

AIRBORNE MULTISENSOR GEOPHYSICAL SURVEYS IN THE CENTRAL QUESNEL MINERAL BELT (93A/5, 6, 12)

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September 2003 (Figure 1). Results of both surveys will be released to the public in Spring 2004.

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INTRODUCTION

Two helicopter-borne multisensor (gamma ray spectrometer, magnetometer) geophysical surveys were flown in the Horsefly and Mount Polley mine areas of the central Quesnel mineral belt in

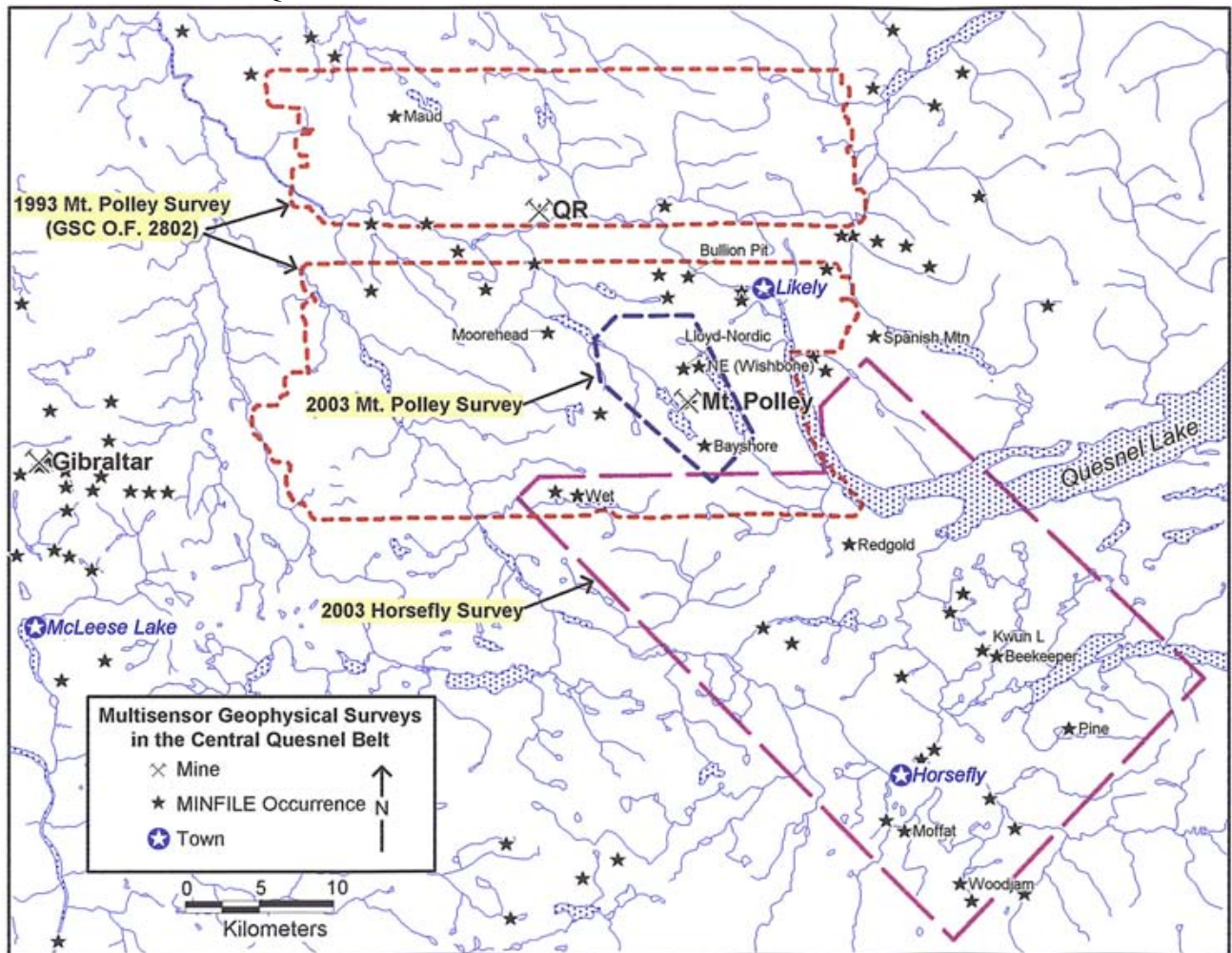


Figure 1. Location of multisensor geophysical surveys flown in the Mount Polley and Horsefly areas in 1993 and 2003.

Fugro Airborne Surveys carried out the work under contract to the Geological Survey of Canada (GSC) and Imperial Metals Corporation. The BC Ministry of Energy and Mines conceived of the project and provided overall management. Funding was provided by the Rocks to Riches program of the BC and Yukon Chamber of Mines and Imperial Metals Corporation.

The overall purpose of the surveys is to provide modern high-definition radiometric and magnetic data that can be used in the assessment and development of targets for mineral exploration, and to assist in future bedrock and surficial mapping studies. These new helicopter-borne surveys partially overlap and extend southeasterly from a similar survey, flown in 1993 (Shives *et al.*, 1995) using the GSC Skyvan fixed wing aircraft. That survey covered portions of NTS map sheets 93A/12 and 93B/9 including the Mount Polley deposits (prior to start of mining operations).

The 2003 Horsefly survey covered an area of 801 square km and was flown at an average 500-metre line spacing (NE-SW lines) and 135-metre terrain clearance, for a total of 1843 line-km including control lines. The 2003 Mount Polley survey covered 67 square km at an average 100-metre line spacing (E-W lines) and 60-metre clearance, for a total of 738 line-km including control lines (Figure 1).

Rationale

The Horsefly area was chosen because it is highly prospective for alkalic porphyry copper-gold deposits like Mount Polley and Afton, which respond well to radiometric and magnetic survey techniques. The area has excellent access and infrastructure, but only had about 15-20% claim coverage at the time of the survey. The area also has potential for gold and base-metal skarn, calc-alkalic copper-molybdenum porphyry, gold-silver vein, placer gold and a variety of other deposit types (Table 1). Topography is subdued and the extensive cover of glacial till, plateau volcanics and timber has hampered past exploration.

The Geological Survey of Canada has had good results in previous multisensor surveys over similar BC porphyry deposits (e.g. Afton and Mt. Milligan). The radiometric (K and eTh/K ratio) and magnetic (total field and calculated vertical gradient) maps are particularly useful in identifying potassic alteration and magnetite enrichment/depletion zones associated

with these copper-gold deposits, and in mapping bedrock lithologies and structures.

Interestingly, the Mount Polley porphyry copper-gold deposit was discovered in 1964 by follow-up prospecting "*at the site of a prominent aeromagnetic anomaly indicated by newly published federal-provincial surveys*" (C.J. Hodgson, R.J. Bailes, & R.S. Verzosa, 1975, CIM Special Volume 15, page 388). It is hoped that by utilizing newer technology, the current surveys could lead to new discoveries in the Quesnel mineral belt.

Project Area Description

The Horsefly area is part of the Cariboo Plateau, an area of relatively gentle topography with low hills and broad valleys. Elevations range from about 800 to 1200 m. Quesnel and Horsefly lakes dominate the landscape to the east and numerous other small lakes and ponds occur throughout the area. Larger drainages are the Cariboo, Quesnel and Horsefly rivers. The small communities of Horsefly and Likely in the area, and the nearest large town is Williams Lake, some 50 km to the southwest. An extensive network of paved highways and gravel logging roads provides excellent access.

Regional Geology, Exploration History and Mineral Potential

Panteleyev *et al.* published an excellent summary of the bedrock geology and mineral deposits of the central Quesnel trough in 1996, and much of the following is taken from that work. The belt is underlain by the Late Triassic-Early Jurassic Nicola volcano-plutonic island arc assemblage, part of the Quesnel Terrane. It is comprised of mafic to intermediate volcanic, volcanoclastic and lesser sedimentary rocks that are intruded by partly coeval Early Jurassic alkalic diorite, monzonite and syenite intrusions. Less common are calc-alkalic intrusions of Early Jurassic and Cretaceous age. Jurassic sedimentary rocks and Permo-Triassic oceanic rocks of the Cache Creek Terrane occur to the west, while Triassic "black clastics" and older metasediments occur to the east. The Nicola volcanic rocks are overlain in places by Eocene volcanics and sediments, Miocene plateau basalts and locally extensive glaciofluvial deposits.

The area has a long history of mining and exploration. Placer mining began on the Horsefly and Quesnel Rivers during the Cariboo gold rush in about 1860. Several large placer operations were active in

the early days, including the famous Bullion Pit near Likely. A variety of lode metal deposits are also known (Table 1) and several deposits have been mined in the past. Three dormant, open-pit metal mines are situated close to the survey area: Gibraltar (Cu-Mo), Mount Polley (Cu-Au) and QR (Au). Each of these mine/mill complexes is currently on care and maintenance awaiting higher metal prices and/or discovery of new or higher-grade deposits. Recent

exploration activity in this belt has focused on bulk tonnage alkalic porphyry and skarn deposits (e.g. Mount Polley, Lloyd-Nordik, QR, Cariboo, Redgold and Woodjam). Imperial Metals made a significant new discovery of porphyry Cu-Au mineralization on the Mt. Polley property in September 2003. Called the Wishbone or Northeast zone, the deposit occurs close to surface and appears to have much higher copper grades than ore previously mined.

TABLE 1
POTENTIAL DEPOSIT TYPES IN THE MT. POLLEY - HORSEFLY AREA

Deposit Type	Examples
Alkalic porphyry Cu-Au-Ag-Pd	Mount Polley mine, Wishbone (Northeast), Lloyd Nordic, Redgold, Woodjam, Pine, Beekeeper, etc.
Propylite (skarn) Au-Ag-Cu	QR mine
Mesothermal Au veins	Spanish Mountain, Frasersgold
Calc-alkalic porphyry Cu-Mo-Au-Ag	Wet, Boss Mountain, Gibraltar
Volcanic disseminated Cu	Red, Moffat, B, Moorehead, Mary
Polymetallic veins	Mandy
Epithermal As-Sb-Ag (Au?)	Minor occurrences
Cu-Au Stockwork in Eocene volcanics	Megabucks
Cu-Au magnetite skarn	Spout Lake, Deer Lake, Craigmont
Placer Au	Bullion pit, Quesnel River, Miocene, Horsefly, Antoine Creek

Methods

The two surveys were completed between September 23, 2003 and September 29, 2003, using an Aerospatiale AS350 helicopter (Photo 1). The flight path was recovered using a post-flight differential Global Positioning System. A vertically mounted video camera was used for verification of the flight path. The traverse lines were flown at an average spacing of 500 m (100 m for Polley) with control lines flown at 4000 m intervals (2000 m). Helicopter flight height was maintained at an average ground clearance of 135 m (60 m).

The gamma ray spectrometry data were recorded at a 1.0 second sample rate using a 256-channel Exploranium GR820 spectrometry system with 33.6 liters of downward-looking and 4.2 liters of upward-looking sodium iodide detectors. The aeromagnetic data were recorded at a 0.1 second sample rate using a 0.01 nT split-beam line cesium vapour magnetometer suspended below the helicopter.

Results

Final results will be presented in GSC and BCGS Open File formats in Spring 2004. The Open Files will consist of digital data (Geosoft compatible line and



Photo 1. Fugro Airborne Surveys helicopter and magnetometer bird in the Likely area, September 2003.

gridded formats) and colour interval maps at 1:20,000 and 1:50,000 scales, for 10 layers (listed below). Map images will be presented as georeferenced .tif files for easy import into GIS programs and as .pdf files with marginal notes, legend and topographic base information. Data will be made available for purchase as digital line or grid data on CD-ROM (from GSC only), in paper format as print-on-demand colour maps from GSC and BCGS and as web-viewable, downloadable images in PDF format, at no cost, from BCGS and GSC-NATGAM websites.

Analogue and digital products will include data for eight radiometric and two magnetic parameters:

- Ternary radioelement map (K, eU, eTh)
- Natural air absorbed dose rate (ADRN, nGy/h)
- Potassium (K, %)
- equivalent Uranium (eU, ppm)
- equivalent Thorium (eTh, ppm)
- equivalent Uranium/equivalent Thorium (eU/eTh)
- equivalent Uranium/Potassium (eU/K, ppm/%)
- equivalent Thorium/Potassium (eTh/K, ppm/%)
- Magnetic total field (nT)
- Magnetic vertical gradient (computed, nT/m)

CONCLUSIONS

Multisensor geophysical data will be released in Spring 2004 for two surveys in the central Quesnel mineral belt. This new data should assist in exploration for alkalic porphyry and other deposit types in this highly prospective area.

REFERENCES

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