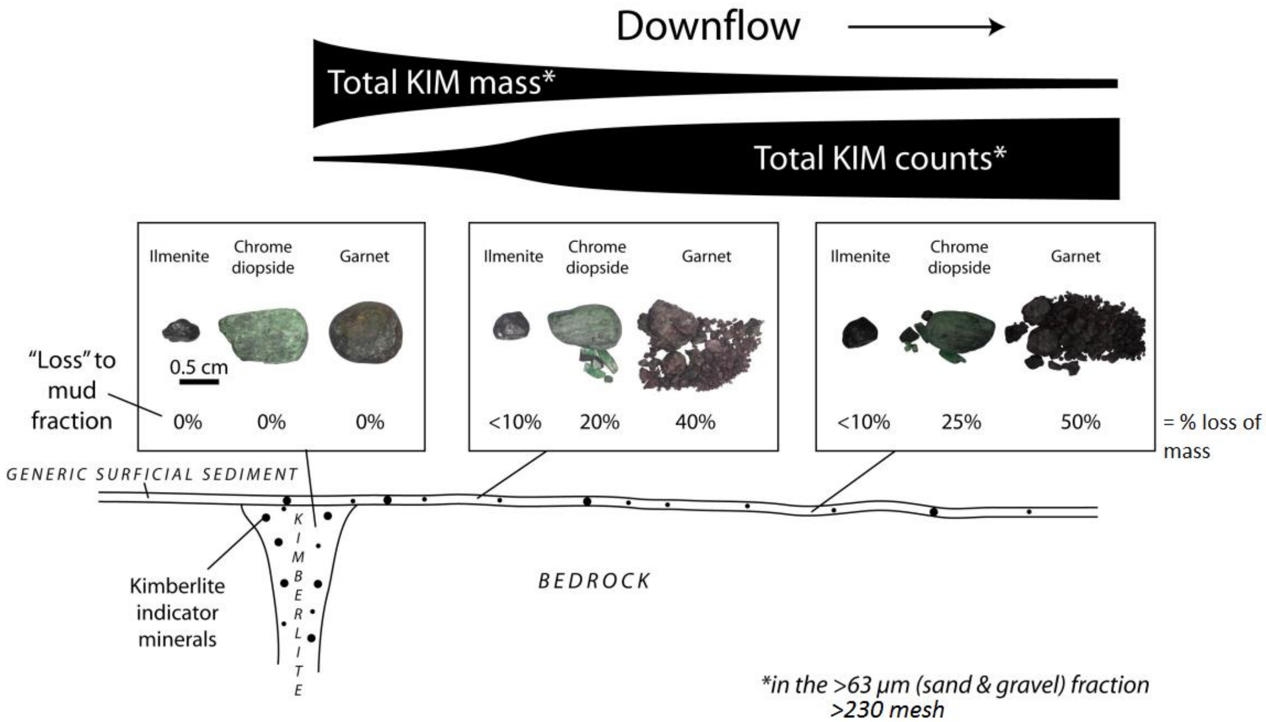


Diagram F: Farther downflow, total KIM counts would decrease, assuming continued comminution (in addition to selective sorting and/or dilution). (Cummings et al. (2014))

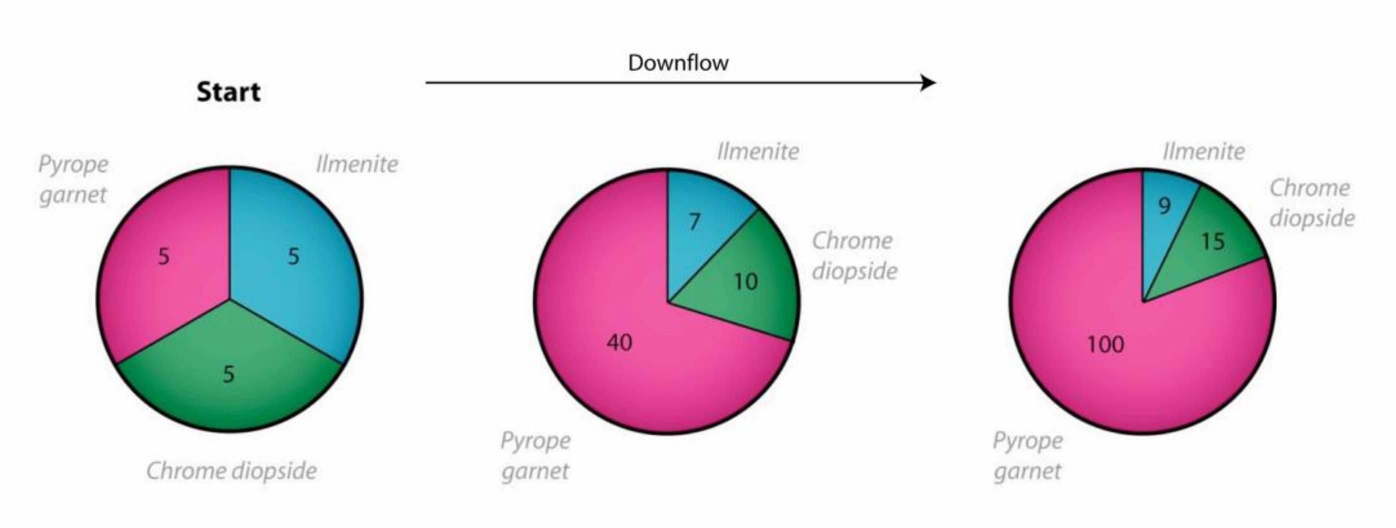


Diagram G: Downflow evolution of indicator mineral assemblages … in which rapid break down of larger pyrope garnets produces abundant sand-sized grains. … Numbers refer to grain counts. (Cummings et al. (2014))

So for interest's sake and interpretation of sampling results for KIMs, I produced the following charts. For simplicity in calculations, I assumed rounded grains. These charts show the relative masses/volume of various sizes of KIM grains and the numbers of smaller grains required to equal the mass of each successive larger size.

Using the formula for volume of a sphere ($V = \frac{4}{3}\pi r^3$), where r = radius of the grain, will reflect an equal relative increase in mass in KIMs from 0.25mm to 2.5mm in diameter, as shown in the following chart.

Kim Grains

Diameter (mm)	Radius (mm)	Volume (mm^3)
0.25	0.125	0.00818
0.375	0.1875	0.028
0.5	0.25	0.065
0.75	0.35	0.22
1.0	0.5	0.52
1.5	0.75	1.77
2.0	1.0	4.19
2.5	1.25	8.18

The next chart shows the total number of smaller grains required to equal the mass of larger grains (number of grains increases as size decreases). (Read: left to right)

Size of grain (mm) ⟶ decreases

2.5	2.0	1.5	1.0	0.75	0.5	0.375	0.25	Grain Size
1.0	1.95	4.6	15.7	37	126	292	1000	# of grains required to maintain same total mass
	1.0	2.4	8	19	64.5	150	512	
		1.0	3.4	8	27	63	216.4	
			1.0	2.4	8	18.6	63.5	
				1.0	3.4	8	27	
					1.0	2.3	8	
						1.0	3.4	
							1.0	

So, as you can see **finding one 2.5mm grain is potentially equivalent to 1000 0.25mm grains**. Companies generally recommend only looking in the 0.25-0.5mm fraction for KIMs in order to maximise returns – this chart explains why.

However, looking for 1.0-2.0mm and 2.0-3.0mm grains becomes much more important (especially Cr pyropes) as one or two of this size indicates a proximal source, even (especially) if many small grains are also encountered. Knowing this, a few larger grains should be given more value than many smaller grains.

In the breadth of two townships, Gillies Limit and Lorrain, in a line ~15km long trending southwest-northeast, are 12 targets being considered as potential kimberlites, and the easternmost targets intersect a northwest-southeast line paralleling the Cross Lake Fault ~6km long that comprises another 7 targets also being considered as potential kimberlites. All are near major faults and many have cross faults running through or near to them. These comprise the 'Bishop Claims'. Kimberlites are commonly found in 'clusters'.

One of The Majors verbally stated that they had not looked at this area and that the published and in-house mag flyovers at 200m spacing could easily have missed them, as typically diamondiferous pipes in Canada are between 60-200m wide, and although I did try to explain that having a weak to no mag signature in many Canadian kimberlites consistently correlates to higher diamond content so no recognisable mag signature might be a good thing [see Appendix 3: Advances in Diamond Exploration in Canada, page 33]. The senior representative insisted on the importance of a 'solid' mag signature as important to the company (which is true in some areas but not on my claims), although the much younger geologist who accompanied him agreed with me (not surprisingly, the senior rep. informed me shortly after the meeting that the geologist was 'no longer with the company').

These targets comprise nearly perfectly round to half-round – when faulted, lakes of the same size range as the diamond mines and other kimberlites found in the Lac de Gras area where virtually all kimberlites are found beneath round lakes, as are all my targets. Attawapiskat, having been covered by the post-glacial Tyrell Sea, however, has a pretty much flat, featureless surface, but with pipes having approximately the same size as Lac de Gras.

As Appendix 3 [page 33] demonstrates, if my targets are diamondiferous kimberlite pipes, then utilising geophysics will cost lots but might provide little in the way of useful diagnostic results. Basically, productive pipes in Canada often/usually have no demonstrable mag, EM, or gravity anomalies.

Therefore, I will continue to sample till and report the results. I will continue to look for kimberlite boulders, which although difficult in overgrown, rough terrain, is strong evidence for proximity to a close up-ice pipe. Three samples of kimberlite have been found on my other claims along with one other possible sample. Continued sampling and prospecting is also planned.

Another excellent advantage of the 'Bishop Claims' is location. They are all on high/dry ground. Driveable roads are within a kilometre, year-round roads (including the Trans Canada Hwy 11) are less than 10km distant. Cobalt, one of the most important mining communities in Canada, is nearby with its railway system and infrastructure. There is no developed private land adjoining any claim, it's mostly undeveloped Crown land in all directions.

A high-resolution drone mag survey was performed over Paradis Pond and area, part of which was over 4282142. The preliminary results are in hand and require consulting with Doug Robinson (PEng) for further analysis. The report on this will be prepared in the near future.

EXPENSES of Assessment Work Claim L 4282142 for June 15, 2016 – June 6, 2018

Work Type	Units of work	Cost per unit of work	Portion re 126017	Portion re 151798	Portion re 155684	Portion re 293947	Total Cost
Prospecting/sampling/field supervision – on 4 of 6 traverses	Tony Bishop: 4 days	$500 per day	$1,000	$1,000			$2,000
Field assistants for 5 traverses	Graeme Bishop: 5 days; Mike Barrette: 1 day	$285 per day	$570	$570	$285	$285	$1,710
Till sample processing, HMC, separating into multiple size fractions, sorting, microscope picking, interpretation of KIMs and logging results, storage of picked grains & concentrates picked (total 26 collected – Traverse 5, Samples 1-3 from trench processed as 1 sample).	Tony Bishop: 24 samples	$500 per sample	$6,500	$4,500	$500	$500	$12,000
Microphotography of select grains & KIMs picked, selection of photos for report from among many grains photographed, labelling & computer storage of micro-photos	31 micro-photos in report	$5 per micro-photo used	$70	$85			$155
Sampling plans, report preparation, map compilations, interpretations, magnetometer flight planning/maps/correspondence	Tony Bishop: 10 days	$500 per day	$2,000	$2,000	$500	$500	$5,000
Historical data consult re: trench area/mapping	David Crouch (P.Eng): 1 day	$850 per day	$425	$425			$850
Mineralogical consult re: orthopyroxene & non-mag garnets; mag grid prep (½ day); prelim result mag map & geology consult (¼ day)	Doug Robinson (P.Eng): ¾ day	$850 per day	$319	$319			$638

(continued) EXPENSES of Assessment Work Claim 4282142 for June 15, 2016 – June 6, 2018

Work Type	Units of work	Cost per unit of work	Portion re 126017	Portion re 151798	Portion re 155684	Portion re 293947	Total Cost
GeoLab EMP & SEM invoice 917052	EMP 1 grain (SG96)	$16.27 per grain (inc HST)	$16				$16
	SEM 1 grain of 35 (SD1)	Prorated $^{1}/_{35}$ x $336.18 (inc HST)	$10				$10
Field supplies – flagging tape	Grant's Home Hardware	$13.53	$14				$14
Office supplies – printer ink, paper	Northern Lites Computing	$92.63	$93				$93
Clerical & technical services	Chloë Bishop	$1,000	$500	$500			$1,000
Transportation based on OPA OEC rate	7 return trips to claim @254km each	$0.50 per km x 1778km	$444	$445			$889
Food re: traverses	10 man days	$35 each	$210	$140			$350
TOTAL VALUE OF ASSESSMENT WORK			**$12,171**	**$9,984**	**$1,285**	**$1,285**	**$24,725**

Appendix 1

History Appendix Overview

History of Development in the Cobalt Area

History of the Nipissing Diamond of the Cobalt Area

Story of the Trench

Appendix 1

History of Development in the Cobalt Area

Before 1900, when the surveyors for the right-of-way of the Temiskaming and North Ontario (T.&N.O.) Railway worked north from North Bay past Long Lake Station [Cobalt, ON] up to Cochrane, there was limited activity in what is now Lorrain Township. Some early fur trading and logging expeditions entered Lake Temiskaming after coming up the Ottawa River from Montreal as early as the late 1700s and some mid-to-late 1800s colonization of Lake Temiskaming on the Quebec shore. A farming community was settled in the 1880s on a bay a bit south and east of the Bishop claims in Lorrain Township, in addition to a mission of oblate Fathers, and the posts of the Northwest Company and Hudson Bay Trading Companies not far away on Lake Temiskaming. Charles Farr founded Haileybury in the late 1880s and petitioned the government for railway access to facilitate colonization of the area. A colonization road did exist which reached the southernmost part of Lake Temiskaming on the Ontario side, but was never widely used.

The first government infrastructure nearest the claim was the building of the T. & N.O. railway which passed to the west, reaching Cobalt, Ontario in 1903-1904, where a silver and cobalt-nickel arsenide deposit was discovered. The mining boom which followed the discovery of silver at Cobalt often dominated the geological interest in the area for many decades, and although prospectors and geologists closely explored the terrain all around Cobalt (leading to the settling of Silver Centre south of these claims in 1907-08), most of the exploration was guided by the search for more silver and cobalt-nickel arsenide deposits.

In the 1980s, there was renewed interest in the geology of the area, this time in search of diamond-bearing kimberlite pipes, stimulated in part by the discovery of an 800-carat yellow diamond by a settler “somewhere in the Cobalt area” in or around 1904 (which was subsequently tested and confirmed and cut into gemstones by Tiffany’s), but became overshadowed by the vastly rich silver discoveries of the day. Soil sampling and geophysics by companies like Cabo, Tres-Or Resources Ltd., DeBeers, and others in addition to exploration by the Ontario Geological Survey, uncovered more than 50 known kimberlite pipes, some diamondiferous, which helped to outline the existence of a Lake Temiskaming Kimberlite Field on the Lake Temiskaming structural zone, which appears to have intruded the Canadian Shield in this region approximately 148 million years before present. Deep sonar has also revealed circular features beneath the water of Lake Temiskaming itself which are inferred to be kimberlite pipes.

As well, a number of diamondiferous lamprophyres have been discovered near Cobalt, including one just NW of Latour Lake in the south part of Lorrain Twp, and another on the “Nip” Hill in Cobalt, as well as others.

Appendix 1

History of the Nipissing Diamond of the Cobalt Area (~112 years ago)

The Gazette Montreal, Thursday, July 26, 1906, page 5

"Stone Sent to New York."
"'New Ontario Diamond' Declared to Be Real Thing"

"… recurrent reports of diamond discoveries in New Ontario by the fact that Mr. A.O. Aubin, M.P., is now in possession of a stone, which, if a genuine diamond, will be one of the largest in the world. …

"The stone … has been submitted to experts, who declare that it is a genuine diamond, and on this assurance Mr. Aubin is sending it to New York to be cut and polished."

Jeweler's Circular Weekly, August 1, 1906, page 55

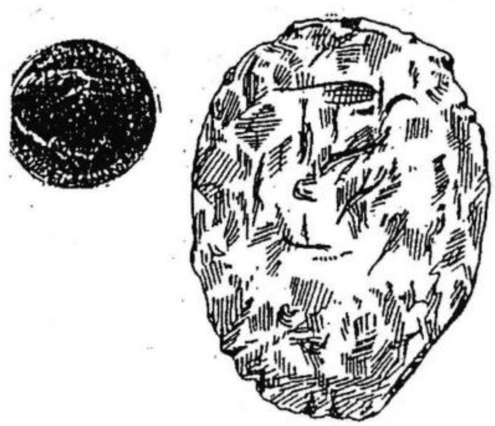
Father Paradis states, "I myself have seen the stone. It is as large as a hen's egg, and has a rough surface and a yellowish tinge. All the usual tests have been applied to it …"

The Mining Journal, September 22, 1906, page 333

The article in the Mining Journal repeats much of the material in the above articles and also includes a copy of the 'actual size' drawing (shown below) made by Father Paradis while the stone was in his possession.

Father Paradis also publicly stated a number of times that the diamond was found near Cobalt. Father Paradis was himself a prospector of note and well versed in the field of geology. Note that the pencil sketch clearly shows what appears to be trigons on the stone's surface. Along with his other attributes, he was an excellent sketch artist and to this day his artwork is considered very good and collectible.

The nickel is the correct size, making the stone 55x43 mm, and it matches the size of a hen's egg (size large) when placed over the drawing.



The "Nipissing Diamond."

The stone discovered in the Nipissing District, and now owned by Mr. Adofhe O. Aubin, M.P.P. Sketch, actual size, by Rev. Father Paradis.

Appendix 1

The Montreal Herald, Monday, November 12, 1906, page 268

"The Diamond Find in Temiskaming"
"… Geologists Anticipate Results from Tiffany Expedition."

> "… expedition of geologists and diamond specialists that has been organized by the Tiffany diamond firm of New York for the purpose of investigating the indications of the presence of diamonds that have been found in the district west of Temiskaming."

When the writer says 'west of Temiskaming', I feel they mean Lake Temiskaming, especially as Father Paradis said it was found near Cobalt.

> "[In September 1882] Father Paradis and a Brother Moffet established a model farm … on the Quebec side (just south of … Paradis Bay on the Ontario side)" (Paradis of Temagami, Bruce W. Hodgins, (1976), page 7).

I have also read of the establishment of a farm collective called Paradis Bay in the late 1800s, which can be seen on a 1910 map in my collection.

A number of more modern articles about the diamond, name Father Paradis as the finder (including a public release by MPP David Ramsey), but the historical references mention it was found by a settler, which Father Paradis was himself. If it was in fact found by a different settler, there's a good possibility that settler would have shown it to Father Paradis, the local priest and also a well-known prospector.

Another interesting paper was found by a good friend, David Crouch (PEng), who worked at finding the original newspaper articles on the discovery of the Nipissing Diamond.

This is Mr. Aubin's Certificate of Registration of Death – District of Nipissing, March 27, 1932, where interestingly, his father's name was written as 'Jean B. Aubin (Paradis). It seems that the father/husband in a French family also lists their mother's maiden name. This strongly suggests Mr. Aubin, the buyer of the Nipissing Diamond, and Father Paradis, who arranged for Aubin to buy the diamond (and possibly found it), were closely related.

Recently, David Crouch (PEng) also tracked down a surviving descendent of Mr. Aubin and personally viewed several multi-carat stones cut from the original rough by Tiffany's. This adds yet more proof of its existence. She mentioned that more stones were in the possession of other family members.

After I staked the original claim, 4273040, I remembered Keith Barron telling me a couple of decades earlier about the Diamond in the Cobalt area that he had researched. I have reprinted here a portion of an article he wrote in 1995 but that I just recently read thanks to the Internet.

“A Geologist on the Trail of a Canadian Find”

“An exciting new exploration play is unfolding in Canada, far from the frozen tundra of Lac de Gras, in rolling farmland just a day’s drive from Toronto. Diapros, a De Beers subsidiary, had been working quietly in this area in the early 1960s. It was joined by four other companies, who worked through the late 1980s until they abandoned the area for prospects elsewhere. But others have filled the gap, using new techniques and ideas which are yielding sparkling success. I entered the scene in 1991, following up on a reference in a 1906 U.S. Geological Survey Report to a large diamond found in the Nipissing district of Ontario. My research uncovered a jewelry trade article of that year describing the stone as ‘large as a hen’s egg with a rough surface and a yellowish tinge.’ The stone had passed through the hands of a priest, a colonization agent for the Canadian Pacific Railway, and Adolphe Aubin, Member of Parliament. Ultimately, it was sent to Tiffany for cutting. The story rang true, especially since the location of the find – on the west side of Lake Timiskaming – matched the location of two kimberlite pipes found 75 years later. The weight was not recorded, but some quick math renders an approximate weight of more than 700 carats. How the discovery escaped world attention was a quirk of history. The find was made near the settlement of Cobalt, where three years earlier, silver veins were uncovered by railway workers. This led to a silver rush, with all it’s associated wild rumors and con games. The Provincial Geologist, Willett Miller, was badgered by prospectors for glowing endorsements of their claims, prompting him to refuse to visit or write about the area for a full five years. He probably considered reports of a giant diamond to be a hoax. The Montreal Herald reported that Tiffany sent geologists to investigate the area, but it’s quite possible they decided against sharing their information with the press, particularly with a silver mining tent city down the road. There is, however, strong evidence that the stone was real. The granddaughter of the original owner, Nicole Aubin, claims that her sister owns one of five stones ‘cut from a large rough diamond owned by her grandfather’.” (Keith Barron, (Dec 3, 1995))

Story of the Trench

Approximately 3km to the east of claim 4282142 lies a steep high hill that runs north-south with Hwy 567 and Lake Timiskaming on the other side except for a small valley through which Lake Timiskaming can be viewed at several locations, near Cedar Pond and Paradis Pond.

When I first noticed this and after driving Hwy 567 and utilising a Topo Map, I realised I was seeing Paradis Bay. I reckoned that with the discovery of silver in 1903-1904, a farming community in Paradis Bay and others in Quebec nearby would have wanted to ship fresh produce, meat, etc. to the many hungry prospectors in Cobalt. About then I recalled the discovery of an 800-carat diamond found near Cobalt as first told to me by Keith Barron.

The most direct route from Paradis Bay would be a road through my claims. I envisioned an east-west road from Paradis Bay between the lakes on claim 4273040 and claim 4282189 (~600m) apart to the southeast of Goodwin Lake, and continuing from there northwest to the top of Chown Lake where the road would then trend towards Cobalt. Many recent articles (including one by our MPP David Ramsey) credited Father Paradis with finding the large diamond. This led me to wonder if the diamond might have been found while building a (hypothetical) road from Paradis Bay at the time of the diamond's discovery first reported in 1906.

I was then and afterwards getting excellent KIM results from sampling below but not off-ice of the two lakes mentioned which added even more interest. Then sometime after, my son, Graeme was looking through his extensive map collection and on one map from 1905 (Miller, (1905)) there was a wagon road shown from Paradis Bay to just below the lake on 4273040 where it angled up towards the southeast end of Goodwin Lake and it continued northwest to the top of Chown Lake where it turned west to the newly built rail spur at Kerr Lake. To be included on the 1905 map, the road would have been under construction in 1903-1904 and being used by 1905 [Appendix 4: Map 11, page 47].

This is especially interesting as it would have been within the time frame in which the diamond was reported being found by a settler and purchased by Mr. Aubin. With this in mind, I drew a line down-ice of Paradis Pond to where it met the road from Paradis Bay and replotted that to Google Earth and recorded the UTM coordinates. I then planned a traverse for my son Graeme to take a sample from that location and others in the general area that he deemed interesting when at that location.

When he arrived at the location, he could see a ribbon nearby from my previous Traverse 3, Sample 2 [see Appendix 5: Traverse 3, Map, page 56]. This general area was in the trough-like feature extending down-ice from Paradis Pond and Graeme found the ground a bit wet and hard to get a good sample, so he moved uphill a short way to the east to get a dry till sample. At the top of the gentle ~20' rise, he 'stumbled' across a trench. It was obviously very old, ~50' long, oriented due north-south with two trees growing in it and much humus infill. Realising the potential importance of the trench being where material glaciated from Paradis Pond meets the road, he took several samples from the trench and then spent the remainder of the day looking for other signs of the wagon road or human activity, before returning to the truck.

When Graeme and I returned on Traverse 5, the ferns were a solid carpet waist deep, the trench was not visible from 5 metres away, unlike Graeme's first trip in early spring [see Appendix 5: Traverse 5, Photos E-I, page 62].

We resampled the trench and spent more time searching and found a small dug pit a short distance north of the trench which we also sampled. Directly north, a sample (3BT S5) was taken which is possibly from the same ridge.

The results from Trench and this last sample are very significant and written up elsewhere in this report.

Structural Geology

"Kimberlite intrusions tend to occur in clusters or fields, with the large-scale distribution possibly controlled by deep seated structural features and local emplacement by shallow zones of weakness such as faults or the margins of diabase dykes." (Power & Hildes, 2007, p 1025)

The claim is near intrusives including upper and the lower contacts of the diabase sills which are specifically noted as priority targets for silver where favourable mineralization is found within 150 metres of the contact. Although silver/cobalt is not our primary mineral of interest, there is good potential for locating this type of mineralization.

The claim is well situated within the Lake Temiskaming Structural Zone (LTSZ) which is known as host for a large number of diamond projects undertaken by a number of notable explorers and Public Junior Mining Companies. Locally over a dozen kimberlite pipes and lamprophyres, many diamondiferous, have been found mainly by testing magnetic anomalies. But, as is now well accepted, many of the most highly diamondiferous kimberlite pipes found and continuing to be found in Canada are not detectable by mag or often by EM. Gravity is useful in these cases but often companies are now returning to high KIM results in till and stream samples and then looking for visual round pipe-sized anomalies, either as lakes or circular depressions in the topography.

A key feature of a number of significant projects within the LTSZ is the Cross Lake Fault. Locally, this deep, regional fault is in close proximity to the east of the claim, approximately 1km away.

Publicly available OGS Geophysical Data and subsequent correlations were instrumental in the decision to stake this land given a high probability of its potential for diamonds and other mineral occurrences. This information was related to products released by the Ontario Geological Society. Lorrain & Gillies Limit have ideal conditions for kimberlite/diamond exploration.

The claim has conjugate, perpendicular structures relating to the Cross Lake Fault and such structures are proven to bear diamondiferous kimberlite pipes in the New Liskeard Kimberlite Field, especially on the east side of the Cross Lake Fault where the pipes are higher in diamond grade in the New Liskeard Area.

The Cross Lake Fault dips steeply to the East to a great depth. This would provide an easy method of transport for an ascending kimberlite and would also allow for faster ascension which is necessary for diamond preservation. This is demonstrated in the New Liskeard area pipes, where the three pipes, Bucke, Gravel, and Peddie, on the east side of the fault are all more highly diamondiferous than the many known pipes on the west side of the fault.

Eight of my kimberlite targets are on the east side of the Cross Lake Fault, very close to the same distance away from the fault as these three pipes in New Liskeard and there are cross faults near or through all of these.

As well, the nature of the rugged Archean terrain of the Lorrain Batholith is important to the diamond potential. The Granite and Diabase are both very hard and when fractured it is reasonable to infer that they are deeply fractured just as the Cross Lake Fault is a deep, regional fracture, which is still active today as part of the Ottawa-Bonnechere Graben System.

As a result, the claims' location within the Lorrain Batholith offers a prime setting to allow for Kimberlite Material to transport readily to surface and allow for better preservation of diamondiferous kimberlites. Glacial erosion would have been limited owing to the hardness of the rock when compared to softer terrains. This may allow for a preservation of a greater volume of pipe than those discovered in glacially eroded terrains. Rapid transportation of diamond bearing magma is essential to the preservation of diamond stability during transport.

Adapted in part from Prairie C – The Lorrain Batholith Project
http://www.geocities.ws/Eureka/Account/6322/PcProprt.html

Appendix 3

Advances in Diamond Exploration in Canada: Understanding the Importance of Non-Magnetic Signatures and Geo-Chemical and Structural Geology

There seems to be a general misconception concerning the necessity of having a "magnetic bullseye" as being the primary method of locating kimberlite pipes and indeed, during the 1980s-1990s, a necessity. The following articles will help dispel that outdated belief, given more recent research and outcomes from Canadian-producing mines, including advances in geo-chemical and structural geology analysis:

From Energie et Ressources naturelles Quebec*, Exploration Methods,* accessed online at: https://www.mern.gouv.qc.ca/english/mines/industry/diamond/diamond-methods.jsp:

- "Anomalies may be negative or positive and locally very close together (Sage, 1996; Saint-Pierre, 1999). **A few diamondiferous lamproite and kimberlite intrusions do not create magnetic anomalies** (Atkinson, 1989; Brummer *et al*., 1992; Fipke *et al.*, 1995)."

- **"Geophysical Surveys:** Kimberlites often form swarms that are generally associated with large, deep fractures (or faults) and with the intersection of major weakness zones in the earth's crust**….** In exploration programs for diamond-bearing kimberlite pipes between 100 m and 1,000 m in diameter world-wide (average of 300 m), the optimal flight line spacing in aeromagnetic surveys is believed to be 100 m, but a line spacing of 200-250 m is considered sufficient [for much of the world, however diamond pipes in Canada tend to be only ~50m to 200m in diameter, i.e., Lac de Gras and Attawapiskat]….In general, the cost of airborne surveys increases exponentially as the line spacing narrows. Magnetic or electromagnetic surveys spaced at 100 m are very expensive. The investment for this type of exploration can quickly become exorbitant. It is therefore important to use other techniques to target locations for conducting these surveys. The most commonly used technique consists of identifying indicator minerals in the heavy fraction of glacial deposits.

- **"Indicator Minerals:** For both kimberlites and lamproites, the "indicator minerals" must present a very specific chemical composition that reflects the prevailing pressure, temperature, and oxidation-reduction conditions for the formation or preservation of diamonds. It is therefore very important to chemically analyze as many "indicator minerals" as possible in order to ensure that a number of grains possess the right chemical composition. This unavoidably results in high costs for analyzing and interpreting results.

- **"Tracer minerals:** This is the most common method used in diamond exploration, especially in the early stages of exploration well before the considerably expensive geophysical methods are used. This method consists of looking in secondary environments (soil, streams, rivers, etc.) for minerals characteristically associated with diamond-bearing kimberlites and retracing them back to their source…. In northern regions, glaciers have eroded kimberlite rocks, dispersing the minerals that compose these rocks over large distances, either in tills or eskers….Studying glacial movement provides information on the directions and distances that glaciers traveled and makes it possible to go back to the source of the dispersal. A number of sampling campaigns based on relatively tight grids will be needed depending on progress made in the work. These sampling campaigns will take place over a number of years. They will also be difficult to carry out and very expensive."

From Geophysical Survey Methods in Diamond Exploration
Posted by: Maiko Sell in Exploration Geophysics, Exploration Methods. Accessed online at https://www.geologyforinvestors.com/geophysical-survey-methods-diamond-exploration/ :

- "Gravity surveys can be time consuming and expensive. When choosing to do a gravity survey at the exploration level, **one is generally expecting to find kimberlites that have no discernible magnetic or electromagnetic response**."

From http://www.pdac.ca/docs/default-source/publications---papers-presentations---conventions/jaques.pdf?sfvrsn=4

- "These companies reported **the discovery of 4 new non-magnetic** satellite **pipes** surrounding Aries kimberlite pipe using the Falcon airborne gravity gradiometer. **Subsequent microdiamond sampling indicated that all were diamondiferous** including the most recently discovered Niobe pipe." From page 20 of presentation at PDAC conference

From http://www.adamera.com/i/pdf/ppt/Amaruk-Project-Presentation.pdf page 9:

- "**In Lac de Gras all economic kimberlites are** strong EM conductors **with weak magnetic signatures**." Page 9
- "Many of the >200 kimberlites discovered on the Slave Craton are magnetic discoveries, often tested with only one diamond drill hole. **Non-magnetic kimberlites are often *more diamondiferous*** than magnetic kimberlites, and these kimberlitic phases would be missed if only magnetic anomalies were tested."

From http://www.metalexventures.com/html/attawapiskat.html on **magnetics not evident on most productive pipes in Attawapiskat**

From http://resourceclips.com/tag/add_ca/ Arctic Star/Margaret Lake Diamonds form JV, follow Kennady's approach to NWT kimberlites, by Greg Klein | November 15, 2016

- "De Beers considered Kelvin and Faraday low grade, based on their lack of prominent magnetic anomalies, according to the **Arctic/Margaret** JV. **Mountain Province** then spun out **Kennady** to explore the pipes. That company "applied ground geophysics, **gravity and Ohm mapper EM, which revealed** extensions to these **kimberlites that were not revealed in the magnetics**," the Diagras partners stated. "Subsequent drilling and bulk sampling has shown that these **non-magnetic phases of the kimberlites have superior diamond grades** to the magnetic phases and significantly increase the tonnage potential." Looking at some nearby deposits, the JV states that **certain kimberlites at the Rio Tinto NYSE:RIO/Dominion Diamond TSX:DDC Diavik mine and the high-grade portions of Peregrine Diamonds' (TSX:PGD)** majority-held **DO-27 kimberlite "are non-magnetic, proof that a magnetic-only approach in the Lac de Gras field could miss significant diamondiferous kimberlite bodies**."

From http://www.grizzlydiscoveries.com/index.php/investor-relations/news/91-grizzly-provides-update-for-diamond-exploration-in-northern-alberta

- "The potential for discovery of additional diamondiferous kimberlites within Grizzly's Buffalo Head Hills properties is considered high, based upon the favourable regional geological setting and the positive results of exploration conducted to date, including the identification of numerous priority geophysical targets. Grizzly's past work has shown that **the focus should be on kimberlites with a weak magnetic signature** with or without an accompanying electromagnetic, gravity and/or seismic signature, **which have tended to yield better diamond counts** in the Buffalo Head Hills kimberlite field."

From Kennedy, C.M. (2008). The Physical Properties of the Lac de Gras Kimberlites and Host Rocks with Correlations to Geophysical Signatures at Diavik Diamond Mines, NWT: http://research.library.mun.ca/10786/1/Kennedy_Carla.pdf

- "To date, the majority of kimberlites discovered using magnetic surveys have been negative magnetic anomalies. These small, circular, negative anomalies are easy to pick out in the comparatively positive magnetic background. It is **assumed that there are still many kimberlites that have not yet been discovered due to their neutral** or positive **magnetic responses**" (Kennedy, 2008, p 5).

- "In the Diavik area, **diabase dykes have large positive magnetic signatures making pipes located close to these dykes difficult to detect**. There is also the issue of remanent magnetization obscuring magnetic signatures" (Kennedy, 2008, p 149).

From: http://www.arcticstar.ca/s/NewsReleases.asp?ReportID=684168&_Title=Arctic-Announces-new-100-owned-Property-in-the-heart-of-the-Lac-de-Gras-dia... November 18, 2014
Arctic Announces new 100% owned Property in the heart of the Lac de Gras diamond field:

- "Twenty years of diamond exploration on the Slave Craton has proven that kimberlites can be small with complex shapes (dykes, sills, and multi-phase pipes) with complex geophysical signatures. …Many of the >200 kimberlites discovered on the Slave Craton are magnetic discoveries…**Non-magnetic kimberlites are often more diamondiferous than magnetic kimberlites, and…would be missed if only magnetic anomalies were tested.** The Kennady Diamonds Property (TSXv-KDI) is a recent examples of exploration **success** that resulted **from exploring for non-magnetic kimberlite**. Close-spaced airborne gravity, ground gravity, and ground EM techniques discovered high diamond grade kimberlites…. On the adjacent Ekati property, 6 new kimberlites were discovered by a modern heli-borne gravity survey. **One kimberlite… is significantly diamondiferous. …The Diavik mine itself consists of non-magnetic kimberlite**, detected by electromagnetic (EM) surveys. …**These new discoveries represented separate, usually volcanic pyroclastic events which were always more diamondiferous than their magnetic partners. We also found diamondiferous kimberlites with no magnetic and EM signature using gravity techniques**."

From Kjarsgaard, B. A. (2007). Kimberlite Pipe Models: Significance for Exploration. In B. Milkereit. *Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration.* (pp. 667-677). Retrieved from http://www.dmec.ca/ex07-dvd/E07/pdfs/46.pdf

- "The physical and geochemical signatures of the host rocks are widely variable in terms of their magnetic response, electrical resistivity, density and elemental distributions. **Hence a variety of kimberlite** – host rock **responses are possible** i.e. positive anomaly, negative anomaly, **or no anomaly**" (Kjarsgaard, B.A., 2007, p 674).

From Shigley, J.E., Shor, R., Padua, P., Breeding, Shirey, S.B., Ashbury, D. (2016). Mining Diamonds in the Canadian Arctic: The Diavik Mine. Gems & Gemology, Summer 2016, Vol. 52, No. 2. Retrieved from https://www.gia.edu/gems-gemology/summer-2016-diamonds-canadian-arctic-diavik-mine

- "Because kimberlites weather and decompose faster than much older surrounding rocks, **the pipes often occur in topographic depressions beneath lakes**. …The pipes are capped by several meters of glacial till, a thin layer of lacustrine sediments, and 15–20 meters of lake water. … With the retreat of the glaciers, the pipe locations often became depressions in the land surface, which filled with water to become lakes. The lakes at pipe locations are generally deeper than those formed by just glacial action." (Shigley et al, 2016).

From Kono, M (Ed) (2010): Geomagnetism: Treatise on Geophysics. Elsevier, May 11, 2010. *Science* pp205. Retrieved from https://books.google.ca/books?id=_YDNCgAAQBAJ&pg=PA205&lpg=PA205#v=onepage&q&f=false

- "**Kimberlite pipes are often found in geographically localized groups, frequently under lakes** because of differential erosion, and the remanence directions within those groups is often similar**. Kimberlite pipes are often associated with diabase dikes**, and are also commonly intruded along pre-existing zones of weakness regional faults, geological contacts." (Kono (Ed), 2010, p 205)

From Kjarsgaard, B. A. (2007). Kimberlite Pipe Models: Significance for Exploration. In B. Milkereit. *Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration.* (pp. 667-677). Retrieved from http://www.dmec.ca/ex07-dvd/E07/pdfs/46.pdf

- "Known, economically viable kimberlites range in size from thin (1 - 4 m) dykes or sills, to small pipes of ~75 m in diameter to very large pipes with sizes of ~1.5 km diameter. Just about any type of rock can host kimberlite bodies. …Kimberlites in the Lac de Gras field tend to be small (50-200m diameter) steep sided bodies…" (Kjarsgaard, B.A., 2007, p 674).

From Power, M., Hildes, D. (2007). *Geophysical strategies for kimberlite exploration in northern Canada*. Paper 89 in "Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration" edited by B. Milkereit, pp1025-1031. Retrieved from https://www.911metallurgist.com/blog/wp-content/uploads/2015/10/Geophysical-strategies-for-kimberlite-exploration-in-northern-Canada.pdf

- "**Kimberlite intrusions tend to occur in clusters or fields**, with the large-scale distribution possibly controlled by deep seated structural features and local emplacement **controlled by shallow zones of weakness such as faults or the margins of diabase dykes**" (Power & Hildes, 2007, p 1025).

From Erlich, E.I., Hausel, W.D. (2002). *Diamond Deposits: Origin, Exploration, and History of Discovery*. Society for Mining, Metallurgy, and Exploration, Inc. (SME). Littleton, CO, USA

- "**Gravity.** The high relative density of kimberlite and lamproite should make these rocks detectable by gravity and seismic surveys. However, most diamondiferous intrusives are small and weathered, and gravity and seismics are generally not sensitive or practical enough to use in the search for kimberlite or lamproite. For example, Hausel, McCallum, Woodzick (1979) noted that **diamondiferous kimberlite intruded in granite** in the Wyoming craton **showed no detectable density differences with the host granite**." (Erlich & Hausel, 2002, p 313)

From Daniels, L.R.M., Tshireletso A. Dira, T.A., Kufandikamwe, O. (2017). The magnitude of termites to the future of kimberlite exploration in Botswana. 11th International Kimberlite Conference Extended Abstract No. 11IKC-4555, 2017

- "**The future of new kimberlite discoveries, mainly poorly magnetic to non-magnetic, is once again dependent on soil sampling for kimberlite indicator minerals**." (Daniels et al, 2017)

Appendix 4

Map Appendix Overview

MAP 1: Claim Location

MAP 2: Road Access

MAP 3: Geological Compilation (portion of Ontario Department of Mines Map 2052)

MAP 4: Mag Map (portion of OGS Map 82 067)

MAP 5: Ice Flow Movement (from OGS OFR 6088)

MAP 6: Local Glacial Flow Direction

MAP 7: Lake Temiskaming Structural Zone (from OGS OFR 6088)

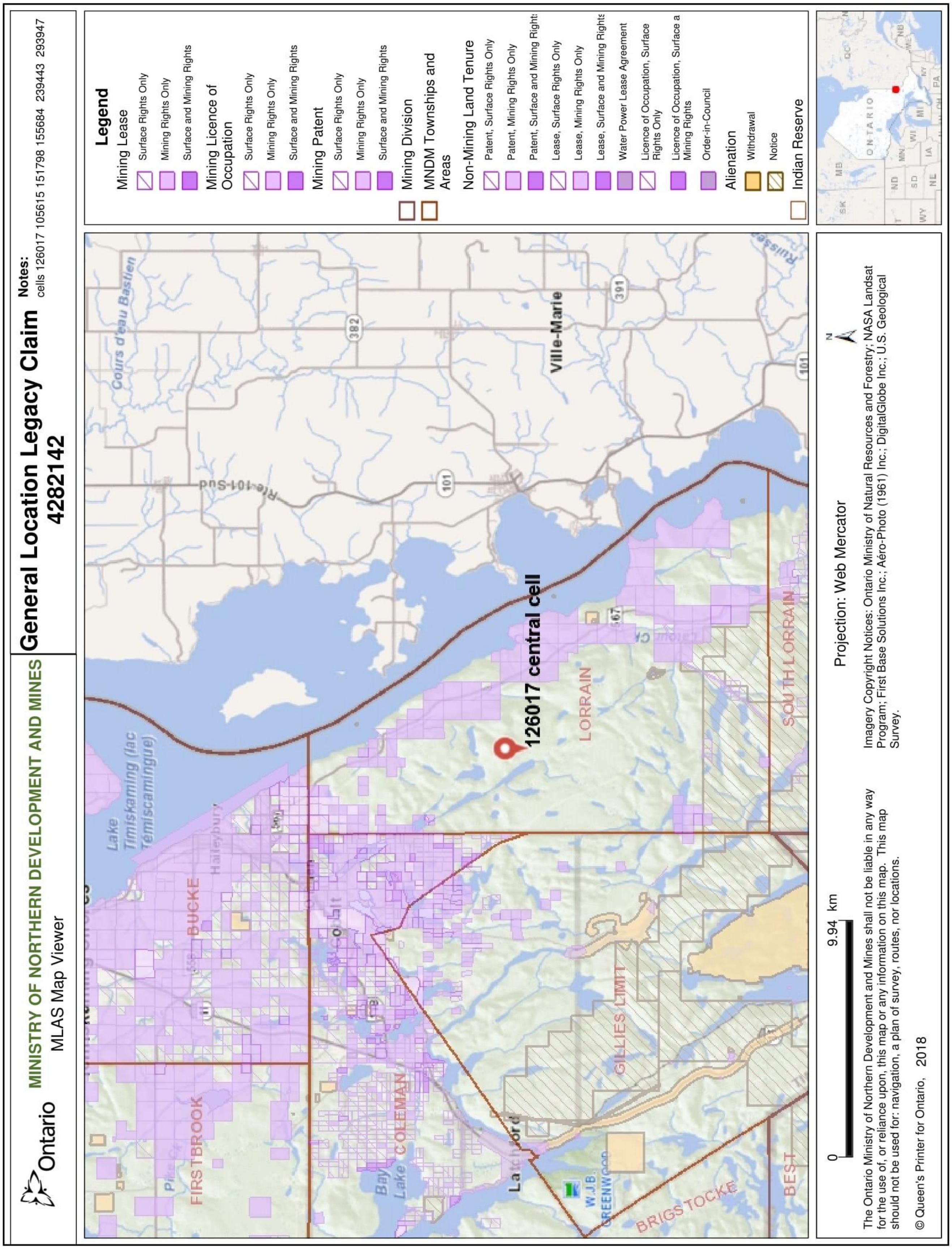
MAP 8: Detailed Local Faults

Map 9: Down-ice glacial direction – tilted view (Google Earth)

Map 10: Straight-down view of Paradis Pond (Google Earth)

Map 11: 1905 Wagon Road Map from Paradis Bay to Cobalt (Miller, (1905) Map)

Appendix 4

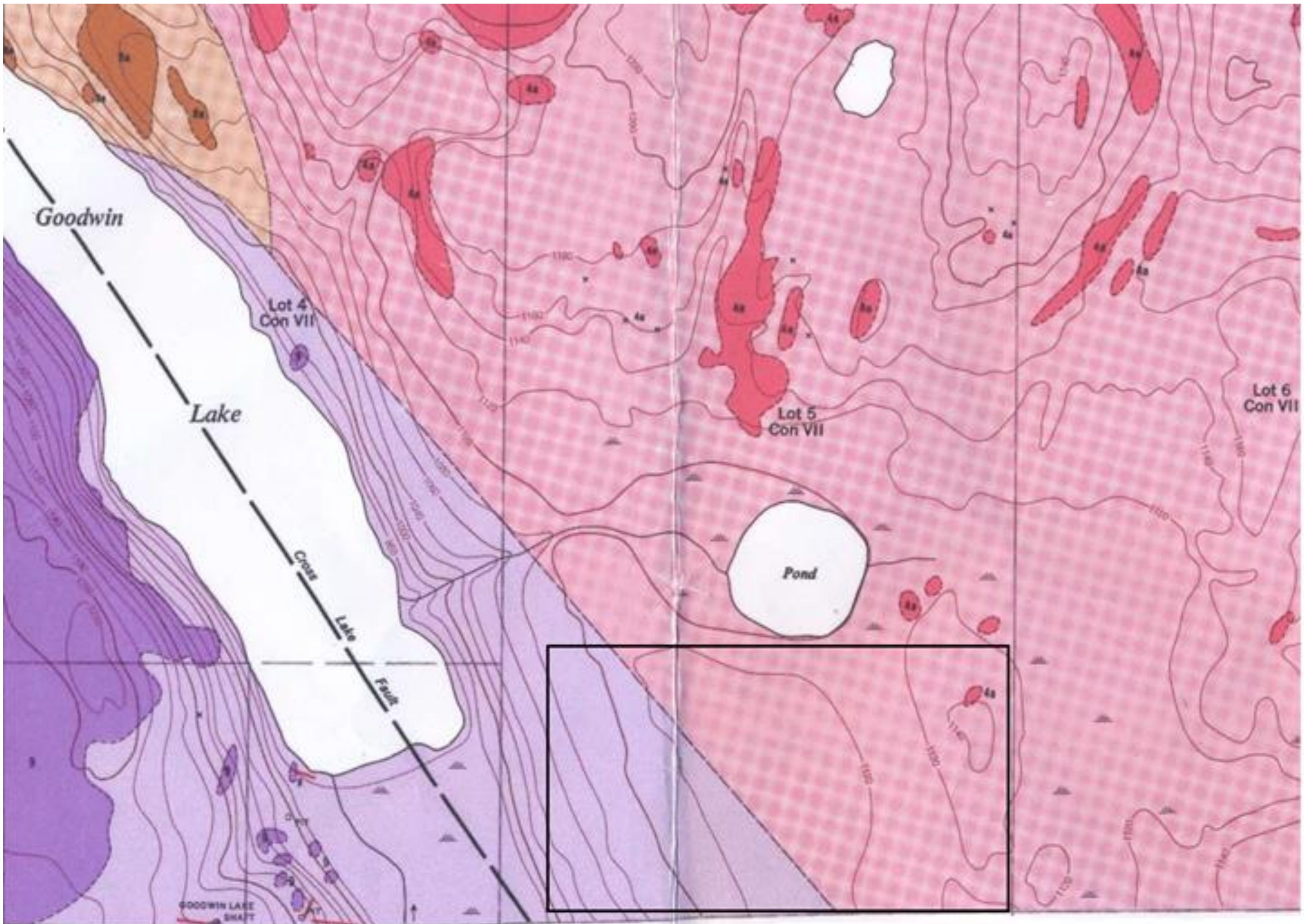


Map 1

Appendix 4

Map 2

Appendix 4



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Feet 1000 0 1000 2000 3000 4000 5000 Feet

Chains 10 0 ¼ ½ ¾ 1 Mile

Metres 100 0 0.2 0.4 0.6 0.8 1 Kilometre

Map Portion Courtesy of ONTARIO DEPARTMENT OF MINES

HON. G. C. WARDROPE, *Minister of Mines*
D. P. Douglass, *Deputy Minister* M. E. Hurst, *Director, Geological Branch*

Map 2052

COBALT SILVER AREA

Southeastern Sheet

TIMISKAMING DISTRICT

Direction of Glaciation

LEGEND

PRECAMBRIAN**
PROTEROZOIC*
KEWEENAWAN?

INTRUSIVE CONTACT

9 *Quartz diabase ("Nipissing" sill).*

ARCHEAN
POST-ALGOMAN

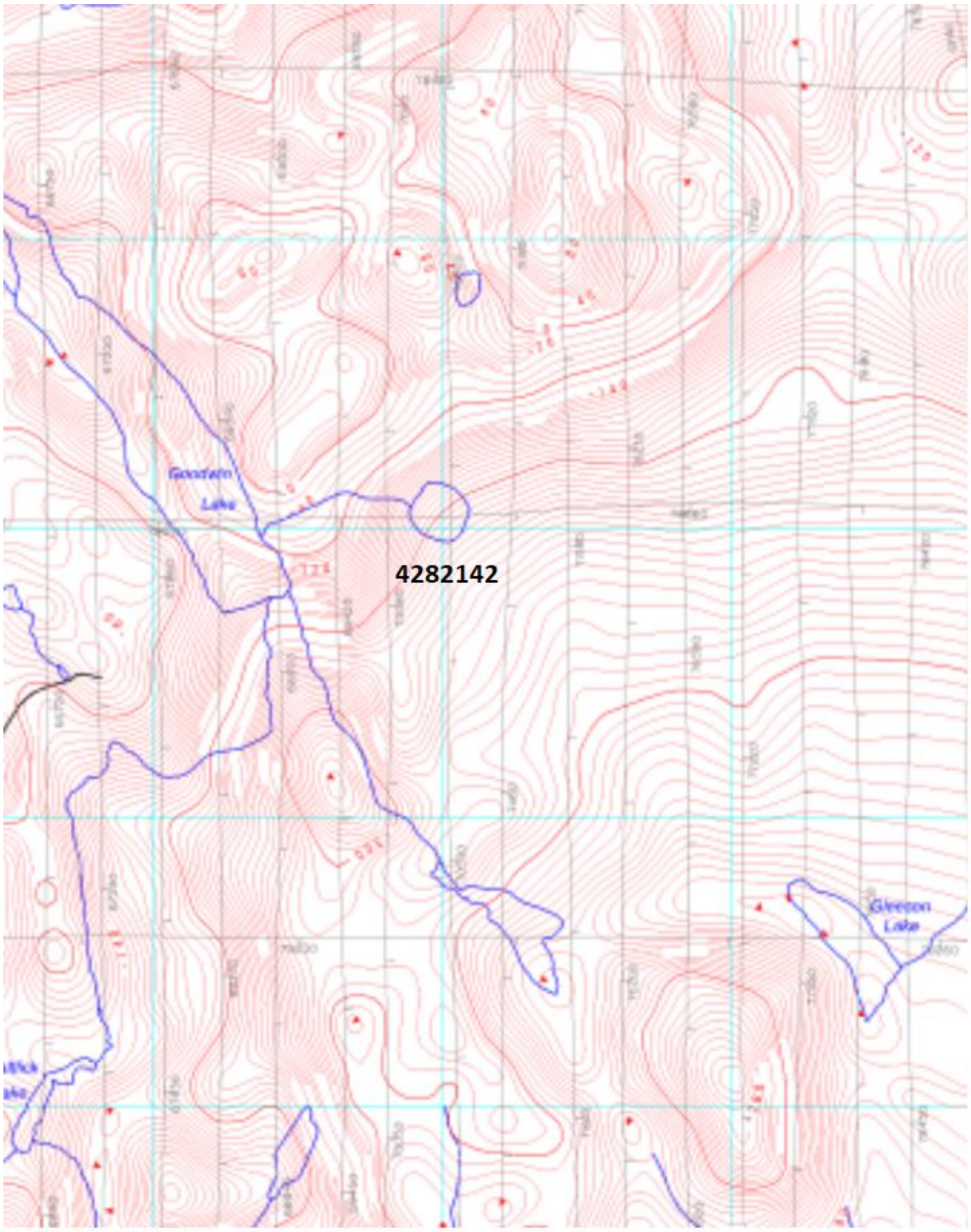
INTRUSIVE CONTACT

ALGOMAN

4a *Granite (locally known as Lorrain granite).*
4b *Felsite (dikes).*

Map 3

Appendix 4



Ontario

Scale 1:20 000

500 m 0 0.5 1 km

Map Portion courtesy of
Ontario Geological Survey

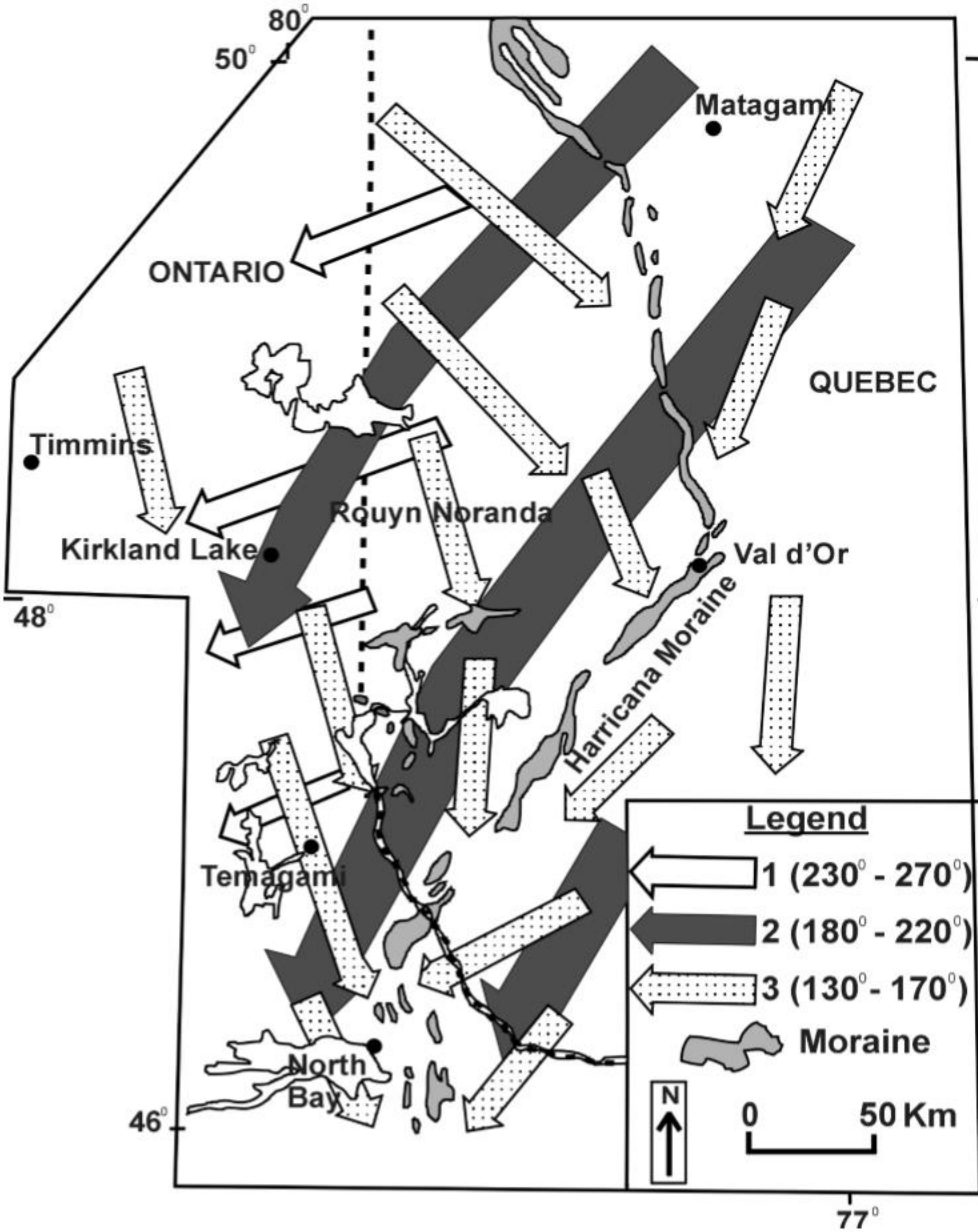
MAP 82 067

AIRBORNE MAGNETIC AND
ELECTROMAGNETIC SURVEYS

TEMAGAMI AREA

OBM References: 20 17 6000 52300, 20 17 6000 52400,
20 17 6100 52300, 20 17 6100 52400.

Map 4

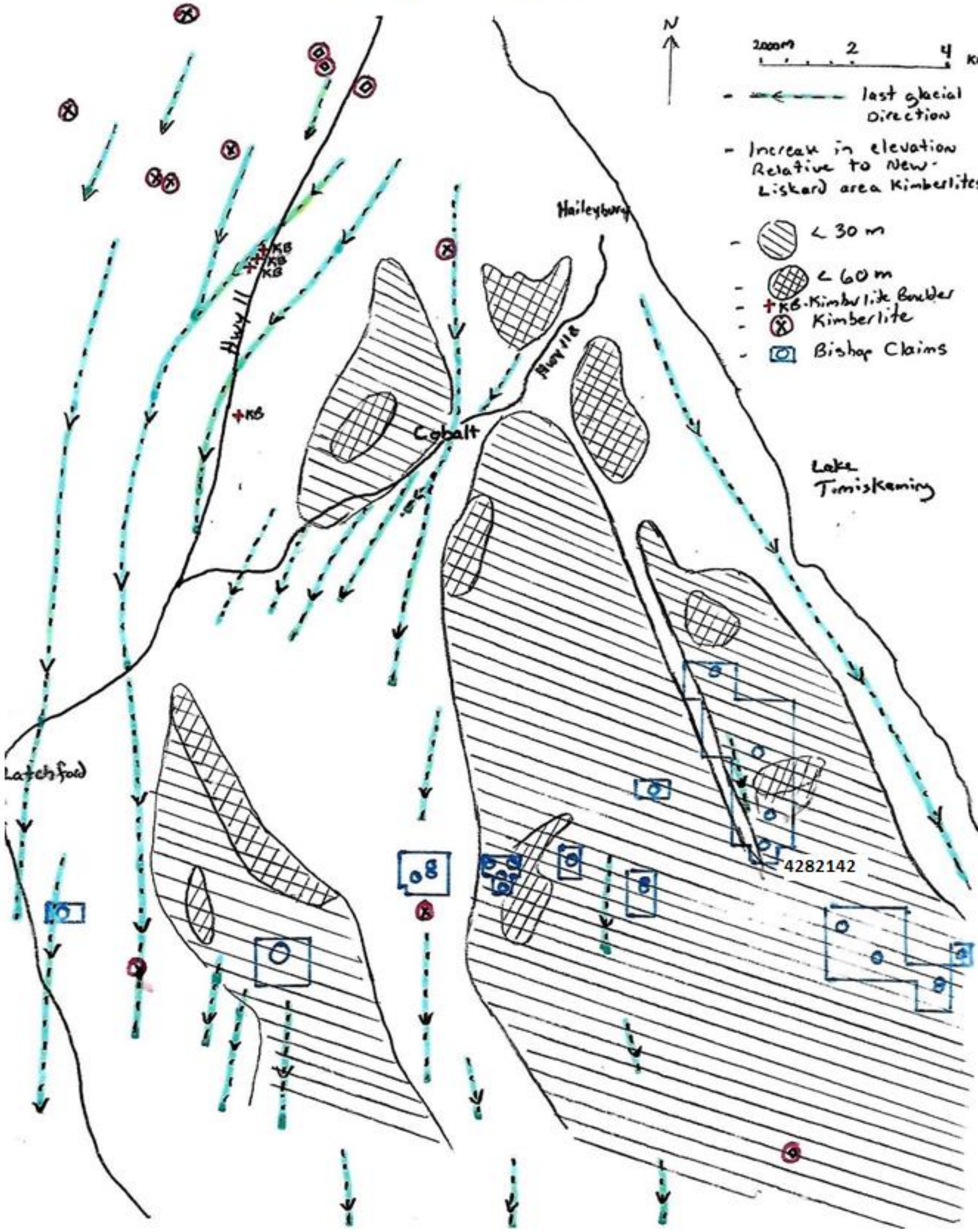


Ice flow movement in the Abitibi-Temiskaming area. The oldest ice flow event is the number 1 movement, the youngest the number 3 movement (after Veillette 1986).

Used courtesy of
Ontario Geological Survey
Open File Report 6088

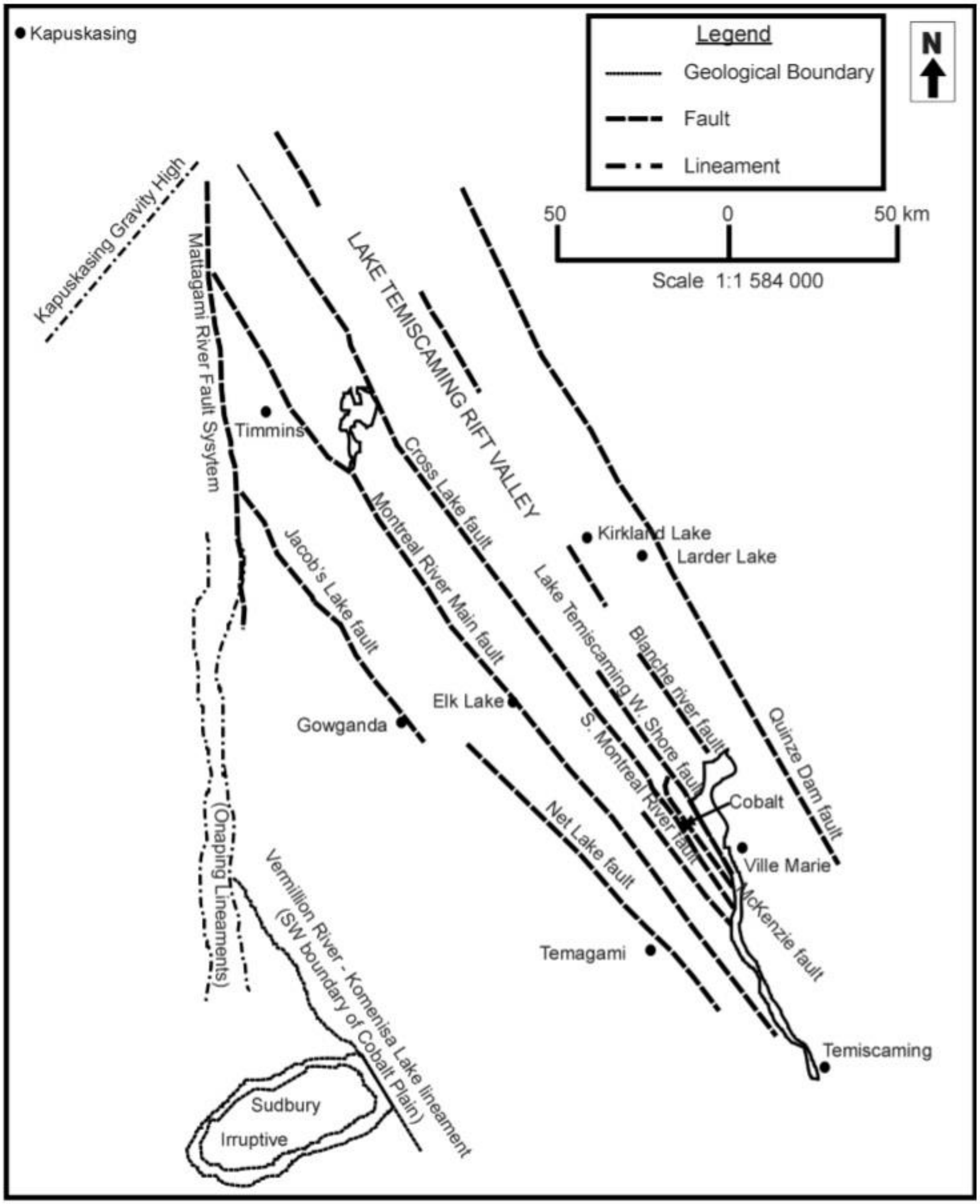
Map 5

Detailed Local Ice Flow Direction
Cobalt/Haileybury Area



Map 6

Appendix 4



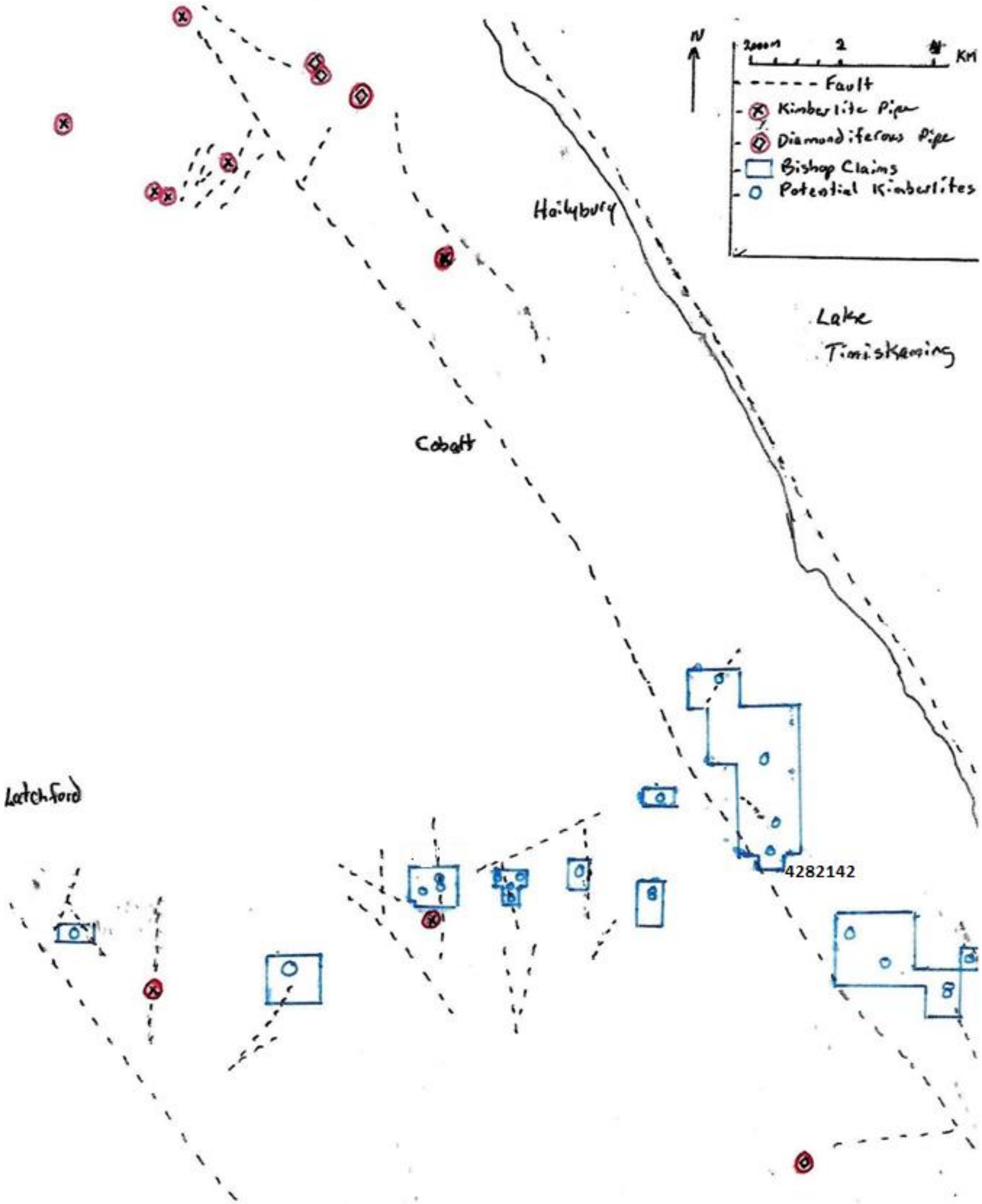
The Lake Temiskaming Rift Valley (also known as the Lake Temiskaming Structural Zone) (after Lovell and Caine 1970).

Used courtesy of
Ontario Geological Survey
Open File Report 6088

Map 7

Appendix 4

Detailed Local Faults



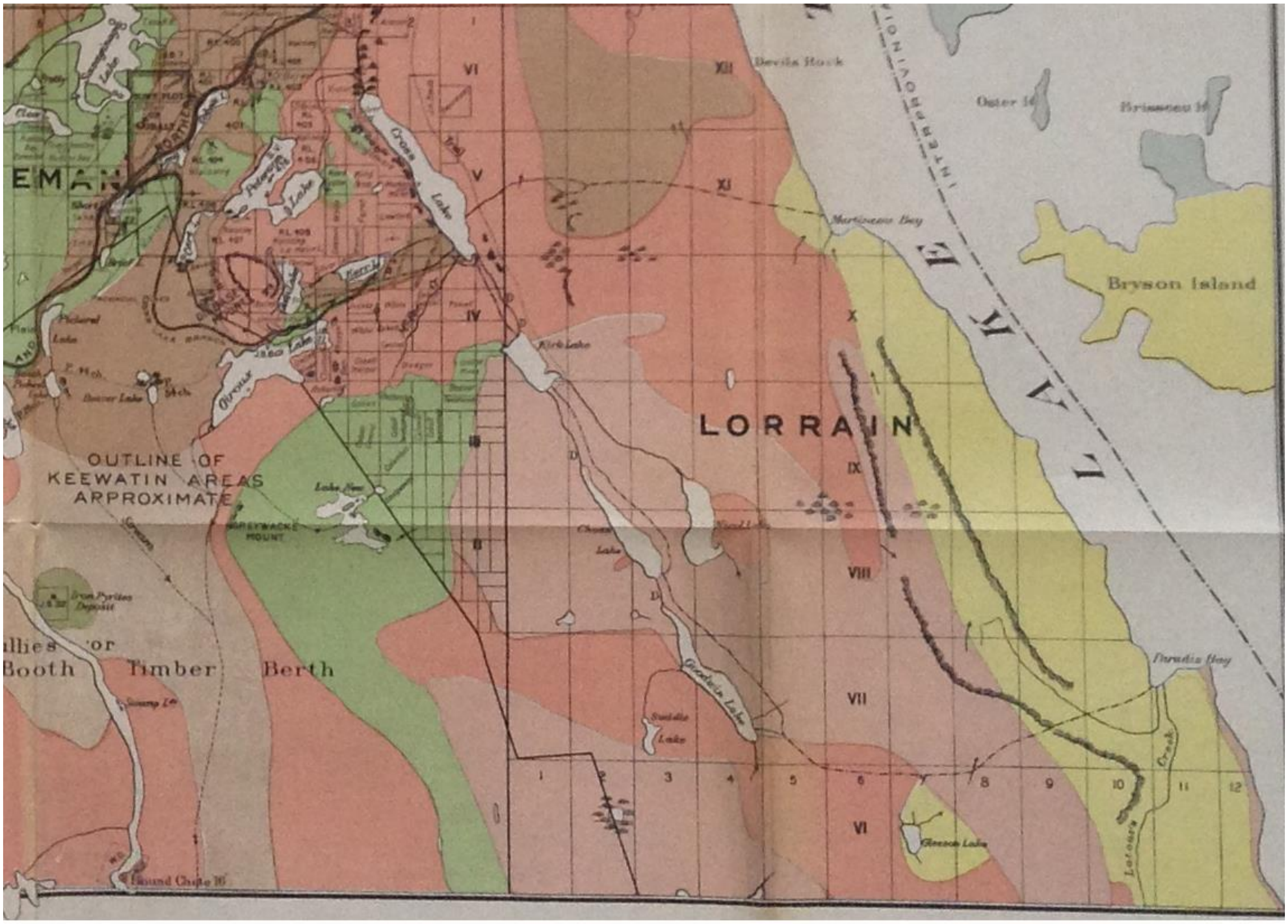
Map 8

Appendix 4

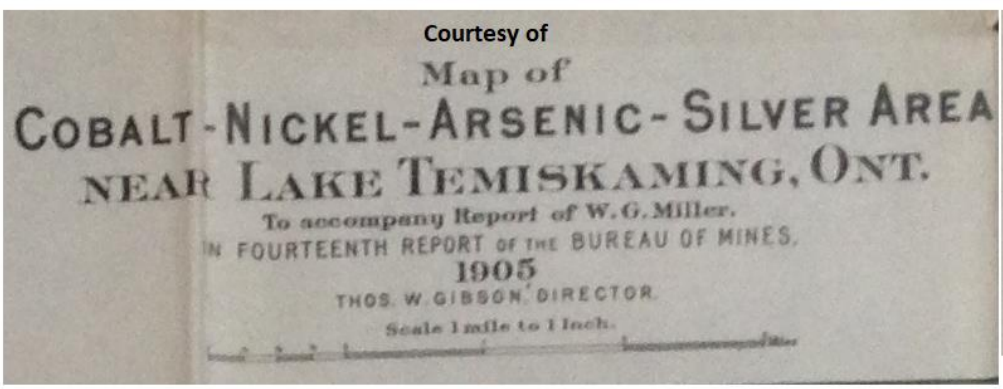
Map 9

Map 10

Appendix 4



Courtesy of


Map of
COBALT-NICKEL-ARSENIC-SILVER AREA
NEAR LAKE TEMISKAMING, ONT.
To accompany Report of W. G. Miller.
IN FOURTEENTH REPORT OF THE BUREAU OF MINES.
1905
THOS. W. GIBSON, DIRECTOR.
Scale 1 mile to 1 Inch.

Map 11

Traverses Appendix Overview

TRAVERSE 1:	June 15, 2016	– Fieldwork, Map, & Field Notes
TRAVERSE 2:	June 23, 2016	– Fieldwork, Map, & Field Notes
TRAVERSE 3:	June 24, 2016	– Fieldwork, Map, & Field Notes
TRAVERSE 4:	May 17, 2017	– Fieldwork, Map, & Field Notes
TRAVERSE 5:	June 12, 2017	– Fieldwork, Map, & Field Notes
TRAVERSE 6:	June 30, 2017	– Fieldwork, Map, & Field Notes

FIELDWORK: Please refer to Appendix 6 for Methodologies for Field Work and Till Sample Processing

L 4282142 (below Paradis Pond L 4273040)

Traverse 1: fieldwork June 15, 2016 Brian A. (Tony) Bishop, Graeme Bishop

After recurring encouraging results from a few samples taken directly below the small round lake [Paradis Pond – see Work Assessment Report L4273040 (Oct 3, 2016)], new sampling plan(s) were initiated by reviewing sources such as Google Earth and topographical & geological maps to best select till sample sites based largely on further determining the validity of Paradis Pond being the surface expression of a kimberlite pipe. This largely will entail taking many samples from favourable locations down-ice of Paradis pond, along with a smaller number off-ice for comparison to concentrate & view under a compound microscope for potential KIMs. From previous experience, I chose a pattern of coordinates and plotted them on a map, subject to change in the field according to local conditions (e.g. under an upended tree root or down-ice side of a large boulder where heavy minerals would concentrate in the meltwater of glacial ice, as in gold creek placers).

The samples are all in till and the size varies from ~1-3 kilograms. Most are not screened in the field, as 'dry' screening damp till is very difficult. Larger stones and twigs, etc. were removed by hand as much as possible.

I explain at length elsewhere in the report about the advantages of many smaller samples, as well the smaller bulk and weight in a pack also for more general prospecting for kimberlite boulders and other minerals of potential interest during a sampling program.

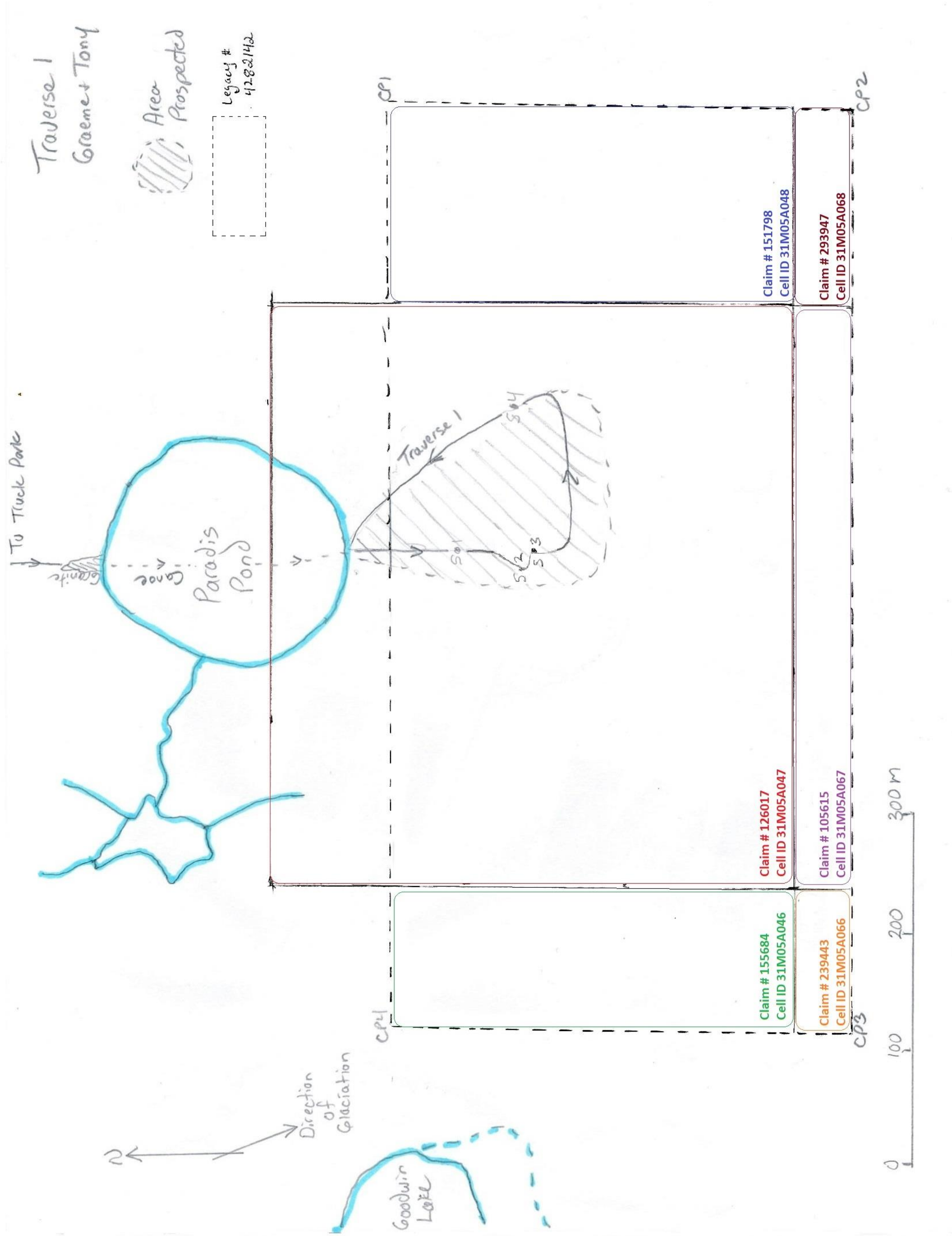
Graeme and I canoed across Paradis Pond to the only landing site located conveniently due south of the launch site. The launch site has a significant granite outcrop terminating abruptly at the water's edge. From here, a small floating platform was placed from which to launch the canoe.

On Traverse 1, kimberlite prospecting and four till samples were taken.

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 1: map June 15, 2016 Brian A. (Tony) Bishop, Graeme Bishop



Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 1: field notes   June 15, 2016   Brian A. (Tony) Bishop, Graeme Bishop

Sample #	Coordinates 17T UTM	Elevation	Activity/Description
S1	0607001_E 5242085_N	1144'	Dug ~2' deep hole from raised area 50x15x6' high (good results obtained) in a ~NS direction
S2	0606993_E 5242024_N	1206'	Sample taken on a hillock
S3	0607024_E 5242021_N	1219'	Shallow sample ~20' east of S2
S4	0607126_E 5242036_N	1132'	Dug 2-3' deep between boulders

Location #	Coordinates 17T UTM
Truck Park	0607135_E/5242601_N
Corner post #1	0607401_E/5242148_N
Corner post #2	0607416_E/5241790_N
Corner post #3	0606609_E/5241756_N
Corner post #4	0606606_E/5242150_N

Claim #	Cell ID
126017	31M0SA047
155684	31M0SA046
239443	31M0SA066
105615	31M0SA067
151798	31M0SA048
293947	31M0SA068

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 2: fieldwork June 23, 2016 Brian A. (Tony) Bishop, Graeme Bishop

After canoeing across Paradis Pond, Graeme and I prospected further southeast in a down-ice direction and looked for suitable sampling locations. I also cut brush and ribboned a line to follow in future traverses as the area is largely overgrown, while Graeme wandered more extensively away from the trail looking for boulders of interest. Many boulders were investigated, but much moss cover which left a muddy/earthy cover on the rocks hindered full ID, but none were obviously kimberlite so no physical samples were taken.

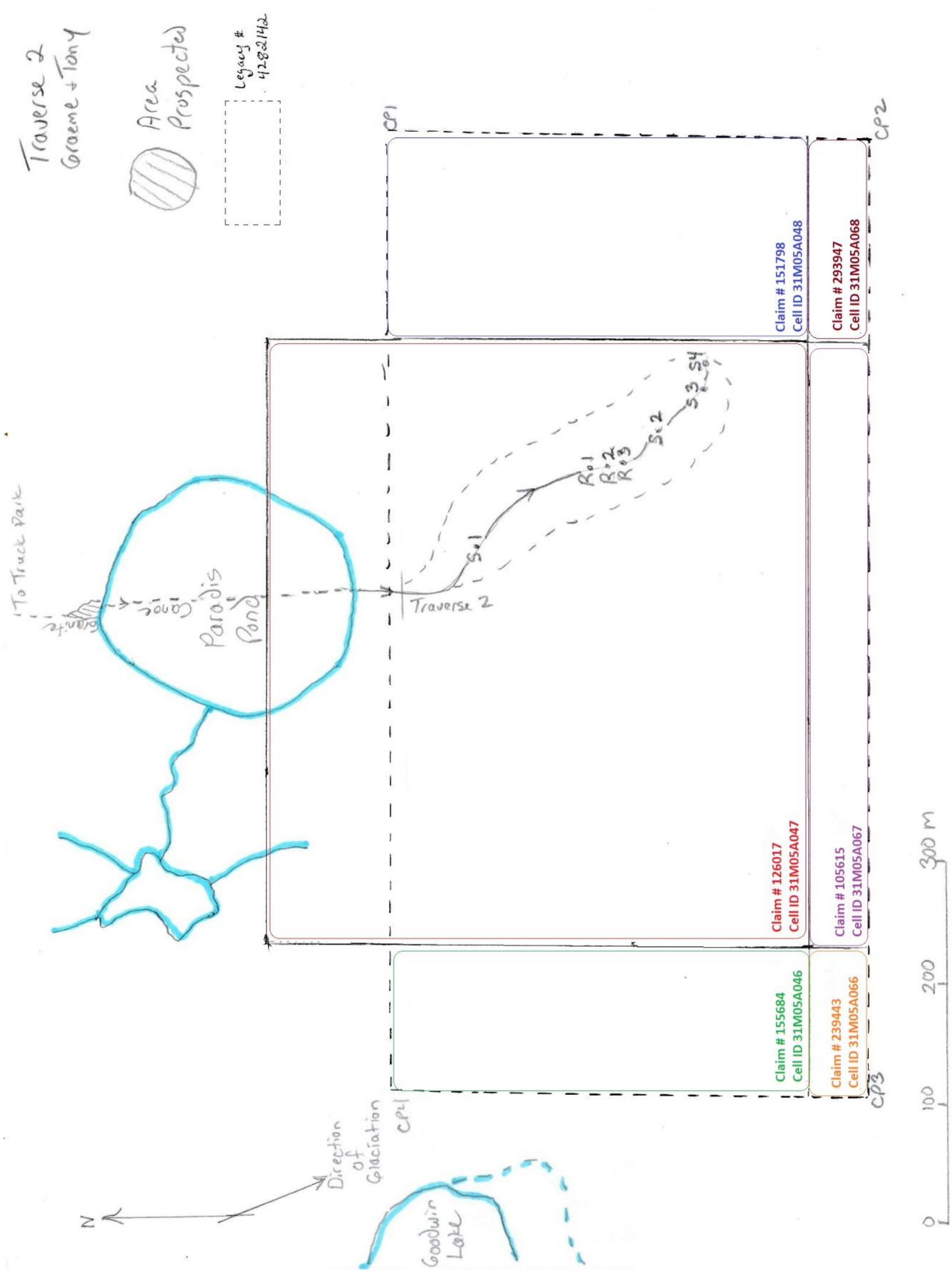
Nearing the end of the work day, we took four samples at the terminus of the trail and on the way back to the canoe.

Back at the truck, the samples were carefully labelled and stored for transport.

Appendix 5

L 4282187 (below Paradis Pond L 4273040)

Traverse 2: map June 23, 2016 Brian A. (Tony) Bishop, Graeme Bishop



Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 2: field notes June 23, 2016 Brian A. (Tony) Bishop, Graeme Bishop

Sample #	Coordinates 17T UTM	Elevation	Activity/Description
S1	0607040_E 5242083_N	1166’	Upended tree root
R1	0607100_E 5241986_N	1153’	Removed moss from boulder, fine-grained diabase magnetic, ~150’ S/SE from S1
R2	0607104_E 5241977_N	1164’	Boulder with irregular magnetic points ~1-3” apart, too dirty to identify rock
R3	0607106_E 5241979_N	1177’	Rock breaking apart
S2	0607137_E 5241931_N	1173’	Dug under diabase boulder
S3	0607166_E 5241891_N	1152’	Dug under boulder 1½’ deep, mostly clay south side
S4	0607198_E 5241891_N	1147’	Dug under boulder, south side

Location #	Coordinates 17T UTM
Truck Park	0607135_E/5242601_N
Corner post #1	0607401_E/5242148_N
Corner post #2	0607416_E/5241790_N
Corner post #3	0606609_E/5241756_N
Corner post #4	0606606_E/5242150_N

Claim #	Cell ID
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293947	31M0SA068

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 3: fieldwork June 24, 2016 Brian A. (Tony) Bishop

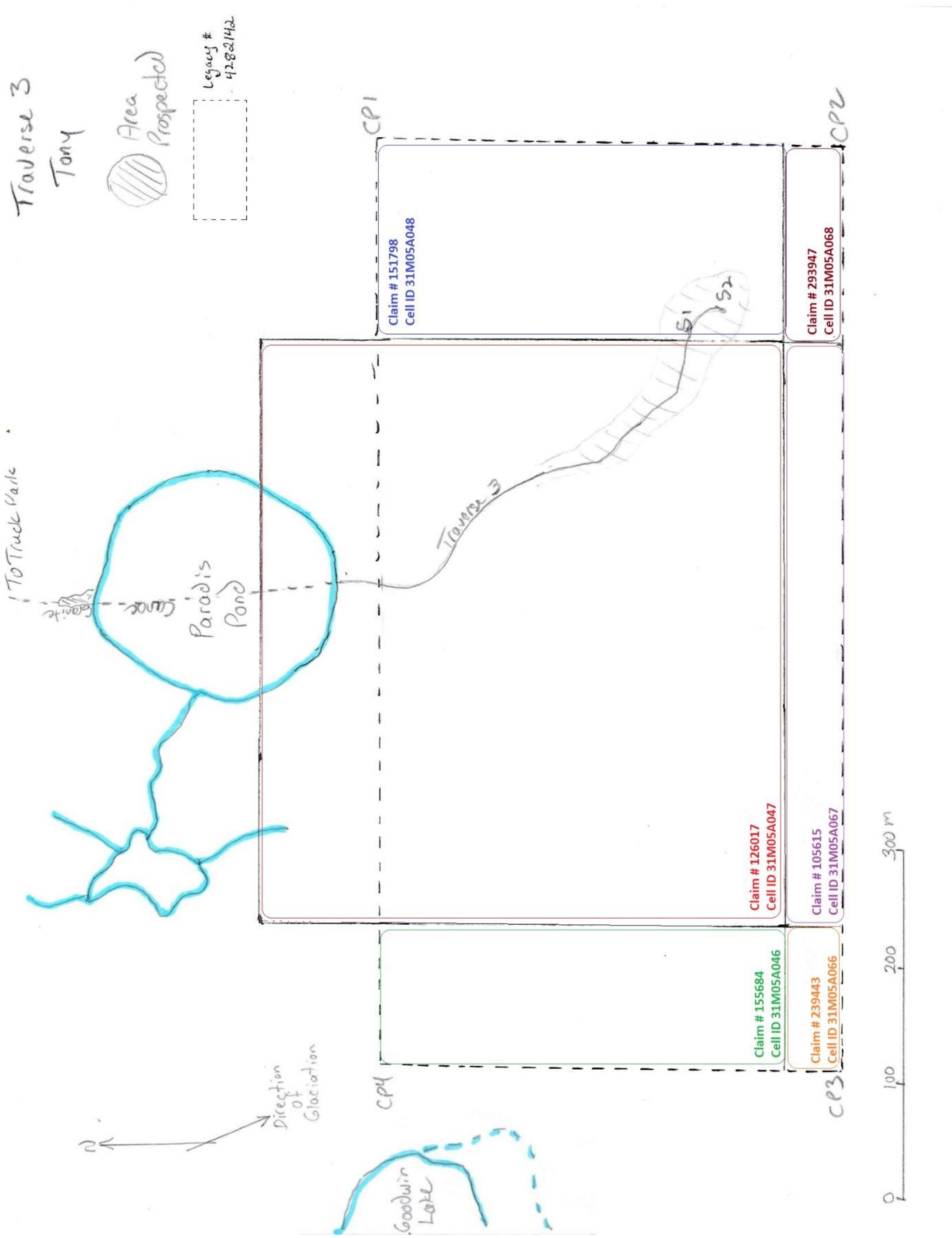
After canoeing across Paradis Pond, I followed the previous day's ribbon trail and checked more boulders on the way to the trail's end. I continued from here down-ice, cutting trail, and took two new samples. Boulders were less frequent and so far no outcrops were observed (not too surprising, as the claim sits entirely in the Lorrain Granite Batholith, and the detailed Map 2052 (Ontario Department of Mines Map 2052) shows only several smaller outcrops to the east of Paradis Pond). Virtually all boulders were granite with some occasional diabase found. I was hoping to locate kimberlite, but most forms of kimberlite weather quickly in exposed conditions. Certain types, however, survive exposure for longer periods of time and so is worth searching for.

I then returned to my canoe to travel back to the truck and carefully stored the samples.

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 3: map June 24, 2016 Brian A. (Tony) Bishop



Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 3: field notes   June 24, 2016   Brian A. (Tony) Bishop

Sample #	Coordinates 17T UTM	Elevation	Activity/Description
S1	0607235_E 5241878_N	1139’	Dug 1½ hours behind a boulder – south side - ~2’ diameter x 2’ deep. With fingers and a small scoop dug a wet sample of clay mixture
S2	0607247_E 5241845_N	1131’	Damp/wet sample further down-ice of S1

Location #	Coordinates 17T UTM
Truck Park	0607135_E/5242601_N
Corner post #1	0607401_E/5242148_N
Corner post #2	0607416_E/5241790_N
Corner post #3	0606609_E/5241756_N
Corner post #4	0606606_E/5242150_N

Claim #	Cell ID
126017	31M0SA047
155684	31M0SA046
239443	31M0SA066
105615	31M0SA067
151798	31M0SA048
293947	31M0SA068

L 4282142 (below Paradis Pond L 4273040)

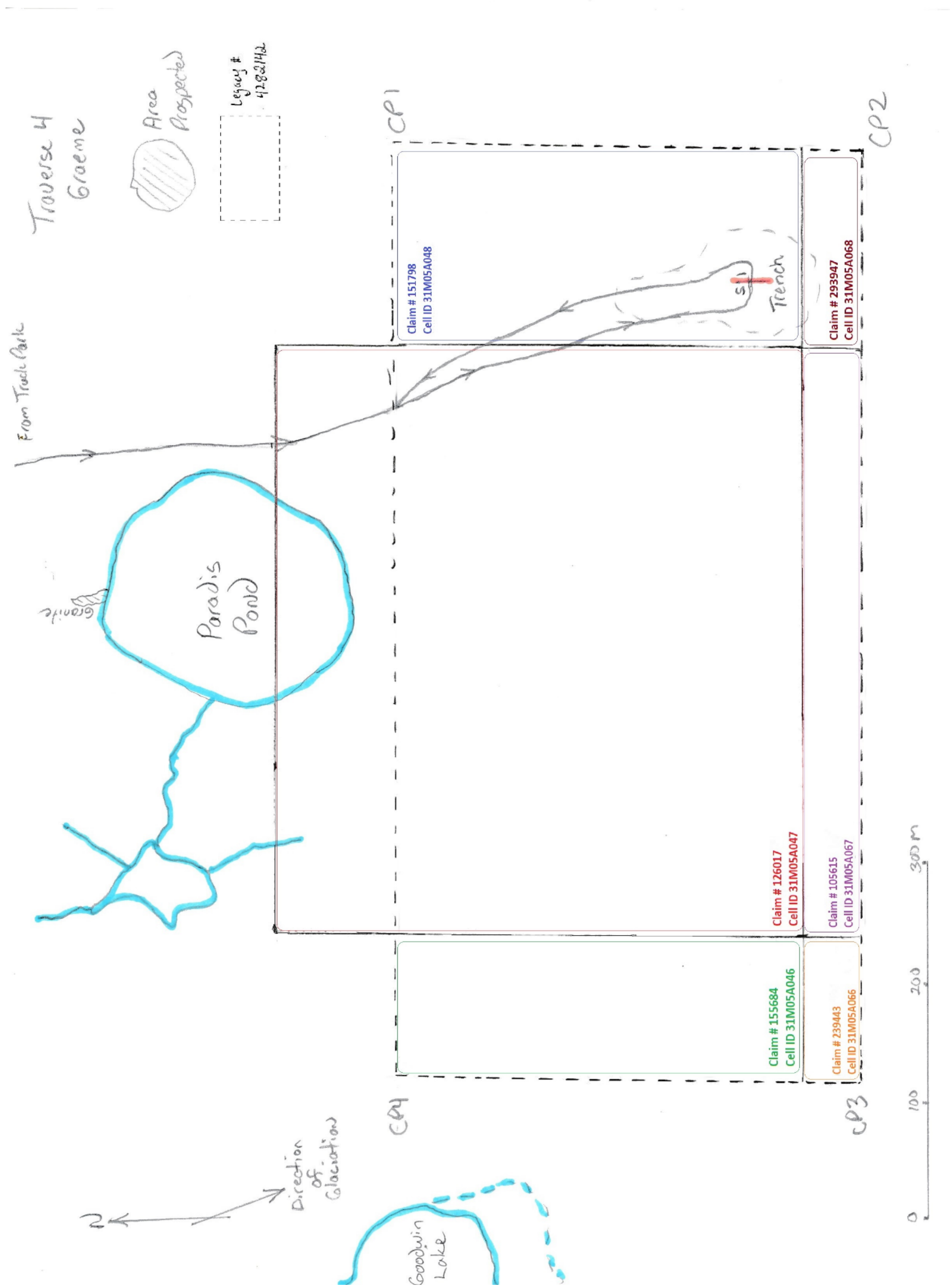
Traverse 4: fieldwork May 17, 2017 Graeme Bishop

After the road was discovered on a 1905 map (Miller, (1905)) [see Appendix 4: Map 11, page 47], I sent Graeme to sample the possible location of where it intersected the down-ice direction from Paradis Pond [see Appendix 1: History of the Nipissing Diamond of the Cobalt Area, page 28]. When he arrived at the coordinates, he could see nearby the ribbon I had left on my last sample of Traverse 3. This location was in a shallow trough-like feature extending from Paradis Pond following the down-ice flow direction, probably formed by glacial action. Due to the nearby previous sample and the damp/wet ground, Graeme walked a short distance to the east where the ground rose up ~4-5 metres. At the crest of the hill, Graeme 'stumbled' across a nearly overgrown trench, North-South in the till. Realising its potential importance, he took a sample from the bottom of the trench and then spent the remainder of the day looking for more signs of activity. He then trekked back the one kilometre (as the crow flies) hike to the Truck Park.

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 4: map May 17, 2017 Graeme Bishop



Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 4: field notes May 17, 2017 Graeme Bishop

Sample #	**Coordinates** 17T UTM	**Elevation**	**Activity/Description**
S1	0607280_E 5241837_N	1158’	In trench Sent Graeme where road intersected down-ice in a low-lying area running ~NWxSE from Paradis Pond, but was too damp/wet at the coordinates so Graeme went east by ~100’ in a raised sandy/rocky till, found trench, and prospected/looked for other signs of previous work

Location #	**Coordinates 17T UTM**
Truck Park	0607135_E/5242601_N
Corner post #1	0607401_E/5242148_N
Corner post #2	0607416_E/5241790_N
Corner post #3	0606609_E/5241756_N
Corner post #4	0606606_E/5242150_N

Claim #	**Cell ID**
126017	31M0SA047
155684	31M0SA046
239443	31M0SA066
105615	31M0SA067
151798	31M0SA048
293947	31M0SA068

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 5: fieldwork June 12, 2017 Brian A. (Tony) Bishop, Graeme Bishop

This trip was planned to further investigate the Trench & area nearby that Graeme discovered on Traverse 4 and to gather more samples.

Hiking the most direct path that Graeme had taken took us quite near the lake on the east side, which I found very difficult due to many knee-deep 1-3’ wide natural ditches running from and to the east from the lake. This slowed us/me down considerably.

The entire area around the trench was covered waist-high in ferns this time of year to the extent that the trench was not visible until literally stepping into it. GPS coordinates, however, were accurate.

The trench itself was quite old, ~50’ long, 3-4’ wide, and ~2-3’ deep with ~1’ of humus in the bottom and sloped sides, and oriented length-wise true north-south at the middle of the hill [see Diagram H below]. Two trees of a good size were growing in the trench blocking its entire view while standing in the trench. Three samples were taken from the bottom of the trench in the south end, middle, and north end [see Photographs E-I of the trench, page 62].

Sample S4 was taken under an upended tree root nearby.

Graeme and I spent more time looking for other signs of activity and a small pit was discovered a short distance north of the trench. Sample S5 was taken from this.

Travelling north towards the trench on a similar raised area, S6 was taken from between three poplars in a group that were heavily infested with bole growths.

We continued back to the Truck Park on a more easterly path to avoid the ‘ditches’. The samples were carefully labelled and stored for transport.

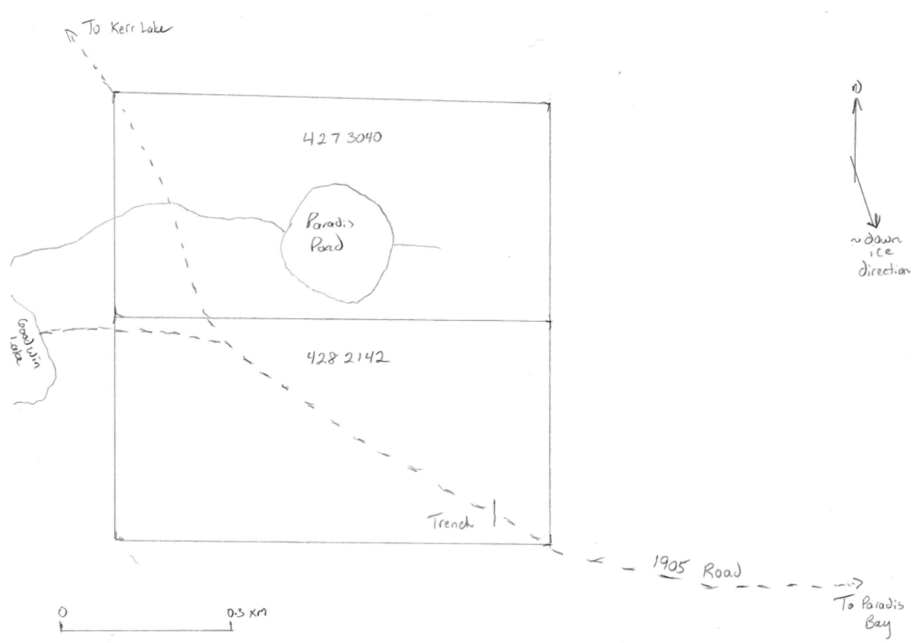


Diagram H

Appendix 5

Photo E: Graeme at trench

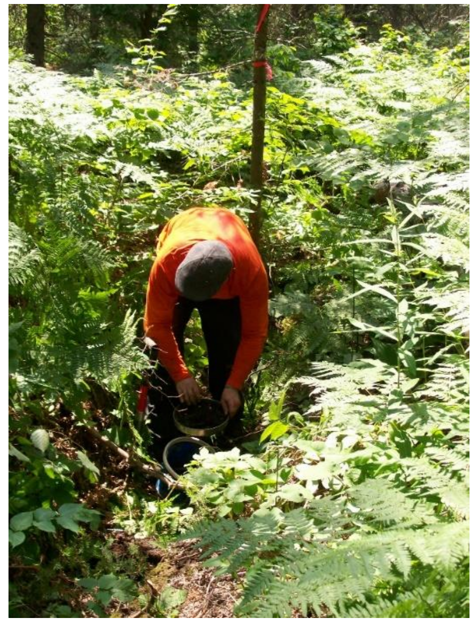


Photo F: Graeme sampling in trench

Photo G: Trench

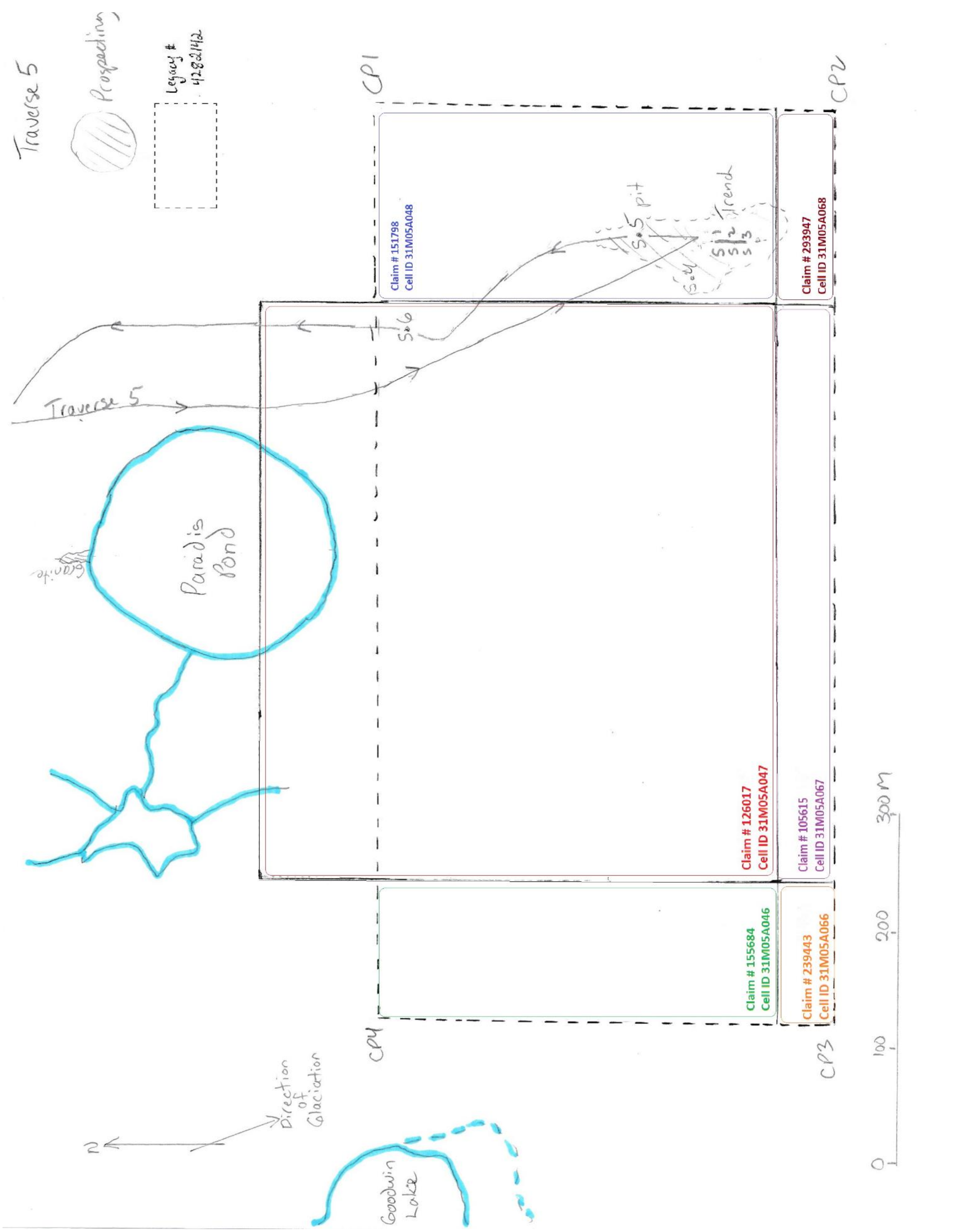
Photo H: Graeme sampling in trench

Photo I: Graeme taking T5 S4 under overturned tree root

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 5: map   June 12, 2017   Brian A. (Tony) Bishop, Graeme Bishop



Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 5: field notes June 12, 2017 Brian A. (Tony) Bishop, Graeme Bishop

Sample #	**Coordinates** 17T UTM	**Elevation**	**Activity/Description**
S1	0607280_E 5241846_N	1158’	Sample in trench~50’ long due N-S, oriented south. Sandy, pebble rock, old trench, 2 trees with much leaf cover, bottom several feet deep and wide.
S2	0607280_E 5241854_N	1158’	Sample in trench~50’ long due N-S, oriented middle. Sandy, pebble rock, old trench, 2 trees with much leaf cover, bottom several feet deep and wide.
S3	0607280_E 5241862_N	1158’	Sample in trench~50’ long due N-S, oriented north. Sandy, pebble rock, old trench, 2 trees with much leaf cover, bottom several feet deep and wide.
S4	0607243_E 5241879_N	1106’	Upended tree root close to trench
S5	0607284_E 5241925_N	1109’	Little pit north of trench
S6	0607192_E 5242124_N	1164’	Raised area of sand & pebble till between 3 trees with lots of boles

Location #	**Coordinates 17T UTM**
Truck Park	0607135_E/5242601_N
Corner post #1	0607401_E/5242148_N
Corner post #2	0607416_E/5241790_N
Corner post #3	0606609_E/5241756_N
Corner post #4	0606606_E/5242150_N

Claim #	**Cell ID**
126017	31M0SA047
155684	31M0SA046
239443	31M0SA066
105615	31M0SA067
151798	31M0SA048
293947	31M0SA068

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 6: fieldwork June 30, 2017 Graeme Bishop, Mike Barrette

To further investigate the road from Paradis Bay to Cobalt, I compiled a set of coordinates as close as I could to where the road might have been in order to get samples.

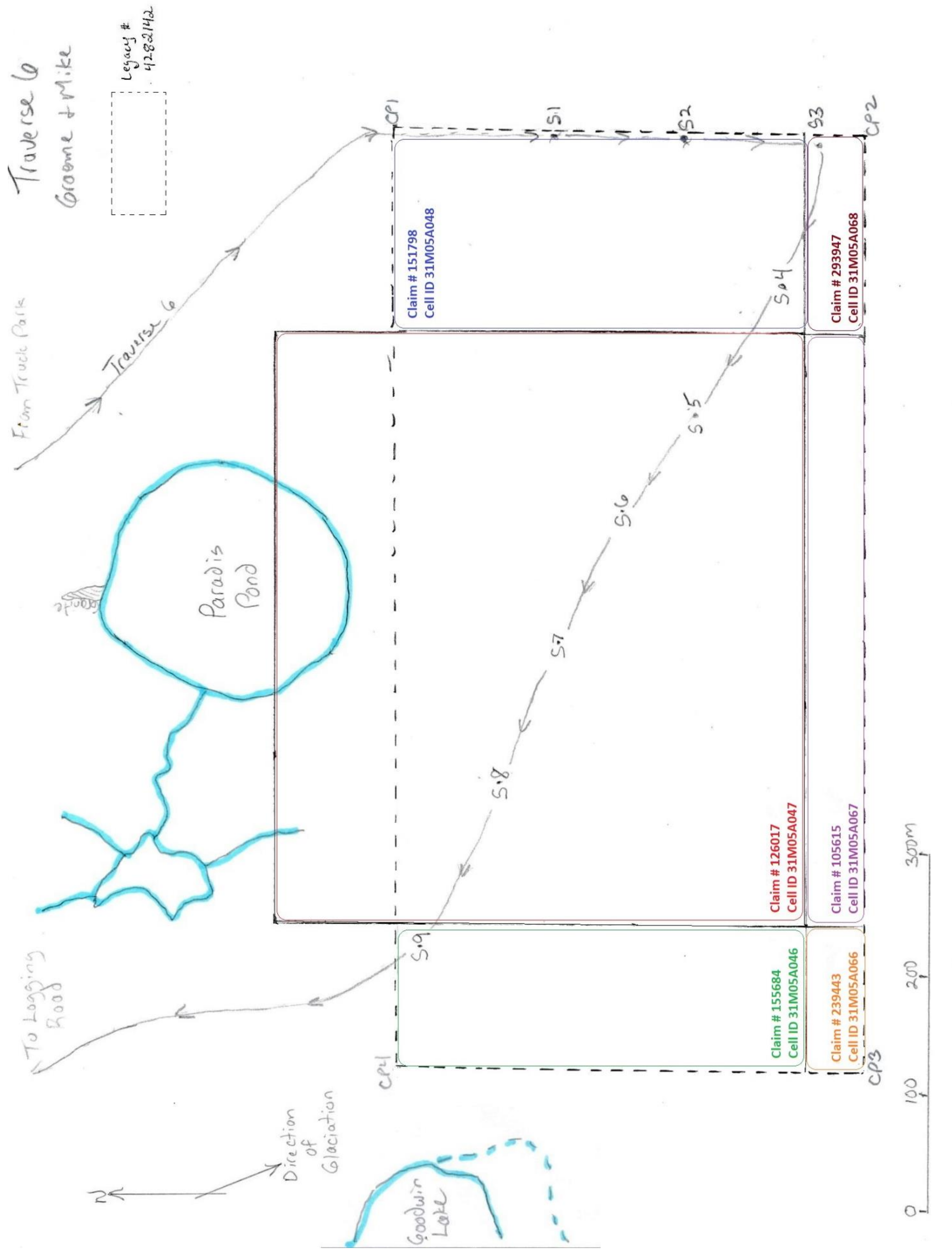
Graeme and Mike Barrette went from Truck Park to #1 post and walked the claim line from #1 post to #2 post, taking three small samples on the line, and then blazed a path to collect samples S4-S9 as near to my original coordinates as possible. After ~110 years, no sign of the wagon road was found but my approximated path from the original 1905 map (Miller, (1905)) was not necessarily quite on the original trail, or it was completely reclaimed by the forest.

Graeme and Mike collected the samples and then continued to the logging road before walking the distance back to the Truck Park.

Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 6: map June 30, 2017 Graeme Bishop, Mike Barrette



Appendix 5

L 4282142 (below Paradis Pond L 4273040)

Traverse 6: field notes June 30, 2017 Graeme Bishop, Mike Barrette

Sample #	Coordinates 17T UTM	Elevation	Activity/Description
S1	0607390_E 5241994_N	1109'	While much effort was made to find evidence of the 100+ year old wagon road and samples were taken from what an equally old map showed to be the road, Graeme and Mike neglected to record details of sampling. From memory, however, Graeme and Mike said all were in mixed sand/gravel/boulder till from holes 2-3' deep with 2 under upended roots of trees.
S2	0607380_E 5241908_N	1106'	
S3	0607385_E 5241770_N	1099'	
S4	0607271_E 5241835_N	1102'	
S5	0607160_E 5241891_N	1122'	
S6	0607075_E 5241947_N	1145'	
S7	0606961_E 5242001_N	1155'	
S8	0606839_E 5242058_N	1138'	
S9	0606695_E 5242126_N	1112'	

Location #	Coordinates 17T UTM
Truck Park	0607135_E/5242601_N
Corner post #1	0607401_E/5242148_N
Corner post #2	0607416_E/5241790_N
Corner post #3	0606609_E/5241756_N
Corner post #4	0606606_E/5242150_N

Claim #	Cell ID
126017	31M0SA047
155684	31M0SA046
239443	31M0SA066
105615	31M0SA067
151798	31M0SA048
293947	31M0SA068

Appendix 6

Methodologies for Field Work and Till Sample Processing

PREFACE:

Diamond exploration is unlike that for any other mineral resource. Search areas are 'limited' to ancient 'cratons' (such as the 'Canadian Shield') which in themselves are vast areas. Geological maps are, in a general sense, of little to no use, as economic kimberlite pipes, relatively small circular to semi-circular, vertical volcanoes, when found may have no direct correlation to local rock types, although locating faults and contacts between different rock types, such as granite/diabase, can be very useful once a kimberlite field has been located by geophysics or till sampling.

Locating a pipe is largely a matter of detective work. Typically, mag maps have been utilized in the search for magnetic 'bulls-eyes' which are then, as funds permit, drilled to see if it is kimberlite or some other magnetic target. However, in Canada so far most of the production pipes have little to no magnetic signature. As well, EM surveys often don't work for the same reason, as is also true of gravity surveys (i.e. no detectible mag, EM, or gravity anomaly). [See Appendix 3]

Soil sampling, either in till or streams, is the simplest and most common method of looking for kimberlites. In fact, though, the search is not directly for diamonds but for kimberlite indicator minerals (KIMs), which include certain garnets, chrome diopsides, ilmenites, chromites, zircons and others.

Stream sediment surveys are for larger scale drainage basins to initially locate KIMs. Till sampling should be then utilized to best zero in on a pipe's location.

These grains must be separated by utilizing their slightly greater specific gravity (SG) compared to most other minerals in the 'soil' samples. However, these grains are generally only 0.25mm to 2.0mm in diameter. This, and the very slightest difference in SG, make it very difficult to concentrate and recognize and pick KIMs from. Basically, commercial-grade microscopes, tweezers, and concentrators must be acquired at great initial cost with trained operators.

As a result, most exploration companies utilize a dedicated lab at a cost of $500 and up per sample for concentrating, visual identification and estimate of KIM grain numbers.

Old-fashioned gold panning for KIMs as one would with gold grains is next to impossible: gold has a specific gravity (SG) of ~20 and therefore is roughly 7 times heavier than the other soil and rocks in a sample. KIMs have an SG 3.3 to 4.3, only very slightly (i.e. <1.4 times) more than most other grains in a field sample. (Common non-KIMs have an SG of ~2.6 to 2.9). As well, size matters. Even experienced individuals can have trouble with separating gold grains the size of KIMs from till or stream gravels, and one basically cannot pan gold this size out of 'black sands', i.e. magnetite. Magnetite (SG of 5.2) is commonly found in kimberlites and hence is also found with KIMs, further complicating concentration of a sample, as magnetite is actually heavier.

With the right equipment however, an individual with some background can concentrate and pick KIMs from till samples.

To further complicate issues, due to a number of glaciations in Canada in different directions, samples must be taken from tens of metres to several kilometres down-ice (usually along the last glacial direction) of the potential kimberlite source. This requires the bulk of meaningful sampling to be done off claim, sometimes a long way off claim, which then cannot be applied for assessment work to maintain that claim in good standing. Direct sampling of a kimberlite target is only accomplished by bulk sampling with a large diamond drilling program, or if near surface, directly with heavy machinery (both very costly and permit-intensive).

These initial obstacles can only be overcome by a lone prospector with determination, knowledge, the use of a collection of specialized and costly equipment, and lots of time (and patience). Even for established commercial labs the bulk of the time and cost comes down to an individual meticulously picking KIMs with a pair of tweezers while viewing the concentrates from a sample under a microscope. This lengthy time-consuming process is such that if large numbers of indicators are encountered, only a portion of the sample is picked for KIMs in a lab and then averaged (i.e. 'guesstimated') to the full sample, possibly risking losing the few/any all-important G10s and other similar grains in the remaining portion.

As such, this Appendix is rather lengthy and details largely the method of processing till and stream samples by the author and achieving meaningful results.

METHODOLOGY/OVERVIEW OF FIELD WORK & TILL SAMPLE COLLECTION:

Standard 38cm x 28cm sample bags are used for collecting till samples. Small shovels are used to dig a 1' to 3' deep hole below the humus line and the bags filled ½ to ⅔ full, taped shut, and labelled. When possible, the sample is screened through a 4-mesh screen (typically just creek samples), or if not, then larger rocks and roots are removed by hand. If a sample site is very near to the transport vehicle I just remove larger cobbles and take a larger sample to be screened later, before concentrating. In between samples the equipment is cleaned as well as possible to avoid cross-contamination. GPS coordinates are taken at each sample site and then recorded if not matching the prechosen map coordinates.

The base of logging roads is basically composed of till collected immediately adjacent to the road as it is constructed. This makes for a very useful till sampling location, namely the area beside the road where the heavy machinery dug down from several to 10+ feet deep. This creates the possibility to collect from a number of horizons at various locations without mechanized equipment, thereby increasing the possibility of finding KIMs.

Whereas most approaches initially involve a regional sampling survey and then trace up-ice to the possible target, I start with identifying a potential target based on structural, glacial, landscape features, and publicly available OGS reports. I then take multiple samples to determine the likelihood of my target hypothesis, down-ice and off-ice for comparison.

My intent is basically to determine kimberlite pipe/or not a kimberlite pipe, based on a visual identification and number of KIMs picked from my till sample concentrates, and EMP analysis of an affordable minimal # of grains selected and sent for lab analysis. Interestingly, a number of exploration companies as well as ODM in Nepean have stated (within the last 5 years) that visually picked KIM grains and total number of KIMs are their criteria for continued interest in an area rather than analysis of grains. ODM said recently in an email that most companies have been adopting this approach. (From personal research it also appears that many of the most successful companies at finding new discoveries of diamondiferous kimberlite pipes now are looking for non- to low-mag and EM targets utilizing gravity surveys, which do not always produce usable results, and finally results in till sampling for KIMs as the primary prospecting tool), especially in a region with known kimberlites.

In their sampling programs, OGS Open File Reports on Alluvium Sampling Surveys recommend creek samples for a far more pre-concentrated material for heavy minerals including KIMs (not for some distance down-ice/water flow of a lake due to its being a heavy mineral trap), and so recommend to "maximise the distance between the sample site and the lake", so I then thought that this is not true if the lake (heavy trap) is the source of KIMs. Large distances between sample spacing and large 10-30kg samples however, are more applicable to doing regional surveys while hunting for a 'target', i.e. in this case a kimberlite pipe. Also, creeks are rarely conveniently placed directly down-ice of a pipe-sized target (in Canada typically 50-200m in diameter) and they concentrate material from a large area, so when sampled can strongly skew results to high numbers of KIMs compared to till samples. In my case, where the lake itself is a potential kimberlite pipe, I take many (5-20) small 1-3 kg unscreened till samples, relatively closely spaced, from between ±50 to 1000 metres down-ice of the target, and generally combine the results into one larger sample, creating a more representative sampling of post-glacial conditions for emplacing KIMs into till.

As you can see, due to the lake being a heavy mineral trap for material up-ice/water flow, all the samples I take from 'close' proximity down-ice/water flow can in all probability be attributed to that lake (or in theory, a hidden pipe in very close proximity down-ice of the lake). So, any of these samples below a proposed pipe can individually or collectively statistically be attributed to this discrete target. Taking many smaller till samples from various locations down-ice was deemed appropriate to mitigate the extreme nugget effect caused by KIMs potentially being restricted to thin stratigraphic horizons in the till.

Side View – Till Sampling Program

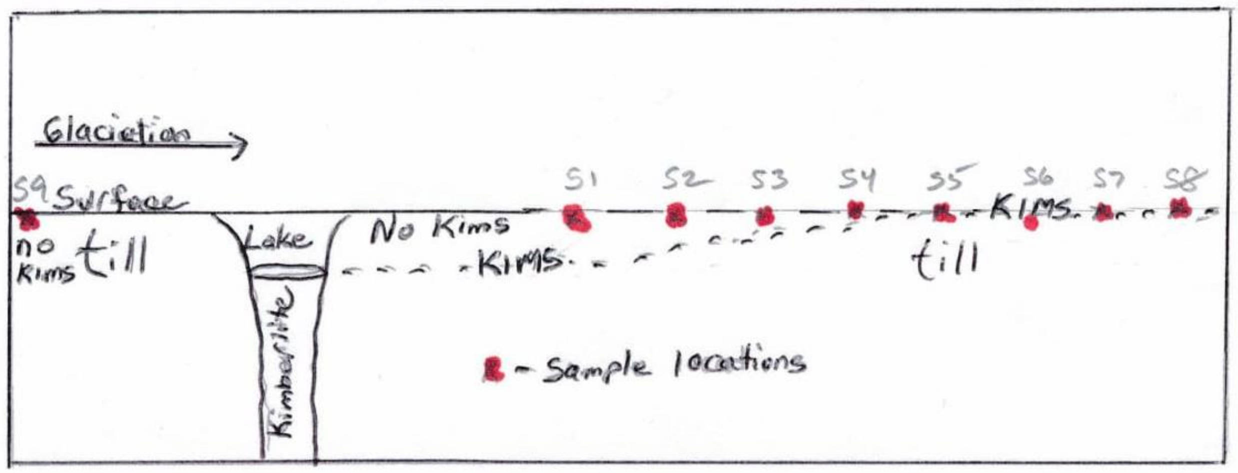


Diagram I

- If only S1 and/or S2 and/or S3 and/or S4 in till were sampled, one would find no KIMs and conclude no kimberlite up-ice
- If any one of S5, S6, S7, or S8 were sampled one might get favourable results for KIMs
- If the S1 ↔ S8 results, after concentrating and picking KIMs, are combined to a single larger sample result the chance of finding KIMs increases dramatically even though only 'one' or more samples contained KIMs initially. This is demonstrably more efficient and accurate at predicting proximity to a kimberlite pipe than only one larger sample would do
- Up-ice, S9 is a check and should statistically contain little to no KIMs
- Further sampling can then help verify/delineate the source of the KIMs

Top View – Till Sampling Program

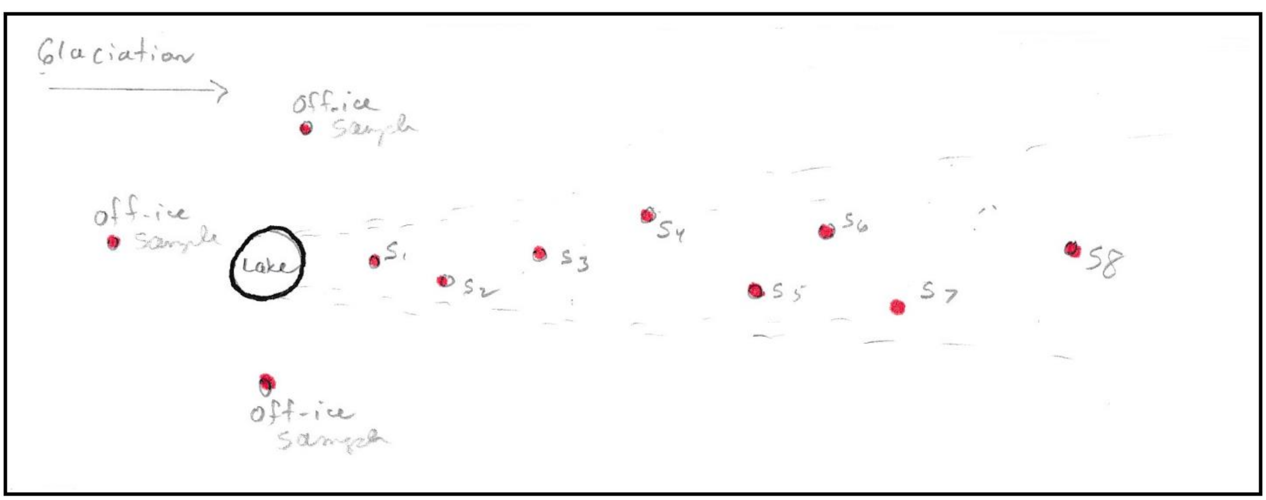


Diagram J

- Same as Diagram I, with off-ice samples containing little-to-no KIMs if lake is a kimberlite pipe

My blended till samples increases finding one or more that are confined to the appropriate KIM emplacement zone: I concentrate off-ice samples individually/separately. When KIM counts in off-ice samples drop to very few to zero, it adds to the probability of a favourable target location.

After concentrating, picking KIMs is done under a variable power binocular microscope with multiple lighting arrangements. I try to pick all KIMs, unless, as in some cases, they are in the thousands, then numbers are estimated. This of course takes many hours to days (sometime weeks) of work, especially when photographing and entering the photos into the computer correctly labelled.

Also, to maximize local topography in the field, my knowledgeable samplers or I can make on the spot decisions in the field to sample near but not on my pre-planned coordinates (e.g., an upended tree root nearby etc.), and GPS coordinates are accepted by field workers as possibly being $\pm$ 10-50 metres off on any given day.

The up-ice samples are processed separately and considered separately. This initial sampling program was performed to obtain a yes/no probability of my target hypothesis. Additional sampling program(s) help further delineate these preliminary results.

Included in picking pyrope garnets are red, pink, and purple colours. Typically, Cr pyrope (by definition) garnets in most literature are considered to be red (colour comes from enhanced chromium and/or iron content) or purple depending on the article; however, McLean et al (2007) shows that the colours in the Canadian Diavik Mine A154-S kimberlite pipe garnets, in order of Chromium content which is important for diamond exploration, are as follows:

- "Orange xenocrysts have <1 wt.% Cr_2O_3, and are inferred to have eclogitic derivation
- There is a general increase in Cr content from orange → red → pink → purple. A similar trend may be seen in the data of Hawthorne et al. (1979) for garnets from the Dokolwayo kimberlite and Hlane paleoalluvial deposits in Swaziland
- Red grains increase in Cr from light → dark red
- Purple xenocrysts are more likely than pink or red to be harzburgitic (G10 or G10D), but colour alone cannot be used as a definitive test"

Pink garnets, however, are not commonly mentioned in diamond exploration literature. In samples from Canadian kimberlites, the Cr content of the pink-purple garnets seem to exceed that of the darker purple garnets when tested at the lab in Sudbury (verbal communication, Dave Crabtree, Geoscience Lab), (McLean et al, 2007), (Grutter et al, 2004); therefore, I am including pink garnets in pyrope garnet counts. This is, of course, subject to change as I continue to sample and have picked garnet grains analysed.

From reading a great number of articles it seems that there is no definitive rule concerning kimberlite minerals, colours of G10s can vary, some diamond pipes have no G10s at all and many other differences also occur. The differences are so numerous and interesting that a future paper or book could be compiled. A certain part of these findings will be presented in this report when applicable to certain claims.

In targeting and evaluating potential kimberlite pipes it is important also to note an article on 'Following kimberlite indicator minerals to source' in GSC OF-7374, "**The corollary for exploration at Chidliak is that any source of high garnet counts in sediment samples is considered worthy of pursuit, regardless of garnet compositions**" (Pell et al, 2013, p 51). With that in mind, if I attempt to normalize my results vs. sample size as compared to say, the OGS-OF report 6088 (see p 13 & 17), taking into account my samples were unscreened (until processed in the sluice and/or GoldCube®), the number of KIMs I picked could be averaged up a considerable amount in quantity.

Of course, while till sampling a large part of the day/traverse is spent investigating boulders by removing moss, etc. and in this case specifically looking for kimberlite boulders (which have been located on 2 claims so far with other possible grain sized pieces that might be) or other interesting rocks with mineralization. Because this claim is in a large expanse of the Lorrain Granite Batholith, most boulders and outcrops are the characteristic pink granite with a mixed percentage of diabase from ~2/3km to the north, with mixed dolomite etc. from further north. As stated earlier, oversize from the sluice is bagged and viewed as time permits. No attempt will be made to identify every possible cobble if it is well worn and unrelated to kimberlite prospecting.

So… I'm sampling unconsolidated till, down-ice of a heavy mineral trap (lake) and taking comparatively small samples and getting high to very high in KIM anomalous results, which in classic teachings should result in poor→ no results. Unless of course the heavy mineral trap (lake) is the source of the heavy minerals.

METHODOLOGY FOR PROCESSING TILL SAMPLES: **Please also see Sluice Efficiency Test Results Chart [Appendix 7] and Flow Sheet for Concentrating and Retrieving KIMs from Till and Stream Samples [Appendix 8]**

EQUIPMENT:

1) GOLDFINDER CUSTOM MADE SLUICE *(since modified by the author for the efficient processing ~10 to 100+ lb soil samples, for initial kimberlite indicators / heavy mineral concentration)***:**

The Goldfinder sluice (see Equipment photo 1) is manufactured with aircraft grade aluminum in 3 sections, with sturdy fast connecting latches. It is 14' long, 14" wide, and has height adjustments at front and back of the top section, and front and back of the fully assembled sluice. From the manufacturer, it excels at saving very fine flour as well as coarser gold. The ability to save 90%+ of flour gold in any sluice is exceedingly rare [The Goldfinder sluice was tested extensively in the 1970s by designer and developer Wayne Loewen on the Saskatchewan River as well as in-house tests with known gold grains counted before and after running through the sluice]. (This particular sluice was rented from me by the then Resident Geologist Gerhard Meyer and District Geologist Gary Grabowski, both of the Kirkland Lake MRO, for testing for gold in eskers on the shores of Abitibi Lake). I determined that with certain beneficial modifications from stock it could also be very good at saving kimberlite indicator minerals (KIMs) from larger till samples.

Saving gold by gravity methods is comparatively easy as gold is about 7x heavier than indicator minerals or diamonds. To use the sluice to obtain a primary concentrate of KIMs, I removed the Hungarian riffles and the solid-backed 'miner's moss' carpet. I used a thicker, slightly more open-weave miner's moss, and overlying the miner's moss, a specific 4 mesh nylon classifying screen. This was cut to fit in the top of the sluice and overlaps the original grizzly bars to reduce the size of the feed material being concentrated prior to the miners' moss sections, and to spill the +4mm feed off the end of the top section which spills into a bucket and saved to visually check for kimberlites or other minerals of interest. A heavy duty ¾ HP submersible sump pump with a large flow rate replaced the 6 ½ HP Honda high pressure pump for a more correct water flow for the lighter material being run. This gave a 1" depth of water running above the top of the miner's moss. The sluice was run at a less steep angle than for gold to further enhance saving potential KIMs, with the first top section of the sluice adjusted to an angle with a drop of ½" over 36". The larger bottom section drops 3" every 5'. Great care must be exercised to level the sluice in the 14" width to provide an even water flow across its surface.

The modified sluice considerably reduced the original volume of material, but most importantly the modified wrap around spray bar [see Equipment photo in Appendix 10] blasts apart clay and other clumped material very quickly and the water flow then also quickly removes very fine silt, humus, and plant matter as well as +4mm rocks (previously, I would spend 1 – 2 hrs or more trying to break this clay and such by hand with various utensils and water spray, and afterwards would have to screen out the humus and then pan and classify with various screens). Efficiently saving the 1mm and smaller grains from clay/till strictly by hand methods is nearly impossible.

To test efficiency after the initial trial run using this equipment, I cleaned and kept separate the 4 carpet sections and the overflow of the sluice, which after further processing resulted in 25 separate samples of various meshes, and then checked the results under the microscope for indicators to determine if any losses were incurred and where. With this information, I was then able to make further modifications and retest to compare efficiencies which I continue to do and modify as needed.

The sluice concentrates <1.0mm are ran through the GoldCube® and the trays are cleaned (i.e. washed for concentrates). The rejects are saved and are again ran through the GoldCube®. The new rejects are discarded. Concentrates from the 1st and 2nd run are then blended and reran through the GoldCube®. The 1st tray is then cleaned and saved separately, as are the 2nd and 3rd trays. These rejects are then saved separately. These will all be dried and demagnetized and screened into a number of different mesh fractions, and these, if individually too large to directly pick for KIMs, are carefully panned to a manageable size. Although time consuming, this results in a very efficient and consistent method of concentrating till for KIMs and other heavy minerals.

Interestingly, many professional labs still list panning as the final concentration technique. This preliminary work was all necessary to determine the efficiency of sluicing till samples for KIMs and other heavy minerals with this particular sluice. Surprisingly, the first top section with no miner's moss had an interesting number of potential KIMs as well as a 1.5mm purple garnet in my sluice efficiency test. The next carpet had very many indicators, the next a sizable number of indicators, the final carpet and overflow had no KIMs or magnetite etc. that would typically comprise a heavy concentration [see Sluice Efficiency Test Results in Appendix 7].

2) GOLDCUBE®:

The GoldCube® is a 'new' and excellent concentrator built for gold, but after much testing I've discovered it works very well for kimberlite indicators minerals and is uncomplicated and easy to use. After numerous tests (much the same as for the sluice), I determined it is very efficient for smaller sized 1-4kg till/creek samples, after wet screening the samples to 1.0-2.0mm and <1.0mm which are ran through the concentrator individually. It has a very high recovery rate for <1.0mm heavy minerals and for removing virtually all the silt sized grains, and it's easy to clean after use.

Unfortunately, many of my early till samples from 4282142 were panned at the lake allowing for easier transport. I feel now many valuable KIMs were inadvertently lost that the GoldCube® would have saved.

3) TYLER PORTABLE SIEVE SHAKER:

The Tyler sieve shaker (Equipment photo 2) is utilized for larger samples. For individual small samples, screening is done by hand with standard sieve screens and larger diamond screens.

4) MANSKER JIG:

I also acquired and compared the efficiency of using a Mansker Jig for concentrating till samples, as some labs and explorationists use this device extensively for this purpose. I purchased one Coleparmer 8" HHSS #40 sieve for KIMs, and one Coleparmer 8" HHSS #100 sieve for lamprophyre indicators. Based on my findings I have determined a preference for my sluicing and Goldcube® methodology, as this appears to be superior to the Mansker Jig in concentrating KIMs, more so when considering a several thousand US dollar price tag.

5) CAMEL SPIRAL CONCENTRATOR:

A Camel Spiral Concentrator, which is used by some commercial labs, was also tested for KIM concentrates and I found it to be the worst of the lot – essentially useless.

6) HIGH-SPEED CENTRIFUGE:

I acquired and tested a high-speed centrifuge to separate the final concentrate into specific gravity layers. The centrifuge only seems to work to an extent on the finest fraction of concentrates. For now I will continue to use a high quality pan for final concentrating.

7) OTHER:

I considered the use of Polytungstate for heavy liquid separation but at $2500 US for 500 ml and special licensing and equipment requirements to use this product I quickly nixed that idea.

8) MICROSCOPE:

After these steps the indicators are then visually picked out (or a number estimated, and/or photographed under the microscope if too many to pick out or count) from each fraction under a Nikon SMZ-2B 8-50x binocular microscope with the help of Pelco (ceramic or carbon-fibre tipped) medical grade tweezers, and colour correct LED lamps for top, left and right, and below lighting. LW and SW ultraviolet lamps are also used in conjunction with the microscope to further identify various mineral grains. I have also been researching and experimenting with the use of switching between incandescent, fluorescent, and LED light, as some/many kimberlite garnets are also rare colour-change garnets.

9) PHOTOGRAPIC RECORDING:

An extra but very important (and time consuming) step is to photograph many of the large/important/unusual potential KIM or other heavy mineral through the microscope ocular, recording the type, size, colour, etc. of each grain, and storing and labelling the images on the computer for later viewing or to aid when consulting with geologists and other experts in the field of mineralogy, especially as related to diamond exploration of which a number of interesting grains are represented in this report. Many photographs were taken for this claim of concentrates/various grains have been taken and stored. As well, when dealing with grains that are from 0.25 to <3.0mm in size, one simply cannot easily find a certain one in picked KIMs and show it to individuals to ascertain their potential importance, and once sent to a lab for microprobe analysis, important physical characteristics such as kelyphitic rims and physical wear are lost. Photographing all KIMs picked (or many representative grains if too numerous) also helps estimate total numbers in the sample.

10) LIGHTING:

Another useful tool for picking kimberlitic Cr Pyropes was discovered in my research.

> "Pyrope grains larger than 0.5mm and have a higher Cr content (Cr203) showed a metameric colour change from purplish in incandescent light to grey, blue-grey, or blue in daylight type fluorescent light (Springfield and Manslar, 1985) which is useful qualitative and for picking garnets with higher Cr content." (Carter Hearn Jr. (2004), p 481)

> "[A] color change garnet is an especially rare and valuable … garnet" (GemSelect (2018))

> "[A] color change garnet is one of the most rare, interesting, and unique of all gemstones." (AJS Gems)

> "Cr pyropes are picked at ODM by switching light sources (LED and Fluorescent) to find colour change garnets which are from this and other sources indication of kimberlitic chrome pyrope garnets" (personal communication)

Over the last several years, I've tried many (several dozen) types and colours of bulbs and a number of lamp configurations. The latest and so far best is a pair of desk-sized gooseneck LED lamps (Jansjö LED Lamp from Ikea) which gives a true colour image under the microscope and in a microphotography image, and a variable intensity ring light (AmScope – 144 Bright White LED Ring Light) that mounts directly onto the lower part of the microscope and provides a very white (daylight) illumination.

After finding a Cr Pyrope (pink → purple), I can switch from one light to the other separately.

The results are dramatic with a colour change from lilac-purple to grey. The microphotograph on the cover page of this report shows the two images of the same Cr pyrope from both lights from the trench sample overlaid together. This is another method I will use from now on to identify KIM Cr pyropes.

Sluice Efficiency Test Results

Appendix 7

Overflow Chart: collected in stainless steel pan after exiting sluice			
Dry weight from sluice = 3160 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	1469		24
-10+20 mesh =	290	3	25
-20+28 mesh =	141	2	19
-28+35 mesh =	171	2	23
-35 mesh =	1058	x	
Total =	**3129**		

Sluice Top: expanded metal over classifying screen – no carpet			
Dry weight from sluice = 940 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	241	15	24
-10+20 mesh =	128	6	25
-20+28 mesh =	66	3	19
-28+35 mesh =	80	3	23
-35 mesh =	419	x	
Total =	**934**		

Sluice 1: classifying screen over miner's moss			
Dry weight from sluice = 2860 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	136	6	26
-10+20 mesh =	495	20	18
-20+28 mesh =	258	6	19
-28+35 mesh =	336	7	17
-35 mesh =	1610	x	
Total =	**2835**		

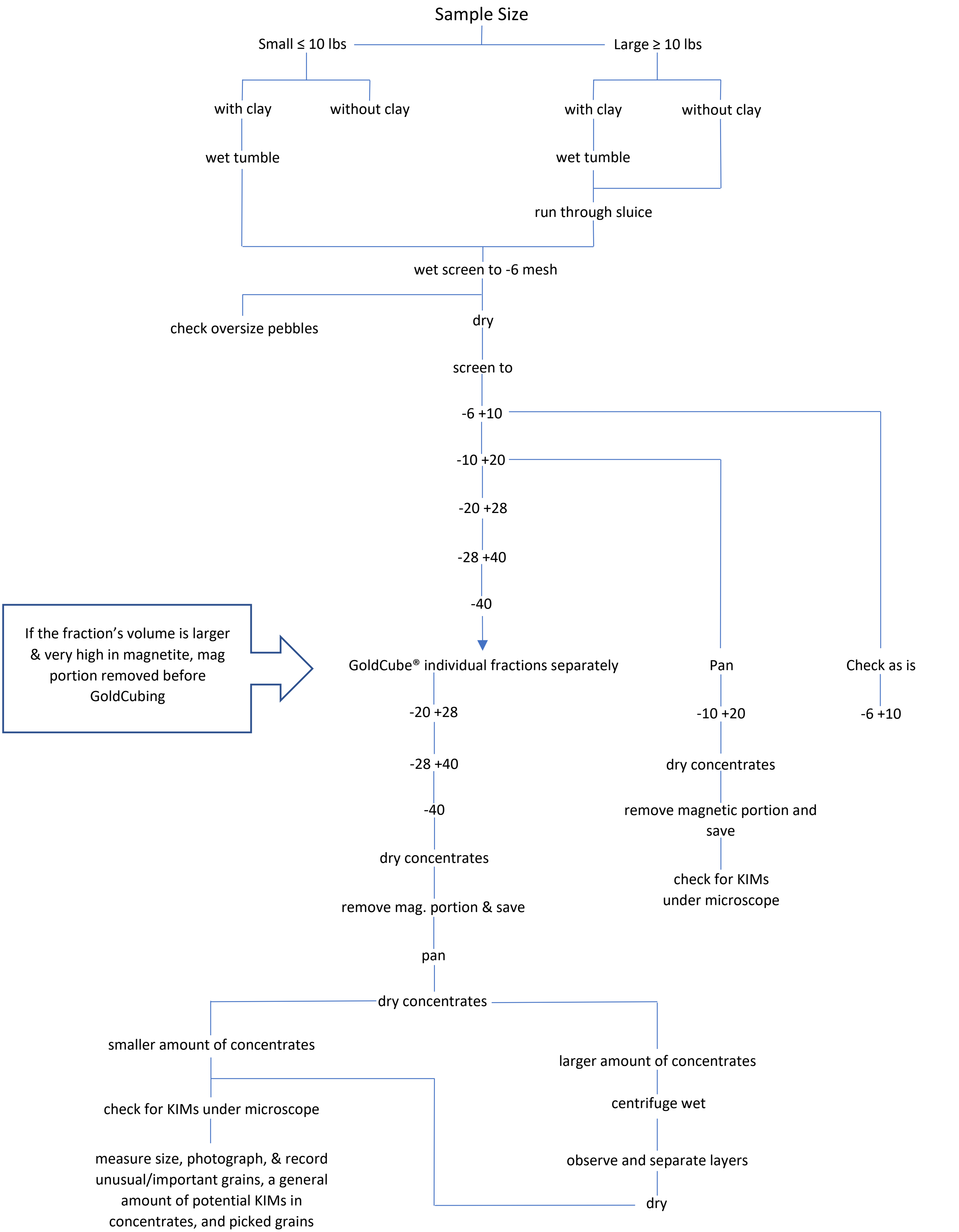
Sluice 2: classifying screen over miner's moss			
Dry weight from sluice = 3020 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	29	1	22
-10+20 mesh =	269	8	18
-20+28 mesh =	248	6	20
-28+35 mesh =	359	7	17
-35 mesh =	2106	x	
Total =	**3011**		

Sluice 3: classifying screen over miner's moss			
Dry weight from sluice = 2550 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	220	10	15
-10+20 mesh =	441	13	17
-20+28 mesh =	198	5	16
-28+35 mesh =	210	4	16
-35 mesh =	1425	x	
Total =	**2494**		

(note: slight differences in sluice and screen weights could be accounted for by moisture differences and loss during screening, tumbling, and container transfers, but are statistically inconsequential)

Appendix 8

Flow Sheet for Concentrating and Retrieving KIMs from Till & Stream Samples



Appendix 9

Equipment List

- Mansker Jig
- Camel Spiral Concentrator
- Custom designed proprietary tube/spiral concentrator for fine to very fine material
- Diamond sieves
- Tyler – 8 sieve Motorized Portable Sieve Shaker
- Various test sieves from -4 to -100 mesh
- 12V and 120V and motorized water pumps for concentrators as needed
- Garrett Au Pans: 15" super sluice, 10"
- Keene's Engineering Au Pans: 14", 12", 10"
- Heavy duty 18" x 16" rubber panning tub
- Goldcube® fine Au/heavy mineral concentrator
- Goldspears (2 of) with extra 4' extensions for precious metal and magnetite soil testing, wet & dry
- Scintrex-Scintillation Counter Model BGS-1S
- Rock saws: 10", 18", 24", 36"
- Various metal/mineral detectors: MineLab Pro-find Pinpointer, Garrett's BFO, ADS VLF 5khz, AT-Gold 15 khz, ATX multi-frequency pulse
- Goldfinder 14' aircraft aluminum collapsible sluice with ¾ hp 120V submersible pump, 6 ½ hp Honda pump, dredging (3") capability, custom designed Hungarian and expanded metal riffles, -4 mesh classifying screen
- Digiweigh digital scale, readability 0.1 gram
- Mettler PM30, 0-60lb, 0.1g scales
- Fujifilm Finepix SL, Nikon Coolpix digital cameras, custom microscope adapter for Coolpix
- Canon EOS Rebel SLR, with commercial microscope adapter
- Zeiss OPMI-1 stereo 4-25x microscope with thru the lens variable halogen lighting, 6' articulating boom stand
- Zeiss Jena 4-25x compound microscope with separate oculars to 80x
- Bristal 40-1000x microscope
- Nikon SMZ 2B continuously variable 8-50x microscope with adjustable boom stand
- Individually switched, colour correct directed LED, incandescent, and fluorescent lighting
- Turnstile microscope viewing platform
- Diamond Selector II
- Superbright 2000SW and Superbright II LW370 portable ultraviolet lights /battery/120V
- Inova multi-wavelength LW UV LED flashlight
- Clay-Adams high speed centrifuge
- 2" Neodymium magnet in waterproof ABS shell
- Weaker 4" x 6" flat magnet cut to fit Au pans
- Various shovels, auger, containers, compasses, GPS, maps, etc. as needed for soil/rock sampling
- Electronic pH tester and pH strips
- Toyota Tacoma 4x4
- 8' Boler, 14' Boler trailers/portable camps

Equipment Photos

Appendix 10

1 - Goldfinder Sluice

1a - Panned and dried concentrates from sluice efficiency test ready to pick for KIMs under microscope

2 -Tyler motorized portable sieve shaker

3 - Goldcube®

4 - Variable speed industrial tumbler

5 - Microscopes

6 - 2-inch neodymium magnet

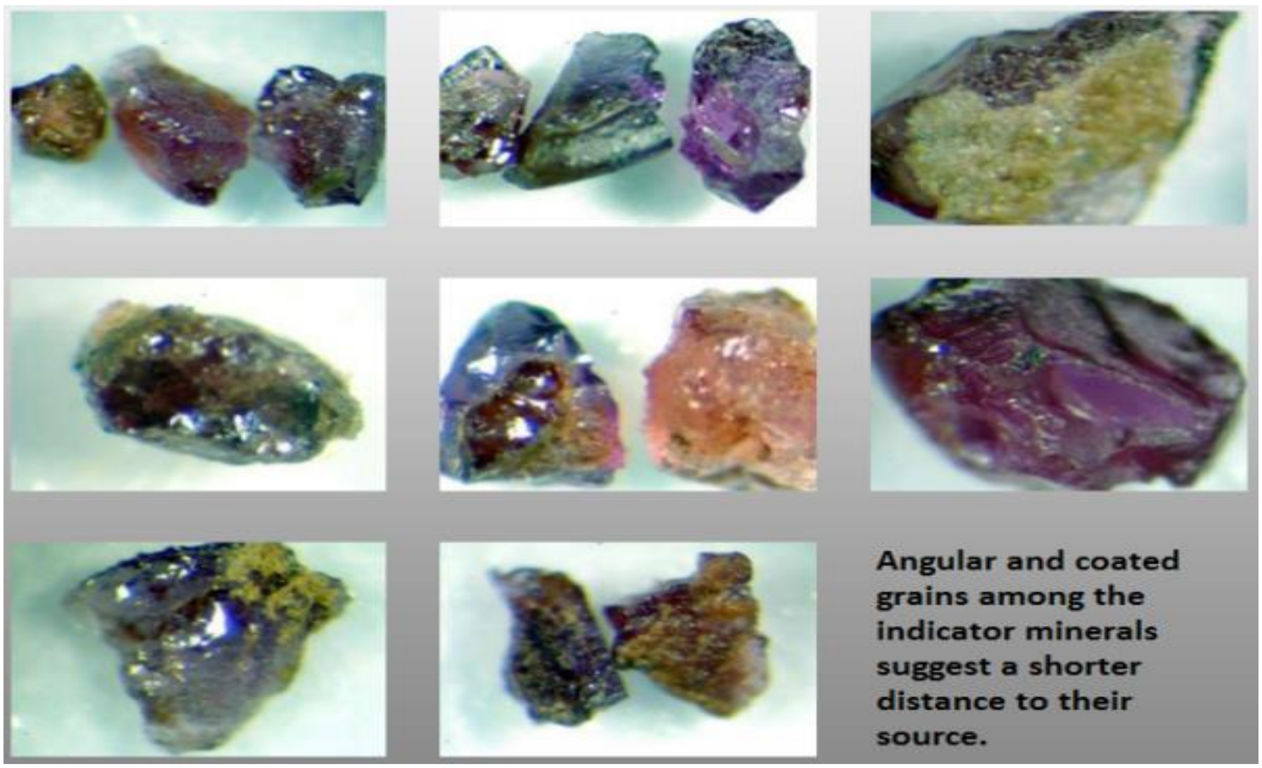
7 - Portable camp near claim

Appendix 11

Reference Photos

"Angular and coated grains among the indicator minerals suggest a shorter distance to their source" ("Arctic Star Presentation", (2016), p 13)

Arctic Star and North Arrow Announce Drilling at Redemption Diamond Project



"Studies of the indicator minerals from the South Coppermine train, some of which are imaged to the right, show very angular habits, some with soft alteration rims, (kelphyite for pyrope and lucoxene for ilmenite), all evidence for close proximity to source. Mineral grains lose their coats and become rounded as they travel down ice in the glacier. The angular/coated grains were most abundant at the head of the South Coppermine train. One grain with kimberlite attached was also noted." ("Arctic Star Presentation", (2016), p 13)

Appendix 12

Geoscience Labs – Certificate of Analysis & Invoice

Ontario

CERTIFICATE OF ANALYSIS
GEO LABS
GEOSCIENCE LABORATORIES

Geoscience Laboratories (Geo Labs)
933 Ramsey Lake Road, Bldg A4
Sudbury, ON P3E 6B5
Phone: (705) 670-5637
Toll Free: 1-866-436-5227

Issued To:	Mr. T. Bishop 440 Grenfell Rd, RR#2 Swastika, ON P0K 1T0 Canada
Phone:	705-642-3937
Fax:	
Email:	bishop.ts@gmail.com
Client No:	1599

Certificate No:	CRT-17-0107-04
Certificate Date:	22/09/2017
Project Number:	
Geo Labs Job No:	17-0107
Submission Date:	06/06/2017
Delivery Via:	Email
QC Requested:	Y

Method Code reported with this certificate: EMP-100

Method Code	Description	QTY	Test Status
EMP-100	Microprobe Analysis / Grain	1	Completed
SEM-101	SEM: Rental With Operator	1	Completed

REVISED
DATE: Sep 22/2017.
RE Certificate # CRT-17-0107-02

Please refer to the Geo Labs Job No. 17-0107 if you have any questions.

CERTIFIED BY :

John Beals, GeoServices Senior Manager

Date: Sept 22 2017

Page 1 of 1

Appendix 12

Ontario

GEO LABS
GEOSCIENCE LABORATORIES

Invoice Summary

Geo Labs Job #: 17-0107 / 17-0279
Sample Submission Date: 06/06/2017 / 14/09/2017
PO/Work Order #:
Quote #:
IFIS Client #:

Invoice To:
David Crouch
[redacted]

Data Report To:
Tony Bishop
[redacted]

Quantity	Method Code	Description	Unit Price	Total
52	EMP-100	Microprobe Analysis / Grain *Job #17-0107*	$14.40	$748.80
2	SEM-101	SEM: Rental With Operator *Job #17-0107*	$148.75	$297.50
43	EMP-100	Microprobe Analysis / Grain *Job #17-0279*	$14.40	$619.20
			Subtotal	**$1,665.50**
			HST	**$216.52**
			Balance Due	**$1,882.02**

For payment inquiries please contact the Financial Processing Operations Branch (FPOB) of Ontario Shared Services (OSS) accounts receivable customer service support centre at **(877) 535-0554**.
For billing inquiries please contact the Geoscience Laboratories at **(705) 670-5637** or geoscience.labs.ndm@ontario.ca.

Statement of Qualifications:

I, Brian Anthony (Tony) Bishop p/l #A44063 of Kenogami (RR#2 Swastika, ON), hereby certify as follows concerning my report on Claim L 4282142 in the Township of Lorrain, Larder Lake Mining Division:

I have been prospecting and placer mining part-time for 43+ years in Ontario, British Columbia, and Nova Scotia (which led to writing a book The Gold Hunter's Guide to Nova Scotia (Nimbus Publishing, 1988, ISBN 0-920852-93-9) which was used in prospecting courses in Nova Scotia). I have held an Ontario Prospector's License for 36+ years, and was issued a Permanent Prospector's License in 2005. I have completed a number of prospecting courses given by the Ministry, and have my Prospector's Blasting Permit. I was one of the directors on the Northern Prospectors Association (NPA) in the early years when Mike Leahy revitalized/resurrected the NPA in Kirkland Lake, and with Mike, initiated the annual gold panning event as part of Kirkland Lake Gold Days.

As well, I sold and used small scale mining and concentrating/processing equipment for over 20 years. This included instructing others in their use.

On short term contracts I have performed specialized work for Cobatec, Macassa, Castle Silver Mines Inc., Gold Bullion Development Corp, as well as short stints in Ecuador and Montana.

The last four years I have devoted to full-time diamond exploration. This has included 1,000+ hours of research from many diverse sources on exploration and processing techniques.

Drawing on this research and my many years of practical experience I have assembled a complete till processing lab I feel rivals many commercial ones. Importantly, I sometimes exceed their results by testing a wider range of samples' fraction sizes and as a result have found a number of kimberlite indicator minerals, notably a number of purple garnets all 1.0mm and larger in size (i.e., > 20 mesh) and other indicators that were larger than the usual upper cut-off for commercial labs' mesh sizes. Many redundancy tests are routinely performed to monitor potential losses of the KIMs and I feel my equipment and techniques closely match that of the industry.

Signed:

Brian Anthony (Tony) Bishop

June 6, 2018

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