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**ASSESSMENT REPORT**

**VALE CANADA LIMITED**

**LORNE AND NAIRN TOWNSHIP CLAIMS**
**GEOLOGICAL MAPPING AND ASSAYING**

**NTS: 41-I-5; 41-I-6**

**MAY 2023**

Jacqueline Trudel, P. Geo
Vale Canada Limited
May 9th, 2023

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## EXECUTIVE SUMMARY

Between October 19th - 21st 2022, geological mapping and sampling follow up program were completed on the Lorne and Nairn townships properties by two Geologists-in-training (GITs), one Project Geologist and one Field Technician for Vale Exploration Canada. A total of 3 days were spent in the field.

The objective of the Nairn township mapping was to investigate versatile time electromagnetic (VTEM) anomalies over a previously mapped quartz diorite with beep mats and mapping. The source of the VTEM anomalies was not identified in the field and a follow-up ground electromagnetic (EM) survey is recommended.

The objective of the Lorne township program was to follow up on grab samples from a metagabbro outcrop that returned anomalous precious metals during a field program completed in 2001 and to complete geologic mapping, with particular focus on locating quartz diorite outcrops.

A total of 26 samples were collected and 21 samples were sent for analysis, none of which returned anomalous nickel, copper or precious metals. Quartz diorite was not identified during this mapping program.

## INTRODUCTION

The Worthington offset, a radial quartz diorite dike, extends 15 km southwest from the Sudbury Igneous Complex. The offset extends north of the Lorne township property and passes though the Nairn mapping area (figure 1).

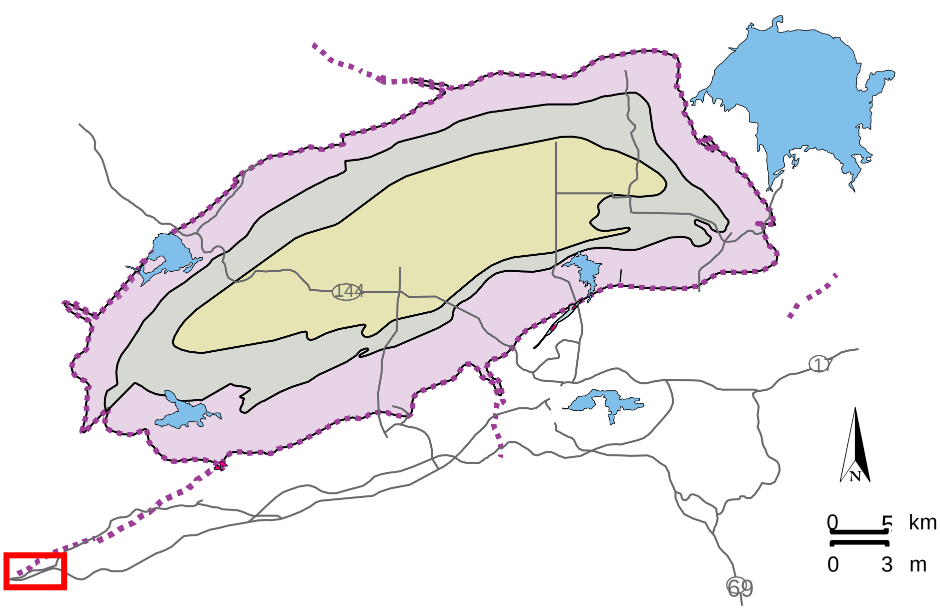



**Figure 1**: Map of the Sudbury Igneous Complex with the mapping area in the red box.

## PROPERTY

### Location and Access

The Lorne and Nairn township properties are approximately 45 km southwest from the City of Sudbury along Highway 17 (Figure 2). The work areas are located in Lot 12 Concession 4 in Lorne township and Lot 1 Concession 4 in Nairn township. The work areas were accessed by pick-up truck and are walking distance from Highway 17.

### Property Status

The Lorne and Nairn township mapping was conducted on two parcels of land, one in each township (Figure 3). Within Nairn Township, work was completed on a Vale Mining Rights Only patent (PIN 73393-0364 (LT)) on the southern side of Highway 17. Within Lorne Township work was completed on Vale's Mining Claim 254187. All surface property owners were contacted prior to commencing the program. Pin 73393-0364 was acquired by Vale (Inco) on March 3rd, 1961, and remains 100% ownership of the mining rights only parcel. Mining claim 254187, previously mining claim S1237374 was staked in June 1999 and is 100% Vale owned. Mining claim 254187 is in good standing until June 2, 2023.


**Figure 2**: Travel route from Vale's Copper Cliff office (A) to the work area (B).

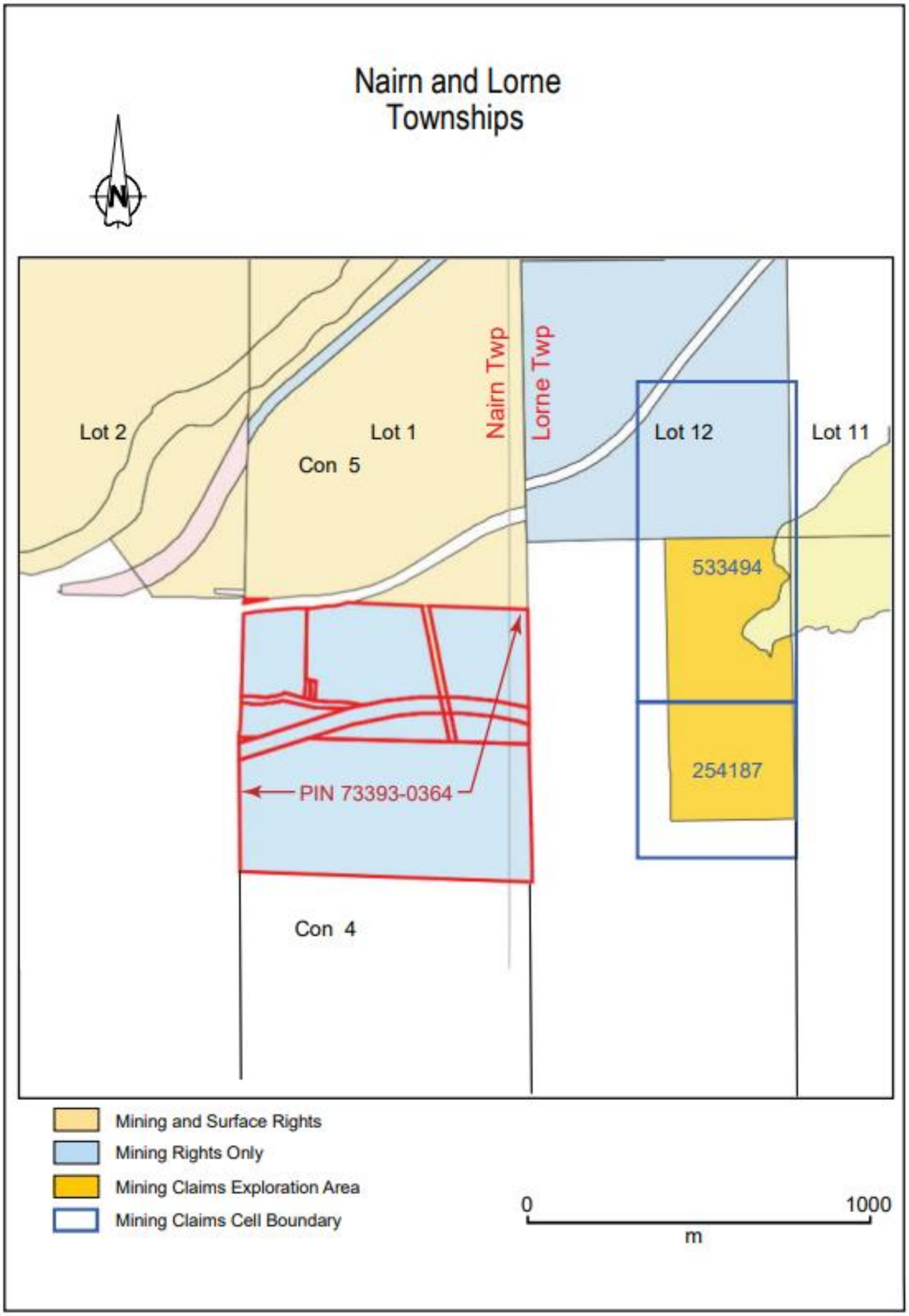



**Figure 3**: Vale claims within the Lorne and Nairn townships

## Exploration History

The property area has a history of exploration for Cu-Ni, Au, U, and most recently PGE mineralization. Two small historical pits are present on the property, one in barren greywacke, the other in olivine diabase. Production information for the pits is not available. The earliest known work on the property was in the 1950's, when the area was geologically mapped as part of the Inco Township Mapping program.

More recently, in 2001, 23 rock samples were collected and 1:20,000 field mapping was done on Mining Claims 533494 and 254187 (previously known as Mining Claims 1237374 and 1237375). No quartz diorite was located during the program but a PGE anomaly in metagabbro was identified, and follow-up was recommended (Makela, 2001).

In 2003, 3 days of line cutting, and a 5.3 line km magnetic survey was completed. There were no significant anomalies identified from the survey and no further work was recommended (Makela, 2003).

In 2005, further work was completed on Mining Claims 533494 and 254187 (previously known as Mining Claims 1237374 and 1237375), including field mapping and prospecting to map the extent of the Worthington Offset. In addition, 10 samples were taken for geochemical analyses and thin section work. Quartz diorite was mapped, and a surface electromagnetics (EM) survey was recommended for a future program (Makela, 2005)

In 2009, a geophysical program was conducted within Lorne township to locate historical drillholes and conduct borehole geophysics. No significant conductors were identified from the survey of BH 166010; however, borehole EM was recommended for BH166090 (Layman, 2009)

In 2016, dummy probing of located historical drillholes, borehole EM on one historical drillhole and a small surface EM survey were completed on Vale patented land within Lorne township. No follow up was recommended following the program (Forget and Dickie, 2017)

## REGIONAL GEOLOGY

The Sudbury Impact Structure lies at the boundary of the Archean Superior Province with the Proterozoic Southern Province, immediately north of the Grenville Province. It formed at ~1850 Ma and consists of three members: the Whitewater Group; the Sudbury Igneous Complex (SIC) which underlies and rings the Whitewater Group (Figure 1); and an outer zone of locally brecciated country rocks (Sudbury breccia).

The Whitewater Group contained within the central depression of the Sudbury Structure consists of four conformable formations generated from impact. These are, in ascending order, the Onaping, Vermilion, Onwatin, and Chelmsford formations. The Onaping Formation consists of a succession of upward-fining breccia units. The Vermilion Formation consists of carbonate, siltstone, and chert units. The Onwatin Formation is comprised of carbonaceous mudstones and siltstones. The Chelmsford Formation is dominated by greywackes.

The Sudbury Igneous Complex (SIC) lies structurally below the Whitewater Group and consists of four main units from base to top: contact sublayer norite, felsic and mafic norite, quartz gabbro, and granophyre. Concentric and radial quartz diorite offset dykes cut the footwall rocks along fracture zones. Footwall or granite breccia occurs as irregular zones varying in thickness from 20 to 225 ft between the SIC and the footwall rocks and is composed of fragments derived from both the SIC and the footwall rocks, contained in a quartz-rich breccia matrix. The granite breccia generally strikes parallel to the basal contact of the SIC but locally, upwellings or tongues project as far as 225 ft into the overlying SIC and underlying footwall rocks. The contact sublayer norite, offset dykes and granite breccia are the main hosts for the nickel-copper-precious metal sulphide ores.

Sudbury breccia represents impact shock features that occur as irregular bodies or dykes throughout the country rocks around the Sudbury structure. It is composed of subrounded fragments, mainly derived from the adjacent host rocks, set in a dark fine-grained matrix which may be fragmental, recrystallized, igneous textured or mylonitic.

Archean gneisses, migmatites, granites and volcanic rocks (>2500 Ma) of the Superior Province lie to the west, northwest and northeast of the SIC. Supracrustal rocks of the Huronian Supergroup are exposed in the Southern Province and lie to the south of the SIC. The Supergroup includes from oldest to youngest; the Elliot Lake Group volcanic and clastic sedimentary rocks; the Hough Lake, Quirke Lake and Cobalt groups consisting of a sequence of conglomerate, mudstone, siltstone and sandstone and the Flack Lake Group consisting of mudstone, siltstone, and sandstone.

Sills and dykes of Nipissing gabbro (approximately 2215 Ma) intrude the Huronian rocks of the Southern Province, and the Superior Province rocks.

Copper, nickel, PGE-Au mineralization occurs in five principal environments:

1. As massive to disseminated sulphides at the base of the main mass in the sublayer; These deposits typically occur on the South Range of the Sudbury Structure. They are situated at the contact between the Sudbury Igneous Complex and footwall supracrustal rocks of the Huronian Supergroup and the Creighton and Murray granites. These deposits are generally zoned from massive ore at the footwall to disseminated sulphide ore toward the hanging wall. The massive ores rest directly on the footwall rocks and contain locally derived inclusions consisting of mafic, felsic, and subordinate metasedimentary clasts as well as ultramafic fragments whose source is unknown. The PGE content of these deposits is variable.

2. As fine and blebby disseminations and massive stringers within breccias beneath the sublayer; This deposit type occurs on the North and East Ranges of the Sudbury Structure (e.g., Onaping-Levack and Victor areas). These deposits are spatially related to breccia filled embayment structures on the margins of the SIC. The mineralization occurs primarily within brecciated country rocks at the basal contact of the SIC and in fractures in country rocks underlying the breccias. The breccias consist of fragments of country rock, ultramafic inclusions, and rare sublayer and mafic norite in a quartzo-feldspathic matrix. Sulphides occur as fine and blebby disseminations and massive stringers within the breccias, as stringers in footwall fractures and occasionally as disseminations within overlying sublayer norite. The PGE-Au content of these deposits is generally low.

3. As veins and stockwork systems in the underlying footwall country rocks; These deposits occur up to 1,600 ft into the underlying footwall and are usually linked to a contact related deposit. Footwall mineralization is often hosted in thick zones of Sudbury Breccia. This breccia is composed of fragments of country rock ranging from microscopic (matrix) to more than 35 ft in diameter that occurs as dykes and irregular masses in all footwall rocks. The deposits are comprised of veins and stockwork systems that are primarily massive chalcopyrite that vary from millimeter scale to greater than 35 ft wide. The edges of the deposits are characterized by stringers that are <3 ft that consist of massive intergrown bornite/chalcopyrite/millerite. Alteration of the host footwall rocks immediately next to the deposits includes quartz carbonate, epidote and chlorite in seams and fractures. Significant PGE-Au mineralization occurs within the main portion of the deposits, but significant concentrations occur in the peripheral sulphide stringers and within altered host rocks.

4. Within quartz diorite offset dykes extending radically from the SIC; Deposits within "Offset Dykes" are spatially associated with inclusion rich quartz diorite and with local structural complexities of the dyke (e.g., folding, displacements etc.). Inclusion quartz diorite (IQD) is generally located within the central portion of the offset, but on occasion may occur to the dyke boundary. Up to 75% of the inclusions are derived from local sources. Inclusions vary in diameter from <1/2" to several feet and volumetrically ranges from a few percent to locally >80% of the IQD. The marginal areas of the dykes are characterized by fine-grained inclusion free quartz diorite (QD). Contacts between the QD and IQD are variable and may be diffuse to gradational in nature to extremely sharp. Mineralization consists of massive and semi-massive Cu-Ni bearing sulphides haloed by disseminated and blebby sulphides. The massive sulphide (>80 volume % sulphide) is dominantly pyrrhotite and pentlandite. The massive sulphide thins and splays into 1 inch to 3 ft thick copper-rich stringer zones within the disseminated sulphide halo. Semi-massive sulphides (50-80% volume sulphide) are also typically pyrrhotite and pentlandite rich but are spatially associated with chalcopyrite-rich patches. The PGE-Au minerals tend to occur at sulphide/silicate boundaries and are spatially associated with more Cu-rich sulphide.

5. Shear zones and related structural traps; These deposits occur within fault zones at the contact of the SIC and metasedimentary rock of the Stobie Formation of the Huronian Supergroup. Examples of this type of deposit include the East, Falconbridge, and Garson mines. The ore zones consist of two styles of mineralization including a contorted schist inclusion sulphide and an inclusion massive sulphide. Contorted schist inclusion sulphide is a sulphide breccia containing inclusions of norite and Huronian supracrustal rocks. The ore minerals are pyrrhotite, pentlandite and chalcopyrite. Inclusion massive sulphide contains inclusions of Huronian supracrustal rocks, quartz and jasperoid. This ore type is characterized by, silicified footwall rocks, strong deformation of the mineralization and late cross cutting quartz carbonate fractures with sphalerite, marcasite, and galena indicative of later hydrothermal activity.

## PROPERTY GEOLOGY

The area mapped within Lorne and Nairn Townships consists predominantly of 2.45-2.22 Ga Huronian Supergroup metasedimentary rocks, a thick package of primarily sedimentary rocks (mudstones, carbonates, sandstones and conglomerates). These units are in intrusive contact with a metagabbro of a regionally extensive Nipissing Diabase sill. A segment of the northeast-trending Worthington Quartz Diorite Offset dyke occurs adjacent the metasediment-metagabbro contact in the south portion of the property.

### Quartz diorite

The Worthington Offset, located on the southwest corner of the SIC, is a quartz diorite offset dike that hosts several known Cu-Ni sulphide orebodies (Figure 3). The offset is defined by two separate quartz diorite phases, characterized by their lithic fragments and sulphide inclusions. The first phase of quartz diorite is homogenous, generally devoid of inclusions, and mainly occurs on the margins of the dike. A secondary phase of quartz diorite, which intrudes the first phase, is an inclusion-rich quartz diorite (IQD) with inclusions of quartz diorite and footwall rocks and is generally found at the center of the dike (Hecht et al., 2008). The known Ni-Cu sulphide orebodies are predominantly hosted within the IQD.

### Metasediments

The exposures examined consist primarily of interbedded siltstone, quartzite, arkose and greywacke, with subordinate argillite component of the Espanola Group within the Huronian Supergroup. Bedding ranges from thin laminations to locally very coarse beds greater than 1 m. Overall orientation is northeast striking, moderate to steeply southeast dipping. Foliation and shearing observed trends subparallel bedding and is developed in the siltstone to argillite beds. Quartz and carbonate veinlets parallel bedding are locally developed. Traces of pyrite were observed in one occurrence of sandstone.

### Metagabbro

Exposures consist primarily of fine-grained to medium-grained, dark grey to greenish grey, blocky to felty textured, non-magnetic amphibolitized gabbro. Quartz-amphibole-chlorite alteration ribs are a distinctive feature. Locally coarser grained more leucocratic phases as irregular patches in fine grained massive metagabbro were observed.

## 2022 MAPPING PROGRAM

The mapping program was conducted within Nairn and Lorne townships from October 19$^{th}$ to October 21$^{st}$, 2022, by two GITs (Kyle Dzuirban and Adam Tomini), one Senior Project Geologist (Linette Macinnis) and one Field Technician (Shane O’Neil) for Vale Exploration Canada. The goal of the program was to: a) follow-up on a versatile time domain electromagnetic (VTEM) anomaly identified within the potential continuation of the Worthington Offset to the southwest within the Nairn Township property (figure 4) and, b) follow up on the anomalous PGE metagabbro grab sample collected during the 2001 mapping program at the Lorne Township property. The programs included mapping, prospecting with the use of a beep-mat and grab sample collection. A total of 23 samples were taken and 19 samples were submitted for whole rock geochemistry.

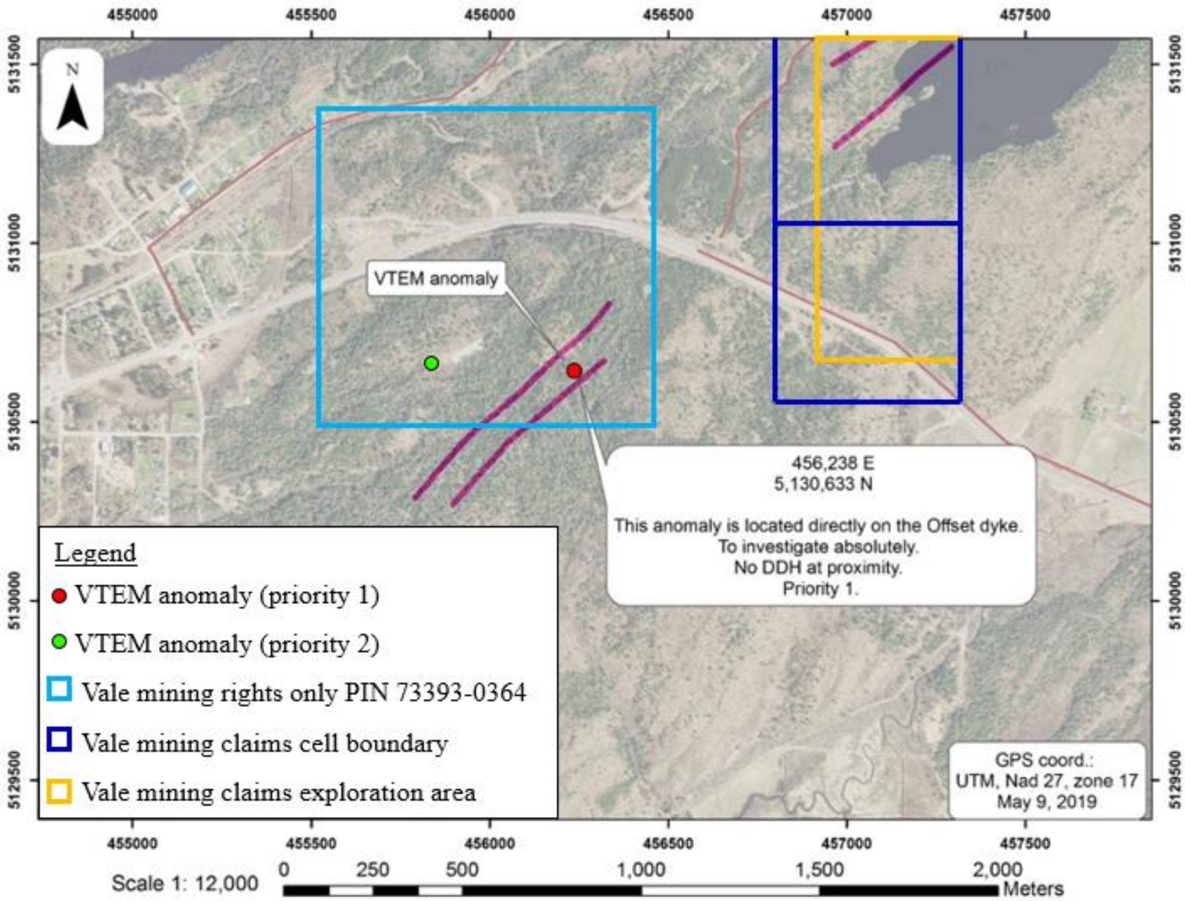



**Figure 4**: Topographic map with the VTEM anomaly and continuation of the Worthington offset.

### Mineralisation

No mineralisation of interest was found during the mapping program. Only trace amount of pyrite occurred in the rocks.

### Geochemistry

Nineteen samples (23 including two standards and two blanks) collected from the mapping program were sent to ALS Canada Limited for whole rock analysis (ME-ICP06), PGM-ICP23 (analyses for Pt, Pd and Au) and ME-ICP61 (33 element four acid ICP-AES) (Figure 5 in appendix IV).

Whole rock analysis uses a lithium borate fusion followed by an XRF and ICP-AES instrument to determine the major-rock forming elements. For these samples, ME-ICP06 is a fused bead acid digestion, followed by ICP-AES.
PGM-ICP23 is the use of fire assay and ICP-AES finish to analyze a 30 g sample of rock for Pd, Pt and Au. ME-ICP61 is the low-grade option for nickel exploration samples where a four acid digestion analyses for 33 elements at 1 ppm (ALS, 2023).

The assay certificate showing the complete results of the analyses are included below in Appendix IV.

## Mapping

A total of 0.25 $km^2$ was mapped within Lorne and Nairn townships. IPad tablets with the ArcGIS Field Maps application was used for the mapping reconnaissance where all lithological mapping, grab sample descriptions, and grab sample data was collected. During the mapping program, solely outcrops of metasedimentary and metagabbroic rocks were identified. The metasedimentary rocks were characterised as a fine grained, thinly bedded, grey, sugary textured unit. The metagabbro was characterised as a medium grained, gray-green, igneous textured, hematite-stained unit with outcrops that appeared silicified.

No quartz diorite was located in the mapping area.

## Beep-mat reconnaissance

Beep-mats are efficient tools that are dragged along the ground to test for magnetic susceptibility and relative electromagnetic conductivity. They are most effective where soil cover is thin or not present. Beep-maps were used within the Nairn township property in an attempt to locate and explain the VTEM anomaly. The beep-mats did not detect any conductive or magnetic material.

## CONCLUSIONS AND RECCOMENDATIONS

The 2022 mapping program failed to locate quartz diorite and grab samples taken did not return anomalous Ni, Cu, or precious metals indicative of offset-style mineralization. The VTEM anomaly remains unexplained and therefore a small 600 m two-line surface EM survey is recommended over the anomaly in Nairn township in order to validate it.

**REFERENCES**

Forget, C. & Dickie, S. (2017). Lorne Township Property Assessment Report. Vale Exploration Canada. *29p*.

Hecht, L., Wittek, A., Riller, U., Mohr, T., Schmitt, R. T., & Grieve, R. A. (2008). Differentiation and emplacement of the Worthington Offset Dike of the Sudbury impact structure, Ontario. *Meteoritics & Planetary Science*, *43*(10), 1659-1679.

Layman, M. (2009). Vale Inco Limited Geophysical survey Lorne Township NTS: 4-I-5. Vale Exploration Canada. *20p*

Makela, E.F. (2001). Inco Limited Reconnaissance Geological Mapping and assaying Lorne Township NTS:41-I-5. Inco Technical Services Limited. *24p.*

Makela, E.F. (2005). Inco Limited Reconnaissance Geological Mapping and assaying Lorne Township NTS: 4-I-5. Inco Technical Services Limited. *27p*

Makela, E.F. (2003). Inco Limited Magnetic Survey Lorne Township NTS:41-I-5. Inco Technical Services Limited. *20p.*

*Certificates of Author Qualifications*

I, Jacqueline Trudel of 77 Brunet Street, Sudbury, Ontario, hereby certify that:

1. I am a 2018 graduate of Laurentian University of Sudbury with a Master of Science (2-year) degree in Geology.

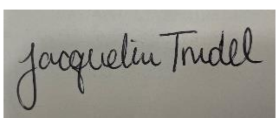
2. I am a professional Geoscientist registered in the province of Ontario with the practising member licence #3517.

3. I have practised in my profession continuously since 2018.

4. I am currently employed as a Sr. Geologist, Project with Vale, 337 Power Street, Copper Cliff, Ontario, P0M 1N0.

5. The work documented in this report was conducted under my direct supervision.

6. I am the author of this report.

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Jacqueline Trudel
May 9th, 2023

**APPENDIX I**
**LIST OF EXPENDITURES**

**Expenditure Summary for 2022**

Costs are applied to the mapping program, which is the project planning and logistics labor from the geologists, geologist-in-training, and the field technicians (outlined in appendix II), the analytical work completed and the transportation rental. The total amount applied is $8,578.18. Details for each category are provided below.

**Table 1**: Expenditures for the 2022 Mapping program

| **Item** | **Cost** |
|---|---|
| 2 x geologist-in-training and 1 x field technician | $4,219.92 |
| 2 x project geologist | $3,000 |
| Assays | $1,097.26 |
| 3 days of truck rental | $261 |
| **Total:** | **$8,578.18** |

**APPENDIX II**
**LIST OF PERSONNEL**

**Table 2:** 2022 Personnel Lorne-Nairn Project

| Geology Personnel | Position | Work | Activity |
|---|---|---|---|
| Jacqueline Trudel | Project geologist | October 2022 /April 2023 | Project logistics, planning and compilation, report writing |
| Linette Macinnis | Project geologist | October 2022 | Field work |
| Kyle Dzuirban | Geologist-in-training | October 2022 | Field work |
| Adam Tomini | Geologist-in-training | October 2022 | Field work |
| | | | |
| **Geotechnical Personnel** | | | |
| Shane O'Neil | Geological technician | October 2022 | Field work |

**APPENDIX III**
**GEOLOGICAL MAP AND ROCK DESCRIPTIONS**

**Table 3:** Abbreviations

| | |
|---|---|
| Au | Gold |
| Cu | Copper |
| EM | Electromagnetic |
| FLT | Fault |
| Ga | Billion years |
| GIT | Geologist-in-training |
| ICP-AES | Inductively coupled plasma atomic emission spectrometry |
| IQD | Inclusions quartz diorite |
| Ma | Million years |
| ME-ICP | Multi-element inductively coupled plasma |
| MTGB | Metagabbro |
| MTSD | Metasediment |
| Ni | Nickel |
| Pd | Palladium |
| PGE | Platinum group elements |
| PGM | Platinum group minerals |
| Pt | Platinum |
| SIC | Sudbury Igneous Complex |
| QD | Quartz diorite |
| QDIA | Quartz Diabase |
| VTEM | Versatile time domain electromagnetic |
| XRF | X-ray fluorescence |

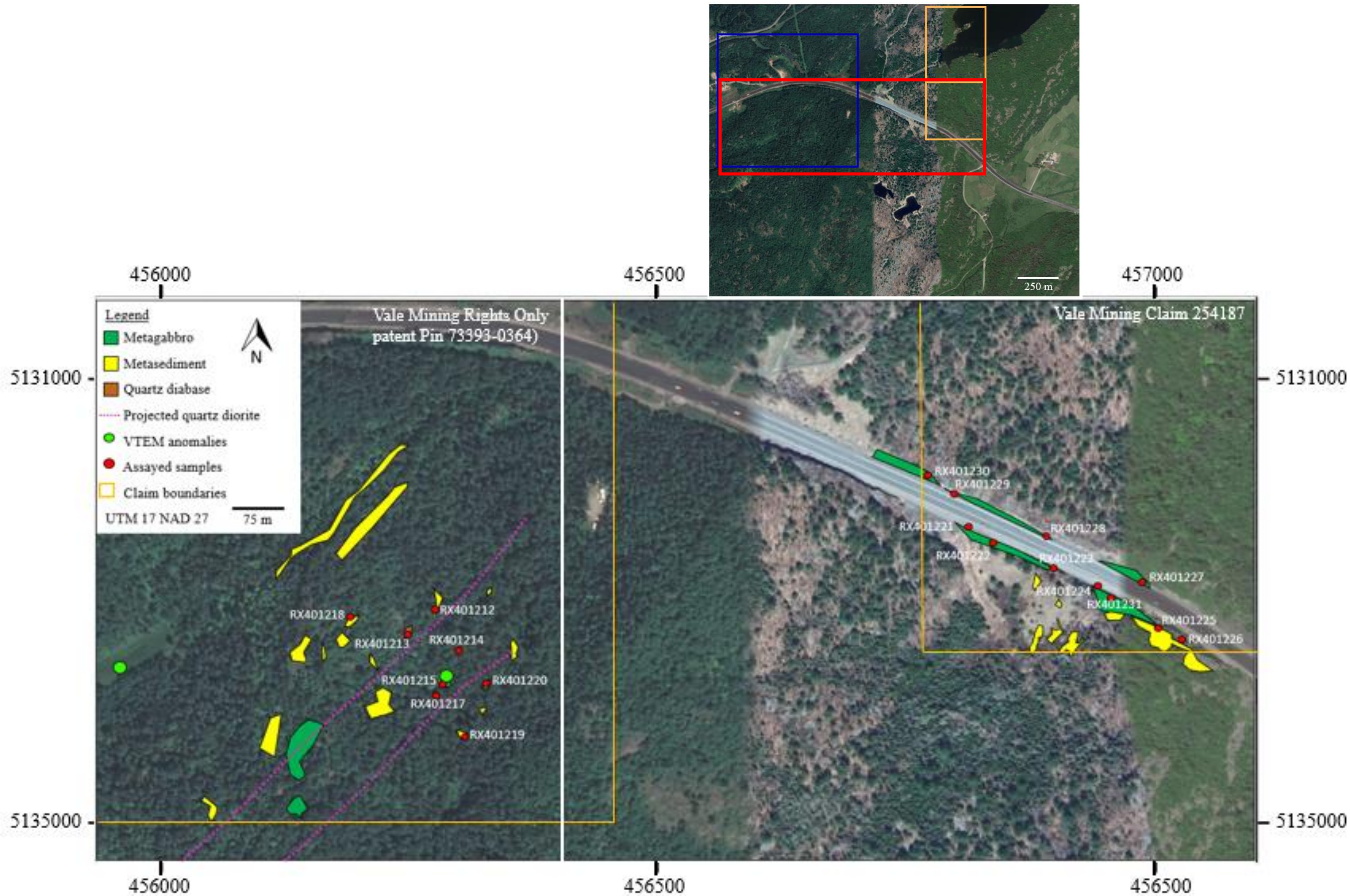


**Figure 5**: Plan view of the mapping area (within the red box) with outcrops mapped out by the field crew and samples collected geochemistry.

**Table 4:** Lorne and Nairn Township Mapping: October 2022 Mapping Observations and Sample Descriptions (UTM NAD 27 Zone 17)

| Station | RX Code | UTM E | UTM N | Rock Code | Structure | Orientation | Mineralisation | Description |
|---|---|---|---|---|---|---|---|---|
| LN-50 | RX401212 | 456239 | 5130945 | MTSD | | | | Fine grained, grey, sugary texture |
| LN-51 | RX401213 | 456210 | 5130923 | QDIA | | | | |
| LN-52 | RX401214 | | | MTSD | | | | |
| LN-53 | RX401215 | 456248 | 5130855 | MTGB | | | | |
| LN-59 | RX401217 | 456241 | 5130842 | MTGB | | | | |
| LN-62 | RX401218 | 456135 | 5130936 | MTSD | | | | Thinly bedded med grey sugary texture nvs |
| LN-67 | RX401219 | | | MTSD | | | | |
| LN-68 | RX401220 | 456302 | 5130855 | MTGB | | | | |
| LN-70 | RX401221 | 456889 | 5131041 | MTGB | | | | |
| LN-70 | | 456888 | 5131040 | MTGB | FLT | 175/80 | | fault zone, ~10m wide. clay gouge throughout |
| LN-72 | RX401222 | | | MTGB | | | | Medium-grained, grey-green, hematite stained, sections of silicified rock along fracture plains |
| LN-73 | RX401223 | | | MTGB | | | | Medium-grained, grey-green, hem stained, igneous texture |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Station** | **RX Code** | **UTM E** | **UTM N** | **Rock Code** | **Structure** | **Orientation** | **Mineralisation** | **Description** |
| LN-74 | RX401224 | 457051 | 5130965 | MTGB | | | | Medium-grained, grey-green, igneous texture |
| LN-75 | RX401225 | 457127 | 5130916 | MTGB | | | | Silicified metagabbro |
| LN-75 | | 457125 | 5130914 | MTGB | FLT | 132/88 | | |
| LN-76 | RX401226 | 457156 | 5130906 | MTSD | | | | Fine-grained, grey, sugary texture |
| LN-77 | RX401227 | 457108 | 5130969 | MTGB | | | | Medium-grained, grey-green, silicified, igneous texture |
| LN-78 | RX401228 | 456992 | 5131025 | MTGB | | | | |
| LN-79 | RX401229 | 456877 | 5131074 | MTGB/OLDI? | | | | |
| | | 456882 | 5131076 | FLT | | 180/85 | | 1.5 m wide fault with clay gouge |
| LN-80 | RX401230 | 456844 | 5131094 | MTGB | | | | Medium-grained, grey-green, igneous texture, hem stained feldspar |
| LN-74 | RX401231 | | | MTGB | | | | Medium-grained, grey-green, igneous (from the same outcrop of the 2001 anomalous sample) |

# APPENDIX IV
# ANALYTICAL RESULTS/ASSAYS

ALS Canada Ltd.

2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: +1 604 984 0221 Fax: +1 604 984 0218
www.alsglobal.com/geochemistry

To: **VALE CANADA LIMITED - NORTH AMERICAN EXPLORATION**
**CLEAN AER PROJECT OFFICE SMELTER COMPLEX**
**18 RINK STREET, BUILDING 517**
**COPPER CLIFF ON P0M 1N0**



## INVOICE NUMBER 6283541

### BILLING INFORMATION

| | |
|---|---|
| Certificate: | **SD23008025** |
| Sample Type: | **Rock** |
| Account: | **ITSNAE** |
| Date: | **27-FEB-2023** |
| Project: | R000454.03.21.01.01 |
| P.O. No.: | |
| Quote: | 1027980 |
| Terms: | **Due on Receipt** C1 |
| Comments: | Sample Drop off on January 10th, 2023 |

| QUANTITY | ANALYSED FOR CODE | - DESCRIPTION | UNIT PRICE | TOTAL |
|---|---|---|---|---|
| 1 | BAT-01 | Administration Fee | 22.54 | 22.54 |
| 21 | PREP-31Y | Crush, Rotary Split, Pulverize | 5.11 | 107.31 |
| 23 | ME_ICP06 | Whole Rock Pkg - ICP-AES w/ LOI | 17.00 | 391.00 |
| 23.33 | PREP-31Y | Weight Charge (kg) - Crush, Rotary Split, Pulverize | 0.55 | 12.83 |
| 2 | LOG-23 | Pulp Login - Rcvd with Barcode | 0.43 | 0.86 |
| 23 | PGM-ICP23 | Pt, Pd, Au 30g FA ICP | 12.60 | 289.80 |
| 23 | ME-ICP61 | 33 element four acid ICP-AES | 8.20 | 188.60 |
| 21.92 | SPL-21X | Weight Charge (kg) - Addnl Crush Split w No Analysis | 0.31 | 6.80 |
| 19 | SPL-21X | Addnl Crush Split w No Analysis | 1.33 | 25.27 |

| | | |
|---|---|---|
| SUBTOTAL (CAD) | $ | 1,045.01 |
| R100938885 GST | $ | 52.25 |
| **TOTAL PAYABLE (CAD)** | **$** | **1,097.26** |

To: **VALE CANADA LIMITED - NORTH AMERICAN EXPLORATION**
ATTN: JACQUELINE TRUDEL
CLEAN AER PROJECT OFFICE SMELTER COMPLEX
18 RINK STREET, BUILDING 517
COPPER CLIFF ON P0M 1N0

Payment may be made by: Cheque or Bank Transfer

| | |
|---|---|
| Beneficiary Name: | ALS Canada Ltd. |
| Bank: | Royal Bank of Canada |
| SWIFT: | ROYCCAT2 |
| Address: | Vancouver, BC, CAN |
| Account: | 003-00010-1001098 |

Please send payment info to accounting.canusa@alsglobal.com

Please Remit Payments To :
**ALS Canada Ltd.**
**2103 Dollarton Hwy**
**North Vancouver BC V7H 0A7**

ALS Canada Ltd.

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Phone: +1 604 984 0221 Fax: +1 604 984 0218
www.alsglobal.com/geochemistry

To: **VALE CANADA LIMITED - NORTH AMERICAN EXPLORATION**
**CLEAN AER PROJECT OFFICE SMELTER COMPLEX**
**18 RINK STREET, BUILDING 517**
**COPPER CLIFF ON P0M 1N0**


**Finalized Date: 27-FEB-2023**
**Account: ITSNAE**

Project: R000454.03.21.01.01

## CERTIFICATE OF ANALYSIS SD23008025

| Sample Description | Method / Analyte / Units / LOD | WEI-21 Recvd Wt. kg 0.02 | CRU-QC Pass2mm % 0.01 | PUL-QC Pass75um % 0.01 | PGM-ICP23 Au oz/ton 0.00003 | PGM-ICP23 Pt oz/ton 0.0001 | PGM-ICP23 Pd oz/ton 0.00003 | ME-ICP06 SiO2 % 0.01 | ME-ICP06 Al2O3 % 0.01 | ME-ICP06 Fe2O3 % 0.01 | ME-ICP06 CaO % 0.01 | ME-ICP06 MgO % 0.01 | ME-ICP06 Na2O % 0.01 | ME-ICP06 K2O % 0.01 | ME-ICP06 Cr2O3 % 0.002 | ME-ICP06 TiO2 % 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RX401212 | | 0.95 | 76.1 | 88.8 | 0.00018 | 0.0004 | 0.00012 | 50.0 | 6.08 | 10.90 | 9.72 | 16.95 | 0.53 | 0.55 | 0.320 | 0.36 |
| RX401213 | | 0.74 | | 91.5 | 0.00006 | 0.0005 | 0.00038 | 50.1 | 14.25 | 15.25 | 9.56 | 5.66 | 2.45 | 0.80 | 0.020 | 1.06 |
| RX401214 | | 0.95 | | | <0.00003 | <0.0001 | <0.00003 | 48.1 | 14.85 | 17.05 | 7.83 | 5.07 | 3.30 | 1.50 | 0.009 | 2.88 |
| RX401215 | | 0.90 | | | 0.00006 | 0.0005 | 0.00032 | 51.3 | 5.47 | 10.35 | 8.37 | 18.65 | 0.67 | 0.17 | 0.349 | 0.30 |
| RX401216 | | 0.07 | | | 0.00499 | 0.0047 | 0.00303 | 49.3 | 16.20 | 12.35 | 7.84 | 5.05 | 2.29 | 2.74 | 1.610 | 1.18 |
| RX401217 | | 1.00 | | | <0.00003 | 0.0005 | 0.00018 | 51.5 | 5.36 | 10.40 | 8.71 | 18.90 | 0.44 | 0.14 | 0.359 | 0.30 |
| RX401218 | | 1.12 | | | <0.00003 | 0.0004 | 0.00020 | 51.9 | 8.98 | 10.95 | 9.00 | 14.40 | 1.30 | 0.45 | 0.233 | 0.47 |
| RX401219 | | 1.30 | | | <0.00003 | 0.0005 | 0.00012 | 52.2 | 4.89 | 10.55 | 9.02 | 19.40 | 0.47 | 0.23 | 0.375 | 0.30 |
| RX401220 | | 1.25 | | | <0.00003 | 0.0006 | 0.00015 | 52.8 | 4.92 | 10.60 | 8.76 | 20.0 | 0.37 | 0.35 | 0.396 | 0.30 |
| RX401221 | | 0.93 | | | <0.00003 | <0.0001 | 0.00020 | 52.1 | 13.80 | 8.96 | 11.95 | 11.25 | 1.44 | 0.44 | 0.113 | 0.38 |
| RX401222 | | 1.07 | | | <0.00003 | 0.0002 | 0.00050 | 51.9 | 13.80 | 7.89 | 5.99 | 10.75 | 2.70 | 2.52 | 0.077 | 0.33 |
| RX401223 | | 1.35 | | | 0.00018 | 0.0008 | 0.00137 | 51.7 | 14.15 | 8.96 | 8.75 | 10.55 | 1.48 | 1.42 | 0.079 | 0.32 |
| RX401233 | | 0.97 | | | <0.00003 | <0.0001 | <0.00003 | 97.8 | 1.10 | 0.56 | 0.03 | 0.05 | 0.19 | 0.20 | 0.010 | 0.03 |
| RX401224 | | 1.23 | | | 0.00102 | 0.0005 | 0.00125 | 50.0 | 13.35 | 13.30 | 9.45 | 8.01 | 2.02 | 0.66 | 0.040 | 0.83 |
| RX401225 | | 1.12 | | | <0.00003 | <0.0001 | 0.00003 | 75.1 | 13.35 | 3.74 | 0.36 | 1.52 | 1.82 | 2.81 | 0.015 | 0.46 |
| RX401226 | | 1.12 | | | <0.00003 | 0.0001 | <0.00003 | 82.2 | 9.19 | 2.06 | 0.15 | 0.73 | 1.23 | 2.81 | 0.013 | 0.27 |
| RX401232 | | 0.07 | | | 0.00604 | 0.0519 | 0.0256 | 47.5 | 13.65 | 10.65 | 7.57 | 14.45 | 1.39 | 0.60 | 1.480 | 0.44 |
| RX401227 | | 1.20 | | | 0.00006 | 0.0004 | 0.00029 | 53.8 | 14.95 | 12.75 | 8.31 | 4.78 | 1.73 | 0.97 | 0.009 | 1.04 |
| RX401228 | | 1.15 | | | 0.00003 | 0.0002 | 0.00044 | 51.8 | 15.35 | 10.30 | 10.25 | 7.42 | 2.05 | 0.50 | 0.031 | 0.61 |
| RX401229 | | 2.13 | | | <0.00003 | 0.0002 | 0.00020 | 51.5 | 13.95 | 9.00 | 11.85 | 10.70 | 1.53 | 0.35 | 0.120 | 0.42 |
| RX401230 | | 1.24 | | | <0.00003 | 0.0002 | 0.00018 | 48.7 | 12.70 | 9.80 | 9.18 | 12.25 | 1.50 | 0.76 | 0.144 | 0.35 |
| RX401234 | | 0.94 | | | <0.00003 | <0.0001 | <0.00003 | 97.5 | 1.17 | 0.69 | 0.05 | 0.07 | 0.23 | 0.19 | 0.011 | 0.03 |
| RX401231 | | 0.67 | | | 0.00006 | 0.0004 | 0.00044 | 48.2 | 13.55 | 13.20 | 9.97 | 7.47 | 1.58 | 0.64 | 0.017 | 1.03 |

Comments: Sample Drop off on January 10th, 2023

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To: VALE CANADA LIMITED - NORTH AMERICAN EXPLORATION
CLEAN AER PROJECT OFFICE SMELTER COMPLEX
18 RINK STREET, BUILDING 517
COPPER CLIFF ON P0M 1N0


Finalized Date: 27-FEB-2023
Account: ITSNAE

Project: R000454.03.21.01.01

# CERTIFICATE OF ANALYSIS SD23008025

| Sample Description / Method | ME-ICP06 | ME-ICP06 | ME-ICP06 | ME-ICP06 | OA-GRA05 | TOT-ICP06 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analyte | MnO | P2O5 | SrO | BaO | LOI | Total | Ag | Al | As | Ba | Be | Bi | Ca | Cd | Co |
| Units | % | % | % | % | % | % | ppm | % | ppm | ppm | ppm | ppm | % | ppm | ppm |
| LOD | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.5 | 0.01 | 5 | 10 | 0.5 | 2 | 0.01 | 0.5 | 1 |
| RX401212 | 0.18 | 0.03 | <0.01 | 0.01 | 2.61 | 98.24 | <0.5 | 3.22 | <5 | 100 | <0.5 | <2 | 6.86 | <0.5 | 62 |
| RX401213 | 0.21 | 0.15 | 0.02 | 0.03 | 1.02 | 100.58 | <0.5 | 7.50 | <5 | 290 | 0.6 | <2 | 6.79 | <0.5 | 52 |
| RX401214 | 0.21 | 0.61 | 0.04 | 0.07 | 0.10 | 101.62 | <0.5 | 7.69 | <5 | 690 | 1.5 | <2 | 5.50 | <0.5 | 49 |
| RX401215 | 0.19 | 0.02 | 0.01 | <0.01 | 3.34 | 99.19 | <0.5 | 2.90 | 7 | 40 | <0.5 | <2 | 6.02 | <0.5 | 67 |
| RX401216 | 0.17 | 0.42 | 0.07 | 0.08 | 1.15 | 100.45 | 0.8 | 8.48 | 57 | 720 | 1.7 | 5 | 5.70 | <0.5 | 76 |
| RX401217 | 0.18 | 0.02 | 0.01 | <0.01 | 2.93 | 99.25 | <0.5 | 2.80 | <5 | 40 | <0.5 | 3 | 6.16 | <0.5 | 65 |
| RX401218 | 0.19 | 0.04 | 0.01 | 0.01 | 2.62 | 100.55 | <0.5 | 4.68 | 6 | 120 | <0.5 | 2 | 6.24 | <0.5 | 59 |
| RX401219 | 0.20 | 0.02 | <0.01 | 0.01 | 2.74 | 100.41 | <0.5 | 2.58 | <5 | 50 | <0.5 | 2 | 6.28 | <0.5 | 69 |
| RX401220 | 0.19 | 0.01 | 0.01 | 0.01 | 2.80 | 101.52 | <0.5 | 2.60 | <5 | 60 | <0.5 | <2 | 6.12 | <0.5 | 69 |
| RX401221 | 0.16 | 0.02 | 0.02 | 0.01 | 1.31 | 101.95 | <0.5 | 7.14 | <5 | 70 | <0.5 | <2 | 8.24 | <0.5 | 50 |
| RX401222 | 0.14 | 0.03 | 0.01 | 0.04 | 3.13 | 99.31 | <0.5 | 7.20 | 112 | 310 | <0.5 | <2 | 4.15 | <0.5 | 70 |
| RX401223 | 0.15 | 0.02 | 0.03 | 0.02 | 2.78 | 100.41 | <0.5 | 6.85 | 39 | 160 | <0.5 | <2 | 6.08 | <0.5 | 56 |
| RX401233 | 0.01 | 0.01 | <0.01 | <0.01 | 0.27 | 100.26 | <0.5 | 0.58 | <5 | 10 | <0.5 | <2 | 0.03 | <0.5 | <1 |
| RX401224 | 0.19 | 0.06 | 0.02 | 0.01 | 1.67 | 99.61 | <0.5 | 6.87 | 9 | 110 | 0.5 | 2 | 6.41 | <0.5 | 54 |
| RX401225 | 0.03 | 0.05 | 0.02 | 0.09 | 1.89 | 101.26 | <0.5 | 6.70 | <5 | 750 | 1.4 | <2 | 0.26 | 12.4 | 19 |
| RX401226 | 0.02 | 0.03 | 0.01 | 0.07 | 1.27 | 100.05 | <0.5 | 4.78 | 5 | 670 | 0.9 | 4 | 0.12 | 11.1 | 15 |
| RX401232 | 0.16 | 0.11 | 0.04 | 0.02 | 1.36 | 99.42 | <0.5 | 7.00 | <5 | 190 | 0.5 | <2 | 5.13 | <0.5 | 86 |
| RX401227 | 0.18 | 0.10 | 0.02 | 0.02 | 0.93 | 99.59 | <0.5 | 7.34 | 6 | 220 | 0.9 | <2 | 5.87 | <0.5 | 47 |
| RX401228 | 0.16 | 0.05 | 0.03 | 0.01 | 1.61 | 100.17 | <0.5 | 7.92 | <5 | 90 | <0.5 | 2 | 7.23 | <0.5 | 46 |
| RX401229 | 0.15 | 0.03 | 0.02 | 0.01 | 0.85 | 100.48 | <0.5 | 7.09 | <5 | 70 | <0.5 | 2 | 8.14 | <0.5 | 47 |
| RX401230 | 0.16 | 0.06 | 0.02 | 0.02 | 3.26 | 98.90 | <0.5 | 6.35 | <5 | 140 | <0.5 | 2 | 6.22 | <0.5 | 50 |
| RX401234 | 0.01 | 0.01 | <0.01 | <0.01 | 0.36 | 100.32 | <0.5 | 0.63 | <5 | 10 | <0.5 | <2 | 0.04 | <0.5 | 1 |
| RX401231 | 0.18 | 0.06 | 0.02 | 0.01 | 3.17 | 99.10 | <0.5 | 7.13 | 60 | 110 | <0.5 | 2 | 6.91 | <0.5 | 73 |

Comments: Sample Drop off on January 10th, 2023

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To: **VALE CANADA LIMITED - NORTH AMERICAN EXPLORATION**
**CLEAN AER PROJECT OFFICE SMELTER COMPLEX**
**18 RINK STREET, BUILDING 517**
**COPPER CLIFF ON P0M 1N0**


**Finalized Date: 27-FEB-2023**
**Account: ITSNAE**

Project: R000454.03.21.01.01

## CERTIFICATE OF ANALYSIS SD23008025

| Sample Description | Method / Analyte / Units / LOD | ME-ICP61 Cr ppm 1 | ME-ICP61 Cu ppm 1 | ME-ICP61 Fe % 0.01 | ME-ICP61 Ga ppm 10 | ME-ICP61 K % 0.01 | ME-ICP61 La ppm 10 | ME-ICP61 Li ppm 10 | ME-ICP61 Mg % 0.01 | ME-ICP61 Mn ppm 5 | ME-ICP61 Mo ppm 1 | ME-ICP61 Na % 0.01 | ME-ICP61 Ni ppm 1 | ME-ICP61 P ppm 10 | ME-ICP61 Pb ppm 2 | ME-ICP61 S % 0.01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RX401212 | | 1545 | 62 | 7.32 | 10 | 0.46 | <10 | 10 | 10.45 | 1315 | 1 | 0.39 | 361 | 140 | 7 | <0.01 |
| RX401213 | | 106 | 186 | 10.25 | 20 | 0.67 | 10 | 10 | 3.37 | 1555 | 1 | 1.85 | 82 | 630 | 8 | 0.07 |
| RX401214 | | 53 | 68 | 11.25 | 30 | 1.23 | 30 | 10 | 2.95 | 1530 | 1 | 2.41 | 60 | 2560 | 4 | 0.13 |
| RX401215 | | 1680 | 39 | 7.04 | 10 | 0.14 | <10 | 10 | 11.55 | 1380 | <1 | 0.50 | 384 | 100 | <2 | 0.01 |
| RX401216 | | 9460 | 2440 | 8.33 | 20 | 2.34 | 30 | 20 | 2.98 | 1230 | 9 | 1.66 | 2380 | 1900 | 20 | 1.18 |
| RX401217 | | 1710 | 15 | 6.92 | 10 | 0.11 | <10 | 10 | 11.50 | 1275 | <1 | 0.32 | 392 | 80 | <2 | 0.01 |
| RX401218 | | 1050 | 61 | 7.41 | 10 | 0.37 | <10 | 20 | 8.62 | 1375 | <1 | 0.96 | 282 | 160 | <2 | 0.01 |
| RX401219 | | 1780 | 33 | 7.17 | 10 | 0.20 | <10 | 10 | 11.85 | 1450 | <1 | 0.35 | 412 | 80 | 3 | 0.01 |
| RX401220 | | 1775 | 20 | 7.24 | 10 | 0.29 | <10 | 10 | 12.25 | 1415 | 1 | 0.28 | 434 | 60 | <2 | <0.01 |
| RX401221 | | 494 | 56 | 6.08 | 10 | 0.37 | <10 | 10 | 6.67 | 1160 | <1 | 1.07 | 233 | 120 | 5 | 0.02 |
| RX401222 | | 352 | 196 | 5.40 | 10 | 2.06 | <10 | 20 | 6.42 | 1055 | <1 | 1.95 | 308 | 110 | 11 | 0.03 |
| RX401223 | | 344 | 456 | 6.01 | 10 | 1.16 | <10 | 20 | 6.13 | 1110 | <1 | 1.10 | 319 | 90 | 7 | 0.06 |
| RX401233 | | 56 | 3 | 0.40 | <10 | 0.16 | 10 | <10 | 0.03 | 42 | 5 | 0.13 | 4 | 20 | <2 | 0.02 |
| RX401224 | | 195 | 9 | 8.98 | 20 | 0.53 | 10 | 20 | 4.62 | 1405 | 1 | 1.47 | 143 | 260 | 6 | 0.01 |
| RX401225 | | 94 | 34 | 2.50 | 20 | 2.39 | 30 | 20 | 0.87 | 253 | 3 | 1.33 | 38 | 250 | 65 | 0.13 |
| RX401226 | | 69 | 36 | 1.44 | 10 | 2.38 | 20 | 10 | 0.43 | 155 | 3 | 0.92 | 24 | 140 | 55 | 0.10 |
| RX401232 | | 7250 | 409 | 7.15 | 10 | 0.48 | 10 | 10 | 8.58 | 1145 | 1 | 0.99 | 1240 | 480 | 10 | 0.20 |
| RX401227 | | 54 | 139 | 8.68 | 20 | 0.78 | 10 | 20 | 2.73 | 1355 | 1 | 1.30 | 71 | 450 | 14 | 0.07 |
| RX401228 | | 149 | 101 | 7.08 | 20 | 0.41 | 10 | 20 | 4.38 | 1225 | <1 | 1.55 | 133 | 250 | 9 | 0.03 |
| RX401229 | | 516 | 60 | 6.08 | 10 | 0.30 | <10 | 10 | 6.26 | 1110 | <1 | 1.14 | 221 | 140 | 5 | 0.02 |
| RX401230 | | 614 | 160 | 6.61 | 10 | 0.63 | <10 | 40 | 7.08 | 1110 | <1 | 1.09 | 253 | 240 | 5 | 0.03 |
| RX401234 | | 66 | 2 | 0.48 | <10 | 0.16 | 10 | <10 | 0.04 | 56 | 5 | 0.16 | 6 | 30 | <2 | 0.01 |
| RX401231 | | 91 | 36 | 9.06 | 20 | 0.53 | 10 | 20 | 4.36 | 1390 | <1 | 1.21 | 121 | 260 | 5 | 0.02 |

Comments: Sample Drop off on January 10th, 2023

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To: VALE CANADA LIMITED - NORTH AMERICAN EXPLORATION
CLEAN AER PROJECT OFFICE SMELTER COMPLEX
18 RINK STREET, BUILDING 517
COPPER CLIFF ON P0M 1N0


Finalized Date: 27-FEB-2023
Account: ITSNAE

Project: R000454.03.21.01.01

## CERTIFICATE OF ANALYSIS SD23008025

| Sample Description / Method | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 | ME-ICP61 |
|---|---|---|---|---|---|---|---|---|---|---|
| Analyte | Sb | Sc | Sr | Th | Ti | Tl | U | V | W | Zn |
| Units | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm | ppm | ppm |
| LOD | 5 | 1 | 1 | 20 | 0.01 | 10 | 10 | 1 | 10 | 2 |
| RX401212 | <5 | 42 | 19 | <20 | 0.19 | <10 | <10 | 240 | <10 | 74 |
| RX401213 | <5 | 39 | 194 | <20 | 0.61 | <10 | <10 | 296 | <10 | 144 |
| RX401214 | <5 | 29 | 365 | <20 | 1.61 | <10 | <10 | 239 | <10 | 153 |
| RX401215 | <5 | 41 | 39 | <20 | 0.16 | <10 | <10 | 235 | <10 | 74 |
| RX401216 | <5 | 26 | 568 | <20 | 0.66 | <10 | <10 | 327 | <10 | 139 |
| RX401217 | <5 | 41 | 24 | <20 | 0.15 | <10 | <10 | 236 | <10 | 67 |
| RX401218 | <5 | 37 | 99 | <20 | 0.21 | <10 | <10 | 219 | <10 | 72 |
| RX401219 | <5 | 42 | 35 | <20 | 0.17 | <10 | <10 | 240 | <10 | 67 |
| RX401220 | <5 | 44 | 23 | <20 | 0.17 | <10 | <10 | 249 | <10 | 75 |
| RX401221 | <5 | 35 | 167 | <20 | 0.21 | <10 | <10 | 221 | <10 | 63 |
| RX401222 | <5 | 33 | 94 | <20 | 0.18 | <10 | <10 | 195 | <10 | 75 |
| RX401223 | <5 | 31 | 247 | <20 | 0.17 | <10 | <10 | 254 | <10 | 71 |
| RX401233 | <5 | <1 | 7 | <20 | 0.01 | <10 | <10 | 3 | <10 | <2 |
| RX401224 | <5 | 35 | 191 | <20 | 0.46 | <10 | <10 | 239 | <10 | 92 |
| RX401225 | <5 | 9 | 170 | 20 | 0.26 | <10 | 10 | 68 | <10 | 2040 |
| RX401226 | <5 | 5 | 78 | 20 | 0.16 | <10 | 10 | 35 | <10 | 1470 |
| RX401232 | <5 | 20 | 281 | <20 | 0.24 | <10 | <10 | 181 | <10 | 97 |
| RX401227 | <5 | 29 | 184 | <20 | 0.60 | <10 | <10 | 201 | <10 | 106 |
| RX401228 | <5 | 30 | 211 | <20 | 0.35 | <10 | <10 | 202 | <10 | 74 |
| RX401229 | <5 | 32 | 149 | <20 | 0.24 | <10 | <10 | 209 | <10 | 59 |
| RX401230 | <5 | 32 | 171 | <20 | 0.19 | <10 | <10 | 215 | <10 | 76 |
| RX401234 | <5 | 1 | 8 | <20 | 0.01 | <10 | <10 | 4 | <10 | 2 |
| RX401231 | <5 | 43 | 223 | <20 | 0.61 | <10 | <10 | 288 | <10 | 90 |

Comments: Sample Drop off on January 10th, 2023