# Technical Report Summarizing Exploration Work on the JOY Project, Toodoggone Region, British Columbia, Canada

## National Instrument 43-101 Technical Report

Prepared for:

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Revision 1

# Table of Contents

## List of Figures

## List of Tables



## Table of Elements

| Element | Name | Element | Name | Element | Name | Element | Name |
|---|---|---|---|---|---|---|---|
| Al ($Al_2O_3$) | Aluminum | Eu | Europium | Nd | Neodymium | Ta | Tantalum |
| Ag | Silver | Fe ($Fe_2O_3$) | Iron | P ($P_2O_5$) | Phosphorus | Tb | Terbium |
| As | Arsenic | Ga | Gallium | Pb | Lead | Ti ($TiO_2$) | Titanium |
| Au | Gold | Gd | Gadolinium | Pd | Palladium | Th | Thorium |
| Ba (BaO) | Barium | Hf | Hafnium | Pt | Platinum | Tm | Thulium |
| Bi | Bismuth | Ho | Holmium | Pr | Praseodymium | U | Uranium |
| C | Carbon | K ($K_2O$) | Potassium | Rb | Rubidium | V | Vanadium |
| Ca (CaO) | Calcium | La | Lanthanum | Re | Rhenium | W | Tungsten |
| Ce | Cerium | Lu | Lutetium | S | Sulphur | Y | Yttrium |
| Cr ($Cr_2O_3$) | Chromium | Mg (MgO) | Magnesium | Si ($SiO_2$) | Silicon | Yb | Ytterbium |
| Cs | Cesium | Mn (MnO) | Manganese | Sm | Samarium | Zn | Zinc |
| Cu | Copper | Mo | Molybdenum | Sb | Antimony | Zr | Zirconium |
| Dy | Dysprosium | Na ($Na_2O$) | Sodium | Sn | Tin | | |
| Er | Erbium | Nb | Niobium | Sr (SrO) | Strontium | | |

## List of Units and Abbreviations

| Abbreviation | Unit or Description |
|---|---|
| AAS | Atomic absorption spectrometry (geochemical analysis) |
| AES | Atomic emission spectrometry (geochemical analysis) |
| AR | Aqua Regia, a mixture of hydrochloric and nitric acid (geochemical analysis) |
| AR-MS(UT1) | Aqua Regia Mass Spectrometry (Ultratrace) (geochemical analysis) |
| ARIS | Assessment report index system (British Columbia government) |
| ASL | Above sea level (elevation reference point) |
| BC | British Columbia, Canada |
| BCGS | BC Geological Survey |
| BCGS-RGS | BC Geological Survey Regional Geochemical Survey |
| BLIS | Black Lake Intrusive Suite (lithologies) |
| BQ | Drill core size (3.64 centimetre diameter) |
| cm | Centimetre |
| $cm^2$ | Square centimetre |
| $cm^3$ | Cubic centimetre |
| CIM | Canadian Institute of Mining, Metallurgy and Petroleum |
| CuEQ | Copper Equivalent |
| ° | Degrees (angle) |
| °C | Degrees Celsius |
| FA | Fire assay (precious metal geochemical analysis) |
| FA-ICP | Fire assay with ICP finish (geochemical analysis) |
| Fm | Formation (geology) |
| FSR | Forest service road |
| GBC | Geoscience BC (Government Geoscience Agency) |
| g | Gram |
| g/t | Grams per tonne |
| > | Greater than |
| ≥ | Greater than or equal to |
| Ha | Hectare (10,000 $m^2$) |
| HQ | Drill core size  (6.3 cm diameter) |
| IP | Induced Polarization (geophysical survey) |
| ICP[-MS] | Inductively coupled plasma  [mass spectrometry] (geochemical analysis) |
| IC-OES | Inductively coupled optical emission spectrometry |
| INAA | Instrumental neutron activation analysis (geochemical analysis) |
| K-Ar | Potassium argon (geochronology) |
| km | Kilometre |
| $km^2$ | Square kilometre |
| lb | Pound (weight) |
| < | Less than |
| ≤ | Less than or equal to |
| l | Litre |
| LDL | Lower Detection Limit |
| m | Metre |
| $m^2$ | Square metre |
| $m^3$ | Cubic metre |
| Ma | Mass in air (density measurement) |
| Ma | Millions of years ago (geochronology) |
| Mt | Million tonnes |

| Abbreviation | Unit or Description |
|---|---|
| Mw | Mass in water (density measurement) |
| µm | Micron |
| MDRU | Mineral Deposits Research Unit (UBC) |
| MEMPR | Ministry of Mines, Energy and Petroleum Resources (BC Government) |
| mm | Millimetre |
| ‘ | Minute (plane angle) |
| min | Minute (time) |
| MS | Mass spectrometry (geochemical analysis) |
| NAA | Neutron activation analysis (geochemical analysis) |
| NAD | North American datum (mapping) |
| NI | National Instrument (43-101) |
| NQ | Drill core size (4.76 centimetre diameter) |
| NSR | Net smelter return |
| NTS | National topographic system (map sheets in Canada) |
| OES | Optical emission spectrometry (geochemical analysis) |
| oz | Troy ounce |
| ± | Plus or minus (above or below) |
| % | Percent |
| ppb | Parts per billion |
| ppm | Parts per million |
| QAQC | Quality assurance / quality control |
| QP | Qualified Person (defined by NI 43-101) |
| SG | Specific gravity (density) |
| SQL | Structured query language (database) |
| SWIR | Short wave infra-red (spectroscopy) |
| RQD | Rock quality designation (geotechnical) |
| 3D | Three dimensional |
| t | Tonne (1,000 kg) |
| t/d | Tonnes per day |
| TD-ICP | Actlabs analytical laboratory method code (geochemical analysis) |
| TMI | Intensity of the total magnetic field (geophysics) |
| UTEM | University of Toronto electromagnetic system (geophysics) |
| UTM | Universal transverse Mercator (mapping) |
| XRF | X-ray Fluorescence (geochemical analysis) |

# 1.0 Executive Summary

## *1.1 Property Description, Location and Ownership*

The 482 km$^2$ JOY project (the "JOY Project", the "Project" or "JOY") is located 310 km north of Mackenzie and 265 km north-northeast of Smithers in northern BC. The Project is 100% owned and operated by Amarc Resources Ltd. ("Amarc").

Situated in the Toodoggone region, an area considered to have high potential for the discovery of additional porphyry Cu-Au deposits, the JOY Project is considered to be the northern extension of the Kemess porphyry Cu-Au district ("Kemess District"), with the southern part of the District held by Centerra Gold Inc. ("Centerra"). The Kemess District includes the former Kemess South Cu-Au mine, the government-approved Kemess Underground Project and the advanced stage Kemess East deposit. Areas of the JOY Project are accessible northwards along the same Omineca Resource Road used to access Centerra's deposits and also the Baker and Lawyers Au-Ag projects, via various resource gravel roads.

## *1.2 Geology and Mineralization*

The geology of the Toodoggone region mainly comprises Upper Triassic to Lower Jurassic Hazelton Group Toodoggone Fm volcanic and sedimentary rocks, which unconformably overlie submarine island-arc volcanic and sedimentary rocks of the Lower Permian Asitka Group ("Asitka") and Middle Triassic Takla Group ("Takla"). In certain areas the Takla rocks are intruded by Upper Triassic to Lower Jurassic plutons and dykes of the Black Lake Intrusive Suite ("BLIS").

At JOY, the Late Triassic Giegerich quartz monzonite intrudes both the Asitka and Takla Groups. Early Jurassic Jock Creek monzonite and other BLIS plutons also intrude the Toodoggone Fm (Duncan and Metsantan members). These plutons manifest in the central-western part of the Project as small stocks and dykes that intrude the Duncan and Metsantan member rocks at shallow depths. In the northeast of JOY, erosion has exposed the Takla Group basalt and andesite flows that unconformably underlie Duncan member volcaniclastic-epiclastic rocks, which are intruded by the Jock Creek monzonite pluton. Elsewhere on the JOY Project, the prospective Takla Group units have been mapped in the central, northwestern and southwestern areas. They are also postulated to be at depth below the Toodoggone Fm including below deposit targets such as PINE. Importantly, a large and underexplored area of Takla occurs as a fault bound, northwesterly trending block extending from the SW Takla target to the northwest of the Project. This occurrence of Takla on the JOY is considered to be the direct extension of that in the southern area of the Kemess District, which in part hosts the Kemess South and Kemess North deposits.

The northwest-trending Black Fault and related splays bisect the central area of the JOY Project. These faults and other northwesterly, northerly and northeasterly striking faults form horst and graben fault-bounded blocks that host swarms of parallel monzonite, basalt and younger latite dykes and have been active conduits over time. The monzonite dykes and dyke swarms are locally proximal to and associated with Cu-Au mineralization, as at the Brenda porphyry target (located just to the north of the JOY Project). Similar mineralized 202 Ma dykes also occur in mineralized Takla volcanic rocks lying above the Kemess North stock, which in part hosts the Kemess Underground and Kemess East deposits. Numerous large gossans mark the location of extensive hydrothermal alteration zones, such as at the MEX, Northwest Breccia ("NWB') and NUB West occurrences at the JOY Project.

Historical drilling at the PINE-TREE-FIN deposit on the JOY has confirmed the presence of a large auriferous porphyry Cu system. The main host to porphyry-style Cu-Au mineralization is a potassically altered porphyritic quartz monzonite / monzodiorite, which also intrudes, alters, and locally mineralizes adjacent Duncan Member rocks of the Toodoggone Fm. Historical drilling mainly tested the uppermost parts of the deposit (most holes < 250 m in length with the majority of drill holes at the PINE deposit recording < 175 m vertical penetration), with many of the holes ending in mineralization while some display increased Cu-Au with depth. Mineralization appears to be open both laterally and to depth.

In preparation of this report, a compilation of historical data from the JOY Project was reviewed during which it was noted that successive companies refer to the specific area in which they were drilling, as the PINE, TREE or FIN targets. There were no defined boundaries established between these areas and there is considerable overlap from one to another. In a general geographic sense, the distribution of drill holes extends from PINE in the southwest to TREE, and on to FIN in the northeast. From review of compiled historical drill hole geological and assay data (principally metal associations and alteration characteristics), it is apparent that the historical drilling was within a single large northeast-trending altered and mineralized porphyry Cu hydrothermal system. Thus, in this report the porphyry prospect as a whole will be referred to as PINE whereas specific magnetic or other unique features with apparent boundaries may referenced PINE, TREE or FIN areas.

## *1.3 Exploration*

The JOY Project hosts a number of porphyry Cu-Au targets that have been explored by historical geological, geochemical and geophysical surveys and drilling over several decades. Since 2016, Amarc has compiled and verified available results for both these surveys and the drilling from sources such as assessment reports and other government databases, and internal company reports and their digital databases utilising the data to assess the potential for porphyry Cu-Au deposits. There are, however, some limitations to the datasets. For example, with respect to the geochemical data and the analytical techniques used over the years, some important elements were not always analysed for, supporting assays certificates were not always included in the reports, locations of samples or drill hole collars were not always surveyed or are uncertain, and there are some gaps in coverage. The verified historical data is considered to be good for exploration targeting, however, additional verification work is necessary prior to moving the Project towards advanced stage studies.

From 2016 - 2018, Amarc focused on early stage geophysical, geochemical and geological mapping exploration surveys with limited follow up drilling on a few initial targets. In total Amarc collected 3,934 new soil samples during the period 2016 - 2018, which greatly enhanced the regional soil coverage over the Project. Amarc has completed geological and alteration mapping over an area encompassing the northwest and southeast sides of the Finlay River, this area includes not only the PINE deposit and MEX deposit targets, but also several new IP and multiple element soil geochemical anomalies. Amarc also completed two new extensive airborne magnetic surveys in 2017 and 2018 to improve the resolution of the dataset, and extend survey areas outside the zones surveyed by historical workers. Amarc's IP surveys were designed to cover multi-element soil geochemical anomalies and other areas deemed prospective on both the northwest and southeast sides of the Finlay River in the general region of PINE and MEX (Figure 9-13). The 112 line km of surveys completed by Amarc to date varies in line spacing from 100 m to 800 m, with a 50 m to 100 m a-spacing and N1 to N10 measurements. This work, combined with historical data, has identified a number of important porphyry-Cu deposit targets for future exploration, including most specifically drill testing.

## *1.5 Conclusions and Recommendations*

The detailed compilation and verification of historical exploration data and its on-going integration with Amarc's survey data has added significantly to Amarc's exploration programs. This invaluable information gathered from historical geochemical, geophysical and geological mapping surveys and drilling programs, drove initial target identification for ground follow-up, and has in many cases continued to assist Amarc's on-going target delineation and refinement.

Historical drilling at PINE confirms the presence of a northeast-trending, 2,500 m-long, auriferous porphyry Cu system that remains open to expansion laterally and to depth. The mainly shallow historical drilling is typically restricted to the uppermost parts of the deposit with many holes ending in mineralization, and some displaying an increase in Cu-Au-Ag concentrations towards the end of the hole. In addition, none of the historical holes penetrated to the depth of the important underlying, prospective unconformity between the Late Triassic-Early Jurassic rocks (around 201.3 Ma). Kemess South and the 5 km-long northeast-trending Kemess North cluster of deposits, like many of the deposits in the Golden Triangle, such as Red Chris mine are at or near this unconformity feature. More expansive drilling is required at PINE both as lateral step-outs and to depth to locate the Takla Group mafic volcanic rocks, which are known to be particularly receptive to mineralizing hydrothermal fluids, and also potentially mineralized Toodoggone units.

The PINE deposit has a number of targets that are ready for drill testing. Many of the historical drill holes intersected interesting Cu and Au grades. Cu-Au mineralization appears to remain open both laterally (PINE Extension) and to depth below most of the historical drilling. Untested areas of high IP chargeability and/or surficial geochemistry lie between the widely-spaced historical holes and laterally away from the core area (e.g. HGA). Re-logging the historical drill core would provide a better geological framework to put the historical work into context, enable 3D modelling of the deposit, and facilitate a better planned drill delineation program to evaluate the deposit.

The MEX area which lies 3 km east of PINE includes both the MEX deposit target and the MEX Cluster of exploration targets that are recommended for early drilling. Widely-spaced historical drilling at the MEX deposit target indicates that the system remains open both laterally under cover and to depth. Re-logging of historical core and further drilling is required to test these targets.

The MEX Cluster, located between and adjacent to both the PINE and MEX hydrothermal systems, comprises the West MEX, North MEX, More MEX and HGA targets. Geochemical, geophysical and mapping surveys have defined coincident anomalies which are recommended for early drill testing.

At Canyon South, located in the south central part of the Project, the 1 km wide high-contrast >28 mV/V core of a 2 km-wide > 18 mV/V IP chargeability anomaly closely coincides with a 500 m diameter magnetic high that is possibly related to an unidentified porphyry stock. Notably on the periphery of the Canyon South target, located on opposite sides of the open 2 km wide IP chargeability anomaly, historical drill hole PIN09-15 encountered 11.43 g/t Au over 3 m (197.0 m to 200.0 m), and historical drill hole MEX12-013 recorded 0.05% Cu and 0.18 g/t Au over 62.3 m (13.73 m to 76.0 m). Such an occurrence of Au±Cu could be related to the outer regions of a porphyry system. A new IP survey to expand on the historical IP, possibly with accompanying soil geochemistry, is required to define the full extent of the chargeability anomaly at Canyon South in preparation for drill testing.

At Twins, located in the south-central area of the Project, a magnetic high at an interpreted extensional dilation jog in a northwest-trending positive magnetic lineament, lies within a >2.5 $km^2$, >20 mV/V IP chargeability anomaly with two internal 400 m diameter cores of >25 mV/V and 28 mV/V. This IP chargeability anomaly is open to the east and south, and a new IP survey is required to define the full extent of the chargeability anomaly in preparation for drill testing.

The SW Takla target area in the south central part of the Project has Cu and Au geochemical anomalies coincident with a magnetic high, and requires IP surveying to assist in the definition of potential drill targets.

IP anomalies with coincident geochemical anomalies occur on the northwest side of the Finlay River, in the central part of the Project. This target area, called North Finlay, encompasses several targets i.e. Northwest Breccia ("NWB"), Ryan, and an unnamed geochemical and IP coincident anomaly to the north of the region; all of these targets are of sufficient quality to warrant drill testing.

The recommended Phase 1 exploration program is designed to drill test certain target areas (Figure 18-1), and complete low-cost surface exploration work to efficiently bring additional earlier stage targets to a drill ready status. It is designed to test up to three individual target areas with diamond drilling. Each target area hosts one or more targets in its own right, and all targets require multiple drill holes. Additional surface programs at the PINE, Canyon South, Twins, SW Takla and Central Takla target areas would assist in the delineation of further drill targets.

A Phase 2 program will focus primarily on core drilling at targets not drilled as part of the Phase 1 program, and at regional targets potentially upgraded to drill-ready status as a result of the Phase 1 program. Phase 2 drilling will also be supported as required by additional geophysical, geochemical and geological surveying to enable better drill collar placement on the new exploration targets.

The Phase 1 program is budgeted at $3,500,000, and includes 5,000 m of core drilling with surface surveying and related program activities. The Phase 2 program has a budget of $6,500,000 and includes the completion of 12,500 m of core drilling, focused surface surveys and related program activities.

# 2.0 Introduction

## *2.1 Terms of Reference and Purpose*

This report was prepared by Mr. C. Mark Rebagliati, P.Eng. and Mr. Eric Titley, P.Geo at the request of Dr. Diane Nicolson, President and CEO of Amarc to provide an up-to-date summary of exploration work completed on the JOY Project located in BC. The objective of this report is to summarize historical work, outline exploration completed by Amarc to date, appraise the exploration potential of the Project and if warranted, make recommendations for future exploration work on the Project.

The authors have completed this report in compliance with National Instrument 43-101 of the Canadian Securities Administrators ("NI 43-101") and the guidelines in Form 43-101 F1. The authors are QP's within the meaning of NI 43-101.

The content of this report is based on information provided by Amarc. Other information was obtained from the public domain. The authors have no reason to doubt the reliability of this information.

This technical report is based on the following sources of information:

- Information from Amarc for matters relating to permits, environmental studies, social or community impacts, surface rights, royalties, agreements and encumbrances relevant to this report;
- Information from geophysical, geochemical and geological surveys, and also drilling conducted or commissioned by Amarc;
- Information from historical geophysical, geochemical and geological surveys, and also drilling as provided by Amarc;
- Compilation, integration, and review of the exploration datasets from work by both historical operators and Amarc, as provided by Amarc;
- Exploration targeting utilizing Amarc and historical information from geophysical, geochemical and geological surveys, and drilling as provided by Amarc;
- Discussions with Amarc personnel;
- Inspection of the JOY Project and surrounding area; and
- Additional information from public domain sources, including previous NI 43-101 reports on the Toodoggone region, Government datasets from, for example, Assessment Reports and information from the BCGS or GBC.

This report has been prepared by Mr. C. Mark Rebagliati, P.Eng. and Mr. Eric Titley, P.Geo. and also by Dr. Andrew J. Fagan under the supervision of the QPs. The information, opinions and conclusions contained herein are based on:

- Information available to the authors at the time of preparation of this report;
- Historical experience gained by C. Mark Rebagliati, P.Eng., who has worked on JOY Project lands and in the adjacent broad Toodoggone-Kemess porphyry Cu-Au region, including on the Kemess South, Kemess North, MEX, PINE and Brenda porphyry Cu-Au deposits and deposit targets during 1990-1997 and 2016 - 2018;
- Assumptions, conditions, and qualifications as set forth in this report; and
- Data, reports and other information supplied by Amarc and other third party sources.

Standard professional procedures were followed in preparing the contents of this report. Data used in this report has been verified where possible and the authors have no reason to believe that the data was not collected in a professional manner.

The report was assembled in Vancouver, Canada during March to May 2020. The effective date of this report is April 16th, 2020.

**Table 2-1: Qualified Persons Responsible for Each Section of this Technical Report.**

| Section | Report Section | Responsibility | |
|---|---|---|---|
| | | Company | Qualified Person & Professional Accreditation |
| **1.0** | Summary | Amarc | C. Mark Rebagliati, P.Eng<br>Eric Titley, P.Geo |
| **2.0** | Introduction | Amarc | C. Mark Rebagliati, P.Eng |
| **3.0** | Reliance on Other Experts | Amarc | C. Mark Rebagliati, P.Eng |
| **4.0** | Property Description and Location | Amarc | C. Mark Rebagliati, P.Eng<br>Eric Titley, P.Geo |
| **5.0** | Accessibility, Climate, Local Resources, Infrastructure, and Physiography | Amarc | C. Mark Rebagliati, P.Eng |
| **6.0** | History | Amarc | C. Mark Rebagliati, P.Eng<br>Eric Titley, P.Geo |
| **7.0** | Geological Setting and Mineralization | Amarc | C. Mark Rebagliati, P.Eng |
| **8.0** | Deposit Types | Amarc | C. Mark Rebagliati, P.Eng |
| **9.0** | Exploration | Amarc | C. Mark Rebagliati, P.Eng<br>Eric Titley, P.Geo |
| **10.0** | Drilling | Amarc | C. Mark Rebagliati, P.Eng<br>Eric Titley, P.Geo |
| **11.0** | Sample Preparation, Analyses and Security | Amarc | Eric Titley, P.Geo |
| **12.0** | Data Verification | Amarc | Eric Titley, P.Geo<br>C. Mark Rebagliati, P.Eng |
| **13.0** | Mineral Processing and Metallurgical Testing | Amarc | C. Mark Rebagliati, P.Eng |
| **14.0** | Mineral Resource Estimates | Amarc | C. Mark Rebagliati, P.Eng |
| **15.0** | Adjacent Properties | Amarc | C. Mark Rebagliati, P.Eng |
| **16.0** | Other Relevant Data and Information | Amarc | C. Mark Rebagliati, P.Eng |
| **17.0** | Interpretation and Conclusions | Amarc | C. Mark Rebagliati, P.Eng<br>Eric Titley, P.Geo |
| **18.0** | Recommendations | Amarc | C. Mark Rebagliati, P.Eng<br>Eric Titley, P.Geo |
| **19.0** | References | Amarc | C. Mark Rebagliati, P.Eng<br>Eric Titley, P.Geo |

## 2.2 Site Visit

In accordance with the NI 43-101 guidelines, QP Mark Rebagliati has visited the JOY Project. The last such QP inspection occurred during operations on August 9, 2018. During the site visit a review of all operations was completed, which included safety, working procedures, QAQC and data management. All aspects of the program were reviewed and found to be of a suitable standard. On July 15, 2019 the QP also examined core from drill hole JY18001 at the company's core storage facility in Williams Lake. The diamond saw-cut half core was examined and compared with drill logs and laboratory assays. The quality of core cutting and geological logging were found to be of acceptable standard. Core library samples from drill hole JY18002 stored at the company warehouse in Langley have also been examined. These samples are 10-20 cm in length and collected at approximately 20 m intervals, or at a greater frequency if changes in lithology are apparent. Lithology, alteration and sulphide as logged were confirmed to correspond closely to that of the core examined. Mr. Rebagliati also conducted historical exploration on the JOY Project for Romulus Resources in the early 1990's, and supervised the Amarc drilling on an initial JOY porphyry Cu-Au deposit target in 2017 and marginal to the PINE deposit in 2018 and, as such his knowledge of the geology underlying the JOY tenure, and the historical work completed on the Project is extensive.

# 3.0 Reliance on Other Experts

Standard professional procedures were followed in preparing the contents of this report. Data used in this report has been verified where possible and the authors have no reason to believe that the data was not collected in a professional manner.

The QP has not independently verified the legal status or title of the claims or exploration permits, and has not investigated the legality of any of the underlying agreements that may exist concerning the JOY Project, and has relied on legal counsel in terms of the confirmation of these matters.

C. Mark Rebagliati, P.Eng., relied on a letter from Trevor Thomas, LLB, Amarc's legal counsel, dated April 16, 2020, confirming that title to the claims comprising the JOY Project are held in the name of Amarc and these are in good standing. Legal counsel further confirmed that the disclosure in the report accurately summarizes the agreements and royalties for the JOY Project.

# 4.0 Property Description and Location

## 4.1 Project Area and Location

The 482 km$^2$ (48,296 Ha) JOY Project is located in the Omineca Mining Division, approximately 310 km north of Mackenzie and 265 km north-northeast of Smithers in northern BC (Figures 4-1, 4-2 and 4-3).

The Project area lies on NTS map sheet 94M/E02, 07 and BCGS maps 094E.026, 027, 036, and 037. The area of work is centred approximately at 57° 12' N Latitude and 126° 43' W Longitude; or UTM Zone 9 (NAD 83) at 6,343,500 m N and 638,500 m E.

## 4.2 Agreements, Royalties, and Encumbrances

Amarc owns 100% interest in and is the operator of the JOY Project.

The JOY Project comprises the JOY, PINE and Paula properties, and also the STAKED Claims (Figure 4-4). The mineral claims comprising the STAKED Claims were staked and are owned 100% by Amarc.

On November 21, 2017, Amarc acquired 100% interest in the 7,200 Ha JOY property from United Minerals Services Ltd. ("UMS"), a private vendor. The JOY property is subject to an underlying NSR royalty from production to a former owner, which is capped at $3.5 million.

On August 29, 2017, Amarc announced that it had concluded option agreements with each of Gold Fields Toodoggone Exploration Corporation ("Gold Fields") and Cascadero Copper Corporation ("Cascadero"), which at that time held the PINE property in a 51%:49% joint venture, that enabled Amarc to purchase 100% of the property. On December 31, 2018, Amarc completed the purchase of Cascadero's 49% interest in the PINE Property (Amarc MD&A December 31, 2018). Further on December 9, 2019, Amarc announced that it had reached an agreement with Gold Fields to amend the option agreement between the parties and purchased outright the remaining 51% of the PINE property from Gold Fields (Amarc news release, December 9, 2019).

Gold Fields will retain a 2.5% NPI royalty on mineral claims comprising about 96% of the PINE property and a 1% NSR royalty on the balance of the claims. The NPI royalty can be reduced to 1.25% at any time through the payment to Gold Fields of $2.5 million in cash or shares. The NSR royalty can be reduced to 0.50% through the payment to Gold Fields of $2.5 million in cash or shares.

The PINE property is subject to a 3% underlying NSR royalty payable from production to a former owner and capped at $5 million payable from production (Amarc November 21, 2017 news release).

In November 2019 Amarc entered into a purchase agreement with two prospectors to acquire 100% of a single mineral claim, called the Paula property, located internal to the wider JOY Project tenure (Amarc MD&A December 31, 2019). The claim is subject to a 1% NSR royalty payable from commercial production that is capped at $0.5 million.

### *4.3 Current Tenure*

Amarc holds a 100% interest in the mineral claims that comprise the JOY Project (Figure 4-4), which include the initial JOY property claims acquired from UMS in 2017 (Table 4-1), the "STAKED" Claims staked by Amarc in 2017 (Table 4-2), the PINE property claims acquired 100% in 2019 (Table 4-3), and the Paula property claim acquired 100% in 2019 (Table 4-4,).

Amarc does not hold any surface rights. BC mining law allows for access and use of the surface for explration through notification of surface rights holders. None of the claims are covered by placer mining claims.

The JOY Project is situated within the asserted traditional territory of certain First Nations. Amarc works closely with local First Nations and other project stakeholders in order to advance its mineral properties responsibly, and seeks early and meaningful engagement to ensure its mineral exploration and development activities are well-coordinated and broadly supported, to address local priorities and concerns, and to optimize opportunities for collaboration and local benefit.

### *4.4 Permits*

All government permits required for Amarc's surface geophysical surveys and drilling on the JOY Project have been acquired under BC Mines Act Permit MX-13-286. These include the following:

> Permission to complete up to 300 line-km of IP ground geophysics surveys over the JOY Project. This permission was granted on 23 June, 2017 and amended on 31 May, 2018, to include the then entire Project tenure, and is valid through to 31 May, 2023 and was accompanied by a Free Use Timber Permit.

Permission to drill up to 20 diamond drill holes on the Joy property was issued on July 28, 2017 and subsequently amended on 21 September, 2018 to include an expanded area of the Project tenure. This permission is valid until 31 May, 2023 and was accompanied by a Free Use Timber Permit.

## 4.5 Current Environmental Liabilities

The authors are not aware of any existing environmental liabilities on the JOY Project related to Amarc's activities.

## 4.6 Factors Affecting Access

A Road Users Agreement with the BC Ministry of Forests, Lands, and Natural Resources permitting use of access roads to the JOY Project was received on June 26, 2017, and remains valid as of the effective date of this report. This agreement allows access to the Omineca Resource Road, specifically via the Finlay Forest Service Road ("FSR") (KM 0 – 18.5, A.M. Anderson Ventures), Finlay-Osilinka FSR (KM 0.0 – 46.7, Conifex Mackenzie Forest Products), Thutade FSR (KM 178.9 – 204.0, Conifex Mackenzie Forest Products), Finlay FSR (KM 19.7 – 135.5, Canadian Forest Products), Finlay FSR (KM 135.3 – 172.3, Conifex Mackenzie Forest Products), Finlay FSR (KM 204 – 233.5, AuRico Metals Inc.), now Centerra. In addition, Amarc also has a valid Road Users Agreement with a private entity for a certain section of the access road to the JOY Project.

The Attycelly Creek, Finlay River, and Firesteel River bridges although passable for lighter loads currently require certain maintenance. It is anticipated that the required maintenance will be completed in the short term, although the work is outside of Amarc's control and may affect movement of heavy equipment to the site if these activities are delayed.

The authors are not aware of any further access, title, or issue affecting Amarc's right to work on the Project.

**Table 4-1: JOY Property Mineral Tenure.**

| Tenure No. | Claim Name | Owner | Issue Date | Good To Date | Status | Area (ha) |
|---|---|---|---|---|---|---|
| 522028 | | Amarc Resources (100%) | 2005/NOV/06 | 2026/MAY/30 | GOOD | 630.42 |
| 522030 | | Amarc Resources (100%) | 2005/NOV/06 | 2026/MAY/30 | GOOD | 525.01 |
| 522031 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 279.87 |
| 522032 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 297.45 |
| 522033 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 402.28 |
| 522034 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 419.86 |
| 522035 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 524.83 |
| 522036 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 139.88 |
| 522037 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 419.64 |
| 522038 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 419.62 |
| 522039 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 524.46 |
| 522040 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 402.32 |
| 522043 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 524.45 |
| 522048 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 419.33 |
| 1043004 | WFM | Amarc Resources (100%) | 2016/MAR/24 | 2024/MAY/30 | GOOD | 1416 |

**Table 4-2: STAKED Claims Mineral Tenure.**

| Tenure No. | Claim Name | Owner | Issue Date | Good To Date | Status | Area (ha) |
|---|---|---|---|---|---|---|
| 1052970 | | Amarc Resources (100%) | 2017/JUL/05 | 2024/MAY/30 | GOOD | 209.97 |
| 1052971 | | Amarc Resources (100%) | 2017/JUL/05 | 2024/MAY/30 | GOOD | 262.45 |
| 1053212 | | Amarc Resources (100%) | 2017/JUL/18 | 2024/MAY/30 | GOOD | 1539.90 |
| 1053214 | | Amarc Resources (100%) | 2017/JUL/18 | 2024/MAY/30 | GOOD | 1118.72 |
| 1053215 | | Amarc Resources (100%) | 2017/JUL/18 | 2026/MAY/30 | GOOD | 1051.84 |
| 1053217 | | Amarc Resources (100%) | 2017/JUL/18 | 2024/MAY/30 | GOOD | 385.80 |
| 1053218 | | Amarc Resources (100%) | 2017/JUL/18 | 2024/MAY/30 | GOOD | 648.00 |
| 1053445 | FS1 | Amarc Resources (100%) | 2017/JUL/27 | 2026/MAY/01 | GOOD | 17.51 |
| 1053446 | FS2 | Amarc Resources (100%) | 2017/JUL/27 | 2026/MAY/30 | GOOD | 70.28 |
| 1053451 | | Amarc Resources (100%) | 2017/JUL/18 | 2024/MAY/30 | GOOD | 768.66 |
| 1053452 | | Amarc Resources (100%) | 2017/JUL/18 | 2024/MAY/30 | GOOD | 104.82 |
| 1053453 | | Amarc Resources (100%) | 2017/JUL/18 | 2024/MAY/30 | GOOD | 471.92 |
| 1053454 | | Amarc Resources (100%) | 2017/JUL/18 | 2024/MAY/30 | GOOD | 367.17 |

**Table 4-3: PINE Property Mineral Tenure.**

| Tenure No. | Claim Name | Owner | Issue Date | Good To Date | Status | Area (ha) |
|---|---|---|---|---|---|---|
| 522029 | | Amarc Resources (100%) | 2005/NOV/06 | 2024/MAY/30 | GOOD | 437.9 |
| 522118 | | Amarc Resources (100%) | 2005/NOV/08 | 2024/MAY/30 | GOOD | 315.16 |
| 522119 | | Amarc Resources (100%) | 2005/NOV/08 | 2024/MAY/30 | GOOD | 315.05 |
| 555589 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 489.97 |
| 555590 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 490.20 |
| 555591 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 262.71 |
| 555595 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 577.70 |
| 555597 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 490.42 |
| 555601 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 420.55 |
| 555604 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 578.52 |
| 555606 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 157.77 |
| 555608 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 420.03 |
| 555609 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 420.22 |
| 555613 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 385.37 |
| 555615 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 403.02 |
| 555620 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 367.98 |
| 555622 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 438.06 |
| 555624 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 175.24 |
| 555626 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 490.86 |
| 555628 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 403.21 |
| 555629 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 526.19 |
| 555630 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 438.51 |
| 555631 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 350.97 |
| 555632 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 421.13 |
| 555633 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 526.39 |
| 555634 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 350.74 |
| 555635 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 526.28 |
| 555636 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 421.01 |
| 555637 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 509.13 |
| 555638 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 316.01 |
| 555639 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 281.03 |
| 555640 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 368.88 |
| 555641 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 491.84 |
| 555642 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 438.93 |

**Table 4-3: (Continued)**

| Tenure No. | Claim Name | Owner | Issue Date | Good To Date | Status | Area (ha) |
|---|---|---|---|---|---|---|
| 555643 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 438.93 |
| 555644 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 333.57 |
| 555645 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 456.41 |
| 555646 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 631.95 |
| 555647 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 526.95 |
| 555648 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 526.63 |
| 555649 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 439.13 |
| 555650 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 526.63 |
| 555651 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 333.72 |
| 555652 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 421.11 |
| 555653 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 420.95 |
| 555654 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 350.61 |
| 555655 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 491.18 |
| 555656 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 420.71 |
| 555657 | | Amarc Resources (100%) | 2007/APR/03 | 2024/MAY/30 | GOOD | 332.88 |
| 555658 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 613.66 |
| 555659 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 350.59 |
| 555660 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 332.96 |
| 555661 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 157.66 |
| 555662 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/30 | GOOD | 421.05 |
| 555663 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 421.04 |
| 555664 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 385.54 |
| 555665 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 262.99 |
| 555666 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 385.87 |
| 555667 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 421.48 |
| 555668 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 421.30 |
| 555669 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 421.12 |
| 555670 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 632.02 |
| 555671 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 631.61 |
| 555672 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 527.01 |
| 555673 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 526.98 |
| 555674 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 438.88 |
| 555675 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 526.35 |
| 555676 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 280.44 |
| 555677 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 280.57 |
| 555678 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 438.06 |
| 555679 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 367.64 |
| 555681 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 507.94 |
| 555682 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 280.25 |
| 555683 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 315.13 |
| 555684 | | Amarc Resources (100%) | 2007/APR/03 | 2026/MAY/01 | GOOD | 402.89 |
| 835518 | BLACK LAKE | Amarc Resources (100%) | 2010/OCT/09 | 2026/MAY/01 | GOOD | 105.22 |
| 838405 | TDG01 | Amarc Resources (100%) | 2010/NOV/16 | 2026/MAY/01 | GOOD | 70.15 |
| 838407 | TDG02 | Amarc Resources (100%) | 2010/NOV/16 | 2026/MAY/01 | GOOD | 35.07 |
| 838408 | LEGHORN | Amarc Resources (100%) | 2010/NOV/16 | 2026/MAY/01 | GOOD | 105.17 |
| 838410 | TDG03 | Amarc Resources (100%) | 2010/NOV/16 | 2026/MAY/01 | GOOD | 35.06 |
| 838411 | LH | Amarc Resources (100%) | 2010/NOV/16 | 2026/MAY/01 | GOOD | 35.06 |
| 838412 | TDG04 | Amarc Resources (100%) | 2010/NOV/16 | 2026/MAY/01 | GOOD | 17.53 |
| 850101 | | Amarc Resources (100%) | 2011/MAR/30 | 2026/MAY/01 | GOOD | 35.07 |

**Table 4-3: (Continued)**

| Tenure No. | Claim Name | Owner | Issue Date | Good To Date | Status | Area (ha) |
|---|---|---|---|---|---|---|
| 929502 | STARS | Amarc Resources (100%) | 2011/NOV/17 | 2026/MAY/01 | GOOD | 333.14 |
| 981665 | | Amarc Resources (100%) | 2012/APR/22 | 2026/MAY/01 | GOOD | 70.14 |
| 994536 | | Amarc Resources (100%) | 2012/JUN/06 | 2026/MAY/01 | GOOD | 122.72 |
| 1012122 | | Amarc Resources (100%) | 2012/AUG/19 | 2026/MAY/01 | GOOD | 403.08 |

**Table 4-4: Paula Property Mineral Tenure.**

| Tenure No. | Claim Name | Owner | Issue Date | Good To Date | Status | Area (ha) |
|---|---|---|---|---|---|---|
| 1043017 | Paula | Amarc Resources (100%) | 2016/MAR/24 | 2020/MAY/12* | GOOD | 1156.37 |

* Note: In accordance with the BC Chief Gold Commissioners Extension Order, Dated 2nd April, 2020, all BC mineral claims with good-to dates due before December 31, 2021 have been protected to December 31, 2021. On or before December 31, 2021 Amarc will be posthumously required to file Assessment Work, or pay cash-in-lieu, in order to maintain the Paula claim in good standing.

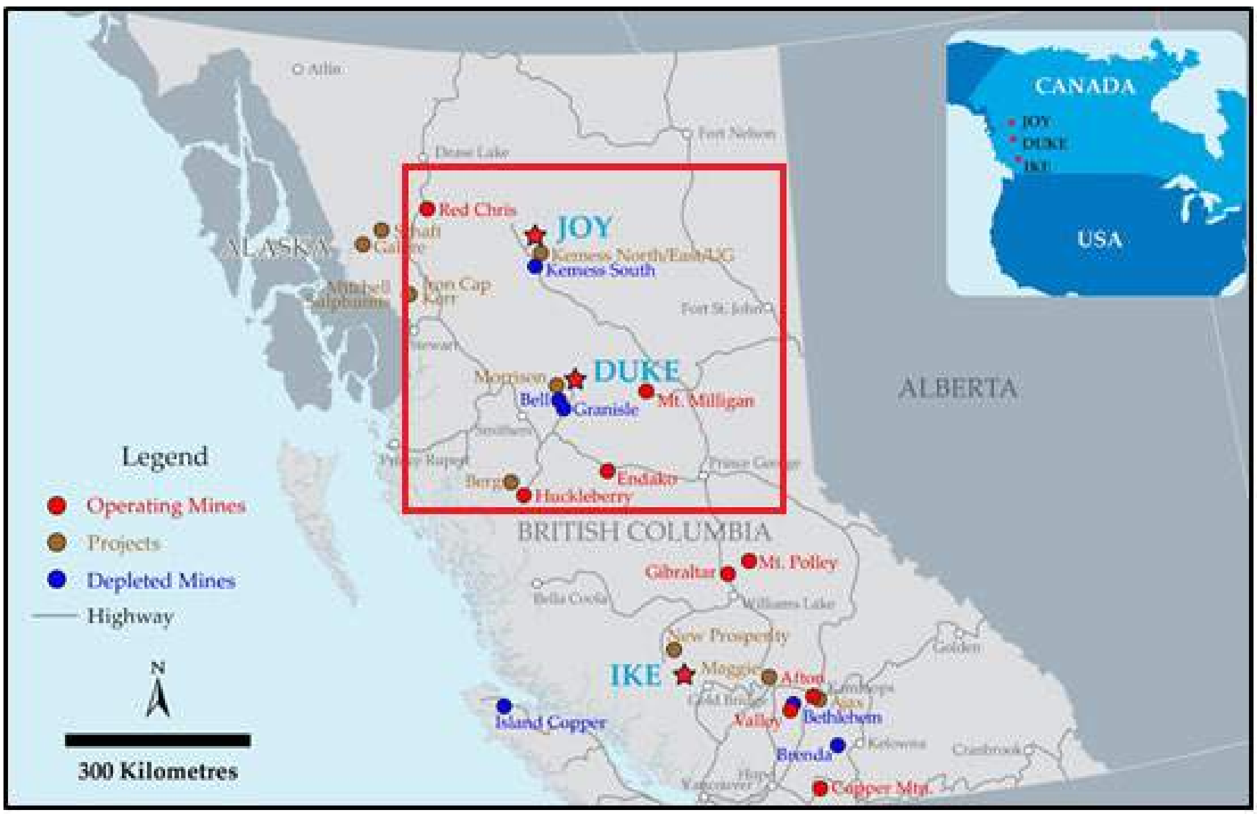



**Figure 4-1: Map of BC Showing the Location of the JOY Project (red star) in Respect to Operating and Past Producing Porphyry Mines, and Advanced Stage Porphyry Projects. The Red Box Outlines the Area Shown in Figure 4-2. Also Shown are the Locations of Amarc's DUKE and IKE Porphyry Projects (red stars).**

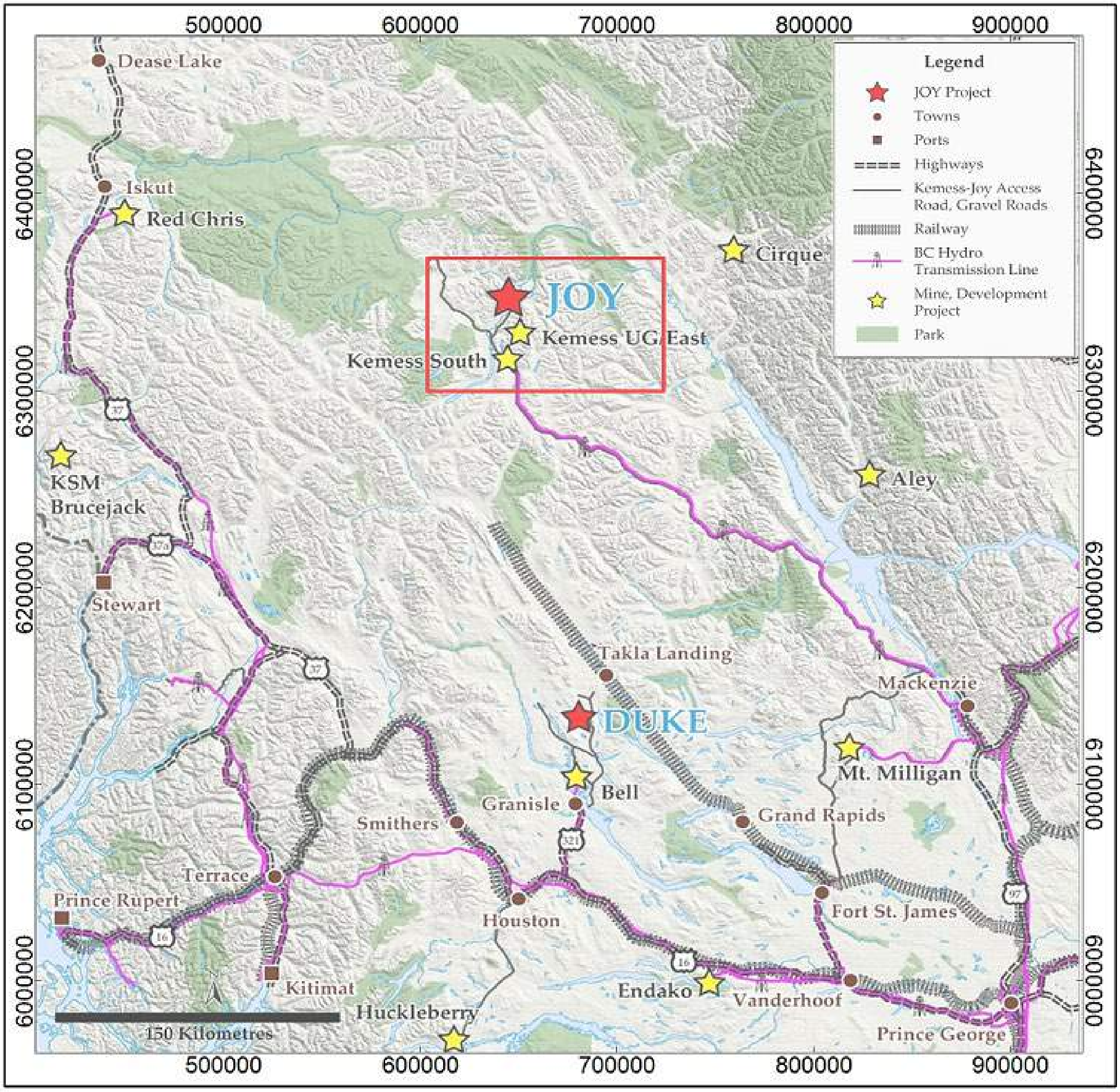



**Figure 4-2: Regional JOY Project Location Map Showing Infrastructure Within the Regional Area As Outlined in the Red Box Delineated in Figure 4-1. The Red Box in this Figure Shows the Area of Figure 4-3.**

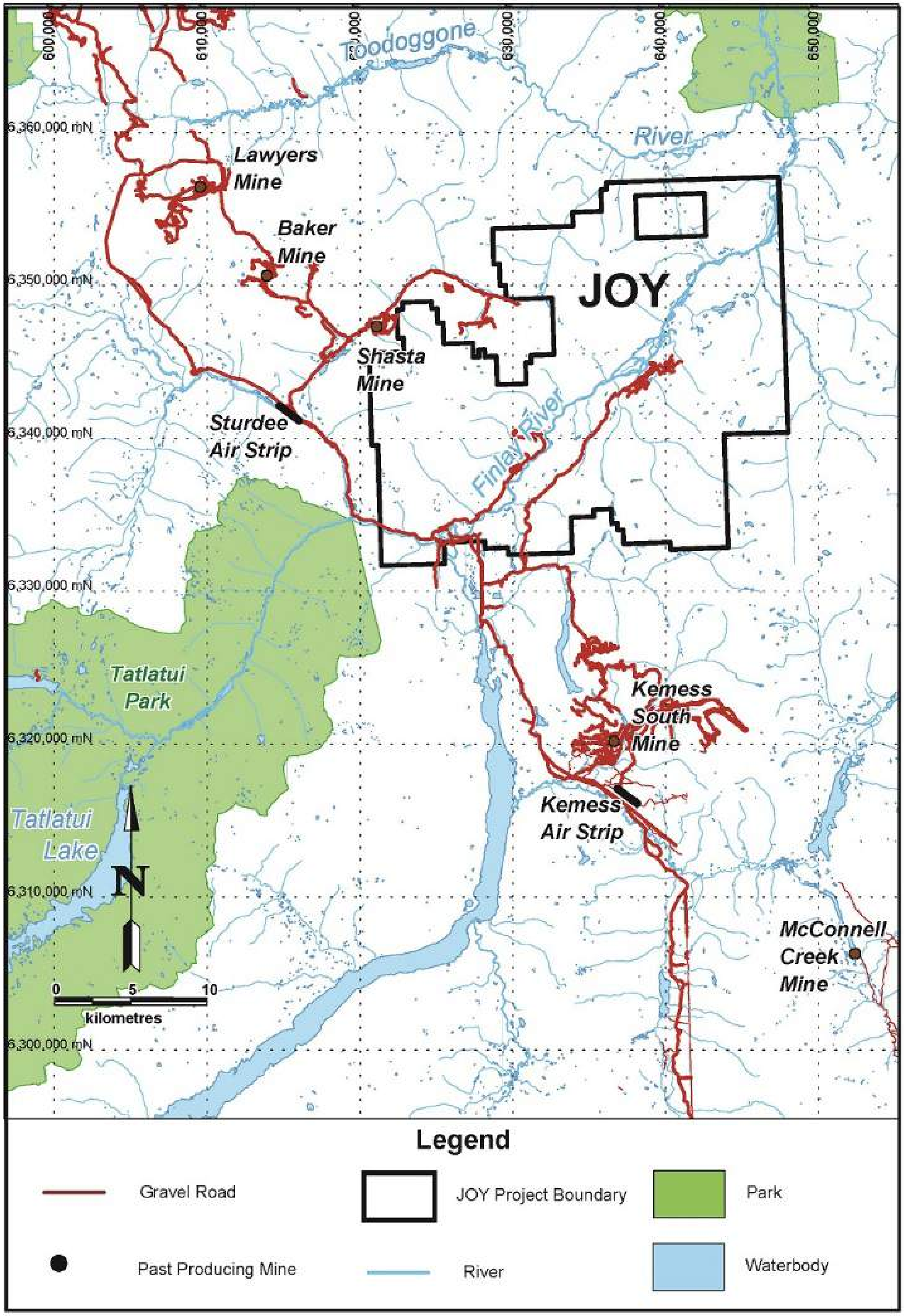



**Figure 4-3: Detailed JOY Project Location Map Within the Toodoggone Region, Showing Past Producing Mines and Road Access.**

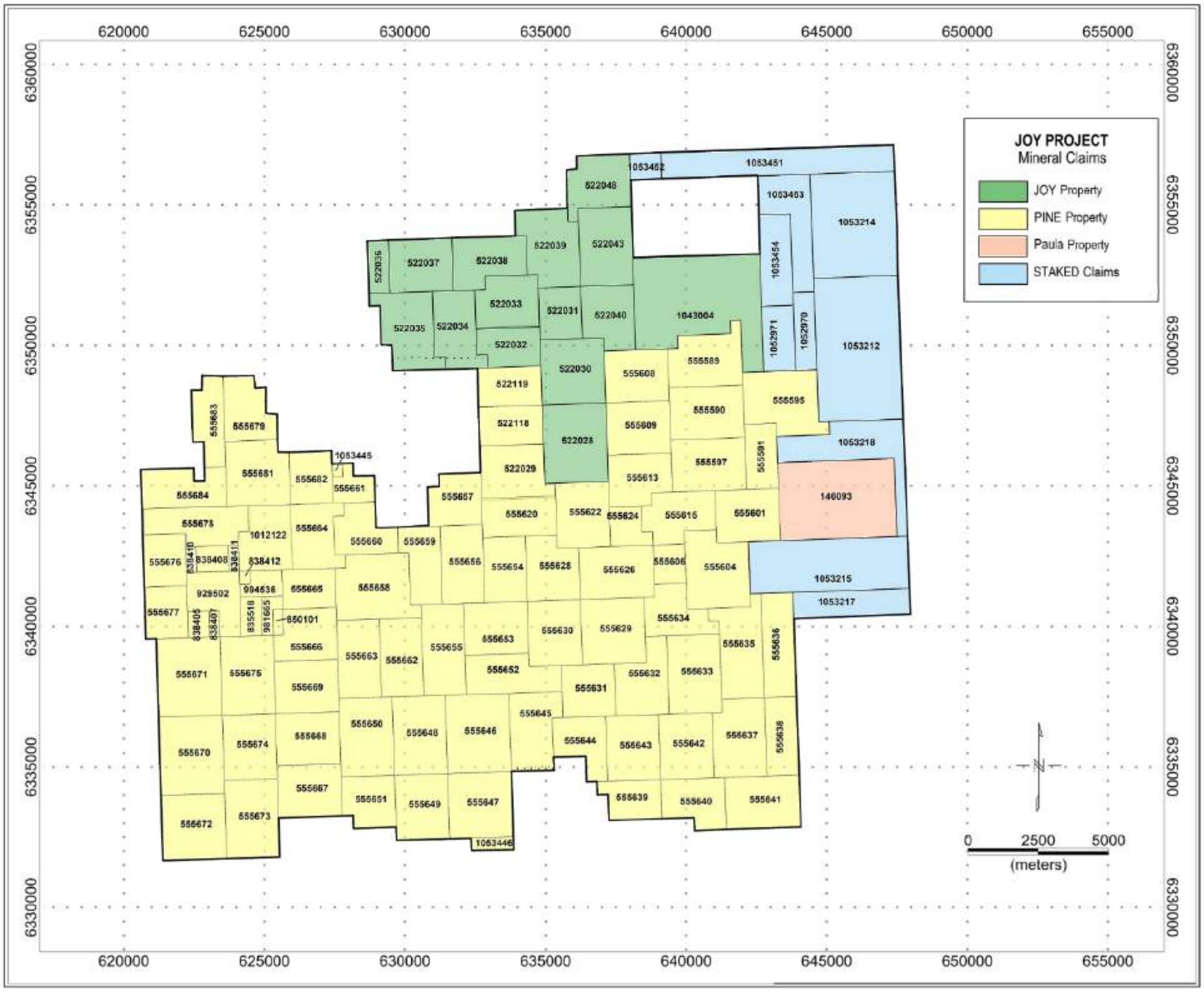



**Figure 4-4: JOY Project Mineral Tenure Map.**

# 5.0 Accessibility, Climate, Local Resources, Infrastructure & Physiography

## *5.1 Access*

The past-producing Kemess South Cu-Au mine, located in the south of the Kemess District, is situated approximately 20 km to the south of the JOY Project boundary. The Kemess District is accessible from Prince George and Mackenzie by travelling along the Omineca Resource Road. Parts of the JOY Project are accessible by trails that connect to the Omineca Resource Road as it proceeds north beyond the Kemess South mine site and Kemess Underground Project site towards the Baker mine and Lawyers Au-Ag project (see Section 15). Other parts of the JOY Project are accessible by helicopter (approximately a 10 minute flight) from either the Kemess or the Sturdee airstrips.

## 5.2 Physiography and Climate

Topography on the JOY Project is moderate to steep, except where the claims cover gentle terrain around the Finlay River and its tributaries. Several cirques and tarns are present at higher elevations in the central portion of the claims. Elevations range from about 1,020 m ASL along the Finlay River to 2,120 m ASL in the northwestern corner of the claims. Most peaks are just under 2,000 m ASL. Approximately 40% of the Project is above tree line. Thick stands of alpine fir occur below tree line on steeper slopes, and a mix of Lodgepole pine and spruce is present at lower elevations.

The climate is generally moderate, although snow can occur in any month. Temperatures range from -35$^0$ C to 30$^0$ C and average annual precipitation amounts to 890 mm. Extreme weather conditions are possible at the higher elevations. When in operation between 1997 and 2011 the nearby Kemess South mine (Figure 4-3), was accessible by road 365 days a year (SRK, 2016).

Surface surveys can be carried out at the JOY Project between approximately June and October depending on the weather conditions in a given season. In areas of the Project that are trail or helicopter accessible drilling may be carried out year round.

## 5.3 Local Resources and Infrastructure

The Kemess District is approximately10 hours' drive from Prince George along the linked FSR known as the Omineca Resource Road. The Kemess North Underground development project (and the exhausted Kemess South mine site) also has a full airstrip that is serviced by charter plane from Prince George or Smithers. Truck deliveries for consumables and industrial supplies occur on a regular basis.

The Sturdee Airstrip lies approximately 26 km northwest of the PINE deposit, and 5 km outside the western border of the JOY Project tenure. This airstrip was built to service historical mining and exploration operations in the Toodoggone area. The strip has no facilities but is in reasonable condition for summer use via charter plane from Prince George or Smithers.

The Black Lake camp is an outfitters commercial lodge and cabins, located approximately 6 km northeast of the Sturdee airstrip. This camp and airstrip are commonly used to support exploration efforts on the JOY Project.

A 380 km long 230 kV electrical transmission line is in-place along the Omineca Resource Road from Mackenzie to service the past-producing 50,000 t/d Kemess South Cu-Au mine site. Current plans for the Kemess Underground mine development call for a mill-size of approximately 24,600 tonnes per day, utilizing roughly half the capacity of the powerline, as such the unused portion of the power transmission may be available for other projects in the area (see Section 15).

## 6.0 History

Gold was first discovered in the Toodoggone region in placer deposits in 1925 (Diakow, et al., 1993). Base metal prospecting was initiated as early as the 1930's. General hard-rock exploration continued sporadically until the mid-1960's when exploration activities focussed on locating the source of anomalous precious and base metals in the region. This exploration was highly successful, with the discovery of the Kemess North porphyry Cu-Au system in 1967, and the subsequent discoveries of epithermal lode gold at Chappelle (later known as the Baker Mine) in 1968, Shasta in 1972 and Lawyers in 1973. Table 6-1 lists the known historical exploration works that have occurred within, or overlapping with, the current JOY Project.

**Table 6-1: Exploration History On, and Overlapping With, the Current JOY Project**.

| Work Year | ARIS # | Operator | Work Categories | Target Area |
|---|---|---|---|---|
| 1967 - 68 | 01825 | Quebec Cartier Mines | Geological, Geochemical, Geophysical, Physical | Opal, TK, Garnet, Spartan, Pillar, Riga |
| 1968 | 01846 | Quebec Cartier Mines | Geological, Geochemical | PINE no.1, PINE no. 2, PINE no. 3 |
| 1968 | 01861 | Kennco Explorations (Canada) Limited | Geochemical | Pillar no. 1 Group |
| 1968 | 01888 | Cominco Ltd. | Geological | Pil |
| 1969 | 01861, 01886 | Kennco Explorations (Canada) Limited | Geochemistry | Pillar Mineral claims 54-56, 58-64, 66-74, 81-89, PINE no. 2 |
| 1969 | 01906, 01983, 02035 | Kennco Explorations (Canada) Limited | Geochemistry | Pillar Mineral claims 1-6, 11-19, 21-28, 39, 53, 57, 65, 75, PINE no. 3, 4 |
| 1969 | 02307 | Cordilleran Engineers | Geophysical | Riga Claim Group |
| 1969 | 02380 | Kennco Explorations (Canada) Limited | Geological | PINE no. 5 |
| 1970 | 03120 | Kennco Explorations (Canada) Limited | Geophysical | PINE no. 6 and PINE no. 7 |
| 1971 | 03265 | Cordilleran Engineers | Geophysical | J.K. Claims 17, 19, 21, 18, 20, 22, 29, 31, 33 |
| 1971 | 03266 | Kennco Explorations (Canada) Limited | Geophysical | PINE no. 6 and PINE no. 7 |
| 1973 | 04870 | Minas De Cerro Dorado | Geochemical, Geological, Geophysical | R.N. Claim Group |
| 1977 | 06762 | Cominco Ltd. | Geochemical, Geological | Amigo Claim |
| 1979 | 07750, 08331 | Rio Tinto Can. Ex. Ltd. | Geological, Physical, Petrography, Geochemical | FIN Claims 1-6 |
| 1980 | 09086 | Rio Tinto Can. Ex. Ltd. | Geological, Geophysical, Geochemical | Jock Claim Group |
| 1980 | 09272 | Du Pont of Canada Exploration Limited | Geochemical, Geological | Fire Claims 1-3 |

**Table 6-1: (continued):**

| Work Year | ARIS # | Operator | Work Categories | Target Area |
|---|---|---|---|---|
| 1980-81 | 09466, 09747,10326 | Serem | Geochemical, Geological | Gotch Claim 1 and 2, Nub Mountain, Atlas, Hercules |
| 1981 | 10344 | Golden Rule Resources Ltd. | Geochemical, Geophysical, Prospecting | Mets, Belle, Saunders, Jock, Rich, MC, JC, Nika, Inge Groups |
| 1982 | 11032 | Brinco Mining Limited | Geological, Physical, Geochemical, Geophysical | FIN |
| 1982 | 11106 | Serem | Geological, Physical, Geochemical, Prospecting | Acapulco, Aca, Pul, Co, Sun, Star |
| 1982-83 | 11174, 11525 | Kidd Creek Mines Ltd. | Geological, Physical, Geochemical | Awesome, Foghorn and Leghorn |
| 1983 | 13057 | Asitka Resource Corp. | Drilling, Geochemical, Geological, Geophysical, Physical | Grace Claims 1 - 5 |
| 1983 | 13083 | Golden Rule Resources Ltd. | Geochemical, Geological, Prospecting | Rich 1 |
| 1984 | 13273, 13855 | Newmont Exploration of Canada Ltd. | Drilling, Geochemical, Physical | Dawn, Golden Ring 2 Claim |
| 1984 | 14025 | Serem | Geochemical, Geological, Geophysical, Physical, Prospecting | Pul, Sun, Star Claims |
| 1985 | 14167 | Energex Minerals Limited | Geochemical | Leghorn |
| 1986 | 15375 | Asitka Resource Corp. | Geochemical, Geological | Grace 5 |
| 1986 | 15548 | Cooke, D. | Geochemical, Prospecting | Rod 1 |
| 1986 | 15555 | Canasil Resources Inc. | Geochemical, Geological, Geophysical, Physical, Drilling, Prospecting | Brenda 1, 4, 5, 6, 7, 8, Jan 1 - 8, Max 2 |
| 1986 | 16463 | Cheni Gold Mines Inc. | Drilling, Geochemical, Physical, Geophysical | Acapulco Claim Group |
| 1986-87 | 15923 | Golden Rule Resources Ltd. | Physical | Richy 1 |
| 1987 | 16307 | Asitka Resource Corp. | Geochemical, Geophysical, Physical | Grace Claims 1 - 5 |
| 1987 | 16470 | Cheni Gold Mines Inc. | Drilling | Wrich Claims 1 - 3 |
| 1987 | 16502 | Harris Exploration Services | Geochemical, Geological, Petrography | FIN Claims |

**Table 6-1: (continued):**

| Work Year | ARIS # | Operator | Work Categories | Target Area |
|---|---|---|---|---|
| 1987 | 17451, 17454, 17459 | Skylark Resources Ltd. | Geochemical, Geological, Prospecting | Pil, Lar, Peak 1 – 2, Jok 1 - 6, Error 1 - 6, Grace 1 - 5, Concha 1 - 7, Skarn 1 - 2, Wrich Claims |
| 1987 | 18098 | Skylark Resources Ltd. | Drilling, Geological, Geochemical, Geophysical | Wrich 1 |
| 1987 | 18161 | Toodoggone Gold Inc. | Geochemical, Geological | Fine, Gord/Mul, Eloise, Jeremy, Daniel, Barney Group |
| 1988 | 17603 | Canadian Venture Corporation | Geophysical | Peak, Swan, Au Claim Group |
| 1988 | 18354 | ESSO Resources Canada Ltd. | Drilling, Geochemical | Paradise, Dawn |
| 1988 | 18313, 18396 | Skylark Resources Ltd. | Drilling, Geochemical, Geological, Prospecting | Grace, Electrum, Concha, Beaverdam Zone, Mina Del Ray, Ricky, Wrich 1, 2, and 3 |
| 1988 | 18441 | Canasil Resources Inc. | Drilling, Geochemical, Geological, Geophysical, Physical | Brenda, Jan, Takla, Creek, White creek |
| 1988 | 18954 | St. John, Robert W.; Pearson, M.J. | Geochemical | FIN Claims |
| 1989 | 18920 | Canadian Venture Corporation/Consolidated Petroquin Resources Ltd. | Geophysical | Eric Claim (Findlay River) |
| 1989 | 19447 | Canasil Resources Inc. | Physical, Geochemical | Tom Group |
| 1989 | 19998 | Toodoggone Gold Inc. | Geochemical, Geological, Physical | Fine I-IV |
| 1990 | 20300 | Cominco Ltd. | Geochemical, Physical, Prospecting | PINE-TREE |
| 1990 | 20963 | Canasil Resources Inc. | Geochemical, Physical | Brenda |
| 1990 | 21139 | Cominco Ltd. | Drilling, Geochemical, Geological, Geophysical, Physical | PINE-TREE |
| 1991 | - | Lloyd Geophysics Inc | Geophysical | PINE-TREE |
| 1991 | 21569 | Pacific Rim Mines | Prospecting, Geochemistry | Jan 1, 2, 3, 4, 5, 7 Claims |
| 1991 | 22240 | Cominco Ltd. | Geochemical, Geological | MEX |
| 1991 | 22248 | Cheni Gold Mines Inc. | Geochemical, Physical | Atlas, Hercules |
| 1991 | 22324 | Canasil Resources Inc. | Prospecting, Geochemistry | PINE |
| 1992 | 22750 | Electrum Resource Corp. | Geochemical | Pil 1 – 3 |

**Table 6-1: (continued):**

| Work Year | ARIS # | Operator | Work Categories | Target Area |
|---|---|---|---|---|
| 1992 | 22820 | Canasil Resources Inc. | Drilling, Geochemical | Brenda 1, 4, 5, 6, 7 and 8, Jan 1 and 2, Tom 3, Hans, Pock, Max 1 -3, Tom 4 and 5, Jan 6 -9 |
| 1992 | 22873 | Romulus Resources Ltd. | Geochemical, Prospecting, Geophysics, Drilling, Geology, Aerial Photography | PINE, FIN, Song 2, TREE |
| 1993 | 23364, 23385 | Romulus Resources Ltd. | Drilling, Geochemical, Geological, Geophysical | PINE, TREE, Brenda 1, Brenda 4 - 8, Jan 1, 2, 6-9, Tom 2 - 5, Pock, Hans, Max 1- 3, Kath 1 - 10 |
| 1995-96 | 24356, 24641 | Electrum Resource Corp. | Geochemical, Geophysical | Pil, Kath, Paula, PINE |
| 1996 | - | Stealth Mining Corporation | Prospect summaries, Geological review & recommendations | PINE, FIN, Three |
| 1996 | 24628 | Canasil Resources Inc. | Drilling, Geochemical | Brenda |
| 1996 | 25054 | Electrum Resource Corp. | Geochemical, Physical | PIL 2, 5, 6, 7, 9, 11, 13 |
| 1997 | 25268, 25517 | Stealth Mining Corporation | Drilling, Geochemical, Geological, Physical | Black 1 – 12, PINE, TREE |
| 1998 | 25908 | Electrum Resource Corp. | Drilling, Geochemical, Geological | PINE, TREE, FIN |
| 1999 | 25919, 26251 | Stealth Mining Corporation | Drilling, Geochemical, Prospecting, Geophysical | Grace, PINE, Goat, VIP, Nub North, Nub West |
| 2000 | 26545 | Stealth Minerals Limited | Geochemical, Geological, Physical | PINE Southwest, Goat-Wrich, VIP |
| 2002 | 27160 | Stealth Minerals Limited | Geophysical, Geochemical, Geological, Physical, Prospecting, Petrography | PINE, Wrich Hill, VIP PINE-SW, MEX, Nub, Goat |
| 2002 | 27161 | Northgate Minerals Corporation | Drilling, Geochemical | Brenda |
| 2003 | 27422 | Northgate Minerals Corporation | Drilling, Geochemical | Brenda |
| 2003 | 27429 | Stealth Minerals Limited | Geophysical, Geochemical, Geological, Physical, Prospecting | Griz, Bee Gee, Nub Mountain, Dawn-Shastex, Dry Pond, 10K, At the Mess, Steel, Electrum, VIP, Wrich Hill |

**Table 6-1: (continued):**

| Work Year | ARIS # | Operator | Work Categories | Target Area |
|---|---|---|---|---|
| 2002-04 | - | Cascadero Copper Corporation | Technical review on previous exploration work & recommendations on diamond drilling | PINE, FIN-TREE, PINE North, Ryan Creek, MEX, 10K, PINE SW, Wrich Hill, McAburn Creek, Goat Mountain, Dry Pond, VIP-L Lake, Electrum, Beaverdam, Mina de Ray, Steel, 343 Creek, Dawn |
| 2004 | 27556 | Northgate Minerals Corporation | Drilling, Geochemical | Brenda |
| 2004 | 27602 | Finlay Minerals Ltd. | Drilling, Geochemical, Geological, Physical | Pil |
| 2004 | 27634 | Stealth Minerals Limited | Geochemical, Geological | Jo Zone, Northwest Breccia, Nub West, PSQ Zone, Malachite Ridge, Malachite Bowl, Nub Stockwork-Skarn, Amethyst Cirque and Gold Nose Ridge |
| 2004 | 27790 | Stealth Minerals Limited | Drilling, Geochemical | Quartz Lake (A-C Veins), Quartz Ridge, Griz Bowl, Sickle Bowl |
| 2004 | 28071 | Cascadero Copper Corporation | Geophysical, Geochemical, Geological, Physical | TREE-FIN, MEX, Ryan Creek, PINE North, 10K, Canyon Creek, Steel, Dry Pond |
| 2005 | 28042 | Stealth Minerals Limited | Prospecting, Geochemistry | Paula Claim Group |
| 2005-06 | - | Cascadero Copper Corporation | Geochemical, Geological | PINE, FIN, MEX |
| 2006 | - | Cascadero Copper Corporation | Geochemical, Geological, Radiometric Dating | Kemess North |
| 2006 | 28649 | Stealth Minerals Ltd. | Geochemistry, Geology | Fog Mess, Mess Ridge, Aug 30, Mess 3 |
| 2006 | 29312 | Birkeland, Arne O. | Prospecting, Geochemistry, Geology | Budd Claim Group |

**Table 6-1: (continued):**

| Work Year | ARIS # | Operator | Work Categories | Target Area |
|---|---|---|---|---|
| 2007 | - | Cascadero Copper Corporation | Geochemical, Geological, Radiometric dating, Petrography | Kemess South |
| 2007 | 30176 | Canasil Resources Inc. | Drilling, Geochemical, Geological, Geophysical, Physical | Brenda |
| 2007 | 30200 | Cascadero Copper Corporation | Drilling, Geochemical | PINE North |
| 2009 | 31564 | Gold Fields Toodoggone Exploration Corporation | Drilling, Geochemical, Geophysical, Geological, Physical, Petrography | PINE, TREE, MEX, Canyon Creek, 10K, VIP, Electrum |
| 2010 | 33171 | Sable Resources Ltd. | Drilling, Geochemical | Shasta |
| 2011 | 33802 | Cascadero Copper Corporation | Drilling, Geochemical, Archeological, Petrography, Water quality assessment | MEX |
| 2012 | 34394 | Multinational Mining Inc. | Geochemical, Geological | Baker Claim Group |
| 2013 | 34999 | Canasil Resources Inc. | Drilling, Geochemical | Brenda |
| 2014 | - | Cascadero Copper Corporation | Surficial sampling | Electrum, VIP |
| 2015 | 35511 | Cazador Explorations Ltd.; Cazador Resources Ltd. | Geophysical | Sophia |
| 2015 | 35687 | Multinational Mining Inc. | Geochemical | Shasta, Baker/Chappelle |
| 2016 | 36132 | Serengeti Resources Inc. | Geophysical | Nub |

Note: Physical work includes trenching, line-cutting, road preparation and other such physical works. The majority of the reports referenced are ARIS assessment reports, with some being internal company reports.

## 6.1 Historical Drilling

Prior to Amarc becoming the current project operator in 2016, historical drilling took place on the JOY Project in 18 different years over a 41-year period from 1972-2012. The 284 drill holes completed from 1972 to 2012 have a total length of 32,578 m and are herein referred to as the historical holes.

Historical exploration programs completed on the Project, and in particular those including core and percussion drilling, have identified three porphyry Cu-Au-Ag type deposit targets, namely the PINE, TREE and FIN. Over time, successive drilling campaigns have added to the size and potential of these targets. Compilation of all available historical data by Amarc indicates that as currently known, the PINE-TREE-FIN system is likely part of the same large +2.5 km long porphyry Cu-Au-Ag mineralized system, and is generally referred to in this report as PINE. However, as noted in various places in this report, for historical or geographic reasons the individual PINE, TREE and FIN names will continue to be used as relevant for clarity. The historical PINE hydrothermal system is not fully delineated, and likely extends over an area greater than the current drill envelope suggests (both laterally and at depth). Elsewhere on the JOY Project, the 2 km long porphyry Cu-Au deposit target called MEX, situated 3 km east of PINE, was partially drill tested in 2005, 2009, and 2012 but remains open laterally and at depth.

A summary of the drilling completed by the nine historical operators on PINE and the two historical operators on MEX, that Amarc is currently aware of, is given in Table 6-2. Table 6-3 is a summary to Amarc's knowledge of all historical drilling completed over the entire Project on a prospect area and year basis. A plan illustrating the location of the historical diamond drill holes on the Project is provided in Figure 6-1, and the historical percussion holes are shown in Figure 6-2. A plan of historical diamond drill holes by project operator on the PINE deposit and MEX deposit target is illustrated by Figure 6-3. Table 6-4 lists all holes, both historical and those completed by Amarc, that have been drilled on the JOY Project.

Kennco Explorations Canada Ltd. ("Kennco"), drilled the first hole on the Project in 1972 to test the FIN prospect. Results from this hole confirmed the existence of porphyry Cu style mineralization. Rio Tinto Canadian Exploration Ltd. ("Rio Tinto") followed up with 12 core holes on the nearby PINE prospect in 1979 and 1980, results from which indicated the presence of porphyry Cu-Au style mineralization.

In 1983, Asitka Resource Corp. ("Asitka") completed seven holes on the VIP Au, Ag, Cu and Zn skarn prospect 10 km south of PINE. Cheni Gold Mines Inc. ("Cheni") drilled 10 holes in 1987, five at the Wrich Hill Au-Ag-Cu target, 8 km south southwest of PINE and five at the Dry Pond Au-Ag prospect 16 km southwest of PINE. Skylark Resources Ltd. ("Skylark") and Asitka drilled 22 diamond drill holes and 92 percussion holes into the Electrum (or "Beaverdams") epithermal Au-Ag prospect 3 km northeast of VIP and 7 km southwest of PINE in 1988 and 1989. Skylark also drilled 10 diamond drill holes at Wrich Hill in 1988. ESSO Minerals Canada, a division of ESSO Resources Canada Limited ("ESSO") also completed two diamond drill holes 15 km west of PINE on the Paradise Au-Ag prospect in 1988.

Cominco Ltd. ("Cominco") continued exploration at FIN in 1990 completing 23 percussion holes, several of which returned anomalous Cu and Au (±Mo) concentrations. Results indicated porphyry Cu-Au potential. In 1992 and 1993, Romulus Resources Ltd. ("Romulus") followed up at PINE and FIN with 13 larger diameter, 150 to 350 m long core holes that expanded the footprints of drill-intersected mineralization of these targets. Stealth Mining Corporation ("Stealth") drilled 22 core holes in 1997, 1998 and 1999 at PINE further delineating the porphyry Cu-Au mineralization. Stealth completed an additional 20 core holes on other prospects on the Project in 2003, including 10 holes at VIP, three holes at Electrum and seven holes at Wrich Hill.

Cascadero Copper Corp. ("Cascadero") drilled 20 core holes in 2005 and 2007, including nine holes at FIN and one at PINE. In addition, Cascadero also drilled at the MEX porphyry Cu-Au deposit target, located 2 km southeast of FIN with five diamond drill holes, the Ryan Creek porphyry target located 4 km northwest of FIN with four core holes, and completed a single core hole 4 km north of FIN testing the PINE North soil anomaly.

Gold Fields drilled 30 core holes in 2009, 2011 and 2012. Drilling included 11 holes of 250 to 400 m length at the PINE and TREE, 14 holes of 300 to 400 m length at MEX, four holes in the Canyon Creek (renamed by Amarc Canyon South) Cu-Au prospect located 4 km southwest of PINE, and a single hole in the 10K grid precious and base metal prospect 8 km southwest of the PINE.

**Table 6-2: Historical Drilling Summary by Operator and Year on the JOY Project.**

| Operator | Year(s) | No. of Holes | Total (m) |
|---|---|---|---|
| Kennco | 1972 | 1 | 24.70 |
| Rio Tinto | 1979 – 1980 | 12 | 1,370.90 |
| Asitka | 1983 | 7 | 291.39 |
| Cheni | 1987 | 10 | 1748.03 |
| Skylark & Asitka | 1988 – 1989 | 114 | 3,837.99 |
| Skylark | 1988 | 10 | 963.35 |
| ESSO | 1988 | 2 | 117.00 |
| Cominco | 1990 | 23 | 1,460.00 |
| Romulus | 1992 - 1993 | 13 | 2,483.86 |
| Stealth | 1997, 1998, 1999, 2003 | 42 | 6,847.75 |
| Cascadero | 2005, 2007 | 20 | 3,967.61 |
| Gold Fields | 2009, 2011, 2012 | 30 | 9,465.23 |
| **Total Historical** | **1972 to 2012** | **284** | **32,577.81** |

**Table 6-3: JOY Project Summary of Historical Drilling by Prospect Area and Year.**

| Area | Year(s) | No. of Holes | Total (m) | Sub Totals |
|---|---|---|---|---|
| FIN | 1972, 1990, 1992, 1993, 2005 | 35 | 3,710.77 | 35 Holes<br>3,710.77 m |
| PINE | 1979, 1980, 1992, 1993,<br>1997-1999, 2005, 2009 | 53 | 9,545.02 | 57 Holes<br>10,781.91 m |
| TREE | 2009 | 4 | 1,236.89 | |
| MEX | 2005, 2011, 2012 | 19 | 5,627.82 | 23 Holes<br>6,865.22 m |
| Canyon South | 2009 | 4 | 1,237.40 | |
| Wrich Hill | 1987, 1988, 2003 | 22 | 2,967.81 | 23 Holes<br>3,265.60 m |
| 10K Grid | 2009 | 1 | 297.79 | |
| Ryan Creek | 2005 | 4 | 918.25 | 5 Holes<br>1,055.56 m |
| PINE North | 2007 | 1 | 137.31 | |
| VIP | 1983, 2003 | 17 | 1,466.29 | 141 Holes<br>6,898.75 m |
| Drypond | 1987, 1988 | 5 | 864.67 | |
| Paradise | 1988 | 2 | 117.00 | |
| Electrum | 1988, 1989, 2003 | 117 | 4,450.79 | |
| **Total Historical** | **Between 1972 & 2012** | **284** | **32,577.81** | |

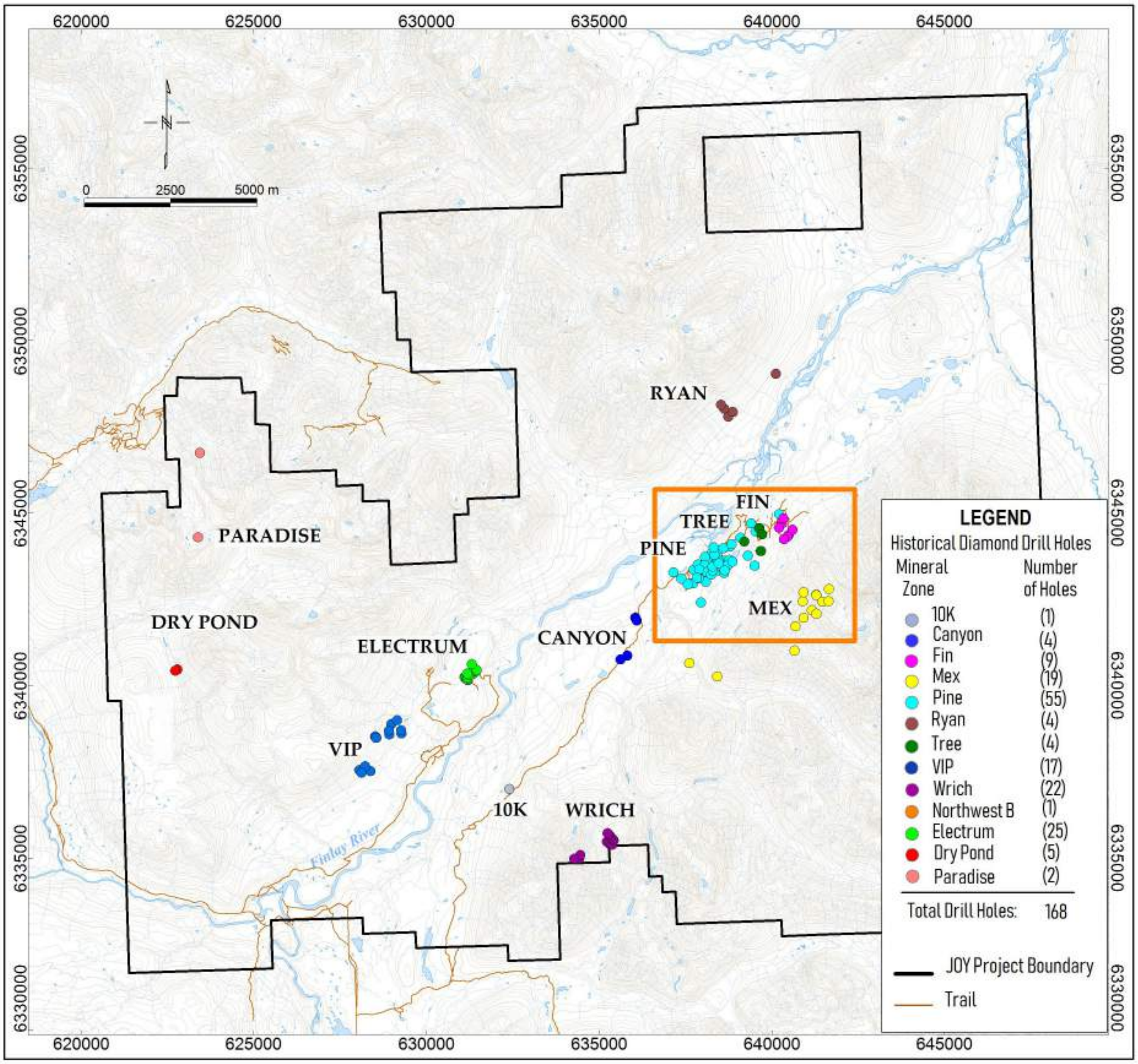



**Figure 6-1: Historical Diamond Drill Hole Plan by Prospect Area. The Orange Box Delineates the Area of Figure 6-3.**

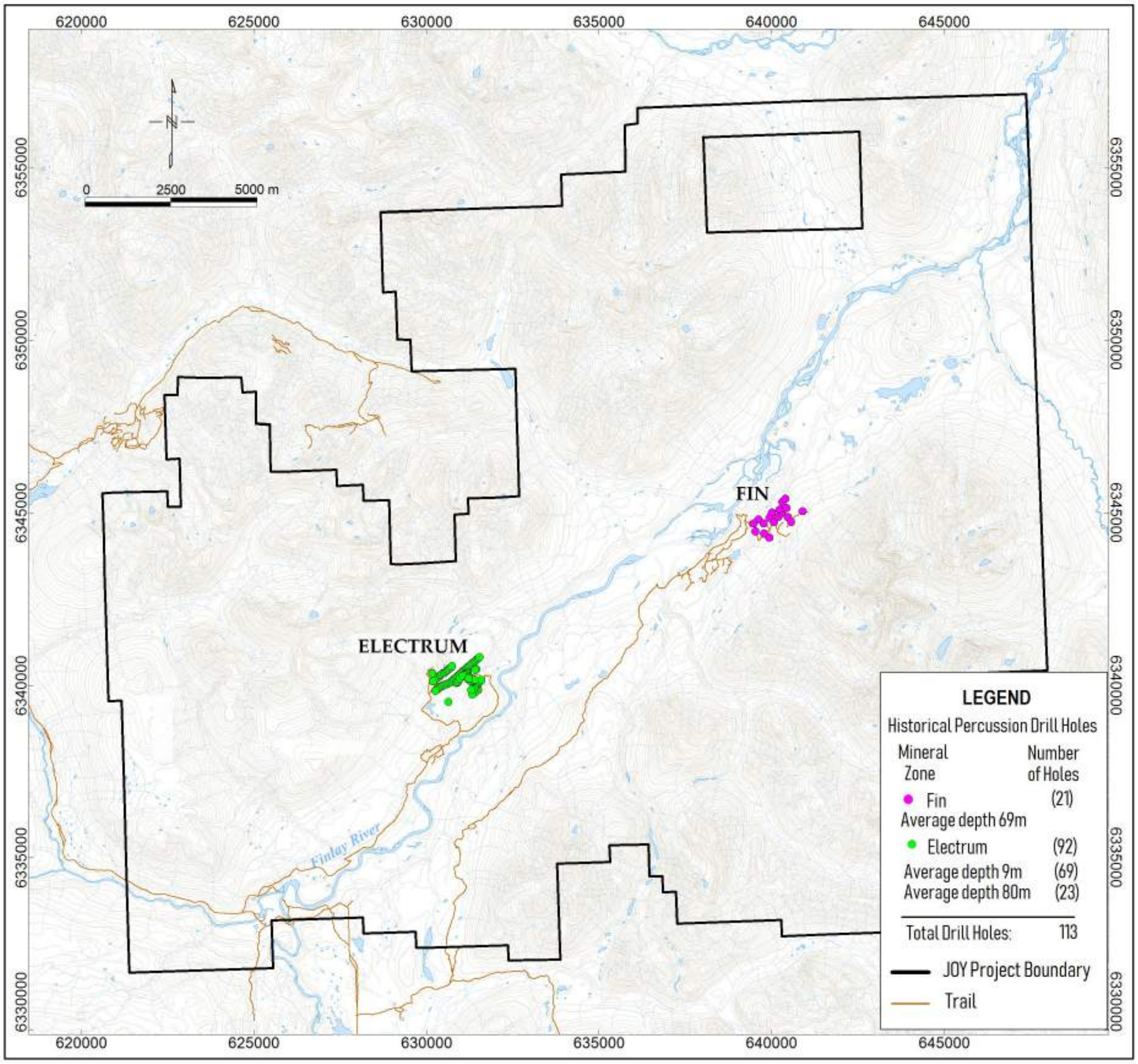



**Figure 6-2: Historical Percussion Drill Hole Plan by Prospect Area.**

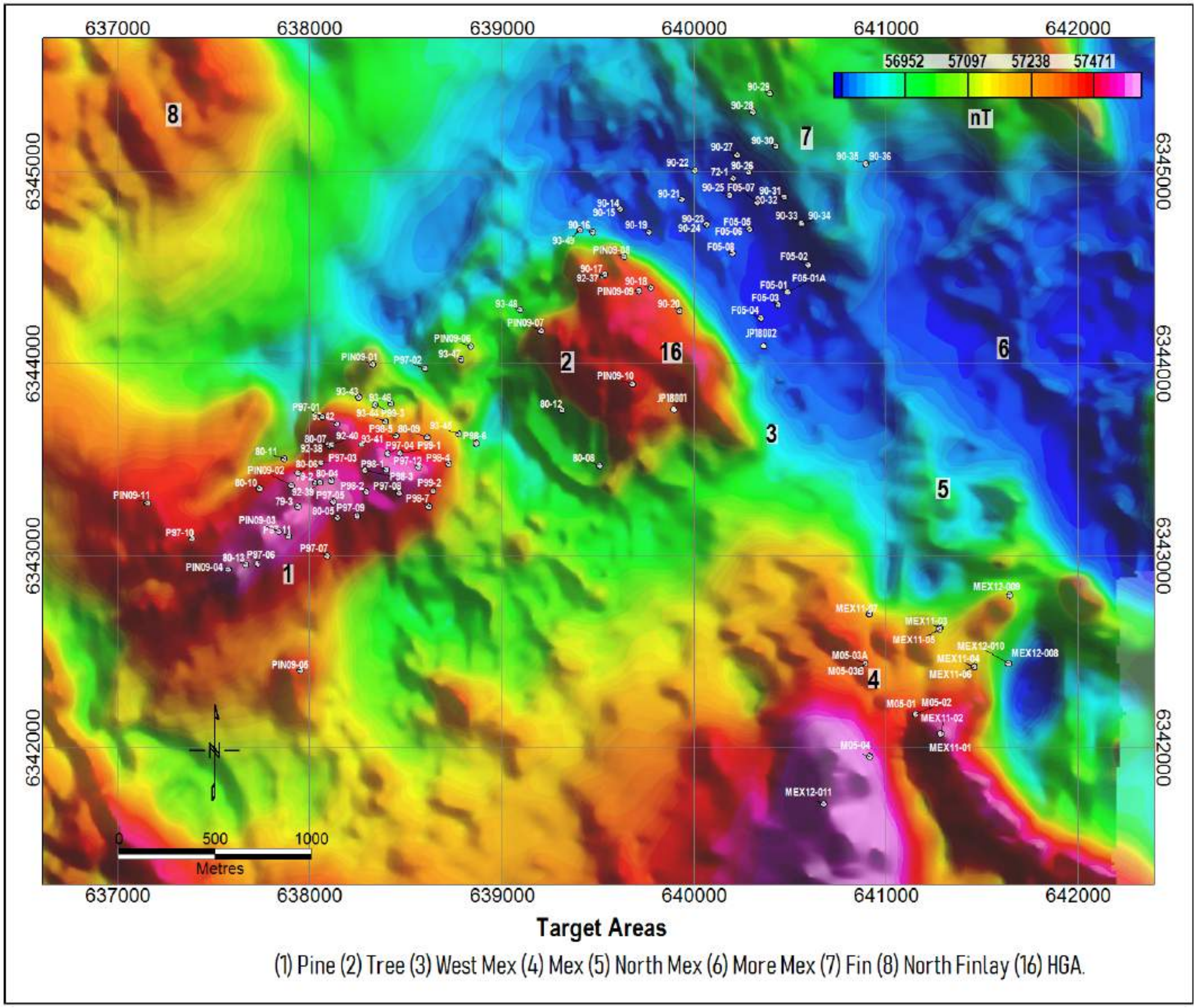



**Figure 6-3: Historical Diamond Drill Holes in the PINE-MEX Deposit Target on TMI Magnetic Base. For Location see Figure 6-1.**

**Table 6-4: Historical 1972-2012 and Amarc 2017-2018 Drilling.**

| Operator | Year | Drill Hole # | # Holes | Hole Size | Total (m) | Avg. Depth (m) | Start Date | End Date |
|---|---|---|---|---|---|---|---|---|
| Kennco | 1972 | 72-1 | 1 | XRT | 24.7 | 25 | 1972 | 1972 |
| Rio Tinto. | 1979 | 79-2 to 79-3 | 2 | BQ | 388.7 | 194 | 1979-11-27 | 1979-12-06 |
| | 1980 | 80-04 to 80-13 | 10 | | 982.2 | 98 | 1980-06-29 | 1980-08-02 |
| Asitka | 1983 | 83-1 to 83-7 | 7 | NQ | 291.39 | 291 | 1983-09-17 | 1983-10-06 |
| Cheni | 1987 | 87-A-1 to 87-A-5<br>87-W1 to 87-W5 | 10 | BQ | 1748.03 | 175 | 1987-07-20 | 1987-08-21 |
| ESSO | 1988 | CR88-01 to CR88-02 | 2 | BQ | 117 | 58 | 1988 | 1988 |
| Skylark | 1988 | W-DDH-1 to W-DDH-10 | 10 | BQ | 963.35 | 96 | 1988-07-19 | 1988-08-05 |
| Skylark. & Asitka | 1988 | 88-01 to 88-22 | 22 | BQ | 1,918.03 | 87 | 1988 | 1988 |
| | 1989 | PH-01 to PH-92 | 92 | 5.1 cm Perc. | 1,919 | 21 | 1989-03-21 | 1989-04-25 |
| Cominco | 1990 | 90-14 to 90-36 | 23 | | 1,460 | 63 | 1990-10-04 | 1990-11-06 |
| Romulus | 1992 | 92-37 to 92-40 | 4 | HQ | 781.52 | 195 | 1992-09-05 | 1992-09-22 |
| | 1993 | 93-41 to 93-49 | 9 | | 1,702.34 | 189 | 1993-08-10 | 1993-09-14 |
| Stealth | 1997 | P97-01 to P97-12 | 12 | NQ | 2,071.18 | 173 | 1997-08-01 | 1997-10-15 |
| | 1998 | P98-1 to P98-7 | 7 | | 1,122.37 | 160 | 1998-06-20 | 1998-10 |
| | 1999 | P99-1 to P99-3 | 3 | | 745.4 | 248 | 1999-08-26 | 1999-09-20 |
| | 2003 | E03-01 to E03-03<br>V03-01 to V03-10<br>W03-01 to W03-07 | 20 | NQ2<br>HQ | 2,908.80 | 145 | 2003-06-28 | 2003-08-04 |
| Cascadero | 2005 | F05-01 to F05-08<br>M05-01 to M05-03B<br>R05-01 to R05-04<br>P05-01 | 19 | NT<br>W<br>BTW | 3830.30 | 202 | 2005-06-19 | 2005-07-24 |
| | 2007 | PN-07-01 | 1 | NQ | 137.31 | 137 | 2007-07-17 | 2007-07-26 |
| Gold Fields | 2009 | PIN09-01 to PIN09-16 | 16 | NQ | 4,827.01 | 302 | 2009-08-08 | 2009-10-05 |
| | 2011 | MEX11-01 to MEX11-07 | 7 | NQ2 | 2,447.94 | 350 | 2011-06-28 | 2011-07-22 |
| | 2012 | MEX12-08 to MEX12-014 | 7 | NQ | 2,190.28 | 313 | 2012-07-17 | 2012-08-07 |
| Amarc | 2017 | JY17001 to JY17003 | 3 | NQ | 1,527.20 | 509 | 2017-08-13 | 2017-09-03 |
| | 2018 | JP18001 to JP18002 | 2 | | 946.30 | 473 | 2018-09-30 | 2018-10-11 |
| **TOTAL** | **23** | | **289** | | **35,051.31** | **122** | | |

The focus of Amarc's JOY Project exploration is porphyry-type Cu-Au deposits. While there are numerous epithermal and skarn-type targets in the Toodoggone region, some of which occur within the Project tenure, these deposit types have not to date been explored for. As such Amarc has focussed on the porphyry Cu potential of the historical drilling, the significant intersections of which are provided in Table 6-5 and Table 6-6.

Significant assay intervals from the PINE-TREE-FIN porphyry deposit and the MEX deposit targets are shown in Tables 6-5 and 6-6. These results have been assessed and intervals of > 0.30% CuEQ are shaded in orange, and those intervals with > 0.50% CuEQ are shown with a red background. These colours illustrate the higher-grade intercepts from the historical drilling. The PINE-TREE-FIN deposit and MEX deposit target warrant further drilling to assess the grade distribution and full extent of mineralization both laterally and vertically. See footnotes to Table 6-5 and Table 6-6 for descriptions and assumptions in respect to the calculation of CuEQ% in column 11 of each table.

**Table 6-5: Significant Historical PINE Drill Intercepts[1]. The CuEQ is Based on Conceptual Metallurgical Recoveries from Other Porphyry Cu Deposits.**

| Area | Year | Drill Holes | From (m) | To (m) | Int. (m)[2,3] | Cu (%) | Au (ppb)[4] | Ag (g/t)[4] | Mo (ppm)[4] | CuEQ (%)[5, 6] |
|---|---|---|---|---|---|---|---|---|---|---|
| PINE | 1979 | 79-2 | 1.80 | 51.00 | 49.20 | 0.279 | 669 | - | - | 0.64 |
| | | and | 99.00 | 127.50 | 28.50 | 0.317 | 647 | - | - | 0.67 |
| PINE | | 79-3 | 69.00 | 78.00 | 9.00 | 0.097 | 267 | - | - | 0.24 |
| | | and | 90.00 | 99.00 | 9.00 | 0.107 | 207 | - | - | 0.22 |
| PINE | 1980 | 80-04 | 7.90 | 17.40 | 9.50 | 0.070 | 445 | 2.0 | 9 | 0.33 |
| PINE | | 80-05 | 3.60 | 15.00 | 11.40 | 0.200 | 416 | 4.9 | - | 0.46 |
| | | and | 22.00 | 30.00 | 8.00 | 0.443 | 30 | 0.3 | - | 0.46 |
| PINE | | 80-06 | 5.50 | 96.00 | 90.50 | 0.108 | 354 | 5.6 | - | 0.34 |
| PINE | | 80-07 | 10.80 | 48.20 | 37.40 | 0.216 | 1,353* | 1.4 | 12 | 0.97* |
| | | Incl. | 13.00 | 15.90 | 2.90 | 0.301 | 3,120 | 1.3 | 11 | 1.94* |
| | | and | 57.00 | 90.50 | 33.50 | 0.105 | 531 | 1.4 | 28 | 0.41 |
| PINE | | 80-09 | 53.90 | 92.10 | 38.20 | 0.097 | 190 | 6.0 | 10 | 0.24 |
| PINE | | 80-13 | 86.00 | 94.20 | 8.20 | 0.077 | 720 | 3.0 | 10 | 0.49 |
| PINE | 1992 | 92-38 | 14.02 | 44.10 | 30.08 | 0.205 | 1,116 | 0.7 | 13 | 0.82 |
| | | and | 53.50 | 192.15 | 138.65 | 0.091 | 381 | 0.6 | 28 | 0.31 |
| PINE | | 92-39 | 26.80 | 47.65 | 20.85 | 0.297 | 623 | 1.7 | 5 | 0.65 |
| | | and | 61.97 | 191.00 | 129.03 | 0.195 | 292 | 0.7 | 17 | 0.37 |
| PINE | | 92-40 | 14.02 | 49.25 | 35.23 | 0.211 | 1,506* | 1.3 | 13 | 1.04* |
| | | Incl. | 20.00 | 22.00 | 2.00 | 0.282 | 3,340 | 1.2 | 10 | 1.93* |
| | | and | 54.55 | 140.00 | 85.45 | 0.141 | 725 | 0.6 | 18 | 0.55 |
| | | and | 164.50 | 182.65 | 18.15 | 0.081 | 367 | 0.6 | 11 | 0.29 |
| PINE | 1993 | 93-41 | 69.49 | 113.00 | 43.51 | 0.130 | 741* | 0.8 | 20 | 0.55* |
| | | Incl. | 75.00 | 77.00 | 2.00 | 0.278 | 3,100 | 3.6 | 11 | 1.94* |
| | | and | 129.00 | 137.00 | 8.00 | 0.358 | 210 | 0.1 | 18 | 0.48 |
| | | and | 189.00 | 197.00 | 8.00 | 0.101 | 375 | 0.6 | 27 | 0.32 |
| | | and | 265.00 | 273.00 | 8.00 | 0.078 | 438 | 0.1 | 40 | 0.33 |
| | | and | 279.00 | 287.00 | 8.00 | 0.063 | 358 | 0.2 | 63 | 0.28 |
| PINE | | 93-41 | 313.00 | 319.00 | 6.00 | 0.507 | 187 | 0.2 | 48 | 0.63 |

| Area | Year | Drill Holes | From (m) | To (m) | Int. (m)[2,3] | Cu (%) | Au (ppb)[4] | Ag (g/t)[4] | Mo (ppm)[4] | CuEQ (%)[5, 6] |
|---|---|---|---|---|---|---|---|---|---|---|
| PINE | | 93-42 | 17.70 | 62.00 | 44.30 | 0.129 | 713 | 0.1 | 23 | 0.53 |
| | | and | 86.00 | 154.00 | 68.00 | 0.090 | 300 | 0.2 | 19 | 0.26 |
| | | and | 162.00 | 184.40 | 22.40 | 0.133 | 368 | 0.4 | 19 | 0.34 |
| PINE | | 93-43 | 15.00 | 30.25 | 15.25 | 0.124 | 207 | 0.7 | 16 | 0.25 |
| PINE | | 93-44 | 13.90 | 20.35 | 6.45 | 0.089 | 278 | 0.1 | 23 | 0.25 |
| | | and | 37.30 | 119.00 | 81.70 | 0.124 | 516 | 1.1 | 26 | 0.42 |
| PINE | | 93-45 | 53.00 | 161.00 | 108.00 | 0.128 | 202 | 0.6 | 14 | 0.25 |
| PINE | | 93-46 | 112.00 | 160.00 | 48.00 | 0.094 | 228 | 0.6 | 22 | 0.23 |
| PINE | | 93-47 | 14.94 | 29.26 | 14.32 | 0.102 | 316 | 0.1 | 10 | 0.28 |
| | | and | 41.45 | 149.96 | 108.51 | 0.105 | 290 | 0.1 | 22 | 0.27 |
| PINE | 1997 | P97-01 | 13.00 | 66.50 | 53.50 | 0.095 | 447 | 0.8 | 20 | 0.35 |
| PINE | | P97-02 | 75.60 | 157.70 | 82.10 | 0.070 | 473 | 1.2 | 13 | 0.34 |
| PINE | | P97-03 | 10.80 | 31.00 | 20.20 | 0.047 | 318 | 2.0 | 8 | 0.24 |
| | | and | 52.10 | 64.50 | 12.40 | 0.049 | 493* | 1.4 | 12 | 0.40* |
| | | Incl. | 54.00 | 55.00 | 1.00 | 0.051 | 5,210 | 3.3 | 22 | 2.12* |
| | | and | 70.70 | 102.00 | 31.30 | 0.181 | 394 | 1.3 | 9 | 0.41 |
| | | and | 112.00 | 126.00 | 14.00 | 0.114 | 181 | 1.3 | 10 | 0.22 |
| PINE | | P97-04 | 37.00 | 47.30 | 10.30 | 0.109 | 268 | 1.4 | 20 | 0.27 |
| | | and | 55.10 | 75.30 | 20.20 | 0.146 | 510* | 4.5 | 19 | 0.46* |
| | | Incl. | 74.00 | 75.30 | 1.30 | 0.317 | 205,200 | 43.4 | 37 | 2.25* |
| | | and | 90.70 | 127.40 | 36.70 | 0.145 | 522 | 2.8 | 21 | 0.46 |
| | | and | 127.40 | 192.40 | 65.00 | 0.156 | 658* | 2.3 | 22 | 0.54* |
| | | Incl. | 150.00 | 153.00 | 3.00 | 0.275 | 39,800 | 16.1 | 27 | 2.02* |
| | | Incl. | 166.80 | 168.40 | 1.60 | 0.171 | 4,360 | 4.4 | 13 | 1.84* |
| PINE | | P97-05 | 4.30 | 11.30 | 7.00 | 0.080 | 576 | 0.7 | 8 | 0.40 |
| PINE | | P97-06 | 67.00 | 76.00 | 9.00 | 0.099 | 427 | 2.0 | 12 | 0.35 |
| PINE | | P97-08 | 127.70 | 268.60 | 140.90 | 0.173 | 492 | 2.0 | 15 | 0.46 |
| PINE | | P97-09 | 39.90 | 47.30 | 7.40 | 0.021 | 426 | 0.3 | 8 | 0.26 |
| | | and | 124.00 | 136.00 | 12.00 | 0.032 | 545 | 0.8 | 76 | 0.36 |
| PINE | | P97-11 | 28.00 | 37.20 | 9.20 | 0.015 | 459 | 0.1 | 18 | 0.27 |
| PINE | | P97-12 | 43.00 | 110.20 | 67.20 | 0.097 | 286 | 0.8 | 17 | 0.26 |
| | | and | 122.30 | 164.70 | 42.40 | 0.176 | 484 | 0.9 | 16 | 0.45 |
| PINE | 1998 | P98-1 | 37.40 | 44.50 | 7.10 | 0.123 | 309 | - | - | 0.29 |
| PINE | | P98-2 | 80.18 | 155.50 | 75.32 | 0.085 | 300 | - | - | 0.25 |
| | | and | 185.00 | 225.91 | 40.91 | 0.138 | 265 | - | - | 0.28 |
| PINE | | P98-4 | 128.66 | 161.00 | 32.34 | 0.105 | 329 | - | - | 0.28 |
| | | and | 170.40 | 284.30 | 113.90 | 0.147 | 299 | - | - | 0.31 |

| Area | Year | Drill Holes | From (m) | To (m) | Int. (m)[2,3] | Cu (%) | Au (ppb)[4] | Ag (g/t)[4] | Mo (ppm)[4] | CuEQ (%)[5,6] |
|---|---|---|---|---|---|---|---|---|---|---|
| PINE | | P98-5 | 17.07 | 63.10 | 46.03 | 0.126 | 483 | - | - | 0.39 |
| | | and | 80.49 | 146.95 | 66.46 | 0.119 | 370 | - | - | 0.32 |
| PINE | | P99-1 | 68.00 | 125.80 | 57.80 | 0.131 | 326 | 1.0 | 21 | 0.32 |
| | | and | 133.20 | 161.60 | 28.40 | 0.140 | 413 | 1.0 | 25 | 0.38 |
| | | and | 171.30 | 212.90 | 41.60 | 0.184 | 328 | 0.6 | 20 | 0.37 |
| PINE | 1999 | P99-2 | 169.00 | 181.00 | 12.00 | 0.095 | 240 | 0.2 | 25 | 0.24 |
| | | and | 198.00 | 253.70 | 55.70 | 0.108 | 218 | 0.8 | 14 | 0.24 |
| PINE | | P99-3 | 36.70 | 77.70 | 41.00 | 0.087 | 422 | 0.3 | 23 | 0.33 |
| | | and | 176.50 | 234.30 | 57.80 | 0.108 | 243 | 1.2 | 27 | 0.26 |
| PINE | 2009 | PIN09-02 | 6.85 | 81.68 | 74.83 | 0.137 | 427 | 1.1 | 19 | 0.38 |
| | | and | 105.46 | 128.00 | 22.54 | 0.165 | 203 | 1.4 | 20 | 0.29 |
| | | and | 162.00 | 259.00 | 97.00 | 0.170 | 231 | 1.5 | 16 | 0.31 |
| | | and | 315.45 | 351.00 | 35.55 | 0.142 | 203 | 1.1 | 9 | 0.26 |
| | | and | 371.00 | 413.61 | 42.61 | 0.141 | 180 | 1.3 | 12 | 0.25 |
| PINE | | PIN09-03 | 26.50 | 36.00 | 9.50 | 0.026 | 681 | 0.8 | 96 | 0.44 |
| | | and | 135.20 | 163.00 | 27.80 | 0.099 | 290 | 1.4 | 19 | 0.27 |
| | | and | 241.00 | 297.10 | 56.10 | 0.195 | 233 | 1.9 | 18 | 0.34 |
| PINE | | PIN09-04 | 128.00 | 134.00 | 6.00 | 0.013 | 587 | 0.4 | 9 | 0.34 |
| | | and | 305.00 | 313.00 | 8.00 | 0.105 | 235 | 1.3 | 27 | 0.25 |
| | | PIN09-06 | 238.60 | 263.10 | 24.50 | 0.124 | 282 | 1.5 | 11 | 0.29 |
| TREE | 2009 | PIN09-07 | 63.09 | 130.84 | 67.75 | 0.106 | 307 | 1.0 | 17 | 0.29 |
| | | and | 187.94 | 201.60 | 13.66 | 0.121 | 292 | 1.4 | 10 | 0.29 |
| TREE | | PIN09-08 | 14.50 | 134.00 | 119.50 | 0.150 | 252 | 2.1 | 13 | 0.31 |
| | | and | 158.00 | 172.00 | 14.00 | 0.128 | 174 | 2.0 | 7 | 0.24 |
| TREE | | PIN09-09 | 224.00 | 231.00 | 7.00 | 0.083 | 223 | 1.3 | 19 | 0.22 |
| FIN | 1972 | 72-1† | 1.50 | 24.70 | 23.20 | 0.250 | - | - | - | 0.25 |
| FIN | 1990 | 90-16‡ | 67.10 | 82.35 | 15.25 | 0.103 | 218 | | 9 | 0.22 |
| FIN | | 90-17‡ | 70.15 | 88.45 | 18.30 | 0.092 | 290 | 0.4 | 4 | 0.25 |
| FIN | | 90-22‡ | 9.14 | 27.43 | 18.29 | 0.182 | 17 | 271.2 | 52 | 1.98 |
| FIN | | 90-25‡ | 6.10 | 18.29 | 12.19 | 0.177 | 18 | 0.8 | 85 | 0.22 |
| FIN | | 90-25‡ | 21.34 | 42.67 | 21.33 | 0.180 | 10 | - | 58 | 0.21 |
| FIN | 1992 | 92-37 | 58.00 | 143.50 | 85.50 | 0.131 | 223 | 1.7 | 10 | 0.27 |
| FIN | 2005 | F05-02 | 114.00 | 120.00 | 6.00 | 0.085 | 338 | 1.6 | 13 | 0.28 |
| FIN | | F05-05 | 51.00 | 56.00 | 5.00 | 0.174 | 30 | 3.1 | 54 | 0.23 |
| | | and | 93.00 | 102.00 | 9.00 | 0.198 | 39 | 3.0 | 4 | 0.24 |
| FIN | | F05-06 | 72.00 | 109.00 | 37.00 | 0.159 | 23 | 3.0 | 119 | 0.23 |
| FIN | | F05-08 | 38.00 | 76.00 | 38.00 | 0.174 | 30 | 2.8 | 40 | 0.22 |

1 Drill holes on PINE with no significant intervals are: 80-08, 80-10 to 80-12, 93-48, P97-07, P97-10, P98-3, P98-6, P98-7, P05-01, PIN09-01, PIN09-05 and PIN09-11; and on TREE are PIN09-1; and on FIN are 90-14, 90-15, 90-18 to 90-21, 90-23, 90-24, 90-26 to 90-36, 93-49, F05-01, F05-01A, F05-03, F05-04 and F05-070.

2 Widths reported are drill widths, such that the thicknesses are unknown.

3 All assay intervals represent length-weighted averages.

4 (-) means not assayed for.

5 The estimated metallurgical recoveries are conceptual in nature. There is no guarantee that the metallurgical testing required to determine metal recoveries will be done or, if done, the metallurgical recoveries could be at the level of the conceptual recoveries used to determine the CuEQ.

6 Copper equivalent (CuEQ) calculations use metal prices of: Cu US$3.00/lb, Mo US$12.00/lb, Ag US$18.00/oz and Au US$1,400.00/oz and conceptual recoveries of: Cu 90%, Au 72%, 67% Ag and 82% Mo. Conversion of metals to an equivalent copper grade based on these metal prices is relative to the copper price per unit mass factored by predicted recoveries for those metals normalized to the copper recovery. The metal equivalencies for each metal are added to the copper grade. The general formula for this is: CuEQ % = Cu% + (Au g/t * (Au recovery / Cu recovery) * (Au $ per oz/ 31.1034768) / (Cu $ per lb* 22.04623)) + (Ag g/t * (Ag recovery / Cu recovery) * (Ag $ per oz/ 31.1034768) / (Cu $ per lb* 22.04623)) + (Mo % * (Mo recovery / Cu recovery) * (Mo $ per lb / Cu $ per lb)).

* Au and CuEQ values marked with an asterisk signify capping of very high Au assay results at 3,000 ppb for the composite calculation (3,000 ppb is the 98th percentile for Au in the JOY drill data). The included (Incl.) interval that follows presents the sample interval with the uncapped Au result.

‡ Percussion drill hole.

† Assay interval from historically reported composite. Individual assay results are unknown.

**Table 6-6: Summary of Historical MEX Deposit Target Significant Intercepts[1]. The CuEQ is Based on Conceptual Metallurgical Recoveries from Other Porphyry Cu Deposits.**

| Area | Year | Drill Holes | From (m) | To (m) | Int. (m)[2,3] | Cu (%) | Au (ppb) | Ag (g/t) | Mo (ppm) | CuEQ (%)[4,5] |
|---|---|---|---|---|---|---|---|---|---|---|
| **MEX** | 2005 | M05-01 | 22.00 | 52.00 | 30.00 | 0.060 | 717 | 1.5 | 42 | 0.48 |
| | | and | 68.00 | 100.00 | 32.00 | 0.170 | 412 | 2.7 | 31 | 0.42 |
| | | and | 138.00 | 145.40 | 7.40 | 0.047 | 1,686 | 2.9 | 47 | 1.00 |
| **MEX** | 2011 | MEX11-01 | 12.19 | 32.00 | 19.81 | 0.026 | 447 | 2.7 | 9 | 0.29 |
| | | and | 140.92 | 227.00 | 86.08 | 0.242 | 186 | 3.4 | 6 | 0.37 |
| | | and | 264.00 | 276.00 | 12.00 | 0.094 | 384 | 1.8 | 12 | 0.32 |
| | | and | 285.00 | 370.33 | 85.33 | 0.098 | 310 | 2.2 | 10 | 0.29 |
| **MEX** | | MEX11-02 | 9.14 | 36.00 | 26.86 | 0.031 | 474 | 2.1 | 16 | 0.31 |
| | | and | 103.28 | 169.00 | 65.72 | 0.076 | 303 | 2.4 | 16 | 0.26 |
| | | and | 206.00 | 229.00 | 23.00 | 0.086 | 282 | 1.5 | 17 | 0.26 |
| **MEX** | | MEX11-04 | 68.00 | 107.00 | 39.00 | 0.127 | 145 | 1.4 | 13 | 0.22 |
| | | and | 228.00 | 248.00 | 20.00 | 0.104 | 278 | 1.1 | 131 | 0.31 |
| **MEX** | | MEX11-06 | 85.00 | 111.00 | 26.00 | 0.132 | 139 | 1.2 | 16 | 0.22 |
| | | and | 137.00 | 151.00 | 14.00 | 0.107 | 217 | 1.5 | 10 | 0.24 |
| | | and | 191.00 | 208.00 | 17.00 | 0.113 | 189 | 2.3 | 9 | 0.23 |
| | | and | 229.00 | 235.00 | 6.00 | 0.129 | 184 | 3.2 | 6 | 0.25 |
| **MEX** | | MEX11-07 | 268.85 | 293.00 | 24.15 | 0.060 | 323 | 1.1 | 49 | 0.26 |
| **MEX** | 2012 | MEX12-08 | 274.00 | 284.00 | 10.00 | 0.082 | 576 | 2.0 | 3 | 0.41 |
| **MEX** | | MEX12-09 | 118.00 | 122.00 | 4.00 | 0.067 | 6,340* | 2.5 | 8 | 1.72* |
| **MEX** | | MEX12-10 | 100.00 | 106.00 | 6.00 | 0.169 | 236 | 1.9 | 11 | 0.31 |
| | | and | 182.00 | 188.00 | 6.00 | 0.121 | 176 | 1.9 | 20 | 0.24 |
| **MEX** | | MEX12-13 | 33.00 | 39.00 | 6.00 | 0.061 | 261 | 1.0 | 6 | 0.21 |

1 The following drill holes on MEX have no significant interval: M05-02, MEX11-03, M05-03A, M05-03B, M05-04, MEX11-05, MEX12-011, MEX12-012 and MEX12-014.

2 Widths reported are drill widths, such that the thicknesses are unknown.

3 All assay intervals represent length-weighted averages.

4 The estimated metallurgical recoveries are conceptual in nature. There is no guarantee that the metallurgical testing required to determine metal recoveries will be done or, if done, the metallurgical recoveries could be at the level of the conceptual recoveries used to determine the CuEQ.

5 Copper equivalent (CuEQ) calculations use metal prices of: Cu US$3.00/lb, Mo US$12.00/lb, Ag US$18.00/oz and Au US$1,400.00/oz and conceptual recoveries of: Cu 90%, Au 72%, 67% Ag and 82% Mo. Conversion of metals to an equivalent copper grade based on these metal prices is relative to the copper price per unit mass factored by predicted recoveries for those metals normalized to the copper recovery. The metal equivalencies for each metal are added to the copper grade. The general formula for this is: CuEQ % = Cu% + (Au g/t * (Au recovery / Cu recovery) * (Au $ per oz/ 31.1034768) / (Cu $ per lb* 22.04623)) + (Ag g/t * (Ag recovery / Cu recovery) * (Ag $ per oz/ 31.1034768) / (Cu $ per lb* 22.04623)) + (Mo % * (Mo recovery / Cu recovery) * (Mo $ per lb / Cu $ per lb)).

* Au and CuEQ values marked with an asterisk signify capping of very high Au assay results at 3,000 ppb for the composite calculation (3,000 ppb is the 98th percentile for Au in the JOY drill data). The included (Incl.) interval that follows presents the sample interval with the uncapped Au result.

Amarc's acquisition of historical analytical data for drill holes was from several sources. Two digital files acquired from Gold Fields provided the framework for much of the Amarc database. Acquisition of missing data was by manual data entry of scanned printouts of assay geochemical method and results in ARIS assessment reports, and also from a large number of digital files provided by Cascadero. The keypunched data included laboratory assay certificates, assay logs and assay lists created by project operators. Receipt of digital assay certificates was directly from the analytical laboratories for the Gold Fields 2009, 2011 and 2012 drill holes, and the 2003 Cascadero holes.

Information was lacking for many historical drill holes including some or all of the following; original assay certificates, certified reference material, laboratory QAQC, client quality control samples, sample splitting methods, crushed and pulverized particle size, detection limits, sample chain of custody, analytical digestion method, one or more of Cu, Au, Ag or Mo analyses and density measurements. In addition, percussion drilling is generally not as robust a method of obtaining representative samples for assay as core drilling methods. For these reasons, the analytical data from the historical percussion holes must be carefully assessed prior to use in any future resource estimation or more advanced stage studies. To date, no thorough assessment has been made. See Section 12.0 for further details.

Overall, percussion drilling chip samples represent about 6% of the drill samples taken on the PINE deposit, and almost 8% of the total number of samples taken on the JOY Project over time. The use of these chip sample results in any future resource estimation or advanced stage study must be carefully assessed.

Table 6-7 lists key drill hole information for both the historical and Amarc drilling on the JOY Project. Amarc drill holes are further described in Section 10. Collar coordinates and orientations of the bulk of 1972 to 2012 historical drill holes were primarily derived from data files provided by Gold Fields. Locations and orientations provided in assessment reports supplemented this information, where it was lacking or if it was in question. Although the drill pad locations are often still evident on the ground, collar markers are typically not evident. Amarc has not verified the collar locations of any of the historical drill holes by re-surveying. Amarc is also unaware of any downhole surveying performed prior to the 2005 drill program of Cascadero. Dip (inclination) surveys of the 2005 holes were typically at the collar and at the end of the hole, however, no downhole azimuth surveys were reported. Further work would need to be done in respect to verifying the historical core drilling data prior to a resource estimate, or an advanced stage study being undertaken.

**Table 6-7: Drill Hole Information for Known Historicalthe and Amarc Porphyry Targets and Deposit Drilling.**

| Year | Area | Operator | Hole-ID | Length | UTM –X | UTM-Y | Elevation | Azi ° | Dip ° |
|---|---|---|---|---|---|---|---|---|---|
| 1979 | PINE | Rio Tinto | 79-2 | 211.2 | 638032 | 6343387 | 1081 | N/A[1] | -90 |
| 1979 | PINE | Rio Tinto | 79-3 | 177.5 | 637941 | 6343262 | 1083 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-04 | 98.2 | 638116 | 6343396 | 1092 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-05 | 99.6 | 638147 | 6343205 | 1082 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-06 | 102.7 | 637942 | 6343437 | 1061 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-07 | 99.6 | 638107 | 6343579 | 1072 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-08 | 115.3 | 639513 | 6343474 | 1156 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-09 | 92.1 | 638615 | 6343621 | 1087 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-10 | 97.9 | 637742 | 6343355 | 1055 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-11 | 90.5 | 637870 | 6343510 | 1052 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-12 | 92.1 | 639317 | 6343765 | 1121 | N/A | -90 |
| 1980 | PINE | Rio Tinto | 80-13 | 94.2 | 637671 | 6342960 | 1101 | N/A | -90 |
| 1992 | PINE | Romulus | 92-38 | 198.7 | 638100 | 6343584 | 1068 | N/A | -90 |
| 1992 | PINE | Romulus | 92-39 | 201.7 | 638057 | 6343387 | 1079 | 270 | -45 |
| 1992 | PINE | Romulus | 92-40 | 200.2 | 638117 | 6343584 | 1072 | 270 | -60 |
| 1993 | PINE | Romulus | 93-41 | 349.6 | 638274 | 6343586 | 1077 | 270 | -62 |
| 1993 | PINE | Romulus | 93-42 | 184.4 | 638145 | 6343691 | 1053 | 270 | -45 |
| 1993 | PINE | Romulus | 93-43 | 209.4 | 638259 | 6343831 | 1047 | 270 | -45 |
| 1993 | PINE | Romulus | 93-44 | 149.9 | 638399 | 6343704 | 1077 | 262 | -45 |
| 1993 | PINE | Romulus | 93-45 | 166.1 | 638780 | 6343640 | 1082 | 270 | -44 |
| 1993 | PINE | Romulus | 93-46 | 167.9 | 638427 | 6343799 | 1080 | 270 | -45 |
| 1993 | PINE | Romulus | 93-47 | 153.0 | 638793 | 6344027 | 1082 | 276 | -45 |
| 1993 | PINE | Romulus | 93-48 | 168.2 | 639098 | 6344286 | 1087 | 270 | -45 |
| 1997 | PINE | Stealth | P97-01 | 90.9 | 638070 | 6343727 | 1033 | 270 | -60 |
| 1997 | PINE | Stealth | P97-02 | 160.1 | 638604 | 6343980 | 1057 | 270 | -60 |
| 1997 | PINE | Stealth | P97-03 | 169.5 | 638060 | 6343490 | 1062 | 270 | -45 |
| 1997 | PINE | Stealth | P97-04 | 192.4 | 638409 | 6343538 | 1092 | 270 | -70 |
| 1997 | PINE | Stealth | P97-05 | 145.7 | 638125 | 6343287 | 1084 | 270 | -60 |
| 1997 | PINE | Stealth | P97-06 | 133.2 | 637731 | 6342966 | 1090 | 270 | -60 |
| 1997 | PINE | Stealth | P97-07 | 89.6 | 638094 | 6343005 | 1080 | 270 | -60 |
| 1997 | PINE | Stealth | P97-08 | 307.0 | 638468 | 6343332 | 1090 | 270 | -60 |
| 1997 | PINE | Stealth | P97-09 | 186.6 | 638251 | 6343213 | 1098 | N/A | -90 |
| 1997 | PINE | Stealth | P97-10 | 181.7 | 637391 | 6343095 | 1050 | N/A | -90 |
| 1997 | PINE | Stealth | P97-11 | 79.9 | 637895 | 6343107 | 1085 | 270 | -60 |
| 1997 | PINE | Stealth | P97-12 | 334.6 | 638570 | 6343468 | 1086 | 270 | -45 |
| 1998 | PINE | Stealth | P98-1 | 119.8 | 638402 | 6343453 | 1093 | 270 | -75 |
| 1998 | PINE | Stealth | P98-2 | 245.7 | 638299 | 6343339 | 1093 | 270 | -60 |
| 1998 | PINE | Stealth | P98-3 | 115.9 | 638290 | 6343450 | 1094 | N/A | -90 |

**Table 6-7: (Continued)**

| Year | Area | Operator | Hole-ID | Length | UTM –X | UTM-Y | Elevation | Azi ° | Dip ° |
|---|---|---|---|---|---|---|---|---|---|
| 1998 | PINE | Stealth | P98-4 | 291.8 | 638728 | 6343483 | 1085 | 270 | -45 |
| 1998 | PINE | Stealth | P98-5 | 146.9 | 638453 | 6343629 | 1087 | 270 | -70 |
| 1998 | PINE | Stealth | P98-6 | 117.8 | 638870 | 6343591 | 1093 | N/A | -90 |
| 1998 | PINE | Stealth | P98-7 | 84.5 | 638624 | 6343261 | 1093 | 270 | -45 |
| 1999 | PINE | Stealth | P99-1 | 231.7 | 638473 | 6343540 | 1075 | 270 | -46 |
| 1999 | PINE | Stealth | P99-2 | 269.8 | 638646 | 6343342 | 1080 | 270 | -60 |
| 1999 | PINE | Stealth | P99-3 | 243.9 | 638344 | 6343791 | 1060 | 270 | -60 |
| 2005 | PINE | Cascadero | P05-01 | 30.8 | 637777 | 6343563 | 1080 | 270 | -75 |
| 2009 | PINE | Gold Fields | PIN09-01 | 300.9 | 638332 | 6344003 | 1044 | 215 | -65 |
| 2009 | PINE | Gold Fields | PIN09-02 | 413.6 | 637908 | 6343371 | 1073 | 045 | -65 |
| 2009 | PINE | Gold Fields | PIN09-03 | 358.8 | 637842 | 6343131 | 1088 | 030 | -65 |
| 2009 | PINE | Gold Fields | PIN09-04 | 398.4 | 637579 | 6342935 | 1098 | 045 | -65 |
| 2009 | PINE | Gold Fields | PIN09-05 | 246 | 637954 | 6342409 | 1106 | 225 | -65 |
| 2009 | PINE | Gold Fields | PIN09-06 | 270.4 | 638842 | 6344095 | 1079 | 090 | -65 |
| 2009 | PINE | Gold Fields | PIN09-11 | 67.0 | 637158 | 6343280 | 1114 | 045 | -65 |
| 2009 | TREE | Gold Fields | PIN09-07 | 282.6 | 639210 | 6344176 | 1094 | 055 | -65 |
| 2009 | TREE | Gold Fields | PIN09-08 | 334.4 | 639642 | 6344563 | 1113 | 225 | -65 |
| 2009 | TREE | Gold Fields | PIN09-09 | 282.6 | 639718 | 6344385 | 1114 | 225 | -65 |
| 2009 | TREE | Gold Fields | PIN09-10 | 337.4 | 639685 | 6343899 | 1138 | 045 | -65 |
| 1993 | FIN | Romulus | 93-49 | 153.7 | 639410 | 6344700 | 1093 | 270 | -45 |
| 1972 | FIN | Kennco | 72-1 | 24.7 | 640208 | 6344970 | 1132 | N/A | -90 |
| 1990 | FIN | Cominco | 90-14 | 27.5 | 639620 | 6344810 | 1105 | N/A | -90 |
| 1990 | FIN | Cominco | 90-15 | 91.5 | 639620 | 6344810 | 1105 | N/A | -90 |
| 1990 | FIN | Cominco | 90-16 | 85.4 | 639478 | 6344690 | 1103 | N/A | -90 |
| 1990 | FIN | Cominco | 90-17 | 91.5 | 639530 | 6344460 | 1112 | N/A | -90 |
| 1990 | FIN | Cominco | 90-18 | 91.5 | 639780 | 6344400 | 1124 | N/A | -90 |
| 1990 | FIN | Cominco | 90-19 | 91.5 | 639770 | 6344690 | 1110 | N/A | -90 |
| 1990 | FIN | Cominco | 90-20 | 91.5 | 639930 | 6344280 | 1149 | N/A | -90 |
| 1990 | FIN | Cominco | 90-21 | 91.5 | 639940 | 6344860 | 1117 | N/A | -90 |
| 1990 | FIN | Cominco | 90-22 | 91.5 | 640010 | 6345010 | 1126 | N/A | -90 |
| 1990 | FIN | Cominco | 90-23 | 21.4 | 640070 | 6344730 | 1135 | N/A | -90 |
| 1990 | FIN | Cominco | 90-24 | 64.0 | 640070 | 6344730 | 1135 | N/A | -90 |
| 1990 | FIN | Cominco | 90-25 | 79.6 | 640190 | 6344880 | 1140 | N/A | -90 |
| 1990 | FIN | Cominco | 90-26 | 70.2 | 640290 | 6345000 | 1143 | N/A | -90 |
| 1990 | FIN | Cominco | 90-27 | 91.5 | 640230 | 6345090 | 1136 | N/A | -90 |
| 1990 | FIN | Cominco | 90-28 | 91.5 | 640311 | 6345315 | 1124 | N/A | -90 |
| 1990 | FIN | Cominco | 90-29 | 79.3 | 640400 | 6345410 | 1125 | N/A | -90 |
| 1990 | FIN | Cominco | 90-30 | 79.3 | 640430 | 6345138 | 1139 | N/A | -90 |

**Table 6-7: (Continued)**

| Year | Area | Operator | Hole-ID | Length | UTM –X | UTM-Y | Elevation | Azi ° | Dip ° |
|---|---|---|---|---|---|---|---|---|---|
| 1990 | FIN | Cominco | 90-31 | 15.3 | 640476 | 6344872 | 1151 | - | -90 |
| 1990 | FIN | Cominco | 90-32 | 48.8 | 640475 | 6344873 | 1151 | - | -90 |
| 1990 | FIN | Cominco | 90-33 | 18.3 | 640565 | 6344734 | 1157 | - | -90 |
| 1990 | FIN | Cominco | 90-34 | 30.5 | 640565 | 6344735 | 1157 | - | -90 |
| 1990 | FIN | Cominco | 90-35 | 8.5 | 640900 | 6345046 | 1183 | - | -90 |
| 1990 | FIN | Cominco | 90-36 | 8.5 | 640900 | 6345046 | 1183 | - | -90 |
| 1992 | FIN | Romulus | 92-37 | 180.8 | 639540 | 6344470 | 1111 | - | -90 |
| 2005 | FIN | Cascadero | F05-01 | 158.6 | 640493 | 6344378 | 1192 | 295 | -75 |
| 2005 | FIN | Cascadero | F05-01A | 72.8 | 640493 | 6344378 | 1192 | 295 | -75 |
| 2005 | FIN | Cascadero | F05-02 | 289.9 | 640600 | 6344519 | 1189 | 270 | -75 |
| 2005 | FIN | Cascadero | F05-03 | 187.5 | 640443 | 6344312 | 1198 | 300 | -75 |
| 2005 | FIN | Cascadero | F05-04 | 215.5 | 640352 | 6344242 | 1187 | 300 | -75 |
| 2005 | FIN | Cascadero | F05-05 | 325.0 | 640295 | 6344705 | 1164 | 300 | -55 |
| 2005 | FIN | Cascadero | F05-06 | 209.2 | 640295 | 6344705 | 1168 | 120 | -50 |
| 2005 | FIN | Cascadero | F05-07 | 246.7 | 640334 | 6344844 | 1140 | 300 | -50 |
| 2005 | FIN | Cascadero | F05-08 | 186.6 | 640205 | 6344580 | 1174 | 120 | -50 |
| 2005 | MEX | Cascadero | M05-01 | 145.4 | 641159 | 6342181 | 1781 | 120 | -45 |
| 2005 | MEX | Cascadero | M05-02 | 246.0 | 641159 | 6342181 | 1781 | 300 | -45 |
| 2005 | MEX | Cascadero | M05-03A | 35.7 | 640898 | 6342443 | 1727 | 320 | -55 |
| 2005 | MEX | Cascadero | M05-03B | 273.2 | 640898 | 6342443 | 1727 | 320 | -55 |
| 2005 | MEX | Cascadero | M05-04 | 289.3 | 640919 | 6341961 | 1647 | 120 | -45 |
| 2011 | MEX | Gold Fields | MEX11-01 | 370.3 | 641290 | 6342080 | 1795 | 045 | -60 |
| 2011 | MEX | Gold Fields | MEX11-02 | 343.5 | 641290 | 6342080 | 1795 | 000 | -60 |
| 2011 | MEX | Gold Fields | MEX11-03 | 313.0 | 641286 | 6342631 | 1530 | 140 | -65 |
| 2011 | MEX | Gold Fields | MEX11-04 | 361.8 | 641466 | 6342427 | 1576 | 180 | -65 |
| 2011 | MEX | Gold Fields | MEX11-05 | 311.6 | 641284 | 6342624 | 1530 | 270 | -65 |
| 2011 | MEX | Gold Fields | MEX11-06 | 352.7 | 641464 | 6342428 | 1576 | 270 | -65 |
| 2011 | MEX | Gold Fields | MEX11-07 | 395.0 | 640918 | 6342704 | 1607 | 140 | -65 |
| 2012 | MEX | Gold Fields | MEX12-08 | 322.2 | 641644 | 6342444 | 1522 | 210 | -70 |
| 2012 | MEX | Gold Fields | MEX12-09 | 309.7 | 641650 | 6342800 | 1650 | 210 | -70 |
| 2012 | MEX | Gold Fields | MEX12-10 | 301.1 | 641644 | 6342444 | 1522 | 270 | -65 |
| 2012 | MEX | Gold Fields | MEX12-11 | 322.2 | 640680 | 6341715 | 1500 | 060 | -70 |
| 2012 | MEX | Gold Fields | MEX12-12 | 328.3 | 640656 | 6341009 | 1400 | 200 | -65 |
| 2012 | MEX | Gold Fields | MEX12-13 | 313.0 | 637617 | 6340645 | 1400 | 350 | -65 |
| 2012 | MEX | Gold Fields | MEX12-14 | 293.8 | 638428 | 6340257 | 1400 | 200 | -70 |
| 2009 | Canyon | Gold Fields | PIN09-12 | 88.0 | 636053 | 6341971 | 1099 | 225 | -65 |
| 2009 | Canyon | Gold Fields | PIN09-13 | 422.8 | 636093 | 6341885 | 1099 | - | -90 |
| 2009 | Canyon | Gold Fields | PIN09-14 | 450.2 | 635820 | 6340866 | 1175 | - | -90 |

**Table 6-7: (Continued)**

| Year | Area | Operator | Hole-ID | Length | UTM –X | UTM-Y | Elevation | Azi ° | Dip ° |
|---|---|---|---|---|---|---|---|---|---|
| 2009 | Canyon | Gold Fields | PIN09-15 | 276.5 | 635623 | 6340753 | 1170 | 020 | -80 |
| 2005 | Ryan | Cascadero | R05-01 | 297.9 | 638634 | 6348030 | 1180 | 036 | -70 |
| 2005 | Ryan | Cascadero | R05-02 | 225.0 | 638745 | 6347800 | 1139 | 030 | -60 |
| 2005 | Ryan | Cascadero | R05-03 | 167.0 | 638878 | 6347936 | 1137 | 030 | -55 |
| 2005 | Ryan | Cascadero | R05-04 | 228.4 | 638537 | 6348147 | 1223 | 030 | -60 |
| 2007 | North | Cascadero | PN-07-01 | 137.3 | 640114 | 6349042 | 1096 | 045 | -70 |
| 2017 | NWB | Amarc | JY17001 | 503.0 | 636271 | 6347697 | 1421 | 000 | -45 |
| 2017 | NWB | Amarc | JY17002 | 507.2 | 637071 | 6347488 | 1423 | 000 | -45 |
| 2017 | NWB | Amarc | JY17003 | 517.0 | 636809 | 6348121 | 1710 | 042 | -45 |
| 2018 | PINE | Amarc | JP18002 | 481.2 | 640363 | 6344092 | 1197 | 090 | -50 |
| 2018 | PINE | Amarc | JP18001 | 465.1 | 639893 | 6343762 | 1194 | 090 | -50 |

Note: Numbers may not total due to rounding. N/A means data was not available. '-' means no azimuth (vertical drilling).

## 6.2 Historical Surficial Sampling

Historical surface geochemical programs occurred in at least 22 different years over the 45-year period between 1969 and 2014. Historical workers collected 11,988 surface samples including 6,390 soil, 4,318 rock, 226 stream sediment samples and 6 panned concentrates totalling 215,000 individual elemental analyses. Amarc compiled, from a variety of non-digital and digital sources, this critical historical information which previously did not exist in a coherent format accessible to modern digital exploration targeting techniques. Lack of information and data integrity issues precluded 1,048 other samples from being included in the compilation and verification process, including 526 soils and 412 samples of unknown type, 108 rock samples and 2 stream sediment samples, giving a total of 10,940 usable samples. The historical surface and Amarc surface sample database includes 14,961 samples (Table 6-8), Section 11-1, and Benn (2018).

For clarity, the Gold Fields field samplers documented the quality of the soil geochemical sample using a scale from 1 to 2. They recorded 74 samples as 'talus' rather than classic B horizon soils. Amarc has treated these samples as if they were classic soil samples for the purposes of verification and use in early stage exploration targeting. Table 6-9 is a summary of historical and Amarc surface sampling compilation by year and sample type.

**Table 6-8: Historical and Amarc Surface Sampling Summarized by Year and Sample Type.**

| Year | Sample Type | No. of Samples | Sub Total |
|---|---|---|---|
| Unknown | Soil | 546 | 546 |
| 1969 | Soil | 812 | 812 |
| 1979 | Soil | 1,234 | 1,329 |
| | Stream | 95 | |
| 1980 | Rock | 106 | 393 |
| | Soil | 284 | |
| | Stream | 3 | |
| 1982 | Rock | 249 | 249 |
| 1983 | Rock | 5 | 5 |
| 1985 | Rock | 5 | 5 |
| 1987 | Rock | 35 | 312 |
| | Soil | 277 | |
| 1988 | Pcon† | 6 | 314 |
| | Rock | 19 | |
| | Soil | 283 | |
| | Stream | 6 | |
| 1989 | Rock | 33 | 124 |
| | Soil | 91 | |
| 1990 | Rock | 313 | 335 |
| | Soil | 22 | |
| 1992 | Soil | 835 | 835 |
| 1993 | Rock | 8 | 8 |
| 1996 | Rock | 29 | 29 |
| 2002 | Soil | 74 | 74 |
| 2003 | Rock | 2,299 | 2,772 |
| | Soil | 449 | |
| | Stream | 24 | |
| 2004 | Rock | 600 | 2,017 |
| | Soil | 1,409 | |
| | Stream | 8 | |
| 2005 | Rock | 174 | 174 |
| 2006 | Rock | 30 | 30 |
| 2009 | Rock | 364 | 436 |
| | Soil | 15 | |
| | Stream | 57 | |
| 2010 | Rock | 37 | 96 |
| | Soil | 59 | |
| 2012 | Rock | 4 | 4 |
| 2014 | Rock | 8 | 41 |
| | Stream | 33 | |
| 2016* | Soil | 620 | 620 |
| 2017* | Rock | 21 | 659 |
| | Soil | 638 | |
| 2018* | Rock | 66 | 2,742 |
| | Soil | 2,676 | |
| **Totals** | **Pcon** | **6** | **14,961** |
| | **Rock** | **4,405** | |
| | **Soil** | **10,324** | |
| | **Stream** | **226** | |

Note: † Pcon = stream sediment panned concentrate. *2016, 2017 and 2018 surface samples were taken by Amarc.

Exploration for porphyry-type deposits on the PINE property, where Amarc's exploration activities have largely been focused, has progressed beyond the utility of stream sediment geochemistry and as such these results are not discussed. In addition, most historical surface rock samples across the Project are considered selected character samples and are mainly related to potential epithermal occurrences and so are not considered. More specifically historical rock samples from the vicinity of the historical PINE, TREE, FIN and MEX porphyry deposits and deposit targets, although assisting early historical exploration programs by former operators are classified as select or grab samples and so deemed not reliable and also will not be discussed further.

Historical soil geochemistry survey coverage was extensive in certain areas of the Project (Figure 6-4). Early samples were in general analyzed for only a limited and variable numbers of elements, and lower detection limits were comparatively high and variable depending on the analytical method used. As time progressed, the number of elements analyzed increased, lower detection limits were decreased, and analytical methods and QC improved. With this cautionary awareness, the bulk of the historical soil geochemistry once integrated with and verified by recent Amarc soil sample geochemistry remains highly relevant and useful for current porphyry exploration. Extensive QAQC, data validation and porphyry targeting was completed in 2019, see Section 11 and Section 12 below, and Benn (2018) for further details.

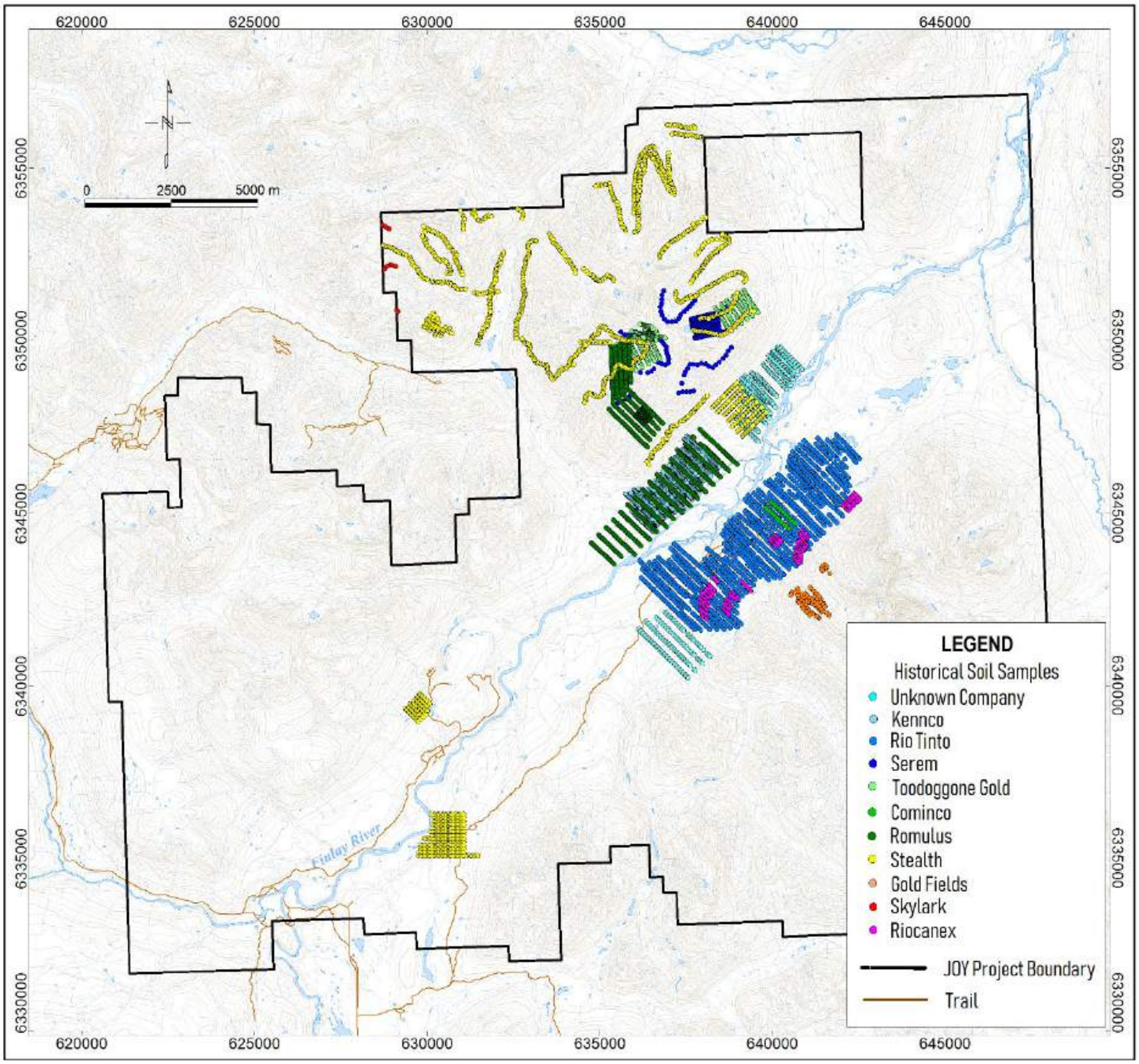



**Figure 6-4: Known JOY Project Historical Soil Sample Locations.**

## 6.3 Historical Resource Estimates

An historical estimate of the quantity and grade of the PINE deposit, which was called "an initial geological reserve", comprises 40 Mt grading 0.15% Cu and 0.57 g/t Au (Rebagliati et al., 1993). At the then prevailing metal prices the value of a gram of Au was nearly equal to the value of 1% Cu. The CuEQ at that time was calculated by adding the Au assay in grams to the Cu assay in % thus 0.15% Cu + 0.57 g/t Au = 0.72% CuEQ. A cut-off grade of 0.40% CuEQ was used. The estimation was done using a polygonal method, with a 10 m bench interval, a polygon radius of 100 m and a density of 2.70. Additionally, the then senior author had full access to the economic assessment at that time for the Kemess South porphyry Cu-Au deposit, which was subsequently developed and profitably mined. This historical estimate was produced prior to the onset of essential NI 43-101 criteria and does not meet CIM requirements. It does not use prescribed mineral resource categories. However, it is relevant to this disclosure as it is referred to in CIM Special Volume 46. Additional drilling by subsequent operators has been completed since the 1993 estimate, and the results of these programs, as well as the analytical methods and quality assurance procedures used, would need to be assessed and verified prior to any new resource estimate being undertaken.

A QP has not done sufficient work to classify the historical estimate as current mineral resources or mineral reserves; and Amarc is not treating the historical estimate as current mineral resources or mineral reserves.

## 6.4 Historical Production

There has been no production from the JOY Project.

# 7.0 Geological Setting

## 7.1 Regional Geology

The geology of the Toodoggone region comprises Upper Triassic to Lower Jurassic Hazelton Group Toodoggone Fm volcanic and sedimentary rocks, which unconformably overlie submarine island-arc volcanic and sedimentary rocks of the Lower Permian Asitka Group ("Asitka") and Middle Triassic Takla Group ("Takla"). Across the JOY Project in various areas the Takla volcanic units are intruded by Upper Triassic to Lower Jurassic plutons and dykes of the BLIS (Duuring, et al., 2009; Figure 7.1). This setting is similar to numerous other major deposits and exploration prospects in the Golden Triangle of BC, where the "Red Line" map of Kyba and Nelson (2014) tracks the prospective Triassic-Jurassic unconformable boundary. The BLIS igneous units are exposed along the margins of the Toodoggone volcanic-sedimentary depression but also occur internally within the depression as elongate, northwest to northeast -trending plutons (Figure 7.2). These intrusions are temporally and probably genetically related to the volcanic rocks of the Toodoggone Fm.

In the Toodoggone region the younger cover rocks have acted to preserve, either entirely or partially, mineralized and altered sequences including those related to both the porphyry Cu-Au systems, and low to high sulphidation epithermal systems that may still retain their clay-rich alteration caps. Epithermal

Au-Ag deposits represent the tops or sides of porphyry Cu-Au systems (Rowins, 2012; Sillitoe, et al., 2016). Zeolite facies regional metamorphism affects the Toodoggone Fm, whereas underlying Takla rocks experienced prehnite-pumpellyite metamorphism (Diakow et al., 1993). High-temperature contact metamorphism is locally associated with plutonic rocks and dykes, and may be overprinted by the hydrothermal alteration halos.

Within the Toodoggone region, several porphyry and epithermal deposits have mineralization ages that are broadly coeval with early Jurassic calc-alkaline plutonism and volcanism (Diakow, et al. 1991). Although plutonism occurred episodically from ca. 218 to 191 Ma, the largest porphyry Cu-Ag±Mo systems known formed from ca. 202 to 197 Ma, with some mineralization also occurring from ca. 197 to 194 Ma (Rebagliati et al., 2020). Porphyry mineralization is hosted by smaller-volume (< 1 $km^2$), single phase, porphyritic igneous stocks or dykes that have high potassium calc-alkaline compositions and are comparable with volcanic arc granites. All porphyry systems in the region are spatially restricted to exposed Asitka and Takla basement rocks, and the lowest members of the Hazelton Group (i.e., the Duncan and Metsantan members of the Toodoggone Fm, Figure 7-1).

The basement rocks to the intrusions that host the porphyry Cu-Au deposits are best exposed in the southern half of the Kemess District, where rates of uplift and erosion have resulted in their preferential exposure. In contrast, low and high-sulphidation epithermal systems are more numerous in the northern half of the District where overlying Hazelton Group rocks dominate exposures (Duuring, et al., 2009). However, cogenetic porphyry systems also exist in the northern areas where they occur in Lower Toodoggone Fm Duncan and Metsantan members. High-sulphidation epithermal systems formed at ca. 201 to 182 Ma, whereas low-sulphidation systems were active at ca. 192 to 162 Ma (Rebagliati et al., 2020).

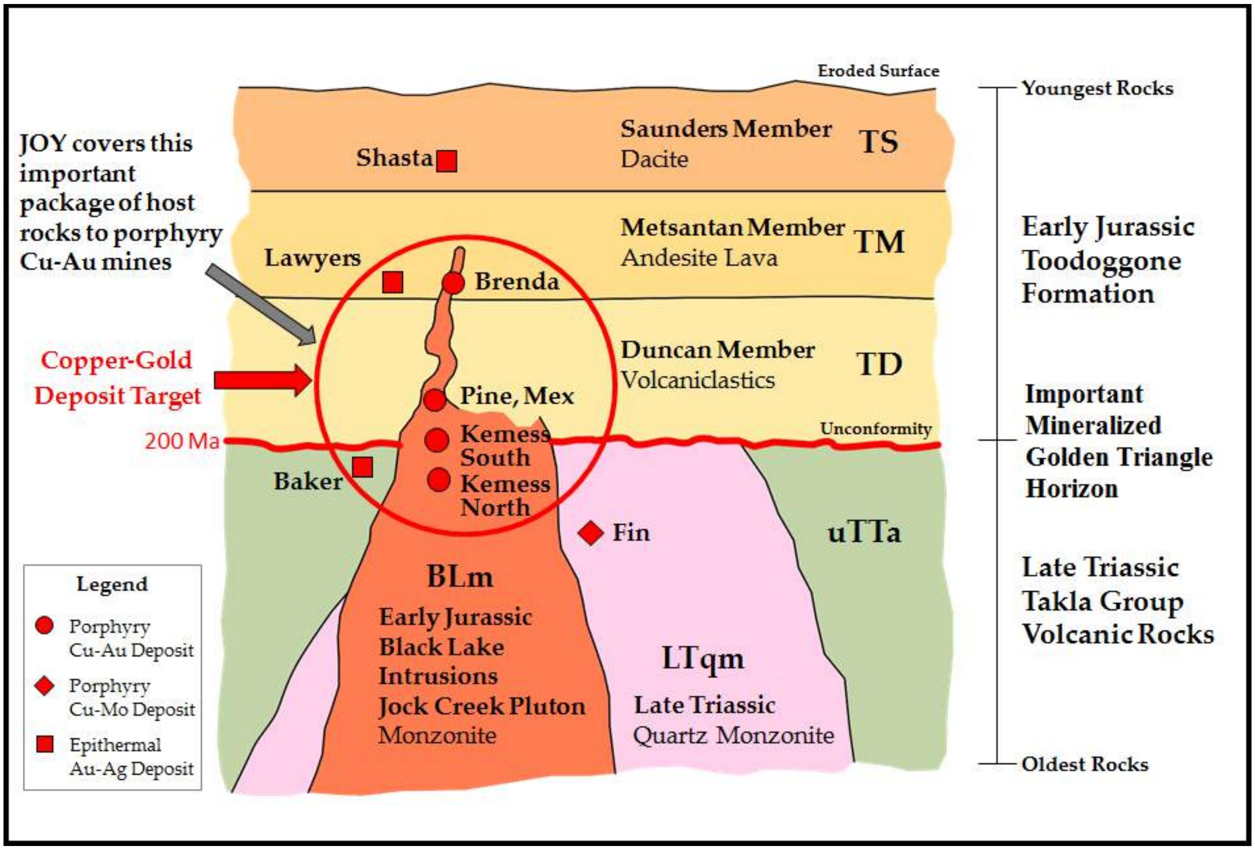



**Figure 7-1: Schematic Regional Geology Cross-Section for the Toodoggone, Showing Prolific Porphyry Deposit Formation between 218 Ma and 191 Ma.**

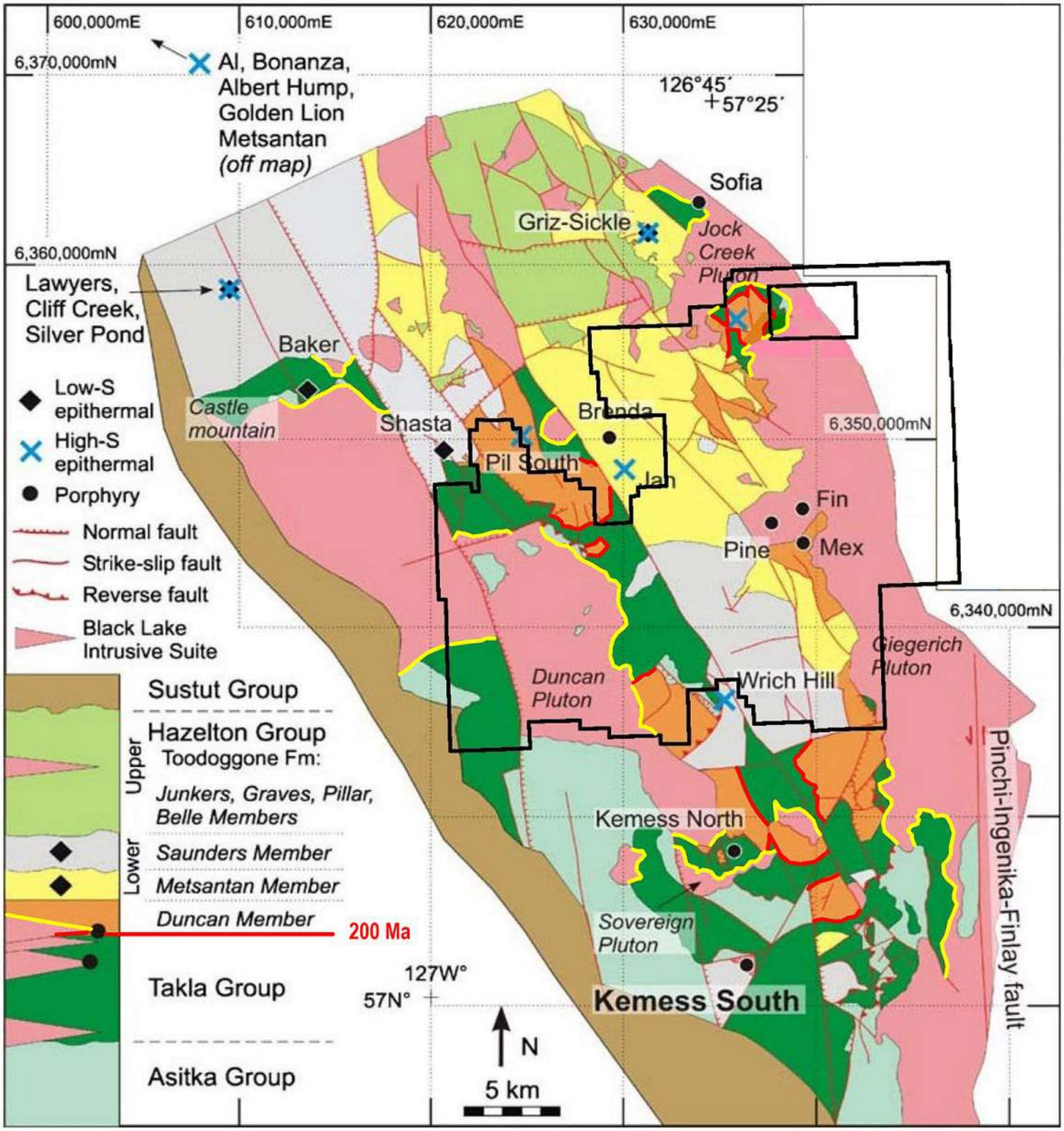



**Figure 7-2: Toodoggone Regional Geology Map (modified after Duuring et al., 2009). The Red Boundary Represents Unconformable Contacts, and Yellow Boundary the Intrusive Contacts between Triassic-Jurassic Units.**

## 7.2 Property Geology

The geology of the JOY Project is shown Figure 7-3. Late Triassic Giegerich pluton quartz monzonite intrude the Asitka, Takla and Early Jurassic Jock Creek pluton hornblende phyric monzonite. Other BLIS plutons also intrude Hazelton Group Toodoggone Fm Duncan and Metsantan members across the Project. These plutons are projected to shallowly underlie the central-western part of the Project where small stocks and dykes intrude the Duncan and Metsantan members. In the northeast and west-central areas of the Project, erosion has exposed both the Takla Group basalt and andesite flows and the unconformably overlying Duncan member volcaniclastic-epiclastic rocks, which are intruded by the Jock Creek monzonite and other BLIS plutons.

The northwest-trending Black Fault and related splays bisect the centre of the JOY Project (Figure 7-3). These faults and other northwesterly, northerly and northeasterly striking faults form horst and graben fault-bounded blocks. These extensional structures host swarms of parallel monzonite, basalt and younger latite dykes, and have been active conduits over time. The monzonite dykes and dyke swarms are locally proximal to and associated with Cu-Au mineralization as found at the Brenda porphyry deposit (Figure 7-2). Similar mineralized 202 Ma dykes occur in mineralized Takla volcanic rocks that lie above the Kemess North stock and are host to the Kemess Underground and Kemess East deposits (Figure 7-2, and McKinley, 2006). Numerous large gossans mark the location of extensive hydrothermal alteration zones, such as at the MEX, NWB and NUB West occurrences (Galicki et al., 2017).

### 7.2.1 PINE Porphyry Cu-Au Deposit

The main host to porphyry-style Cu-Au-Ag mineralization at PINE is the potassically altered (K-feldspar + magnetite) porphyritic quartz monzonite / monzodiorite (Figure 7-4). This quartz monzonite / monzodiorite has a U-Pb zircon emplacement age of 197.6±0.5 Ma and intrudes, alters, and locally mineralizes adjacent 200.9±0.4 Ma Duncan Member rocks of the Toodoggone Fm (Dickinson, 2006). Locally adjacent to the west of the quartz monzonite/ monzodiorite is a phase of weakly mineralized granodiorite.

The PINE quartz monzonite / monzodiorite has a central potassic alteration zone that is flanked by phyllic and distal propylitic alteration zones as developed in the surrounding Toodoggone Fm country rock (Rebagliati et al., 1995; Dickinson, 2006). Main-stage Cu–Au-Ag±Mo mineralization is most intense in the PINE quartz monzonite and is genetically related to quartz–magnetite–chalcopyrite–pyrite veins, which are magnetite-rich and sulfide-poor and surrounded by potassic (alkali feldspar–magnetite) alteration. Cu and Au concentrations display a positive correlation with Mo, Ag, Pb and Zn.

Main-stage veins and alteration minerals formed from a magmatic-derived, high-temperature (430 to 550°C) fluid (Dickinson, 2006). Late-stage anhydrite–pyrite ± specular hematite ± chalcopyrite, quartz–pyrite ± chalcopyrite, and pyrite ± chalcopyrite veins and associated phyllic alteration zones formed in the PINE quartz monzonite at the same time as the nearby PINE granodiorite stock was emplaced (Dickinson, 2006). The final known mineralization phase of the PINE porphyry Cu–Au–Ag±Mo system is temporally constrained by the emplacement of weakly Cu-bearing syenite dykes (U–Pb zircon age of 193.8 ±0.5 Ma; Dickinson, 2006), whereas the final stage of magmatism at PINE is defined by the emplacement of post-mineral rhyolite dykes (U–Pb zircon age of 193.6±0.4 Ma; Dickinson, 2006). This constrains the age of the PINE mineralization to between approximately 193 Ma age and the 197.6±0.5

Ma age of the intrusion. No drill holes have probed below the Toodoggone Fm host-rock and into the receptive Takla mafic volcanic rocks underlying the PINE deposit. This stratigraphic and intrusive setting is similar to Kemess South mine dated at 201.1±1.2 Ma (Duuring et al., 2008) and the Kemess North Deposits (which include the Kemess Underground project) dated at 201.9±0.8 Ma (Diakow, P.Comm. 2019).

TREE is essentially the central northeast extension of the PINE mineralized system. This mineralized area emerges in places through a layer of overburden till, which is sufficiently thick and extensive to have notably subdued geochemical soils exploration results over the PINE-TREE portion of the mineralized system. Magnetic features (see below) show that TREE conforms to a distinct circular magnetic high, located on the northeastern trend of the elongate PINE magnetic feature. It is postulated from the IP chargeability surveys and the relatively persistent relationship between Cu, Au and Ag concentrations in drilling, that the PINE and TREE stocks are related hydrothermal systems that coalesced to form one large zoned system encompassing the entire PINE-TREE-FIN area. This system forms what is referred to generally in this report as the PINE (or the "PINE deposit"). Mineralization does not appear to be host rock lithology restricted.

High resolution magnetic surveys refined the location of major and numerous smaller scale northwest faults. Subtle, shorter strike-length northeast lineaments may reflect an earlier or concurrent set of faults that parallel the northeast alignment of the Kemess North area deposits (Figure 7-2). The PINE deposit is situated 18 km north of Kemess North zone, and has a similar distinct northeast oriented magnetic high feature, marking the possible extent of the mineralized quartz monzonite stock and magnetite-rich potassic alteration (Rebagliati 1995; Dickinson, 2006).

Historical drilling at PINE (Figure 7-4 and Figure 7-5) confirms the presence of a large auriferous porphyry Cu system. Importantly the deposit appears to be open both laterally and to depth. In respect to the latter the historical drilling is in general restricted to the uppermost parts of the deposit (~80% of holes are <250 m in length, with the majority of drill holes at the PINE deposit recording < 175 m vertical penetration), with many holes ending in mineralization and some displaying increased Cu and Au with depth.

Figure 7-4 shows the mapped surface geology of the PINE-MEX area. The mineralization at PINE occurs in the Black Lake monzodiorite and the Duncan Member of the Toodoggone Fm, both of which have positive magnetic features. FIN is hosted in a late Triassic granodiorite that appears to be cut by the younger PINE-TREE BLIS intrusions. MEX is hosted by a monzodioritic intrusive in a similar setting to the PINE deposit.

In cross section (Figure 7-5) the core of the PINE is shown to have been tested only by relatively shallow drilling that intercepted long and continuous intervals of Cu-Au-Ag mineralization (Table 6-5). Constrained intercepts which have low to zero grade are likely related to historically documented post-mineralization latite or syenomonzonite dykes that were variably sampled and showed very low grade, or were not sampled by historical workers. It is not possible to produce a geological cross section at this time given the number of past operators, each with their own rock-codes and descriptions. For this and other reasons the historical PINE drill core requires re-logging to ensure geological unit consistency. However, the historical grades have been QAQC validated by Amarc (see Section 11) and in the QP's opinion the data can be used to guide, and are informative for, future exploration activities (see Section 12).

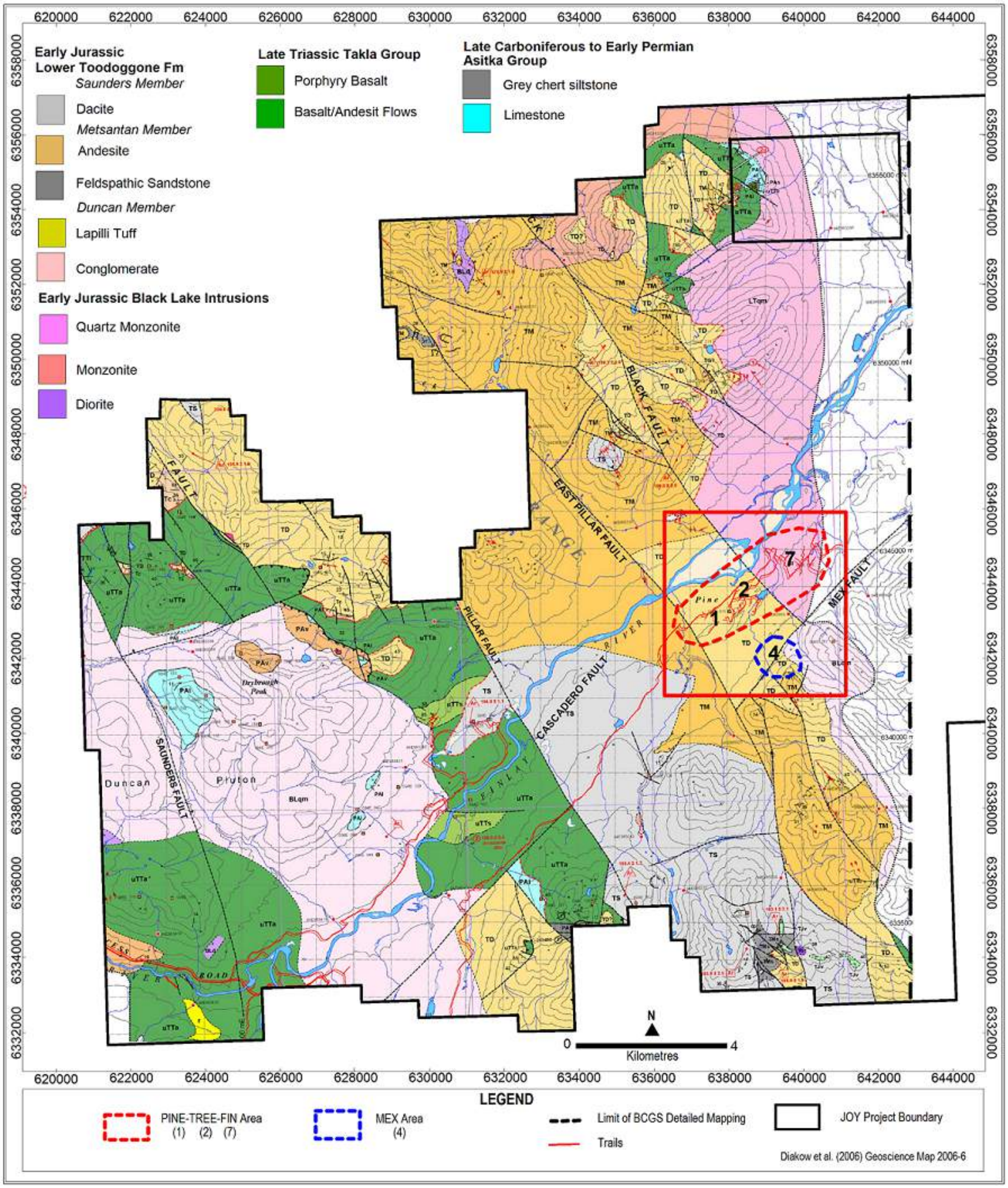



**Figure 7-3: Local Geology of JOY Project. Red Box Shows Area of Figure 7-4. The Geology is Modified After Diakow et al., 2001.**

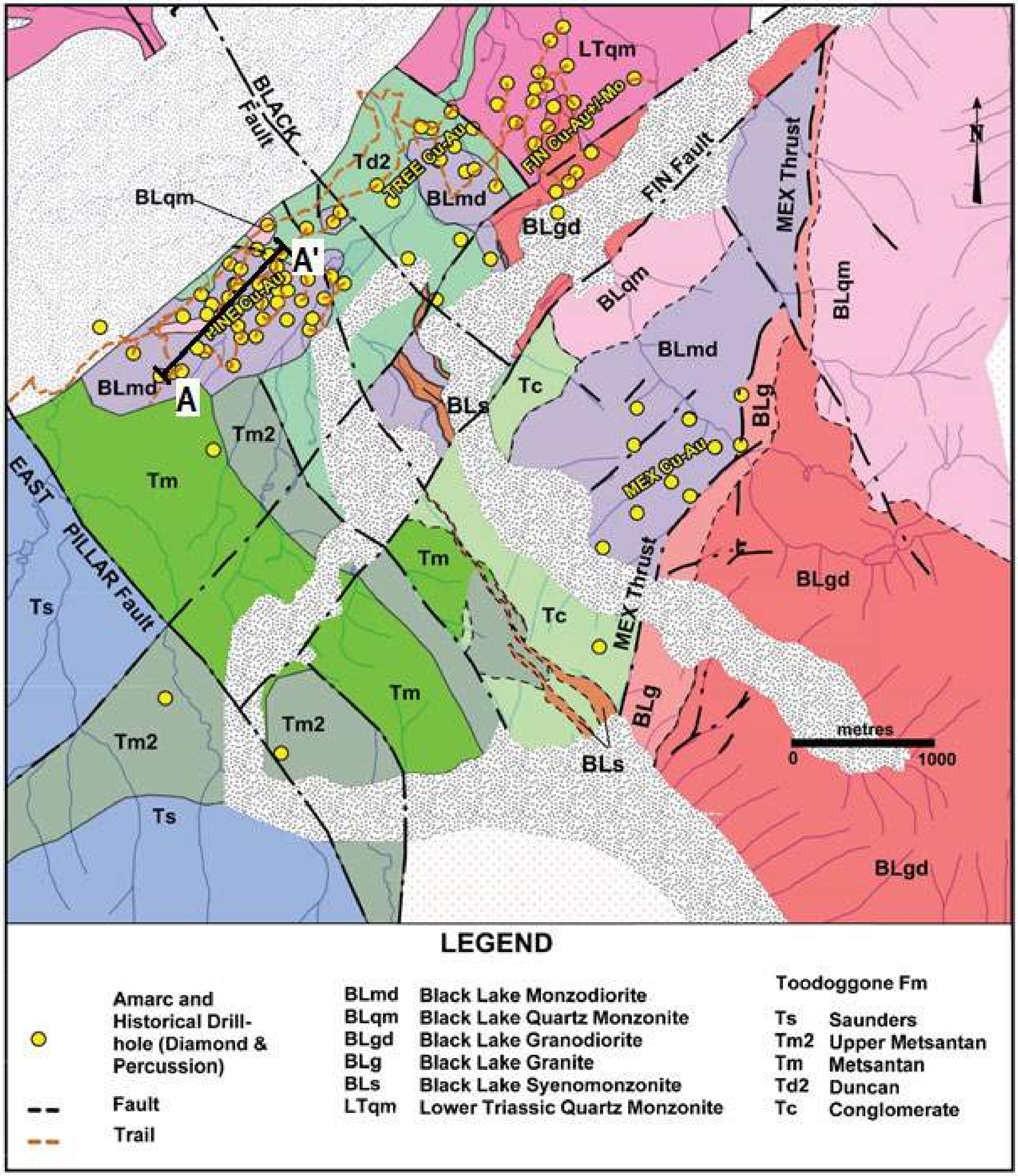



**Figure 7-4: Local Geology of the PINE and MEX Porphyry Cu-Au-Ag Deposit Targets. The Location of the Cross-Section Through PINE Deposit is Shown as A-A', and Relates to Figure 7-5.**

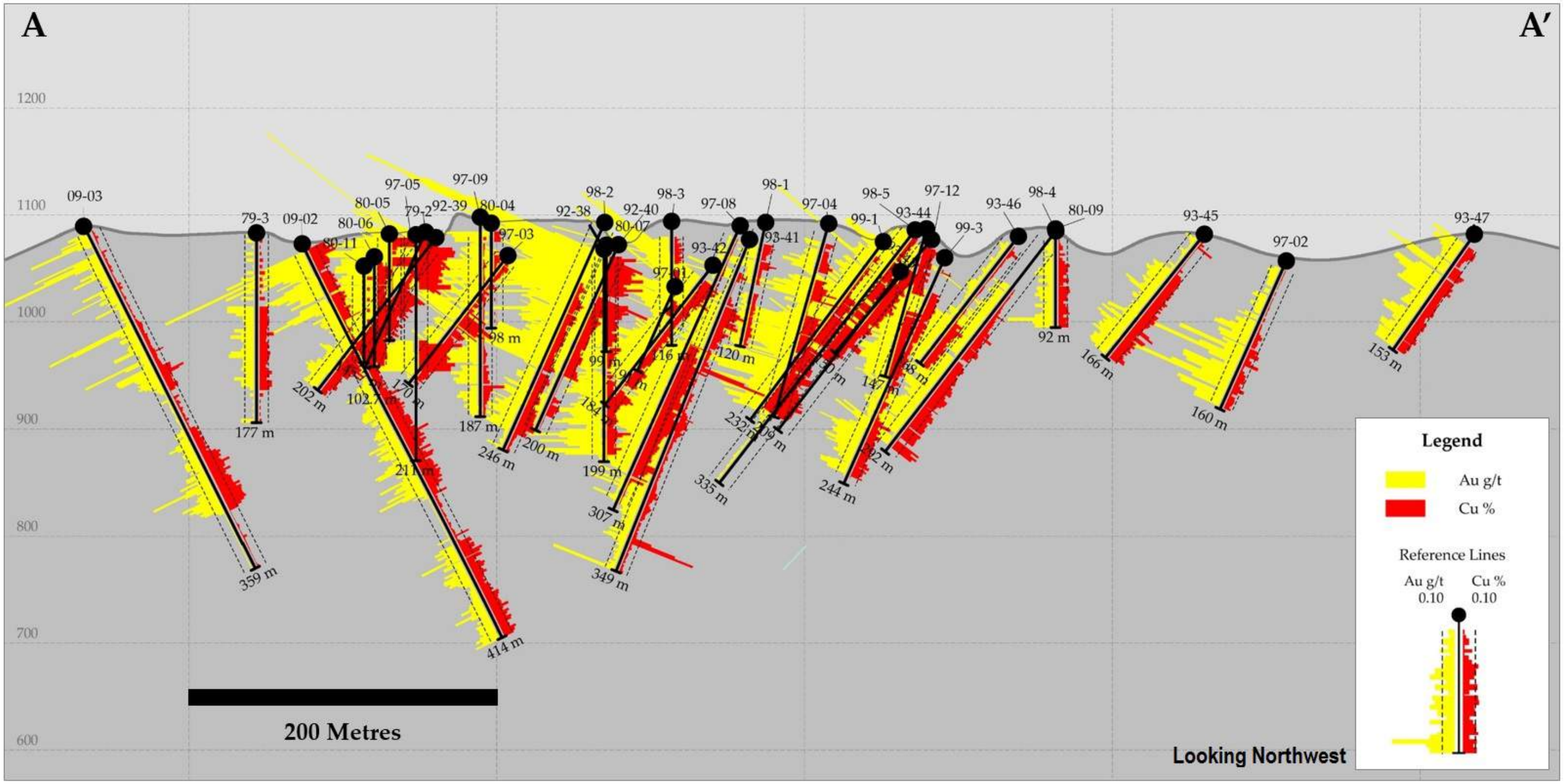



**Figure 7-5: Cross- Section Through the PINE Porphyry Cu-Au-Ag Deposit (Looking Northwest) Showing Historical Drilling Together with Cu and Au Grade Distribution.**

### 7.2.2 MEX Porphyry Cu-Au Deposit Target

The MEX deposit target was developed by Gold Fields during their 2009, 2011 and 2012 field programs. The deposit target is outlined on surface by a pronounced 1 km long, northwest-trending reddish-brown gossanous ridge located 3 km east of PINE. Oxidation of sulphides is locally variable occurring from surface to vertical depths of 150 m. The MEX monzonite / monzodiorite and the enclosing fine-grained intermediate volcaniclastics, which grade down section to medium-grained epiclastics of the Toodoggone Fm, are cut by quartz–magnetite–pyrite–chalcopyrite veins with associated alkali feldspar–magnetite (potassic) alteration. Potassic alteration is surrounded by quartz–pyrite–sericite (phyllic) alteration and more distal chlorite–epidote (propylitic) alteration zones in the MEX monzonite. The 2 km long magmatic-hydrothermal footprint of the MEX porphyry system has been truncated to the southeast by the north-northeast-striking, northwest-side-down extensional MEX fault, which juxtaposes the MEX monzonite against unmineralized Giegerich granodiorite located to the south (Dickinson, 2006; Duuring et al., 2009). North-northwest-trending post-mineral syenomonzonite dykes which intrude the MEX system appear to be absent from the Giegerich granodiorite.

The widely spaced historical drilling shows MEX remains open laterally under cover and to depth, with further drilling required prior to estimation of the mineral endowment.

## *7.3 Mineralization*

Mineralization takes several forms across the greater JOY Project, which are described below.

### 7.3.1 Porphyry-style mineralization

At the current time, porphyry Cu-Au-Ag±Mo mineralization is recognized on the Project as being most intensely developed in the PINE quartz monzonite / monzodiorite. It is genetically related to consistent northeast striking quartz–magnetite–chalcopyrite–pyrite veins, which are magnetite-rich and sulfide-poor, and surrounded by potassic (alkali feldspar–magnetite) alteration (Dickinson, 2006). The relative abundance of magnetite is typical of deep, oxidized porphyry systems (Seedorff et al. 2005). Cu and Au concentrations display a variably positive correlation with Mo, Ag, Pb and Zn. The main-stage veins are typified by mineralization and alteration that formed from a magmatic-derived, high-temperature (430 to 550°C) fluid (Dickinson, 2006). Late-stage anhydrite – pyrite ± specular hematite ± chalcopyrite, quartz – pyrite ± chalcopyrite, and pyrite ± chalcopyrite veins and associated phyllic alteration zones are considered to have formed in the PINE quartz monzonite / monzodiorite at the same time as the nearby PINE granodiorite stock was emplaced (Dickinson, 2006). Metals were initially deposited from the late-stage fluid at temperatures of 430 to 460°C, which fell to temperatures of about 340°C during the formation of later veins. The estimated depth for late-stage mineralization at PINE of 5.0 to 5.5 km (Dickinson, 2006) is comparable with the deeper range of porphyry systems (i.e. 1-6 km, Seedorff et al. 2005).

### 7.3.2 Other styles of mineralization

Epithermal Au-Ag mineralization has been historically documented on the JOY Project, however, these systems are not currently a focus of Amarc's exploration activities. It is, however, important to note the epithermal mineralization tends to occur within Toodoggone Fm volcanic sequences that are proximal to major northwest-north, northwest and northeast trending regional structures. Epithermal mineralization is known at Electrum-Beaverdam, Wrich Hill and areas near to Dry Pond, which are all proximal to the Pillar Fault (Figure 7-3). Mineralization occurs in veins, typically composed of quartz-sulphide, with K-feldspar and adularia. Au-Ag is reported to occur in a free state, but no historical metallurgy or detailed petrography is available to support this. Alteration is often hard to assess, especially in the Electrum-VIP area as there may have been overprinting by a deep seated porphyry or replacement-style mineralization formed within a possible roof pendant. However, where alteration around the epithermal veins is documented it is reported as chlorite-epidote with hematite brecciation nearer to the vein zone, with the alteration halo and vein section being up to 40 m in width.

Replacement or skarn-style mineralization is also historically documented on the JOY Project, and is mostly reported from the Northwest-Dry Pond area, where the Asitka Group limestone and carbonaceous siltstones form skarn-style alteration and mineralization adjacent to the quartz monzonites of the Duncan Pluton. Little information is available from the historical workers, and the historical drilling that specifically targeted these skarn occurrences indicates that they are fairly small and of limited economic potential. Amarc has not conducted a detailed review of this type of mineralization type as it is not currently a focus of the company's exploration.

## 8.0 Deposit Type

The JOY Project is an exploration stage project focused on locating porphyry-style Cu-Au-Ag±Mo-deposits.

The principal features of porphyry Cu deposits, as summarized recently by John et al. (2010), include:

- Mineralization defined by Cu and other metals which occur as disseminations and in veins and breccias which are relatively evenly distributed throughout their host rocks;
- Large tonnage amenable to bulk mining methods;
- Low to moderate overall Cu grades, typically between 0.15% and 2.0%;
- A genetic relationship to igneous porphyritic intrusions of intermediate composition that typically formed in convergent-margin tectonic settings;
- Generally, these deposits form in clusters, or within a camp area and less commonly as single events;
- A metal assemblage dominated by various combinations of Cu, Au, Ag, and Mo, but commonly with other associated metals of lower concentration; and
- A spatial association with other styles of intrusion-related mineralization, including skarns, polymetallic replacements and veins, distal disseminated Au-Ag deposits, and intermediate to high-sulphidation epithermal deposits.

These characteristics correspond closely to the principal features of the JOY Project targets as described in Section 6.0 of this report. Other deposit types, including intrusion-related skarn, and epithermal style mineralization have been documented elsewhere on the wider tenure but have not yet been the subject of exploration or delineation.

# 9.0 Exploration

## 9.1 Overview

Since initiating exploration activities on the JOY Project in 2016 Amarc has capitalized on the extensive historical datasets, which the company has fastidiously located, compiled and verified. This invaluable information gathered from historical geochemical, geophysical and mapping surveys and drilling programs drove initial target identification for ground follow-up, and has in many cases continued to assist Amarc's on-going target delineation and refinement.

The large historical soils geochemical database as discussed in Section 6.2 and detailed in Table 6-9, proved to be particularly useful. The collated data was verified in detail using modern verification techniques, which confirmed that the majority of the information was usable for exploration targeting (see Section 12.3.4 and Benn, 2018). In total 6,390 historical soil samples were entered into the Amarc database.

Initially Amarc's soil geochemical sampling program focused on completing new soil sampling grids to confirm, and potentially enhance, the resolution of historical target areas as delineated from the compiled historical data. However, as exploration progressed this work also successfully delineated a number of new geochemical targets for IP and geological survey follow-up. In total Amarc collected 3,934 new soil samples during the period 2016 - 2018, which greatly enhanced the regional soil coverage over the Project. These new soils significantly refined Amarc's targeting, both by assisting in the reinterpretation of numerous historical soil grids and contributing to the definition of new porphyry-style targets for follow-up. In total data from 10,324 Amarc and historical soil samples are now included in the JOY database.

As Amarc's field programs progressed, historical datasets were constantly re-evaluated in conjunction with new information from geochemical, geophysical and geological surveys. This integrated approach has ensured field exploration was efficiently and effectively guided on an on-going basis. A number of high potential targets were redefined and new exploration targets have been delineated through the combination of the historical and Amarc data. Amarc has completed only very limited initial drill testing of two of the new targets in 2017 and 2018. As such a significant number of high-priority integrated geochemical, geophysical and geological targets remain to be drill tested as part of a future exploration program which will include substantial drilling.

## 9.2 Amarc 2016, 2017 and 2018 Soil Geochemical Exploration

Amarc utilized classic B-horizon soil geochemical sampling extensively on the JOY Project to target hidden porphyry deposit geochemical signatures. The company's extensive 2016 - 2018 soil sampling programs typically proceeded along the lines laid out for IP surveying, which allowed efficient layering of geochemical and geophysical results. The methodology and sample locations for each of these programs is briefly described below, and the results discussed in detail as part of the overall combined historical plus Amarc dataset in Section 9.3.1. Amarc's individual survey results and methodologies are recorded in various assessment reports (Rebagliati et al. 2016; Galicki et al., 2017; Galicki et al., 2018; Fagan et al., 2019) with a summarized information provided below. For clarity, the Amarc field samplers documented the quality of the soil geochemical sample using a scale from 1 to 3, this ranged from true B horizon soil (1), intermediate (2), to talus fine (3). Amarc treated the soil geochemical samples in a similar manner when plotting and examining the datasets, thus Figure 9-1 includes a mix of all three subtypes of 'soil' sample. Amarc collected a total of 397 talus fines (class 3 soils), 835 intermediate class (class 2 soils), while the remainder of the database (2,711 samples) was high quality B horizon samples (class 1 soils).

Amarc's 2016 soil sampling focused on the southern area of the original JOY property (see Figure 4-4 for the JOY property outline, and Figure 9-1 for soil sample locations). A total of 468 soil samples were collected. Sample spacing was 50 m along lines spaced at 100 or 200 m. Closer line spacing was utilized over the old Romulus detailed soil grid (Figure 6-4) and wider spacing was used where lines extended beyond this. Samples were collected from the B horizon, which was typically found at depths of 5-30 cm, and locally the A or C horizon was sampled whichever being present in the absence of B horizon. Most 2016 soil anomalies were geologically mapped in 2017 with some targets being covered by IP surveys (see Section 9.8). These target zones were re-allocated and re-named in a new combined targeting matrix in 2018, with the 2016 soil sample anomalies now forming part of the Finlay North target. Most of the prospective soil geochemical anomalies from 2016 remain untested by drilling.

The Amarc 2017 soil geochemical sampling program also focussed on the area to the north of the Finlay River (now called Finlay North target), and significantly expanded the 2016 coverage (see Figure 9-1). Specifically, it investigated the historically anomalous NWB target area and added geochemical interpretation over the new 2017 IP survey area. Soil samples were collected every 100 m along the 250 m spaced IP survey lines. In addition, sample coverage was extended northwards beyond the end of the IP grid to target geochemically anomalous areas as indicated in historical geochemical contour-line sampling that was anomalous in Cu, and slightly anomalous in other porphyry elements. In total 638 soil samples were collected over 64 line-km. Where possible, samples were taken from the B horizon, which was typically found at depths of 5-30 cm, and where this was absent, they were taken from the A or C horizons depending on whichever was present. Results were integrated with the 2016 Amarc and historical sampling database (see Section 9.3).

Amarc's 2018 soil geochemical survey was extensive, and was one of the main exploration methodologies utilized during that field season. Four areas were prioritized for detailed soil geochemistry: North of the Finlay River to follow upon positive results from 2016 and 2017; the PINE-MEX corridor; areas over the SW Takla target; and historical IP chargeability targets at Canyon South and the Twins (see Figure 9-1). Soil samples were collected every 100 m (or every 50 m on some lines) along and between the 2018 IP survey lines. In total, 2,676 soil samples were collected over 74 line-km. Samples targeted the B horizon, which was typically found at depths of 5–30 cm, and locally the A or C horizon was sampled in the absence of B horizon material.

After the 2018 soil results were received and validated they were integrated and assessed with the other Amarc and historical data. This compilation resulted in an extensive, verified, combined Amarc and historical sampling database that was then utilized for geochemical targeting of porphyry-style deposits (see section 9.3.1). New target areas were assigned to distinguish each specific geochemical and geophysical target or group of targets; these are outlined in Figure 9-2 (green boxes), and will be further discussed in Section 9.3.1 and Section 18.

Historical surficial sampling programs also included rock and occasionally silt samples. However, these samples were mainly completed on a reconnaissance scale and were not regarded as materially useful to Amarc's programs in targeting soil grids or in guiding exploration in general, and as such they are not discussed herein. More specifically and notably in terms of the rock samples, many were recorded as grab samples, which introduces an unavoidable selective sampling bias which could be misleading to exploration efforts. As such, historical rock samples were not used to target exploration by Amarc as the soil's dataset was considered far more representative, and was fully validated with a far more expansive coverage across the JOY Project. Amarc took only a small set of rock samples to aid the geological mapping program and its regional alteration and structural interpretations.

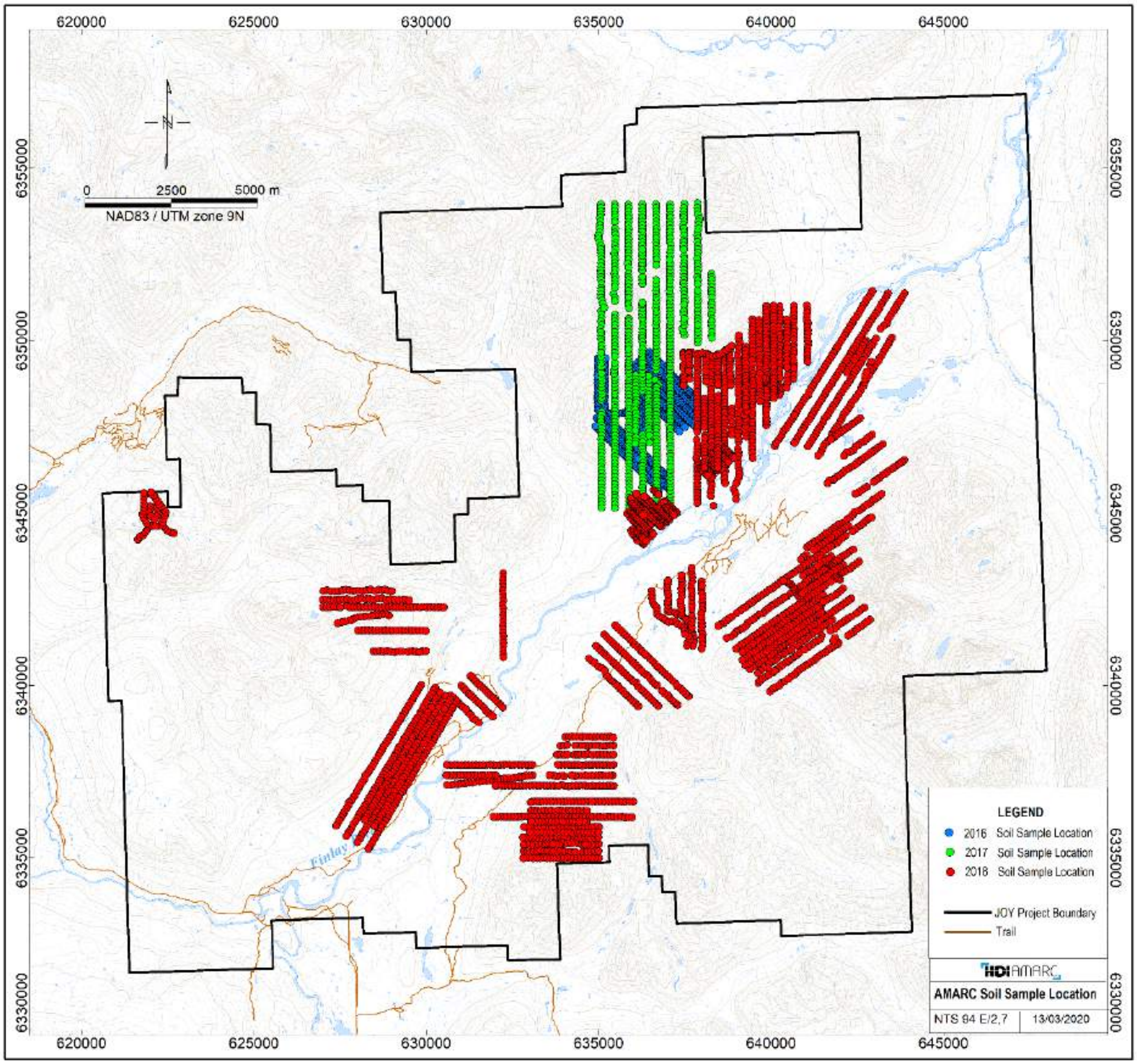



**Figure 9-1: Amarc Soil Sampling Program Location Map by Exploration Program Year.**

## 9.3 Amarc 2016 - 2018 Soil Geochemistry Compilation

A number of historical operators have completed exploration works on the tenure that now comprises the JOY Project. In 2016, Amarc compiled the majority of the known historical information for the original JOY property, and subsequently in early 2018 this work was expanded to cover most of the current Project tenure following the acquisition of the PINE property (Figure 4-4).

In 2018, Amarc reviewed, validated and compiled an additional approximately 360,970 geochemical analytes from the historical surficial and drilling programs. This data was then integrated to form a combined Amarc and historical surface and drilling geochemical databases. Of these analytes approximately 94,504 relate to the historical soil samples. Data was acquired from publicly-available assessment reports, other report databases, or from internal reports and digital data obtained from various historical property operators. There was no digital data available for reports prior to 2004. All location data for these reports was captured using MapInfo GIS software from assessment report maps. If no sample location map was available, unique sample numbers were created using UTM coordinates. Where no analytical certificates were available, metal concentrations were manually entered into MapInfo from assessment report maps. All data entered into MapInfo was exported to Excel tables which were in turn imported into a Microsoft SQL database for QAQC evaluation. Where analytical certificates were available, data was entered using a combination of Optical Character Recognition ("OCR') where possible, and manual data entry where OCR was not possible. All data was verified against the original certificates before importing Excel tables into the SQL database.

Once in the SQL database, data was rigorously checked for errors. A sample log and a separate table of results were checked against each other to verify that all sample numbers had analyses, and vice-versa. All ">" signs were stripped from the data, and analyses with "<" signs to indicate results were below detection limits were converted to half the reported detection limit concentration. Amarc's 3,934 mainly B-horizon soil samples were integrated into the database to make comprehensive new maps

Some of the historical documentation reviewed contained information and results that could not be verified, were incomplete, or locations were not clearly shown. Data compiled herein may not be all the data available, however, it is the QP's opinion that material information contained within this report is based on the most reliable data available at this time.

The multi-element soils geochemical dataset (drilling and surficial) was then filtered through an extensive modern QAQC protocol and found to have >90% sample acceptance (Benn, 2018). This work validated each set of historical data by assessing its analytical methods, detection limits, and historical QAQC (where available). The samples were plotted using ioGAS software and analyzed using box and whisker diagrams, and other common QAQC plots to determine overall data quality and ultimately the usability of the data to target for future exploration. The samples that failed this QAQC filter were eliminated from the database and have not been utilized in exploration interpretation.

Figure 9-2 shows all of the soil sample locations, historical plus the 3,943 samples taken by Amarc since 2016; all illustrated samples have passed the QAQC protocols and have been utilized for deposit targeting (Section 9.3.1).

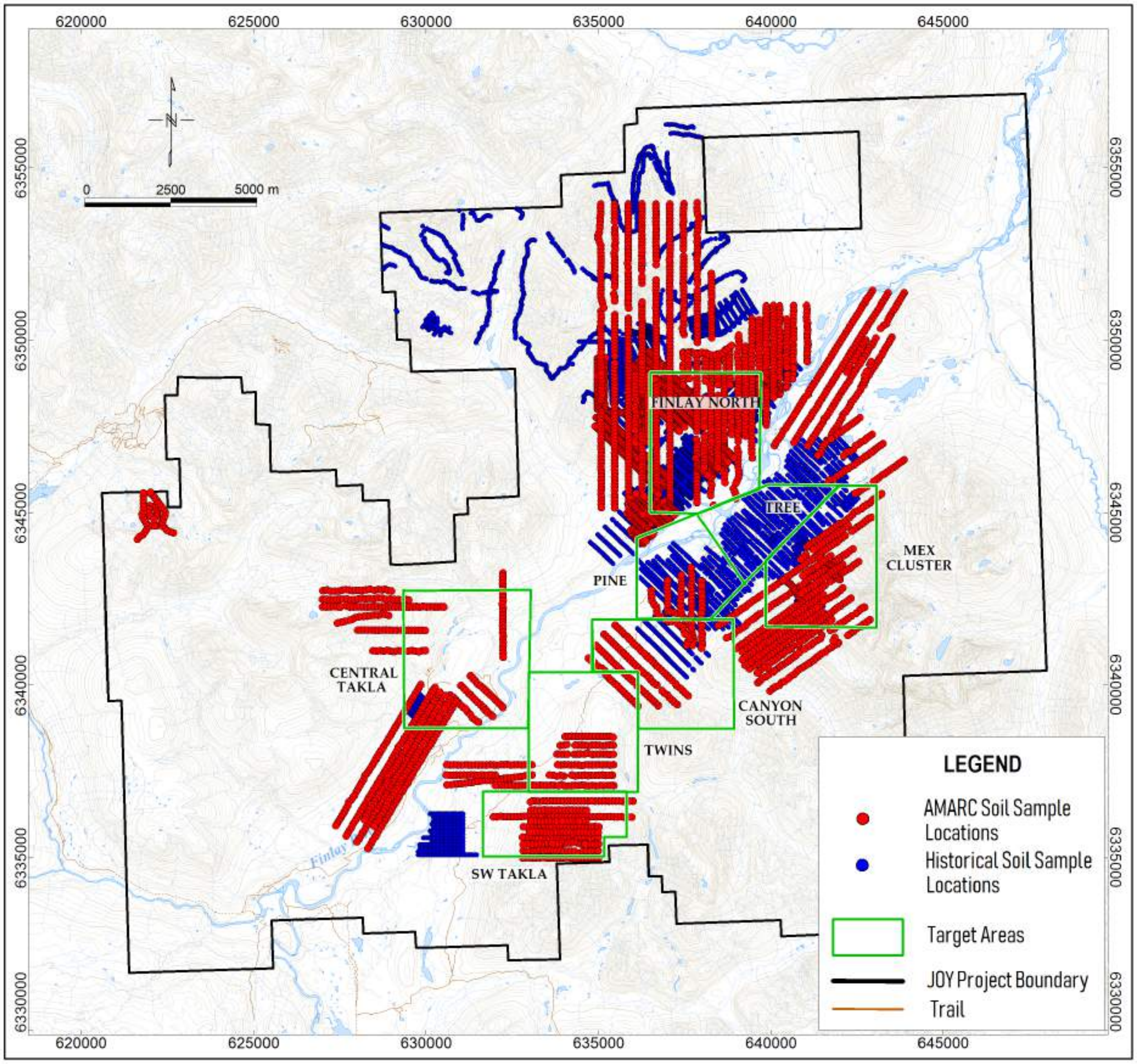



**Figure 9-2: Summary Map Showing Amarc and Historical Soil Samples on the JOY Project. Green Boxes Indicate Porphyry-Style Deposit Target Areas for Follow-up (see also Figures 18-1 and 18-2).**

### 9.3.1 Geochemical Targeting Results

Amarc's targeting process focused on compiling results for nine elements (Cu, Mo, Au, Ag, Pb, Zn, As, Sb and Bi) but also assessed other elements, especially porphyry indicator trace elements, if they were available. Areas with anomalous metal concentrations were outlined for each element. These areas, as outlined in Figures 9-3 and 9-4, were not compiled based on gridded contouring of element concentrations, but instead represent empirical outlines of areas containing samples with elevated and anomalous metal concentrations. Anomalous element concentrations in soils were empirically determined through a combination of the evaluation of the project-wide statistical distribution of metal concentrations, and the QP's extensive soil geochemical experience in the Toodoggone porphyry and epithermal region. Notably the potential of smaller or scattered anomalous areas should not be discounted, as limited sampling over the wider JOY Project may have resulted in isolated geochemical anomalies appearing to be of less significant than they may actually be.

Numerous areas of anomaly clustering were identified, some of which encompass several km$^2$ characterized by multiple lobes of clustered and/or scattered anomalous samples (see Figure 9-2 for historical and Amarc soil sample locations, and Figure 9-3 and Figure 9-4 for Au, Cu, Ag and Mo raw geochemical anomalies utilizing both Amarc and historical soils database). Many of the identified soil geochemical anomalies have not been fully delineated nor adequately examined in the field. Notably any one or a combination of glacial direction, and/or the thickness or composition of unconsolidated overburden in low lying areas along the Finlay River valley may have impacted the geochemical results. This is readily apparent at PINE where a restricted area with a zone of comparatively thin overburden offset from the historical PINE deposit returned strongly anomalous metal concentrations (Figure 9-3). However, where comparatively thicker tills and sediments are encountered across the wider PINE-TREE area geochemical anomalism is notably subdued with only a minimal or scattered geochemical expression of the underlying mineralization.

Elemental concentrations of combined historical and Amarc samples within selected areas of soil anomalies are depicted in Figure 9-3 and Figure 9-4. For the relationship of these selected areas to the Project boundary and location of targets, refer to Figure 9-5. The element concentration benchmarks for the anomalies are summarized in Table 9-1. Population counts vary because samples with no analyses were excluded.

**Table 9-1: Element Concentrations of Amarc and Historical Soil Samples and Related Anomalies.**

| | Cu ppm | Mo ppm | Au ppb | Ag ppm | Pb ppm | Zn ppm | As ppm |
|---|---|---|---|---|---|---|---|
| Count | 726 | 346 | 1,177 | 1,011 | 681 | 627 | 459 |
| Maximum | 1,380 | 89 | 12,000 | 375 | 15,868 | 2,385 | 305 |
| Minimum | 4 | 1 | 0.8 | 0.1 | 13.9 | 18 | 1 |
| Mean | 70 | 10 | 55 | 2 | 238 | 333 | 15 |
| Median (M) | 43 | 7 | 13 | 1 | 133 | 254 | 10.9 |
| Anomalous* | ≥80 | ≥15 | ≥25 | ≥2 | ≥250 | ≥450 | ≥15 |
| Strongly Anomalous* | ≥160 | ≥25 | ≥75 | ≥3 | ≥400 | ≥900 | ≥30 |

Note: * Empirical Application

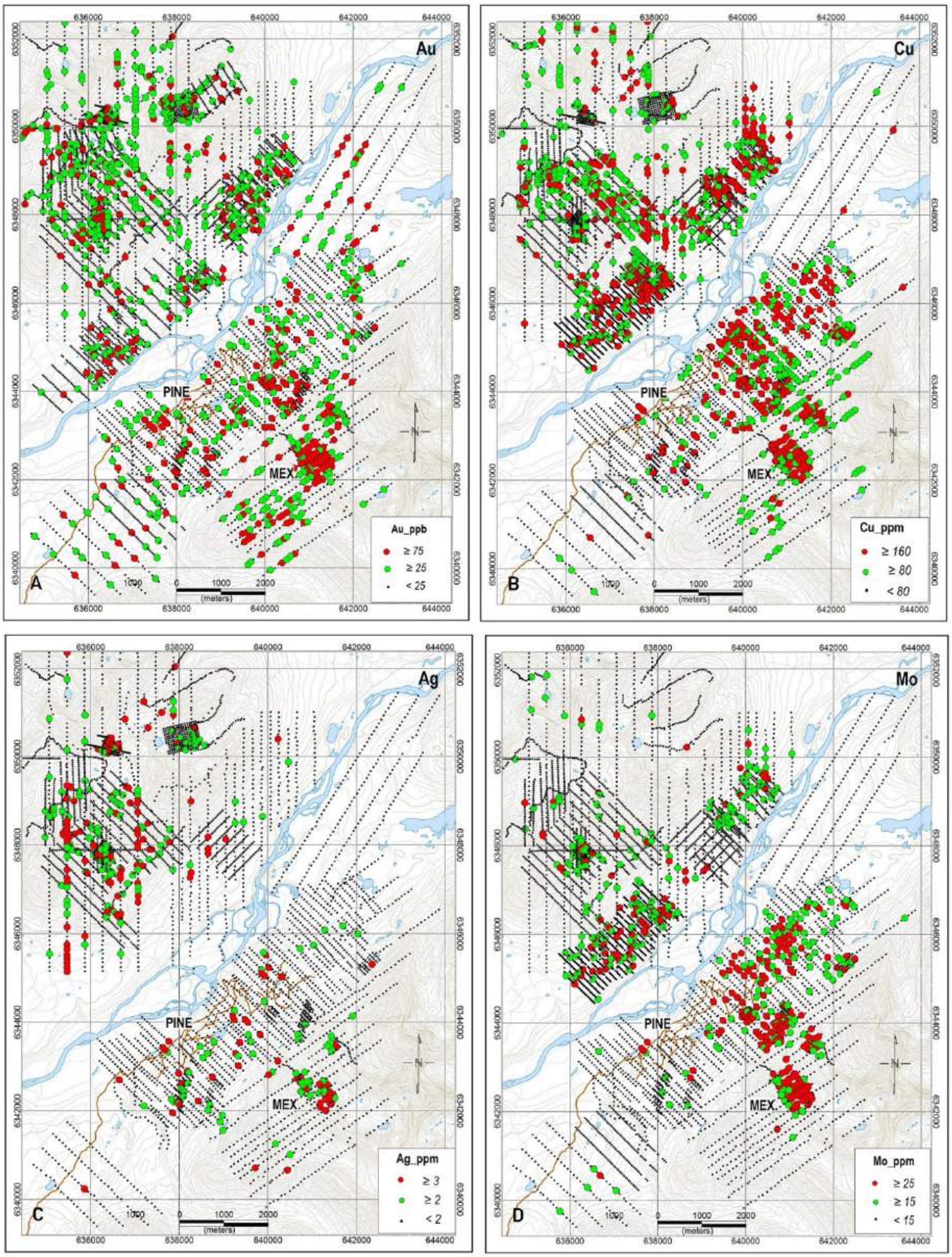



**Figure 9-3: Results of Amarc and Historical Soil Sampling (Au-Cu-A-Mo). For the locations of Area A (North Finlay) and Area B (PINE-MEX), see Figure 9-5. Note Lack of Geochemical Response Over PINE Due to Thicker Overburden.**

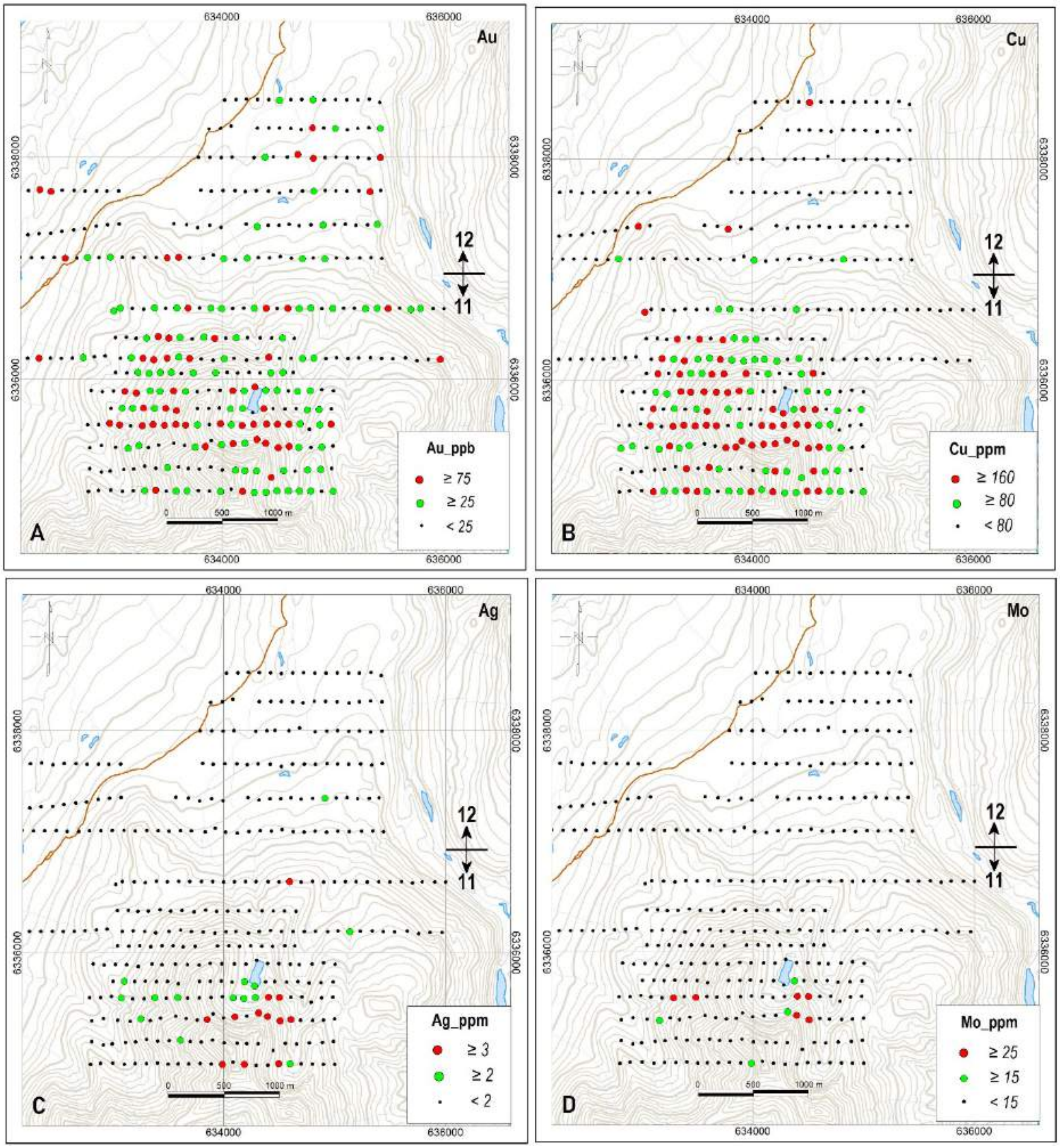



**Figure 9-4: Results of Amarc Soil Sampling (Au-Cu-Ag-Mo) in Area C (SW Takla (#11) & Twins (#12) (refer to see Figure 9-5 for Location of Areas). Note Lack of Cu-Ag-Mo Response Over the Twins May Be Due to Thicker Overburden, However an Au Anomaly is Present.**

Figures 9-3 and 9-4 depict clear, moderate to high contrast, multi-elemental soils anomalies for Areas A and B, and C respectively (see Figure 9-5 for location of Areas A, B and C within the JOY Project). In terms of Cu, Au, Ag and Mo the strongly anomalous samples (approximately > 4 times median concentrations) are depicted by the red dots. These are clearly localized, with many not being accounted for by the historical data. The green dots show anomalous geochemistry approximately 2 to 4 times median background concentrations. These are important since the varying thickness of glacial till may mask comparatively more thickly covered and/or deep seated targets. Thus, an anomaly comprised of green samples remains an important target, especially if supported by other exploration survey data such as an IP chargeability anomaly.

In Figures 9-5 to 9-7 the soil multi-element soil anomalies shown in Figures 9-3 and 9-4 have been outlined to provide clarity when overlaying the various elements and assessing coincidence. The outlined combined Amarc and historical soil geochemical survey data shows numerous prospective multi-element geochemical targets that require survey follow-up and/or drill testing.

Target #1 (PINE) (Figure 9-6) shows a focused high intensity geochemical anomaly displaced to the northwest of the current extent of the PINE deposit. Also the historical PINE drilling shows intercepts of Au-in-bedrock in areas well to the east (e.g. drill hole 80-09), southeast (e.g. drill hole P98-2), and south (e.g. drill holes 99-1 and 80-09), in areas that have no surface geochemical response. Notable, the area to the south of both the PINE (#1) and TREE (#2) deposit has potential to host further expansions of the Cu-Au mineralization. These targets remain to be drill tested.

Three large anomalies were identified in the North Finlay region (Area A, Figures 9-5 and 9-6, #8 North Finley, #9 NWB and #10 NW Anomaly), six in the TREE-MEX Cluster (Area B, Figures 9-5 and 9-6), which include the known deposit targets of TREE (#2, that forms part of the PINE deposit) and MEX (#4), and the four newly identified targets in the MEX Cluster (#3 West MEX, #5 North MEX, #6 and #16 HGA), and two newly discovered targets in the SW Takla-Twins area (Area C, Figures 9-5, 9-6 and 9-7, #11 SW Takla, and #12 Twins).

Figure 9-6 shows geochemical anomalies for porphyry indicator elements Cu, Au and Mo in Areas A and B, over magnetic targets (either magnetic high's or magnetic lows), and composited Au results from the top 100 m of historical and Amarc drill holes. The latter illustrates where known Au-in-bedrock occurrences are traced in historical drilling. The best estimated ice direction is from the southwest towards the northeast.

Soil geochemical results from the north side of the Finlay River (Area A, Figure 9-5 and Figure 9-6) outline a highly complex 3 km$^2$ zone of coincident anomalous concentrations of Au, Mo, Ag, Zn and lesser Cu. This area includes a 1.5 km$^2$ core of strongly anomalous concentrations of Au, Mo, Ag and Zn at the NWB target (#9, Figure 9-6). The second anomalous zone lies to the east northeast, where coincident Cu, Au and Mo anomalies (#10 Figure 9-6) cover a 4 km$^2$ area. Less extensive Cu, Mo and Au anomalies are also present west of the two principal anomalous zones, and minor Cu and Mo anomalies occur towards the south. To the north of these anomalies, in close proximity to prospective Takla volcanic rocks and the Jock Creek Pluton (northernmost samples of the 2017 survey, colored green in Figure 9-1) there are three open-ended Cu and Au anomalies located in a zone of elevated Cu concentrations. Notably, these new anomalies are underlain by a 400 m long low contrast IP chargeability and high resistivity target. This target has not yet been followed up. A third anomaly is located 2 km southeast of the 2017 Amarc drill area. The core of this anomaly is 1 km$^2$, and is characterized by an area of high contrast Cu-Mo-Pb-Zn±Au (#8, Figure 9-6). To the southwest and west of the core zone, there are clusters of samples with anomalous Cu-Mo-Pb-Zn-Au and Ag concentrations extending over a broad 2 km diameter area. Further sampling and application of high resolution analytical techniques may refine these targets for future follow-up.

Results from south of the Finlay River show numerous new coincident multi-element geochemical anomalies that concentrate in Areas B and C (Figure 9-5). Some of these anomalies reflect known porphyry mineralization at localities such as PINE and MEX (#1, #4, Figure 9-6, and see below from additional detail). However, others are newly delineated high-contrast multi-element anomaly targets that require drill testing for potential porphyry style mineralization. The latter includes the soil anomalies at HGA (#16, Figure 9-6), and at SW Takla (#11, Figure 9-7).

Area B (Figure 9-5) comprises the current principal target region on the JOY Project. It encompasses the known porphyry Cu-Au±Ag±Mo mineralization at PINE-TREE-FIN and MEX (#1, #2, #7, #4; Figure 9-6), each of which displays distinct multi-element geochemical anomalies. However, both PINE (#1) and TREE (#2) have low contrast to background anomalies, which are likely a result of comparatively deeper overburden masking the geochemical response (Benn, 2018).

Three new moderate contrast coincident geochemical anomalies have been delineated between the established porphyry Cu-Au PINE deposit and MEX deposit target. These anomalies, West MEX (#3), North MEX (#5), More MEX (#6), and the high contrast HGA (#16) (see Figure 9-6), are collectively termed the "MEX Cluster". Each of West MEX, North MEX and More MEX have a tightly concentric multi-elemental geochemical anomaly with moderate element-to-background ratio. The 1.1 km diameter West MEX (#3) Cu-Au-Ag-Mo anomaly is highly coincident and overlies an elongated northeast-trending IP chargeability high (> 30 mV/V at depth). The North MEX (#5) anomaly (900 m in diameter), has highly coincident Cu-Au-Ag-Mo that corresponds to a high IP chargeability anomaly at surface. The eastern offset of the MEX Cluster, More MEX (#6), is a soil anomaly 700 m in diameter, which has coincident but slightly diffuse Cu-Au-Mo anomalies. This geochemical anomaly is postulated to have been offset 500 to 1,000 m by down ice glacial dispersion from a possible mineralized bedrock source, as indicated by a northwest-trending zone of elevated IP chargeability situated to the northeast of the West MEX target. The final and notable high contrast anomaly in this area is HGA (#16), which is characterized by a strong geochemically anomalous 400 m diameter area overlying an area of elevated surficial IP chargeability. The HGA Au-Cu-Mo anomaly is located at the east end of the main TREE magnetic high anomaly.

The large Au-in-soil anomaly to the southwest of MEX is pending further ground investigation, however its source is currently unknown. Notably topography precludes the main MEX deposit target (#4, Figure 9-6) from being the likely source. From this anomaly, north-northeast to MEX (#4), North Mex (#5) and More Mex (#6) the alignment of soil anomalies spatially follows the alignment of an IP chargeability anomaly extending south-southwest beyond the extent of the soil and IP surveys (see Section 9.6, Figure 9-14). These coincident features may trace a previously unrecognized fault structure utilized by mineralized, porphyry Cu-forming hydrothermal fluids. As such, the structures potential south-southwest extension warrants geological, geochemical and geophysical investigation.

In the northeast of Area B, the FIN deposit target (#7, Figure 9-6) shows a broad Cu-Mo surficial geochemical anomaly emanating from near the historical drill holes and proceeding down-ice (to the northeast). It is likely that this area may have comparatively thinner overburden than in general over the PINE-TREE area (Benn, 2018).

The location and extent of Area C is shown in Figure 9-5 and in detail with geochemical anomalies and a magnetic TMI background in Figure 9-7. The SW Takla Target (Figure 9-7, #11) is a large moderate to high contrast 4 $km^2$ coincident Cu-Au±Ag±Mo anomaly that is also anomalous for other porphyry associated trace elements. SW Takla is in spatial association with Takla mafic volcanic and volcanoclastic sediments and a northwest-trending magnetic high (Figure 9-7). The geochemical anomaly cannot be explained by historical datasets. The principal geochemical and magnetic anomalies have not yet been covered by an IP survey, which would be the next step prior to drilling (see Section 18).

The Twins Target (#12, Figure 9-7) has no coherent geochemical anomalies, but does have several adjacent single samples spanning six lines in a north-south alignment, at approximately 634,800 E, with elevated Au (see Figure 9-4a). The comparatively subdued geochemical response may well relate to the relative overburden thickness across this target area, which likely masks any surficial response. Importantly, an historical IP chargeability survey indicates the presence of a 2.5 $km^2$ and > 20 mV/V chargeability anomaly, that has two internal 400 m diameter cores of > 25 mV/V and 28 mV/V. These anomalies are discussed later in this report as IP targets (see Section 9-6).

The Canyon South target lacks a geochemical response above the anomaly threshold (#15, Figure 9-7), however this target is defined in a historical IP chargeability survey with responses > 28 mV/V over a magnetic high (as discussed in Sections 9.5 and 9.6). Notably on the periphery of the Canyon South target, located on opposite sides of the open 2 $km^2$-wide IP anomaly, historical drill hole PIN-09-15 encountered 11.43 g/t Au over 3 m (197.0 m to 200.0 m), and historical drill hole MEX12-013 recorded 0.05% Cu and 0.18 g/t Au over 62.3 m (13.73 m to 76.0 m). Such an occurrence of Au can be characteristic of the outer regions of a porphyry Cu system.

The VIP target (#13, Figure 9-7) is an historical target area, with mapped potassic altered granodiorite and reported anomalous Cu±Au±Mo in soils. The Central Takla Target (#14, Figure 9-7) has a low contrast geochemical anomaly that did not meet threshold for plotting on Figure 9-7. However, the depth of overburden in this region is believed to be (but not confirmed to be) beyond that where B horizon soil sampling is effective. Notably, the target is clearly delineated by a substantial northeast trending magnetic high (akin to the magnetic signatures recorded at PINE and the alignment of the Kemess North deposits). This feature may represent an intrusive body hosted by the Takla volcanic units that also in part hosts the mineralisation at both Kemess South and Kemess North deposits. The target has not been previously drill tested. Further geochemical sampling and an IP survey is warranted. Ten historical drilling holes by Stealth (Figure 9-7, Table 6-4) at VIP targeted shallow epithermal and skarn mineralization. No significant intercepts were documented but the holes are mildly anomalous in Au.

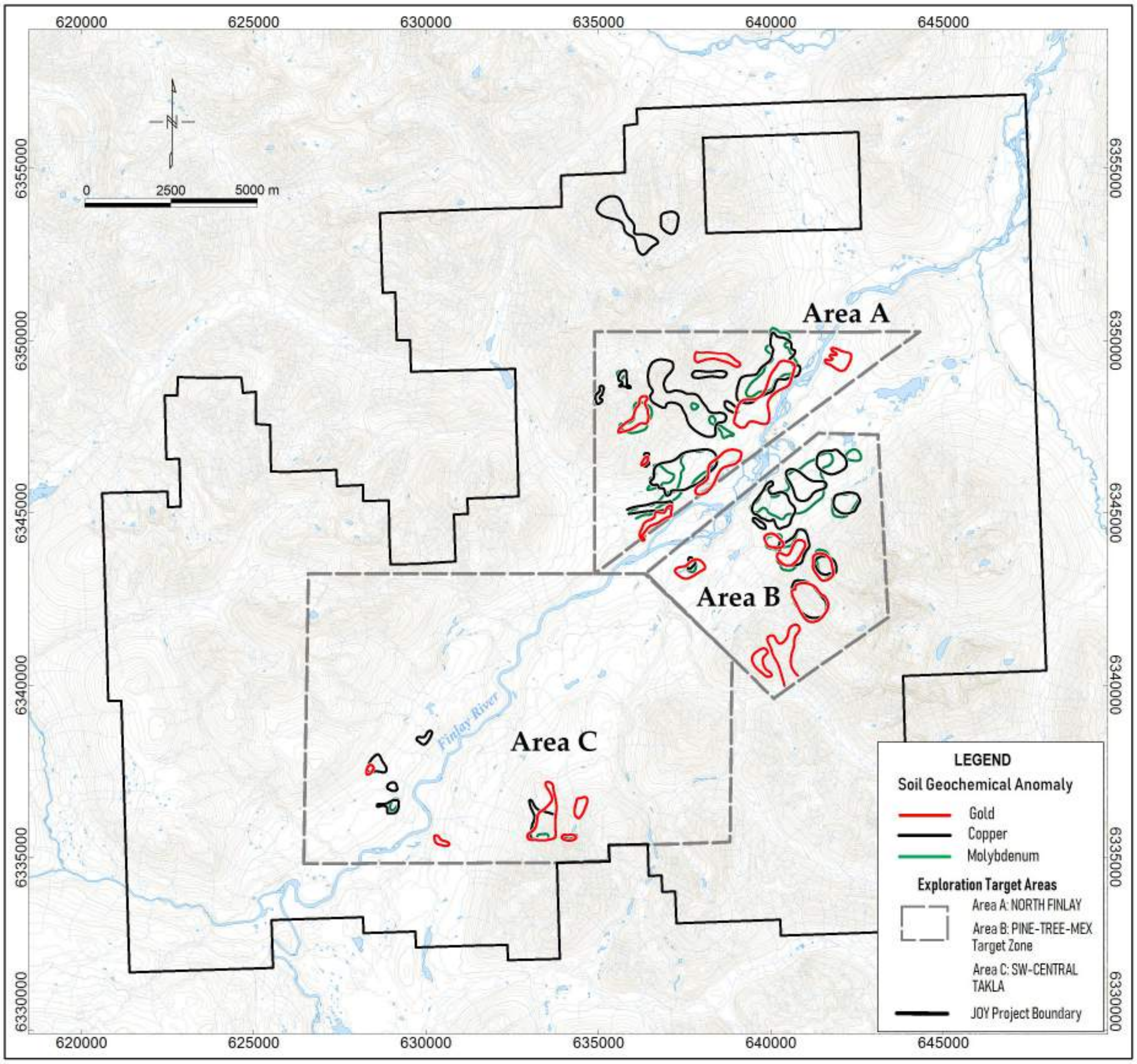



**Figure 9-5: Index Map Showing Soil Geochemical Results from Amarc and Validated Historical Datasets. Areas A, B and C are Shown in More Detail in Figures 9-6 and 9-7 Below.**

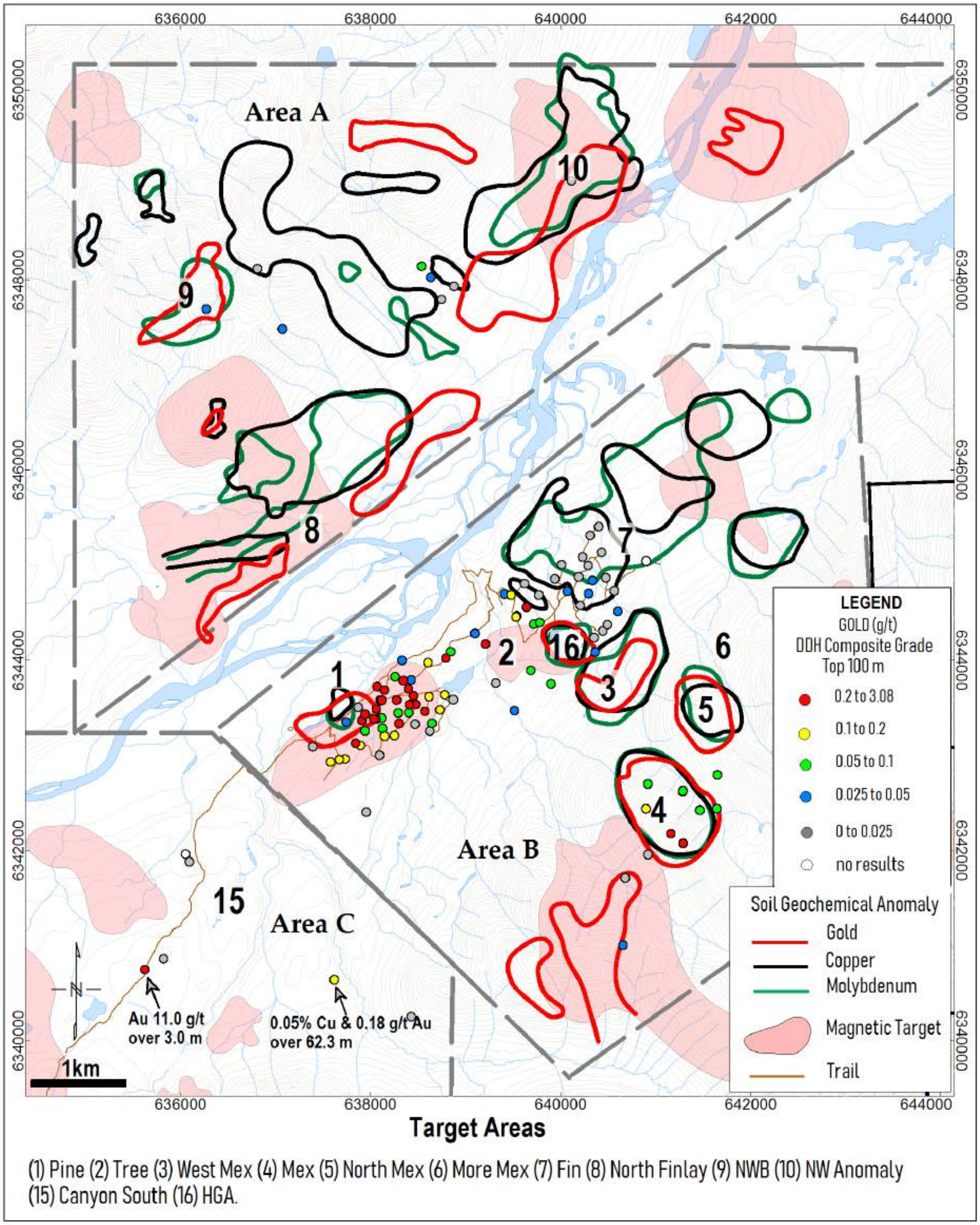



**Figure 9-6: Soils Geochemical Results for Areas A and B Showing Multi-Element Coincident Target Areas for Follow-up Exploration (See Section 18). Magnetic Anomalies Shown for Reference.**

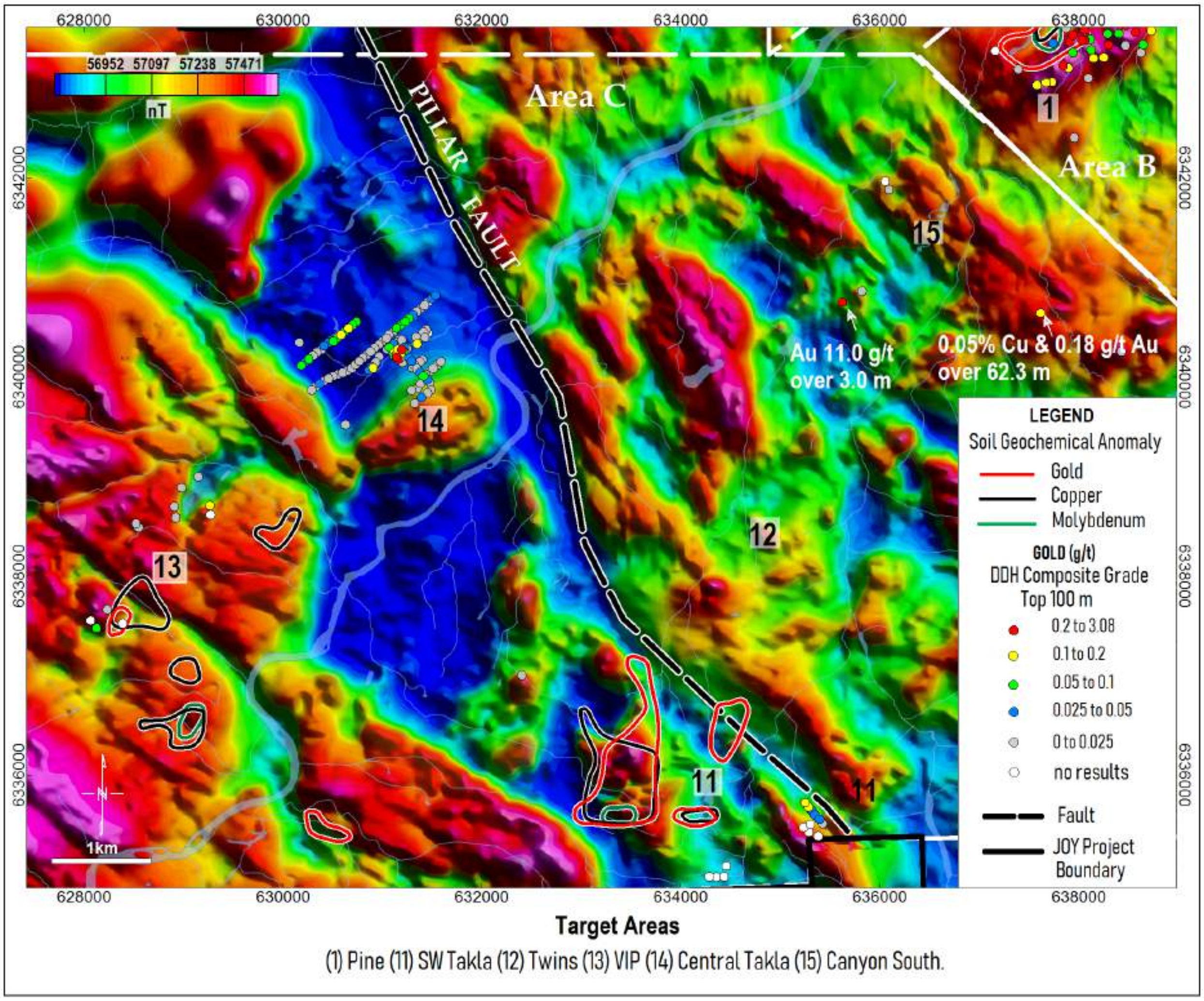



**Figure 9-7: Outlined Soil Geochemical Results for Area C Showing Multi-Element Coincident Target Areas for Follow-up Exploration (see Section 18). Also Shown are the Pillar Fault and Historical Diamond Drill Upper 100 m Intercepts for Au. Drilling to the North of Central Takla (#14) is at Electrum and Comprises Shallow Percussion Holes. The Deep Blue (magnetic low) Areas to the West of the Pillar Fault are Takla Volcanic Units at Surface.**

## 9.4 GEOLOGICAL MAPPING

Amarc has completed geological and alteration mapping over an area encompassing the northwest and southeast sides of the Finlay River (primarily within Areas A and B, Figure 9-6), which is depicted by the red polygon in Figure 9-8 (Amarc mapping combined with that by Diakow et al., 2001). This area includes not only the PINE deposit and MEX deposit targets, but also several promising new IP and multiple element soil geochemical anomalies. Geological and alteration mapping have collectively with geophysical and geochemical surveys, confirmed these targeted areas as having promising potential to host previously unrecognized porphyry deposits (Figures 9-9 and 9-10).

Multi-element geochemical anomaly outlines are shown overlying the Black Lake monzodiorite in certain areas peripheral or down-ice from the PINE deposit, at the MEX deposit target, and at the MEX Cluster (Figure 9-9). While the older quartz monzonite appears to correlate with the FIN and various soils anomalies north of the Finlay River.

Moderate to strong potassic alteration is coincident with both the PINE deposit and MEX deposit target (Figure 9-10). The phyllic alteration associated with PINE is at least 4 km long and up to 1.5 km wide, with the majority of this alteration not having been fully explored and drill tested in order to establish if additional potassic alteration (and Cu-Au mineralization) exists. At MEX the phyllic alteration occurs over a 2 km by 800 m area, but may extend below the MEX thrust fault in the footwall block. Again, the majority of this alteration has not been drill tested. Untested occurrences of potassic and phyllic alteration also occur within the North Finlay Target Area (#8, Figure 9-6) and at the NW Anomaly (#10, Figure 9-6), as well as on the northern bank of the Finlay River directly opposite PINE. The later suggests that the potassic zone associated with the PINE hydrothermal system may extend towards Target #8 and, as such is, in need of further testing both towards the north and also to the southwest of the current drilled areas.

Quaternary cover (white, Figure 9-8 through 9-10) limits exposure and mapping in lower areas, especially along the Finlay River corridor.

Regional faulting and block rotation appear to be major influences in the distribution of surface geological units. Late stage northwest-trending regional faults (Black, Pillar, East Pillar, Saunders etc.) are all younger than mineralization, however they likely reactivated existing structures, or structural weaknesses, and as such may represent important controls for intrusion emplacement. The Kemess District (from Kemess South to JOY) shows the same northhwest trending regional faulting, and the northeast trending intrusions (Maple Leaf etc.) that host Cu-Au mineralization Rebagliati et al., (2020). This structural model has been applied to JOY during the geological targeting program, and deposit-scale targets such as Central Takla have been identified for follow-up ground exploration work. Of note is that faulting at Kemess South has rotated the deposit by up to 90°, and substantially segmented the Kemess North deposits. This faulting has resulted in a complex distribution of alteration and mineralization zones, and also presents the opportunity to bring parts of the Takla units to surface. Amarc observed analogies to this block rotation during deposit-scale mapping at MEX and further work is required to fully understand the structural controls at this deposit target. The Takla and the Triassic-Jurassic unconformity (red line, Figure 7-2) are highly prospective for the development of porphyry Cu-Au exploration.

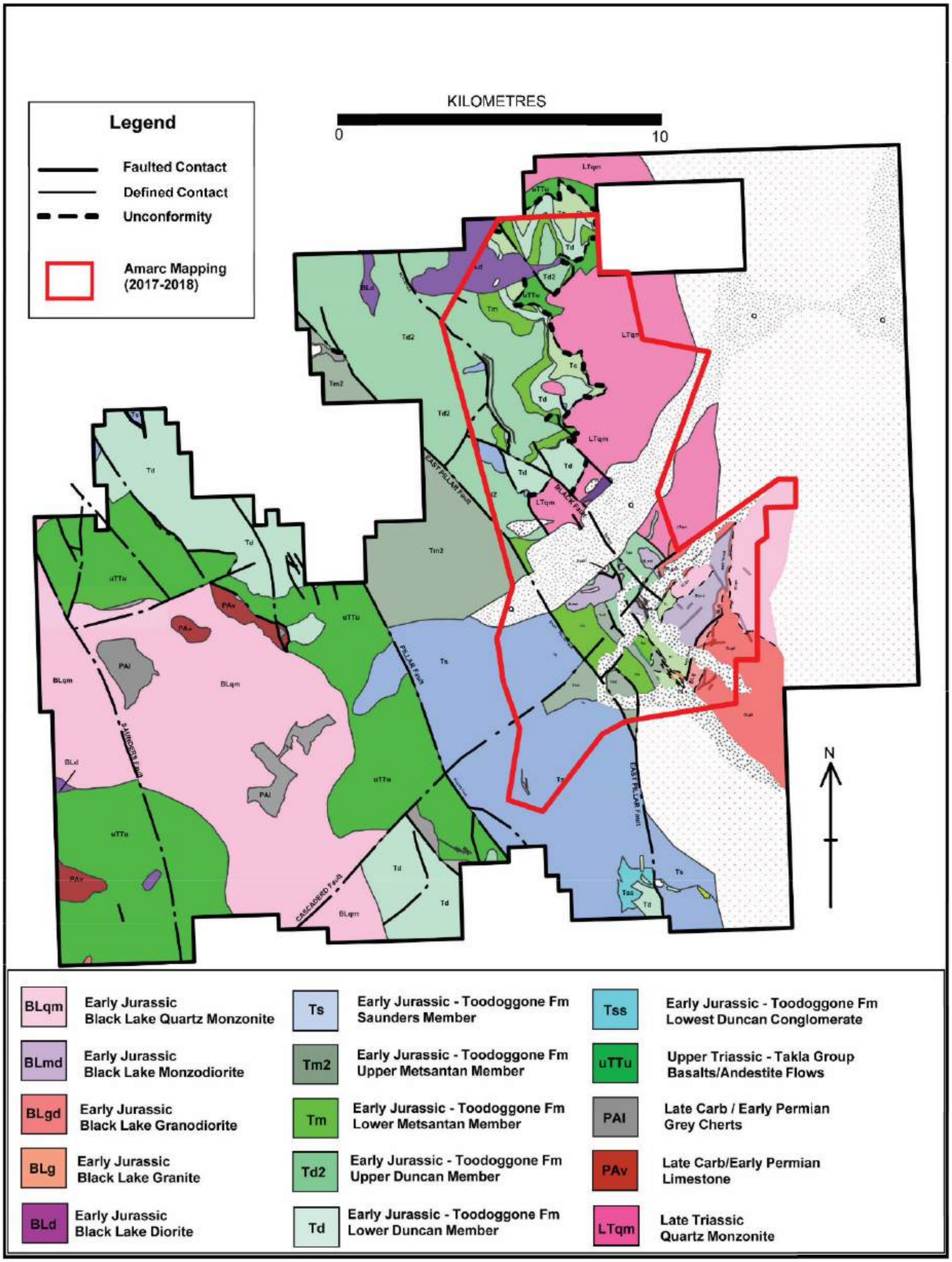



**Figure 9-8: Geological Compilation Map of the JOY Project Area.**

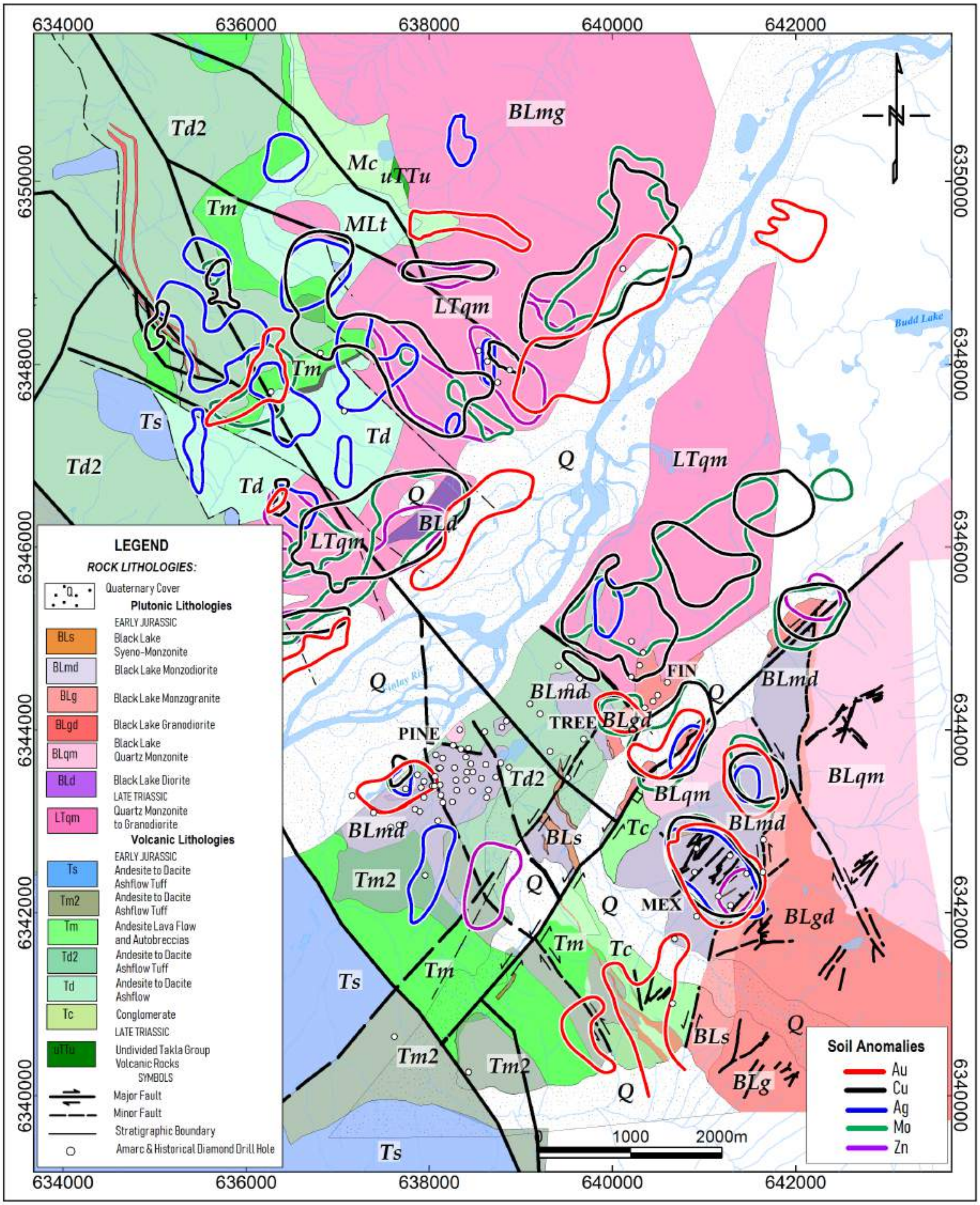



**Figure 9-9: Combined Geochemical and Geological Results from Amarc Mapping. Refer to Section 7 for the PINE-MEX Geology Descriptions.**

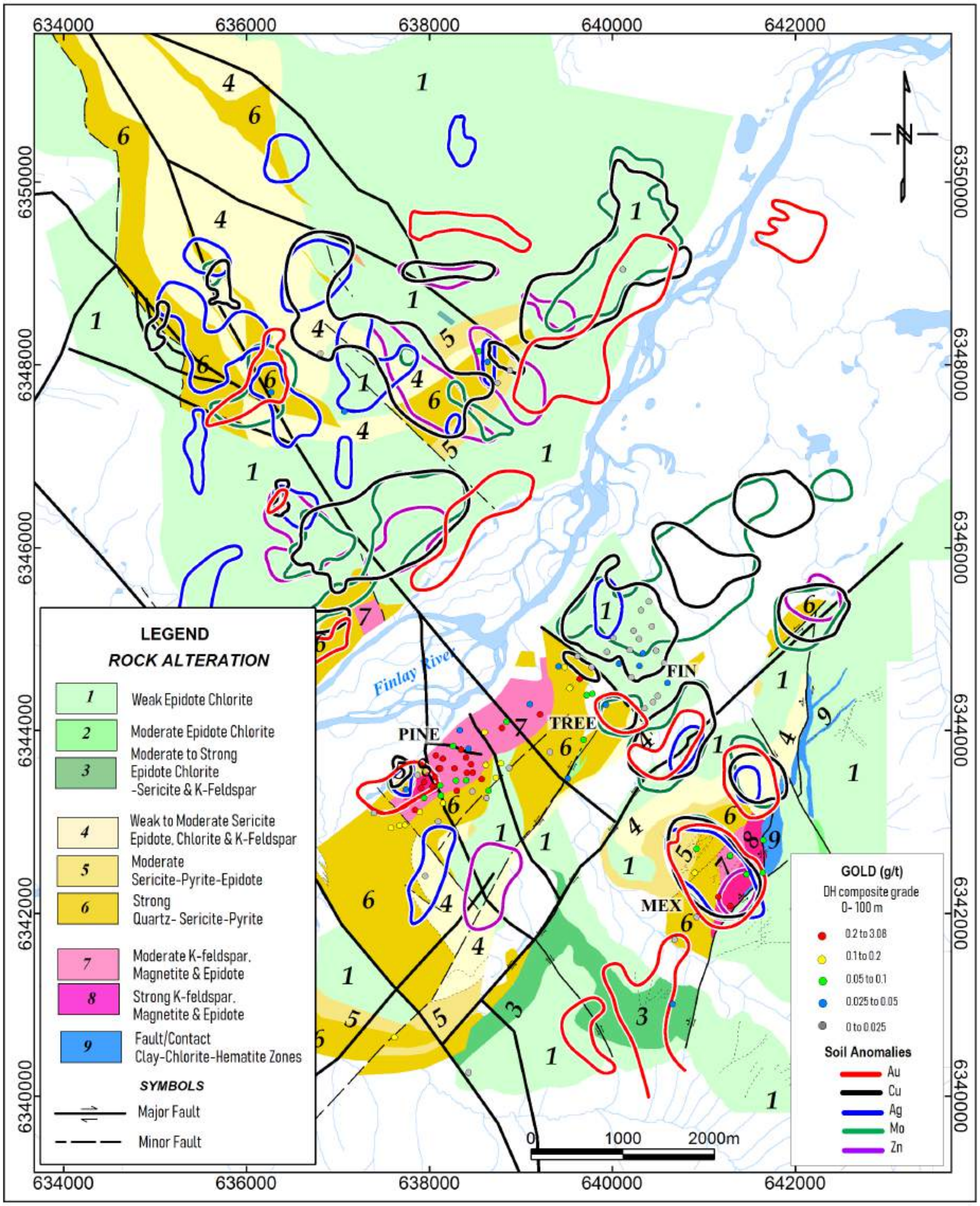



**Figure 9-10: Combined Soil Geochemical Anomaly Outlines on Alteration from Amarc Mapping. Refer to Section 7 for the PINE-MEX Geology. Au-in-Drilling Composites Show Geochemically Anomalous Bedrock and the Location of the PINE Deposit and MEX Deposit Target Relative to Potassic and Phyllic Altered Centres.**

## 9.5 REGIONAL AEROMAGNETIC SURVEY

Helicopter-borne magnetic surveys have been completed by various historical workers over the JOY Project area. Amarc completed two new extensive airborne magnetic surveys in 2017 and 2018 to improve the resolution of the dataset, and extend survey areas outside the zones surveyed by Gold Fields and others. Results of the Amarc surveys were gridded and merged into both the publicly available wider-spaced BCGS and Geoscience BC airborne magnetic datasets and the historical high resolution Gold Fields datasets, giving Project-wide, high resolution coverage (Figure 9-11). This merged dataset was utilized to define possible porphyry-related subtle magnetic features, and to complete a Project wide structural interpretation to track the large regional northwest trending faults and the important northeasterly trending splays (or secondary faults) throughout the Project area.

The high-resolution magnetic data was an effective guide for selection of early-stage exploration porphyry target areas, especially when used in combination with geochemical, IP and geological survey information. The combined survey data aided in the identification and definition of targets with higher potential for discovery (Figure 9-12).

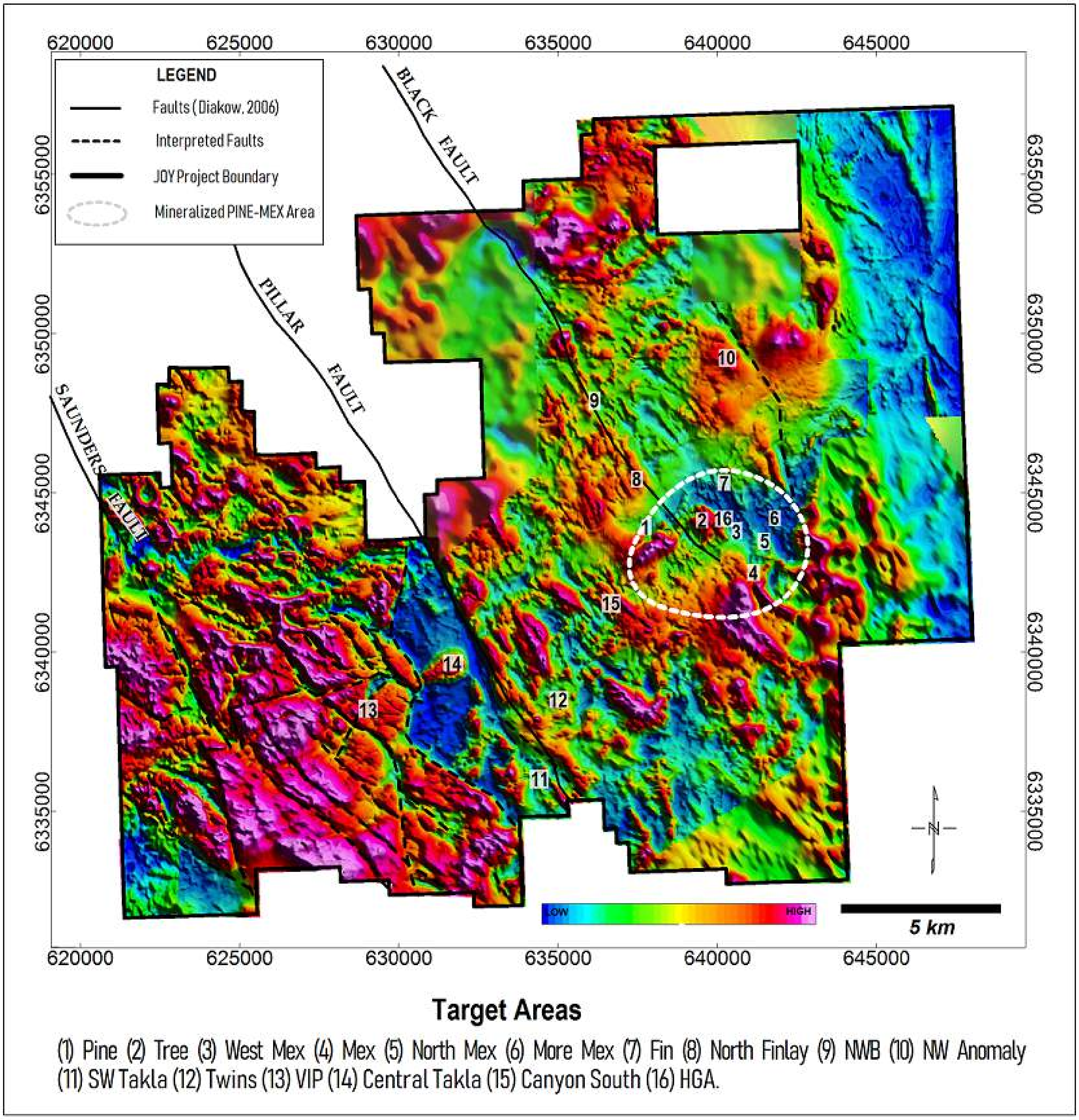
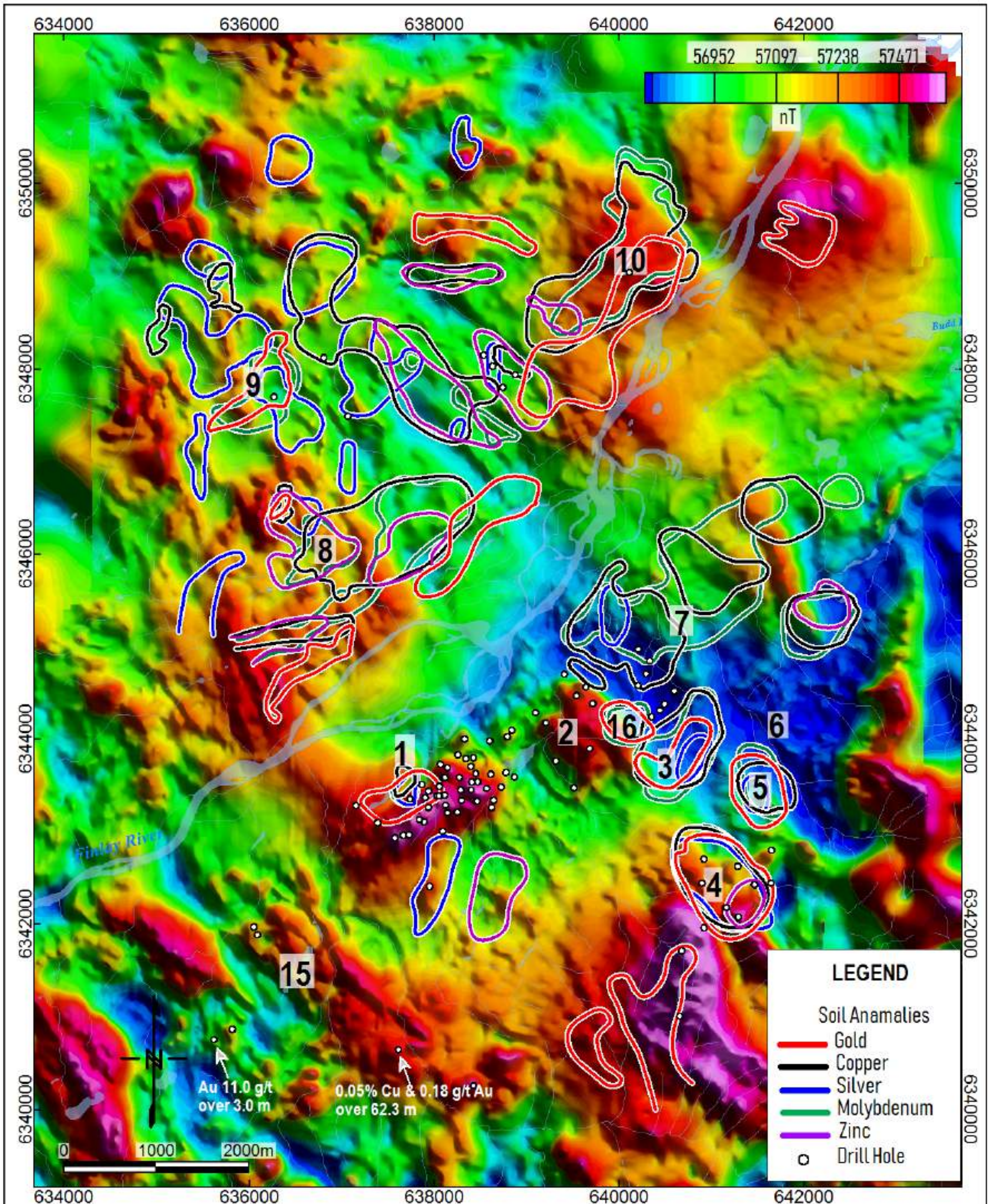



**Figure 9-11: Total Magnetic Intensity Over the JOY Project Showing Regional Structural Interpretation and Porphyry Target Areas.**




**Target Areas**

(1) Pine (2) Tree (3) West Mex (4) Mex (5) North Mex (6) More Mex (7) Fin (8) North Finlay (9) NWB (10) NW Anomaly (15) Canyon South (16) HGA.

**Figure 9-12: Integrated Targeting Showing Merged TMI Magnetic Basemap Overlain With Outlined Soil Geochemical Anomalies in Target Areas A and B.**

## 9.6 Induced Polarization (IP) Surveys

Amarc and a number of historical operators have completed IP surveys on the JOY Project. IP chargeability is one of the key exploration targeting techniques utilized by Amarc, and when results are integrated with alteration mapping and soil geochemistry the combination has proved to be a powerful exploration vectoring tool. The most extensive and useful of the historical IP surveys was completed on the Pine property by Gold Fields. The Amarc and Gold Fields surveys have been merged, inverted, and re-gridded by Walcott and Associates to provide an extensive integrated IP chargeability (Figure 9-13) and resistivity model that extends over a significant area of the Project.

### 9.6.1 Induced Polarization Results

Amarc's IP surveys were designed to cover multi-element soil geochemical anomalies, and other areas deemed prospective on both the northwest and southeast sides of the Finlay River in the general region of PINE and MEX (Figure 9-13). The 112 line km of surveys completed by Amarc to date varies in line spacing from 100 m to 800 m, with a 50 m to 100 m a-spacing and N1 to N10 measurements.

Notably, the extension of the known PINE porphyry Cu-Au system can be observed as a moderate intensity IP chargeability high (> 18 mV/V to < 26 mV/V) at moderate depth below the near surface volcanic units of the Toodoggone Fm. This is important as it shows the near surface IP chargeability expression (Figure 9-13) is likely under-representing the size of the underlying chargeability anomaly at the PINE deposit, hence indicating some significant exploration potential. When viewed in 3D or 2D pseudosection, the chargeability anomaly grows towards the south, and especially at depths <100 m near the south side of the TREE target that expands to the south of the PINE deposit (towards the southwest). This area is known as the PINE Extension Target.

Substantial areas of IP chargeability anomalies were identified on both sides of the Finlay River. Except where comparatively thick overburden exists these anomalies coincide with multi-element geochemical anomalies (or their post-glacial down-ice positions). This validates the capacity of soil geochemistry on the Project to identify new porphyry Cu-Au targets where IP surveying is the logical next exploration stage, such as at the SW Takla target. Conversely, IP chargeability anomalies in areas not previously covered by soil geochemistry require soil geochemical coverage, such as at the Canyon South and Twins porphyry targets. It is currently understood that the till blanket at both of these sites is fairly extensive, thus careful re-assessment of the soil grid methodology should take place prior to completing any future survey. Notably, on the periphery of the Canyon South target, located on opposite sides of the open 2 $km^2$-wide IP chargeability anomaly, historical drill hole PIN09-15 encountered 11.43 g/t Au over 3 m (197.0 m to 200.0 m), and historical drill hole MEX12-013 recorded 0.05% Cu and 0.18 g/t Au over 62.3 m (13.73 m to 76.0 m). Such occurrence of Au±Cu can be characteristic of the outer regions of a porphyry system. Interestingly, these holes record 7.0 m and 16.0 m of overburden, respectfully, which may account for the lack of surficial geochemical response over the IP target despite the anomalous Au in the nearby drill holes.

Selected areas with projected permissive geology, magnetic features and thick overburden cover are best explored by IP surveys and drilling, such as at the Central Takla target (#14, Figure 9-13). The areas of coincident IP chargeability and geochemical anomalism on the northwest and southeast sides of the Finlay River (Figure 9-14) all require drill testing with multiple drill holes, as the IP and geochemical signatures are complex.

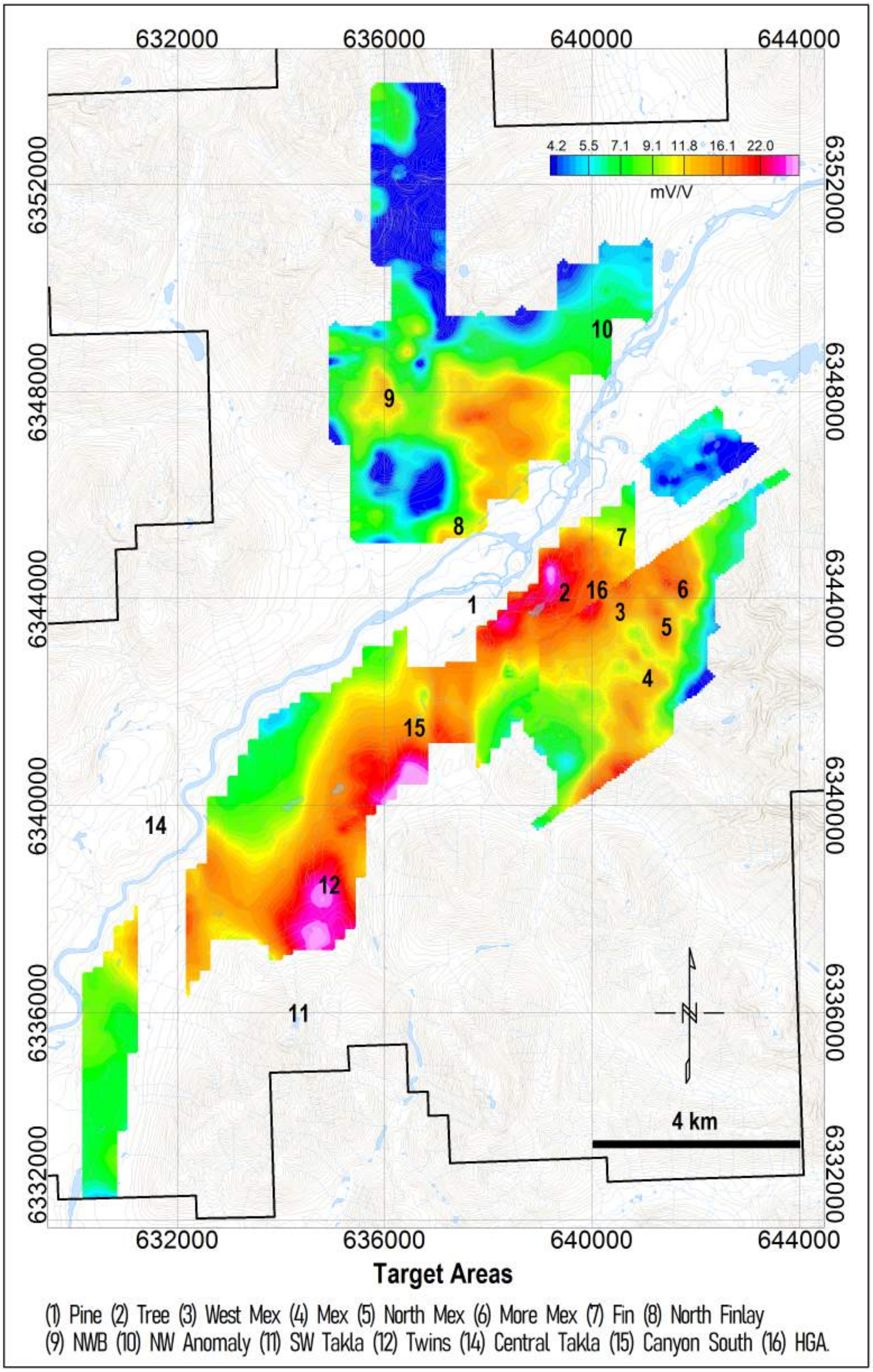



**Figure 9-13: Amarc 2017 and 2018 IP Surveys Merged with the Historical Gold Fields IP Survey, Showing Surface Chargeability and Porphyry Target Areas Across the JOY Project.**

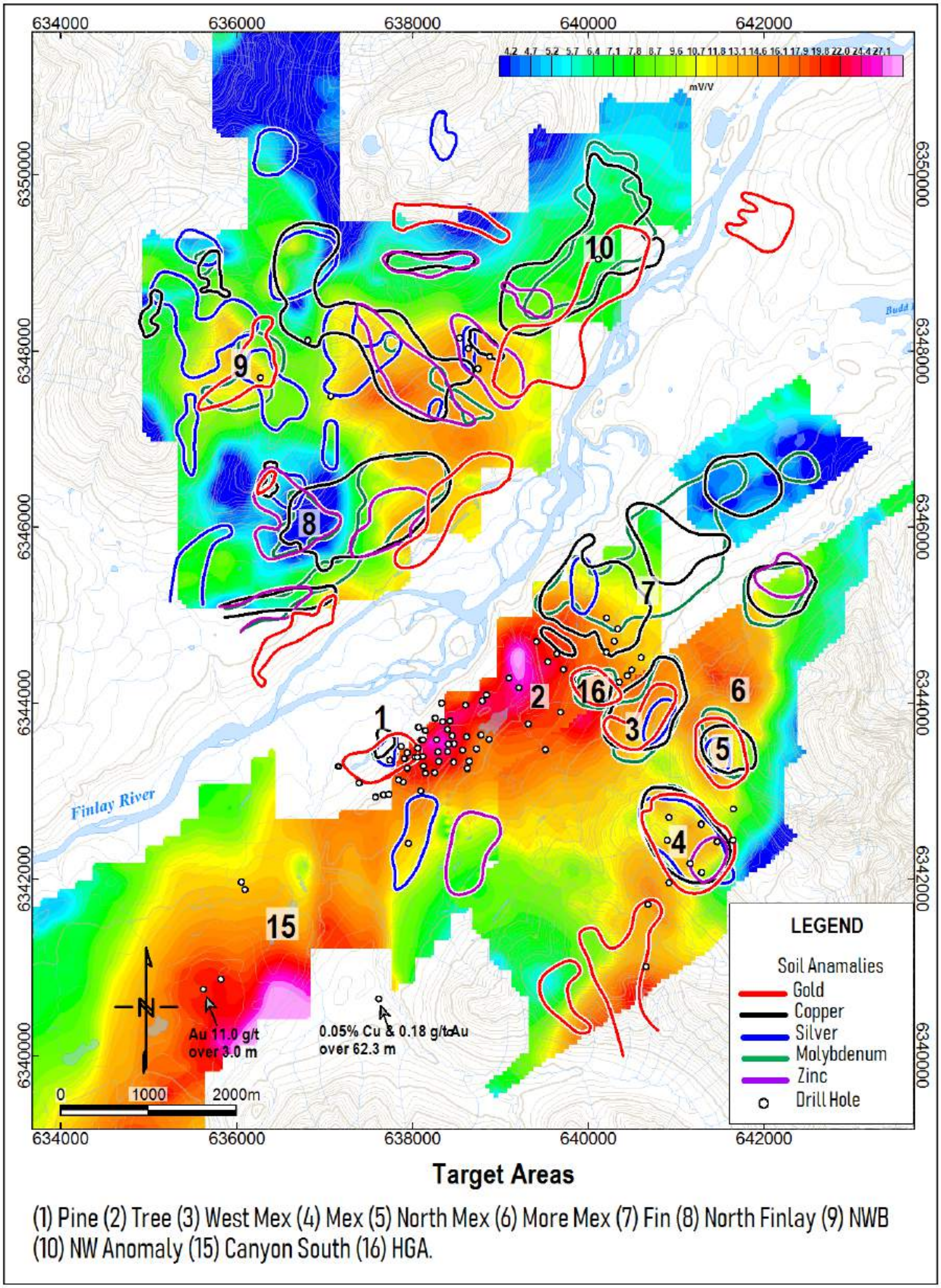



**Figure 9-14: Integrated Surface IP Chargeability and Surficial Geochemical Targeting.**

## 9.7 INTEGRATED EXPLORATION TARGETING

The combined historical and Amarc geological, geophysical and soil geochemical databases have been utilized to identify numerous geological features, and IP, magnetic and multi-element geochemical anomalies of various coincidence, size and intensity within a 90 $km^2$ area in the core area of the JOY Project. Most of these anomalies occur in the PINE-MEX corridor.

At PINE, IP chargeability and magnetic surveys suggest two hydrothermal systems centered on the PINE and TREE magnetic anomalies, which coalesce to form one apparent large, Cu-Au-bearing mineralized system (referred to as PINE). Its northeast alinement shows that a porphyry emplacement event was likely controlled by northeast trending offset faults running perpendicular to the reactivated northwest-trending regional faults.

Many of the newly identified targets have coincident IP chargeability, magnetic and moderate to high contrast multi-element geochemical anomalies, together with favorable geological host rocks that show potassic or phyllic alteration. This combination shows the capacity of integrated exploration methodologies to identify areas on the JOY Project with enhanced potential to host porphyry-type mineralization. However, the delineated targets require drill testing.

Where certain methods have generated a coincident anomaly, surveying the area with the remaining method or methods is the next logical exploration stage prior to drill testing these target areas. However, if the area is known to have deep overburden, then careful consideration should be given as to whether geophysical methods may be a better exploration tool in this environment, than further soil sampling as. Specifically, the Canyon South (#15, Figure 9-14), Twins (#12, Figure 9-7) and SW Takla (#11, Figure 9-7) target areas require additional IP surveying. IP chargeability anomalies associated with coincident, potentially prospective, magnetic feature are open to expansion to the east and south at Canyon South and Twins. However, the northern and west sides of these anomalies are valid drill targets in their own right, and could be drilled tested without further surveying. At the North Finlay target (#8, Figure 9-6), soil sampling results outline a 14 $km^2$ of widespread anomalous concentrations of Cu–Mo–Zn±Pb±Au. Within this area historical widely-spaced drill holes (area of the Ryan drilling) intersected 20 to 160 m intervals of disseminated and stockwork mineralization with 2,299 to 6,780 ppm Zn, 642 to 1,314 pm Pb, 23 to 59 ppb Au, and up to 1,446 ppm Cu and 138 ppm Mo in lower Toodoggone Fm fragmental rocks, diorite porphyry dykes and Black Lake quartz monzonites. Coincident IP and geochemical anomalies remain to be drill tested in this target zone.

Valley glacial and glaciofluvial sediment transport is towards the northeast (downstream) along the Finlay River where, at lower elevations (1,000–1,150 m ASL) glacial and glaciofluvial sediments are variably interbedded. A broad 3 to 25 m thick glaciofluvial terrace on the southeast side of the Finlay River masks the greater proportion of the PINE mineralized system. As a result, there is no apparent geochemical Cu–Mo±Au surface expression related to the significant porphyry mineralization lying below the till sequences. Notably though there is a single high contrast Cu–Mo–Au–Ag anomaly on the northwest edge of PINE deposit that remains to be drill tested. By contrast, two km down-ice from PINE, a 3.5 km long Cu–Mo±Au anomaly coincides with the position of the TREE Cu–Au and FIN Cu-Au-± Mo occurrences (Figures 9-13 to 9-16). This anomaly may be explained by the existence of a shallowing down-ice overburden sequence in these areas (Benn, 2018). However, caution is required as Au concentrations in soils over the east end of the PINE-TREE-FIN deposit target rarely exceed the 25–75 ppb range and their distribution is irregular.

At the PINE deposit, results from relatively shallow historical drilling show significant Cu-Au mineralization that requires both deeper and lateral step-out drilling to test both immediate expansion potential, and identify satellite deposits below the comparatively thicker till sequences. Alteration mapping (Figure 9-10) shows an extensive area of potassic alteration associated with the core of the mineralized PINE hydrothermal system, most of which has not been drill tested. In addition, a large prospective 6 $km^2$ zone of phyllic alteration surrounding the potassic zone, remains to be fully explored. A second 1.6 $km^2$ area of phyllic alteration is also present surrounding the MEX deposit target that also requires additional drill testing for both concealed mineralization and extensions to the known mineralization. The potential of the PINE phyllic zone is supported by, for example, the IP chargeability anomaly at the south Pine Extension Target. At MEX, the recent recognition that the MEX fault may be a shallow thrust offers substantial upside as the footwall may host mineralization; this zone has not been drill tested.

# 10.0 Drilling

A significant number of historical drill holes were completed on the JOY Project by 11 operators over a 41-year period from 1972 to 2012, prior to Amarc assuming operatorship in 2016. The 284 historical holes (described further in Section 6) totaling 32,578 m in length, were drilled in 13 different target areas, and include 92 holes (14,492 m) at the PINE porphyry Cu-Au deposit. Leveraging the results of this historical information has been a key component in the modern exploration targeting by Amarc, and the relevant historical holes will be briefly discussed below. In addition to the historical drilling, in 2017 and 2018 Amarc completed 2,473.5 m of drilling in five core holes that were collared to test initial coincident geophysical and geochemical targets in the North Finlay area and peripheral to the TREE target.

The combined historical and Amarc drilling database for the JOY Project ("JOY drill database") totals 35,051 m in 289 holes.

## *10.1 Historical Collar Coordinates, Drill Hole Orientations and Type*

Details of the collar coordinates and orientations of the bulk of 1972 to 2012 historical drill holes used in the Amarc database are described in Section 6. Amarc has not verified or re-surveyed any of the historical drill hole locations. Although evidence of drill pad locations can be seen in the field, historical collar markers are typically no longer evident. No information has been located in respect to downhole surveying on any holes prior to 2005, or in respect to the 2011 MEX holes of Gold Fields. In 2005 through 2007, Cascadero performed dip (inclination) surveys, but typically only at the collar and at the end of the hole. No downhole azimuth surveys were performed. In 2009 and 2012, Gold Fields employed an EZ-Shot magnetic compass inclinometer tool to measure downhole azimuths and dips at intervals from 30 to 200 m downhole.

The lack of confirmatory drill hole collar surveys and paucity of downhole surveys for the historical holes, could have a material impact on the accuracy and reliability of the downhole location information for the analytical results. It is recommended that the locations of the 1972 through 2012 historical drill holes be confirmed by site investigation and re-surveying, wherever possible, in order to increase the level of confidence in the downhole location information particularly for holes in the PINE deposit area.

## 10.2 Amarc Drilling

Amarc drilled five core holes totaling 2473.5 m at JOY in 2017 and 2018 to test coincident geophysical and geochemical targets further described below. A summary of the Amarc drilling is provided in Table 10-1. Figure 10-1 is a drill hole plan illustrating the locations and projected traces of these holes.

All drill core recovered in the Amarc programs was subject to photography, geological and geotechnical logging, and sampling and assay. The average core recovery and RQD (rock quality designation) for the 807 drill runs cored in the 2017 and 2018 drill programs is 96.4% and 58.6%, respectively, from drill runs that averaged 3 m in length. Table 10-1 summarizes the drill run and geotechnical data of the Amarc holes.

**Table 10-1: Amarc 2017-2018 Drill Runs and Geotechnical Summary.**

| Year | Total Runs | Average Run Length (m) | Average Core Recovery (%) | Average RQD (%) |
|---|---|---|---|---|
| 2017 | 493 | 3.01 | 95.4 | 62.9 |
| 2018 | 314 | 2.98 | 97.9 | 51.9 |
| **Total/Average** | **807** | **3.00** | **96.4** | **58.6** |

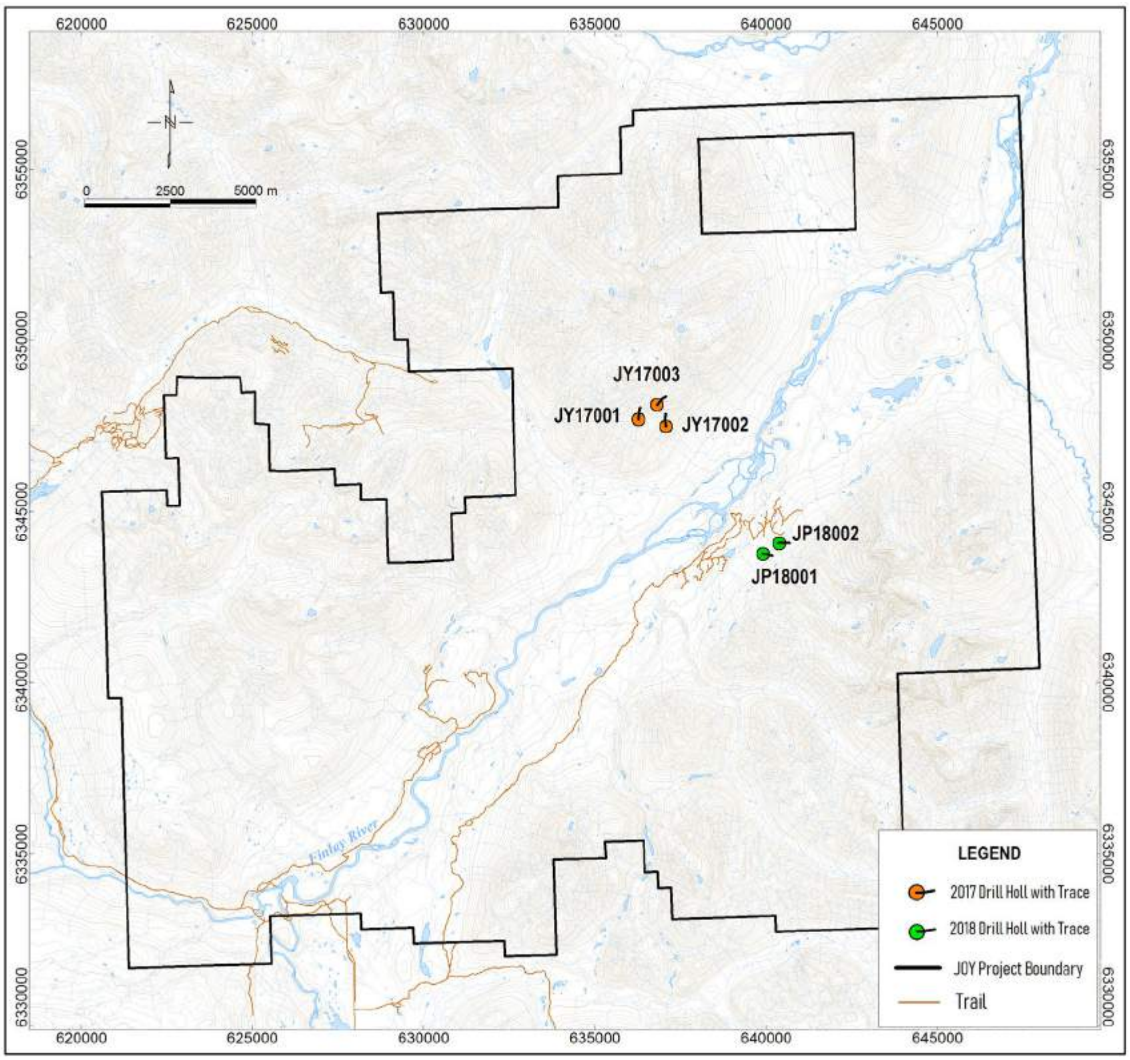



**Figure 10-1: Amarc Drill Hole Location Map.**

## 10.1 Diamond Drilling 2017

The 2017 drilling program targeted geochemical and geophysical anomalies of the NWB target area (later re-classified as Finlay North Target zone). The three holes of the 1,527.2 m drilling program (holes JY17001, JY17002 and JY17003) averaged 509 m in depth. Of this total, 1,482 m was cored bedrock (NQ size) and the remaining 45.2 m was overburden that was triconed and cased but not recovered, logged or sampled. The average core recovery was 95.4% with an average RQD of 62.9%. Figure 10-2 shows the location of the holes and Table 10-2 gives the details of the orientation, length and collar locations of the holes.

**Table 10-2: 2017 Drill Hole Collar information.**

| Drill Hole | Azimuth | Dip | Total depth (m) | Easting (NAD83) | Northing (NAD83) | Elevation (m) |
|---|---|---|---|---|---|---|
| JY17001 | 000 | -45 | 503 | 636271 | 6347697 | 1421 |
| JY17002 | 000 | -45 | 507 | 637071 | 6347488 | 1423 |
| JY17003 | 042 | -45 | 517 | 636809 | 6348121 | 1710 |

### 10.1.1 JY17001

JY17001 targeted the NWB zone, and was designed to test a coincident IP chargeability and Au-Mo soil geochemical anomalies (Figure 10-2). The hole was collared and drilled to cross-cut the extent of the soil anomaly while testing the IP chargeability anomaly at depth.

This hole cored a sequence of intermediate volcanic and volcaniclastic rocks that have been intruded by a series of porphyry dykes. This rock package is consistent with Metsantan and Duncan members of the Early Jurassic Toodoggone Fm. The hole terminated in a quartz-monzonite intrusion, which is interpreted to be part of the Early Jurassic BLIS. Fine intermediate volcaniclastics at the top of JY17001 at 14-149 m and short intercepts further downhole are anomalous in Au, however, the concentrations of Au in JY17001 (30-50 ppb) are much less than recorded in the overlying soil anomaly (up to 1,000 ppb). The porphyry dykes encountered in this hole are anomalous with respect to Cu (0.1% Cu) and Mo (0.01% Mo) over their entire length. As such, the Au-Mo soil geochemical anomaly is only partly explained by the drill results of JY17001.

In the absence of significant base metal sulphides, the overall pyrite abundance of 2.3% only partially explains the IP chargeability anomaly. The area lateral to JY17001 remains prospective as the main cause of the soil and geophysical anomalies are not adequately explained, and the alteration style and intensity encountered in JY17001 is consistent with being proximal to an as yet unidentified magmatic-hydrothermal system.

### 10.1.2 JY17002

JY17002 tested an extensive IP chargeability anomaly 800 m to the east of JY17001 (Figure 10-2). This hole cored a similar sequence of intermediate volcanic and volcaniclastic rocks of the Early Jurassic Toodoggone Fm as JY17001 did, but did not intersect the porphyritic dykes or the underlying BLIS. However, some local sections of the volcanics show strong quartz-pyrite alteration. Anomalous concentrations of Au and especially Ag and Zn were intersected over significant intervals, which correlates with surface soil geochemical anomalies (Figure 10-2).

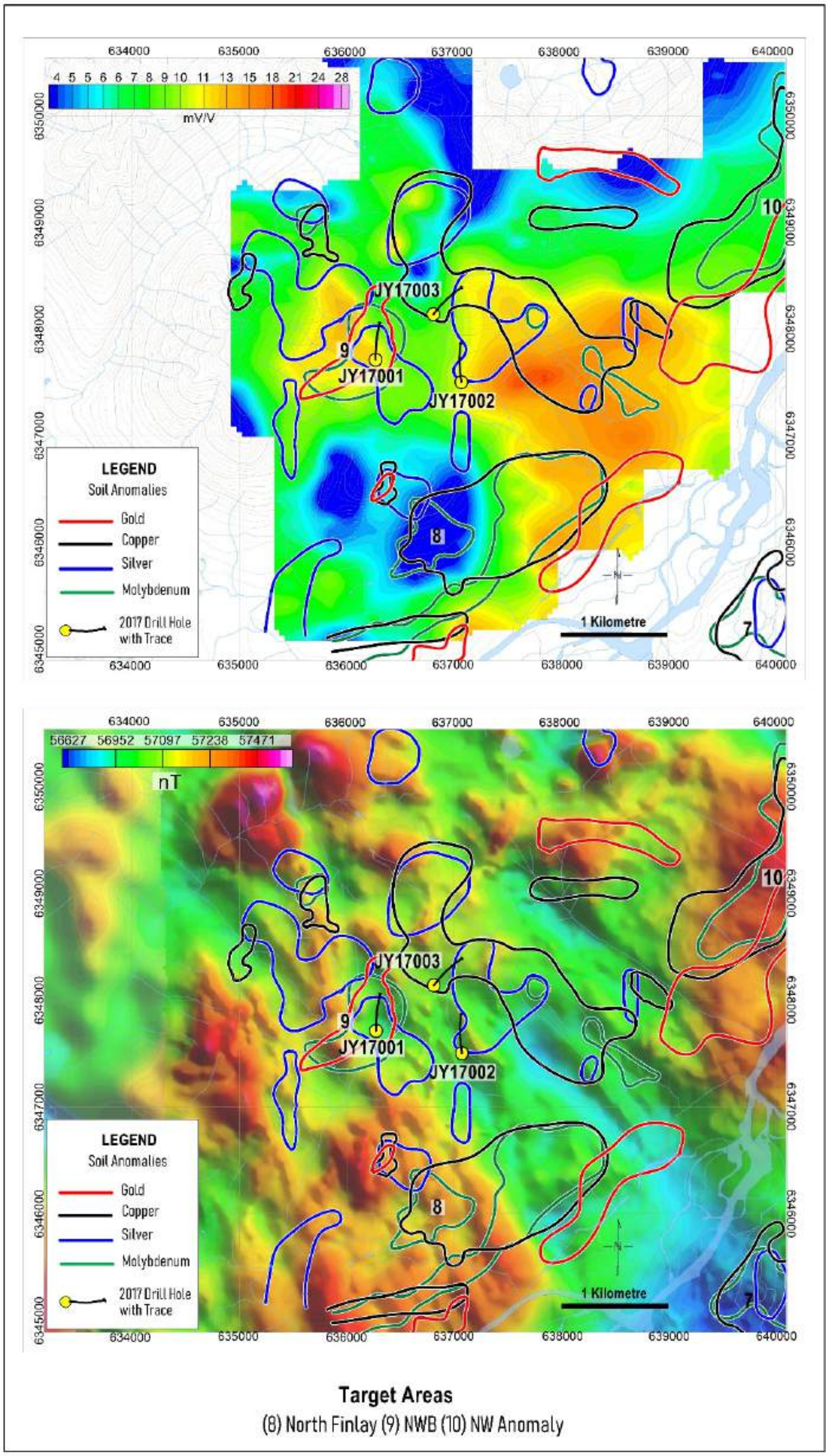



**Figure 10-2: 2017 Drill Hole Location Map at the NWB / North Finlay Target Zone, with Surficial Geochemical Anomalies on Surface IP Chargeability (top) and TMI (bottom).**

In the lower half of JY17002 the altered porphyritic andesite flows and interbedded tuffs returned 27.30 m, from 432.20-459.5 m, of 0.15 g/t Au, 2.1 g/t Ag and 556 ppm Zn. The anomalous Au, Ag and Zn are accompanied by anomalous Mo and Pb concentrations. The long intervals of anomalous Au, Ag and Zn as well as the alteration style and intensity are consistent with JY17002 being located proximal to an unidentified mineralized magmatic-hydrothermal system.

### 10.1.3 JY17003

JY17003 was collared and drilled to crosscut a multi-element (Cu-Ag-Zn) geochemical anomaly and test a coincident extensive IP chargeability anomaly (Figure 10-2), and is located 600 m north of JY17002.

JY17003 intersected volcanic rocks and porphyritic dykes of the Early Jurassic Toodoggone Fm. The quartz-sericite altered felsic volcanics at the top of the hole (10.00-113.96 m) are strongly pyritic - averaging 11% (calculated) pyrite compared to the rest of the hole, which averages 1.2%. Anomalous concentrations of Cu, Mo, Ag and Zn increase towards the bottom of the hole. Strong epidote-chlorite-pyrite alteration of the porphyry dykes occurs at the bottom of the hole. These dykes are also strongly anomalous in Zn and averaged 5,573.5 ppm Zn over 88.32 m from 384.58 m to 472.90 m, including 15,789 ppm Zn and 0.17 g/t Au over 5.60 m from 467.30 m to 472.90 m. The long intervals of anomalous Zn as well as alteration style and intensity are consistent with JY17003 being located proximal to an unrecognized mineralized magmatic-hydrothermal system. The decrease in pyrite and increase in intervals of disseminated and stockwork mineralization and corresponding increased concentrations of Cu, Mo, Zn and Ag might be indicative of a porphyry system occurring at depth, or laterally to the drill hole.

## *10.2 Diamond Drilling 2018*

Amarc completed 946.30 m of NQ drilling in two diamond drill holes on the JOY Project in 2018. The drilling targeted initial geochemical and geophysical anomalies in the TREE porphyry area. Table 10-5 shows the collar information with drill hole locations shown in Figure 10-1 and Figure 10-4.

In holes JP18001 and JP18002, a total of 946.30 m of bedrock was cored (NQ size) and 8.90 m of overburden was triconed and cased, but not recovered, logged or sampled. The average core recovery was 97.9%, with an average RQD of 51.9%.

**Table 10-3: 2018 Drill Holes Collar Information.**

| Drill Hole | Azimuth | Dip | Total depth (m) | Easting (NAD83) | Northing (NAD83) | Elevation (m) |
|---|---|---|---|---|---|---|
| JY18001 | 090 | -50 | 465 | 639,899 | 6,343,755 | 1,167 |
| JY18002 | 090 | -50 | 481 | 640,364 | 6,344,092 | 1,196 |

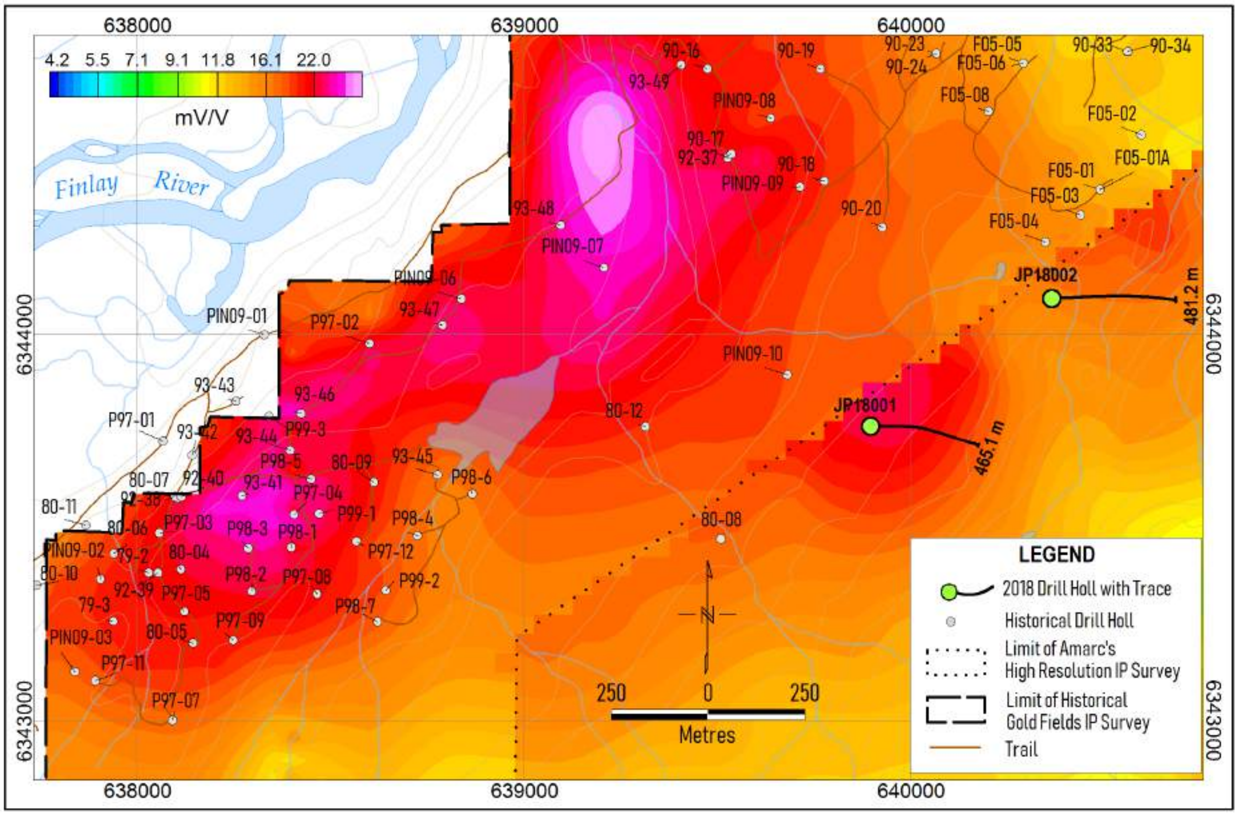



**Figure 10-3: 2018 Drill Hole Map With Drill Traces on an IP Chargeability Base that Shows a Strong Anomaly at PINE-TREE. JY18001 Flanked a Deep Rooted IP Anomaly but Failed to Intercept it, this Target Remains to be Drill Tested.**

### 10.2.1 Drill hole JY18001

Diamond drill hole JP18001 was collared 260 m southeast of historic hole PIN09-10, and was drilled at an azimuth of 090° and at a -50° inclination, to a depth of 465.10 m. This hole targeted IP chargeability highs and to test the edge of the magnetic anomaly associated with the TREE porphyry system. The hole cored a sequence of intermediate volcaniclastic rocks consistent with the Duncan member of the Early Jurassic Toodoggone Fm that have been intruded by dykes of quartz syenomonzonite porphyry, monzodiorite to quartz-monzodiorite and equigranular to graphic textured syenogranite.

Much of the hole exhibits a fairly strong, broadly 'propylitic' alteration, with abundant epidote development and a somewhat variable but usually strong chloritic alteration of the mafic minerals with associated pyrite in the uppermost portion of the hole. Below approximately 269.00 m, alteration within the monzodiorite transitions to more of an epidote-chlorite ± magnetite style with little to no pyrite. Nonetheless, epidote is generally more abundant in this lower interval. In places there are also minor intervals of quartz-sericite ± pyrite alteration. Visible sulphide is almost entirely pyritic, however, examination with the Niton XRF suggest that there are trace amounts of chalcopyrite within these pyritic zones. Three thin (5-20 mm) isolated 'base metal' veins (largely sphalerite-molybdenite bearing) at 198.95 m, 222.50 m and 395.10 m are the exception to this. Sufficient pyrite is present to explain this portion of the IP chargeability anomaly.

### 10.2.2 Drill hole JY18002

Diamond drill hole JP18002 was collared 575 m northeast of JP18001 and was drilled at an azimuth of 090° and at a -50° inclination, to a depth of 481.20 m. This hole targeted a deep IP chargeability anomaly, and was due to test the outer edges of peak chargeability. JP18002 intercepted quartz syenomonzonite porphyry and monzodiorite to quartz-monzodiorite dykes, both of which were previously encountered in JP18001.

The alteration of the monzodiorite unit is moderate to very strong with minor zones of textural destruction. There is variable development of epidotitic streaks and dark grey-green chloritic-epidote replacement of mafics, along with a general sericitization or strong to intense patchy epidote replacement of feldspar and portions of the groundmass. Minor amounts of quartz-sericite ± pyrite and/or silicification also occur locally (particularly at 344.00 to 356.00 m).

In terms of mineralization, like JP18001, visible sulphide in JP18002 is almost entirely pyritic, occurring as fine to locally coarse disseminations intergrown with the mafics, and rarely, in irregular patches or partial veins/veinlets. Like JP18001, sulphide veining is largely absent. JY18002 appears to be sited further from a hydrothermal system.

### 10.2.3 2017-2018 Drilling Results

The 2017 holes were collared to test the NWB target area to the north of the Finlay River. They traced anomalous metal content from the soil anomalies to depth but have not yet located or explained the source of the Cu-Au-Ag-Mo-Zn in this target area. The area lateral to JY17001 remains prospective as the main cause of the soil and geophysical anomalies was not fully explained, and the geological alteration style and intensity encountered in JY17001 is consistent with being proximal to an as yet unidentified magmatic-hydrothermal system. The magnetic high and coincident IP chargeability anomaly approximately 250 m west of the collar of JY18001 warrants drill testing. The long intervals of anomalous Au, Ag and Zn as well as the alteration style and intensity are consistent with JY17002 also being located proximal to an unidentified mineralized magmatic-hydrothermal system, possibly the same one as observed in JY17001. In JY17003, the long intervals of anomalous Zn, alteration style and intensity, decrease in pyrite content, and the increase in intervals of disseminated and stockwork mineralization and thus the corresponding increased concentration of Cu, Mo, Zn and Ag, might be indicative of a porphyry system occurring at depth or laterally to the drill hole. This area remains prospective and warrants further drilling.

In general, there is overall lack of veining and Cu mineralization in the 2018 drill holes. The tenor of Cu mineralization is low in both drill holes (typically 0.01 – 0.02%), and when present mineralization is hosted primarily within the monzodiorite units. Drill hole JP18001 is more consistently and uniformly mineralized with respect to Cu since it lacks the largely barren, younger syenomonzonite dykes observed in JY18002.

In contrast, assay data highlight the significant difference in Au content and distribution between JP18001 and JP18002, even within the comparable monzodiorite units. For example, in JP18001 Au, albeit at fairly low concentrations (averaging 49 ppb), is present more or less continuously throughout the drill hole, aside from the thin syenomonzonite units, and is considered geochemically anomalous. In addition, individual (3 m) sample spikes ranging from ~0.20 ppm Au up to 0.47 g/t Au are scattered throughout.

In view of these results and the fact that much of the relatively strong alteration in both drill holes is essentially propylitic in nature, it is clear that both drill holes are located on the margins of a mineralized hydrothermal system. Nonetheless, the widespread and often strong level of alteration in widely-spaced drill holes is indicative of substantial hydrothermal activity in the area.

Amarc selected a minimum cut-off of 0.20% CuEQ over a minimum of 5 m as a significant intersection. No intervals from 2017 or 2018 drilling met these criteria.

## 10.3 Surveying 2017 – 2018

Amarc personnel surveyed all holes drilled in 2017 and 2018 using a Garmin 62S hand held tool. Amarc obtained downhole surveys using a Reflex EZ-Shot magnetic and gravimetric instrument. The measurements taken were immediately below casing and approximately every 50 m downhole to the final depth. For collar coordinates and drill hole information refer to Table 6-6.

## 10.4 Density Measurements

Amarc obtained an overall mean density of 2.78 on 144 bulk density measurements from the 2018 drill core, also described as specific gravity or "SG" in some descriptions. Density measurements took place at an Amarc facility upon the completion of the field program in late 2018, using a water immersion method employed on dry, uncoated sections of whole core. Daily calibration of the A&D EJ2000 electronic balance used for measuring density was with Mettler-Toledo certified standard weights. Measurement was of core samples free of visible moisture for measurement. Samples selected ranged from 8 to 20 cm in length and averaged 10 cm. They were dried, allowed to cool and weighed in air on a digital scale with a capacity of 2,100 g. Measurement of mass in air (Ma) was to the nearest 0.1 g. Mass in water (Mw) measurements were derived from samples suspended in water below the scale.

Measurements took place at minimum 30 m intervals within continuous rock units down hole, with variation in the rock unit triggering additional measurements. Because of this variation, the typical distance between measurements is actually about 10 m. Where the sample selection point occurred in a section of missing core, or poorly consolidated material unsuitable for measurement, the nearest intact piece of core was measured instead. Measurements were on whole pieces of drill core from the 2018 drill program, but none from 2017. Density calculations use the following formula: Density = Ma / (Ma – Mw).

Amarc is not aware of any density data for the historical drilling.

## 10.5 Drilling Conclusions

The 2017 Amarc holes were collared to test the NWB target area (#8) to the north of the Finlay River. They traced anomalous metal content from the soil anomalies to depth but have not yet located or explained the source of the Cu-Au-Ag-Mo-Zn in this target area. The area lateral to JY17001 remains prospective as the main cause of the soil and geophysical anomalies was not fully explained, and the geological alteration style and intensity encountered in JY17001 is consistent with being proximal to an as yet unidentified magmatic-hydrothermal system. The long intervals of anomalous Au, Ag and Zn as well as the alteration style and intensity are consistent with JY17002 also being located proximal to an unidentified mineralized magmatic-hydrothermal system, possibly the same one as observed in JY17001. In JY17003, the long intervals of anomalous Zn, alteration style and intensity, decrease in pyrite content, and the increase in intervals of disseminated and stockwork mineralization and thus the corresponding increased concentration of Cu, Mo, Zn and Ag, might be indicative of a porphyry system occurring at depth or laterally to the drill hole. This area remains prospective and warrants further drilling.

In general, there is overall lack of veining and Cu mineralization in the 2018 drill holes at south TREE. The tenor of Cu mineralization is low in both drill holes (typically 0.01 – 0.02%), and when present mineralization is hosted primarily within the monzodiorite units. Drill hole JP18001 is more consistently and uniform mineralized with respect to Cu since it lacks the largely barren, younger syenomonzonite dykes observed in JY18002.

In contrast, assay data highlight the significant difference in Au content and distribution between JP18001 and JP18002, even within the comparable monzodiorite units. For example, in JP18001 Au, albeit at fairly low concentrations (averaging 49 ppb), is present more or less continuously throughout the drill hole, aside from the thin syenomonzonite units, and is considered geochemically anomalous. In addition, individual (3 m) sample spikes ranging from ~0.20 ppm Au up to 0.47 g/t Au are scattered throughout.

In view of these results and the fact that much of the relatively strong alteration in both drill holes is essentially propylitic in nature, and the inverted 3D IP chargeability model indicates an untested high lying to the west of the drill hole, it is clear that both drill holes are located on the margins of a mineralized hydrothermal system. Nonetheless, the widespread and often strong level of alteration in widely-spaced drill holes is indicative of substantial hydrothermal activity in the area.

Amarc selected a minimum cut-off of 0.20% CuEQ over a minimum of 5 m as a significant intersection. No intervals from 2017 or 2018 drilling met these criteria.

# 11.0 Sampling, Sample Preparation, Analyses & Security

The number of samples taken and analyzed in the historical and Amarc drill programs total 12,710. Table 11-1 is a summary of the number of regular mainstream drill hole samples taken and analyzed for selected elements by year for the historical and Amarc drill programs.

**Table 11-1: Historical and Amarc Drill Core Samples Taken and Analyzed for Various Elements by Year.**

| Year | Samples | Au | Cu | Ag | Zn | Pb | Mo | Fe |
|---|---|---|---|---|---|---|---|---|
| 1972* | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1979 | 66 | 66 | 66 | 0 | 0 | 0 | 0 | 0 |
| 1980 | 180 | 176 | 157 | 148 | 21 | 21 | 71 | 3 |
| 1983† | 64 | 64 | 58 | 64 | 58 | 0 | 0 | 0 |
| 1987 | 244 | 244 | 0 | 244 | 0 | 0 | 0 | 0 |
| 1988 | 1,186 | 1,185 | 161 | 1,184 | 161 | 161 | 0 | 0 |
| 1989‡ | 562 | 560 | 30 | 561 | 30 | 30 | 0 | 0 |
| 1990 | 337 | 337 | 337 | 24 | 0 | 0 | 328 | 0 |
| 1992 | 344 | 334 | 334 | 334 | 334 | 334 | 334 | 0 |
| 1993 | 634 | 634 | 634 | 634 | 634 | 634 | 541 | 0 |

**Table 11-1: (continued)**

| Year | Sampl | Au | Cu | Ag | Zn | Pb | Mo | Fe |
|---|---|---|---|---|---|---|---|---|
| 1997 | 655 | 655 | 612 | 612 | 612 | 612 | 612 | 0 |
| 1998 | 366 | 366 | 366 | 22 | 22 | 22 | 22 | 22 |
| 1999 | 330 | 309 | 309 | 309 | 309 | 308 | 309 | 0 |
| 2003 | 863 | 862 | 863 | 862 | 863 | 863 | 863 | 862 |
| 2005 | 2,018 | 2,018 | 2,018 | 2,017 | 2,016 | 2,017 | 2,017 | 1,978 |
| 2007 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 0 |
| 2009 | 2,245 | 2,245 | 2,245 | 2,245 | 2,245 | 2,245 | 2,245 | 2,245 |
| 2011 | 923 | 923 | 923 | 923 | 923 | 923 | 923 | 923 |
| 2012 | 866 | 866 | 866 | 866 | 866 | 866 | 866 | 866 |
| 2017 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| 2018 | 313 | 313 | 313 | 313 | 313 | 313 | 313 | 313 |
| **Total** | **12,710** | **12,669** | **10,805** | **11,874** | **9,919** | **9,861** | **9,956** | **7,712** |

* The number of samples is unknown, but at least one sample was taken in 1972.
† The 1983 sampling and analytical information from the VIP area has not been data entered.
‡ Chip samples taken from percussion holes.

## *11.1 Historical Sampling, Sample Preparation, Analyses and Security*

Acquisition of data on historical drilling is discussed in Section 6.

Table 11-2 provides a summary of the sample preparation and analytical laboratories, including the analytical methods used, by year for drill core analysis. Table 11-3 lists the 18 historical drill holes lacking assay results in the Amarc drill hole database. Most samples taken were analyzed for Au, 93% were analyzed for Ag, 87% were analyzed for Cu and about 63% of the samples were subject to multi-element analysis. The sampling method, sample preparation procedures, sample security, analytical methods and analytical laboratories used in the 1972 through 2012 drill programs are described to varying extents in the ARIS reports of the historical drill programs filed with BC Government.

There are at least two storage locations for the historical core on the Project. It is likely that much of the unsampled whole core and the previously sampled half core, particularly from the 1997 through 2012 drill programs of Stealth, Cascadero and Gold Fields is available for examination on site. In general, the quality and quantity of core available is inversely proportional to the age of remaining drill core. Amarc is unaware of any drill core rejects or pulps available from the historical drill programs.

**Table 11-2: Historical Analytical Laboratories and Analytical Methods Used for Drill Core Analysis.**

| Year | Sample Preparation & Analytical Laboratories | Analytical Methods |
|---|---|---|
| 1972 | Kennco Explorations, (Western) Limited Laboratory N. Vancouver, BC* | Nitric / perchloric acid digest atomic absorption spectroscopy (AAS) finish for Cu*. (No individual results, no certificates) |
| 1979 | Rossbacher Laboratory Ltd., N Vancouver<br>Chemex Labs Ltd., N Vancouver BC<br>Bondar Clegg, N Vancouver BC | Methods unknown. Cu and Au assays only. Ag assays considered unreliable because of inconsistency with 1992 re-assays. (No certificates) |
| 1980 | Chemex Labs Ltd., N Vancouver BC<br>Riocanex Laboratory<br>Acme Analytical Labs, Vancouver BC | Neutron activation analysis (NAA) for Au (Some certificates)<br>Methods unknown, Ag, Cu, Mo, Pb, Zn<br>FA AAS for Au. 3 acid digest AAS other elements |
| 1983 | Rossbacher Laboratory Ltd., N Vancouver BC | Methods unknown, Ag, Au, Cu, Pb, Zn, some As |
| 1987 | Min-En Laboratories, N. Vancouver BC | AR digestion of 5 g sample, AA finish for Ag followed by HBr MIBK AA finish for Au. |
| 1988 | Chemex Labs Ltd., N Vancouver BC (Cheni) | 1 assay-ton (30g) A fusion gravimetric finish for Au, Ag |
| 1988 | Acme Analytical Labs, Vancouver BC (Skylark & Asitka) | 10 g AR digest ICP-AES for Au, Ag. No other elements analyzed |
| 1989 | Acme Analytical Labs, Vancouver BC | Methods unknown, presumably same as above for Au, Ag. |
| 1990 | Cominco Exploration & Research Laboratory, Vancouver BC | Au by AR digest, solvent extraction AAS (aliquot size unknown). Cu and Ag by nitric acid digest AAS. Mo by nitric & perchloric acid digest AAS. |
| 1992-1993 | Min-En Laboratories, N. Vancouver BC | 30 g FA AAS for Au<br>$HNO_3$-$KClO_4$ HCl digest AAS for Ag, Co, Cu, Ni, Pb, Zn<br>AR digest ICP-ES for Ba, Be, Ca, Cd, Co, Cr, Fe, K, Li, Mg, Mn, Mo, Na, P, Sn, Sr, Th, Ti, V, W |
| 1997 | Min-En Laboratories, N. Vancouver BC | AR digest ICP-ES for Ag, Al, Ca, Cu, Fe, K, Mn, Mo, Na, P, Pb, Zn. 30 g FA AAS for Au |
| 1998 | Min-En Laboratories, N. Vancouver BC<br><br><br>Acme Analytical Labs, Vancouver BC | Multi-element (30) AR digest ICP-AES<br>AR digest AAS for Cu<br>30g FA AAS for Au<br>Multi-element (33) AR digest ICP-MS |
| 1999 | Acme Analytical Labs, Vancouver BC | Multi-element (33) AR digest ICP-MS -<br>Multi-element (15) AR digest ICP-AES – 7AR<br>30g FA ICP-AES for Au |
| 2003 | Acme Analytical Labs, Vancouver BC | Multi-element (33) AR digest ICP-MS<br>30g FA AAS for Au & Ag |
| 2005 2007 | Eco-Tech, Kamloops BC | Multi-element (36) AR digest ICP-AES<br>30g FA AAS for Au |
| 2009 | Acme Analytical Labs, Vancouver BC | Multi-element (36) ICP-MS by HCl, HF, HNO3, HClO4 digest of 0.25 g pulp - Group 1EX<br>30g FA ICP-AES or gravimetric finish for Au - G6<br>AR digest ICP-AES for Cu overlimits - 7AR and for Multi-acid HCl, HF, HNO3, HClO4 digest ICP-AES for Pb & Zn overlimits - 7TD |
| 2011-2012 | ALS Minerals, Vancouver, BC | Multi-element (33) assay by four acid "near-total" digestion with ICP-MS finish - ME-ICP61<br>30g FA ICP-AES for Au - Au-ICP21<br>38 element Lithium Metaborate fusion ICP-MS - ME-MS81 |

* Laboratory and method used for 1970 surface sampling program.

**Table 11-3 Historical Drill Holes with No Assay Data in the Amarc Database.**

<table>
<tr><th>Drill Hole</th><th>Area</th><th>Comment</th></tr>
<tr><td>83-1</td><td rowspan="7">VIP</td><td rowspan="7">Data entry of assays listed in ARIS Report 13057 deferred as of report date.</td></tr>
<tr><td>83-2</td></tr>
<tr><td>83-3</td></tr>
<tr><td>83-4</td></tr>
<tr><td>83-5</td></tr>
<tr><td>83-6</td></tr>
<tr><td>83-7</td></tr>
<tr><td>88-14</td><td rowspan="3">Electrum</td><td rowspan="2">Hole not sampled or assayed.</td></tr>
<tr><td>88-20</td></tr>
<tr><td>PH-69</td><td>No sampling or analytical information reported for this hole.</td></tr>
<tr><td>90-32</td><td rowspan="4">FIN</td><td>Geology log estimate to 0.4% Cu. No sampling or analytical</td></tr>
<tr><td>90-33</td><td>No sampling or analytical information reported.</td></tr>
<tr><td>90-35</td><td rowspan="3">Hole abandoned, not sampled.</td></tr>
<tr><td>90-36</td></tr>
<tr><td>V03-02</td><td>VIP</td></tr>
<tr><td>P05-01</td><td rowspan="2">PINE</td><td rowspan="3">Hole abandoned, not sampled, assayed or logged.</td></tr>
<tr><td>PIN09-11</td></tr>
<tr><td>PIN09-12</td><td>Canyon</td></tr>
</table>

## *11.2 Amarc Drill Program 2017 and 2018*

Amarc systematically sampled and analyzed all drill core in the 2017 – 2018 drill programs. Core sampling of sawn half core included 813 regular samples with an average length of 3.0 m submitted for preparation and analysis. Overburden was not recovered or sampled.

Full chain of custody control was for all analytical samples in the 2017 and 2018 drill programs, from collection at the drill rig through to delivery at the analytical laboratory. Upon completion of all core-logging procedures, the core went to a secure cutting facility at site for processing and sampling by Amarc core cutters trained and supervised by experienced Amarc technical staff. Sample guidelines marked by a geologist, denoted the intervals to cut lengthwise using a rock saw. The sampling procedure involved placing the bottom tab of the sample tag from the sample book into a pre-marked plastic sample bag and stapling the stub from the tag book to the core box at the beginning of each sample interval. Core cutters always selected samples from the same side of the whole core to avoid sample bias. This also ensured that the remaining half-core pieces fit together when placed back in the core box for storage. Placement of one-half of the cut core into the appropriate sample bag followed. Secure closure of the sample bag with a plastic cable tie followed upon completion of sampling. At the end of each shift, the sample bags were placed into labelled rice bags (3 to 4 samples per bag), which were also securely closed with cable ties and made ready for transport to the analytical laboratory. The rice bags and sample shipment paperwork were shipped by Amarc vehicle and then by commercial surface freight carrier to Activation Laboratories Ltd ("Actlabs") laboratory facility in Kamloops, BC. The half core remaining after sampling is stored in a facility in Williams Lake.

### 11.2.1 Amarc Surface Sampling 2016, 2017 & 2018

Surface samples collected in 2016, 2017 and 2018 total 4,021, including 3,934 soil and 87 rock samples. Surface sampling took place in September 2016, July and August 2017 and from late June to early September in 2018. A description of details on the sampling methodology and results of these programs are included in the JOY Project reports listed in the references.

Weekly sample shipments by commercial aircraft from site were to Smithers, BC. From there the samples were sent by commercial surface freight carrier to Actlabs in Kamloops, BC.

### 11.2.2 Sample Preparation

Drill core samples submittal to Actlabs Kamloops, BC for sample preparation and analysis was between August 30 and September 19 in 2017 and between October 11 and October 16 in 2018. At the Actlabs analytical laboratory the drill core samples were prepared under laboratory code RX1. They were dried and crushed to >90% passing to 2 mm, then a 250 g riffle split was taken. The sub-sample and any reject duplicate samples were pulverized to >95% passing 105 microns prior to aliquot selection for digestion and analysis. Figure 11-1 is an example of the sampling, sample preparation, security and analytical flow chart for the Amarc 2017 drill program.

After the completion of sample preparation and assay analysis, the coarse rejects and assay pulps were stored at Actlabs in Kamloops, BC. Transfer of all Amarc assay pulps including those derived from drill core, surface rock samples, and soil samples to a company warehouse in Surrey, BC for long-term storage took place in late 2019. Amarc discarded all drill core, surface rock, soil/talus assay reject portion of their samples in storage at Actlabs Kamloops in mid-2019.

### 11.2.3 Assay Analysis

Processing of the 2016, 2017 and 2018 drill core and surface samples was at Actlabs Kamloops, BC an ISO 17025 accredited laboratory. An average 20-day analytical turnaround was achieved for the 2016, 2017 and 2018 drilling and surface sampling programs, although turnaround of up to one or two weeks longer occurred towards the end of the late summer – early fall season. Turnaround included the date the laboratory received the samples to the analytical certification date, including weekends and holidays. Timing does not include QC reruns or inter-laboratory duplicates.

Amarc selected analytical techniques, in coordination with Actlabs, for the determination of Au and Cu for possible use in a future resource evaluation prior to initiation of analytical work on the project. Analysis of all drill core samples was by three separate assay methods at Actlabs, Kamloops:

1. 30 g FA fusion (FA-ICP);
    a. Method 1C-OES used in 2017 included Au, Pd and Pt.
    b. Method 1A2-ICP used in 2018 included Au only.
2. 36 element four acid (total) digestion ICP-OES – Method TD-ICP (1F2-Assay); and
3. 63 element AR digestion ICP-MS – Method AR-MS (UT1).

In all, 65 elements were determined in 2017 and 63 elements in 2018.

All core samples were analyzed by 30 g FA fusion. Actlabs method FA-ICP (1C-OES) which included Au, Pd and Pt was used on the 2017 drill core samples and the 2016 surface samples. Actlabs method 1A2-ICP (FA-ICP) was used to determine Au in the 2018 drill core samples and the 2017 and 2018 surface samples. The elements analyzed and the detection limits of this method are listed in Table 11-4 and 11-5.

**Table 11-4: Precious Metal Fire Assay Analytical Method (1C-OES) and Au Only Method (1A2-ICP) Limits.**

| Element | Unit | Detection Limit | Upper Limit |
|---|---|---|---|
| Au | ppb | 2 | 30,000 |
| Pt | ppb | 5 | 30,000 |
| Pd | ppb | 5 | 30,000 |

The selected Cu and Mo assay protocol is Actlabs analytical method 1F2-Assay Amarc- Kamloops Total Digestion ICP, (TD-ICP on the certificates of analysis). In this method, a 0.25 g sample is digested with four acids (HF-HNO3-HClO4-HCl) beginning with hydrofluoric, followed by a mixture of nitric and perchloric acids, heated using precise programmer controlled heating in several ramping and holding cycles that takes the samples to incipient dryness. After samples attain incipient dryness, they are brought back into solution using AR. Analysis of the samples is by ICP-OES (sometimes referred to as ICP-AES). QC for the digestion is 14% for each batch, five method reagent blanks, ten in-house controls, ten sample duplicates, and eight certified reference materials. QC is performed an additional 13% of the samples as part of the instrumental analysis to ensure quality in the areas of instrument drift. Table 11-6 lists the elements analyzed and the detection limits of this method.

In Actlabs laboratory analytical method Ultratrace-1-Kamloops AR ICP/MS, (AR-MS on the certificates of analysis, also known as Method UT1), digestion of a 0.5 g sample is by AR at 90°C in a microprocessor controlled digestion block for 2 hours. Dilution and analysis of digested samples is by ICP-MS. One blank is run for every 68 samples. An in-house control is run every 33 samples. Digested standards are run every 68 samples. Analysis of a digestion duplicate occurs after every 15 samples. The instrument is recalibrated every 68 samples. Table 11-5 lists the elements analyzed and the detection limits of this method.

The majority of Cu results used in the database are by the TD-ICP assay method, with the exception of some of the very lowest concentrations reported. No overlimit analyses were required. All Ag concentrations and most of the Mo concentrations in the current database are by AR-MS. The maximum value received by AR-MS for Ag was 8.98 g/t.

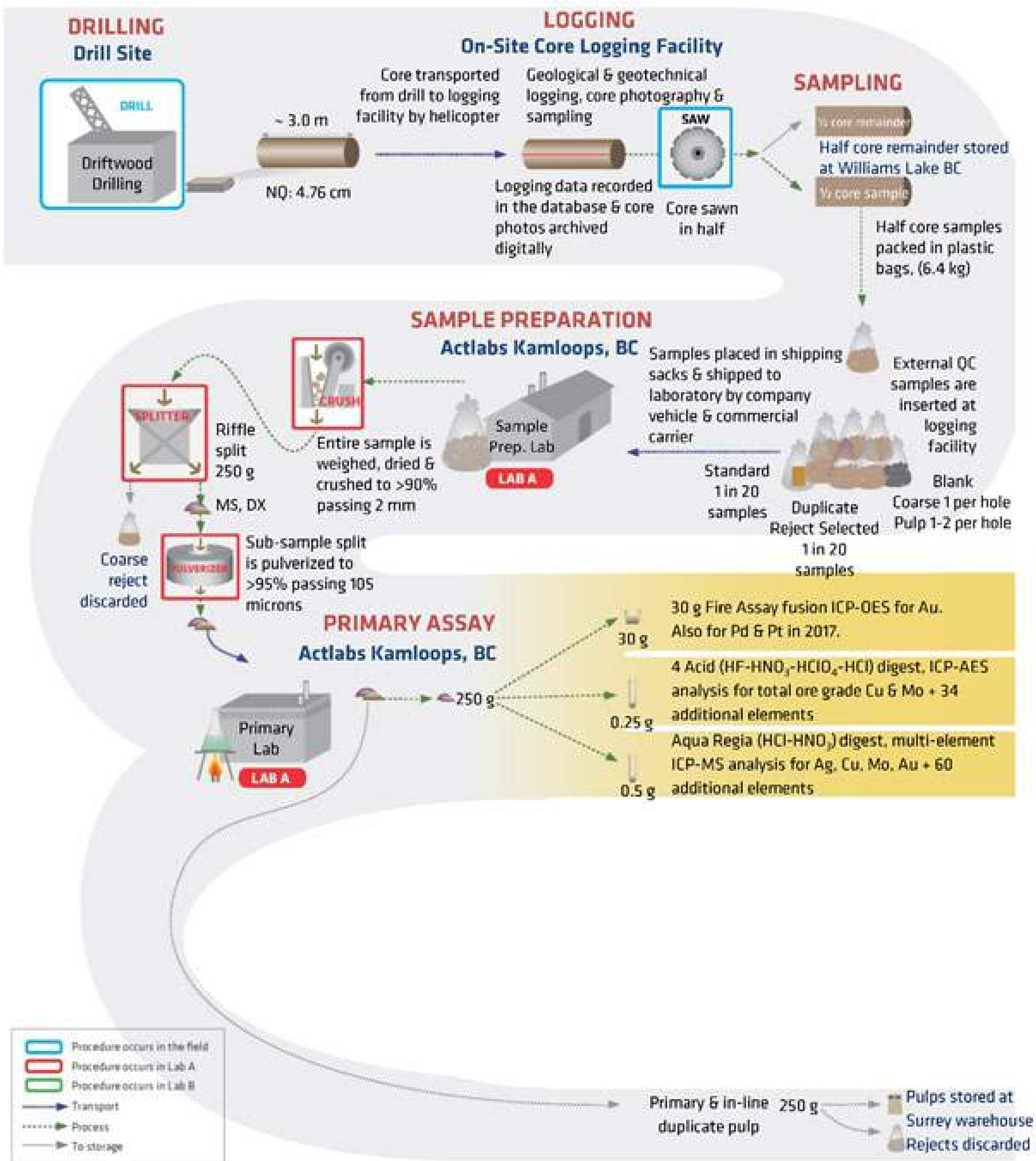



**Figure 11-1: Amarc Sampling, Sample Preparation, Security and Analytical Flow Chart for Drill Core.**

Analysis of all samples is by three analytical methods and analysis of 37 elements is by two different analytical methods. Selection of the most appropriate combination of digestion and analytical method for use in instances requiring the reporting of a single value for each element is according to the analytical hierarchy listed in Table 11-7. For samples analyzed more than once, particularly in the case of QAQC reruns, the digital compilation used the first valid analytical result received that passed QAQC from the primary laboratory. This compilation also respects the priority in the analytical hierarchy. The digital compilation of assay results for samples analyzed multiple times or by different methods does not employ averaging. Inter-laboratory duplicate analysis of Amarc drill core samples was deferred.

Analysis of surface samples from the 2016, 2017 and 2018 programs was by the same methods as the drill core samples. The chip and grab samples were prepared in the same method as the core samples at Actlabs, Kamloops. Preparation of soil samples included drying at 60°C and sieving to -150 mesh (0.1 mm). For database and results plotting purposes, the categorization of talus fines samples was as soil samples.

**Table 11-5: Multi-Element Analytical Method 1F2 Total Digestion ICP-OES (TD-ICP) Elements & Limits.**

| Element | Unit | Detection Limit | Upper Limit | Note | | Element | Unit | Detection Limit | Upper Limit | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Ag | ppm | 3 | 100 | | | Mo | % | 0.001 | 10,000 | |
| Al | % | 0.1 | - | * | | Na | % | 0.1 | - | |
| As | ppm | 30 | 5,000 | | | Ni | % | 0.001 | 10,000 | |
| Ba | ppm | 70 | 1,000 | | | P | % | 0.01 | - | |
| Be | ppm | 10 | - | * | | Pb | ppm | 30 | 5,000 | |
| Bi | ppm | 20 | - | | | S | % | 0.1 | 20 | |
| Ca | % | 0.1 | - | | | Sb | ppm | 50 | 10,000 | |
| Cd | ppm | 3 | 2,000 | | | Sc | ppm | 40 | - | |
| Co | ppm | 10 | - | | | Sr | ppm | 10 | - | |
| Cr | ppm | 10 | 10,000 | | | Te | ppm | 20 | - | |
| Cu | % | 0.001 | - | | | Ti | % | 0.1 | - | |
| Fe | % | 0.1 | - | | | Tl | ppm | 50 | - | |
| Ga | ppm | 10 | - | * | | U | ppm | 100 | - | * |
| Hg | ppm | 10 | - | | | V | ppm | 20 | - | |
| K | % | 0.1 | - | | | W | ppm | 5 | - | * |
| Li | ppm | 10 | - | | | Y | ppm | 10 | 10,000 | * |
| Mg | % | 0.1 | - | | | Zn | % | 0.001 | 10,000 | |
| Mn | % | 0.001 | 100,000 | | | Zr | ppm | 50 | - | * |

Note: * Element may only be partially extracted.

**Table 11-6: Multi-Element Analytical Method Aqua Regia Digest ICP-MS (AR-MS) Elements & Limits.**

| Element | Unit | Detection Limit | Upper Limit | Note | | Element | Unit | Detection Limit | Upper Limit | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Ag | ppm | 0.002 | 100 | * | | Mo | ppm | 0.01 | 10,000 | |
| Al | % | 0.01 | 10 | * | | Na | % | 0.001 | 5 | * |
| As | ppm | 0.1 | 10,000 | * | | Nb | ppm | 0.1 | 500 | * |
| Au | ppb | 0.5 | 10,000 | * | | Nd | ppm | 0.02 | - | * |
| B | ppm | 1 | 5,000 | * | | Ni | ppm | 0.1 | 10,000 | * |
| Ba | ppm | 1 | 6,000 | * | | P | % | 0.001 | - | * |
| Be | ppm | 0.1 | 1,000 | * | | Pb | ppm | 0.01 | 10,000 | * |
| Bi | ppm | 0.02 | 2,000 | | | Pr | ppm | 0.1 | - | |
| Ca | % | 0.01 | 50 | * | | Rb | ppm | 0.1 | 500 | * |
| Cd | ppm | 0.01 | - | | | Re | ppm | 0.001 | 100 | |
| Ce | ppm | 0.01 | 10,000 | * | | S | % | 1 | - | * |
| Co | ppm | 0.1 | 5,000 | | | Sb | ppm | 0.02 | 500 | |
| Cr | ppm | 0.5 | 5,000 | * | | Sc | ppm | 0.1 | - | |
| Cs | ppm | 0.02 | - | * | | Se | ppm | 0.1 | 1,000 | |
| Cu | ppm | 0.01 | 10,000 | | | Sm | ppm | 0.1 | 100 | * |
| Dy | ppm | 0.1 | - | | | Sn | ppm | 0.05 | 200 | * |
| Er | ppm | 0.1 | - | | | Sr | ppm | 0.5 | 1,000 | * |
| Eu | ppm | 0.1 | 100 | * | | Ta | ppm | 0.05 | 50 | * |
| Fe | % | 0.01 | 50 | * | | Tb | ppm | 0.1 | 100 | * |
| Ga | ppm | 0.02 | 500 | * | | Te | ppm | 0.02 | 500 | |
| Gd | ppm | 0.1 | - | | | Th | ppm | 0.1 | 200 | * |
| Ge | ppm | 0.1 | 500 | * | | Ti | ppm | 0.001 | - | * |
| Hf | ppm | 0.1 | 500 | * | | Tl | ppm | 0.02 | 500 | * |
| Hg | ppb | 10 | 10,000 | * | | Tm | ppm | 0.1 | - | |
| Ho | ppm | 0.1 | - | | | U | ppm | 0.1 | 10,000 | * |
| In | ppm | 0.02 | - | | | V | ppm | 1 | 1,000 | * |
| K | % | 0.01 | 5 | * | | W | ppm | 0.1 | 200 | * |
| La | ppm | 0.5 | 1,000 | * | | Y | ppm | 0.01 | - | * |
| Li | ppm | 0.1 | - | | | Yb | ppm | 0.1 | 200 | * |
| Lu | ppm | 0.1 | 100 | * | | Zn | ppm | 0.1 | 10,000 | * |
| Mg | % | 0.01 | 10 | * | | Zr | ppm | 0.1 | 5,000 | * |
| Mn | ppm | 1 | 10,000 | * | | | | | | |

Note: * May not be total. Unaltered silicates and resistate minerals may not be dissolved.

**Table 11-7: Analytical Hierarchy.**

| Element | Method | Element | Method | Element | Method |
|---|---|---|---|---|---|
| **Ag** | If TD-ICP<30, then AR-MS | **Ge** | AR-MS | **S** | TD-ICP |
| **Al** | TD-ICP | **Hf** | AR-MS | **Sb** | AR-MS |
| **As** | AR-MS | **Hg** | If TD-ICP<20, then AR-MS | **Sc** | If TD-ICP<80, then AR-MS |
| **Au** | FA-ICP if exists, else AR-MS | **Ho** | AR-MS | **Se** | AR-MS |
| **B** | AR-MS | **In** | AR-MS | **Sm** | AR-MS |
| **Ba** | TD-ICP | **K** | TD-ICP | **Sn** | AR-MS |
| **Be** | If TD-ICP<20, then AR-MS | **La** | AR-MS | **Sr** | If TD-ICP<10, then AR-MS |
| **Bi** | If TD-ICP<40, then AR-MS | **Li** | If TD-ICP<10, then AR-MS | **Ta** | AR-MS |
| **Ca** | TD-ICP | **Lu** | AR-MS | **Tb** | AR-MS |
| **Cd** | If TD-ICP<6, then AR-MS | **Mg** | TD-ICP | **Te** | If TD-ICP<20, then AR-MS |
| **Ce** | AR-MS | **Mn** | TD-ICP | **Th** | AR-MS |
| **Co** | If TD-ICP<30, then AR-MS | **Mo** | If TD-ICP<0.006, then AR-MS | **Ti** | If TD-ICP<0.1, then AR-MS |
| **Cr** | If TD-ICP<10, then AR-MS | **Na** | If TD-ICP<0.1, then AR-MS | **Tl** | If TD-ICP<50, then AR-MS |
| **Cs** | AR-MS | **Nb** | AR-MS | **Tm** | AR-MS |
| **Cu** | If TD-ICP<0.01, then AR-MS | **Nd** | AR-MS | **U** | If TD-ICP<300, then AR-MS |
| **Dy** | AR-MS | **Ni** | AR-MS | **V** | If TD-ICP<20, then AR-MS |
| **Er** | AR-MS | **P** | TD-ICP | **W** | If TD-ICP<50, then AR-MS |
| **Eu** | AR-MS | **Pb** | If TD-ICP<70, then AR-MS | **Y** | If TD-ICP<20, then AR-MS |
| **Fe** | TD-ICP | **Pr** | AR-MS | **Yb** | AR-MS |
| **Ga** | If TD-ICP<10, then AR-MS | **Rb** | AR-MS | **Zn** | If TD-ICP<0.001, then AR-MS |
| **Gd** | AR-MS | **Re** | AR-MS | **Zr** | If TD-ICP<50, then AR-MS |

## 11.3 Historical Drill Data Verification

A number of verification procedures were implemented to assess the historical (and Amarc, see Section 11.4) geochemical and geological datasets.

For the historical data a number of cross-checks of were made of the data imported to the Amarc database against the original source documents for each drilling and surface sampling program. The compiled database was checked against sampling information from sources such as assessment reports, internal company project reports and their accompanying digital datasets and analytical laboratory certificates where available. A number of inadvertencies were identified during the compilation process including, for example, sample-from to errors in relation to drill samples, sample identification errors, unit conversion errors, over-limits not being applied, elements not imported or imported to the wrong column, laboratory errors, typographical and entry errors. Overall the number and severity of these errors was not a major impediment to the exploration targeting program. No new samples were taken from the historical drill core that exists, as these materials have not yet been properly rehabilitated, inventoried and re-logged.

In general, the oldest historical JOY Project analytical data is less reliable than the more recent data. Documentation as to the provenance of some of the oldest data is poor, particularly for the pre-1992 data. A variety of analytical methods were used and information in terms of method descriptions also varies considerably, as does the number of different laboratories that were involved over the years. Another issue with much of the older analytical data is the inability to validate it in terms of accuracy and precision due to lack of accompanying QAQC information in the original source records. For some of the more recent years, QAQC information exists in the historical records but for expediency it has not been compiled in the Amarc database. For this reason, the use of this historical analytical data as it is must be carefully assessed prior to use in resource estimation or more advanced studies.

Chip samples were taken from percussion drill holes for two years of drilling in 1989 and 1990 at the Electrum prospect and PINE deposit. Historical percussion drilling is not as robust a method of obtaining representative samples for assay as core drilling methods. Overall, chip samples represent about 6% of the drill related samples taken in the PINE area. The use of these chip sample results in any future resource estimation or economic analysis must be carefully assessed.

A recommendation is to import all of the historical analytical QAQC data so it can be assessed. A further recommendation is to find and rehabilitate any historical core that exists so that it can be re-logged and sampled as appropriate.

## *11.4 Amarc Drill Data Verification*

Several verification procedures applied to the JOY Project drill hole data confirm the appropriateness and accuracy of this information for use in public disclosure.

Amarc implemented an effective external QAQC system consistent with industry best practice and applied it to the 2017 and 2018 drilling and 2016, 2017, and 2018 surface programs. The results of this QAQC program lend credence to the veracity of this geological and analytical data.

Designation of QAQC samples by the core-logging geologists took place at the JOY Project core logging facility in the 2017 and 2018 drill programs. Insertion of appropriate QC samples within the regular sample stream took place prior to shipment of samples to the preparation and analytical laboratories. This "external" QAQC system is in addition to the QAQC procedures used internally by the analytical laboratories. Table 11-8 outlines the types of external QAQC sample types used in this system, and Table 11-9 displays a summary of hole sampling for each QC sample type.

**Table 11-8: QAQC Sample Types Used in Amarc 2017-2018 Drill Programs.**

| QC Code | Sample Type | Description | Percent of Total |
|---|---|---|---|
| MS | Regular Mainstream | Regular samples submitted for preparation and analysis at the primary laboratory. | 88% |
| DX<br>DP | Duplicate<br>or Replicate | An additional split taken from the remaining pulp reject (DP) and coarse reject (DX).<br>Random selection using pre-numbered sample tags. | 6% |
| ST<br>SD | Standard or<br>Certified Reference Material or CRM | Mineralised material in pulverised form with a known concentration and distribution of element(s) of interest. Inserted at primary laboratory (ST) and check laboratory (SD)<br>Randomly inserted using pre-numbered sample tags. | 4.5% |
| BL | Blank | A very low-grade standard or sample with no appreciable grade of the element(s) of interest used to test for contamination.<br>Includes pulp blanks and coarse (1 - 2 cm size) blanks | 1.5% |

**Table 11-9: Amarc 2017-2018 Drill Hole Sampling and Analysis Summary by QC Code.**

| Year | MS | BL | DX | ST | Total |
|---|---|---|---|---|---|
| 2017 | 500 | 9 | 28 | 24 | 561 |
| 2018 | 313 | 4 | 16 | 17 | 350 |
| **Total** | **813** | **13** | **44** | **41** | **911** |

Note: Table 11-8 lists the QC codes.

### 11.4.1 Validation and Verification

Use of a site-specific digital data entry module to compile and validate Project data occurred in 2017 and MX Deposit software replaced this module in 2018. These programs standardize and document the data entry, restrict data that can be entered and processed and enable corrections to be made at an early stage. Users make selections from pick-lists where appropriate and some entries are restricted to reasonable ranges of input. In other instances, entry of information must follow certain steps prior to advancing to the next step. Finally, the core logger reviews and validates the digital logs after entry is complete. A schematic illustration of the data flow from the project site to the analytical laboratories is in Figure 11-2.

Synchronization and uploading of the 2017 and 2018 site drill data was to the JOY Project master SQL database on a regular basis. Validation of the compiled data from the header, survey, assay, geology and geotechnical tables for missing, overlapping or duplicated intervals or sample numbers and for matching drill hole lengths in each table then took place. Confirmation of the validity of drill data by a project geologist ensued from the review of drill hole collars, traces and downhole information generated from the database.

Review of the merged sampling and analytical data returned from the laboratory, particularly for Au, Cu and Ag of the regular mainstream and QAQC samples, took place upon receipt of the results. Immediate identification of QC failures, including out-of-range standards, high blanks, mis-matching duplicates, sample sequencing and sample identity issues, resulted in timely and appropriate requests for remediation to the data entry team or analytical laboratory as necessary.

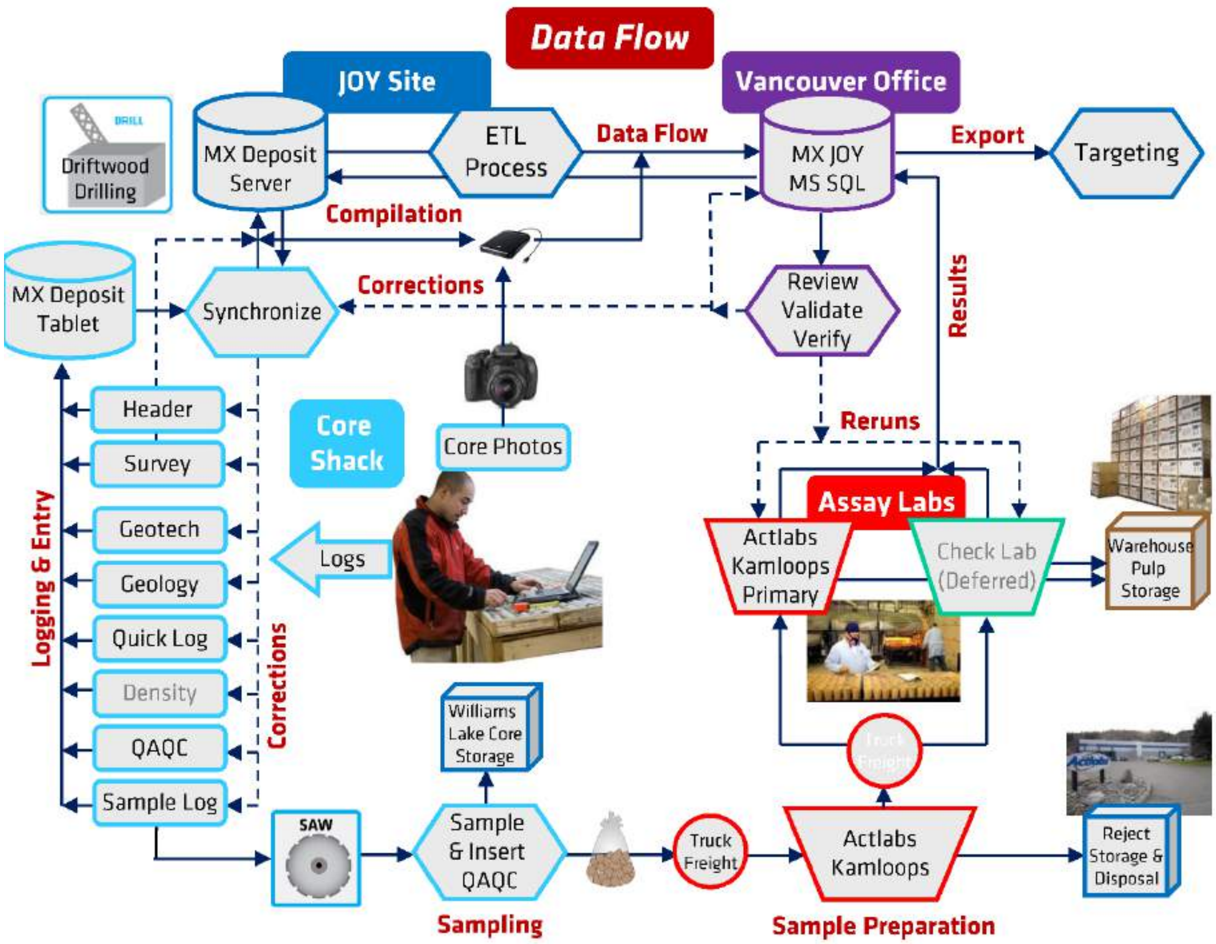



**Figure 11-2: JOY Project Drill Data Flow 2017 - 2018**

Timely processing and presentation of project data enable assessment by management with respect to ongoing requirements for disclosure of material information and overall advancement of exploration objectives. In this regard, the availability of compiled drill data and assay results to management, the project technical team and consultants advancing the project, is immediately after completion of the initial error trapping and analytical QAQC appraisal process, provided there are no significant concerns. More extensive, long-term validation, verification, QAQC, and error correction procedures follow.

### 11.4.2 Standards (Certified Reference Materials)

Table 11-10 lists the standards used in the 2017 - 2018 exploration drilling programs. A significant basis for the control of assay results for Au and Cu are the limits determined for the inserted standards from round-robin analysis as follows: Mean ± 3 Standard Deviations (*3SD*) define the Control Limits.

A standard failure occurs when the results falls outside the control limits for element(s) of interest. If review of the input sampling data and sample sequencing for the failure does not correct the failure then notification is provided to the laboratory to re-run the affected range of the samples for that element as necessary until the included standard passes (falls within the control limits). Replacement of failed data from the affected range with data that passes QC follows.

Geologists at the logging facility designate and insert standards of an appropriate grade range and suitable source rock matrix at a rate of 1 in 20 regular samples by the use of pre-numbered sample tags. The identities of the standards are anonymous to the analytical laboratory.

**Table 11-10: Standards Used in Amarc Drill Programs – Certified and Mean Concentrations of Results Received.**

| Standard[1,2] | Times Used | Au g/t (FA[3]) | Cu % (4 Acid) | Mo ppm (4 Acid) | Ag g/t (AR) | As ppm (AR) | Re ppm (AR) | S % (4 Acid) |
|---|---|---|---|---|---|---|---|---|
| 151b | 17 | 0.065 | 0.182 | 54 | 0.516 | 30.8 | 0.17 | 0.724 |
| 152b | 4 | 0.134 | 0.375 | 78 | 0.865 | 38.3 | 0.18 | 0.988 |
| CGS-16 | 7 | <u>0.14</u> | 0.112 | <u>15</u> | <u>0.9</u> | <u>44</u> | <u>0.02</u> | <u>1.4</u> |
| CGS-23 | 4 | *0.218* | 0.182 | <u>175</u> | <u>1.7</u> | <u>24</u> | <u>0.19</u> | <u>1.7</u> |
| PLP-1 | 2 | 0.289 | 0.297 | 154 | 1.74 | 106 | <u>0.27</u> | <u>2.4</u> |
| PLP-2 | 6 | <u>0.005</u> | 0.016 | 3.3 | 0.11 | 15.3 | <u>0.006</u> | <u>0.15</u> |
| PLP-5 | 1 | 0.369 | 0.506 | 275 | 2.00 | 43.0 | <u>0.43</u> | <u>3.4</u> |

1. Certified concentrations are in regular text
2. Concentrations in lighter text (grey) are not certified. Italicized concentrations are provisional and underlined concentrations are the overall mean of results received from analysis at Actlabs.
3. FA is Fire Assay fusion and AR is Aqua Regia digestion.

#### 11.4.2.1. Copper

The performance of two of the Cu standards regularly inserted by Amarc personnel and analyzed by Actlabs method TD-ICP are illustrated in Figure 11-3 and Figure 11-4. Reruns were deemed unwarranted for two 151b standards that failed slightly high for Cu due to the low Cu grades (overall average 0.016%), encountered in the three 2017 drill holes. In drill hole JP18001 from 2018, sample 602070 was labelled control sample 151b. Reassignment of this control sample as standard 152b bases on the Cu result of 3,880 ppm and Au result of 140 ppb resolved the failure as a data entry error.

#### 11.4.2.2. Gold

Gold results for the 2017 - 2018 drill programs are by 30 g FA fusion ICP finish methods (FA-ICP). The Au results by FA-ICP of the inserted standards are good and within the acceptable QC limits (Figure 11-5, only 151b standard shown as this is illustrative of the others). The Au results included with the AR-MS analytical package are unreliable due to the small 0.5 g aliquot size and should not be used.

#### 11.4.2.3. Silver

For Ag, the lower detection limit ("LDL") by the TD-ICP method at 3 ppm is too high for the typical JOY porphyry-style Ag mineralization, which is in the 0.5 to 2.0 ppm range. Although the AR-MS method for Ag has a much lower LDL at 0.002 ppm, and the standards used are in a suitable range, the lack of optimization of the AR-MS method for Ag precluded viable QC. Therefore, AR-MS Ag concentrations may only be semi-quantitative indications of the concentration. The analytical performance of Ag in standard results overall is generally not satisfactory. However, considering the lack of analytical method optimization, relatively low Ag grades, lesser overall importance of Ag, possibly nuggety nature of this element and the early stage of the project, no laboratory re-runs were requested. More precise determinations of Ag in this grade range may require an additional Ag-specific, single element digestion and analysis at considerable additional cost.

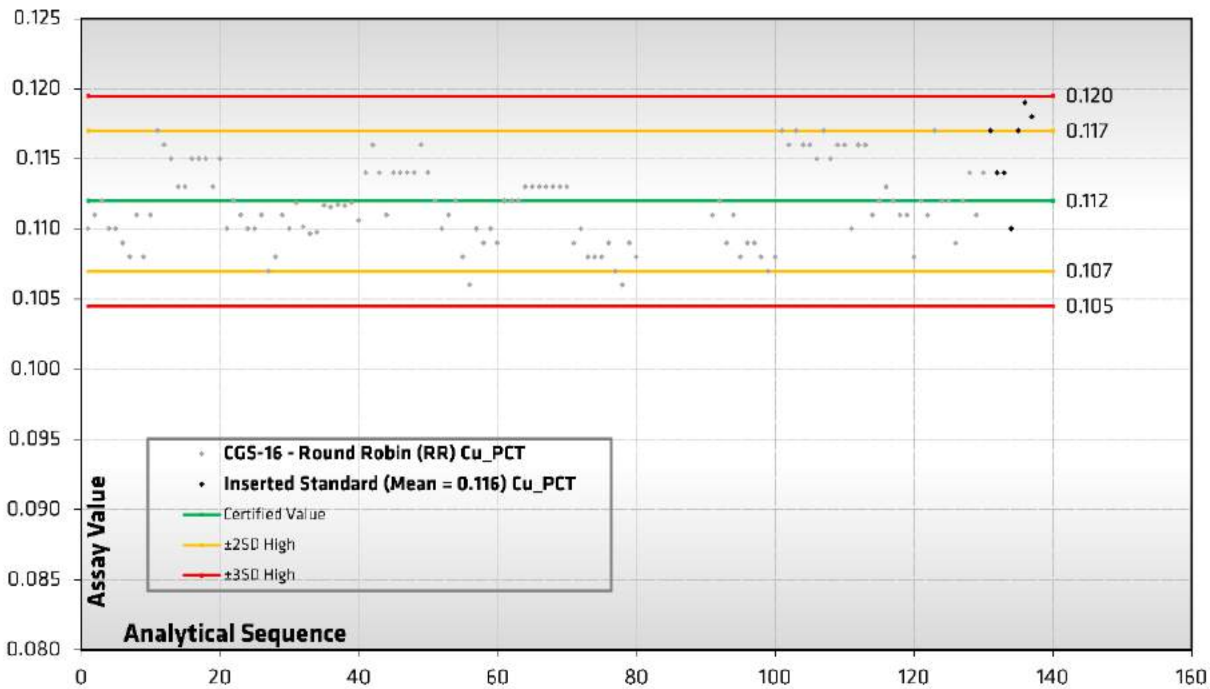



**Figure 11-3: Cu Results - Standard CDN-CGS-16.**

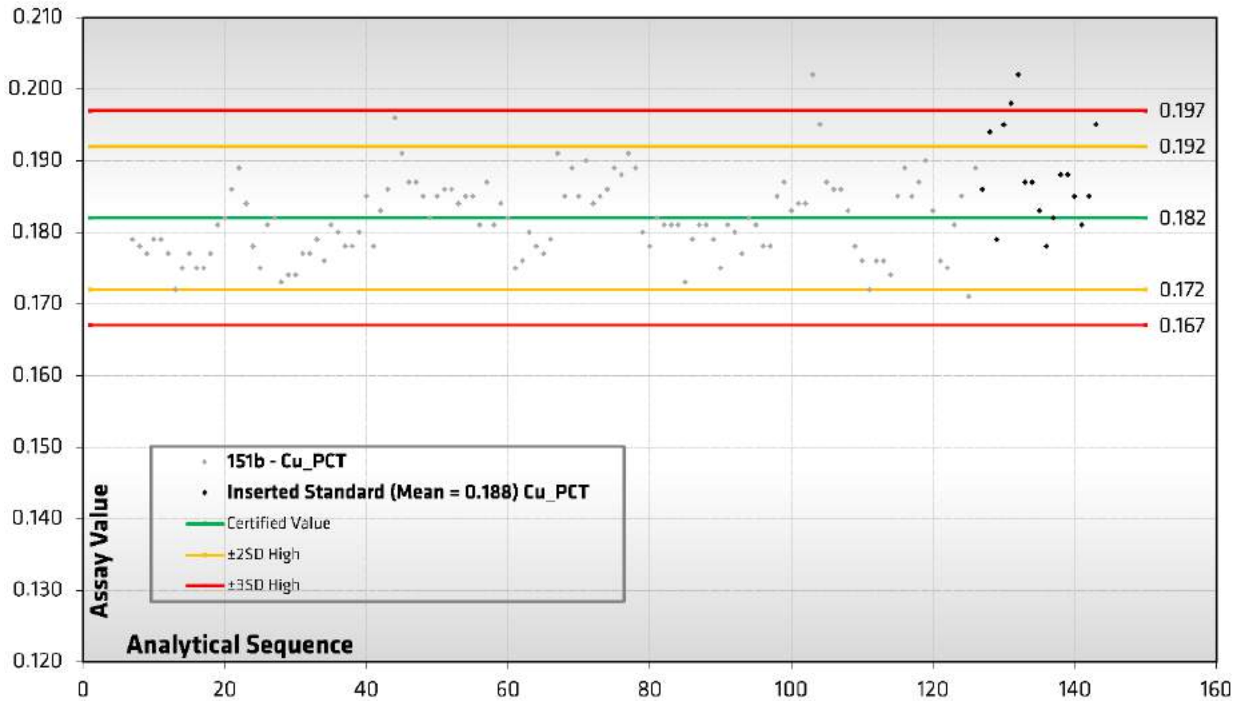



**Figure 11-4: Cu Results - Standard Oreas-151b.**

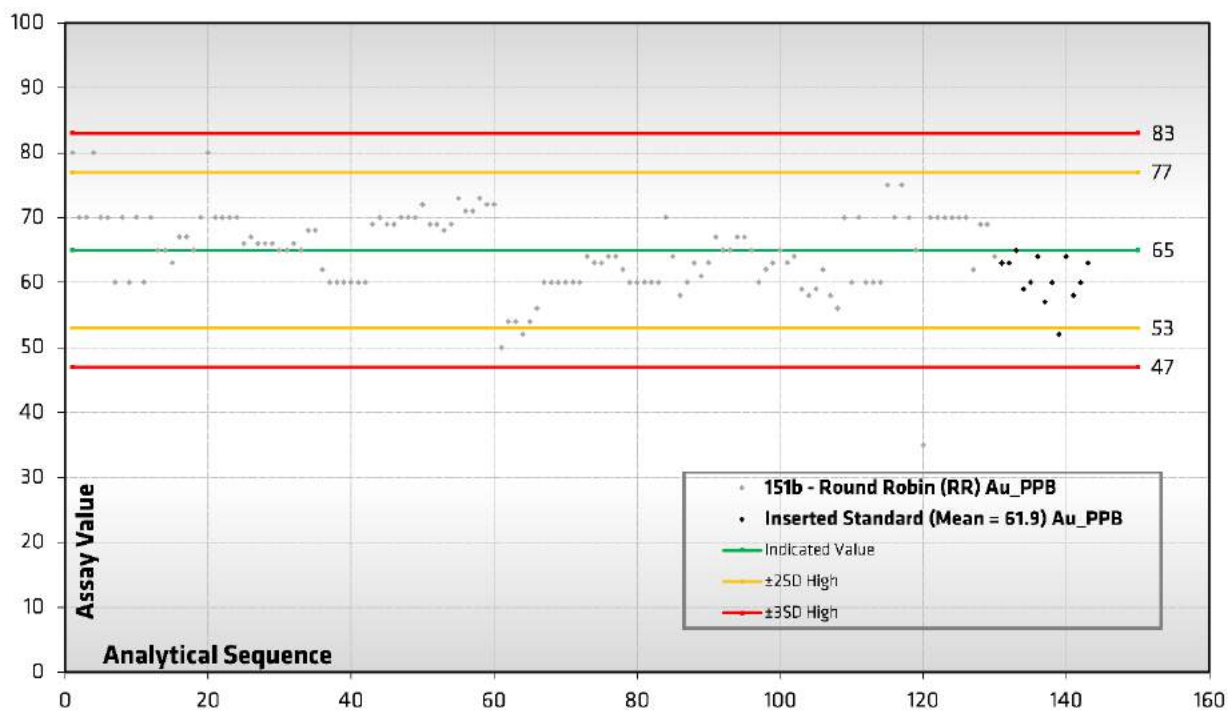



**Figure 11-5: Au Results - Standard 151b.**

#### 11.4.2.4. Other elements

No detailed investigation of the analytical accuracy, precision and reproducibility of elements other than Cu by the TD-ICP method, Au by the FA-ICP method and Ag by the AR-MS method took place. Certification of Ore Research standards 151a and 151b used in this program are for a number of other elements and have been analyzed by a variety of analytical methods if this is deemed necessary in future.

### 11.4.3 Blanks

The insertion of blanks allowed for an assessment to be made for the possibility of contamination, and sample sequencing errors during field sampling, and laboratory sample preparation and analysis. Based on results received from the blank samples inserted during this program, there is no evidence that any significant contamination, cross-contamination or sequencing errors have taken place in these materials. None of the pulp blanks or coarse granitic material inserted in this program returned any appreciable Cu or Au.

Insertion of pulverized (pulp) and coarse field blanks was undertaken at the core logging facility at a rate of two per hole. Certification of pulp blanks CDN-BL-7 and CDN-BL-10 are for low levels of Au, Pt and Pd, but not Cu or any other elements. The coarse gravel-size (1 to 2 cm) field blank "Granite" used in 2017 is a grey granitic landscaping material. It is visually barren of sulphide minerals and relatively homogeneous. The coarse gravel-size (1 to 2 cm) field blank "Granite2" used in 2018 is from bulk commercial aggregate. It is also visually barren of sulphide minerals and relatively homogeneous. Analysis of this latter blank has taken place numerous times at three analytical laboratories. Note that Ag results for the inserted blanks average 5 to 10 times higher at Actlabs by method AR-MS than at other laboratories. This, along with the Ag results on standards noted previously, further calls in to question the suitability the AR-MS method for the quantitative determination of Ag in this grade range. Table 11-11 lists the mean obtained concentrations for the nominal blanks used. Figure 11-6 and Figure 11-7 present some examples of the Cu and Au analytical performance of the blank samples.

**Table 11-11: Mean Concentrations from Actlabs of Nominal Blanks Inserted with Drill Core Samples.**

| Blank | Times Used | Au g/t (FA) | Cu % (4 Acid) | Cu % (AR) | Mo ppm (4 Acid) | Mo ppm (AR) | Ag g/t (AR) | As ppm (AR) | S % (4 Acid) |
|---|---|---|---|---|---|---|---|---|---|
| BL-10 | 2 | <0.01 | *0.002* | *0.0024* | *<10* | *2.2* | *0.44* | *4.1* | *<0.1* |
| BL-7 | 4 | <0.01 | *0.001* | *0.0024* | *<10* | *2.9* | *0.27* | *4.6* | *<0.1* |
| Granite | 5 | *0.0018* | *<0.001* | *0.0003* | *<10* | *1.5* | *0.26* | *0.33* | *<0.1* |
| Granite2 | 2 | *0.001* | *<0.001* | *0.0001* | *<10* | *2.1* | *0.34* | *0.28* | *<0.1* |

1. The nominal blanks are not certified for any of the elements listed above, with the exception of CDN-BL-7 and BL-10 shown in regular text which are certified for Au.
2. Italicized concentrations are the mean concentrations of data as received from the analytical lab with outliers removed.
3. Lower detection limits (LDL) for Cu, Mo and S by the 4 Acid digestion method used are 0.001%, 10 ppm and 0.1%, respectively.

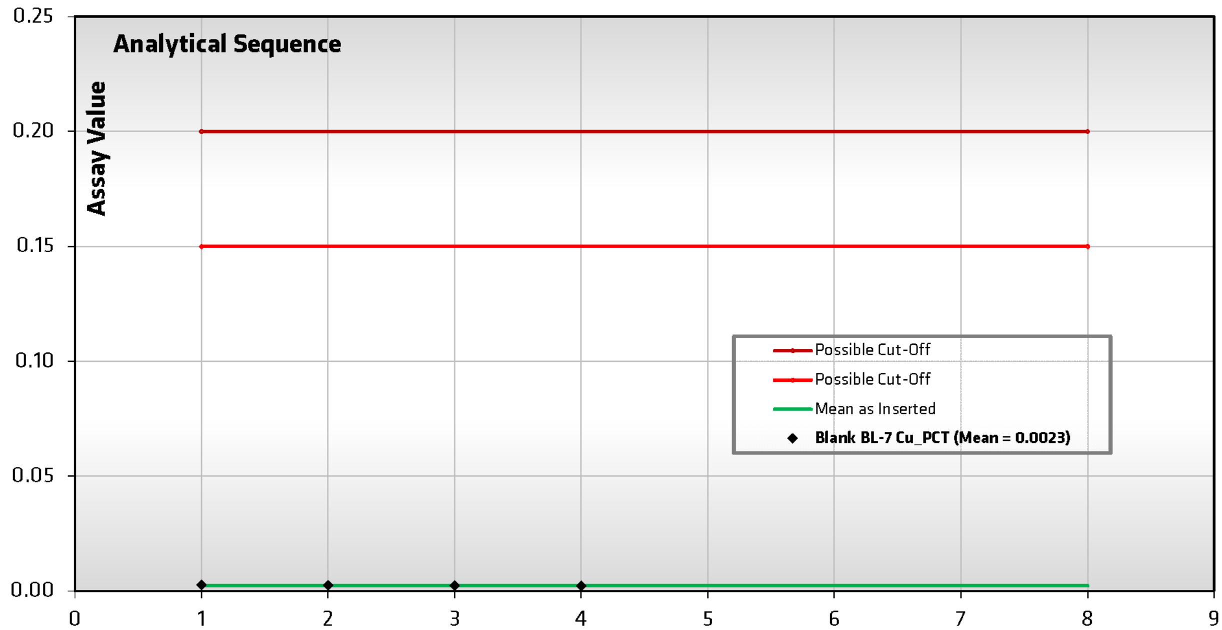



**Figure 11-6: Cu Results – Pulp Blank - CDN-BL-7.**

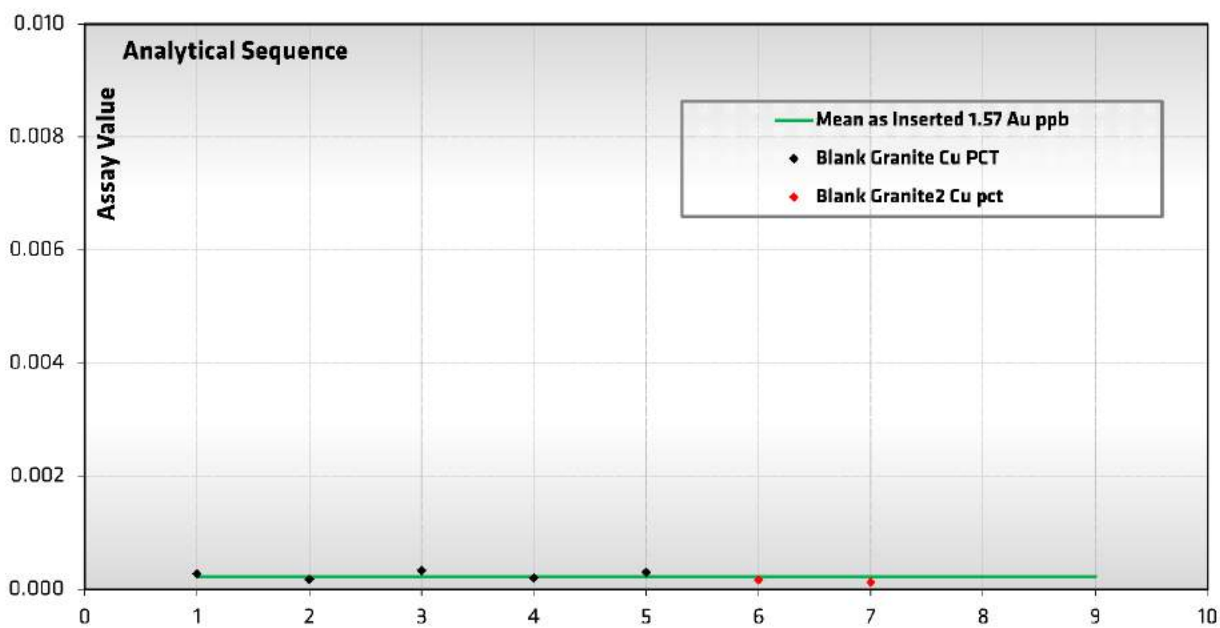



**Figure 11-7: Au Results - Coarse Blanks – Granite & Granite2.**

### 11.4.4 Duplicates

Two types of duplicate samples were analyzed in the 2017 and 2018 drill programs to monitor precision:

1. Method Duplicates - all samples submitted in 2017 – 2018 were analyzed by two separate analytical methods:
    a. Au by FA fusion (FA-ICP) and AR digest ICP-MS (AR-MS).
    b. 4 acid digestion ICP-AES (TD-ICP) and AR digest ICP-MS (AR-MS) on a number of elements.
2. Random in-Line, intra-laboratory reject "DX" duplicates – samples are marked and tagged in the field at a rate of 1 in 20 regular samples by the use of pre-marked sample tags.

Figure 11-8 is a flow chart of the regular mainstream and duplicate sample processing sequence for typical random duplicates and corresponding mainstream samples.

Designation of random duplicate samples was by Amarc staff. Actlabs - Kamloops prepared and assayed these duplicates at the same time and in the same sequence as the regular samples. Designation of these inline, intra-laboratory series of duplicates is type "DX" in the QC coding scheme. They are prepared from a second 250 g split riffled from the coarse reject, pulverized and analyzed within the regular sample stream and reported on the same assay certificate at the primary laboratory.

No inter-laboratory duplicate samples were analyzed during the 2017 and 2018 programs. A recommendation is to perform inter-laboratory duplicate sample analysis in future drill programs where significant mineralization is encountered. The recommendation is to use the master pulp of the original sample of the DX duplicate pair above for this procedure.

The analytical method duplicates plot in a series of scatterplots in Figure 11-9. Actlabs Cu, Au and Ag acid digestion ICP-AES (TD-ICP) concentrations plot on the x-axis and AR digestion ICP-MS (AR-MS) results plot on the y-axis. Comparison is also of the method duplicates analyzed for Au by 30 g FA (FA-ICP) with the 0.5 g aliquot size AR-MS results. Figure 11-10 contains a series of mean percent difference charts for these elements by two methods. The results by the two methods match reasonably closely for Cu and Au. For Cu, the 4-acid ICP-AES method (TD-ICP) provides a more consistent and reproducible analysis, and these methods are recommended for use in future resource work. For Au, the results by FA fusion (FA-ICP) are consistently higher than the AR-MS results. As discussed previously, 30 g FA-ICP is the recommended method to for Au. Charts of the Ag results highlight the detection limit and reproducibility issues of the analytical methods used. Figure 11-11 and Figure 11-12 show intra-laboratory cross checks using coarse rejects.

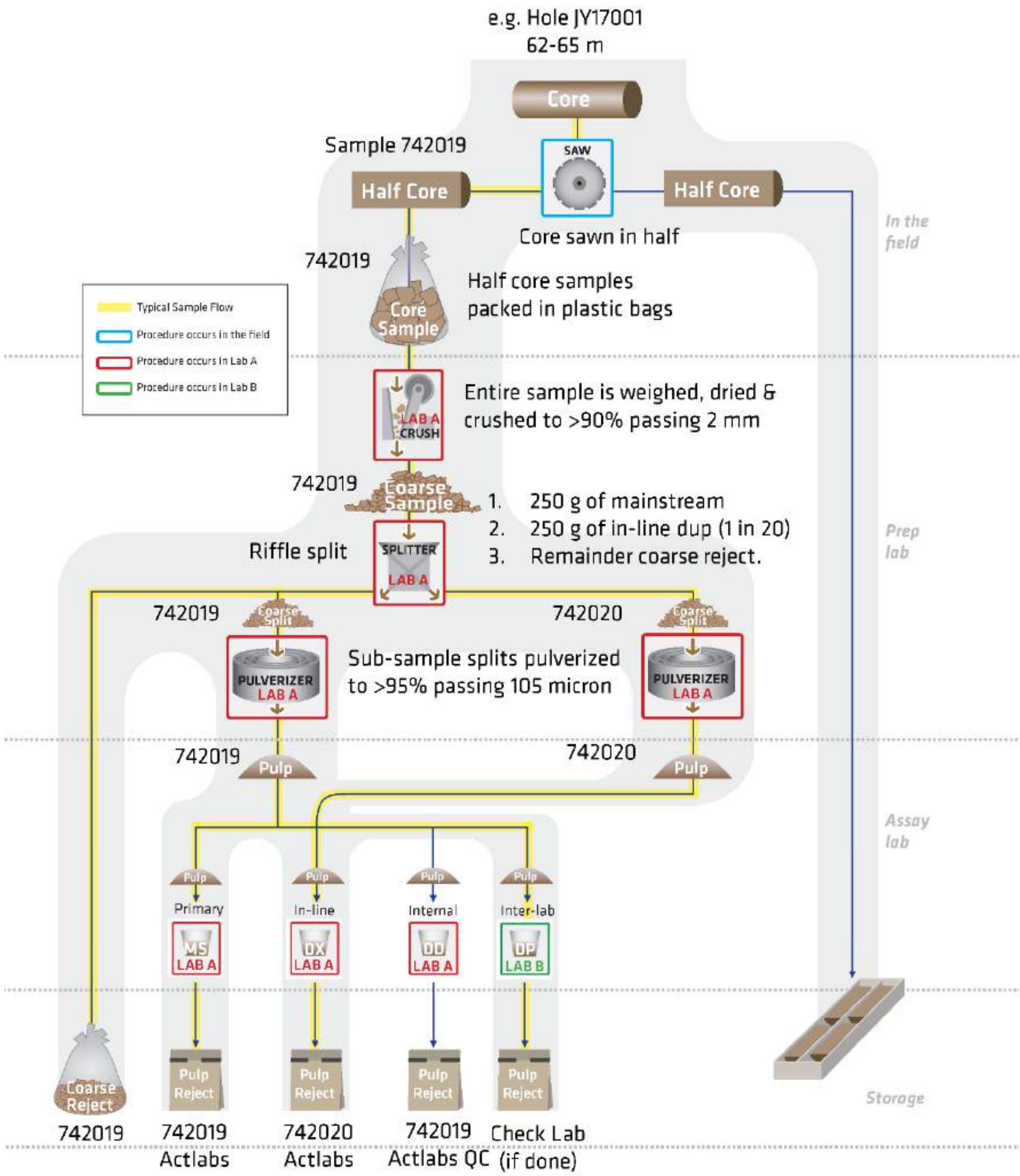



**Figure 11-8: Duplicate Sample Processing Flow Chart for Drill Core Samples.**

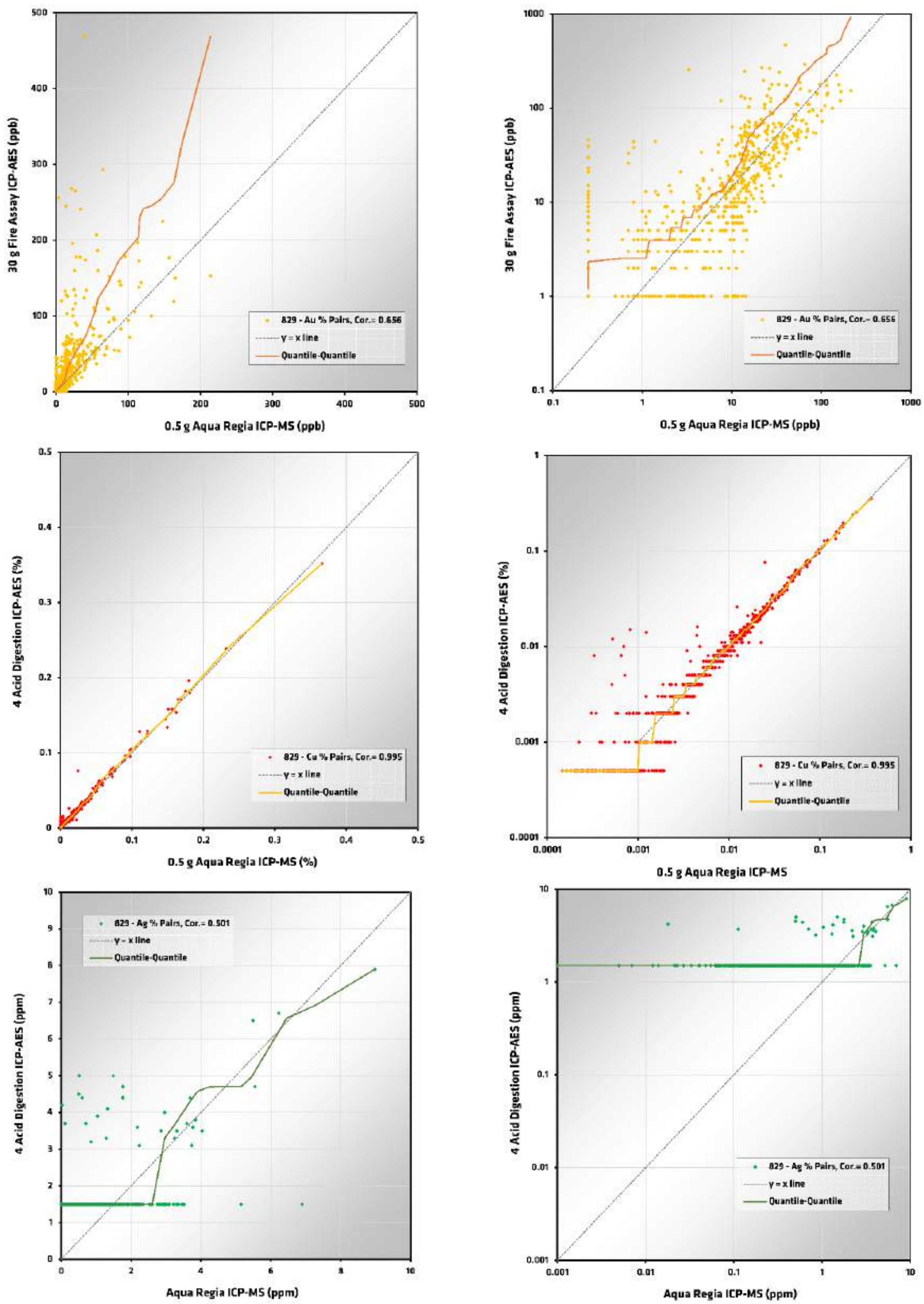



**Figure 11-9: Analytical Method Duplicates Actlabs Au (top), Cu (middle) and Ag (bottom) plotted in Normal (left) and Log Space (right).**

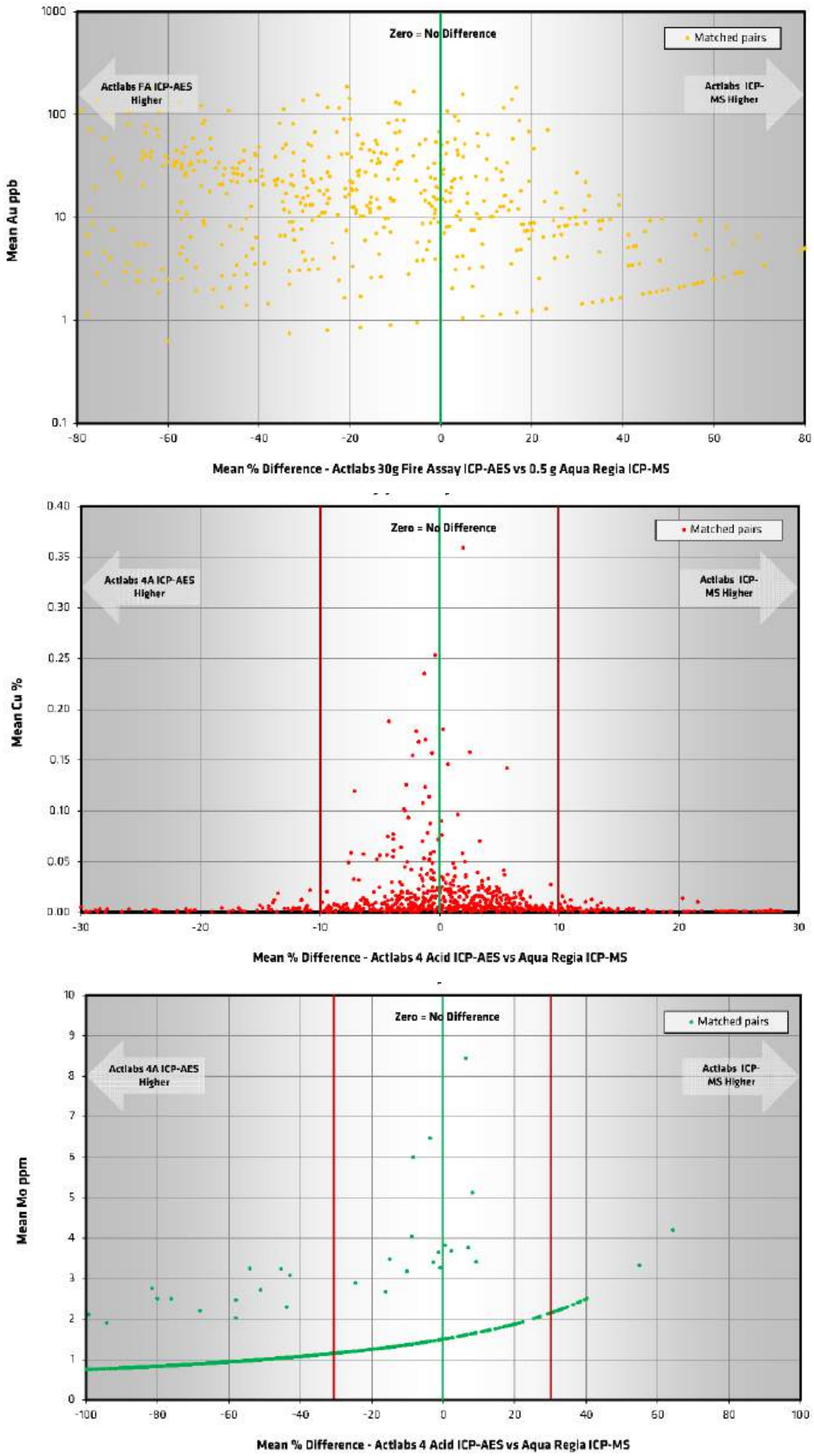



**Figure 11-10: Analytical Method Duplicates – Au (top), Cu (middle) and Mo (bottom) - Mean % Difference from 0% (identical) for 4-Acid vs AR Analysis**

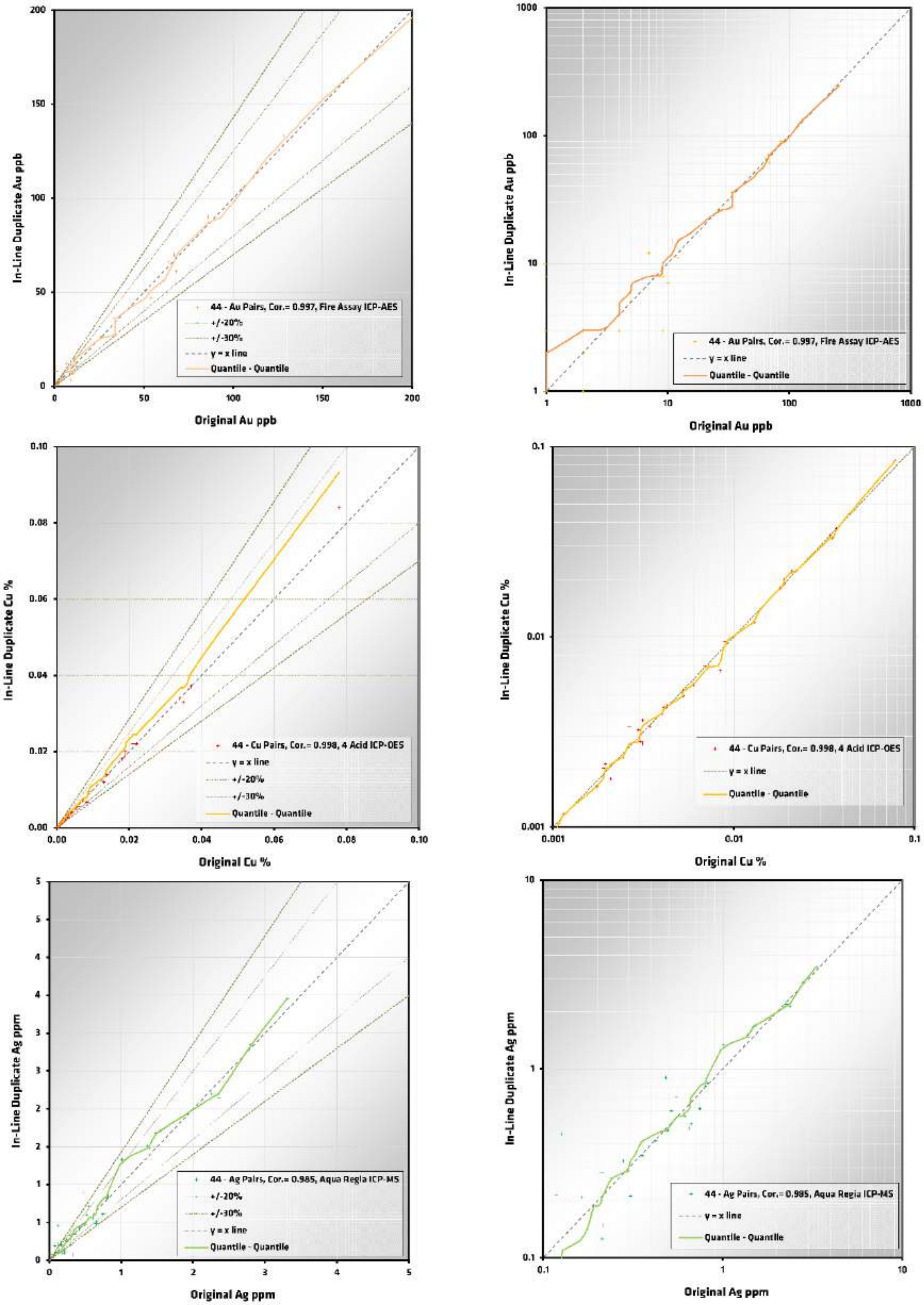



**Figure 11-11: Intra-Laboratory Reject Duplicates Actlabs – FA-ICP Au (top), TD-ICP Cu (middle) and Ag (bottom) plotted in Normal (left) and Log Space (right).**

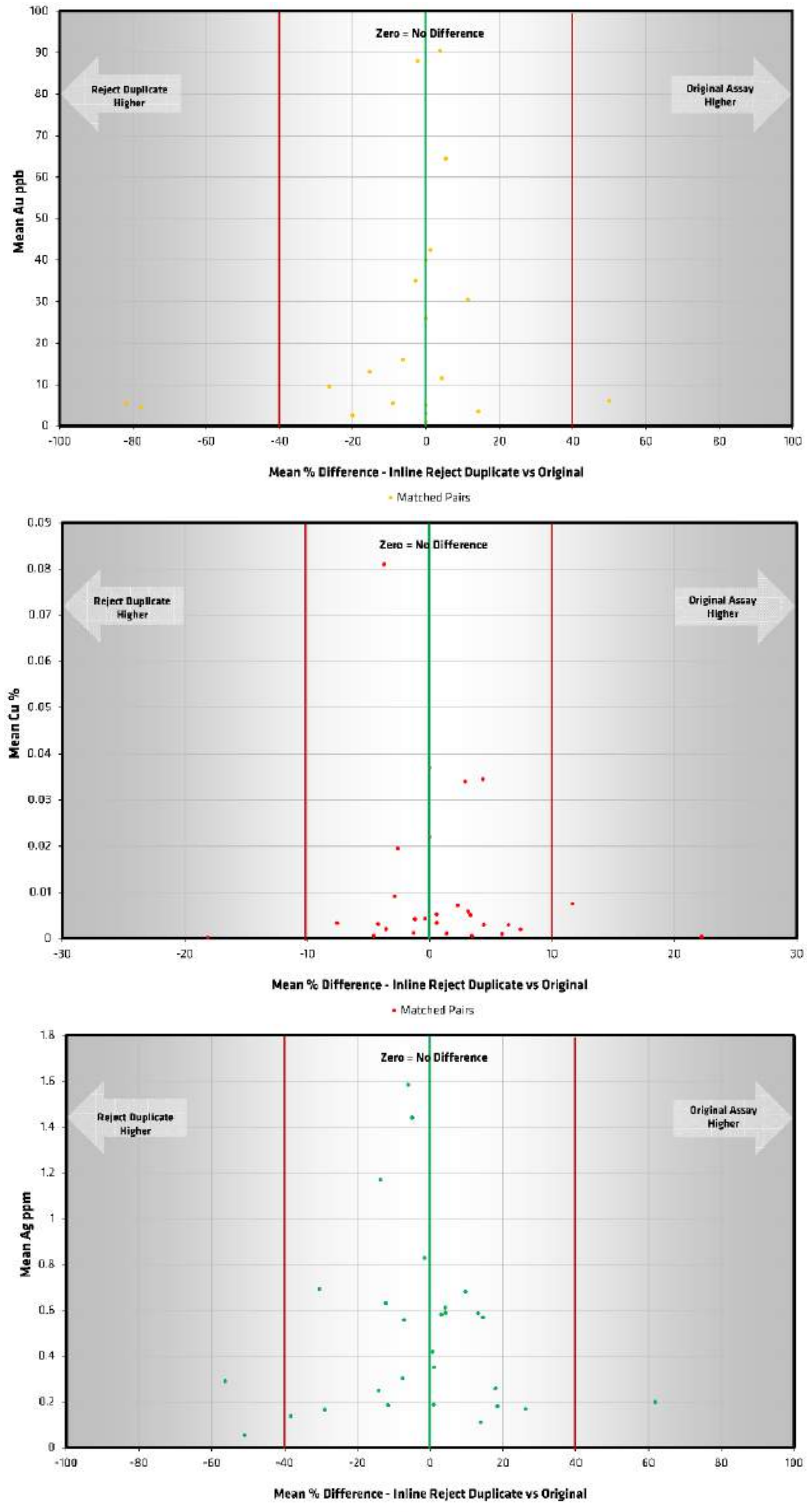



**Figure 11-12: Intra-Laboratory Reject Duplicates Actlabs – Au (top), Cu (middle) and Ag (bottom) - Mean % Difference from Zero for Reject Duplicate vs Original QC.**

### 11.4.5 Density Validation

Measurement of a solid, core-sized, aluminum cylinder known as density standard Al-14 occurred in the 2018 program as part of the QC procedure for core density. Measurements of the density standard took place at a rate of 1 in 50. Comparison of the density of the standard calculated from the control measurements with the expected value of 2.70 was on a regular basis as a check on the procedure. From the 144 density measurements made on 2018 drill core, a single reading of 2.43 was removed as an outlier. No density measurements were taken from the exploration holes from the 2017 program and Amarc is not aware of any density measurements from the historical programs.

## *11.5 Surface Sampling QAQC 2016 – 2018*

The Amarc 2016, 2017 and 2018 surface sampling programs produced 3,934 soil samples and 87 rock samples for analysis at Actlabs.

### 11.5.1 Control Samples

A total of 55 Amarc control samples (standards and blanks) were inserted and analyzed in-line with the regular samples for each batch submitted to Actlabs. The control samples include the standard CDN-CGS-8, and the blanks CDN-BL-4, CDN-BL-6, CDN-BL-7 and Oreas PLP-2. Table 11-12 summarizes the mean of the Actlabs results for Au, Cu, Mo, Ag and As for these control samples.

**Table 11-12: Mean of Actlabs Results of Control Samples Inserted with Surface Samples.**

| Standard | Times Used | Au ppb (FA) | Cu ppm (AR) | Mo ppm (AR) | Ag ppm (AR) | As ppm (AR) |
|---|---|---|---|---|---|---|
| BL-4 | 3 | 1 | 21 | 2.3 | 0.24 | 3.6 |
| BL-6 | 5 | 2 | 50 | 4.3 | 0.08 | 3.9 |
| BL-7 | 1 | 1 | 19 | 2.8 | 0.001 | 3.7 |
| CGS-8 | 3 | 77 | 1008 | 6.4 | 0.20 | 3.1 |
| PLP-2 | 43 | 5.5 | 153 | 2.9 | 0.19 | 12 |

1. BL-4, 5 and 6 recommended concentrations for Au are <10 ppb.
2. CGS-8 provisional value for Au ppb is 80 ppb; certified concentration for Cu is 1,050 ppm.
3. PLP-2 certified concentrations are Cu 16 ppm, Mo 3.3 ppm, Ag 0.11 ppm and As 15.3 ppm.

Some of the surface standard results reported on Actlabs certificate number A17-07494 failed QC. Mo was high by AR-MS on standard PLP-2. Other elements also did not match the anticipated concentrations for this CRM. The 35 samples between 745926 and 952332 on this batch were re-analysed. The analytical results of the rerun passed QC for Mo and the other elements matched their anticipated concentrations reasonably well.

In work order A18-09341, 11 samples had a dot "." in the middle of the sample number in the assay report from the laboratory which led to their being excluded during the data import process. This was corrected, the certificate reissued and the data successfully imported to the Amarc database. Three unresolved sample errors occurred in the 2018 program. Sample number 955584 was included on a shipment notice, but not received by Actlabs. No sampling information or physical sample exists, so it was assumed to be a tagging issue. No sample description or location information was found for samples 955587 and 748492 that were received and analyzed by Actlabs. The original field notes should be checked for these two samples if possible. Given the size and complexity of the sampling program and project logistics the sample error rate is considered acceptable.

### 11.5.2 Analytical Method Duplicates

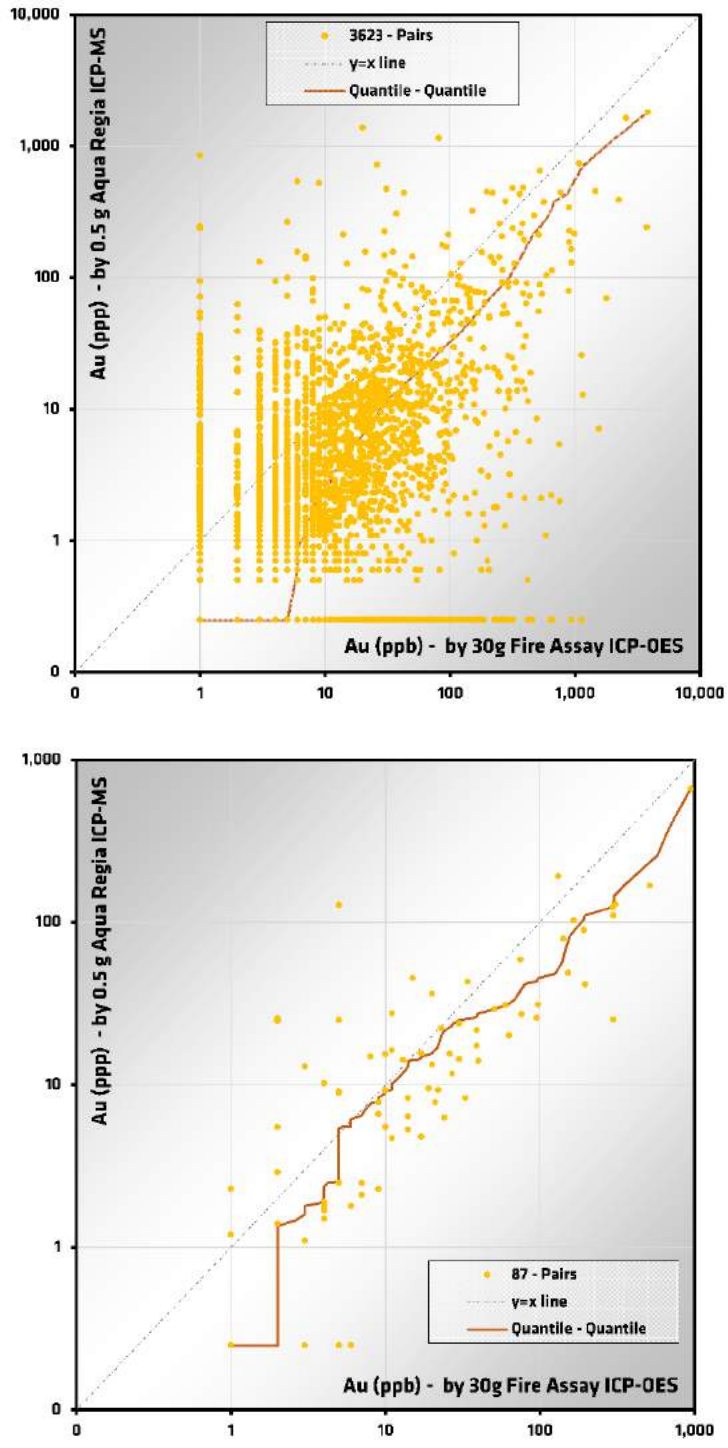



**Figure 11-13: Analytical Method Duplicate for Au - Soil (top) and Rock (bottom), Log Scale.**

Gold analysis was by two different methods for both the soil and rock samples taken during the 2016, 2017 and 2018 programs. Figure 11-13 is a scatterplot comparing analytical method duplicates for both soil and rock samples (from the mapping program), with control samples removed. The Au by 30 g FA (FA-ICP) results plot on the x-axis and the 0.5 g aliquot size AR-MS Au results plot on the y-axis. Overall, the results are quite scattered and the average Au results by FA fusion (FA-ICP) are typically consistently higher than the AR-MS results. This is as expected, as the 30g FA-ICP method is the recommended method for total Au determination. The smaller aliquot Au results by AR-MS also tend to exhibit poor standard performance and poor reproducibility in the results received by Amarc. This is likely due to the nugget effect on the smaller sub-sample analytical method. Amarc uses Au results by the FA-ICP method for plotting purposes.

### 11.5.3 Surface Sample Validation and Verification

Amarc performed extensive validation and verification on the historical surface sample database during the compilation process. Results recorded in the database were crosschecked against the analytical certificates, where available, and other digital and scanned source documents. The location information was plotted and compared with plots made by other project operators to achieve acceptable accuracy. The data was also examined, charted and plotted by independent geochemical consultant, Chris Benn (Benn, 2018). He provided a detailed list of potential inadvertencies in the compiled data set provided to him that were then reviewed and corrected as required by Amarc. Typical issues involved mis-importation of analytical data by historical workers into the pre-Amarc digital files and a small number of manual data entry errors in the records added by Amarc. Most of these issues were resolved by referencing the assay certificates and by close review of the available digital files.

A number of database issues were encountered in the historical surface sample database compilation. A large number of '0' (zero) concentrations were encountered in the historical digital data files. If the assay certificates were available, the certificate concentrations were applied. However, many zero concentrations were from the historical data sources not backed up by assay certificates. Based on their position in the results sequence, it is believed most of them were actually analyzed. They probably represent either less than detection limit concentrations or results that were truncated by rounding (e.g. concentrations less than 0.4 rounded to integer value of 0) by historical workers. If, after review of the assay certificate and other data sources the original assay result was still uncertain, these concentrations were left as zeros.

There were several instances of inconsistent reporting of units, for example percent vs ppm in base metal and multi-element results, ounce per ton (opt), gram per tonne (gpt) and parts per billion (ppb) in precious metal results. There were also a number of cases where similar sample numbers exist at the same location, e.g. 6311 (removed) and G-06311 (kept) in different files. Several instances were found where samples with different descriptions or sample type were recorded at the exact same location as another sample. In all of these instances, the original source documentation or assay certificate were checked in detail to resolve the issue. All original QAQC data with the historical surface sampling programs including duplicates and standards, was entered and imported into the Amarc database. The amount of historical QAQC information was too limited to provide a meaningful analysis of the results.

Overall the veracity of the digital database is good and is suitable for ongoing exploration targeting purposes.

### 11.5.4 Surface Sample Validation by Benn

The Amarc surface soil and rock sample database was reviewed and validated by consultant C. Benn in 2018 (Benn, 2018). A series of surface maps were generated showing the age and provenance of the multi-element analytical data that highlighted a number of errors and inadvertencies that were related to data compilation, either in the original compilation by the historical workers or by Amarc during entry to our databases. These issues were checked against the original records, corrected and the maps replotted. Some features identified in the data are artefacts particularly related to the age, analytical method and provenance of the data. In particular, differences in detection limits and the relative strength of different analytical digestions in subset of the data appeared as artefacts. Despite the range of years, number of laboratories, sample preparations and digestions used by the various historical operators on the JOY Project, Benn (2018) concluded the data was remarkably robust and suitable for use in on-going exploration activities. This exercise greatly improved the overall confidence in the use of this data in ongoing exploration targeting.

## *11.6 Summary*

Work on the five core holes completed in the 2017 and 2018 JOY programs by Amarc, included: collar and down hole surveys, geology and geotechnical logs, density measurements, core photography, sampling and analytical QAQC work, particularly for Au, Cu and Ag – the key elements of interest.

A number of inadvertencies in the historical drill hole and surface sample records, including sample interval errors, sample number misidentification, decimal place errors in results, data column swapping in results and missed over-limits results, were corrected by Amarc. Validation, spot checks and comparisons of sample and drill plots of data in the current compilation with the drill hole and surface sampling records provided by the pre-2016 historical operators of the project was completed, lending credence to the veracity of the Amarc database. Amarc has not undertaken an exhaustive verification effort, particularly of the entire set of analytical certificates. This exercise, and a thorough review of the analytical QAQC work of the historical drill programs is recommended prior to any resource estimation work.

The sample preparation, security and analytical procedures performed on drill core samples by Amarc are in accordance with good industry standard practices. The QP considers the sample preparation, sample security and analytical procedures for the Amarc drill core on the JOY Project adequate to support technical reporting and more advanced stage studies.

# 12.0 Data Verification

During his site visit in August 9, 2018, QP Mark Rebagliati reviewed all on-going operations at the JOY Project, including safety, working procedures, QAQC and data management. The QP also reviewed the geology and the veracity of geological observations being recorded by the Amarc field-crews. All aspects of the program were found to be of a suitable standard.

On July 15, 2019 the QP Mark Rebagliati also examined core from hole JY18001 at the core storage facility in Williams Lake. The diamond saw-cut half core was examined and compared with drill logs and with laboratory assays. The quality of core cutting, geological logging was to acceptable standards. Core library samples from hole JY18002 stored at the company warehouse in Langley were examined. These samples were 10-20 cm length collected at approximately 20 m intervals or sooner at changes in lithology. Lithology and alteration and sulphide as logged corresponded closely to that of the core examined.

Mr. Rebagliati also conducted historical exploration on the JOY Project for Romulus Resources in the early 1990's, and supervised the Amarc drilling on the NWB target in 2017 and on the southern periphery of the TREE in 2018 and, as such, his knowledge of the geology underlying the JOY tenure, and the historical work completed on the Project is extensive.

The QP Eric Titley worked extensively on behalf of Amarc in the compilation of both the historical and Amarc exploration drill hole and surficial datasets from the JOY Project, between June 2016 and April 2020, and has detailed knowledge of this work.

The following data verification procedures were applied to the JOY drill hole and surficial datasets by the QP Eric Titley to verify information:

For the historical pre-2017 drill and surficial programs:

- Reviewed available hard copy, digital data compilations and digitally scanned technical documents including;
  - Assessment reports;
  - Unpublished company reports, plans and cross-sections;
  - Survey information;
  - Geological logs;
  - Sampling and assay reports; and
  - Laboratory assay certificates.
- Reviewed the digital assay compilations of previous operators and historical assay results keypunched by Amarc;
- Reviewed the georeferenced drill hole collar and surficial sample locations.
- Verified a subset of the digitally acquired and keypunched sampling and analytical data in the compiled database against the original source documents.

For the Amarc 2017 – 2018 drill program:

- Reviewed sampling, security and analytical protocols;
- Reviewed geological, sampling, core photographs and density information from the field programs;
- Reviewed digital assay data and assay certificates received directly from the analytical laboratory;
- Verified a subset of the imported assay data against the assay certificates;
- Reviewed merged sampling and assay results and analytical QAQC;
- Checked for failed standards, high blanks and mis-matching duplicates in the QAQC data;

For the compiled historical and Amarc drill database information:

- Printed and reviewed the assay results reported directly from the database;
- Reviewed drill data in plan, cross-section and 3D view from the compiled database and compared this output with historical figures; and
- Prepared a table of significant assay intervals and compared with historical tables.
- Checked for mismatching, overlapping and underlapping intervals in the assay and geological tables; and
- Checked for errant or improbable collar and downhole survey records, density and geotechnical measurements.

Amarc intends to continue acquiring, compiling and verifying information on the historical drilling and surficial sampling programs, including checks on collar survey and sample locations, scanned analytical data and laboratory assay certificates. As such, an exhaustive compilation of historical work on the entire JOY Project is not yet complete. However, the QP Eric Titley concludes that the data as currently compiled by Amarc is sufficient in quality and quantity for use in advanced exploration targeting, particularly in the primary areas of interest.

The QPs applied several verification procedures to the JOY deposit targets datasets to assess the appropriateness and accuracy of this information for use in public disclosure and establishing targets for further exploration. The QPs have thoroughly assessed the data from the JOY Project exploration programs and believe that they are appropriate for continued use in exploration stage programs.

# 13.0 Mineral Processing and Metallurgical Testing

No mineral processing or metallurgical testing has been carried out on any samples from the JOY Project.

# 14.0 Mineral Resource Estimates

No current mineral resource or reserves estimates have been completed on the JOY Project.

# 15.0 Adjacent Properties

Deposits in the southern half of the Toodoggone region include a 5 km-long, east-northeast-trending hydrothermal system which hosts, from west to east, the Nugget, Kemess North, Kemess Underground, Kemess Offset and Kemess East porphyry Cu-Au deposits and, 6 km to the south, the former Kemess South mine. These deposits form the southern portion of the Kemess District and are currently held by Centerra.

The Kemess South porphyry Cu–Au deposit was the first porphyry deposit to be developed and mined in the Toodoggone region. Over the 13 years of operation, the mine recovered 2.975 Moz of Au and 749 M lb of Cu from 218 Mt of ore (SRK Consulting Inc., 2013). The mine reported an Ag:Au ratio of 1.2:1, which, if constant over the life-of-mine, would have recovered approximately 3.6 Moz of Ag. Mo concentrations of ~0.008% were too low for economic recovery (BC MINFILE Mineral Inventory, 2010). The deposit was mainly hosted by a flat lying body of 199.6±0.6 Ma Maple Leaf granodiorite, and also extended a short distance into footwall Takla volcanic and sedimentary rocks. The deposit measured 1,700 m east-west, 650 m north-south and ranged in vertical thickness from 100 to 290 m. The deposit was very near surface at its eastern end with depth increasing toward the west (to 182 m below surface). Published figures on mineral resources and mineral reserves and past production on the main deposits in the Kemess District are tabulated below.

**Table 15-1: Kemess District Porphyry Mines and Advanced-Stage Deposits.**

| Name | Category | Million Tonnes | Cu % | Au g/t | Ag g/t |
|---|---|---|---|---|---|
| Kemess South | Mined | 218 | 0.21 | 0.63 | |
| Kemess Underground | Probable | 107.7 | 0.27 | 0.54 | 1.99 |
| | Indicated | 246 | 0.22 | 0.42 | 1.75 |
| Kemess East | Indicated Resources | 113 | 0.38 | 0.46 | 1.94 |

Source: Golder Associates, "Technical Report for the Kemess Underground Project and Kemess East Project, BC," for AuRico Metals Ltd., July 2017; Kemess Underground (reserve NSR cut-off NSR C$15.30/t; resource cut-off NSR C$15/t) and Kemess East Indicated Resources (cut-off NSR C$17.30/t); South Kemess Past Production (ore milled). Kemess Underground mineral resources include mineral reserves.

While epithermal deposits are not a focus of Amarc's exploration strategy on the JOY Project, it is important to both recognize their presence and understand their relation to overall regional mineralization. Notably, according to the latest MDRU studies, some of the historical epithermal deposits in the Toodoggone Region may have unrecognized porphyry roots (Bouzari, et al. 2019). As such, the exploration activities on adjacent properties are important for understanding mineralization in the greater Toodoggone region

The Toodoggone epithermal Au-Ag projects are currently being explored by a number of companies. These operators include Benchmark Resources Ltd., who are currently exploring the Lawyers Au-Ag deposit at the former Lawyers mine that operated from 1989-1992, producing 171,200 oz Au and 3.6 million oz Ag over the 4 year period. The deposit was not mined out (Table 15-2) and the surrounding area was not thoroughly explored. Other active Toodoggone projects include the Shasta-Baker-Chappelle Au-Ag Project of Talisker Resources Ltd. ("Talisker"). The Shasta Mine is located 9 km east from Talisker's processing and camp facilities. Production began in 1989, operated intermittently by Sable Resources Ltd. until 2012 when the mine was put on care-and-maintenance. Historical production from Shasta occurred mainly during the periods 1989-1991 (from the JM and D zones) and 2008-2012 (from the Creek zone). The mine production was processed at the Baker mill at rates between 200-250 tons/day.

**Table 15-2: Toodoggone Epithermal Deposit**

| Name | Category | Thousand Tonnes | Au g/t | Ag g/t |
|---|---|---|---|---|
| Lawyers | Mined | 621 | 8.7 | 183 |

Source: BC MINFILE Number: 094E 066, LAWYERS.

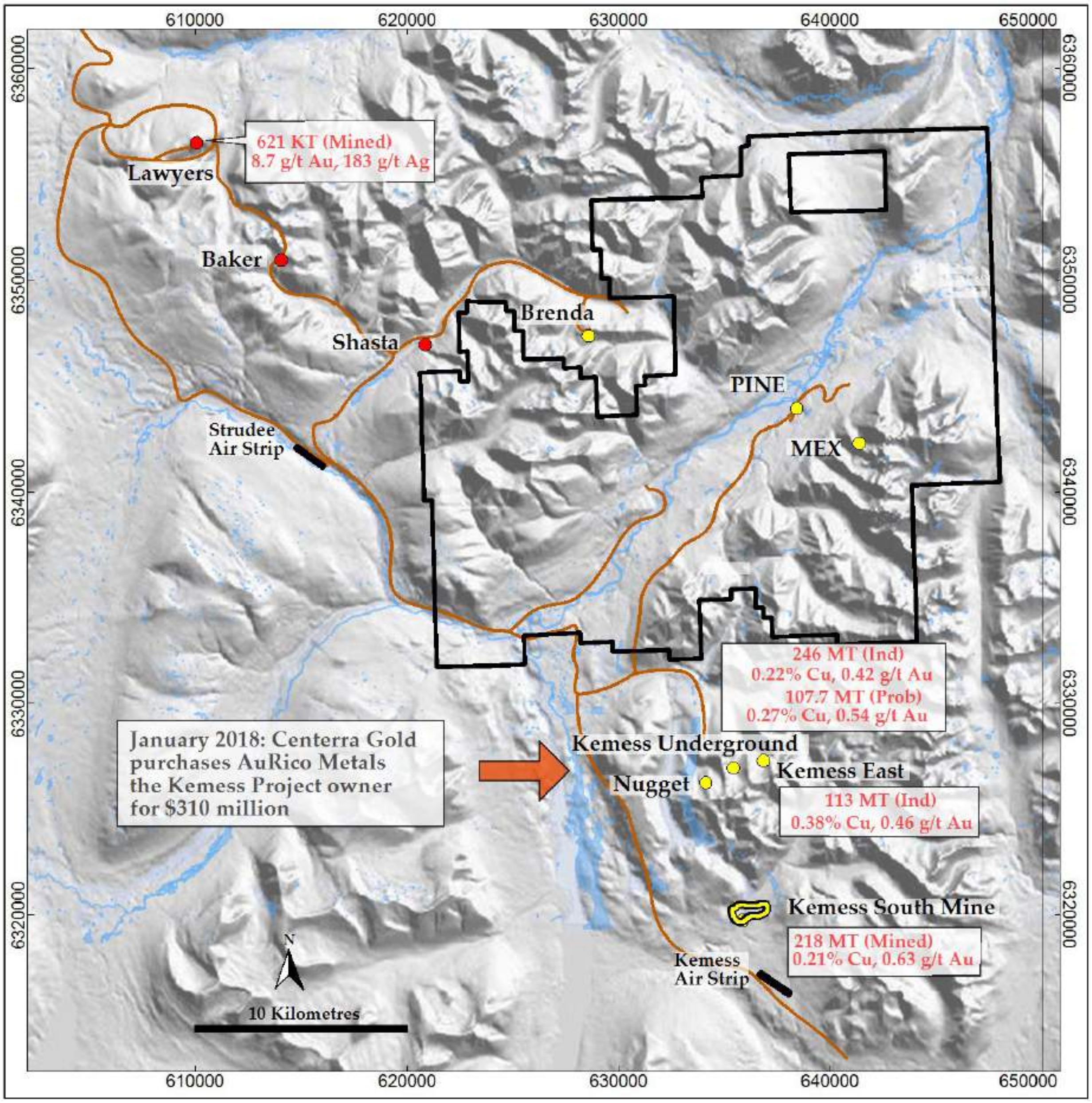



**Figure 15-1: Adjacent Property Information Relevant to the JOY Project.**

The QP has been unable to verify the information on the adjacent properties and, as such, the information is not necessarily indicative of the mineralization on the JOY Project.

## 16.0 Other Relevant Data & Information

The authors are unaware of any further information and data relevant to the JOY Project.

## 17.0 Interpretations & Conclusions

Amarc has carefully and appropriately compiled and integrated a significant quantity of historical information from geological, geochemical and geophysical surveys, and also from drilling completed by previous workers on the JOY Project. Historical data was validated and verified to the extent possible or required at the current time, with particular emphasis on geochemical surface survey and drill sample assay information in respect to key elements such as Cu and Au. This work permitted the rapid advancement of the Project in 2017 and 2018 through the delineation of several potential targets for follow up survey work by Amarc, and has continued to contribute significantly to the on-going and evolving targeting process.

Amarc has completed extensive geological mapping, geochemical and geophysical surveys and also limited drill testing of a few initial targets. These works have both verified the potential of targets initially generated from the historical data which are pending drill testing, and also generated new targets for focused survey work followed by drill testing.

The extensive validation and verification work completed on all data sets in respect to both historical and Amarc's recent programs provides a good degree of confidence in the information, and especially that the geochemical data utilized is of appropriate quality. Notably, the historical drill assay data, although regarded as acceptable for use in the current exploration and drill targeting programs requires further verification before it could be utilized to support resource estimate or other more advanced studies.

The 2016, 2017 and 2018 fieldwork on the JOY Project completed by Amarc expanded the number of potential porphyry targets, and increased exploration confidence in utilizing both the Project wide and deposit scale datasets to target potential new mineralization. Exploration works have both confirmed and expanded the prospective nature of the JOY Project, with a series of drill-ready targets delineated and other developing exploration targets with excellent indications for porphyry-type mineralization.

The main conclusions from Amarc's exploration work are summarised below:

The compilation of historical exploration data and its integration with Amarc's survey data has confirmed the geological potential of the JOY Project to host significant porphyry Cu-Au mineralization. Significant expansion potential has been identified at the PINE deposit and MEX deposit target, and at the rapidly developing regional targets that are ready for drill testing. Numerous other newly identified targets are worthy of continued exploration and potential drill testing.

Historical drilling at PINE confirms the presence of a northeast-trending, 2,500 m-long, auriferous porphyry Cu system, which remains open to expansion both laterally and to depth. Historical drilling is typically restricted to the uppermost parts of the deposit (80% of holes are < 250 m in length, with the majority of drill holes at the PINE deposit recording < 175 m vertical penetration). Many holes ended in mineralization, while some display an increase in Cu-Au-Ag concentrations towards the end of the hole. Notably none of historical holes penetrated to the depth of the important underlying, prospective unconformity between the Late Triassic and Early Jurassic rocks around 201.3 Ma. The Kemess South deposit and the 5 km-long northeast-trending Kemess North cluster of deposits, as well as many of the deposits in the Golden Triangle such as the Red Chris porphyry Cu-Au mine, occur at or near this "Red Line" unconformity feature (Figure 7-1). The Takla Group mafic volcanic rocks that underlie the known mineralization at PINE are particularly receptive to mineralizing hydrothermal fluids and in part host the mineralization in the deposits of the southern Kemess District, supporting the premise that deeper drilling is warranted.

The PINE deposit is ready for further drill testing. Many of the historical drill holes intersected interesting grades and the Cu-Au mineralization remains open both laterally (including PINE Extension) and to depth below the relatively shallow historical drilling. Untested areas of high IP chargeability and/or surficial geochemistry lie between the widely-spaced historical holes and laterally away from the core area (e.g. HGA (#16) and the chargeability high located in the 500 m wide gap between the holes at TREE, see Figure 10-3).

Re-logging the historical PINE drill core would provide a better geological framework to put the historical work into context, enable 3D modelling of the deposit, and facilitate a better planned drill delineation program to move the deposit to more advanced stages.

IP anomalies with coincident geochemical anomalies occur on the northwest side of the Finlay River, which are of sufficient quality to warrant drill testing.

IP surveys completed in 2017 and 2018 have been tied into a large historical IP survey by Gold Fields greatly expanding Amarc's understanding of sulphide distribution within a number of target zones, including the PINE deposit, Twins, Canyon South, and the MEX cluster.

The 2017 and 2018 airborne magnetic surveys completed coverage of the JOY Project enabling enhanced targeting and interpretation of Project-wide features and the identification of possible porphyry Cu deposit forming plutons. Magnetic targets, such as the southeast extension of PINE should be further investigated. These targets are drill ready.

Widely-spaced historical drilling indicates that the MEX deposit target remains open laterally under cover and to depth. Re-logging of historical core and further drilling is required to test these extensions.

Geological, geochemical and geophysical surveys have defined coincident anomalies in the MEX Cluster at West MEX, North MEX, More MEX and HGA, which lie between and adjacent to both the PINE and MEX hydrothermal systems. These are all drill ready targets.

At Canyon South, the high-contrast >28 mV/V core of a two km-wide >18 mV/V IP chargeability anomaly coincides with a 500 m diameter magnetic high, that is possibly related to an unidentified porphyry stock. On the periphery of the Canyon South target, on the opposite sides of the open 2 km wide IP chargeability anomaly, historical drill hole PIN09-15 encountered 11.43 g/t Au over 3.0 m (197.00 m to 200.00 m), and historical drill hole MEX12-013 intercepted 0.05% Cu and 0.18 g/t Au over 62.3 m (13.70 m to 76.00 m). A new IP survey, possibly with accompanying soil geochemistry, is required to define the full extent of the chargeability anomaly at Canyon South in preparation for future drill testing.

At Twins a magnetic high, at an interpreted extensional dilation jog in a northwest-trending positive magnetic lineament, lies within a large (>2.5 $km^2$) area with a high contrast IP chargeability response with two 400 m, diameter internal zones of high chargeability. This chargeability anomaly is open to the east and south and a new IP survey is required to define the full extent of the chargeability anomaly in preparation for drill testing.

The Cu-Au soil geochemical anomalies over a magnetic high at the SW Takla target require IP surveying to assist in the definition of potential drill targets.

Significant geological mapping has been carried out to create a new 1:20,000 geological and alteration map of the central and northern part of the JOY Project. This geological compilation needs to be extended down to the southern JOY Project boundary to provide a better understanding of the distribution of Takla and Toodoggone Fms, along with any porphyry intrusives and their associated porphyry Cu-Au deposits.

Surface geochemical surveys are highly important and were utilized to define new targets, such as the North Finlay and SW Takla target areas.

At some targets (e.g. PINE) the surface geochemistry is subdued by the comparatively deeper till or glaciofluvial sediment cover, however in areas with less Quaternary influence the geochemical signature of hydrothermally altered and mineralized bedrock is clear.

The targeting techniques employed by Amarc proved successful in identifying and delineating targeted prospective exploration targets for drill testing, and should continue to be used to assess other areas of interest not previously investigated.

A more complete verification of the historical analytical data and review of the analytical QAQC information provided by previous workers (as outlined below) is required to support more advanced studies. A re-logging program is proposed in conjunction with in section 18 of this report. The other aspects would need to be done if the drilling proposed in section 18 is successful and before more advanced studies.

1. Drill, survey, log, sample and analyze a number of new holes to validate and confirm results of the historical drilling in the PINE deposit area.
2. Confirm by site investigation and re-surveying, the locations of the 1972 to 2012 historical drill hole collars, wherever possible. The majority of the collar locations currently used are as reported in the Gold Fields databases.
3. Verify key historical analytical data by comparison of that included in the Amarc database to original source documents, wherever assay certificates and sampling logs are available. Most sampling and analytical data derives from databases provided by Gold Fields. Appropriate resolution of a number of discrepancies, errors and omissions noted in these data sets took place during various stages of the Amarc compilation work. However, a complete resource-level data review was not undertaken. The historical drill hole analytical certificate and sample log data that exists in ARIS assessment reports in scanned format should be broken out of these reports and filed separately by year and drill hole for easier access and comparison with the digital database in verification, for data room presentations and use by QPs and technical report authors.
4. Re-log historical drill core and re-sample representative sections for analysis. Much of the original historical drill core is stored on the Project. Rehabilitate and inventory the core stored at site and assess how best to approach geologic re-logging, re-sampling and re-assaying of these historic holes.
5. Assess scanned historical drill logs, including geological, geotechnical, density logs, that exists in assessment reports. Break them out of these reports and file separately by year and drill hole for easier access in re-logging, verification and use by QPs and technical report authors.
6. Assess digital historical geological and geotechnical data provided by Stealth, Cascadero and Gold Fields and import to the database where appropriate.
7. Review the results of the analytical QAQC programs on drill core done by previous operators and analytical laboratories, wherever possible. For example, the historical drill hole QAQC data from the 2003 through 2012 programs of Stealth, Cascadero and Gold Fields that exists in a number of digital files provided by these operators, should be compiled, imported to the database and assessed.
8. Measure the density of representative rock types at regular intervals of historical drill core.
   Input the complete set of analytical data for all drill holes. For a number of historical drill holes where the only analytical records exist as scanned copies not all analytical data was input by Amarc. Most of the unrecorded information is in lower priority target areas, or are for elements of lesser interest. However, entry and compilation of all of these data into the master drill hole database is desirable for completeness.

9. Input the complete set of analytical data for all surface samples. A complete set of analytical data is lacking for a number of historical surface samples where the only records of this information exist as scanned copies. Most of unrecorded information is in lower priority target areas, or are for elements of lesser interest. However, entry and compilation of all of these data into the master surface database is desirable.

# 18.0 Recommendations

## 18.1 Recommended Exploration Program

The recommended Phase 1 exploration program is designed to both drill test delineated target areas (Figure 18-1), and concurrently complete low-cost surface exploration work in other target areas to rapidly bring the earlier stage targets to a drill ready status. A Phase 2 program will focus primarily on core drilling, as the Phase 1 program is not designed to drill test all of the target areas on the JOY Project but instead will test the areas where Amarc has the most information at this time (Figure 18-1). The Phase two program is not contingent on Phase 1.

Figures 18-1 summarizes the porphyry Cu-Au target areas on the JOY Project generated from Amarc's exploration work to date, and locates 34 potential diamond drill hole locations. Phase 1 drilling will focus on testing two or three of the identified target areas with approximately 5,000 m of drilling in 11 holes (each approximately 450 m in length). Each target area has merit in its own right, and therefore drill results from one target does not negate the requirement to drill the other targets. This is especially important as each target area is large, approximately 1 to 8 $km^2$, and will require multiple drill holes (see Figure 18-1). No prioritization is herein applied to the targets outlined in Figures 18-1.

Additional step-out and grade confirmation drilling at the PINE deposit should also be considered as the historical drilling indicates that the mineralization is open to expansion both laterally and to depth. The new 2019 IP inversion models show significant potential to expand and trace new mineralization to the south and southwest and to depth at both PINE and Pine Extension. The MEX deposit target also hosts mineralization of a tonnage and grade that may be economically interesting, as such, further step-out and grade confirmation drilling is also warranted at this locality.

A focused Phase 1 surficial program is required to further delineate the exploration targets at SW Takla, Central Takla, and the northern extension of the PINE-TREE corridor prior to drill testing. These surveys should focus on extending historical IP surveys to the south and west of the Canyon South and Twins historical IP chargeability anomalies, and over the SW Takla geochemical soils grids, completing a new IP grid over the Central Takla Target Area, and also expanding the existing IP survey at the PINE Extension towards the southwest and north.

**Proposed budgets for phased exploration plan**

**Phase 1 Exploration Program:**

| | |
|---|---|
| IP, infill geochemical and geological surveys | $400,000 |
| Re-logging of historical drill core at PINE and MEX, and at other targets | $100,000 |
| 5,000 m diamond drilling program to test up to three target areas | $2,500,000 |
| Reporting, processing and other program costs | $500,000 |
| **Total estimated cost** | **$3,500,000** |

**Phase 2 Exploration Program:**

| | |
|---|---|
| IP, infill geochemical and geological surveys | $250,000 |
| 12,500 m diamond drilling program to test the remaining target areas | $5,750,000 |
| Reporting, Processing and other program costs | $500,000 |
| **Total estimated cost** | **$6,500,000** |

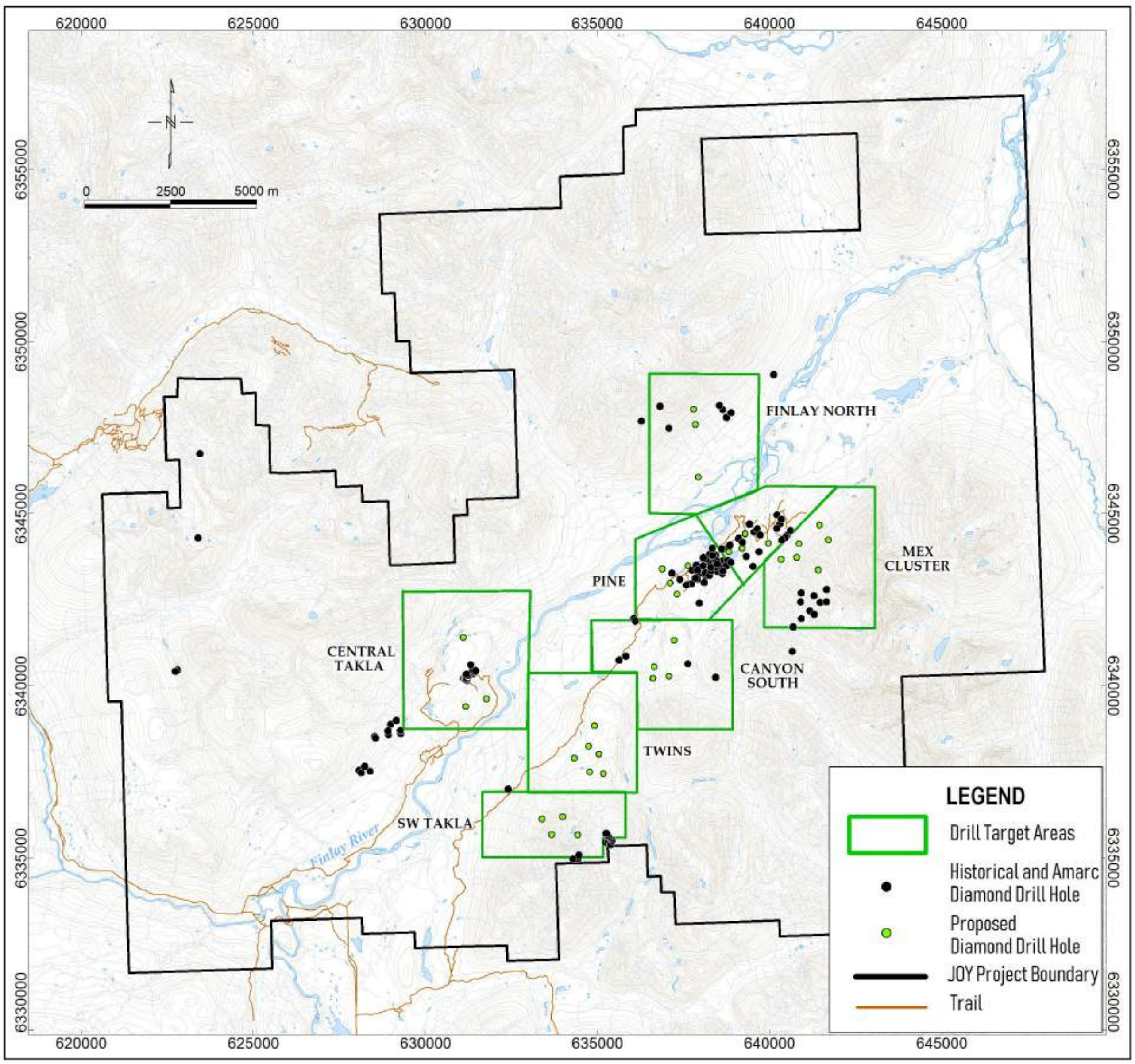



**Figure 18-1: JOY Target Areas for Future Exploration and Recommended Future Drill Collar Locations.**

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# 20.0 Certificate of Qualified Persons

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I, C. Mark Rebagliati, P. Eng., am a Professional Engineer of 1500-1040 West Georgia Street in the City of Vancouver, in the Province of British Columbia.

1. I am co-author of this report entitled "Technical Report Summarizing Exploration Work on the Joy Project, Toodoggone Region, British Columbia, Canada", effective date April 16th, 2020. I am responsible for the Summary and sections 2, 3, 4, 5, 7, 8, 13, 14, 15, and 16, and jointly responsible sections 1, 6, 9, 10, 12, 17, 18, and 19 of this report.
2. I have been involved with the Project since 2014. I have not authored a previous technical report.
3. I am a member in good standing of: Engineers and Geoscientists BC, registration No. 8352, The Society of Economic Geologists, Canada and the Association for Mineral Exploration British Columbia.
4. I am a graduate of the Provincial Institute of Mining, Haileybury, Ontario (Mining Technology, 1966).
5. I am a graduate of the Michigan Technological University, Houghton, Michigan USA (B.Sc., Geological Engineering, 1969).
6. I have practiced my profession continuously since graduation and have been involved in mineral exploration for precious and base metal deposits in Canada, USA, Mexico, El Salvador, Chile, Panama, Peru, Bolivia, Brazil, Albania, Armenia, Argentina, Australia, Fiji, New Zealand, Solomon Islands, Papua New Guinea, Ireland, Spain, Portugal, Romania, Albania, Hungary, Poland, Germany, Russia, Kazakhstan, Afghanistan, India, China, Ghana, Laos, Viet Nam, Turkey, Saudi Arabia, Morocco, Philippines and South Africa. I have extensive experience with porphyry-type copper prospects and deposits, notably the Copper Mountain, Red Chris, Gibraltar, Whiting Creek, Mt. Milligan, Southern Star, Lorraine, Kemess South, Kemess North, Pine, Casino, Prosperity, Xietongmen, Newtongmen and Pebble deposits.
7. As a result of my qualifications and experience I am a Qualified Person as defined in National Instrument 43–101.
8. I am not independent of the issuer, Amarc Resources Ltd.
9. I have visited the JOY Project several times, most recently on August 9, 2018, and have supervised the exploration programs from 2016 to 2018. I am very familiar with the geology, topography, physical features, access and local infrastructure.
10. I have read National Instrument 43-101, Form 43-101FI and this report has been prepared in compliance with NI 43-101 and Form 43-101FI.
11. I am not aware or any material fact or material change with respect to the subject matter of this technical report, which is not reflected in the report, the omission of which to disclose would make this report misleading.
12. I consent to the filing of the subject Technical Report with any stock exchange and any other regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public, of the subject Technical report.

Dated in Vancouver on this 14th day of May, 2020.

*C Mark Rebagliati*

C. Mark Rebagliati, P. Eng.

I, ***Eric Titley***, P. Geo. do hereby certify that:

I am Senior Manager | Resource Geology for Hunter Dickinson Services Inc., at the address below.

This certificate applies to the technical report titled "Technical Report Summarizing Exploration Work on the JOY Project, Toodoggone Region, British Columbia, Canada" that has an effective date of 16th April, 2020 (the "technical report").

I am a Professional Geoscientist registered with Engineers and Geoscientists British Columbia (EGBC) in the province of British Columbia, Canada. I graduated from the University of Waterloo, Waterloo, Ontario, Canada with a Bachelor of Science degree in Earth Sciences (geography minor) in 1980.

I have practiced my profession continuously since 1980 on projects in North America, Africa, Asia, South America, Europe and Australia. I have been directly involved in providing geological and technical assistance to mineral exploration, mineral development and mining projects, and in the development of resource models and in resource estimation on mineral projects.

I am a Qualified Person as defined in National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) because of my experience and qualifications.

I am a co-author of the report entitled "Summarizing Exploration Work on the JOY Project, Toodoggone Region, British Columbia, Canada".

I am responsible for Section 11 and jointly responsible for Sections 1, 6, 9, 10, 12, 17, 18, and 19 of the Technical Report. ,

The Technical Report is based on my knowledge of the Project area and drilling database included in the Technical Report, and on review of published and unpublished information on the property and surrounding areas. I have not conducted a site visit.

I am not independent of Amarc and affiliated companies applying the tests in section 1.5 of National Instrument 43-101.

I have had prior involvement with the Project in the compilation of historical work and the Amarc drilling database.

I have read National Instrument 43-101. The sections of the Technical Report that I am responsible for have been prepared in compliance with that Instrument.

I consent to the filing of the Technical Report with any Canadian stock exchange and other regulatory authority and any publication by them, including electronic publication in the public company files on their website accessible by the public, of the Technical Report.

As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the technical report that I am responsible for preparing contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Dated this 14th day of May, 2020.

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