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## **TECHNICAL REPORT**

# **Roche Bay Magnetite Project C-Zone Nunavut, Canada**

**Submitted to:**

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REPORT



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## APPENDICES

### APPENDIX A

Certificates of Qualification



## 1.0 SUMMARY

### 1.1 Scope of Work

Golder Associates Ltd. ("Golder") was commissioned by Advanced Exploration Inc. ("AEI") to provide an updated independent mineral resource estimate for the Roche Bay Magnetite Project C-Zone ("C-Zone") and technical report for filing with the security commission. The mineral resource estimate was completed in conformance with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Mineral Resource and Mineral Reserve definitions referred to in National Instrument (NI) 43-101, Standards of Disclosure for Mineral Projects. This is the second time an independent mineral resource estimate has been prepared for the C-Zone for AEI and is in support of the April 6, 2011 press release (AEI, 2011a). The updated mineral resource estimate (effective date of April 6, 2011) is based on additional metallurgical test work, updated mineral interpolation and a resource classification study. No additional drilling to the C-Zone has been completed, but the additional work completed has upgraded a material portion of the C-Zone from the Inferred classification to Indicated.

The C-Zone mineral resource estimate and technical report was completed under the supervision of qualified persons (QP) Mr. Paul Palmer, P.Eng., P.Geo., and Mr. Greg Greenough, P.Geo., of Golder.

### 1.2 Location and Ownership

The Roche Bay Magnetite Project is located immediately to the west of Roche Bay, approximately 60 km southwest of Hall Beach, Nunavut, Canada and located approximately 6 km from the tidal water along the east coast of the Melville Peninsula. The project is comprised of four mining leases covering approximately 2,232 ha. The focus of the mineral resource estimate is the mineralized area identified as the C-Zone which is located on Lease No. 2953.

Under a Definitive Agreement reached with Roche Bay Plc ("Roche Bay"), the named lease owner, AEI has been granted an option to earn up to a 100% interest in the Leases subject to a royalty in favour of Roche Bay, and once the earn-in structure has been completed, AEI will acquire Roche Bay's interest in the Leases subject to:

- i) a retained 4% Gross Overriding Royalty (GOR) on iron products (such as nuggets) having greater than 90% iron content;
- ii) a 6% GOR on iron products (such as concentrates and pellets) having less than 90% iron content; and
- iii) a 10% gross overriding royalty on by-product precious metals (the "Royalty");

AEI will thereafter have the right to buy out 50% of the Royalty (other than the precious metals royalty) before March 31, 2020 for a total payment of \$35,000,000 plus an inflation adjustment, allowing the Company to effectively reduce the gross overriding royalty on iron products to 2% on nuggets and 3% on concentrates/pellets, respectively.

At its election, AEI also has the opportunity to reduce the royalty rate by making a payment of \$22,500,000 to Roche Bay by August 5, 2011. In doing so, AEI would reduce all royalties to 1.875% on all mineral products except any precious metals (such as gold) which was reduced to 3.9% (the "New Buy-Out Option"). All other



terms and conditions set out in AEI's agreement with Roche Bay will remain the same. If the New Buy-Out Option is not exercised, the previous will continue to apply. Any amendments remain subject to TSX Venture Exchange approval.

The Definitive Agreement will replace the amended and Restated Option and Farm-Out Agreement dated May 30, 2007 between AEI and Roche Bay (as amended).

### 1.3 Geology and Mineralization

The Roche Bay Magnetite Project has been defined as an Algoma type Banded Iron Formation (BIF) deposit with five defined zones of mineralization labelled A, B, C, D and E-Zones. These zones are generally characterized by alternate bands of magnetite and silica, ranging in thickness from one metre, down to one millimetre. The strike length of these deposits is between 820 m and 4,800 m and the width is between 120 m to 160 m. The dips of the deposits are generally sub-vertical to steeply dipping and strike NE-SW. Drilling to date for the C-Zone has consistently defined magnetite mineralization to a minimum depth of 250 m below surface, but is open at depth to a minimum of 540 m below surface.

Exploration campaigns completed by Roche Bay in 2006 and by AEI in 2007 and 2008 have focussed primarily on the C-Zone which currently covers a strike length of 4.8 km. Current geological interpretation from the surface mapping, the 2006 airborne geological survey and information from the 2007 and 2008 drilling programs have outlined five BIF horizons within the C-Zone. These BIF horizons have been labelled the Hanging Wall (HWX), Main (MAIN), Footwall 1 (FW1), Footwall 2 (FW2) and Footwall 3 (FW3). These BIF horizons have been defined originally by AEI geological staff based on a combination of marker stratigraphic lithological units, varying amounts of silica zones, Fe% content in the BIF zones and other mineral contents (sulphur).

The updated mineral interpretation of the C-Zone by Golder has combined these various BIF zones into a continuous single zone and encompasses some internal waste or non-BIF zones. Based on the total length of captured data for each lithological unit, the final mineralized envelope contains approximately 81% BIF material, with reasonably small internal amounts of waste metasediments (12%), schist (4%), and gabbro and other lithologies (3%).

### 1.4 Exploration Programs

Prior to 2006, historical exploration programs were completed on the Roche Bay Magnetite Project throughout two periods: from 1968 to 1970 and 1982. Metallurgical testing was completed from 1968 to 1970 and 1982 to 1984. As part of these historical exploration programs, a total of 16 drill holes were drilled into A-Zone (6 drill holes), B-Zone (9 drill holes) and C-Zone (1 drill hole) during the 1982 field program for a total length of 3,214 m. The ultimate vertical extents of the deposits were not defined by this drilling. The deepest BIF intercepted in the 1982 drilling for A-Zone was at 165 m below surface, B-Zone was at 180 m below surface and C-Zone was at 175 m below surface. In addition, geophysical surveys completed on the property showed that the strike length and width of the magnetic signatures was extensive (several kilometres in strike and up to 300 m in width).



In 2006, Roche Bay completed their first field season on the Roche Bay Magnetite Project which consisted of drilling 3 short exploration drill holes (a total of 53.94 m) with an AWX drilling system for C-Zone, confirmation surface mapping of A, B and C-Zones and an airborne high resolution magnetic gradiometer geophysical survey on A, B and C-Zones.

In addition, core samples collected from the 3 AWX drill holes and samples from historical drill core samples, stored on site, from A and C-Zones were metallurgical tested at SGS metallurgical facility in Lakefield, Ontario, Canada (SGS Lakefield). A technical report (Palmer et al., 2007) was completed for Roche Bay outlining the historical data, 2006 exploration activities and metallurgical test work by SGS Lakefield.

In 2007, AEI financed and managed the field program as per the Option Agreement. The focus of the 2007 drilling program was to define the C-Zone mineralization on 400 m spaced sections along the strike of the C-Zone, with holes drilled down dip and perpendicular to dip (inclined between 45° and 60° from horizontal), spaced approximately 100 m across strike. During the 2007 exploration program, a total of 36 NQ drill holes and 9,300 m were completed.

In 2008, AEI completed a multi-faceted drill campaign designed to define a mineral resource estimate of the C-Zone and collect data to advance the project. The goals of the 2008 exploration core drilling were to further define the geology and mineralization of the iron formation and to acquire additional grade, specific gravity, metallurgical and geotechnical data to support the mineral resource estimate. During the 2008 exploration program, a total of 55 NQ drill holes and 16,500 m were completed in the C-Zone. The spacing of the drilling was 200 m centres over the 4.8 km defined strike length. The drill holes were collared with dip angles varying between -45° and -75° and typically a 305° azimuth (approximately perpendicular to the strike of the iron formation).

In addition to the exploration drilling on the C-Zone, 6 HQ drill holes were drilled to collect geotechnical data with 4 drill holes for infrastructure and 2 drill holes collared from the sea ice above Roche Bay to test the sea floor for possible dam/port construction.

Two NQ exploration drill holes were drilled on the A and B-Zones (located 3 km NE along strike over the C-Zone) to verify historical mineralization and provide material for future metallurgical testing.

AEI initiated their 2011 exploration program in May 2011. The first part of their exploration program is exploration diamond drilling on the Tuktu Property (3,000 m) followed by definition diamond drilling (approximately 7,500 m) on the C-Zone at Roche Bay (June-August). Samples from both programs will be sampled and sawed at the exploration camps with initially processing (crushing) at the Hall Beach preparation laboratory by Activation Laboratories Inc. (Actlabs Hall Beach) prior to being sent to Actlabs in Ancaster, Ontario. Additional drilling programs will be completed as part of the geotechnical studies for open pit rock mechanics and surface infrastructure and a shipping port are required to complete the feasibility study.

### 1.5 Sampling Preparation and QA/QC Programs

The general procedure for core processing at the Roche Bay camp site during the 2007 and 2008 drilling programs was to log all recovered drill core for geology and geotechnical data acquisition prior to sampling for grade. The typical grade sample length during the 2007 drilling program was 1 m and 2 m during the 2008 drilling program.



The drill core from the 2007 exploration program was initially processed at the Roche Bay camp site preparation facility and the drill core from the 2008 exploration program was processed at the temporary SGS crushing facility at Hall Beach (SGS Hall Beach). After initial sample preparation, samples were transported to the SGS Lakefield. All permanent half core samples from the 2007 and 2008 drilling programs are stored on site at the Roche Bay camp site.

Initial drill core processing of half core samples at the Roche Bay camp site during the 2007 exploration program included jaw crushing (2 to 3 stages) followed by a rotor mill crush to a 95% pass of 1 mm and then sample splitting. A 100 g sample (and 100 g duplicate) were taken from each sample and shipped to SGS Lakefield.

Initial drill core processing of half core samples at the SGS Hall Beach preparation facility in 2008 consisted of drying, crushing to >85% passing 13 mm chips, then splitting before being crushed to >85% passing 200 mesh (75 µm). The final pulp was split (100 g) for shipment to SGS Lakefield. All samples shipped to SGS Lakefield (from 2007 and 2008 programs) were processed for whole rock XRF analysis and Satmagan testing, a physical test to determine magnetite content.

The chips and pulps from the 2007 program are stored at SGS Lakefield. The original pulps from the 2008 program are stored at SGS Lakefield. The chips and pulps duplicates from the 2008 program are stored at SGS Lakefield.

All 2011 sample preparation work will be completed at Roche Bay (logging, sampling and sawing) and Hall Beach (crushing) before being sent to by ActLabs in Ancaster, Ontario. The same logging and sample preparation procedures previously used in 2008 will be employed during the 2011 exploration programs.

## 1.6 QA/QC Sampling Programs

During the 2007 and 2008 drilling programs, AEI carried out a sampling quality assurance and quality control (QA/QC) program which initially consisted of one field duplicate inserted for approximately every twenty samples sent to SGS Hall Beach. In addition, a selection of the total pulp samples were re-tagged and submitted as supplemental pulp repeats.

In addition to the AEI QA/QC sampling program, SGS Lakefield re-assayed a selection of laboratory pulp duplicates and inserted blanks into every batch as part of their internal QA/QC process for both the 2007 and 2008 exploration programs.

Analytical standards were also submitted by AEI to monitor assaying performance. AEI has not been able to provide Golder with the expected grade of the standard reference material that was submitted with the 2007 samples. As Golder is unable to verify the accuracy of these assays, they are not considered during Golder's data validation.

During the 2008 drilling program, a total of 47 analytical standards samples (FER-3) were inserted into eight selected holes and in ten Hall Beach pulp batches as part of the AEI QA/QC program.

A review of the QA/QC programs for AEI and SGS Lakefield was completed using histograms, scatter plots, precision plots, QQ plots, relative error and relative difference plots. The results of the analysis indicate the assay precision and sampling error are generally acceptable; however, there was some local variability observed



between 2008 samples in eight duplicate pairs (3% of total data) from drill core which were significantly higher than average. In general, the QA/QC program started in 2007 by AEI has been improved during the 2008 program (by including standard samples) and is acceptable for the current mineral resource estimate.

Improvements to the QA/QC program include adding blanks, continuing using a range of certified reference materials for submission as standards (1 in 20), sending pulp repeats (1 in 40 samples) to a second laboratory for testing and development of a drill hole database system to store logging data, survey data and QA/QC data.

### 1.7 Data Validation

Various data verification checks have been completed on the data that was relied upon for the previous mineral resource estimate (Palmer and Shaw, 2009) for the Roche Bay Magnetite Project. This data verification included a review of a selection of the original data (core logs, assays, assay certificates and bulk density) against the 2009 Excel drill hole database and reviews of drill hole collar survey checks, QA/QC standards and duplicate checks.

Validation checks were also completed when the drill hole database was uploaded to Datamine. During the 2011 mineral resource estimate, validation checks were also completed by comparing the updated 3D mineralized envelope against the drill holes captured and the populated block model. The Kriged mineral resource estimate was also compared against a nearest neighbour model. The Kriged resource was validated to determine if high grade spreading was an issue (smoothness) and was found to be acceptable based on industry standards, so no corrections were required.

Errors identified by Golder in the 2009 drill hole database were corrected by AEI staff. Observations by Golder staff during a 2007 site visit and data validation procedures completed for the 2007 and 2008 drilling programs indicate that AEI is generally following appropriate industry standard practices and that the quality of the data is appropriate for the mineral resource estimate.

As part of the validation process, a review of Satmagan and Davis Tube magnetite values that were used in the mineral resource estimate was completed. A total of 206 Davis Tube magnetic tests and 797 Satmagan magnetic have been added to the previous database and are included in the updated mineral resource estimate. A review of this data against the original samples was completed.

During the 2007 drilling program, a number of samples were not assayed since they did not contain any visible Fe. Of the samples selected for resource estimation, 6% (796 m of 13,257 m) consisted of these un-sampled intervals, and all potentially economic minerals for them were set to 0.0.

Mr. Palmer completed a site visit to the Roche Bay Magnetite Project in 2006 and on August 26, 2009. During the 2009 site visit, Mr. Palmer reviewed core from the 2007 and 2008 drilling programs, observed BIF outcrops along the strike of the C-Zone, reviewed areas for future development (plant site and sea port areas) and GPS surveyed in 12 drill hole collars from the 2007 and 2008 drilling programs. No site visit has been completed for this current technical report, since no additional drilling or work has been completed on site since the 2008 drilling campaign and 2009 site visit. All new work included in the current technical report is laboratory test work and resource classification studies.



## 1.8 Mineral Process and Metallurgical Testing

The current option of the Roche Bay Magnetite Project, in accordance with the present technical report, is the production of 5 Mt marketable iron concentrate per year from the C-Zone ores, based on C-Zone indicated ore resources corresponding to the ore cut-off of 20% Fe (previously assumed ore cut-off 25% Fe). The geological block model indicates the following run of mine (ROM) iron grades versus the ore cut-off values (Table 1-1):

- Cut-off 20% Fe, ROM iron grade 26.74% (assumed 27% Fe); and
- Cut-off 25% Fe, ROM iron grade 28.74% (assumed 29% Fe).

The aimed quality of marketable Roche Bay iron concentrate is expressed by the following major chemical and physical characteristics: minimum 65% Fe; maximum 5% SiO<sub>2</sub>; maximum 0.1% S (assumed 0.07% S) and 0.035 mm size (P80).

The experimental basis of the mineral processing is constituted from previous SGS Lakefield test results and additional COREM (Québec) sulphide flotation tests developed on the two Roche Bay composite samples C1 and C2, sampled from the C-Zone of the Roche Bay ore deposit. The SGS Lakefield and COREM wet magnetic separation test results confirm the possibility of obtaining a final magnetic concentrate of minimum 65% Fe and maximum 5% SiO<sub>2</sub>, under efficient process conditions, from the Roche Bay ores >25% Fe. Consequently, the current ore cut-off 20% Fe (27% Fe in ROM) meets the aimed concentrate quality requirements. The sulphide flotation tests demonstrated the possibility of obtaining 0.03% to 0.04% S in final Roche Bay concentrate. The assumed level of 0.07% S is consequently ensured by the sulphide flotation process.

In conclusion, the final concentrate quality, in accordance with the available test results valid for 20% Fe ore cut-off, is obtained by the use of the previous process flowsheet and equipment proposed for the production of the iron concentrate by the NI 43-101 AEI Preliminary Economic Assessment (Dorval, 2010). Table 1-1 comparatively shows the major operating parameters in the case of the 20% Fe ore cut-off (ROM 27% Fe), 25% Fe ore cut-off (ROM 29% Fe) and 28% Fe cut-off (ROM 30% Fe, from NI 43-101 AEI Preliminary Economic Assessment, Dorval, 2010).

**Table 1-1: Material Balance and Major Chemistries vs. Ore Cut-Off**

| PARAMETER                                                    | VALUE        |             |             |
|--------------------------------------------------------------|--------------|-------------|-------------|
|                                                              | 20           | 25          | 28          |
| <b>Ore Cut-Off, % Fe</b>                                     | <b>20</b>    | <b>25</b>   | <b>28</b>   |
| ROM Iron Grade, <b>FH1</b> , %                               | <b>27</b>    | <b>28.7</b> | <b>30</b>   |
| ROM Sulphur Grade, <b>SH1</b> , %                            | 0.7          | 0.62        | 0.60        |
| Yearly ROM Production, <b>YHP1</b> , Mt/year                 | <b>18.47</b> | <b>0.62</b> | <b>0.60</b> |
| Hourly ROM Production, <b>HHP1</b> , t/hour                  | <b>2493</b>  | <b>2313</b> | <b>2006</b> |
| <b>Dry Magnetic Separation (COBBING)</b>                     |              |             |             |
| Cobbing Concentrate Iron Grade, <b>FC1</b> , %               | 32.36        | 32.61       | 33.11       |
| Pre-Concentrate Sulphur Grade, <b>SC1</b> , %                | 0.91         | 0.81        | 0.62        |
| Yearly Cobbing Concentrate Production, <b>YCP1</b> , Mt/year | 13.04        | 12.71       | 12.06       |
| Hourly Cobbing Concentrate Production, <b>HCP1</b> , t/hour  | 1756         | 1712        | 1625        |
| Cobbing Tailing Iron Grade, <b>FT1</b> , %                   | 14.22        | 14.87       | 16.65       |
| Yearly Cobbing Tailing Production, <b>YTP1</b> , Mt/year     | 5.46         | 4.46        | 2.81        |
| Hourly Cobbing Tailing Production, <b>HTP1</b> , t/hour      | 736          | 601         | 379         |
| Cobbing Weight Recovery, <b>WR1</b> , %                      | 70.47        | 74.01       | 81.09       |
| Cobbing Iron Recovery, <b>IR1</b> , %                        | 84.45        | 86.19       | 89.50       |



| PARAMETER                                                                | VALUE |       |       |
|--------------------------------------------------------------------------|-------|-------|-------|
| Wet Magnetic Separation (LIMS)                                           |       |       |       |
| LIMS Concentrate Iron Grade, <b>FC2</b> , %                              | 65.44 | 65.45 | 65.49 |
| LIMS Concentrate Sulphur Grade, <b>SC2</b> ,%                            | 1.50  | 1.26  | 0.86  |
| Yearly LIMS Concentrate Production, <b>YCP2</b> , Mt/year                | 5.39  | 5.36  | 5.29  |
| Hourly LIMS Concentrate Production, <b>HCP2</b> , t/hour                 | 728   | 723   | 713   |
| LIMS Tailing Iron Grade, <b>FT2</b> , %                                  | 8.96  | 8.60  | 7.81  |
| Yearly LIMS Tailing Production, <b>YTP2</b> , Mt/year                    | 7.63  | 7.33  | 6.76  |
| Hourly LIMS Tailing Production, <b>HTP2</b> , t/hour                     | 1029  | 989   | 912   |
| LIMS Weight Recovery, <b>WR2</b> , %                                     | 41.43 | 42.23 | 43.87 |
| LIMS Iron Recovery, <b>IR2</b> , %                                       | 83.79 | 84.77 | 86.77 |
| Sulphide Flotation                                                       |       |       |       |
| Final Concentrate Iron Grade, <b>FC3</b> , %                             | 65.99 | 65.90 | 65.79 |
| Final Concentrate Sulphur Grade, <b>SC3</b> , %                          | 0.07  | 0.07  | 0.07  |
| Yearly Final Concentrate Production, <b>YCP3</b> , Mt/year               | 5.0   | 5.0   | 5.0   |
| Hourly Final Concentrate Production, <b>HCP3</b> , t/hour                | 675   | 675   | 675   |
| Flotation Tailing Iron Grade, <b>FT3</b> , %                             | 58.44 | 59.12 | 60.26 |
| Yearly Flotation Tailing Production, <b>YTP3</b> , Mt/year               | 0.38  | 0.35  | 0.28  |
| Hourly Flotation Tailing Production, <b>HTP3</b> , t/hour                | 52.60 | 47.96 | 38.00 |
| Flotation Weight Recovery, <b>WR3</b> , %                                | 92.77 | 93.37 | 94.67 |
| Flotation Iron Recovery, <b>IR3</b>                                      | 93.55 | 94.01 | 95.10 |
| Global                                                                   |       |       |       |
| Global Weight Recovery, <b>GWR</b> , %                                   | 27.08 | 29.18 | 33.68 |
| Global Iron Recovery, <b>GIR</b> , %                                     | 66.19 | 68.69 | 73.85 |
| Total Yearly Wet Tailing Production, <b>YTPG</b> , Mt/year               | 8.03  | 7.70  | 7.05  |
| Total Hourly Wet Tailing Production, <b>HTPG</b> , t/year                | 1082  | 1037  | 950   |
| Global Wet Tailing Iron Grade (solid basis), <b>FTG</b> , %              | 11.36 | 10.93 | 9.90  |
| Global Wet Tailing Sulphur Grade (solid basis), <b>STG</b> , %           | 1.44  | 1.29  | 1.01  |
| Yearly Wet Tailing Production (slurry 50% solid), <b>SYTPG</b> , Mt/year | 16.04 | 15.40 | 14.11 |
| Hourly Wet Tailing Production (slurry 50% solid), <b>SHTPG</b> , t/hour  | 2163  | 2074  | 1900  |
| Global Wet Tailing Iron Grade (slurry), <b>SFTG</b> , %                  | 5.68  | 5.47  | 4.95  |
| Global Wet Tailing Sulphur Grade(slurry), <b>SSTG</b> , %                | 0.72  | 0.65  | 0.51  |

## 1.9 Mineral Resources

The April 6, 2011 Roche Bay C-Zone deposit Mineral Resource Estimate is the second NI 43-101 mineral resource estimate AEI has published for Roche Bay and was completed by Mr. Greg Greenough, P.Geo., (QP) and reviewed by Mr. Paul Palmer, P.Eng., P.Geo., (QP) and Mr. Greg Warren of Golder. The estimate incorporated data analysis, 3D solids modelling, variogram analysis and block model interpolation utilizing Datamine Studio v3 (Datamine) in extended (double) precision.

This resource estimate is an update to the April 24, 2009 independent NI 43-101 Mineral Resource Estimate submitted to AEI by Golder. The new estimate is based on the same number of drill holes (2007 and 2008 drilling programs), but with additional Satmagan results not previously available, as well as supporting Davis Tube test results, as recommended by Golder in the April 24, 2009 Technical Report.



## TECHNICAL REPORT - ROCHE BAY MAGNETITE PROJECT C-ZONE

Table 1-2 summarizes the results of the independent April 6, 2011 Mineral Resource Estimate for the C-Zone. It is based on 93 NQ drill holes and a total of 25,616 m. The mineral resource estimate used the following parameters:

- Samples were composited to 2.5 m lengths.
- Block model size was 10 m (E-W) by 50 m (N-S) and 20 m (elevation).
- All data and modelling was completed in the local drill grid (40° counter clockwise translation).
- One continuous mineralized envelope was interpolated from drill hole data only and was based on multiple BIF zones with some internal waste. The mineralized envelope dimensions is approximately 5 km in strike length, 160 m in average width with a depth of 300 m. The BIF zones are open to depth and on the ends of the deposit.
- The  $\text{Fe}_3\text{O}_4$  (magnetics) is based on Satmagan testwork that is corrected to 206 Davis Tube testwork samples located throughout the deposit.
- No metal grade capping of samples or corrections of high grade spreading was required based on the smoothness factor which was within acceptable industry practices.
- The mineral envelope was unfolded in Datamine to reduce the irregular shape of the deposits and allowed for a more robust variogram calculations and grade estimate.
- The resource is based on a Kriged estimate and variogram analysis of the drill hole data.
- Three searches were used to populate the block model based on the variogram assessment. The first search was 50 m (x) by 75 m (y) by 200 (z) in the unfolded grid. The second search was two times the first search and the third search was three times the first search. Octant restrictions were used to assist in de-clustering the data.
- The mineral resource was classified based on a drill density study completed by Golder (based on proposed annual production) and the Davis Tube testwork.

The mineral resources are reported at a total Iron (Fe) cut-off grade of 20% Fe to reflect the “reasonable prospects” for economic extraction, and the assumption that the C-Zone deposit can be extracted through open pit methods.

**Table 1-2: Mineral Resource Statement – Roche Bay C-Zone**

|                  | Tonnes<br>(000,000) | Fe    | $\text{Fe}_3\text{O}_4$ * | $\text{SiO}_2$ | $\text{Al}_2\text{O}_3$ | MnO  | $\text{P}_2\text{O}_5$ | S    | LOI  | $\text{Cr}_2\text{O}_3$ | $\text{Fe}_3\text{O}_4$ |
|------------------|---------------------|-------|---------------------------|----------------|-------------------------|------|------------------------|------|------|-------------------------|-------------------------|
| <b>Indicated</b> | 323.181             | 26.73 | 25.77                     | 50.85          | 2.86                    | 0.07 | 0.20                   | 0.70 | 0.81 | 0.02                    | 26.58                   |
| <b>Inferred</b>  | 226.264             | 25.85 | 23.85                     | 51.83          | 3.09                    | 0.07 | 0.20                   | 0.81 | 1.04 | 0.02                    | 24.51                   |

\*Magnetics ( $\text{Fe}_3\text{O}_4$  %) are the Satmagan results corrected to reflect Davis Tube test work.

Notes: Resources based on Fe Cut-off = 20%.

All grades in %.

No mining recoveries or dilution factors have been considered.



### 1.10 Conclusions

A second time independent NI 43-101 mineral resource has been completed for the Roche Bay Magnetite Property for AEI and is based on drilling information collected in the 2007-2008 exploration programs under the direction of AEI, magnetite test work, mineral interpretation and resource classification studies. A 2011 exploration drilling program is planned to continue to define additional resources and update existing resources. A feasibility study is currently underway and will be completed after the 2011 drilling campaign has been completed.

### 1.11 Recommendations

The following recommendations are provided for ongoing development of the Roche Bay Magnetite Property:

- Davis Tube metallurgical testing should be continued during the 2011 drilling campaign (1 in 20 or 25) to be representative of samples from the C-Zone as the project is advanced. Additional Davis Tube testing of 2007/2008 and 2011 samples are required in the fringes of the C-Zone (Sections 9200N to 9600N and 13400N to 14000N) prior to increasing the classification of these areas.
- Future drilling should consider further testing the BIF footwall and hanging wall zone areas in order to fully define the BIF mineralization and potentially increase the width of the overall C-Zone.
- Blanks and standards should be routinely included in all future sampling programs to validate the sample preparation and assaying. A site standard can be used from coarse rejects if sufficient testing is completed on the site standard.
- A selection of stored pulp (as a minimum 100 samples) should be selected from the 2007 and 2008 exploration programs for umpire testing as part of the AEI QA/QC program.
- Down hole surveys (non-magnetic) should continue to be carried out for all future drill holes.
- Future drilling programs should continue collecting geotechnical data in critical areas (i.e. proposed pit walls and known hydrogeological areas).
- Completion of the C-Zone surface geological mapping project that was initiated during the 2008 exploration program.

In addition to the above recommendations by Golder, AEI has ongoing studies. The work proposed includes an NI 43-101 mineral resource update, and continuation of environmental studies in support of the development of the Environmental Impact Study (EIS). AEI has initiated the development of the project feasibility study.

The Phase 2 work plan study includes a mineral resource update, completion of metallurgical test work for concentrating plant and direct reduction plant, an optimization project and mine design project, preparation of a project report description and submissions to regulators, commencement of the permitting, consultation and agreement process. The cost of the Phase 2 study is estimated by AEI to be US \$20,000,000.



## 2.0 INTRODUCTION

### 2.1 Purpose and Site Visit

Golder was commissioned by AEI to provide an updated independent mineral resource estimate for the C-Zone and technical report for filing with the security commission. The mineral resource estimate was completed in conformance with the CIM Mineral Resource and Mineral Reserve definitions referred to in NI 43-101, Standards of Disclosure for Mineral Projects. This is the second time an independent mineral resource estimate has been prepared for the C-Zone for AEI and is in support of the April 6, 2011 press release (AEI, 2011a). The updated mineral resource estimate (effective date of April 6, 2011) is based on additional metallurgical test work, updated mineral interpolation and a resource classification study. No additional drilling to the C-Zone has been completed, but the additional work completed has upgraded a material portion of the C-Zone from the Inferred classification to Indicated.

The C-Zone mineral resource estimate and technical report was completed under the supervision of QP, Mr. Paul Palmer, P.Eng., P.Geo., and Mr. Greg Greenough, P.Geo., of Golder. The drill density study was completed by Mr. Greg Warren of Golder under the supervision of Mr. Greg Greenough.

Mr. Palmer completed a site visit to the Roche Bay Magnetite Project (C-Zone) in 2006 and on August 26, 2009. During the 2009 site visit, Mr. Palmer reviewed core from the 2007 and 2008 drilling programs, observed BIF outcrops along the strike of C-Zone, reviewed areas for future development (plant site and sea port areas) and GPS surveyed in 12 drill hole collars from the 2007 and 2008 drilling programs. No site visit has been completed for this current technical report since no additional drilling or work has been completed on site since the 2008 drilling campaign and 2009 site visit. All new work included in the current technical report is laboratory test work and resource classification studies.

### 2.2 Source of Information

The sources of information that were provided in the preparation of the independent mineral resource estimate and technical report were provided by AEI under the direction of Mr. Steve Roebuck (Vice President Exploration) and from previous reports and are outlined as follows:

- 2011 Satmagan assay data from SGS Mineral Services in Lakefield, Ontario.
- 2011 Davis Tube assay data from SGS Mineral Services in Lakefield, Ontario.
- September 17, 2009 Technical Report (Palmer and Shaw, 2009).
- 2007 and 2008 drill hole data and other field data pertaining to the 2007-2008 explorations programs provided by AEI as Microsoft Excel files.
- 2007 and 2008 drill hole assay data provided by AEI from SGS Mineral Services in Lakefield.
- February 14, 2007 Technical Report (Palmer et al., 2007).
- Metallurgical data pertaining to the property in Section 16 from information provided by Mr. Florin Gheorghiu, Ph.D. Eng., Vice President of Engineering and Technology for AEI.

All units of measure (see Figure 2-1) used in this report are in the metric system, unless stated otherwise. Currencies outlined in the report are in Canadian dollars unless otherwise stated.



|                                          |                   |
|------------------------------------------|-------------------|
| Centimetre .....                         | cm                |
| Cubic centimetre .....                   | cm <sup>3</sup>   |
| Cubic metre .....                        | m <sup>3</sup>    |
| Degree .....                             | °                 |
| Degrees Celsius .....                    | °C                |
| Gram .....                               | g                 |
| Grams per tonne .....                    | g/t               |
| Greater than .....                       | >                 |
| Hectare (10,000 m <sup>2</sup> ) .....   | ha                |
| Iron .....                               | Fe                |
| Kilogram .....                           | kg                |
| Kilograms per cubic metre .....          | kg/m <sup>3</sup> |
| Kilograms per square metre .....         | kg/m <sup>2</sup> |
| Kilometre .....                          | km                |
| Kilometre per hour .....                 | km/h              |
| Less than .....                          | <                 |
| Metre .....                              | m                 |
| Metres above sea level .....             | masl              |
| Millimetre .....                         | mm                |
| Million .....                            | M                 |
| Million tonnes .....                     | Mt                |
| Ounce (troy ounce - 31.1035 grams) ..... | oz                |
| Percent .....                            | %                 |
| Pound(s) .....                           | lb                |
| Parts per million .....                  | ppm               |
| Parts per billion .....                  | ppb               |
| Square km .....                          | km <sup>2</sup>   |
| Square metre .....                       | m <sup>2</sup>    |
| Short Tons (907 kgs) .....               | tons              |
| Tonnes (1000 kgs) .....                  | t                 |
| Tonnes per day .....                     | t/d               |

*Figure 2-1: Units of Measure and Abbreviations*

### 3.0 RELIANCE ON OTHER EXPERTS

The authors have made no attempt to independently verify the legal status and ownership of the property claims and have relied on the information provided by AEI outlined in Section 4.0.

## 4.0 PROPERTY DESCRIPTION AND LOCATION

### 4.1 Property Location

The Roche Bay Magnetite Project is located immediately to the west of Roche Bay, approximately 60 km southwest of Hall Beach, Nunavut, Canada and located approximately 6 km from the tidal water along the east coast of the Melville Peninsula as illustrated on Figure 4-1. The Roche Bay Magnetite Project C-Zone is located on mining lease number 2953 (802.5 ha) with an approximate UTM NAD 27 location between 424000E, 7589000N and 428000E, 7593000N.



## 4.2 Mineral Tenure

The Roche Bay Magnetite Project consists of four non-continuous mining leases (2952, 2953 and 2954 and 2955) with a total area of 2231.9 ha as illustrated on Figure 4-1 (Note: mining lease number 2955 is located southwest of 2954). The distance from each mining lease is 1 km and 10 km southeast of the nearest lease. The mining leases' expiry date is July 23, 2021 and the details of the leases are listed in Table 4-1. The mining leases are currently 100% owned by Roche Bay (formally named Roche Bay Mining Corporation Company Ltd.) and AEI has completed a formal Agreement to continue earning up to 100 percent interest to Roche Bay Magnetite Project announced on April 1, 2009 (AEI, 2009).

In Nunavut, all mining lease boundaries are located by four corner posts and boundary posts (between the corner posts) that have been legally surveyed. Golder has not verified the location of the corner and boundary posts and has relied upon AEI that all posts are placed in accordance with the Indian and Northern Affairs Canada Acquiring Mineral Rights in Nunavut (Ministry of Indian Affairs and Northern Development, 2004).

**Table 4-1: Roche Bay Magnetite Project Mining Leases**

| Lease Number | NTS Sheet 1                | Expires Date  | Hectares |
|--------------|----------------------------|---------------|----------|
| 2952         | Lot 1 Group 1380<br>047A06 | July 23, 2021 | 908.5    |
| 2953         | Lot 2 Group 1380<br>047A06 | July 23, 2021 | 802.5    |
| 2954         | Lot 3 Group 1380<br>047A06 | July 23, 2021 | 402.3    |
| 2955         | Lot 4 Group 1380<br>047A06 | July 23, 2021 | 118.6    |

## 4.3 Ownership and Agreements

During fiscal 2007, the Company acquired the right to earn a 50.1% interest in the Roche Bay Iron Ore Project located near Roche Bay, on the eastern Melville Peninsula, Nunavut Territory from Roche Bay plc pursuant to an Option Agreement between AEI and Roche Bay plc dated January 29, 2007, as amended.

Under the Option Agreement to earn up to 50.1%, AEI paid Roche Bay plc \$250,000 and issued 8,000,000 Rights (the "Rights") at an exercise price of \$0.35 per Right in 2007. The Company was to issue a further 2,000,000 Rights at an exercise price of \$0.60 per Right upon completion of 15,000 metres of drilling. A further 2,000,000 Rights were issuable at an exercise price of \$1.00 per Right upon the completion of both (a) a total of 30,000 metres of drilling and (b) a NI 43 101 compliant pre feasibility study based on an envisioned minimum 6 million tonne per year mining operation containing a resource estimate of at least 750,000,000 tonnes of iron ore in the aggregate among the "measured" and "indicated" categories. The second tranche for 2,000,000 Rights was not issued upon completion of the 15,000 metres of drilling due to amendments to the original option agreement as noted below.

In July 2008, AEI announced an amendment to the Option Agreement with Roche Bay Plc that would allow the AEI to earn up to 70% of the Roche Bay Project. The July 2008 amendment was subsequently replaced by the AEI with a signed Memorandum of Understanding with Roche Bay plc dated December 3, 2008, which was later finalized on April 1, 2009 with the completion of the Definitive Agreement.



The Definitive Agreement granted AEI the option to acquire the remaining 85% of the right, title and interest in and to the Mining Property from Roche Bay Plc. The Definitive Agreement required additional payment of \$365,000 in 2009, payment of \$275,000 in each of 2010, 2011 and 2012, and the issuance of either 4,000,000 shares or 6,000,000 share purchase warrants with an exercise price of \$0.20 for the purchase of one share. All future rights to be issued to Roche Bay Plc in accordance with the previous agreement were cancelled.

In July 2009, the Definitive Agreement was approved by the TSX Venture Exchange and 4,000,000, Company shares which form part of the additional payments were issued to Roche Bay Plc. The Definitive Agreement replaced the Amended and Restated Option and Farm-Out Agreement dated May 30, 2007 between AEI and Roche Bay Plc. As a result of finalizing this Definitive Agreement, the Company may:

- Acquire Roche Bay Plc's interest in the Leases subject to: (i) a retained 4% Gross Overriding Royalty (GOR) on iron products (such as nuggets) having greater than 90% iron content; (ii) a 6% GOR on iron products (such as concentrates and pellets) having less than 90% iron content; and (iii) a 10% GOR on by-product precious metals (the "Royalty"); or
- Purchase Roche Bay Plc's interest in the Leases outright, and terminate the Royalty if effective, for a lump sum payment of \$25,000,000 on or before March 15, 2010 or \$30,000,000 after March 15, 2010 and on or before March 15, 2011.

As the Buy-Out Option was not exercised, AEI will thereafter has the right to buy out 50% of the Royalty (other than the precious metals royalty) before December 31, 2020 for a total payment of \$35,000,000 plus an inflation adjustment, allowing the Company to effectively reduce the GOR on iron products to 2% on nuggets and 3% on concentrates/pellets, respectively.

Subsequent to year end, AEI announced that it has agreed to terms for a new Buy-Out Option for the Roche Bay Project with Roche Bay Plc. As a result of recent discussions, AEI and Roche Bay Plc have amended their Royalty Agreement and finalized a New Buy-Out Option to enable AEI to reduce any existing royalty to 1.875% on all mineral products (except precious metals).

At its election, AEI will have the opportunity to reduce the royalty rate by making a payment of \$22,500,000 to Roche Bay Plc by August 5, 2011. In doing so, AEI will reduce all royalties to 1.875% on all mineral products except any precious metals (such as gold) which was reduced to 3.9%. All other terms and conditions set out in AEI's agreement with Roche Bay Plc will remain the same. If the New Buy-Out Option is not exercised, the previous will continue to apply. Any amendments remain subject to TSX Venture Exchange approval.

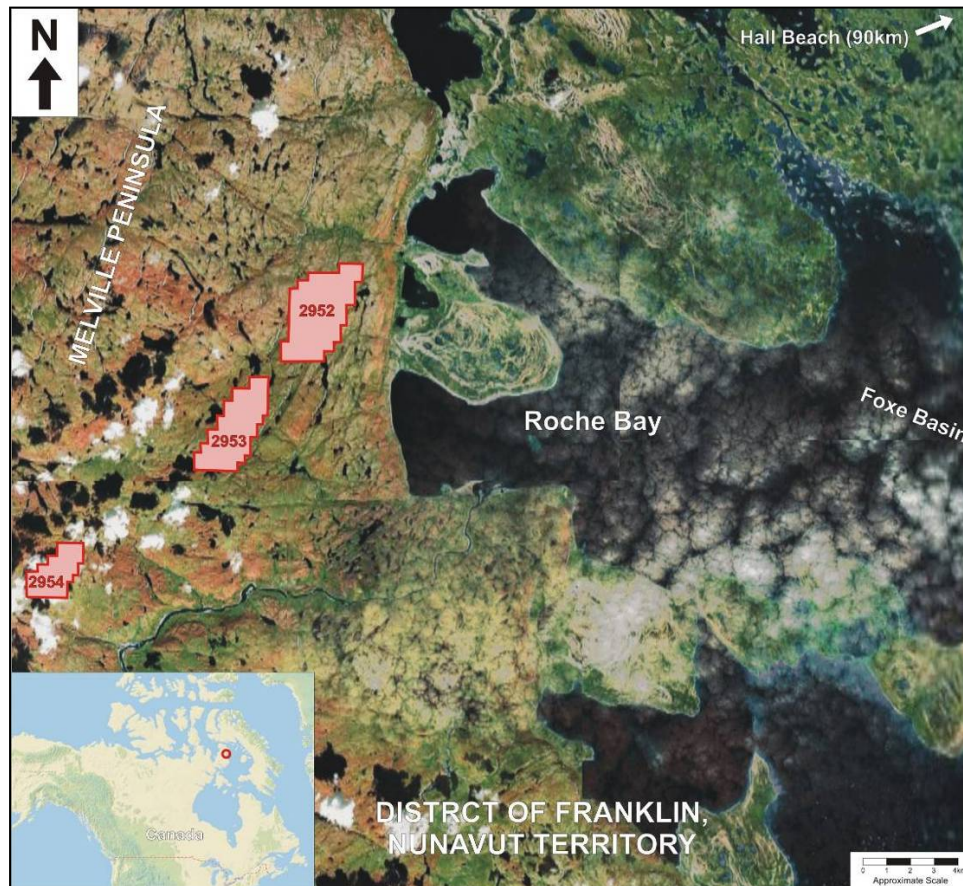


Figure 4-1: Roche Bay Magnetite Project Location and Mining Leases

Note: After Mining Recorder Nunavut Regional Office, 2006. Mineral Claim Sheet 47A6  
(Mining Lease 2955 Located Southwest Mining Lease 2954)

### 4.4 Location of Mineralized Zones

The iron formations of the Roche Bay Magnetite Project are divided into 5 areas (mineralized zones) labelled throughout this report A, B, C, D and E-Zones. In earlier reports, these areas have also been labelled as Deposits or Areas A (Adler), B, C, D and E. For consistency in the report, these will be referred to A, B, C, D and E-Zones and are located within the mining leases outlined in Table 4-1.

The mineral resource estimate defined in this report is only on the C-Zone.

### 4.5 Environmental Liabilities and Permits

AEI has advised Golder that there are no known environmental issues or liabilities on the Roche Bay Magnetite Project and that all the proper permits required to conduct exploration activities on the property were obtained.



## **5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY**

### **5.1 Accessibility**

The Roche Bay Magnetite Project is located immediately to the west of Roche Bay, approximately 60 km southwest of Hall Beach, Nunavut, Canada and located approximately 6 km from the tidal water along the east coast of the Melville Peninsula. This area of Canada is remote and north of the Arctic Circle. Access to the property is currently seasonable, between the spring (April) and fall seasons (November). During the exploration programs completed by AEI access to site was via plane, helicopter and boat from the nearby hamlet of Hall Beach. Both supplies and camp personnel were transported this way. Hall Beach has regular commercial air service six days a week. This service depends on the weather.

### **5.2 Climate**

The daily average temperatures from December to March are -27°C to -33°C. During the summer, the average daily temperature ranges between 1°C to 5°C. However, temperatures can reach as high as 16°C in the summer. Annual precipitation averages about 23 cm (9 inches). Fifty percent of the annual precipitation falls during the months of July, August and September. Total snowfall for the year averages 124 cm. Owing to the relative uniformity of the prevailing winds, snow accumulates in large drifts at any break point in the wind (Harper, 1984). Table 5-1 summarizes the average daily temperatures for Hall Beach town (Environment Canada, 2007). The length of the exploration operating season is between spring (April) and fall (November) with currently no safe access to site during winter.

**Table 5-1: Average Temperature for Hall Beach, Nunavut 1970-2000  
(Environment Canada, 2007)**

| <b>Temperature</b> | <b>Daily Average<br/>(°C)</b> | <b>Standard Deviation</b> | <b>Daily Maximum<br/>(°C)</b> | <b>Daily Minimum<br/>(°C)</b> |
|--------------------|-------------------------------|---------------------------|-------------------------------|-------------------------------|
| January            | -31.8                         | 3.5                       | -27.8                         | -35.7                         |
| February           | -33.2                         | 3.5                       | -29.2                         | -37.2                         |
| March              | -29.2                         | 2.8                       | -24.7                         | -33.7                         |
| April              | -20.4                         | 2.8                       | -15.2                         | -25.6                         |
| May                | -9                            | 2.3                       | -4.8                          | -13.2                         |
| June               | 0.7                           | 2.1                       | 3.3                           | -1.9                          |
| July               | 6.1                           | 1.4                       | 9.4                           | 2.8                           |
| August             | 4.7                           | 1.1                       | 7.4                           | 1.8                           |
| September          | -0.3                          | 1.3                       | 1.6                           | -2.2                          |
| October            | -9.5                          | 3.2                       | -6.3                          | -12.6                         |
| November           | -20.2                         | 3.4                       | -16                           | -24.3                         |
| December           | -27.5                         | 3.8                       | -23.4                         | -31.5                         |
| Year               | -14.1                         | 1.4                       | -10.5                         | -17.8                         |



## **5.3 Physiography**

The Roche Bay Magnetite Project falls within two main physiographic regions of Canada. The low-lying peninsula that extends into Roche Bay ("the Roche Bay Peninsula") is part of the Foxe Basin region of the interior plains. The more rugged upland areas are part of the Canadian Shield. The summary of the physiography of the Roche Bay Magnetite Project area is taken directly from a report by Harper (1984) and is described in the following sections.

### **5.3.1 Shield Region**

The upland areas are composed of metamorphic and igneous rocks. This dissected upland rises abruptly from the plain to an elevation of more than 200 m and forms a modified escarpment trending north south. The surface of the upland area rolls gently to the west and becomes mountainous (500+ m) within 20 km of the west coast of the peninsula. The mountainous area of western Melville Peninsula forms the drainage divide, with many large deeply entrenched streams flowing west to Committee Bay. Melville Peninsula was glaciated during the last glacial period, and a thin (1-2 m) veneer of till was deposited. The till is generally silty and buff to grey in colour. The till is derived from local rocks and thus is largely composed of shield type material. Owing to the lack of vegetation, there has been extensive surface washing of the till resulting in the removal of fines, leaving the ground surface littered with boulders. Existing and abandoned streams tend to concentrate boulders in their stream beds.

During the previous glaciation (110 Ka to 10 Ka), the land mass was depressed and wave action modified the landscape to an elevation of at least 110 m above sea level. At elevations below the marine limit, the till has been reworked into beaches or been completely eroded. The beaches consist of coarse pebbles and cobbles. The entire fine fraction has been removed by wave action. The beach at the highest elevation is generally poorly developed, tends to be relatively flat and is capable of supporting vegetation. An organic mat up to 0.10 m thick has formed on these areas.

### **5.3.2 Foxe Basin Region**

The Roche Bay Peninsula extending into Roche Bay is underlain by relatively flat-lying Palaeozoic sedimentary rocks. This plain has an elevation of less than 30 masl in the vicinity of the base camp, and is up to 60 km wide at Hall Beach. Shallow lakes, swamp, and sand and gravel deposits cover the area. As the sea level dropped following deglaciation, the upper surface of the dolomite and limestone rocks was frost-shattered and wave worked into beaches. A single drill hole that penetrated the beaches indicated that the beach material was at least 3 m thick. The beaches are extensive and, owing to their mode of formation, tend to form closed depressions. Relict bedrock structures have been identified in the interbeach areas. These structures suggest that the overburden layer in the interbeach regions may be relatively thin. The beach tops tend to be well drained, dry and devoid of vegetation, and the interbeach terrain is wet and capable of supporting vegetation.



### 5.4 Infrastructure and Other Local Resources

There is no permanent infrastructure on the project site other than the gravel air strip located northeast of the core storage area and the dock area as illustrated on Figure 5-1. The 2007 and 2008 and current exploration main camp is located in the C-Zone deposit and approximately 8 km west of the peninsula area. All required infrastructure for exploration is already on site and used each field season. Power for the exploration programs was provided by generators and water was supplied from surface local rivers.

The nearest population centre is the hamlet of Hall Beach located 60 km to the northeast of the Roche Bay camp. Hall Beach has a population of 543 and is one of the longest permanently populated communities north of the Arctic Circle. Hall Beach is a northern transportation centre with a commercial-grade airport which can accommodate large jetliners with commercial flights 6 days a week. Growth in the Hall Beach area is projected to rise in the near future. The community of Igloolik, located on an island north of Hall Beach, has a population of 1,500 and is also a major area of resources (people and supplies) to the area. The majority of the Hall Beach and Igloolik population is Inuit with both Inuktitut and English languages spoken.

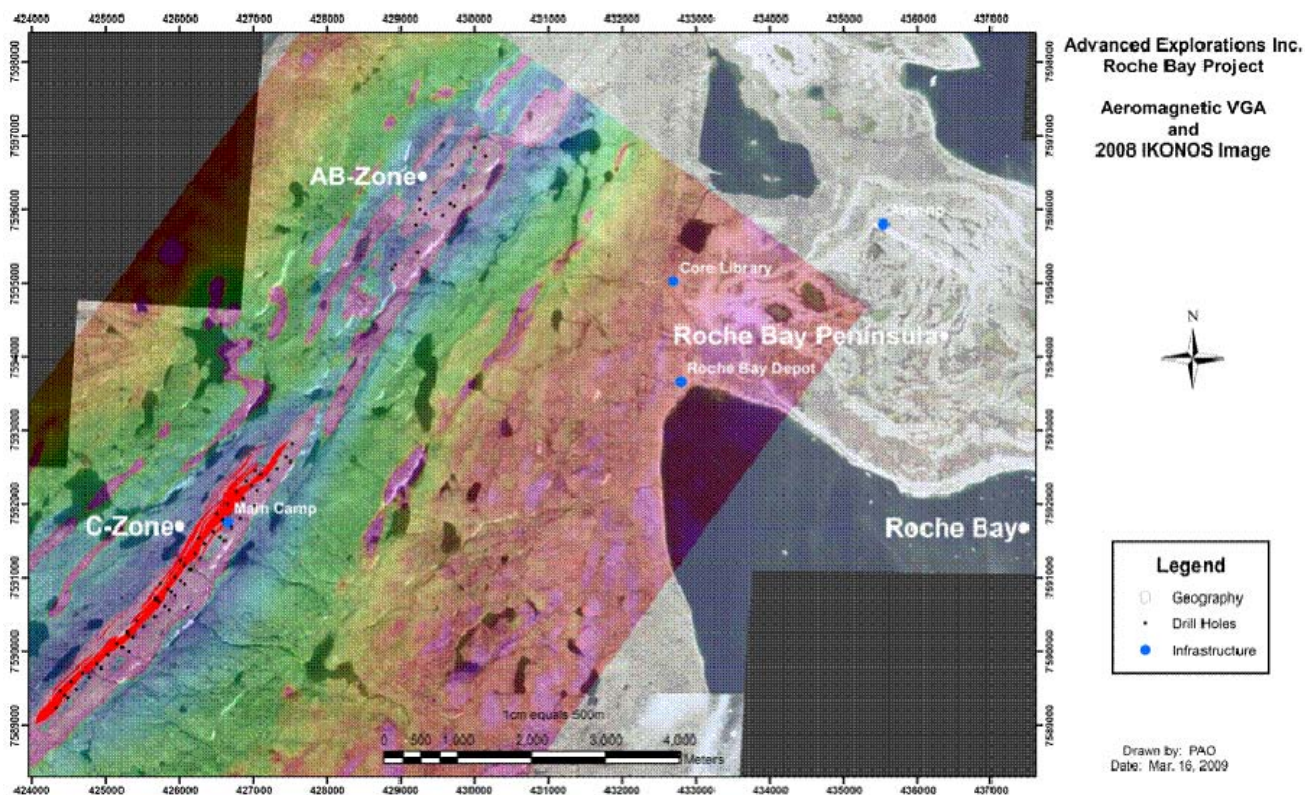


Figure 5-1: 2008 IKONOS Image of Roche Bay Magnetite Project



## 6.0 HISTORY

The documented history of the Roche Bay Magnetite Project is based on reports by Harper (1984) and Ursel (1968, 1969 and 1970) and the 2007 and 2009 Technical Reports (Palmer et al., 2007 and Palmer and Shaw, 2009).

### 6.1 Historical Exploration

The historical exploration activities for the Roche Bay Magnetite Property have taken place between 1968 and 2006.

All historical exploration prior to 2006 were completed under the direction of Borealis Exploration Ltd. (Borealis) which was a direct predecessor of Roche Bay and the exploration activities completed in 2006 were under the direction of Roche Bay.

In general, initial exploration consisted of surface and airborne geophysical surveys, surface mapping and sampling, trenching and 16 BQ core holes in 1982 (3,214 m). The 1982 core drilling focussed on the A and B-Zones, with only one hole drilled in the C-Zone. Drill core and surface samples from the historical exploration programs were metallurgical tested to determine iron content, liberation and concentration methods (Davis Tube testing). Half core samples from the 1982 drill program are stored on the property (Palmer et al., 2007).

In 2006, Roche Bay commenced exploration activities that included surface mapping and 3 AWX shallow core holes (53.94 m). The core from the 2006 drilling and a selection of core from the 1982 drilling program were metallurgical tested to determine iron content, liberation and concentration methods.

All exploration activities have been previously summarized in the 2007 Technical Report (Palmer et al., 2007) including the 2006 exploration activities undertaken by Roche Bay. Those exploration activities conducted prior to the commencement of the 2007 field season are considered historic and have not been used in the 2009 mineral resource estimate.

### 6.2 Historical Tonnage and Grade Estimate

Historical tonnages for the Roche Bay Magnetite Property were estimated in 1968 and updated annually until 1970 by Ursel. The tonnages were updated again in 1984 by Underhill (Palmer et al., 2007) and are reproduced in Table 6-1.

**Table 6-1: 1984 Historical Tonnages Estimated by Underhill  
Roche Bay Magnetite Project**

| Zone      | Tonnage       |
|-----------|---------------|
| A (Adler) | 158,000,000   |
| B         | 309,000,000   |
| C         | 426,000,000   |
| D         | 160,000,000   |
| E         | 86,000,000    |
| Total     | 1,139,000,000 |



Underhill (Harper, 1984) calculated these historical tonnages based upon surface geological mapping of the bedrock outcrops and the metallurgical testing of rock and bulk samples. The % Fe grade of the BIF tonnage estimated by Underhill was between 23% and 34% Fe (Palmer et al., 2007).

The specific data used to calculate the historical tonnages and grades were not available and have not been confirmed by Golder (Palmer et al., 2007). The historical tonnage and grade estimate was considered by Golder to be a historical estimate as a Qualified Person had not done sufficient work to classify the historical estimates as current mineral resources for AEI. The historical estimates should not be relied upon and have been provided for the purpose of documentation of previous work.

### 6.3 2009 Mineral Resource Estimate

A first time mineral resource estimate was completed for the C-Zone and was published in the 2009 Technical Report (Palmer and Shaw, 2009). Table 6-2 summarizes the results of the independent March 12, 2009 Mineral Resource Estimate for the C-Zone for total iron cut-off grades between 20% and 30%. An Inferred Mineral Resource of 357.0 million tonnes at an average grade of 28.07% total iron and 28.57% magnetics ( $\text{Fe}_3\text{O}_4$ ) using a 25% iron cut-off grade to a depth of 250 m below surface was reported for the C-Zone.

**Table 6-2: March 12, 2009 Roche Bay Magnetite Project  
Mineral Resource Estimate – Inferred Resource**

| Cut-off Grade Fe (%) | Tonnes (Mt)* | Total Fe (%) | Magnetics (%)** | $\text{SiO}_2$ (%) | $\text{Al}_2\text{O}_3$ (%) | MnO (%)     | $\text{P}_2\text{O}_5$ (%) | S (%)       | LOI (%)     |
|----------------------|--------------|--------------|-----------------|--------------------|-----------------------------|-------------|----------------------------|-------------|-------------|
| 20                   | 500.3        | 26.76        | 25.62           | 51.17              | 2.87                        | 0.07        | 0.20                       | 0.77        | 0.82        |
| 22                   | 481.9        | 26.97        | 26.04           | 51.07              | 2.79                        | 0.07        | 0.20                       | 0.76        | 0.79        |
| 24                   | 414.5        | 27.59        | 27.39           | 50.71              | 2.59                        | 0.07        | 0.20                       | 0.73        | 0.69        |
| <b>25</b>            | <b>357.0</b> | <b>28.07</b> | <b>28.57</b>    | <b>50.37</b>       | <b>2.44</b>                 | <b>0.07</b> | <b>0.20</b>                | <b>0.71</b> | <b>0.62</b> |
| 26                   | 287.7        | 28.70        | 30.09           | 49.88              | 2.27                        | 0.06        | 0.20                       | 0.67        | 0.54        |
| 28                   | 157.2        | 30.17        | 33.66           | 48.67              | 1.92                        | 0.05        | 0.20                       | 0.59        | 0.33        |
| 30                   | 72.3         | 31.63        | 37.10           | 47.52              | 1.64                        | 0.05        | 0.20                       | 0.50        | 0.07        |

Notes:

\* All values rounded to the nearest 100,000 Tonnes.

\*\* Magnetism is reported directly by SGS Mineral Services at the Lakefield laboratory as %  $\text{Fe}_3\text{O}_4$  and is the percentage of contained magnetism based on Satmagan testwork. It assumes that all recovered material is magnetite. Golder accepts this as reasonable considering the pyrrhotite content is low as demonstrated by the sulphur assays.

The updated mineral resource estimate for the C-Zone has been developed by Golder and is detailed in Section 17.

### 6.4 Preliminary Economic Assessment

A Preliminary Economic Assessment (PEA) was completed for the C-Zone based on the 2009 Mineral Resource Estimate and was published on March 4, 2010 (Dorval, 2010). The details of the PEA can be reviewed in the March 4, 2010 Technical Report (Dorval, 2010). A summary of the topics outlined in the PEA Technical Report are as follows:



- Open pit mine design and production schedule of the C-Zone North;
- Operations and infrastructure, mining equipment, mine personnel;
- Preliminary flowsheet for an Iron Nugget Plant;
- Power generation and distribution;
- Port and shipping concepts;
- Environmental Considerations;
- Market Analysis and Market Concept;
- Cost Estimate, Financial Analysis and Investment Appraisal; and
- Risk Analysis.

## 7.0 GEOLOGICAL SETTING

The geological setting descriptions of the Roche Bay Magnetite deposit has been provided directly from reports by van Evendingen (1982), Ford (1982), Harper (1984) and the 2007 and 2009 Technical Reports (Palmer et al., 2007 and Palmer and Shaw, 2009). The following is a summary of the geology setting for the Roche Bay Magnetite by previous authors with update from exploration activities completed by AEI.

### 7.1 Regional Geology

The east-central portion of the Melville Peninsula is underlain by Precambrian rocks of the Churchill Structural Province in the interior, and Phanerozoic strata along the coast and eastward across the Foxe Basin.

The Precambrian rocks are predominantly Archean and Aphebian granitoids (both massive and foliated) with narrow elongated belts of Archean supracrustals cutting across the peninsula in a northeast direction, which is concordant with the main structural grain in this part of the Canadian Shield. These belts consist of a suite of rocks known as the Prince Albert Group which consist of a sequence of Aphebian (early Proterozoic) or Archean metamorphosed sedimentary and volcanic rock (greenstones) exposed mainly in two belts on the Melville Peninsula and one belt southwest of Committee Bay. Subsequent work has shown these rocks to be Archean. The rocks are predominantly metavolcanics, which vary in composition from dark-coloured basaltic rocks through intermediate dacite to light-coloured rhyolite.

Three phases of diabasic dyke rocks are present, ranging in age from possible Archean to Upper Proterozoic.

The Phanerozoic rocks consist of Cambrian-Ordovician massive micritic limestone, sandstone, dolomite and dolomitic limestone.

Illustrated on Figure 7-1 is the regional geology of the Melville Peninsula and Baffin Island area of Nunavut (Jackson and Berman, 2000).



## 7.2 Local and Property Geology C-Zone

The local geology of the iron deposits for the Roche Bay Magnetite Project has been described by Ursel (1968, 1969 and 1970), van Evendingen (1982), Ford (1982) and Harper (1984) and is summarized in the 2007 Technical Report (Palmer et al., 2007). The Roche Bay Magnetite Project lies in the Churchill Province of the Canadian Shield on the Melville Peninsula as illustrated on Figure 7-1. Roche Bay formations represent upper green schist to lower amphibolite facies, and have undergone extensive metamorphism at temperatures between 500°C and 700°C. The age of these rocks has been determined to be in the range of 1,580 to 2,900 million years before present. Two periods of folding have occurred, one with a northwest-southeast axis, and the other with a northeast-southwest axis (Ford, 1982).

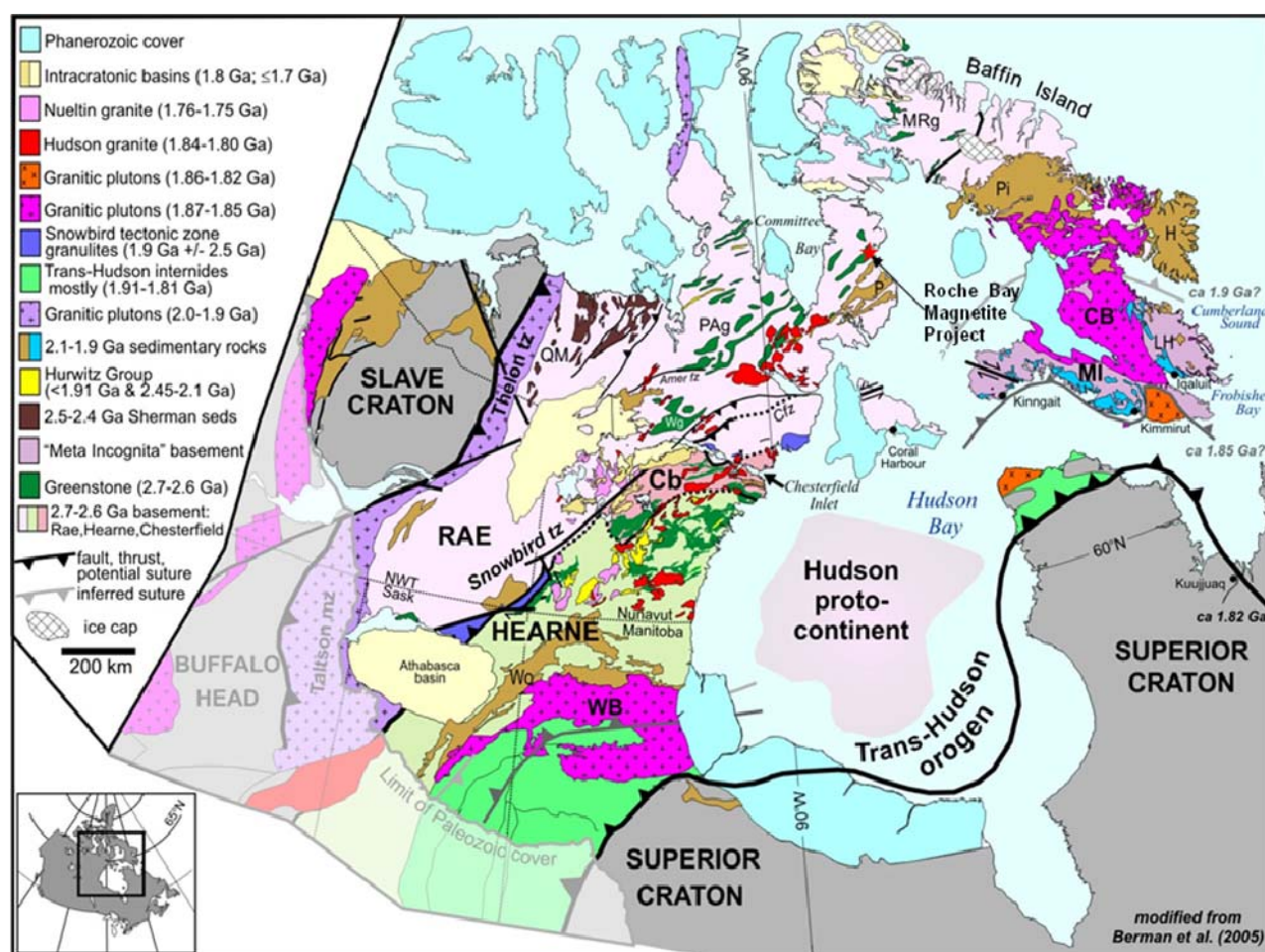


Figure 7-1: Regional Geology of the Melville Peninsula and Baffin Island Area of Nunavut (Jackson and Berman, 2000)

Illustrated on Figure 7-2 is a property geology map of the C-Zone completed by Compton et al. (2008). The BIF horizons illustrated on Figure 7-2 are bound to the west by metasediments and schist units and to the east by gabbro (metagabbro), serpentine and metasediment units. North of the C-Zone are metavolcanics and south of the C-zone are granitic gneiss. It appears that all units were turned on end and isoclinally folded. A series of steeply dipping faults cut the now near vertical dipping beds. Uplift and erosion have removed evidence of fold hinges (Ford, 1982).



## TECHNICAL REPORT - ROCHE BAY MAGNETITE PROJECT C-ZONE

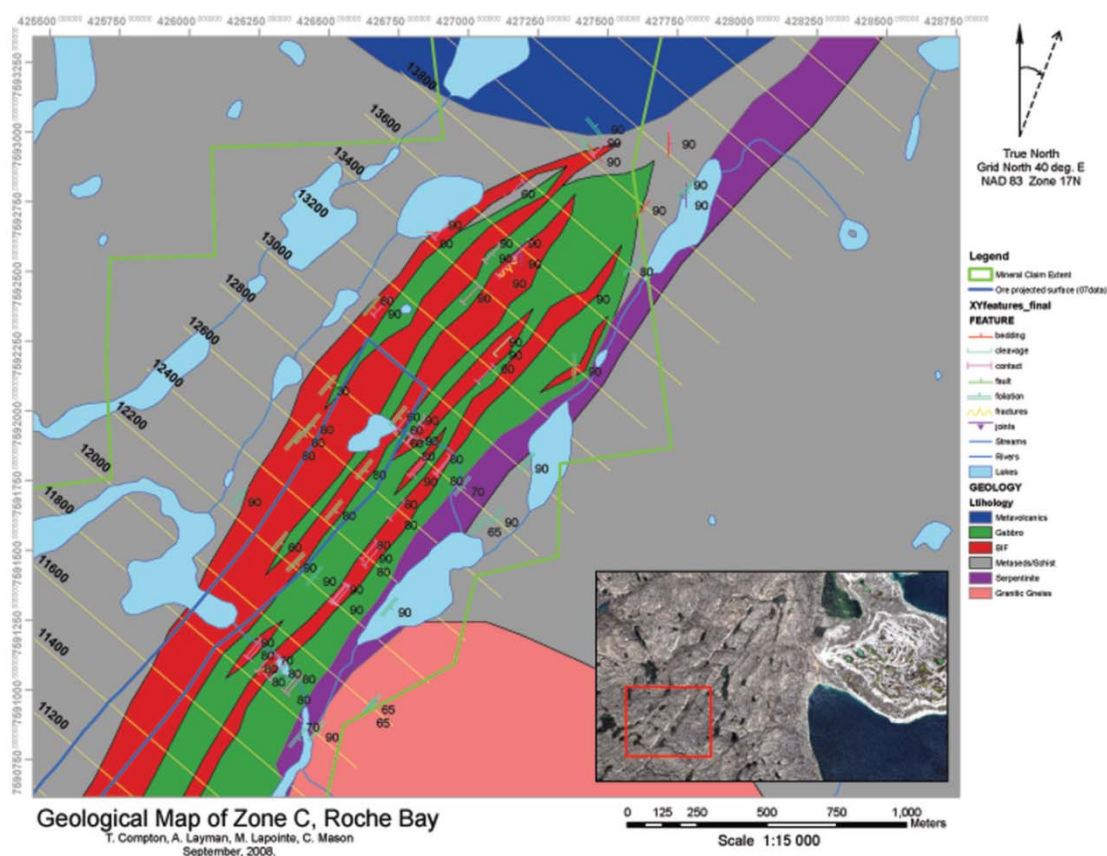


Figure 7-2: Property Geology (Compton et al., 2008)

Property scale structures observed by Harper (1984) identified bedrock outcrop pattern showing the regional NE-SW main structural trend with nearly vertical dips and foliations. Occasionally, the dip angles vary from near-vertical down to 60° to 70°. Many faults and folds are present, but the vertically dipping nature of the bedding and foliation made structural interpretation difficult.

Locally, the faulting can be divided into two major groups depending on trend:

- NE-SW faults with an average trend of 30° to 40° (no dip direction stated in report). The fault planes are parallel to the regional strike and are generally vertical. Relative motion is impossible to assess but, in proximity to these faults, the local rock units are more sheared and finer-grained.
- NW-SE trending faults averaging 1,200 m in length. Both sinistral and dextral strike-slip faults are present, and just south of Area C an offset of up to 800 m can be noted in the Prince Albert Group. The north end of the Area A terminates against one of these faults.

Small-scale faulting (up to 1 m) was observed by Harper (1984) in slump structures within the iron formation. This faulting was reported as syndepositional, occurring while the iron formation was still capable of soft sediment deformation.



Small-scale folding (on the order of a few centimetres) is abundant within the iron formation and, with its alternating black and white bands, it is an ideal rock type to illustrate this small-scale folding. The folds are probably a result of soft sediment deformation (slumping). Chevron and isoclinal folding on the same scale probably represent the regional fold pattern. Occasionally, three phases of folding can be noted at the bedrock outcrop scale (Harper, 1984).

### 8.0 DEPOSIT TYPE

The Roche Bay Magnetite Project has been classified as an Algoma type BIF. The iron formation is characterized by well-laminated rock consisting predominantly of alternating magnetite and white quartz bands. On fresh surfaces, this banding has been described as visually striking, clearly showing microstructures such as small folds and minor displacement. Weathered surfaces are commonly steel black with occasional rusty zones. The rocks have been recrystallized but are still fine grained. Essential minerals are quartz (recrystallized chert) and magnetite. In addition, the iron formation contains silicates such as amphiboles, micas, and chlorite, which together may form up to 40% of the rock. Amphiboles present include grunerite, actinolite and hornblende. Chlorite is occasionally associated with magnetite, and biotite and muscovite may also be present. Sulphide mineralization is dominated by pyrite and pyrrhotite with traces of chalcopyrite and arsenopyrite. The thickness of each band in the iron formation ranges between 1 m to 1 mm but is generally from 5 to 20 mm. There is also often a thickness variation between adjacent bands.

The Roche Bay iron formation deposits have been compared to the Algoma type iron formation deposits by Harper (1984) which is reproduced in Table 8-1.

**Table 8-1: Comparison Table - Algoma-Type and Roche Bay Magnetite Deposits**

| <b>Algoma-Type Iron Formation</b>                                                                                                                                                            | <b>Roche Bay Magnetite Deposit</b>                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Present in Archean volcanic and sedimentary rocks of the Canadian Shield                                                                                                                     | Present in Archean volcanic and sedimentary rocks of the Canadian Shield                                                                                                                                                                                                                  |
| Characteristically thin-banded or laminated with interlayered bands of ferruginous grey or jasper chert and hematite and magnetite                                                           | Jasper chert and hematite rare in east Melville deposits, more common in west Melville Deposits                                                                                                                                                                                           |
| Chemically precipitated sediment                                                                                                                                                             | Chemically precipitated sediment                                                                                                                                                                                                                                                          |
| Individual members range for more than 100 m to less than 1m thickness                                                                                                                       | Individual members range for more than 100 m to less than 1 m thickness.                                                                                                                                                                                                                  |
| Individual members rarely extend more than a few km along strike, but may be linked together or distributed en echelon                                                                       | Individual members rarely extend more than a few km along strike, but may be linked together or distributed en echelon.                                                                                                                                                                   |
| Massive siderite and carbonate beds, iron silicate mineral facies (glauconite, chamosite) and iron— sulphide mineral facies (pyrite, pyrrhotite) present but less abundant than oxide facies | Calcite is often present (predominantly in microfractures) in wall rock, but less common in the banded iron formation. No massive carbonate beds observed. No siderite observed. No glauconite or chamosite observed. Pyrite and pyrrhotite are present occasionally up to a few percent. |



| Algoma-Type Iron Formation                                                                                                                                                               | Roche Bay Magnetite Deposit                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intimately associated with various volcanic rocks including pillowed andesite, tuffs, pyroclastics, or rhyolite flows, and with greywacke, grey-green slate, or black carbonaceous slate | Metabasalt and possibly minor tuffs, and pyroclastics are present; rhyolite absent in this region. The dominant sedimentary rocks are quartzite and quartz-biotite schist (plus greenstones associated with the mafic volcanics). Some black slate or argillite is present (inter-bedded with quartzite and iron formation). |
| Tuff and fine-grained elastic beds or ferruginous cherts are inter-bedded with the iron formation                                                                                        | Argillite is interbedded with the iron formation. Inter bedded quartzite occurs at the margins.                                                                                                                                                                                                                              |
| Zonal relationships: sulphide-carbonate-oxide facies                                                                                                                                     | Only oxide facies observed                                                                                                                                                                                                                                                                                                   |
| In general, the iron formation overlaps the bulk of the acidic volcanic and in turn is covered by andesitic volcanics and associated greywackes                                          | Iron formation interbedded with greenstone metasediments and associated with metabasalt. Acid volcanics absent in the immediate area, but present elsewhere in the greenstone belt.                                                                                                                                          |

## 9.0 MINERALIZATION

The Roche Bay Magnetite Deposit is a BIF that occurs in linear deposits in a belt of steeply dipping folded and faulted volcanics and sediments of Archean age. Five iron formations or zones have been defined on the Roche Bay Magnetite Project with the majority of the current exploration concentrated on the C-Zone and minor historical exploration concentrated on B, C, D and E-Zones.

These zones are generally characterized by alternate bands of magnetite and silica, ranging in thickness from 1 m, down to 1 mm. The dips of the deposits are generally sub-vertical to steeply dipping and strike NE-SW. Current exploration activities by AEI are on the C-Zone which currently covers a strike length of 4.8 km and has been outlined to a depth of over 250 m below surface, for the mineral resource estimate, even though iron mineralization was intercepted to a depth of 540 m below surface. The geological interpretation from the 2008 surface mapping, the 2006 airborne geological survey and information from the 2007 and 2008 drilling programs have outlined five BIF horizons within the C-Zone as illustrated on Figure 9-1. These BIF horizons have been labelled the Hanging Wall (HWX), Main (MAIN), Footwalls 1, 2 and 3 (FW1, FW2 and FW3). These BIF horizons have been defined by AEI geological staff based on a combination of marker stratigraphic lithological units, varying amounts of silica zones, Fe% content in the BIF zones and other mineral contents (sulphur). The 2011 Mineral Resource Estimate for the Roche Bay Magnetite Property is based entirely on the C-Zone mineralization, which consists of one overall envelope defining the Main, FW1 and FW2 horizons.

Based on the drilling samples assayed from the 2007 and 2008 exploration programs, the total iron content (as magnetite) assayed in the C-Zone horizons varied between 3% Fe (in silica rich units) to a maximum of 63% Fe with means between 25% to 28% Fe for the MAIN and FW1 and FW2 horizons.

Sulphide mineralization (percentages unknown) has been observed in some areas of the BIF (core and outcrops) and is dominated by pyrite and pyrrhotite with traces of chalcopyrite and arsenopyrite (van Huyssteen and Lakshmanan, 1984). Additionally, the presence of trace amounts of silver and gold has also been identified on the property from historical reports, but has not been the focus of current exploration by AEI.

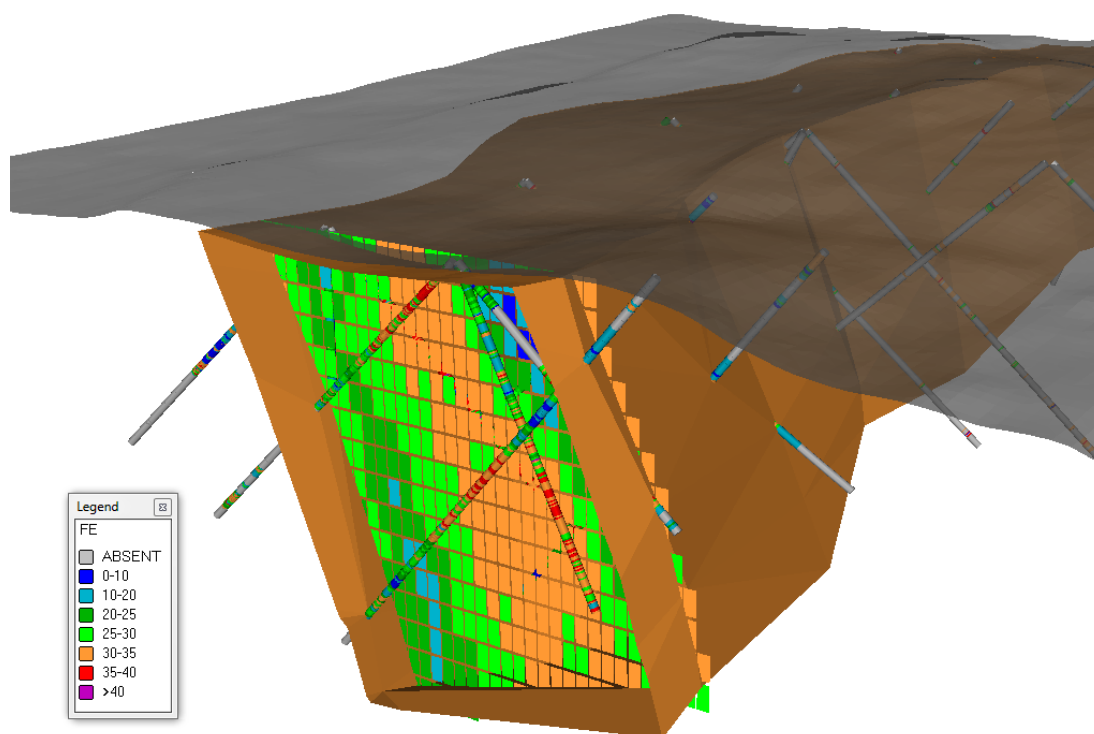


Figure 9-1: Roche Bay Magnetite Project Isometric View (looking north-west local grid))

## 10.0 EXPLORATION

### 10.1 Historical Exploration (1968 to 2006)

The exploration activities that have been completed on the Roche Bay Magnetite Project are divided into historical (1968 to 2006) and recent (2007 to 2008). All historical exploration programs were completed under the direction of Borealis prior to 2006 and the 2006 exploration program was completed under the direction of Roche Bay. A brief summary of the historical exploration programs prior to 2007 are outlined in Section 6.1 with details provided in the 2007 and 2009 Technical Reports (Palmer et al., 2007 and Palmer and Shaw, 2009).

### 10.2 2007 Exploration Program

In 2007, AEI was the operator of the exploration programs on the Roche Bay Magnetite Project as to their Agreement with Roche Bay. During the 2007 field season (April to November), AEI conducted further exploration at the site primarily in the form of diamond drilling. Boart Longyear was contracted to site with 2 Longyear 38 surface diamond drill rigs. A total of 38 holes were drilled for a total of 9,260 m. The core size was NQ (45 mm).

Drilling activities were again observed during Golder's site visit and core recovery remained good. Core was logged, sawn and crushed on site, before being dispatched to SGS Lakefield for assaying.



### **10.3 2008 Exploration Program**

The 2008 field season commenced in late April and wound up in early September. The program included geological and geotechnical core drilling, surface geological mapping, land survey of drill hole location, collar orientation surveys and re-sampling of drill core from the 2007 season for QA/QC and dry bulk density. The geological core drilling was primarily intended to infill the section gaps remaining from the 2007 campaign as well as increase the geological understanding of the mineral resource. The sampling and assaying of these holes was conducted in accordance with recommendations made by Golder during the site visit to increase precision and accuracy. The geotechnical core drilling was intended to assess bedrock conditions at potential surface infrastructure sites and Roche Bay submarine ground conditions.

### **10.4 2011 Exploration Program**

AEI initiated their 2011 exploration program in May 2011. The first part of their exploration program is exploration diamond drilling on the Tuktu Property followed by definition diamond drilling on the C-Zone at Roche Bay (June-August). Samples from both programs will be sampled and sawed at the exploration camps with initially processing (crushing) at the Actlabs Hall Beach prior to be sent to Actlabs in Ancaster, Ontario. Additional drilling programs will be completed as part of the geotechnical studies for open pit rock mechanics and surface infrastructure and shipping port are required to complete the feasibility study.

## **11.0 DRILLING**

### **11.1 Historical Drilling Programs**

Prior to 2006, historical exploration programs were completed on the Roche Bay Magnetite Project throughout two periods: from 1968 to 1970 and 1982. Metallurgical testing was completed from 1968 to 1970 and 1982 to 1984. As part of these historical exploration programs, a total of 16 drill holes were drilled: A-Zone (6 drill holes), B-Zone (9 drill holes) and C-Zone (1 drill hole) during the 1982 field program, for a total length of 3,214 m. The ultimate vertical extents of the deposits were not defined by this drilling. The deepest BIF intercepted in the 1982 drilling for A-Zone was at 165 m below surface, B-Zone was at 180 m below surface and C-Zone was at 175 m below surface. In addition, geophysical surveys completed on the property have shown that the strike length and width of the magnetic signatures is extensive (several kilometres in strike and up to 300 m in width) (Palmer et al., 2007).

In 2006, Roche Bay completed their first field season on the Roche Bay Magnetite Project, which consisted of drilling 3 exploration drill holes (53.94 m) with an AWX drilling system for the C-Zone. In addition, core samples collected from the 3 AWX drill holes and samples from historical drill core samples, stored on site, from the A and C-Zones were metallurgically tested at SGS Lakefield.



### 11.2 2007 Drilling Programs

In 2007, AEI financed and managed the field program as per the Option Agreement. The focus of the 2007 drilling program was to define the C-Zone mineralization on 400 m spaced sections along the strike of the C-Zone, with holes drilled down dip and perpendicular to dip (inclined between  $-45^{\circ}$  and  $-60^{\circ}$  from horizontal), spaced approximately 100 m across strike. During the 2007 exploration program, a total of 38 NQ drill holes and 9,260 m were completed. The drill contractor was Boart Longyear Canada (Boart), based out of the Haileybury, Ontario and Boart used 2 Longyear-38 surface diamond drill rigs.

Drill hole collars were initially surveyed using handheld GPS, and it is these coordinates which were used in the database. These collars were surveyed in 2008 using total station survey equipment (once the estimation was completed) and, during a review by AEI, the GPS versus the total station survey found no material difference between the two surveys, and AEI is confident of the accuracy of the initial handheld GPS surveys. No down hole surveying techniques were employed during the 2007 drilling program. An in-depth review, by AEI, of down hole surveys from the 2008 drilling program indicated that drill hole deviation was on the order of  $\pm 11$  m on strike and  $\pm 4$  m on-dip. Therefore, based on drill hole deviation estimates from the 2008 drilling and that the average 2007 drill hole length was 250 m to a maximum of 600 m and that the drill hole spacing along strike is 200 m, there is sufficient information to locate the 2007 drill holes to the current resource classification level.

### 11.3 2008 Drilling Program

In 2008, AEI completed a multi-faceted drill campaign designed to complete a mineral resource estimate of the C-Zone and collect data to begin advancing the project closer toward the preliminary feasibility study stage. The goals of the 2008 exploration core drilling were to further define the geology and mineralization of the iron formation and to acquire additional grade, specific gravity, metallurgical and geotechnical data to support the 2009 mineral resource estimate. During the 2008 exploration program, a total of 55 NQ drill holes and 16,500 m were completed in the C-Zone. The spacing of the drilling was 200 m centres over the 4.8 km defined strike length. The drill holes were collared with dip angles varying between  $-45^{\circ}$  and  $-75^{\circ}$  and typically a  $305^{\circ}$  azimuth (approximately perpendicular to the strike of the iron formation).

In addition to the exploration drilling on the C-Zone, 6 HQ drill holes were drilled to collect geotechnical data with 4 drill holes for infrastructure and 2 drill holes collared from the sea ice above Roche Bay to test the sea floor for possible dam/port construction.

Two NQ exploration drill holes were drilled on the A and B-Zones (located 3 km NE along strike over the C-Zone) to verify historical mineralization and provide material for future metallurgical testing.

Core hole depths varied from 139 m to 617 m with an average depth of 290 m. Fifty percent of the hole depths varied between 190 m and 330 m. Five holes were stopped short of the planned depths due to hole freezing. Fifty-five holes were collared at  $305^{\circ}$  azimuth perpendicular to the strike of the iron formation. Two holes were targeted at  $125^{\circ}$  to intersect specific structures. The holes were collared with dip angles varying between  $-45^{\circ}$  and  $-75^{\circ}$ . Fifty percent of the drill hole dip angles varied between  $-45^{\circ}$  and  $-55^{\circ}$ .

All 2008 drill hole collars were surveyed in 2008 using total station survey equipment and down hole surveys were completed using a the Reflex Maxibor II down hole multi-shot tool (Maxibor).

In addition, oriented drill core data was completed for 4 drill holes by using the Reflex ACE tool and clay-bombs for redundancy.



Similar to 2007, the drill contractor was Boart Longyear and five drills were provided for the program: three LY 38s and two LM 55s.

## 11.4 2011 Drilling Program

AEI is planning on completing additional drilling on the C-Zone in 2011 (June-August). The current plan is approximately 7,500 m of diamond drilling to focus on further delineating the BIF zones and continue to upgrade Inferred classified resources. Additional drilling will be completed as part of the geotechnical studies required to complete the feasibility study.

## 11.5 Drilling Results Summary

Drilling of the C-Zone during the 2007 and 2008 exploration programs consisted of drill holes primarily orientated perpendicular (305° azimuth) to the strike length of the zone and with dip angles varying between -45° and -75° on a steeply dipping to near vertical dipping zone. A selection of drill holes intercepts from the MAIN horizon is provided in Table 11-1 and illustrated on Figure 11-1 is a plan drawing of the 2007 and 2008 drill hole collars and traces from the C-Zone.

**Table 11-1: C-Zone MAIN Horizon Drill Holes Intercepts**

| Local Grid Ref | Drill Hole No | From  | To    | Core Length (m) | Total Fe % | Magnetics % | S %  |
|----------------|---------------|-------|-------|-----------------|------------|-------------|------|
| 9400N          | RBC-08-70     | 114.3 | 277.0 | 162.7           | 28.60      | 31.90       | 0.65 |
| 9600N          | RBC-08-61     | 79.9  | 215.0 | 135.1           | 26.56      | 25.55       | 0.78 |
| 10000N         | RBC-08-69     | 5.9   | 91.0  | 85.1            | 25.76      | 25.94       | 0.75 |
| 10200N         | RBC-08-71     | 6.0   | 90.0  | 84.0            | 26.80      | 26.45       | 0.71 |
| 10400N         | RBC-08-55     | 49.9  | 142.2 | 92.3            | 28.16      | 29.24       | 0.67 |
| 10600N         | RBC-08-79     | 24.4  | 160.6 | 106.2           | 26.61      | 22.23       | 0.81 |
| 10800N         | RBC-08-81     | 56.2  | 183.3 | 127.1           | 26.53      | 25.94       | 0.75 |
| 11000N         | RBC-08-67     | 48.2  | 182.0 | 133.8           | 27.85      | 30.34       | 0.51 |
| 11200N         | RBC-08-50     | 64.3  | 188.7 | 124.4           | 28.47      | 33.69       | 0.61 |
| 11400N         | RBC-07-012W   | 37.0  | 138.3 | 101.3           | 29.02      | 31.99       | 0.54 |
| 11600N         | RBC-08-40     | 49.4  | 145.9 | 96.5            | 26.12      | 25.59       | 0.78 |
| 11800N         | RBC-07-009W   | 66.6  | 130.8 | 61.2            | 28.36      | 30.11       | 0.59 |
| 12200N         | RBC-07-038E   | 10.2  | 166.0 | 155.8           | 28.73      | 31.14       | 0.59 |
| 12400N         | RBC-08-75     | 27.1  | 156.0 | 128.9           | 27.10      | 26.92       | 0.73 |
| 12400N         | RBC-08-83     | 146.0 | 265.8 | 119.8           | 27.10      | 27.61       | 0.67 |
| 12600N         | RBC-08-72     | 126.0 | 289.1 | 163.1           | 29.00      | 29.53       | 0.56 |
| 13000N         | RBC-07-027V   | 26.6  | 189.0 | 162.4           | 29.86      | 35.99       | 0.54 |
| 13000N         | RBC-07-027W   | 19.0  | 162.7 | 143.7           | 31.28      | 43.38       | 0.48 |
| 13400N         | RBC-08-49     | 67.1  | 150.8 | 83.7            | 21.06      | 17.63       | 0.54 |
| 13600N         | RBC-08-63     | 64.1  | 13.85 | 74.4            | 25.85      | 24.09       | 0.63 |

Note: Magnetics is reported directly by SGS Lakefield laboratory as % Fe<sub>3</sub>O<sub>4</sub> and is the percentage of contained magnetics based on Satmagan testwork. It assumes that all recovered material is magnetite.

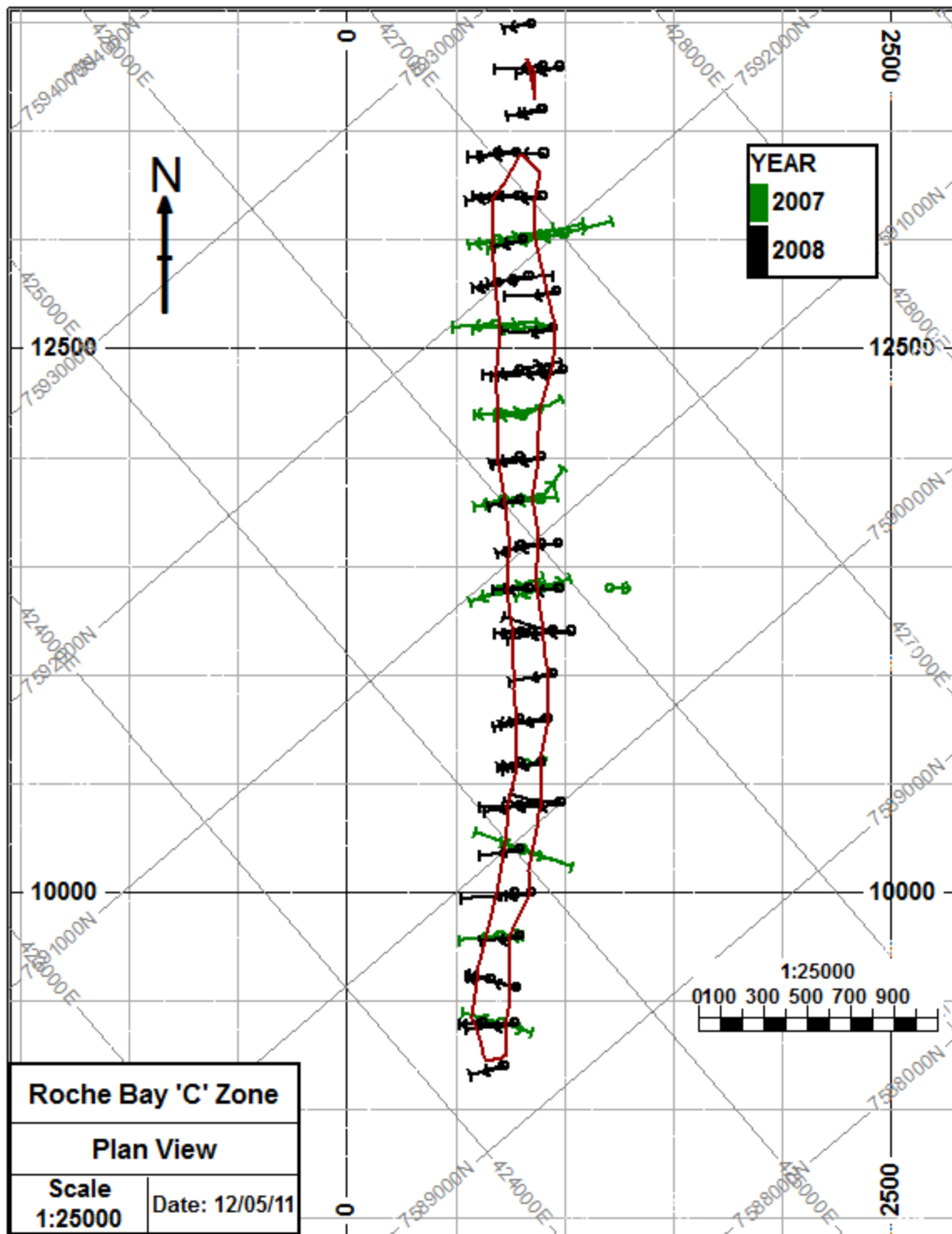


Figure 11-1: C-Zone 2007 and 2008 Drill Holes



## **12.0 SAMPLING METHOD AND APPROACH**

### **12.1 Historical Sampling Method**

Prior to 2006, the historical sampling methods employed on the Roche Bay Magnetite Project has been a combination of grab and bulk surface samples and composited drill core samples for metallurgical testing which has been previously summarized in the 2007 Technical Report (Palmer et al., 2007). These samples were not used in the 2009 Mineral Resource Estimate.

The 2006 sampling approach used for the 3 AWX drill holes included combining all 3 drill holes into a single composited batch sample using the entire core lengths. The 3 drill holes combined equalled a total length of 53.94 m. The AWX composited sample was then combined with 163 m of core from 82-C1 (0 to 163 m) to complete the Batch 1 sample. Batch 1 was considered the “low grade” BIF sample from C-Zone and Batch 2 (82-C1 – 163 m to 315 m) was considered the “high grade” BIF sample from C-Zone. Roche Bay staff created the batch samples on site and shipped the samples to SGS Lakefield for XRF, Satmagan and Davis Tube Testing. The 2006 samples were not used in the 2009 Mineral Resource Estimate.

### **12.2 2007 Sampling Method**

Samples collected from the 2007 drilling program were from diamond drill core, which was half sawn and crushed on site at the Roche Bay main camp and shipped to SGS Lakefield for whole rock XRF analysis and Satmagan testing. The process used by AEI to prepare and analyse core samples is summarized on Figure 12-1.

Core recovered from the drilling rigs were in 3 m runs from triple tube NQ coring equipment. The core was stored in core trays that were then transported back to the Roche Bay camp site. The core was processed at the sample preparation facility in two tents. One tent was used for logging and photographing the core, the other was used for cutting and crushing the core. The core had an aluminum stamped tag stapled to the core tray to ensure permanent identification.

Core was simultaneously logged and marked out for sampling. Geologists marked the geological contacts onto the core and logged information was recorded on paper and later transposed to Microsoft Excel files.



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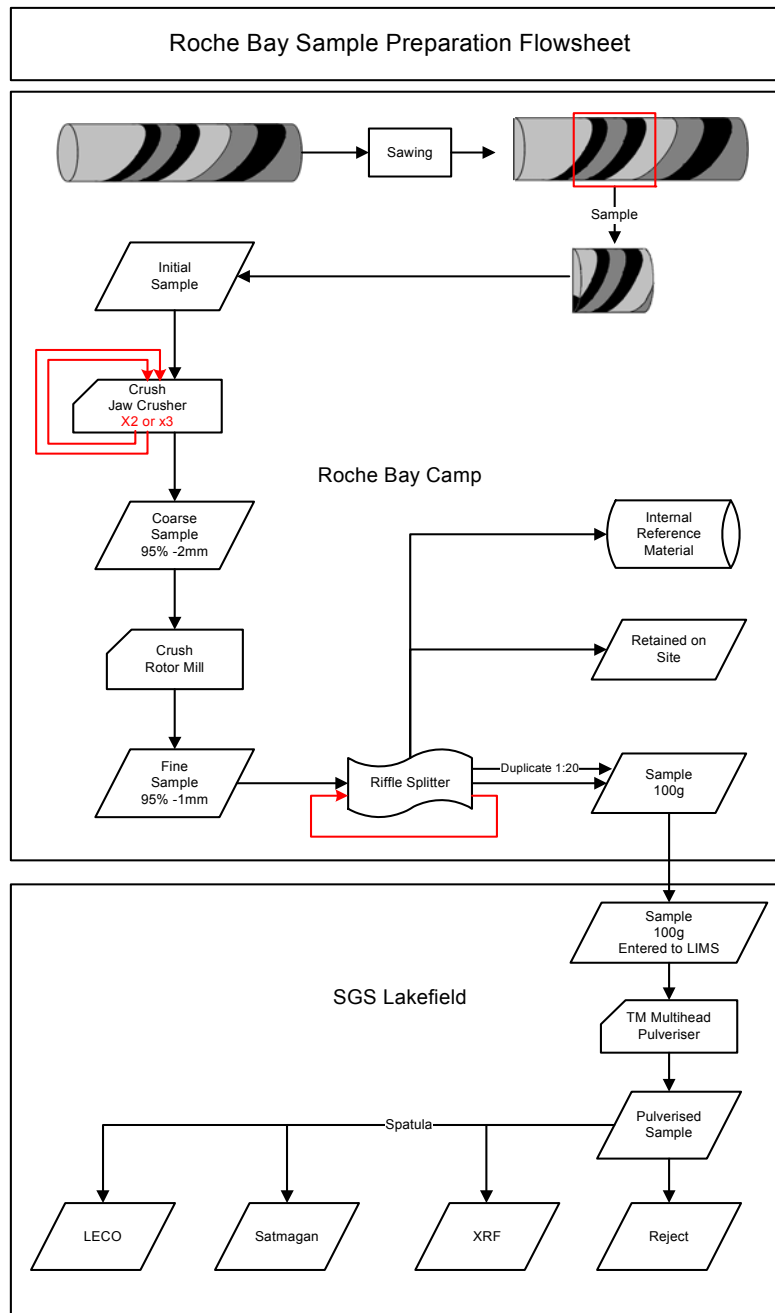


Figure 12-1: Roche Bay Project Site Sample Preparation Flowsheet



Core recovery was calculated by measuring actual core lengths and comparing these to the down hole depths listed at the start of each core run (marked on the core trays). Core recovery for the 2007 drill was generally above 95%. Structural information was recorded in the comments section but no geotechnical information was collected.

Core intervals intended for sampling were marked on the core at the time of logging. Sample intervals were generally set at 1 m in the iron mineralized zones and 2 m in the un-mineralized gabbro host rock. The sample intervals were occasionally altered if smaller, geologically significant units were required to be separated within the 1 m. Sample intervals were also shorter than 1 m if a geological contact occurred within an interval, in which case the assay interval was shortened to coincide with the geological boundary. Core intervals were sampled to always coincide with lithological boundaries.

Once sawn, the core was placed back into the trays and returned to the logging tent. One half of the core (always the same half), from each sample interval was collected and placed into a bucket for crushing by the field technicians. A label was also placed into the bucket to help identify the sample. A second 100 g sample was split from the original sample lot at a planned rate of approximately 1 in 25 samples (actual rates were 1 in 15) and submitted to SGS Lakefield as a field duplicate. No blank samples were included during the 2007 sampling program. Non-sampled core and remaining half-core samples permanently stored at the Roche Bay camp on core racks.

### 12.3 2008 Sampling Method

Upon receiving the exploration drill core at the Roche Bay camp, all core was logged for geology and geotechnical data acquisition prior to sampling for grade. The standard grade sample interval was 2 m. All core was photographed in sequence and selectively in detail for specific structures prior to cutting. Core in areas of interest was marked and cut lengthwise with diamond saws for grade sampling. One half of the sawed core was tagged and bagged for shipment to the SGS Hall Beach facility. Sample manifests were prepared by the AEI geologists and signed-off by the Roche Bay camp manager. Non-sampled core and the remaining half-core samples were tagged and re-boxed for storage and permanently stored at the Roche Bay camp on core racks.

Core was logged both for geological and geotechnical data (rock quality designation, total core recovered and simple joint property data) prior to sampling.

Prior to samples being submitted to SGS Hall Beach, representative samples from a variety of rock types were collected and measured for bulk density using the Caliper Method to determine volume as discussed below for the 2008 sampling program (see Section 13.3). Sampling preparation at SGS Hall Beach included drying, crushing to >85% passing 13 mm chips, then splitting before being crushed to >85% passing 200 mesh (75 µm). All samples shipped to SGS Lakefield (from 2007 and 2008 programs) were further processed and analysed for whole rock XRF analysis and Satmagan (Magnetite) testing.



## **13.0 SAMPLE PREPARATION, ANALYSIS AND SECURITY**

### **13.1 Historic Sample Preparation and Analysis (1968 to 1984)**

Sample preparation and analyses for historical grab, bulk and core samples were completed at the various testing labs through 1968 to 1984. Most historical reports detail the standard sample preparations and analysis completed. There was no indication in the reports of the status of the samples tested and it is assumed now that any remaining sample materials from this period have been discarded. Split drill core samples from the 1982 drilling program which has been used during the 2006 metallurgical test work at SGS Lakefield could still be used for confirmation testing of historical samples tested (Palmer et al., 2007).

### **13.2 Historic Sample Preparation and Analysis (2006)**

The sample preparation and analysis methods for the 2006 drill core samples were reviewed by Golder during the January 8, 2007 site visit to the SGS testing facility and have been summarized in the 2007 Technical Report (Palmer et al., 2007). Five batch samples were provided to SGS Lakefield for testing. All batch samples were prepared by SGS Lakefield followed by XRF, recoverable magnetite (Satmagan testing), grindability (SPI and BWI) and Fe beneficiation (Coarse Cobbing and Davis Tube) testing.

### **13.3 2007 Sample Preparation**

The sampling preparation procedure used during the 2007 field program at the Roche Bay main camp is illustrated on Figure 12-1 and described as follows. Once the core is sawn and sampled, each bag is given a unique sample number. The first three digits represent the batch that was submitted to the laboratory. A batch usually comprised 100 to 120 samples. A drill hole may span 3 or more batches. The second series of three digits referred to the drill hole. This number will be found on all samples submitted from the same drill hole, but may be preceded by numerous batch numbers. The final series of numbers identified the specific sample on each hole.

The sampled half core was crushed 2 to 3 times in a Retsch BB100 jaw crusher to ensure a nominal -2 mm. AEI selected a sub-sample from 1 in 20 crushed samples and conducted a size screen test to ensure that 95% of the material passed -2 mm. The sample was then put through a Retsch SK100 rotor mill to further reduce the size of the material to 95% passing -1mm. The crushers were not cleaned between samples.

The crushed sample was passed through a Jones riffle splitter repeatedly, until a sample of approximately 100 g was separated. Each sample was packaged up with a unique sample label and transported to SGS Lakefield. A second 100 g sample was split from the original sample lot at the planned rate of approximately 1 in 25 (but actual rates were 1 in 15) samples and submitted to SGS as a laboratory duplicate. The remaining material was then returned to the original sample bag and stored on site for any further test work or in case of complications in delivering the initial sample to SGS Lakefield.

Observations by Golder during the 2007 site visit indicated that the splitter was near new and found to have an even number of riffles of equal size. It was also well set up on a level bench top and well maintained. The splitter was cleaned with a brush at the end of each day. The sample collection bins beneath the splitter were confined to minimise dust loss.



No sample weights were collected by AEI as there was relatively consistent core recovery and density of rock mass. The split samples were placed in a heavy duty plastic bag, along with a white fabric sample tag with the sample ID marked with permanent marker. The fabric tag was stapled to the top of the plastic bag, which was then folded over three times and stapled again to securely enclose the sample. An entire “batch” of samples was then placed in a polyweave bag and secured for transport to SGS Lakefield for assay.

During the 2007 drilling program, the bulk density of the various rock types of the deposit was determined by the Caliper Method using volume and weight measurements using the following the steps:

- From the interval specified a sample was selected, as long a piece as possible;
- Ends were squared by diamond saw;
- Three thickness measurements were taken and averaged;
- One length measurement was taken;
- Volume was determined by partial cylinder integral; and
- Weight was determined, undried and dried, density calculated.

Sample batches were flown to Hall Beach and then transported by air and ground transport to SGS Lakefield. Once the samples were received at SGS Lakefield, they were prepared for XRF and Satmagan testing which is described below.

### 13.3.1 XRF Test Procedure

The XRF testing procedure employed at SGS Lakefield is based on information provided in their Mineral Services Method Summary, Method 9-6-1, Determination of Major Element Oxides and Rare Earth Oxides by Borate Fusion-XRF. Prior to XRF testing, all samples were pulverized to 150 mesh with a size analysis check done every 50 samples by SGS Lakefield. The test procedure can measure 11 whole rock oxides, two metals, 5 rare earth oxides, and 8 other oxides and LOI is determined gravimetrically.

The sample preparation includes the formation of a homogenous glass disk by the fusion of 0.2 to 0.5 g of rock pulp with 7 g of lithium tetraborate/lithium metaborate (50/50). The disk is then analyzed by WDXRF spectrometry. All elements are measured in percentage with a limit of quantification of 0.01% for most oxides and 0.02% and 0.03% for 7 of the elements.

The quality control for the XRF testing includes one blank, one duplicate and a matrix suitable certified or in-house standard per batch of 20 samples. This method is accredited by the Standards Council of Canada and conforms to the requirements of the ISO/IEC 17025 standard.



### 13.3.2 Satmagan Test Procedure

The Satmagan testing (Satmagan 135) is a physical rather than a chemical determination of the magnetite of a small sample. The samples are pulverized to -388  $\mu\text{m}$  (-48 mesh) to -140 $\mu\text{m}$  (100 mesh). Samples are tested dry in order to obtain a proper weight percentage. The test procedure measures the force acting on the sample in a magnetic field with a spatial gradient. The stated accuracy of the Satmagan 135 is  $\pm 0.4\%$  or less (Rapiscan Systems). It has been assumed, based on petrographic evidence, that there is a very low proportion in Roche Bay samples of pyrrhotite (a magnetic iron sulphide mineral) that all measured material is magnetite. Each sample is tested once and provides a measure of the magnetic content as a weight percentage. Accordingly, it is equivalent to (but not in fact) an assay of %  $\text{Fe}_3\text{O}_4$ .

In 2011, an additional 797 missing Satmagan samples were provided for the mineral resource update replacing the Satmagan samples that were previously calculated from a regression analysis of total Fe, and  $\text{Fe}_3\text{O}_4$  values.

### 13.3.3 Davis Tube Test Procedure

The Davis Tube test procedure used by SGS Lakefield included a head sample size of 100 g that was riffled and stage-pulverized to a P80 target of approximately 35 microns. A 20 g sub-sample was submitted to Davis Tube separation at 100 strokes/min and with 1 L/min of wash water. The non-magnetic material was continuously collected in a pail throughout the test period of 4 minutes, after which the electromagnet was interrupted and the magnetic material flushed into a separate pail. The magnetic and non-magnetic material were submitted to assay for  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ , MgO, CaO,  $\text{Na}_2\text{O}$ ,  $\text{TiO}_2$ ,  $\text{P}_2\text{O}_5$ , MnO,  $\text{Cr}_2\text{O}_3$ ,  $\text{V}_2\text{O}_5$ , LOI, S and Fe for the Davis Tube concentrate, tails and a calculated head and direct head grade.

A total of 200 drill hole samples (pulpes stored at SGS Lakefield) were selected by Golder and AEI to give a general representation of the 2007 and 2008 drilling program from the C-Zone to confirm the Satmagan data. The samples selected were primarily of the 20% to 30% total Fe grade and were collected from throughout the C-Zone (50 drill holes) with half the samples collect in the widest and higher grade areas of the C-Zone.

## 13.4 2008 Sample Preparation

The 2008 sample procedure was similar to the procedures employed during the 2007 exploration program. The main exceptions included that sample sizes were generally increased to a 2 m length and continuous sampling was used from the footwall of the BIF intervals to the hanging wall with no sample breaks. Also, SGS set up a sample preparation laboratory in Hall Beach (SGS Hall Beach) to prepare the half core samples that were transported from the Roche Bay camp. Details of the sample preparation were provided in Section 12.2 with the exception that AEI did not initially process the samples during the 2008 exploration program. The initially processing work was completed by the SGS Hall Beach facility. During the 2008 sampling program, a selection of standard samples was included in the sample batches including a duplicate sample after initially processing at SGS Hall Beach.

Sample batches were transported from SGS Hall Beach by air and ground transport to the SGS Lakefield. Once the samples were received at SGS Lakefield, they were prepared for XRF and Satmagan testing as described in Section 13.3.



### 13.5 Davis Tube / Satmagan Comparison

One of the recommendations made in the April 24, 2009 (and revised September 17, 2009) Roche Bay Magnetite Project C-Zone Technical Report is that Davis Tube metallurgical tests should be conducted on representative samples from the C-Zone to confirm the suitability of the Satmagan analytical method for determining magnetite content and recovered iron.

Two hundred samples were chosen from sections 10,400 N to 13,400 N. A visual representation of the locations of the selected samples is provided on Figure 13-1. Samples were selected to give a range of %Fe values above the expected cut-off of 20% Fe.

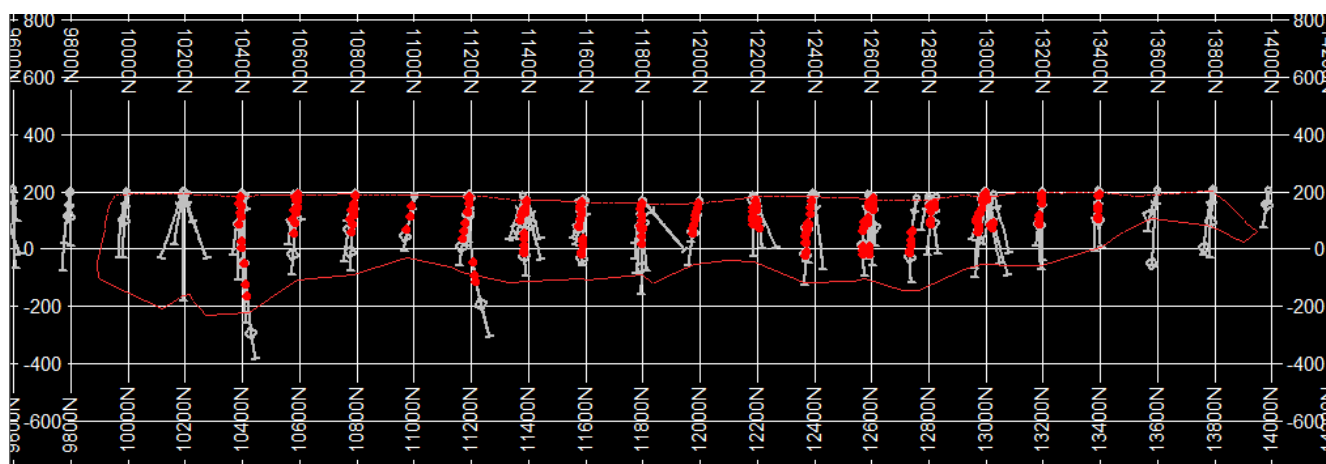


Figure 13-1: Visual Representation of the Locations of Samples Selected for Davis Tube Tests

For each sample the %Fe in the Davis Tube concentrate and tailings was used to back-calculate the %Fe head grade. This was compared to the original assayed %Fe for the sample. If the difference was greater than 10%, the samples were removed from further analysis. Only 6 samples failed this test. For the remaining 194 samples, the %Fe in the concentrate was used to calculate magnetic Fe based on the relative element atomic weights in  $\text{Fe}_3\text{O}_4$ .

The distribution of differences between the Davis Tube magnetic Fe when compared to the Satmagan magnetic Fe is shown on Figure 13-2. The correlation between the two methods is shown on Figure 13-3. The relationship between the two methods can be described as follows:

- Davis Tube magnetic Fe ( $\text{Fe}_3\text{O}_4$ ) =  $1.1384 + (\text{Satmagan magnetic Fe} * 0.9267)$ ; and
- The correlation co-efficient of this relationship is 0.97.

This relationship was used to calculate the  $\text{Fe}_3\text{O}_4$  which is reported in the mineral resource statement stated in Section 17.9.

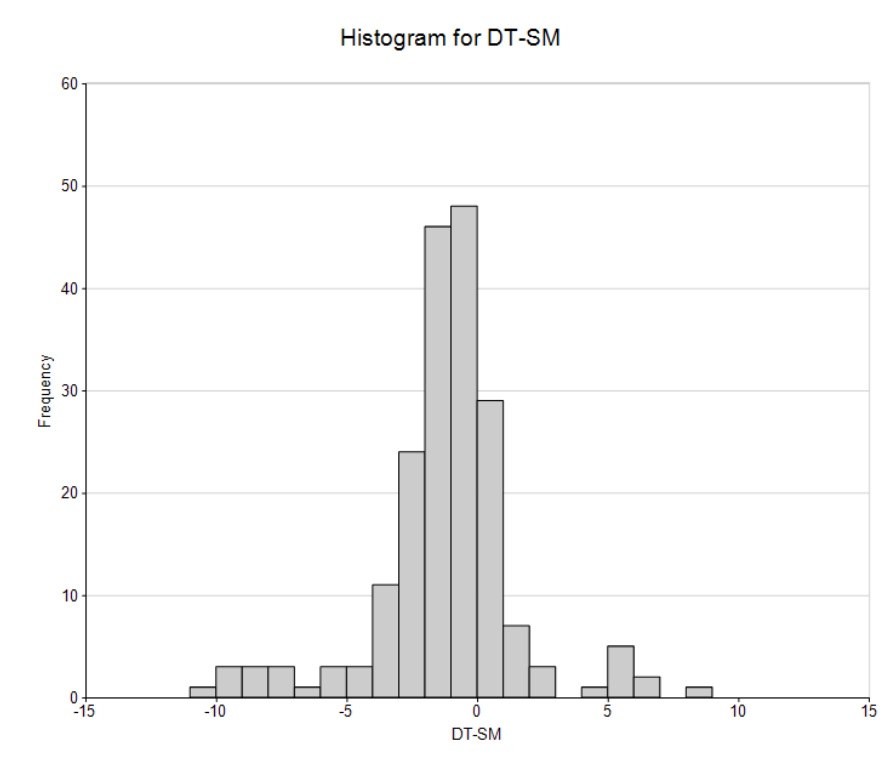


Figure 13-2: Distribution of the Differences between Davis Tube Magnetic Fe and Satmagan Magnetic Fe

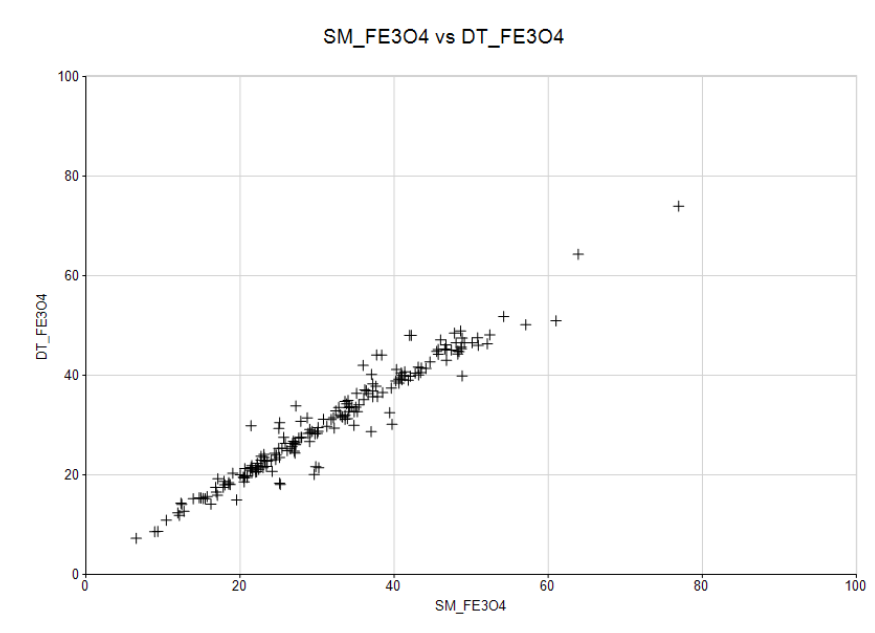


Figure 13-3: Distribution of the Differences between Davis Tube Magnetic Fe and Satmagan Magnetic Fe



## **14.0 DATA VERIFICATION**

### **14.1 Historical Data Verification**

A review of the Roche Bay Magnetite Project's historical data (pre-1960) was completed during the 2007 Technical Report (Palmer et al., 2007) and included summaries of historical field program reports, geological reports, drill logs and metallurgical testing reports that were generated from 1968-1970 and 1982 to 1984. The 2009 Mineral Resource Estimate only includes data from the 2007 and 2008 exploration programs, so no historical data verification has been included and details of the previous historical data verification can be reviewed in the 2007 Technical Report (Palmer et al., 2007). A summary of the data verification checks completed on the 2007 to 2008 data is briefly outlined below and is directly from the 2009 Technical Report (Shaw and Palmer, 2009). Verification checks completed in 2011 are outlined in Section 17 with respect to the updated mineral resource estimate.

### **14.2 2006 Data Verification**

The 2006 data verification review that has been completed by Golder is based on the October 15, 2006 site visit conducted on the property and the January 8, 2007 site visit to the SGS Lakefield metallurgical testing facility by Mr. P. Palmer which is summarized in the 2007 Technical Report (Palmer et al., 2007).

As part of these site visits, Golder observed the 2006 drilling conditions including set-up, core recovery, core storage and metallurgical testing of five batch samples submitted to SGS Lakefield which is comprised of core samples from the 2006 drilling program and split core from the 1982 drilling programs.

### **14.3 2007 Data Verification**

The 2007 data verification conducted by Golder includes a review of the drilling completed during the 2007 field season. The drilling database was interrogated using Golder's proprietary validation tools in Microsoft Access. The assay results were also analysed, in particular the standards and duplicates submitted in order to ensure the accuracy and precision of the analysis. Details of the data verification are provided in the 2009 Technical Report (Palmer and Shaw, 2009).

#### **14.3.1 2007 Drilling Database**

During the 2007 drilling program, all drill hole information collected was stored in various Microsoft Excel spreadsheets containing assays, collars and the proposed hole orientations. Golder merged the supplied 2007 collar, geology and assay information into a single Microsoft Access database. Once in this format, Golder ran a validation macro which tests the data for validity, incorrect characters, data mismatches and cross checks the individual tables against each other. During this review, no material validation errors were flagged during the database audit. The detection limit for the analysis conducted on the 2007 samples was 0.01% and any results contained within the database shown as "< 0.01%" were modified to half the detection limit of altered to 0.005%.



During the 2007 drilling program, there was no available down hole survey data collected. No down hole surveying techniques were employed during the 2007 drilling program. However, a review completed by AEI of down hole surveys from the 2008 drilling program indicated that drill hole deviation was on the order of +/- 11 m on-strike and +/- 4 m on-dip. Therefore, based on drill hole deviation estimates from the 2008 drilling and that the average 2007 drill hole length was 250 m to a maximum of 600 m and that the drill hole spacing along strike is 200 m, there is sufficient information to locate the 2007 drill holes to the current resource classification level.

### 14.3.2 2007 Sample Assay Review

During the 2007 drilling program, AEI submitted a selection of standards and field duplicate samples.

Out of a total assay batch of 4,555 samples, there were 42 standards and 312 pairs of field duplicates submitted. This corresponds to a realised insertion rate of approximately 1 in 100 and 1 in 15, respectively. This rate is lower than typical QA/QC programs and was increased during the 2008 sampling program.

A review of the AEI standard samples used during the 2007 sampling program by Golder identified that the original certificates for the standard samples were misplaced on site and therefore could not be used to properly assess the accuracy of the assaying program. Instead, a general review of these standards was completed. There were 42 standard samples in total. Thirty-nine were labelled "HIGH IRM", two were labelled "IRM LOW" (or "low grade IRM") and one was labelled "standard IRM".

After removing obvious discrepancies (incorrect labelling, etc.), and the standard and low IRM standards (as there is insufficient quantity to draw any conclusions), there were 38 HIGH IRM samples available in the dataset.

Golder analysed the results of the remaining standard reference sample submissions using firstly, the assumption that the true mean is close to the calculated mean of the dataset and, secondly, using ranges from this expected value of 2% and 5% relative tolerance. The precision of the assays of these standards can be seen by their departure from the mean. The performance of the "High IRM" standard for Fe is in that the tolerance is generally within  $\pm 5\%$  with no evident trend over time. It was recommended by Golder during the 2007 site visit (and implemented by AEI) that during the 2008 drilling program the standard reference materials should be submitted at a rate of 1 in 25.

The field duplicate samples were submitted to SGS Lakefield at an approximate average rate of 1 in 10 samples. Overall, the results showed a good correlation between the duplicate and original samples. In the data for Fe and SiO<sub>2</sub> there are 4 outlier samples that were attributed to labelling errors in the sample numbering. Excluding these obvious errors, the duplicates showed a strong correlation to their original samples for Fe, SiO<sub>2</sub> and MnO. The dataset for Al<sub>2</sub>O<sub>3</sub> indicates that there may be 2 sample populations and also shows 3 or 4 outliers, due to the same error in the sample numbering. The dataset for S shows a weaker correlation and more than one sample population. Results were sufficient to demonstrate a reasonable level of precision in sample preparation.

Despite the absence of a certified value with which to compare the samples submitted as standards, the repeatability of these assays, as well as the results of the duplicate analysis indicate a level of precision of sufficient standard for the assay data to be used in the estimation of the current resource. The processing of these samples at an appropriate commercial laboratory (SGS Lakefield) and the provision of these sample results to AEI with certification further support the use of these assay results.



### 14.3.3 2007 Missing Sample Assays

The sampling procedure used at Roche Bay Magnetite Project prior to the commencement of the 2008 field season did not require the geologists to sample the entire down hole interval. Any areas which were not lithologically classified as BIF were not sampled, as it was obvious to the geologists that they did not contain any grade. In some instances, this led to small intervals within the BIF zone not being sampled, which in turn creates a gap in the down hole assays used for grade interpolation. Table 14-1 is a list of non-sampled intervals during the 2007 drilling program.

**Table 14-1: 2007 Non-sampled Intervals through the BIF Zone**

| Hole ID     | From   | To     |
|-------------|--------|--------|
| RBC_07_26W  | 202    | 208    |
| RBC_07_24W  | 60     | 119.5  |
| RBC_07_39E  | 89     | 95.8   |
| RBC_07_39W  | 6.38   | 8.35   |
| RBC_07_39W  | 11.6   | 12.18  |
| RBC_07_009W | 156    | 160    |
| RBC_07_009W | 162.66 | 167    |
| RBC_07_038E | 170    | 188    |
| RBC_07_007E | 7      | 17     |
| RBC_07_007E | 19     | 53     |
| RBC_07_036W | 38     | 39     |
| RBC_07_036V | 90     | 91     |
| RBC_07_036E | 37     | 82.27  |
| RBC_07_001E | 175.62 | 177    |
| RBC_07_001E | 36.22  | 37.8   |
| RBC_07_001E | 29.36  | 33.42  |
| RBC_07_001E | 23.42  | 28.53  |
| RBC_07_001W | 113.26 | 113.62 |

### 14.3.4 2007 Bulk Density Data

The density values for the various rock types of the deposit were determined using the Water Displacement method. This method was verified and the calculations were spot checked by Golder during the 2007 site visit and found to be reasonable. The volume measurements are likely to be subject to minor errors due to loss of core from chips made during the core sawing process, slight variances in the diameter of the core arising during drilling (the largest diameter is taken as a conservative approach) and averaging of measurements. The drying procedure was carried out in a household oven at 105 degrees Celsius, and may be subject to minor errors; however, there is very little difference in the wet and dry density readings with the exception of measurements taken in quartz vein material. This could be due to vugs and pore space within the quartz veins.



Density was determined using the Water Displacement method (weight in air / weight in air – weight in water) and compared to the Caliper Method. While the BIF densities were slightly higher using the check method (Water Displacement), most of the waste materials were significantly lower. The average density measurements for the main rock types from the 2007 sampling program are summarized in Table 14-2.

**Table 14-2: Density Estimates for Roche Bay**

| <b>Rock Type</b>      | <b>Count</b> | <b>Average Undried Density (g/cm<sup>3</sup>)</b> | <b>Average Dry Density (g/cm<sup>3</sup>)</b> | <b>Average Density (Water Displacement Method) (g/cm<sup>3</sup>)</b> |
|-----------------------|--------------|---------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------|
| Banded Iron Formation | 50           | 3.28                                              | 3.28                                          | 3.25                                                                  |
| Gabbro                | 6            | 2.97                                              | 2.97                                          | 3.02                                                                  |
| Metasediments         | 7            | 2.88                                              | 2.87                                          | 2.91                                                                  |
| Quartz Vein           | 3            | 2.77                                              | 2.64                                          | 2.78                                                                  |
| Schist                | 7            | 2.88                                              | 2.88                                          | 2.93                                                                  |

## **14.4 2008 Data Verification**

### **14.4.1 2008 Bulk Density Data**

The density values for the various rock types of the deposit were determined using the Water Displacement method for whole and half-core sampled collected in August 2008. Representative samples from a variety of rock types were collected and measured. The bulk density measurements were checked for location identification and accuracy. One sample measurement was found not to have been entered into the final compilation and was consequently excluded from analysis. A total of 254 bulk density measurements were accepted. Ten samples from the available core samples were immersed in water before being oven-dried at 200°F and weighed after 6 hours, then again after 14 hours to assess the susceptibility of the drill core to absorb moisture. Average moisture content is 0.3% and varies from 0.0 to 0.7%.

Density data from 203 half-core samples were compared with Fe assays to determine whether reasonable estimates of bulk density could be calculated from iron content for the sample intervals.

The measured bulk density data was plotted against Fe to determine the correlation between the two variables. The variance of the calculated bulk density estimates compared to the measured BD data was visually estimated from the measured data from the trend line. The variability of the measured BD values was estimated to be approximately  $\pm 0.2\%$  with precision of the calculated bulk density estimates on the order of 90%.

The objective was to provide a more useful spatial bulk density estimate correlated to Fe as 'soft data' to support a local estimate rather than to assume average values for each rock type. Global mean bulk density estimates were calculated for whole-core country rock samples lacking Fe assays. These estimates were assigned, by rock type, to the small number of sample intervals lacking actual drill core bulk density measurements. The global bulk density estimates for sample intervals lacking Fe assays are summarized in Table 14-3.

The formula of the regression curve was used to calculate bulk density for all grade sample intervals containing a valid Fe assay. An inverse distance squared estimator was used on all bulk density data, measured and 'soft' (or calculated data) in the block model for the resource estimate. The calculated bulk density formula is defined as follows:

$$\text{Bulk Density} = 0.0247 \times \% \text{Fe} + 2.6 \text{ g/cm}^3$$

**Table 14-3: Dry Bulk Density Estimates for Roche Bay Magnetite Project**

| Rock Type                          | Horizon | Dry Bulk Density g/cm <sup>3</sup> |
|------------------------------------|---------|------------------------------------|
| AB-Zone BIF                        | AB      | 3.20                               |
| C-Zone Footwall BIF Horizon        | FW1     | 3.20                               |
| C-Zone Footwall BIF Horizon        | FW2     | 3.28                               |
| C-Zone Footwall BIF Horizon        | FW3     | 3.27                               |
| C-Zone Footwall BIF Horizon        | FWX     | 3.45                               |
| C-Zone Hanging Wall BIF Horizon    | HWX     | 3.20                               |
| C-Zone Main BIF Horizon            | MAIN    | 3.33                               |
| BIF Average                        | N/A     | 3.30                               |
| Gabbro                             | GAB     | 3.00                               |
| Granite\Gneiss\Quartzite\Intrusive | GRAN    | 2.67                               |
| Meta Sediments                     | METS    | 2.87                               |
| Meta Volcanics                     | METV    | 3.12                               |
| Quartz Vein                        | QZVN    | 2.75                               |
| Schist                             | SCHT    | 3.00                               |
| Serp\Talc                          | SERP    | 2.87                               |

#### 14.4.2 2008 Drilling Database

The 2008 Roche Bay Magnetite Project database provided to Golder in February 2009 included several Microsoft Excel spreadsheets. The collar, survey and lithology data were stored in a separate Excel spreadsheet, and the assay, density and metallurgical recovery data were stored in a single compilation file. All the original data used for the verification, except some of the original laboratory certificates, were provided by AEI. Most of the original SGS Lakefield laboratory certificates were downloaded from a secured website for independent verification.

Original source documents were compared against the AEI Microsoft Excel spreadsheet records. The check was conducted on collar, survey, lithology, assays (% Fe, % Fe<sub>3</sub>O<sub>4</sub>, % MnO, % P<sub>2</sub>O<sub>5</sub>, % Al<sub>2</sub>O<sub>3</sub>, % S, % SiO<sub>2</sub> and % LOI), and densities. No checks on core recovery were made because while the original geotechnical logs were available, they were not included in the 2008 AEI drill hole database.

There are 110 drill holes in the current AEI drill holes database which includes drilling information from the 1982 historical drilling program and AEI's 2007 and 2008 exploration programs. Only 85 drill holes within the resource mode mineralization envelope were selected for the estimation. The drill holes that were excluded included:

- 16 historical drill holes from the 1982 exploration program (RBA-82-001 to RBA-82-016 and RBC-82-001);
- 2 drill holes in the A-B-Zone from the 2008 exploration program (RBA-08-016 and RBA-08-017); and
- 7 drill holes to the hangingwall of the 'C' Zone mineralization (RBC-07-004,9,12,13,21,26,27E).



### **14.4.3 Collar Review**

Drill hole collar position data compiled by AEI was compared to the original data by Northern Surveys. The comparison was conducted using queries based on X, Y and Z values between the source document and the original Northern Surveys spreadsheet. Twenty collar positions were checked (about 20%) and no differences were identified.

### **14.4.4 Survey Review**

No down hole surveys were conducted by AEI during the 2007 drilling program. During the 2008 exploration program, AEI geologists conducted down hole surveys using a Maxibor tool. Recalculation of raw data was made by AEI using either the collar position previously surveyed by Northern Survey or the planned dip and dip azimuth. Since not all the collars were surveyed by Northern Survey, not all the Maxibor surveys were corrected. The comparison was made using queries based on depth, azimuth and dip. Twenty-five percent of the data were checked (1,163 entries). Only minor discrepancies due to rounded depth values were found.

### **14.4.5 Lithology Review**

The AEI lithology source document is a compilation of original geology logging in Microsoft Excel spreadsheets. The verification was conducted based on depths, rock codes and horizon codes between the source document and the original geology logs spreadsheet. About 18% of the data were checked (415 entries). There were 2 errors in depth values and 1 error in rock code, all explained as typing errors. They were changed directly by Golder in the AEI database and also reported to AEI.

### **14.4.6 Sample Assay Review**

Most of the 2008 Original SRC certificates (June to December 2008) were downloaded from a secured website. Early 2008 and 2007 certificates were not available on the SRC website and were provided directly by AEI for the data sent to Golder. The verification was based on matched sample identification numbers between the original certificates and the AEI Compiled Master Assay database. Assay comparison between the database and the original were conducted in Excel for all assayed elements.

About 50% of the data in the AEI Database was verified (6,528 samples). Differences in assay values identified by Golder were addressed by AEI and a cleaned and corrected database was sent back to Golder.

### **14.4.7 Bulk Density Review**

Only 2007 and 2008 bulk density measurements conducted by AEI were available for verification against the database. A comparison between the source file and the original calculation spreadsheet was conducted in Microsoft Access based on hole identification, depth and densities. A 100% check of the original calculation spreadsheet was conducted, which only represents 2% of the complete AEI database (255 out of 12,195 samples). Only minor discrepancies were found and these were corrected.



## 14.5 2008 QA/QC Procedure Review

AEI's 2008 QA/QC program consisted of inserting one field duplicate sample for every twenty samples submitted in each batch sent to SGS Hall Beach. A total of 179 field duplicates (or 3% of the total 6,200 samples) were collected from 57 drill holes from the 2008 exploration program. In addition, 233 duplicate samples (4% of the total pulps samples) from 41 batches were retagged and submitted as supplemental field samples at SGS Hall Beach.

A total of 47 analytical standards (FER-3 with Fe reported as  $\text{Fe}_2\text{O}_3$ ), from the Canadian Certified Reference Materials Project (CCRMP), were inserted in 8 selected drill holes and into 10 ten SGS Hall Beach batches.

As part of SGS Lakefield's internal QA/QC program, a total of 293 samples from the 2008 drilling program were re-assayed as laboratory pulp duplicates and blanks were inserted in each batch

Comparative analysis was undertaken for half-core field duplicates for  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{Fe}_3\text{O}_4$  and S values by plotting histograms, scatter plots, precision plots, and calculating relative error and relative difference plots. The comparative analysis for the field sample duplicates indicates, with the exception of a few outlier samples (8 duplicate pairs or 3% of data), that the combined sampling and assaying relative error was generally acceptable. The eight samples were considered to be outliers resulting from geological variability between core halves and not representative of AEI sampling or SGS laboratory procedures.

Summarized in Table 14-4 is the relative error for field duplicate samples for  $\text{Fe}_2\text{O}_3$  duplicate samples. The S values are slightly higher than the  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$  and  $\text{Fe}_3\text{O}_4$  assays probably because a number of these values are much closer to the detection limit.

**Table 14-4: Relative Error for Field Sample Duplicates**

| Element                 | Relative Error at 1 SD<br>(68.3%) | At 95%<br>Confidence Level |
|-------------------------|-----------------------------------|----------------------------|
| $\text{SiO}_2$          | $\pm 2.36$                        | $\pm 4.62$                 |
| $\text{Al}_2\text{O}_3$ | $\pm 3.64$                        | $\pm 7.13$                 |
| $\text{Fe}_2\text{O}_3$ | $\pm 4.12$                        | $\pm 8.07$                 |
| $\text{Fe}_3\text{O}_4$ | $\pm 4.41$                        | $\pm 8.65$                 |
| S                       | $\pm 7.74$                        | $\pm 15.16$                |

Note: SD=Standard Deviation

A review of the comparative analysis for the supplemental field duplicate samples (re-tagged samples from SGS Hall Beach) shows similar results as the field sample duplicates (also with higher relative errors for S) as summarized in Table 14-5.

**Table 14-5: Relative Error for Supplemental Field Duplicates Sample**

| Element                        | Relative Error at 1 SD (68.3%) | At 95% Confidence Level |
|--------------------------------|--------------------------------|-------------------------|
| SiO <sub>2</sub>               | ±1.20                          | ±2.34                   |
| Al <sub>2</sub> O <sub>3</sub> | ±3.43                          | ±6.70                   |
| Fe <sub>2</sub> O <sub>3</sub> | ±1.40                          | ±2.74                   |
| Fe <sub>3</sub> O <sub>4</sub> | ±2.99                          | ±5.87                   |
| S                              | ±5.92                          | ±11.60                  |

The results of the XRF assay values for the 47 analytical standards (FER-3) indicated 3 of the samples were more than 2 times the standard deviation (SD) from the mean. The mean of the data (44.2% Fe<sub>2</sub>O<sub>3</sub>) exhibits a negative bias of -0.3% from the FER-3 Standard. However, the bias becomes positive (+0.4%) when the outliers are removed, as summarized in Table 14-6. Excluding the three outliers, the range of the data is ±1.85% which is acceptable and reasonable. The FER-3 Standards were submitted during the midpoint of the 2008 exploration program due to late acquisition of the Standards. Therefore, future drilling programs will require a regular standard insertion program and review of the result to determine if batches requiring re-analysis.

**Table 14-6: 2008 FER-3 Standard Sample Statistics**

|                    | Original FER-3 Standards           | Standards Filtered for Outliers    |
|--------------------|------------------------------------|------------------------------------|
|                    | Fe <sub>2</sub> O <sub>3</sub> (%) | Fe <sub>2</sub> O <sub>3</sub> (%) |
| Mean               | 44.2                               | 44.9                               |
| Median             | 44.8                               | 44.8                               |
| Standard Deviation | 3.03                               | 0.66                               |
| Range              | 20.3                               | 3.7                                |
| Minimum            | 26.6                               | 43.2                               |
| Maximum            | 46.9                               | 46.9                               |
| Count              | 47                                 | 44                                 |

## 14.6 Verification Site Visits

Mr. Palmer completed a site visit to the Roche Bay Magnetite Project in 2006 and on August 26, 2009. During the 2009 site visit, Mr. Palmer reviewed core from the 2007 and 2008 drilling programs, observed BIF outcrops along the strike of the C-Zone, reviewed areas for future development (plant site and sea port areas) and GPS surveyed in 12 drill hole collars from the 2007 and 2008 drilling programs. No site visit has been completed for this current technical report since no additional drilling or work has been completed on site since the 2008 drilling campaign and 2009 site visit. All new work included in the current technical report is laboratory test work and resource classification studies.

Mr. Paul Palmer visited the SGS Lakefield laboratory facilities on January 8, 2007 to observe sample preparation, Satmagan and Davis Tube testing.



## **14.7 2011 Verification of Data**

Since there were no changes to the data other than the addition of the new Satmagan results and Davis Tube testing, the data 2008 data verification documented in section 14.4 is deemed appropriate for this resource estimate. Similar checks to the drill hole data provided by AEI were carried out (overlaps, duplicates, etc.) to ensure the data remained unchanged, with no issues identified.

## **14.8 General Observations and Conclusions**

Golder recommends that an appropriate database be created for the storage of collar, survey, geological and assay data. This should also include the density measurements as well as quality control samples submitted to monitor the precision and accuracy of the sampling process. Currently, all the data is stored in various Microsoft Excel spreadsheets that should be compiled into a single database system.

The standard and duplicate data indicates a suitable level of repeatability (precision); however, blank samples should be inserted into the sample batches. Down hole surveys should continue to be completed on all future drilling programs and all final collars continue to be surveyed by an independent company.

In order to continually monitor the performance of the analytical laboratories AEI uses, it is recommended that a selection of resubmitted assay pulps and rejects be sent to an umpire laboratory.

Parallel tests between Satmagan and Davis Tube analysis methods continue to determine the suitability of each as a method for determining magnetite content and recovered iron as % Fe.

## **15.0 ADJACENT PROPERTIES**

The nearest adjacent iron ore property to the Roche Bay Magnetite Project are the Borealis Leases. The Borealis Leases are located on the western part of the Melville Peninsula, Nunavut approximately 103 km to 114 km west of the Roche Bay Magnetite Project main camp.

### **15.1 Borealis Leases**

The Borealis Leases were previously owned by Borealis but are now owned by Roche Bay plc. AEI and Roche Bay plc currently have agreements in place to conduct exploration activities on the Roche Bay Magnetite Project. Golder staff and AEI staff also conducted a site visit to the Borealis Leases on September 12, 2008. As part of this site visit, Golder provided AEI with a report (Bordet et al., 2008) that included background information, geological setting, summary of the site visit and recommendations for the Borealis Leases and is briefly summarized as follows.

The iron mineralization observed on the western Melville Peninsula occurs in a series of sedimentary and meta-sedimentary, steeply dipping, faulted and folded Archean rocks. The iron mineralization is interpreted as Algoma-type Deposit. The stratigraphic succession consists of greenstone, quartz schist, iron formation and intrusive granite. The structure of the sequence is characterized by an anticline-syncline pair with steeply dipping, north-northeast striking axial surfaces. The axes of the folds plunge towards the southwest. The folds



are crosscut by a series of east-southeast striking faults along which lateral, mostly horizontal, movements has occurred (Bordet et al., 2008).

During the site visit by Golder, five mineralized zones were observed, identified as Borealis 1 to 5, the existence, extent and quality of the mineralization was compared to the information provided in the Borealis Exploration memorandum (Scruggs, 1977) including photographs of bedrock outcrops and general observations (Bordet et al., 2008).

Borealis 1, 2, 4 and 5 mineralized zones are characterized by a dominantly magnetic iron formation, with some local occurrences of hematite. Borealis 3 mineralized zone is mostly hematitic with some local magnetite occurrences (Bordet et al., 2008).

## 15.2 Tuktu Property

A reconnaissance sampling and mapping program for the Tuktu Iron Project (Tuktu Project) was conducted in September 2009.

AEI has identified this area as a possible location for BIF which can be a significant source of magnetite.

The Tuktu Project consists of 11 contiguous mining claims (HABS 1 to HABS 11) and is located approximately 70 km WNW of Hall Beach, Nunavut, Canada.

The September 2009 exploration program concentrated on a magnetic high located on HABS 1, which was identified from a mid-1980s geophysics map produced by the GSC. On HABS 1, there were nine rock units identified. The rock units of interest were: 1) the BIF for iron; and 2) Unit 2 gossan material which could host precious or base metal mineralization. Several samples were taken from the HABS 2 claim and BIF was identified but, due to time constraints, it was deferred to a future exploration program for detailed mapping.

Seventy-five (75) samples were collected and assayed and 77 waypoints enabled the interpreted outline of the granite, metasediments, gossan material, gabbro and BIF units and to construct a preliminary geological map.

A total of seventy-five (75) samples were sent for assay to SGS Lakefield Analytical Lab in Lakefield, ON. Sixty-three (63) samples were collected from HABS 1, ten (10) from HABS 2 and two (2) from HABS 10. No samples were collected from HABS 3. The testing chosen for this stage of analysis were XRF for whole rock, pyrosulphate fusion XRF to test for base metals and Fire Assay to test for gold. Satmagan Testing was completed on sixty (60) samples to measure the magnetite content. Davis Tube testing was completed on four (4) samples to determine the iron content, liberation and concentration methods. Twenty-four (24) samples were tested for gold content. Testing for base metals was completed on eleven (11) samples. The testing for base metals came back with less than or at the detection limit of the equipment. The assay results of the sampling campaign confirmed the presence of iron at HABS 1. Whole rock analysis of the samples taken at HABS 1 showed the total Fe as %  $\text{Fe}_2\text{O}_3$  ranged from 31.6% to 54.1% with an arithmetic mean of 48.4%. The contaminants of concern for iron deposits are sulphur and phosphorus. The analysis results from the HABS 1 samples displayed a sulphur content ranging from 0.01% S to 0.43% S and a phosphorus content of <0.01%  $\text{P}_2\text{O}_5$  to 0.23%  $\text{P}_2\text{O}_5$ . The samples were also tested for gold and base metals but produced no significant results.



Five (5) samples from HABS 3 yielded total Fe as %  $\text{Fe}_2\text{O}_3$  ranging from 27.7% to 52.7%. Phosphorus content ranged from 0.03%  $\text{P}_2\text{O}_5$  to 0.20%  $\text{P}_2\text{O}_5$  and sulphur content ranged from 0.02% S to 1.18% S.

Two (2) samples from HABS 10 yielded total Fe as %  $\text{Fe}_2\text{O}_3$  from 39.1% to 55.9%. Phosphorus content ranged from 0.08%  $\text{P}_2\text{O}_5$  to 0.26%  $\text{P}_2\text{O}_5$  and sulphur content ranged from 0.12% S to 0.18% S.

The BIF unit delineated in HABS 1 had a mathematical average iron content of 48.4% Fe as  $\text{Fe}_2\text{O}_3$  (XRF) and is based on grab sample analyses. The extremely weathered condition of Unit 2 gossan made it difficult to obtain a fresh sample which is necessary for an accurate sample assay. The geology in this area supports the potential for base metal and precious metal mineralization, but sampling to date has not identified metals of a significant quantity or content.

The September 2009 mapping and sampling campaign carried out by AEI delineated a zone of BIF as wide as 700 m with a strike length of 2,600 m. The BIF unit, which has a NW-SE orientation, is hosted by metasedimentary and granitic rocks. A gabbro dyke cuts through the BIF, Unit 1, Unit 2 and Unit 2 gossan.

In May, 2011 AEI has initiated exploration on the Tuktuk Property with planning to drill a total of 3000 for the first exploration drilling program on the Tuktuk Property.

## 16.0 MINERAL PROCESSING AND METALLURGICAL TESTING

### 16.1 Historical

Mineral processing and metallurgical testing were completed on grab, trench, bulk and drill core samples from the Roche Bay Magnetite Project site between 1968 and 1984. A summary of these testing programs is provided in the September 17, 2009 Technical Report (Palmer and Shaw, 2009). No metallurgical work has been carried out by Golder and the following information is based on information provided to Golder by AEI.

### 16.2 Mineral Processing and Metallurgical Test Work 2006 to 2007

Recent metallurgical work on the project has included testing of 5 composite samples from the 2006 and 1982 drilling programs. The metallurgical evaluation was conducted by SGS Lakefield in 2007. The metallurgical testing of drill core samples from A and C-Zones indicates that effective concentration and recovery may be achieved by crushing, dry magnetic separation, fine grinding and wet magnetic separation.

Recent data from the 2007 and 2008 drilling programs allows qualitative and quantitative evaluation of the metallurgical characteristics of the Roche Bay Magnetite Deposit.

AEI has carried out evaluations including logistical and marketing criteria that indicate that the production of 1 Mt/year of iron nuggets, by direct reduction process, based on the MIDREX-KOBE STEEL Technology (ITmk3), should be the target mineral processing method for the Roche Bay Magnetite Project.



## TECHNICAL REPORT - ROCHE BAY MAGNETITE PROJECT C-ZONE

Based on metallurgical testwork performed at SGS Lakefield on five samples, two of which are from C-Zone, AEI has formulated a proposed treatment plan for the Roche Bay magnetic ores for which expected grades are as shown in Table 16.1 as follows:

**Table 16-1: Results of the Ore Treatment Model; Sources: SGS Metallurgical Tests and Statistical Treatment of 2007 Drilling Chemical Data**

| FO | SO   | PO  | F1   | S1   | WR1  | P1  | F2    | S2          | WR2  | P2   | WR3  | GWR  |
|----|------|-----|------|------|------|-----|-------|-------------|------|------|------|------|
| %  | %    | t/y | %    | %    | %    | t/y | %     | %           | %    | t/y  | %    | %    |
| 25 | 0.59 | 7.3 | 31.9 | 0.86 | 63.4 | 4.6 | 65.43 | 1.38        | 39.8 | 1.84 | 81.7 | 20.6 |
| 26 | 0.56 | 6.6 | 32.1 | 0.75 | 66.9 | 4.4 | 65.43 | <b>1.14</b> | 40.6 | 1.80 | 83.4 | 22.7 |
| 27 | 0.62 | 6.1 | 32.4 | 0.66 | 70.5 | 4.3 | 65.44 | 0.93        | 41.4 | 1.77 | 84.8 | 24.8 |
| 28 | 0.49 | 5.6 | 32.6 | 0.57 | 74.0 | 4.1 | 65.45 | 0.77        | 42.2 | 1.74 | 86.0 | 26.9 |
| 29 | 0.45 | 5.2 | 32.9 | 0.50 | 77.6 | 4.0 | 65.47 | 0.63        | 43.1 | 1.73 | 87.0 | 29.0 |
| 30 | 0.42 | 4.8 | 33.1 | 0.44 | 81.1 | 3.9 | 65.49 | 0.52        | 43.9 | 1.71 | 87.7 | 31.2 |
| 31 | 0.39 | 4.5 | 33.4 | 0.39 | 84.6 | 3.8 | 65.52 | 0.43        | 44.7 | 1.70 | 88.3 | 33.4 |
| 32 | 0.36 | 4.2 | 33.6 | 0.34 | 88.2 | 3.7 | 65.55 | 0.35        | 45.5 | 1.69 | 88.9 | 35.7 |
| 33 | 0.34 | 3.9 | 33.9 | 0.29 | 91.7 | 3.6 | 65.58 | 0.29        | 46.3 | 1.68 | 89.3 | 38.0 |
| 34 | 0.31 | 3.7 | 34.1 | 0.26 | 95.3 | 3.6 | 65.62 | 0.24        | 47.2 | 1.67 | 89.7 | 40.3 |

During the completion of the 2009 Mineral Resource Technical Report and the PEA Technical Report, the iron magnetite processing method was the Direct Reduction Technology which is defined below.

MIDREX-KOBE Direct Reduction Technology (ITmk3): The ITmk3 Process developed by MIDREX and Kobe Steel, Ltd. is a new iron making technology that, by direct reduction of iron oxides, turns iron ore fines and pulverized coal into iron nuggets of similar quality as blast furnace pig iron.

The iron nuggets can be fed directly to a Basic Oxygen Furnace or Electric Arc Furnace as a pure iron source instead of pig iron and as an excellent scrap substitute. The benefits of the use of the ITmk3 Process for the Roche Bay Magnetite Project are as follows:

- Low investment cost for high value of final product;
- Higher profitability of the investment in comparison with pelletizing;
- Use of non-metallurgical coal for the reduction process;
- High thermal efficiency of the process by the use of recovered heat from process off-gas to produce the power necessary for the ore treatment process giving savings on the provision of diesel fuel to the remote site; and
- Environmental friendlier process supported by a lower carbon footprint.

The selection of iron nuggets as the final product is based on mineralogical, chemical and physical characteristics of Roche Bay ores by AEI.



The expected operating parameters for AEI's proposed treatment process are:

- Maximal acceptable ore sulphur grade, SO = 0.8%.
- Maximal acceptable sulphur grade in magnetic concentrate, S2 = 1.14%.
- Minimal iron grade in final concentrate, after sulphur flotation, F3 = 65%.
- Maximal sulphur grade in final concentrate, after sulphur flotation, S3 = 0.15%. This condition is imposed by the desulphuration potential of the MIDREX-KOBELCO process, in order to obtain maximum 0.05% S in the nuggets.
- Production after flotation of 1.5 Mt/year of dry concentrate.

The selection of the production capacity of 1.0 Mt/annum iron nuggets aims to ensure a long lifetime of the mine operation and to minimize the impact of the Roche Bay climate on the ore mining, beneficiation and material handling processes and their efficiency.

AEI proposes, at the first phase of the project, to install two ITmk3 Plants, each with a production capacity of 0.5 Mt nuggets/year.

To produce 1.0 Mt nuggets/year will require concentrate feed of *1.5 Mt concentrate/year* (dry solid basis). The required operating parameters (material balance; dry solid basis) of Roche Bay Magnetite Project are shown in Table 16.2.

**Table16-2: Roche Bay Magnetite Project: Required Operating Parameters  
(Annual Material Balance)**

| Parameter                                                               | Value     |
|-------------------------------------------------------------------------|-----------|
| Production Capacity (nuggets; 2 ITkm3 lines; 8,000 hours/year), Mt/year | 1.00      |
| Concentrate Production Capacity (7,420 hours/year), Mt/year             | 1.5       |
| Concentrate Iron Grade, %                                               | 65 - 68   |
| Concentrate Silica Grade, %                                             | 5.0       |
| Concentrate Sulphur Grade (before sulphur flotation), %                 | max. 1.15 |
| Concentrate Size (K80), µm                                              | 35 - 40   |
| Global Weight Recovery of Concentrating Process (RB High Iron Ores), %  | 38        |
| Ore Production Capacity (ROM), Mt/year                                  | 3.95      |
| Wet Tailing Quantity, Mt/year                                           | 2.45      |
| Siliceous Slag (from ITkm3), Mt/year                                    | 0.5       |

The required hourly production capacities with regard to the annual material balance are presented in Table 16.3.



**Table 16-3: Roche Bay Magnetite Project: Required Operating Parameters  
(Hourly Material Balance)**

| Parameter                                                           | Value |
|---------------------------------------------------------------------|-------|
| Production Capacity (nuggets; 2 ITkm3 lines; 8,000 hours/year), t/h | 125   |
| Concentrate Production Capacity (7,420 hours/year), t/hour          | 203   |
| Ore Production Capacity (ROM; 7,420 hours/year), t/hour             | 532   |
| Wet Tailing Quantity (7,420 hours/year), t/hour                     | 329   |
| Siliceous Slag (from ITkm3; 8,000 hours/year), t/h                  | 62.5  |

### 16.2.1 Ore Treatment Process – Preliminary Flowsheet Concept

The preliminary concept for ore treatment has been developed to meet the operating, capacity and quality requirements of the ITmk3 Process, and the proposed concept is as follows.

**Mining:** Selective mining will be used to maximize the head grade of material being fed to the plant by minimizing dilution.

**Primary Crushing:** Two METSO Impact Crushers will reduce the ore size from 400 mm up to -135 mm. Two Grizzlies with 135 mm opening will be placed at the discharge of each jaw crusher, in closed circuit.

**Secondary Crushing:** The crushed ore, of -135 mm size, will be transported to, and fed to the Secondary Crushing Bins (10 hours crushed ore reserve); the vibrating feeders will distribute the crushed ore to the two secondary cone crushers, that will reduce the ore size from 135 mm up to -13 mm, in closed circuit with a screening plant (single deck screens; 13 mm opening; the oversize +13 mm will be re-circulated to the cone crushers; the undersize -13 mm will be fed to the bins of the dry magnetic separators (Cobbing).

**Primary Grinding (HPGR) and Low Magnetic Separation:** The ore size will be reduced from 13 mm to -1.6 mm by a HPGR (1 grinding unit), in closed circuit with a wet screening plant (single deck screens, 1.6 mm sieve opening); the oversize +1.6 mm will be re-circulated to HPGR and the undersize -1.6 mm will be submitted to primary wet magnetic separation (LIMS).

**Secondary Grinding:** The -1.6 mm ore fraction after primary magnetic separation (LIMS) will be submitted to wet secondary grinding by the use of one or two small ball mills or Vertimills, in closed circuit with sizing hydro cyclones and additional LIMS. The size reduction will be from 1.6 mm to -40 µm (K80).

**Final Low Magnetic Separation:** The final low magnetic separation will be carried out by 2 to 3 LIMS stages, in serial connection, in order to obtain a final concentrate with a minimum of 65% Fe.

**Sulphur Flotation:** Sulphur flotation process will ensure a maximum of 0.15% S in final concentrate based on MIDREX process requirement.

**Final concentrate Storage:** After dewatering, the final concentrate will be stored in bins or stockpiles, to ensure a concentrate reserve for the continuous operation of the ITmk3 plants, during shutdowns of the concentrating plant.



Wet Tailing Management: The wet tailings from the concentrating process will be thickened and disposed of in an appropriate way (options to be defined during the next stage of study).

Nugget Storage: The nuggets will be stored in a covered stockpiling area.

Slag Management: Slag from the ITmk3 plants will be disposed of in an appropriate way (options to be defined during the next stage of study).

## 16.3 Current Mineral Processing and Metallurgical Test Work Program

### 16.3.1 General Considerations

The development of the current Roche Bay Project is based on the following design basis assumptions:

- Production of 5 Mt/year iron concentrate of minimum 65% Fe, maximum 5% SiO<sub>2</sub>, maximum 0.07% S and -0,035 to 0.040 mm size (P80), from Roche Bay magnetite ores, C-Zone, using the ore cut-off 20% Fe (ROM 27% Fe).
- The experimental basis of the project is constituted from the previous metallurgical testwork programs developed by the SGS Lakefield and COREM (Québec, Canada). The results of the mentioned metallurgical testwork programs were used in the development of the previous NI 43-101 technical reports regarding geological and financial (Palmer and Shaw, 2009 and Dorval, 2010). These NI 43-101 technical reports demonstrate the possibility of obtaining the 1.5 Mt concentrate/year necessary to the production of 1 Mt DR iron nugget/year, from Roche Bay ores, C-Zone, of 30% Fe (ROM). The AEI PEA (Dorval, 2010) required the quality of the concentrate be similar to the current concentrate specification, except for the sulphur grade (0.15% S; current, 0.07% S, maximum 0.1%). The COREM sulphide flotation tests developed on the two composite samples confirm the possibility of sulphur removal up to 0.03% S, in the final Roche Bay concentrate, under efficient economic conditions. Future laboratory and pilot metallurgical tests will be developed with COREM (Canada), SGA (Germany), Thyssen-Krupp Polysius (Germany) and CRIMM (China) in order to meet the usual requirements of the Roche Bay project feasibility study development.
- The previous process flowsheet proposed for the production of 1.5 Mt concentrate per year, including the intermediate product characteristics (chemistries and sizes) and process parameters of the process phases, are integrally valid for the current process variant, the production of 5 Mt concentrate per year, from the Roche Bay magnetite ores, cut-off 20% Fe and, consequently, from the ROM of 27% Fe.
- The material balance (solid basis) and process efficiency indexes (per phase of the process) are comparatively shown in Table 16-4.



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**Table 16-4: Material Balance and Major Chemistries vs. Ore Cut-Off**

| PARAMETER                                    | VALUE        |             |             |
|----------------------------------------------|--------------|-------------|-------------|
| <b>Ore Cut-Off, % Fe</b>                     | <b>20</b>    | <b>25</b>   | <b>28</b>   |
| ROM Iron Grade, <b>FH1</b> , %               | <b>27</b>    | <b>28.7</b> | <b>30</b>   |
| ROM Sulphur Grade, <b>SH1</b> , %            | 0.7          | 0.62        | 0.60        |
| Yearly ROM Production, <b>YHP1</b> , Mt/year | <b>18.47</b> | <b>0.62</b> | <b>0.60</b> |
| Hourly ROM Production, <b>HHP1</b> , t/hour  | <b>2493</b>  | <b>2313</b> | <b>2006</b> |

| PARAMETER                                                    | VALUE |       |       |
|--------------------------------------------------------------|-------|-------|-------|
| Dry Magnetic Separation (COBBING)                            |       |       |       |
| Cobbing Concentrate Iron Grade, <b>FC1</b> , %               | 32.36 | 32.61 | 33.11 |
| Pre-Concentrate Sulphur Grade, <b>SC1</b> , %                | 0.91  | 0.81  | 0.62  |
| Yearly Cobbing Concentrate Production, <b>YCP1</b> , Mt/year | 13.04 | 12.71 | 12.06 |
| Hourly Cobbing Concentrate Production, <b>HCP1</b> , t/hour  | 1756  | 1712  | 1625  |
| Cobbing Tailing Iron Grade, <b>FT1</b> , %                   | 14.22 | 14.87 | 16.65 |
| Yearly Cobbing Tailing Production, <b>YTP1</b> , Mt/year     | 5.46  | 4.46  | 2.81  |
| Hourly Cobbing Tailing Production, <b>HTP1</b> , t/hour      | 736   | 601   | 379   |
| Cobbing Weight Recovery, <b>WR1</b> , %                      | 70.47 | 74.01 | 81.09 |
| Cobbing Iron Recovery, <b>IR1</b> , %                        | 84.45 | 86.19 | 89.50 |
| Wet Magnetic Separation (LIMS)                               |       |       |       |
| LIMS Concentrate Iron Grade, <b>FC2</b> , %                  | 65.44 | 65.45 | 65.49 |
| LIMS Concentrate Sulphur Grade, <b>SC2</b> , %               | 1.50  | 1.26  | 0.86  |
| Yearly LIMS Concentrate Production, <b>YCP2</b> , Mt/year    | 5.39  | 5.36  | 5.29  |
| Hourly LIMS Concentrate Production, <b>HCP2</b> , t/hour     | 728   | 723   | 713   |
| LIMS Tailing Iron Grade, <b>FT2</b> , %                      | 8.96  | 8.60  | 7.81  |
| Yearly LIMS Tailing Production, <b>YTP2</b> , Mt/year        | 7.63  | 7.33  | 6.76  |
| Hourly LIMS Tailing Production, <b>HTP2</b> , t/hour         | 1029  | 989   | 912   |
| LIMS Weight Recovery, <b>WR2</b> , %                         | 41.43 | 42.23 | 43.87 |
| LIMS Iron Recovery, <b>IR2</b> , %                           | 83.79 | 84.77 | 86.77 |
| Sulphide Flotation                                           |       |       |       |
| Final Concentrate Iron Grade, <b>FC3</b> , %                 | 65.99 | 65.90 | 65.79 |
| Final Concentrate Sulphur Grade, <b>SC3</b> , %              | 0.07  | 0.07  | 0.07  |
| Yearly Final Concentrate Production, <b>YCP3</b> , Mt/year   | 5.0   | 5.0   | 5.0   |
| Hourly Final Concentrate Production, <b>HCP3</b> , t/hour    | 675   | 675   | 675   |
| Flotation Tailing Iron Grade, <b>FT3</b> , %                 | 58.44 | 59.12 | 60.26 |
| Yearly Flotation Tailing Production, <b>YTP3</b> , Mt/year   | 0.38  | 0.35  | 0.28  |
| Hourly Flotation Tailing Production, <b>HTP3</b> , t/hour    | 52.60 | 47.96 | 38.00 |
| Flotation Weight Recovery, <b>WR3</b> , %                    | 92.77 | 93.37 | 94.67 |
| Flotation Iron Recovery, <b>IR3</b>                          | 93.55 | 94.01 | 95.10 |
| Global                                                       |       |       |       |
| Global Weight Recovery, <b>GWR</b> , %                       | 27.08 | 29.18 | 33.68 |



| PARAMETER                                                                | VALUE        |              |              |
|--------------------------------------------------------------------------|--------------|--------------|--------------|
| Global Iron Recovery, <b>GIR</b> , %                                     | <b>66.19</b> | <b>68.69</b> | <b>73.85</b> |
| Total Yearly Wet Tailing Production, <b>YTPG</b> , Mt/year               | 8.03         | 7.70         | 7.05         |
| Total Hourly Wet Tailing Production, <b>HTPG</b> , t/year                | 1082         | 1037         | 950          |
| Global Wet Tailing Iron Grade (solid basis), <b>FTG</b> , %              | 11.36        | 10.93        | 9.90         |
| Global Wet Tailing Sulphur Grade (solid basis), <b>STG</b> , %           | 1.44         | 1.29         | 1.01         |
| Yearly Wet Tailing Production (slurry 50% solid), <b>SYTPG</b> , Mt/year | 16.04        | 15.40        | 14.11        |
| Hourly Wet Tailing Production (slurry 50% solid), <b>SHTPG</b> , t/hour  | 2163         | 2074         | 1900         |
| Global Wet Tailing Iron Grade (slurry), <b>SFTG</b> , %                  | 5.68         | 5.47         | 4.95         |
| Global Wet Tailing Sulphur Grade(slurry), <b>SSTG</b> , %                | 0.72         | 0.65         | 0.51         |

### 16.3.2 Summary of the Metallurgical Test Work Results

#### General

The objective of the Roche Bay metallurgical test work programs, developed by recognized Canadian R&D Centres/Laboratories, SGS Lakefield and COREM, Québec, Canada, was the experimental investigation of the metallurgical processes able to efficiently produce a standard iron concentrate characterized by the following chemistry: 65% Fe, maximum 5% SiO<sub>2</sub> and maximum 0.07% S.

The magnetic separation processes (dry and wet), at laboratory and pilot scales, including Davis Tube tests, were considered and investigated. The liberation grinding size, necessary to the obtaining of the standard concentrate quality was quantified. The laboratory and pilot sulphide flotation tests were developed, in order to quantify the flotation process parameters necessary to obtain the required concentrate sulphur grade of maximum 0.07%.

In addition to the metallurgical tests, the physical characteristics of Roche Bay ores (ore hardness) were evaluated by the quantification of the ore energy consumptions during the crushing and grinding processes (crushing and ball mill Work Indexes).

The results of the metallurgical test work programs and required production capacity of the Roche Bay concentrating plant are the basis of the selection of the ore treatment flowsheet concept.

Knowing the high energy consumption required by comminution processes (about 70% from total energy required by concentration process), the most efficient crushing and grinding equipment were selected. The process equipment arrangement is based on the study of the concepts existing in operation concentrating plants treating magnetite ores, presenting similar characteristics (mineralogy, chemistry, liberation degree and hardness).

#### Metallurgical Tests Results

##### Summary of SGS Lakefield and COREM Metallurgical Tests

Five ore composite samples, B1, B2, B3, B4 and B5 (SGS Tests) and 2 composite samples C1 and C2 (COREM Tests) were crushed and ground, and submitted to dry and wet magnetic separation processes and sulphide flotation tests (COREM). The 2007 and 2008 SGS Lakefield and 2010 COREM reports present the test programs and results, including the quantification of the crushing and grinding energy consumption.



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The ore samples marked B1, B2, B3, B4, B5 (SGS), C1 and C2 (COREM) were submitted to the comminution and enrichment tests in accordance with the testwork program, as follows:

- Crushing and grinding, in order to quantify the crushability and grindability of the Roche Bay ores;
- Ore enrichment by dry magnetic and wet magnetic separation testing procedures (Cobbing and Davis Tube); and
- Sulphide flotation tests.

The chemistries of the ore composite samples B1 to B5 and C1 and C2 are summarized in Tables 16-5 and 16-6, respectively.

**Table 16-5: Chemistries of Ore Samples 1 to 5  
(Source: SGS Tests, Dry Magnetic Separation Tests)**

| Assay                        | B1    | B2    | B3    | B4    | B5    |
|------------------------------|-------|-------|-------|-------|-------|
| Fe, %                        | 32.90 | 22.80 | 32.90 | 26.30 | 21.70 |
| SiO <sub>2</sub> , %         | 47.70 | 51.90 | 47.80 | 55.00 | 55.50 |
| S, %                         | 0.40  | 0.70  | 0.29  | 0.50  | 0.72  |
| Satmagan                     | 40.20 | 16.00 | 42.80 | 22.00 | 15.90 |
| %Recoverable Fe <sub>m</sub> | 29.10 | 11.60 | 31.00 | 15.90 | 11.50 |
| %Recoverable Fe              | 88.50 | 50.70 | 94.30 | 60.60 | 52.90 |
| %Non-recoverable Fe          | 3.79  | 11.20 | 1.87  | 10.40 | 10.20 |

**Table 16-6: Chemistries of Ore Samples C1 and C2  
(Source: COREM Tests)**

| Assay                             | C1    | C2    |
|-----------------------------------|-------|-------|
| Fe, %                             | 30.10 | 34.50 |
| SiO <sub>2</sub> , %              | 48.91 | 45.12 |
| S, %                              | 0.54  | 0.28  |
| P <sub>2</sub> O <sub>5</sub> , % | 0.22  | 0.22  |
| Magnetite (Satmagan)              | 26.30 | 39.40 |

The Dry Magnetic Separation (DMS) process was selected as the first phase of the enrichment process, taking into consideration its general use for primary enrichment of magnetite ores. The results of DMS tests are shown in Table 16.7.



**Table 16-7: Results of the Dry Magnetic Separation Tests; Maximal Iron Recoveries (IR) at Grind Size 12.5 mm (100% Passing)**

| Test  | Grind Size<br>K <sub>100</sub> , mm | Fe <sub>CONC,1</sub><br>% | SiO <sub>2</sub><br>% | S<br>% | MAG<br>% | WR<br>% | IR<br>% | Batch # |
|-------|-------------------------------------|---------------------------|-----------------------|--------|----------|---------|---------|---------|
| MS-1  | 12.5                                | 41.10                     | 35.20                 | 0.64   | 53.40    | 89.00   | 97.70   | 1       |
| MS-2  | 12.5                                | 32.60                     | 39.40                 | 1.27   | 41.30    | 52.00   | 73.70   | 2       |
| MS-3  | 12.5                                | 37.80                     | 39.50                 | 0.34   | 62.60    | 92.00   | 98.60   | 3       |
| MS-4  | 12.5                                | 35.50                     | 41.60                 | 0.83   | 36.00    | 73.00   | 90.10   | 4       |
| MS-5  | 12.5                                | 35.70                     | 39.80                 | 1.43   | 34.60    | 52.00   | 79.20   | 5       |
| MS-6  | 3.35                                | 39.20                     | 38.70                 | 0.52   | 52.30    | 81.30   | 95.40   | 1       |
| MS-7  | 3.35                                | 36.70                     | 40.70                 | 1.08   | 37.50    | 44.10   | 70.50   | 2       |
| MS-8  | 3.35                                | 37.40                     | 40.90                 | 0.31   | 52.10    | 89.50   | 98.50   | 3       |
| MS-9  | 3.35                                | 34.20                     | 44.30                 | 0.66   | 34.00    | 66.10   | 87.20   | 4       |
| MS-10 | 3.35                                | 33.90                     | 43.40                 | 1.10   | 31.50    | 50.60   | 77.60   | 5       |
| SJ-1  | 0.30                                | 53.40                     | 22.00                 | 0.53   | 74.90    | 53.90   | 87.60   | 1       |
| SJ-2  | 0.30                                | 46.70                     | 27.90                 | 2.06   | 57.20    | 28.00   | 56.20   | 2       |
| SJ-3  | 0.30                                | 51.10                     | 25.50                 | 0.31   | 72.90    | 58.90   | 92.00   | 3       |
| SJ-4  | 0.30                                | 44.30                     | 31.70                 | 1.11   | 54.60    | 40.70   | 68.60   | 4       |
| SJ-5  | 0.30                                | 46.20                     | 29.10                 | 2.11   | 55.00    | 27.80   | 58.80   | 5       |
| SJ-6  | 0.85                                | 46.90                     | 30.30                 | 0.43   | 63.90    | 61.90   | 87.30   | 1       |
| SJ-7  | 0.85                                | 45.50                     | 29.10                 | 1.51   | 54.20    | 28.70   | 54.60   | 2       |
| SJ-8  | 0.85                                | 43.10                     | 35.30                 | 0.28   | 59.30    | 72.10   | 94.20   | 3       |
| SJ-9  | 0.85                                | 38.80                     | 38.70                 | 0.71   | 42.90    | 49.20   | 72.10   | 4       |
| SJ-10 | 0.85                                | 42.50                     | 32.70                 | 1.24   | 47.50    | 29.40   | 57.10   | 5       |

*Wet Magnetic Separation (SGS and COREM Davis Tube Tests):* The results of Davis Tube tests are shown in Tables 16-8 (SGS) and 16-9 (COREM). The SGS tests were conducted on ore samples **B1, B2, B3, B4** and **B5**, ground to sizes 26, 38 and 50 µm (K<sub>80</sub>). The COREM samples grinding sizes were K<sub>80</sub> 38 and 31 µm. The review of the test results takes into account the requirements of the standard concentrate quality specification, as follows:

- Minimum 65% Fe, maximum 5% SiO<sub>2</sub> in final concentrate and maximum 0.07% S after sulphide flotation.

The study of the SGS and COREM Davis Tube test results reveals the following aspects:

- The ore grinding size of -38 µm meets the concentrate quality specification, excepting the silica grade.
- The ore grinding sizes of -35 µm (K<sub>80</sub>) seems to meet the concentrate quality specification including iron and silica grade, **Fe<sub>c</sub>>65% and SiO<sub>2,c</sub><5%**.



**Table 16-8: SGS Davis Tube Test Results (from Ore to Magnetic Concentrate)**

| Test  | Batch Sample | K <sub>80</sub> µm | Fe <sub>C</sub> % | SiO <sub>2,C</sub> % | S <sub>C</sub> % | P <sub>C</sub> % | WR % | IR % | MR % | Fe <sub>ORE</sub> % | M <sub>ORE</sub> % |
|-------|--------------|--------------------|-------------------|----------------------|------------------|------------------|------|------|------|---------------------|--------------------|
| DT-11 | B1           | 26                 | 69.00             | 3.54                 | 0.63             | 0.01             | 42.1 | 88.3 | 99.2 | 32.9                | 40.2               |
| DT-12 | B2           | 26                 | 66.40             | 4.65                 | 3.58             | 0.02             | 17.1 | 49.8 | 97.6 | 22.8                | 16.0               |
| DT-13 | B3           | 26                 | 69.20             | 3.06                 | 0.29             | 0.01             | 43.5 | 91.5 | 99.0 | 32.9                | 42.8               |
| DT-14 | B4           | 26                 | 65.70             | 6.49                 | 1.93             | 0.02             | 24.9 | 75.4 | 97.8 | 26.3                | 22.0               |
| DT-15 | B5           | 26                 | 67.60             | 4.10                 | 3.57             | 0.02             | 17.2 | 53.6 | 97.1 | 21.7                | 15.9               |
| DT-21 | B1           | 38                 | 66.90             | 5.02                 | 0.71             | 0.01             | 41.9 | 85.2 | 99.0 | 32.9                | 40.2               |
| DT-22 | B2           | 38                 | 65.70             | 5.88                 | 3.45             | 0.02             | 17.9 | 51.6 | 94.7 | 22.8                | 16.0               |
| DT-23 | B3           | 38                 | 68.30             | 3.65                 | 0.29             | 0.01             | 43.6 | 90.5 | 98.7 | 32.9                | 42.8               |
| DT-24 | B4           | 38                 | 65.40             | 7.15                 | 1.90             | 0.03             | 24.7 | 61.4 | 97.4 | 26.3                | 22.0               |
| DT-25 | B5           | 38                 | 66.00             | 5.36                 | 3.53             | 0.02             | 18.1 | 55.1 | 96.6 | 21.7                | 15.9               |
| DT-16 | B1           | 50                 | 66.00             | 7.11                 | 0.64             | 0.01             | 43.5 | 87.3 | 98.6 | 32.9                | 40.2               |
| DT-17 | B2           | 50                 | 63.00             | 9.28                 | 3.52             | 0.03             | 19.5 | 53.9 | 97.1 | 22.8                | 16.0               |
| DT-18 | B3           | 50                 | 65.10             | 8.41                 | 0.36             | 0.01             | 45.3 | 89.6 | 98.6 | 32.9                | 42.8               |
| DT-19 | B4           | 50                 | 62.00             | 10.10                | 1.94             | 0.03             | 26.2 | 61.8 | 98.1 | 26.3                | 22.0               |
| DT-20 | B5           | 50                 | 63.40             | 8.31                 | 3.59             | 0.02             | 18.7 | 54.6 | 93.4 | 21.7                | 15.9               |
| Calc. | B1           | 35                 | 67.36             | 4.61                 | 0.71             | -                | 42.6 | 87.2 | -    | 32.9                | 40.2               |
| Calc. | B2           | 35                 | 66.12             | 5.33                 | 3.45             | -                | 17.9 | 51.9 | -    | 22.8                | 16.0               |
| Calc. | B3           | 35                 | 68.72             | 3.55                 | 0.29             | -                | 44.0 | 91.9 | -    | 32.9                | 42.8               |
| Calc. | B4           | 35                 | 65.60             | 6.83                 | 1.90             | -                | 25.4 | 63.4 | -    | 26.3                | 22.0               |
| Calc. | B5           | 35                 | 66.46             | 4.92                 | 3.53             | -                | 17.8 | 54.5 | -    | 21.7                | 15.9               |

Note: The notations used in Table 16.8 are as follows: %Fe<sub>C</sub> – Iron in concentrate; %WR – Davis Tube Weight Recovery; %IR – Iron Recovery; %MR – Magnetite Recovery; %Fe<sub>ORE</sub> – Iron in Ore; %M<sub>ORE</sub> – Magnetite in Ore; High Iron Ores shaded in yellow.

**Table 16-9: COREM Davis Tube Test Results (from Ore to Magnetic Concentrate)**

| Test | Sample | K <sub>80</sub> µm | Fe <sub>C</sub> % | SiO <sub>2,C</sub> % | S <sub>C</sub> % | P <sub>C</sub> % | WR % | IR % | MR % | Fe <sub>ORE</sub> % | M <sub>ORE</sub> % |
|------|--------|--------------------|-------------------|----------------------|------------------|------------------|------|------|------|---------------------|--------------------|
| DT-1 | C1     | 38                 | 65.00             | 7.52                 | 0.56             | 0.03             | 31.0 | 68.1 | 96.9 | 29.6                | 28.4               |
| DT-2 | C1     | 31                 | 66.10             | 5.48                 | 0.54             | 0.02             | 29.9 | 65.7 | 96.5 | 30.1                | 26.3               |
| DT-3 | C2     | 38                 | 66.10             | 6.80                 | 0.58             | 0.02             | 43.1 | 84.8 | 98.4 | 33.6                | 40.6               |
| DT-4 | C2     | 31                 | 68.08             | 4.30                 | 0.54             | 0.01             | 42.3 | 83.5 | 98.6 | 34.5                | 39.4               |

Note: The notations used in Tables 16.8 and 16.9 are as follows: %Fe<sub>C</sub> – Iron in concentrate; %WR – Davis Tube Weight Recovery; %IR – Iron Recovery; %MR – Magnetite Recovery; %Fe<sub>ORE</sub> – Iron in Ore; %M<sub>ORE</sub> – Magnetite in Ore; High Iron Ores shaded in yellow (SGS Tests).



### Conclusions and Recommendations

- The aspects presented above aim, by the interpretation of the results of the metallurgical tests, to identify the impacts of the ore characteristics on the quality of the Roche Bay concentrate and on the most appropriate selection of the ore treatment procedures. The crushability and grindability of Roche Bay ores are not included in the work.
- The interpretation of the test results is based on the mathematical/statistical treatment of available test data (SGS Lakefield and COREM, Canada).
- The metallurgical test results, summarized above, reveal the important characteristics of Roche Bay ores, as such the medium hardness, sulphur presence (pyrrhotite), high magnetite dispersion and low contaminant levels (P, Ti, V).
- The objective of the testwork programs was the obtaining, by low intensity magnetic separation and sulphide flotation, under efficient metallurgical procedures, of a standard iron concentrate, characterized by minimum 65% Fe, maximum 5%  $\text{SiO}_2$  and maximum 0.07% S. In addition, the mathematical treatment of the test results has tried to identify the ways able to obtain other concentrate qualities from Roche Bay magnetite ores.
- The test results demonstrate, because of the magnetite low liberation degree, the necessity of the advanced grinding process required by the silica removal. The required liberation grinding size for  $\text{SiO}_2$  <5% in final concentrate is **-35  $\mu\text{m}$  or -400 mesh ( $K_{80}$ )**.
- Based on the test result, the recommended minimal grinding size is -30  $\mu\text{m}$  ( $K_{80}$ ). In conclusion, the obtaining of the high iron grade levels in the concentrate (>64% Fe), by cheap wet magnetic separation, is not a metallurgical problem. The silica removal requires the advanced grinding only.
- The ore sulphur grade, because of the magnetic character of the pyrrhotite, requires additional sulphide flotation process, necessary to the obtaining of maximum 0.07% S in final concentrate.
- The dry magnetic separation process aims to ensure the stability of the operating parameters of the primary and secondary grinding processes, by the diminishing of the iron grade variability of the crushed ore. Based on the efficiency criteria, in the case of the ore >32% Fe, the dry magnetic separation is not recommended (magnetite loss).
- It will be possible, by the variation of the operational parameters, to obtain different concentrate qualities.
- Taking account of the Roche Bay concentrate chemistry and grinding size, the Roche Bay concentrate is ideally suited for pelletizing and/or direct reduction processes and are the recommended for ulterior processing of Roche Bay concentrate. The chemistry and grinding size of Roche Bay concentrate meets the quality requirements of the pelletizing and/or direct reduction processes without additional grinding and enrichment phases.



### ***Additional DFS Metallurgical and Process Test Works (Finalized and/or in Progress)***

- 1) Work Program for Roche Bay sample handling, selection and preparation (8 tonnes samples; 1,064 samples) toward the selection preparation of the samples  $\geq 25\%$  Fe ( $\geq 28\%$  Fe in ROM) necessary to the development of the metallurgical tests (China, 500 kg and COREM, Canada 500 kg), High Pressure Roller and Ball Mill Grinding (Thyssen Krupp Polysius, Germany, 2 tonnes samples), Advanced Ore Treatment Pilot Tests (SGA R&D Center, Germany, 2 tonnes, previously ground at Thyssen Krupp Polysius) and Semi-Industrial Concentrate Production Tests (COREM, Canada, 2 tonnes samples).
- 2) Shipping by plane of the 500 kg sample to CRIMM Laboratory, China for the development of the metallurgical tests toward the additional validation of the Roche Bay ore treatment flowsheet.
- 3) High Pressure Roller and Ball Mill Grinding Testwork Program, Thyssen Krupp Polysius; Laboratory and pilot grinding tests, including the characterization of Roche Bay ore grindability, roller abrasion index and the quantification of grinding process parameters on 2 tonnes Roche Bay Samples.
- 4) Ore Mineralogical Study and Laboratory Metallurgical Testwork Program, will be developed by COREM on the ore composite samples resulted from the preparation of 1,064 ore samples mentioned above (item 1); 729 samples of  $\geq 25\%$  will participate in the composite sample preparation. Ore structures, mineral associations and their quantitative distribution will be quantified. Ore liberation degree and grinding size necessary to the obtaining of standard concentrate will be quantified. Wet LIMS and sulfide flotation tests will be developed.
- 5) Advanced Pilot Testwork Program (SGA R&D Center, Germany; 2 tonnes samples, previously ground at Thyssen Krupp Polysius), including all phases of Roche Bay ore treatment process. The necessity of the tests is justified by the qualification of the ore response in the case of the particular form of the ore particles resulting from high pressure grinding process.
- 6) Semi-Industrial Concentrate Production Tests (COREM, Canada, 2 tonnes samples).
- 7) Concentrate Sedimentation and Dewatering Testwork Program, toward the qualification of the response of Roche Bay concentrate to dewatering processes, taking into consideration the shipping requirement, maximum 7% moisture in the concentrate and Roche Bay process conditions (slurry temperature and fine grinding size); Stage: Finalized.

### **16.3.3 Roche Bay Ore Treatment Flowsheet (Proposal)**

#### ***Ore Characteristics***

In accordance with the geological assumptions, the ore cut-off of 20% Fe will be used. The average ROM iron grade, corresponding to the cut-off, is 27% Fe.

The complete chemistries of the Roche Bay ores can be found in the geological sections of this document.

#### ***Final Product***

The final product is the fine iron concentrate in accordance with the quality specification presented above. The required grinding size (liberation grinding size) of the concentrate is  $-35\ \mu\text{m}$  or 400 mesh (K80), based on the SGS and CORE test results. The maximal sulphur grade in the final concentrate (after sulphide flotation) will be 0.07%.



### Production Capacity

The aimed production capacity is **5.0 Mt** concentrate per year or **675 t/hour** (7420 hours/year; dry basis), the maximal admissible moisture being 7%. The ROM production capacity, in the case of **ROM 27% Fe**, is **18.47 Mt/year** or **2493 t/hour**. The expected size of the ROM is -1000 mm and the humidity 4% to 5%. The dry magnetic separation is not recommended if **FH1>\*32% Fe**.

### Process Flowsheet Concept

Based on the SGS and COREM metallurgical test results, SGS process flowsheet proposal (2008), MAN Ferrostaal and Metso Minerals proposals, the Roche Bay ore treatment process includes the following phases:

- Ore comminution from the ROM size max. 1000 mm up to 12 to 13 mm, required by dry magnetic separation process. Dry magnetic separation process (Cobbing) is not recommended if the ROM iron grade is >32%;
- Ore grinding and enrichment, including the primary grinding (from 12 to 13 mm up to 1.6 mm), secondary grinding (from 1.6 mm up to 35 µm) and wet magnetic separation (LIMS);
- Sulphide flotation necessary for the removal the sulphur from the magnetic concentrate, up to 0.07%;
- Concentrate dewatering/thickening and filtration, in order to meet the shipping requirement, maximum 7% moisture in final concentrate; and
- Wet tailing thickening.

The selection of the Roche Bay process flowsheet concept and equipment has been based on the following major technical and financial criteria:

- Respect of the metallurgical, process and concentrate quality requirements resulted from metallurgical and process testwork and concentrate quality specification;
- Optimal relationships between the required production capacity and process flowsheet concept (equipment type included) aiming at the maximization of the process efficiency;
- Selection of the process equipment able, under minimal CAPEX and OPEX levels, to meet the capacity and quality requirements of the project; and
- Process flowsheet is able to, by its operating flexibility, ensure the stability of the process and product quality, under inevitable variable conditions of the production capacity and ore quality.



## **17.0 MINERAL RESOURCE AND MINERAL RESERVE ESTIMATES**

### **17.1 Introduction**

The first independent mineral resource for the C-Zone was completed by Golder and released on March 12, 2009, with a revised technical report dated September 17, 2009 (Palmer and Shaw, 2009). This first mineral resource estimate was based on a 25% iron cut-off grade and defined an Inferred Mineral Resource of 357.0 million tonnes at an average grade of 28.07% iron and 28.57 magnetics ( $\text{Fe}_3\text{O}_4$ ) to a depth of 250 m below surface. The March 12, 2009 Mineral Resource was based on a mineral processing method that created an iron nugget product and no major Davis Tube metallurgical test work on the C-Zone 2007 and 2008 drill hole campaign data.

The April 6, 2011 Roche Bay C-Zone deposit Mineral Resource Estimate was completed by Greg Greenough, P.Geo., and reviewed by Paul Palmer, P.Eng., P.Geo. The estimate incorporated data analysis, 3-dimensional solids modelling, variogram analysis and block model interpolation utilizing Datamine Studio v3, 3.19.4135, (Datamine) in extended (double) precision.

The Roche Bay C-Zone resource model consists of one mineralized envelope constructed by Golder, based on drill hole geology and total Fe metal grade data. The overall trend of the deposit is northeast-southwest, in UTM coordinates, dipping 70 degrees to the south-east. The zone has a total strike length of approximately 5 kms, an average horizontal thickness of 160 m, and is still open below the currently defined depth of approximately 300 m below surface. Golder used top of bedrock drill data and topographic survey data to develop overburden and topography surfaces.

Drill hole data was provided in both UTM and local (drilling) grid co-ordinates (which is a counter-clockwise rotation of 40.5° to UTM). All resource modelling work was done in the local grid coordinate system as this is the one used for section references and drill hole layout. Resource model blocks will therefore be orthogonal to the drilling grid.

This mineral resource estimate is an update to the April 24, 2009 independent NI 43-101 Mineral Resource Estimate submitted to AEI by Golder. The new estimate is based on the same number of drill holes, but with additional Satmagan results not previously available, as well as supporting Davis Tube test results, as recommended by Golder in the April 24, 2009 Technical Report.

Good correlations between total iron (Fe) and Bulk Density (Specific Gravity - SG) allowed polynomial regression formulae to be used to calculate SG where SG was not included in the assay data.

Variogram calculations, variogram model fitting, and block model grade interpolations for all elements supplied in the drill hole data were done with Datamine.

### **17.2 Drill Hole Data**

The Roche Bay drill hole database information supplied to Golder by AEI included a total of 110 surface holes drilled during 2007 and 2008 exploration drill programs. The final collars, down-hole surveys, lithological descriptions and codes, dry bulk densities, and assay data files were supplied in comma-separated-value (csv) format.



A summary and description of the data files provided to Golder by AEI is provided in Table 17-1.

**Table 17-1: Roche Bay Data Files**

| File name              | Effective Date            | Comments                                                                                                                                                               |
|------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Collars_20090205.csv   | Feb 5, 2009               | 110 records; contains both UTM and local grid collar coordinates – local grid used.                                                                                    |
| Survey_20081008.csv    | Oct 8, 2008               | 4,518 records: no down-hole surveys available for 2007 drilling – straight from collar assumed.                                                                        |
| Geology_20090125.csv   | Jan 25, 2009              | 2,227 records                                                                                                                                                          |
| Litho_20090216.csv     | Feb 16, 2009              | 12,195 records                                                                                                                                                         |
| Densities_20090216.csv | Feb 16, 2009              | 12,195 records: 211 measured; 11205 calculated from Fe assay; 753 assigned 'default' values; 25 null values                                                            |
| Assay.csv              | Same as previous estimate | 12,240 records: -99 values set to null after import to Datamine                                                                                                        |
| New_Satmagans.csv      | Feb 18, 2011              | 797 records, replace previously calculated Fe <sub>3</sub> O <sub>4</sub> values: 10 duplicate records removed and values of "<" set to zero before import to Datamine |

The data was imported into Datamine and de-surveyed using internal Datamine processes. Although the drill hole log for RBC-82-001 shows abundant BIF, no samples were taken; therefore this hole was removed from the data for grade interpolation.

### 17.3 Geological Interpretation

A data terrain model (dtm) surface representing the base-of-overburden/top-of-bedrock was generated from the bottom of the casing intervals in the de-surveyed drill hole data. A digital topographical surface was provided by AEI and the de-surveyed collar locations were checked against the surface and found to be within acceptable limits (approximately 1 m or less).

Total iron in the deposit is very closely associated with the BIF; therefore definition of the resource model envelope attempted to encompass as many of the contiguous multi-layered BIF horizons as possible, while keeping the amount of internal waste material to a minimum. Based on the total length of captured data for each lithological unit, the final mineralized envelope (wire frame) contains approximately 81% BIF material, with reasonably small internal amounts of waste metasediments (12%), schist (4%), and gabbro and other lithologies (3%).

Some very minor BIF intervals were observed external to the mineral envelope in the hanging wall, but were very discontinuous and ignored for this estimate. More significant BIF intervals were identified external to the footwall of the mineral envelope but the absence of longer holes on many of the drill sections prevented reliable interpretation of another contiguous mineralized zone. Golder recommends that future drilling consider further testing of these footwall areas in order to fully define the BIF mineralization.



To ensure that all of the mineral envelope is supported by drill data, the outer limits of the mineralization were extended using a distance of approximately 1/3 the drill spacing (to the closest un-mineralized hole or from the last mineralized hole) as a control. Surface meshes (dtms) were made from the digitized points in the general plane of the deposit using control strings for the outer limits. This method is useful for removing irregularities in the outer limits, and also for minimizing interpretational bias that can exist in wire frames generated from section or plan strings/polylines.

To ensure proper sample capture, points defining the mineralized envelope were snapped to the end points of the appropriate drill hole intervals and validated through visual checks. The volumes were verified to ensure that there were no intersections or invalid (open or shared) edges.

Boolean wire frame facilities in Datamine were used to provide the correct contact between the mineralized zone upper limit and bedrock/overburden.

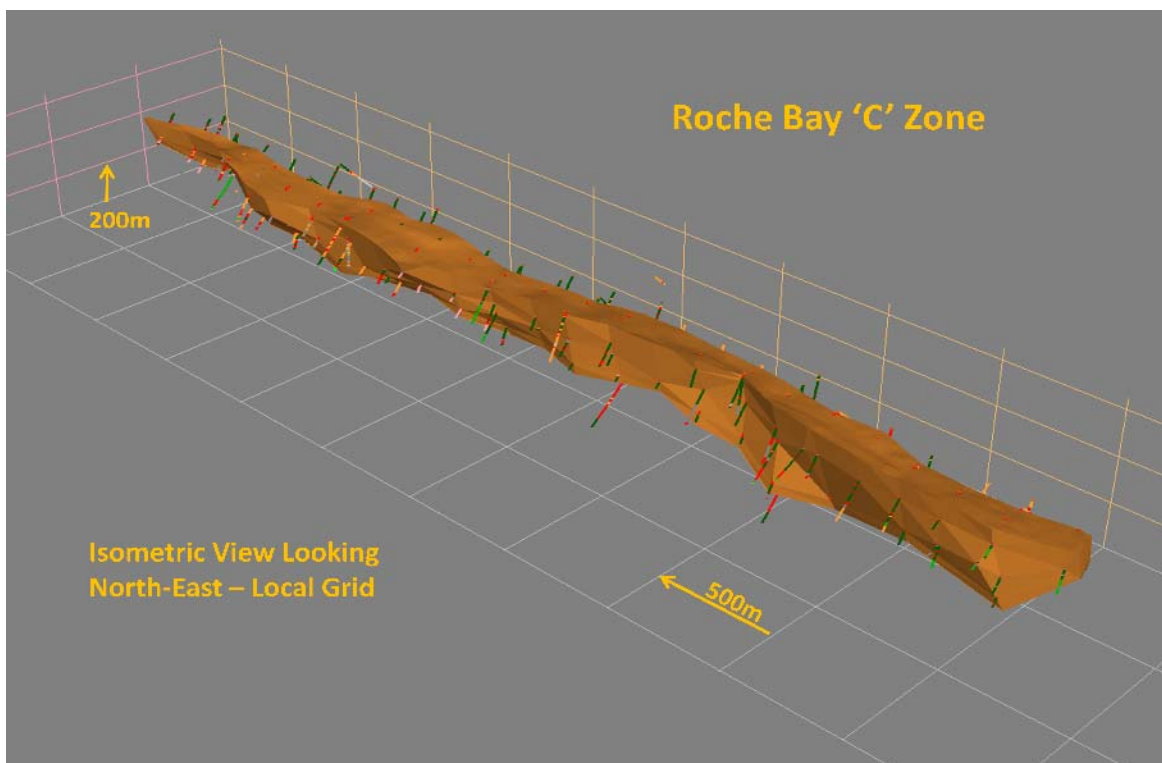


Figure 17-1: Roche Bay 3D Isometric View of Mineralized Zone and Diamond Drill Coverage

## 17.4 Exploratory Data Analysis (EDA)

### 17.4.1 Raw Assay Data

Primary statistics of raw assay data for the entire drill hole database are summarized in Table 17-2.



Table 17-2: Roche Bay Raw Sample Data

| FIELD  | SAMPLES | MINIMUM | MAXIMUM | TOTAL  | MEAN  | VARIANCE | STANDDEV |
|--------|---------|---------|---------|--------|-------|----------|----------|
| LENGTH | 12240   | 0.10    | 327.00  | 28,867 | 2.36  | 78.23    | 8.84     |
| SIO2   | 11549   | 3.40    | 95.50   |        | 51.50 | 43.50    | 6.60     |
| AL2O3  | 11550   | 0.04    | 17.40   |        | 4.75  | 19.83    | 4.45     |
| FE2O3  | 11550   | 1.00    | 92.40   |        | 33.28 | 183.19   | 13.53    |
| MGO    | 11550   | 0.01    | 25.80   |        | 2.95  | 6.46     | 2.54     |
| CAO    | 11550   | 0.04    | 27.30   |        | 3.11  | 7.74     | 2.78     |
| NA2O   | 11550   | 0.01    | 10.60   |        | 0.75  | 1.22     | 1.11     |
| K2O    | 11550   | 0.01    | 10.40   |        | 1.40  | 1.76     | 1.33     |
| TIO2   | 11550   | 0.01    | 2.40    |        | 0.22  | 0.09     | 0.30     |
| P2O5   | 11550   | 0.01    | 2.39    |        | 0.18  | 0.01     | 0.08     |
| MNO    | 11550   | 0.01    | 1.56    |        | 0.09  | 0.00     | 0.06     |
| CR2O3  | 11625   | 0.01    | 0.43    |        | 0.02  | 0.00     | 0.03     |
| V2O5   | 11550   | 0.01    | 0.17    |        | 0.02  | 0.00     | 0.01     |
| LOI    | 11550   | -2.98   | 40.20   |        | 1.26  | 3.65     | 1.91     |
| SUM    | 11461   | 94.50   | 101.90  |        | 99.52 | 0.58     | 0.76     |
| S      | 11550   | 0.01    | 6.36    |        | 0.71  | 0.41     | 0.64     |
| FE     | 11550   | 0.70    | 64.62   |        | 23.33 | 90.04    | 9.49     |
| FE3O4  | 11550   | 0.00    | 77.00   |        | 20.77 | 255.16   | 15.97    |
| S_CONC | 10176   | 0.00    | 39.94   |        | 3.29  | 17.86    | 4.23     |
| DRY_BD | 10604   | 1.60    | 4.20    |        | 3.18  | 0.05     | 0.23     |

Notes: All statistics weighted by LENGTH.

Fe<sub>3</sub>O<sub>4</sub> includes 10,736 measured (Satmagan) and 814 calculated values.

Fe<sub>2</sub>O<sub>3</sub>: total Fe based on XRF.

## 17.4.2 Data Capture

The mineralization wire frame volumes were used to capture drill hole samples. Samples with centres lying within the wire frame were selected and since all points defining the volume are snapped to the appropriate ends of the samples no sample lengths appear outside.

Statistical analysis of the captured samples for the Roche Bay mineralized zone is presented in Table 17-3 with an example histogram plot of Fe<sub>2</sub>O<sub>3</sub> (Fe or total Fe) illustrated on Figure 17-2.

To help ensure that over-estimation of grade in the interpolation does not occur, 287 un-sampled intervals in the captured data (Sample ID = 'NS') were assumed to have been identified as barren material during core logging and were assigned 0.0 (zero) for TiO<sub>2</sub>, MNO, Cr<sub>2</sub>O<sub>3</sub>, V<sub>2</sub>O<sub>5</sub>, S, Fe, and Fe<sub>3</sub>O<sub>4</sub> prior to compositing. Table 17-3 for these elements shows 9 intervals of absent data (8,793 minus 8,784), representing intervals that were left as absent data; i.e., they were sampled but had no assay values (null).

The other database elements in the un-sampled intervals were left as null values.



Table 17-3: Roche Bay Captured Sample Data Statistics

| FIELD    | SAMPLES | MINIMUM | MAXIMUM | TOTAL  | MEAN  | VARIANCE | STANDDEV |
|----------|---------|---------|---------|--------|-------|----------|----------|
| LENGTH   | 8793    | 0.01    | 10.00   | 13,257 | 1.51  | 0.60     | 0.77     |
| DENSITY* | 8784    | 2.22    | 4.20    |        | 3.20  | 0.06     | 0.24     |
| SIO2     | 8477    | 3.40    | 93.20   |        | 51.40 | 41.08    | 6.41     |
| AL2O3    | 8478    | 0.06    | 15.50   |        | 3.09  | 9.35     | 3.06     |
| FE2O3    | 8784    | 0.00    | 92.40   |        | 35.10 | 211.21   | 14.53    |
| MGO      | 8478    | 0.04    | 21.20   |        | 2.13  | 1.52     | 1.23     |
| CAO      | 8478    | 0.04    | 14.80   |        | 2.10  | 1.90     | 1.38     |
| NA2O     | 8478    | 0.01    | 5.06    |        | 0.36  | 0.35     | 0.59     |
| K2O      | 8478    | 0.01    | 10.40   |        | 1.32  | 1.68     | 1.30     |
| TIO2     | 8784    | 0.00    | 1.97    |        | 0.10  | 0.03     | 0.16     |
| P2O5     | 8478    | 0.01    | 2.39    |        | 0.20  | 0.01     | 0.08     |
| MNO      | 8784    | 0.00    | 1.04    |        | 0.07  | 0.00     | 0.05     |
| CR2O3    | 8784    | 0.00    | 0.43    |        | 0.02  | 0.00     | 0.02     |
| V2O5     | 8784    | 0.00    | 0.17    |        | 0.01  | 0.00     | 0.01     |
| LOI      | 8478    | -2.98   | 40.20   |        | 0.84  | 2.55     | 1.60     |
| SUM      | 8432    | 94.50   | 101.60  |        | 99.53 | 0.57     | 0.75     |
| S        | 8784    | 0.00    | 5.75    |        | 0.72  | 0.37     | 0.61     |
| FE       | 8784    | 0.00    | 64.62   |        | 24.63 | 103.71   | 10.18    |
| FE3O4    | 8784    | 0.00    | 77.00   |        | 23.70 | 242.37   | 15.57    |
| S_CONC   | 7511    | 0.00    | 37.03   |        | 3.49  | 17.53    | 4.19     |

Note: \* DENSITY=DRY\_BD from AEI database  
 LENGTH statistics are un-weighted  
 DENSITY statistics are weighted by LENGTH  
 All other statistics weighted by LENGTH x DENSITY

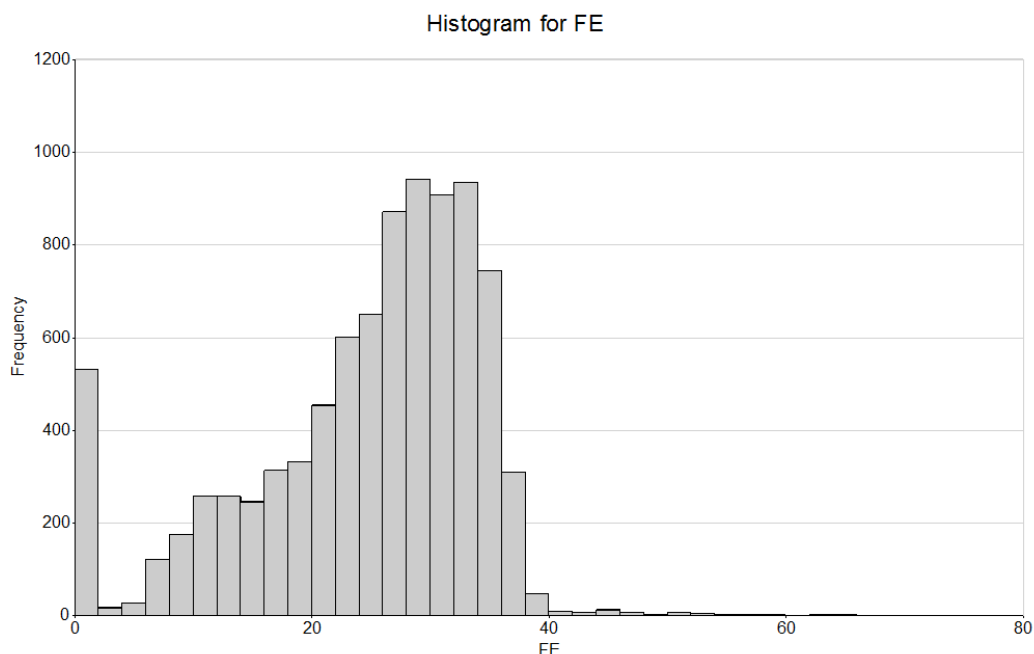


Figure 17-2: Captured Samples Histogram (Fe)

### 17.4.3 Correlations

Table 17-4 shows a correlation matrix developed from the Roche Bay raw assay sample data for only those samples where the magnetics ( $\text{Fe}_3\text{O}_4$ ) were measured by Satmagan testing (10,736 samples).

Table 17-4: Roche Bay Correlation Matrix

|              | <u>FE</u> | <u>FE3O4</u> | <u>FE2O3</u> | <u>CR2O3</u> | <u>S</u> | <u>SiO2</u> | <u>MGO</u> | <u>NA2O</u> | <u>K2O</u> | <u>TiO2</u> |
|--------------|-----------|--------------|--------------|--------------|----------|-------------|------------|-------------|------------|-------------|
| <u>FE</u>    | 1         |              |              |              |          |             |            |             |            |             |
| <u>FE3O4</u> | 0.91      | 1            |              |              |          |             |            |             |            |             |
| <u>FE2O3</u> | 0.99      | 0.91         | 1            |              |          |             |            |             |            |             |
| <u>CR2O3</u> | -0.25     | -0.20        | -0.25        | 1            |          |             |            |             |            |             |
| <u>S</u>     | -0.10     | -0.25        | -0.10        | -0.08        | 1        |             |            |             |            |             |
| <u>SiO2</u>  | -0.54     | -0.49        | -0.54        | -0.05        | 0.32     | 1           |            |             |            |             |
| <u>MGO</u>   | -0.54     | -0.49        | -0.54        | 0.54         | -0.24    | -0.23       | 1          |             |            |             |
| <u>NA2O</u>  | -0.72     | -0.58        | -0.73        | 0.08         | -0.15    | 0.20        | 0.41       | 1           |            |             |
| <u>K2O</u>   | -0.60     | -0.57        | -0.61        | 0.12         | 0.31     | 0.36        | 0.16       | 0.30        | 1          |             |
| <u>TiO2</u>  | -0.68     | -0.62        | -0.68        | 0.13         | -0.18    | -0.07       | 0.64       | 0.69        | 0.33       | 1           |



Since  $\text{Fe}_2\text{O}_3$  is a calculated value from total Fe, its correlation to Fe is essentially a perfect 1. The only other clear correlation is between total Iron (Fe) and measured magnetics ( $\text{Fe}_3\text{O}_4$ ). Since there were only 9 captured samples with missing  $\text{Fe}_3\text{O}_4$  values where Fe assays were present, no regression formula was calculated and these intervals were left as 'null' for grade interpolation.

### 17.4.4 Bulk Density (SG)

No new bulk density information has been introduced since the previous resource estimate. See Section 14.4.1.1 for a detailed description of bulk density data collection and analysis documented in the previous technical report (Palmer and Shaw, 2009).

The formula of the regression curve was used to calculate bulk density for all grade sample intervals containing a valid Fe assay, and is defined as follows:

$$\text{DENSITY} = 0.0247 \times \% \text{Fe} + 2.6 \text{ g/cm}^3$$

Polynomial regression was run on the bulk density and Fe data again using Datamine, confirming the formula stated above for calculated density. This formula was applied to all captured intervals without measured bulk density data, replacing the 'calculated' and 'default' values in the density data file supplied by AEI.

Figure 17-3 shows the measured and calculated density vs. assayed Fe for samples captured by the C-Zone mineralized envelope and used for the resource estimate.

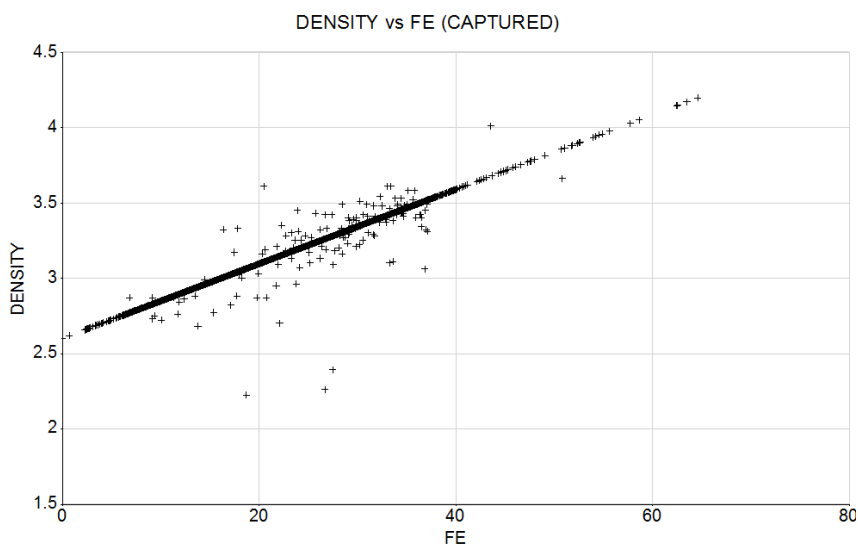


Figure 17-3: Roche Bay Density vs. Fe (measured and calculated)



### 17.4.5 Composites

A histogram of the captured sample data lengths was used to determine an optimum composite length for grade estimation (Figure 17-4). The majority of raw sample data was either 1 m or 2 m in length. At the chosen composite length of 2.5 m, 99% of the raw samples are combined into longer lengths, and only 1% are split into smaller lengths.

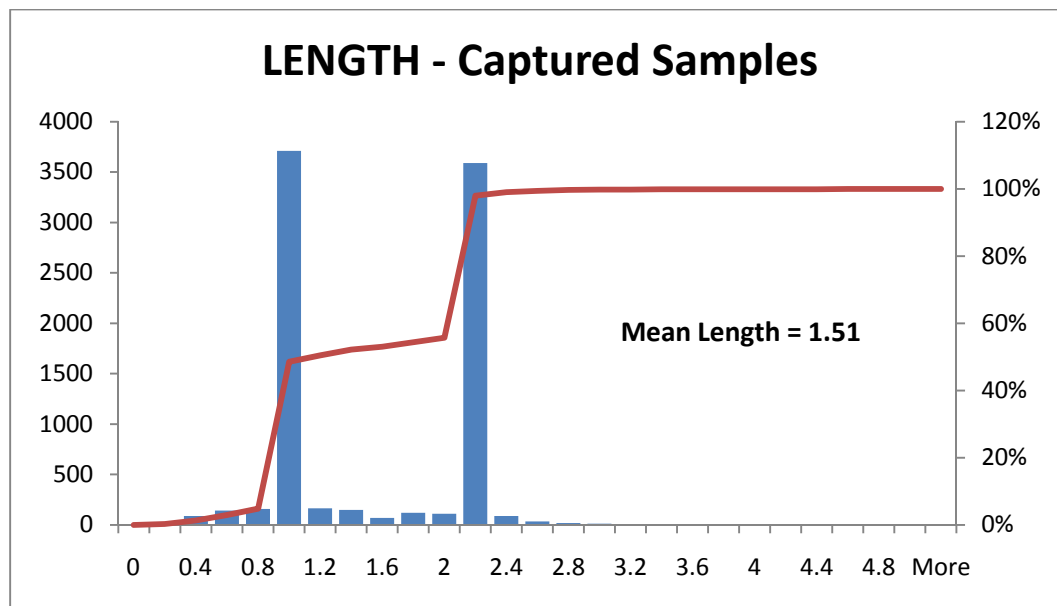


Figure 17-4: Captured Sample Length Histogram

Prior to generating the composites, un-assayed captured intervals of  $\text{TiO}_2$ ,  $\text{MnO}$ ,  $\text{Cr}_2\text{O}_3$ ,  $\text{V}_2\text{O}_5$ ,  $\text{S}$ ,  $\text{Fe}$ , and  $\text{Fe}_3\text{O}_4$  were assigned 0.0 values (see Section 17.4.2).

A compositing process mode was used that does not eliminate any samples from the compositing process, but rather forces all samples to be included by adjusting the composite length, while keeping it as close as possible to the chosen composite interval. The maximum possible composite length will be 1.5 times the interval.

The correlation between bulk density and  $\text{Fe}$  necessitated that density-weighting be used in the compositing process. Statistics for composite sample data weighted by sample length and density are shown in Table 17-5, and a histogram of composite  $\text{Fe}$  distribution is given on Figure 17-5. Note that the total length of composited samples is the same as the total length of the corresponding captured samples (Table 17-3).



**Table 17-5: Roche Bay Composite Sample Data Statistics**

| FIELD   | SAMPLES | MINIMUM | MAXIMUM | TOTAL  | MEAN  | VARIANCE | STANDDEV |
|---------|---------|---------|---------|--------|-------|----------|----------|
| LENGTH  | 5301    | 2.45    | 2.65    | 13,257 | 2.50  | 0.00     | 0.01     |
| DENSITY | 5301    | 2.44    | 3.98    |        | 3.20  | 0.05     | 0.23     |
| SIO2    | 5037    | 9.33    | 77.06   |        | 51.48 | 32.28    | 5.68     |
| AL2O3   | 5037    | 0.20    | 14.74   |        | 3.15  | 7.85     | 2.80     |
| FE2O3   | 5301    | 0.00    | 79.72   |        | 35.84 | 160.28   | 12.66    |
| MGO     | 5037    | 0.46    | 18.56   |        | 2.15  | 1.22     | 1.10     |
| CAO     | 5037    | 0.19    | 10.29   |        | 2.12  | 1.57     | 1.25     |
| NA2O    | 5037    | 0.01    | 4.69    |        | 0.36  | 0.27     | 0.52     |
| K2O     | 5037    | 0.01    | 9.91    |        | 1.34  | 1.35     | 1.16     |
| TIO2    | 5301    | 0.00    | 1.96    |        | 0.11  | 0.02     | 0.15     |
| P2O5    | 5301    | 0.04    | 1.08    |        | 0.20  | 0.00     | 0.06     |
| MNO     | 5301    | 0.00    | 0.85    |        | 0.07  | 0.00     | 0.05     |
| CR2O3   | 5301    | 0.00    | 0.28    |        | 0.02  | 0.00     | 0.01     |
| V2O5    | 5301    | 0.00    | 0.07    |        | 0.01  | 0.00     | 0.01     |
| LOI     | 5037    | -1.28   | 21.78   |        | 0.86  | 2.06     | 1.43     |
| SUM     | 5031    | 96.31   | 101.54  |        | 99.53 | 0.42     | 0.65     |
| S       | 5301    | 0.00    | 4.75    |        | 0.74  | 0.29     | 0.54     |
| FE      | 5301    | 0.00    | 55.75   |        | 25.15 | 78.76    | 8.87     |
| FE3O4   | 5301    | 0.00    | 70.74   |        | 24.12 | 208.88   | 14.45    |
| S_CONC  | 4313    | 0.00    | 31.26   |        | 3.53  | 14.27    | 3.78     |

Notes: LENGTH statistics are unweighted.  
 DENSITY weighted by LENGTH.  
 All other statistics weighted by LENGTH x DENSITY.  
 $Fe_3O_4$ : magnetic based on Satmagan.  
 $Fe_2O_3$ : total Fe based on XRF.

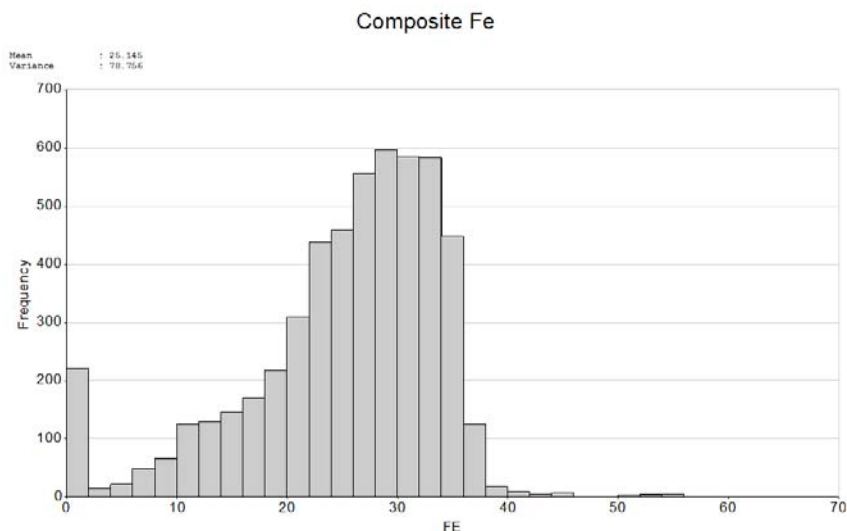


Figure 17-5: Composites Histogram (Fe)

#### 17.4.6 Capping Strategy

Examination of the slightly skewed Fe distribution and comparison to other elements through scatter plots ( $\text{SiO}_2$  vs. Fe, example given on Figure 17-6) indicate no unreasonably high grades in the composite sample data. This, along with minimizing the influence of higher grades through the appropriate Kriging estimation parameters (minimum number of samples = 20, for example), indicate to Golder that capping is not required for this mineral resource estimate.

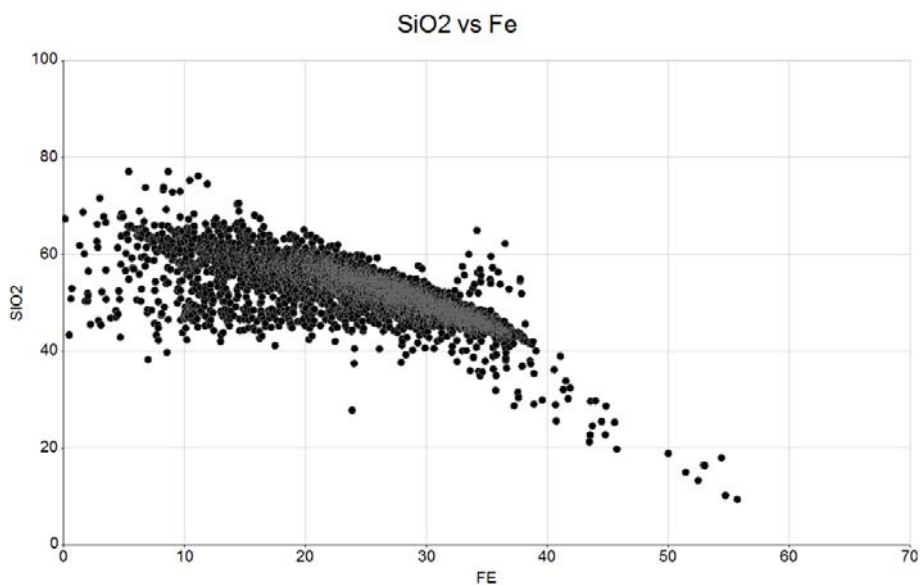


Figure 17-6: Composite SiO<sub>2</sub> vs. Fe



## 17.5 Resource Estimation

### 17.5.1 Unfolding

The “unfold” process within Datamine was used to transform the composite sample data coordinates into an unfolded coordinate system, as defined by the mineralized geometries’ footwall and hanging wall contacts. This transformation essentially removes bends, pinches and swells in the mineral model, allowing for more robust variogram calculations and grade estimation.

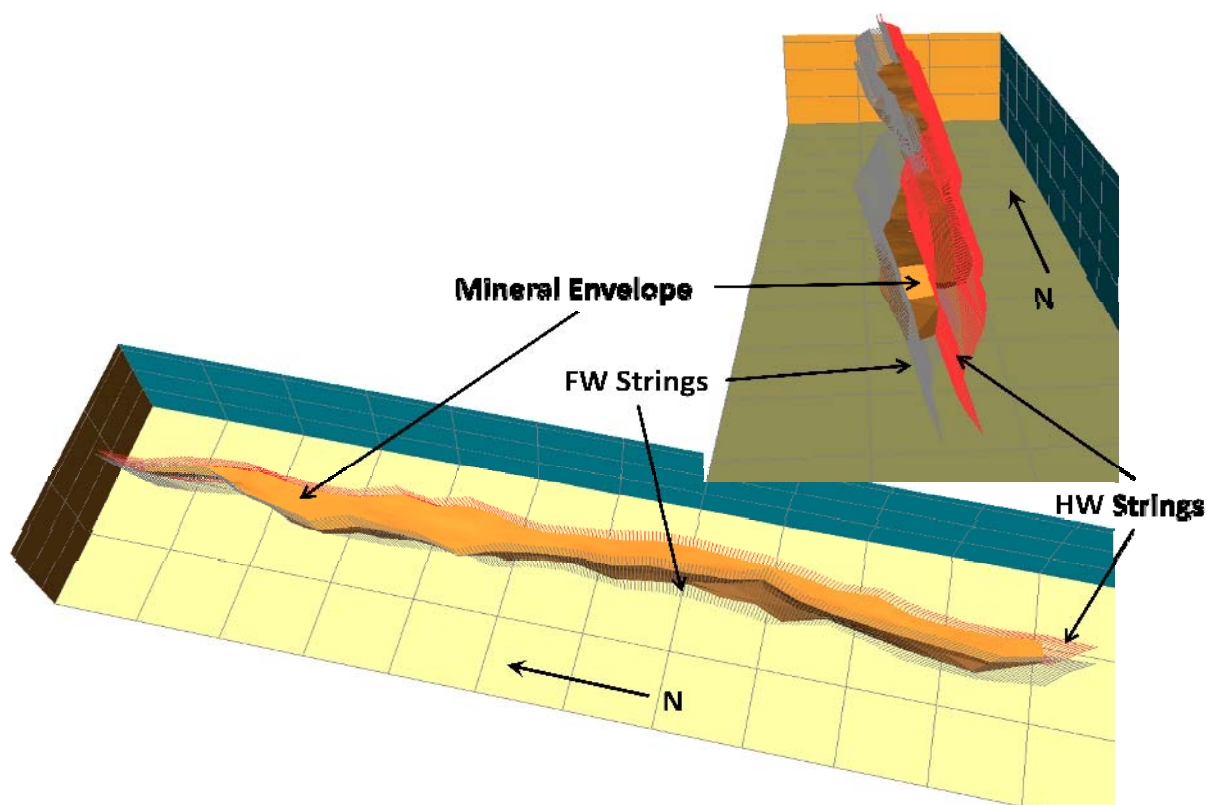


Figure 17-7: Roche Bay C-Zone Unfold Strings

Strings representing the footwall and hanging wall contacts of the deposit are constructed and tagged, as shown on Figure 17-7. These strings are then used to ‘unfold’ the composite samples into the transformed coordinate system shown on Figure 17-8. The same unfold strings are used in the grade estimation process to unfold the blocks into the same transformed system as the composite samples. In the Datamine unfolding system, the X-axis in folded space becomes UCSA in unfolded space and represents the thickness of the zone, the Y-axis in folded space becomes UCSB in unfolded space and represents the down-dip direction of the zone and the Z-axis in folded space becomes UCSC in unfolded space and represents the strike direction of the zone.

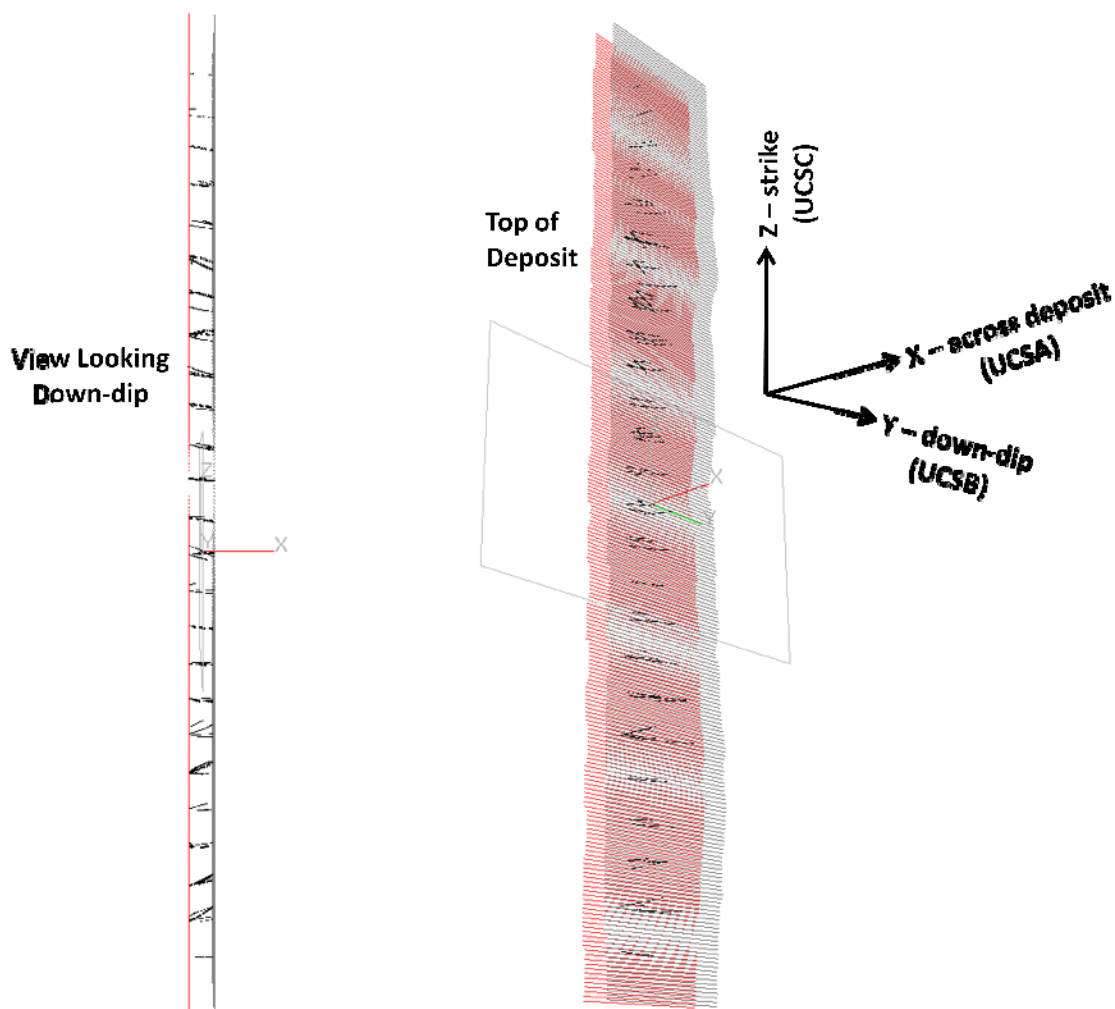


Figure 17-8: Unfolded Strings and Composites

Checks throughout the unfolding process are carried out to ensure that all samples were properly captured and unfolded.

### 17.5.2 Grade Variography

Variogram contours were calculated and plotted for the unfolded Fe composites to test for potential plunge in the grade continuity (Figure 17-9). Normally, any preferred orientation indicated by the contours should be validated through visual investigation of the sample data. In the case of the Roche Bay mineral zones, no obvious preferred orientation (non-orthogonal to the unfolded coordinates) supported by visual validation was observed; therefore no rotations were applied to the experimental grade variogram calculations. Note that when working in the unfolded coordinate system, strike and dip rotations are already accounted for, so the only the rotation required will be that needed to account for a plunge in the continuity.

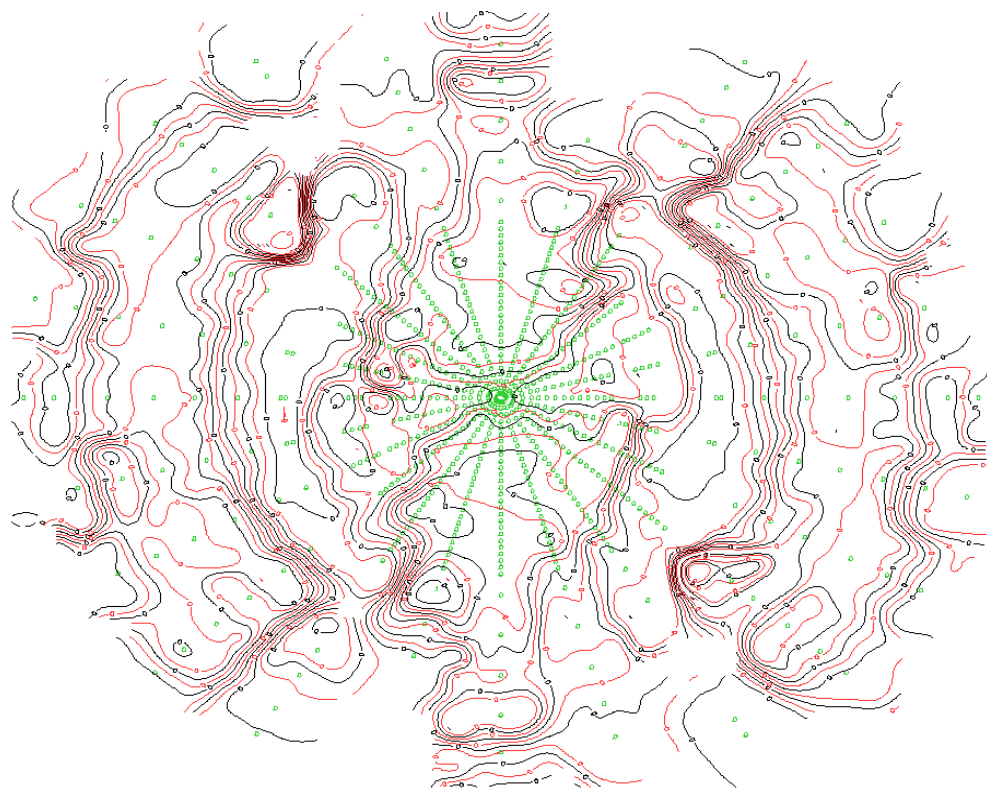


Figure 17-9: FE Variogram Contours in Unfolded Coordinates

Variogram contours of other elements in the Roche Bay suite were examined, with similar results to Fe.

Experimental variograms were calculated for all elements interpolated for the resource estimate, using the parameters shown in Table 17-6.

Table 17-6: Experimental Grade Variogram Parameters

| Elements                     | Fe, Fe <sub>2</sub> O <sub>3</sub> , SiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> , MgO, CaO, Na <sub>2</sub> O, K <sub>2</sub> O, TiO <sub>2</sub> , P <sub>2</sub> O <sub>5</sub> , MnO, Cr <sub>2</sub> O <sub>3</sub> , V <sub>2</sub> O <sub>5</sub> , LOI, S, Fe <sub>3</sub> O <sub>4</sub> , S_Conc, Density |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rotations                    | None                                                                                                                                                                                                                                                                                                                      |
| Lag Distance                 | 100                                                                                                                                                                                                                                                                                                                       |
| Number of Lags               | 5                                                                                                                                                                                                                                                                                                                         |
| Sub-lag Distance             | 5                                                                                                                                                                                                                                                                                                                         |
| Number Lags to be Sub-lagged | 2                                                                                                                                                                                                                                                                                                                         |
| Regularization angle         | 30                                                                                                                                                                                                                                                                                                                        |
| Number of Azimuths           | 2                                                                                                                                                                                                                                                                                                                         |
| Cylindrical search radius    | 25                                                                                                                                                                                                                                                                                                                        |



Interactive fitting of models to the experimental variograms was carried out using Datamine. In addition to the normal variograms, the process calculates pair-wise relative variograms (PWRVGRAM), which are the same except that every term in the calculation is divided by the average value of the two samples contributing to that term. These pair-wise relative variograms were used in the variogram modelling process for all elements.

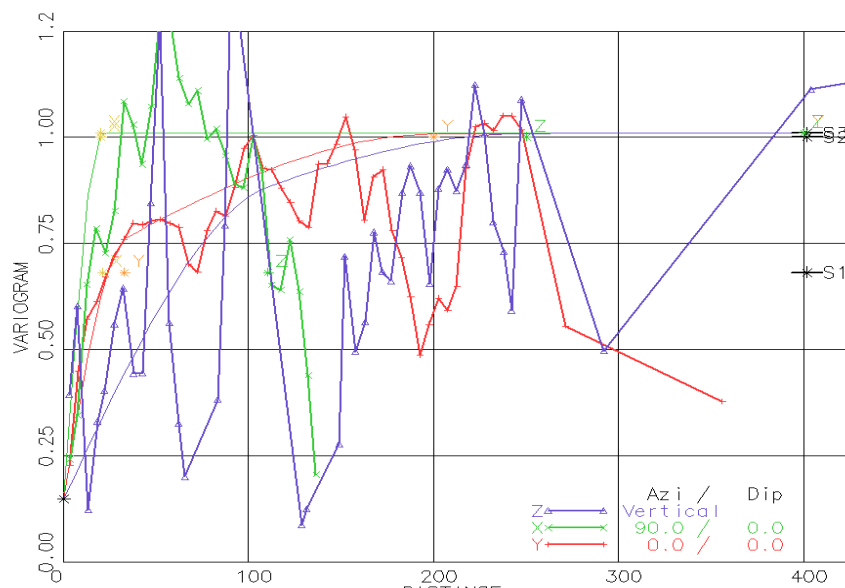
Variogram modelling assumed the best fit using an anisotropic two-structure spherical model. As seen with the variogram modelling results in Table 17-7 and Figure 17-10, the first structure ranges for all directions are relatively short. The second structure ranges were used to help define the search distances used in the grade estimates.

A third structure with long ranges and a very small variance was added for each model to give the variography some relevance in those Kriged estimates using very long searches.

**Table 17-7: Grade Variogram Models**

| ELEMENT  | NUGGET | 1st Structure |         |         |          | 2nd Structure |         |         |          | 3rd Structure |         |         |          |
|----------|--------|---------------|---------|---------|----------|---------------|---------|---------|----------|---------------|---------|---------|----------|
|          |        | X-Range       | Y-Range | Z-Range | Variance | X-Range       | Y-Range | Z-Range | Variance | X-Range       | Y-Range | Z-Range | Variance |
| FE,FE2O3 | 0.15   | 11            | 33      | 111     | 0.53     | 20            | 200     | 250     | 0.32     | 20            | 400     | 400     | 0.01     |
| SIO2     | 0.31   | 5             | 26      | 94      | 0.51     | 15            | 145     | 150     | 0.18     | 15            | 300     | 300     | 0.01     |
| AL2O3    | 0.35   | 19            | 26      | 101     | 0.34     | 20            | 200     | 250     | 0.31     | 20            | 400     | 400     | 0.01     |
| MGO      | 0.35   | 29            | 32      | 200     | 0.33     | 30            | 145     | 250     | 0.32     | 30            | 300     | 300     | 0.01     |
| CAO      | 0.27   | 24            | 25      | 200     | 0.39     | 35            | 200     | 250     | 0.34     | 35            | 400     | 400     | 0.01     |
| NA2O     | 0.27   | 12            | 16      | 150     | 0.33     | 40            | 200     | 200     | 0.39     | 40            | 400     | 400     | 0.01     |
| K2O      | 0.33   | 21            | 25      | 200     | 0.62     | 20            | 100     | 250     | 0.05     | 20            | 200     | 200     | 0.01     |
| TIO2     | 0.26   | 23            | 34      | 200     | 0.28     | 20            | 200     | 250     | 0.09     | 20            | 400     | 400     | 0.01     |
| P2O5     | 0.31   | 21            | 28      | 150     | 0.46     | 20            | 150     | 200     | 0.24     | 20            | 300     | 300     | 0.01     |
| MNO      | 0.26   | 33            | 42      | 200     | 0.40     | 25            | 200     | 250     | 0.35     | 25            | 400     | 400     | 0.01     |
| CR2O3    | 0.35   | 23            | 31      | 200     | 0.34     | 25            | 200     | 250     | 0.32     | 25            | 400     | 400     | 0.01     |
| V2O5     | 0.14   | 87            | 10      | 150     | 0.69     | 50            | 75      | 200     | 0.17     | 50            | 150     | 150     | 0.01     |
| LOI      | 0.34   | 63            | 10      | 200     | 0.37     | 40            | 50      | 250     | 0.20     | 40            | 100     | 100     | 0.01     |
| S        | 0.38   | 20            | 27      | 150     | 0.24     | 30            | 100     | 200     | 0.29     | 30            | 200     | 200     | 0.01     |
| FE3O4    | 0.15   | 21            | 41      | 111     | 0.43     | 20            | 200     | 250     | 0.42     | 20            | 400     | 400     | 0.01     |
| S_CONC   | 0.28   | 14            | 19      | 200     | 0.32     | 25            | 200     | 250     | 0.40     | 25            | 400     | 400     | 0.01     |
| DENSITY  | 0.30   | 28            | 33      | 200     | 0.37     | 20            | 200     | 250     | 0.32     | 20            | 400     | 400     | 0.01     |

Note: unfolded coordinates – X=across, Y=down-dip, Z=strike



| Variogram |       |                   | Grade: FE |        |         |
|-----------|-------|-------------------|-----------|--------|---------|
| Structure | Range | Anisotropic Model | Range     | Nugget | C Value |
| 1         | 21.2  | X                 | 33.0      | 110.5  | 0.53    |
| 2         | 20.0  | Y                 | 200.0     | 250.0  | 0.32    |
| 3         | 20.0  | Z                 | 400.0     | 400.0  | 0.01    |
|           |       |                   | Sill      |        |         |
|           |       |                   | 0.68      |        |         |
|           |       |                   | 1.00      |        |         |
|           |       |                   | 1.01      |        |         |

Figure 17-10: FE Variogram Model

Note: In the unfolded coordinates, X (vertical) is across the mineralization, Y is down-dip, and Z is along strike.

### 17.5.3 Block Model Definition

The block model for the Roche Bay C-Zone resource covers a 3D block in local grid coordinates from 500 to 1020 East, 9090 to 14090 North, and -260 to 260 Elevation. Block shape and size is typically a function of the geometry of the deposit, density of sample data, and expected potential smallest mining unit (SMU). On this basis, a parent block size of 10 m (E-W) by 50 m (N-S) by 20 m (Elevation) was defined. The block model definition parameters are summarized in Table 17-8.

Table 17-8: Block Model Definition

| Origin |      |      | Block size (m) |    |    | Number of blocks |     |    | Extent (m) |      |     |
|--------|------|------|----------------|----|----|------------------|-----|----|------------|------|-----|
| X      | Y    | Z    | X              | Y  | Z  | X                | Y   | Z  | X          | Y    | Z   |
| 500    | 9090 | -260 | 10             | 50 | 20 | 52               | 100 | 26 | 520        | 5000 | 520 |

The mineralization envelope was filled with blocks using the block model volume parameters described in Table 17-8. Sub-blocking was permitted at the boundaries to provide accurate volume representations. To allow more thorough validation techniques, regularized models were also generated (all blocks put back to the parent cell size), with the field FILLVOL representing the volume of the block lying within the wire frame. Volume checks of the 'split' block model for each zone versus the wire frames corresponded well (see Table 17-9).



Table 17-9: Block Model vs. Wireframe Volume Check

| Zone | Number of blocks | Wire Frame Volume | Block Model Volume | Difference |
|------|------------------|-------------------|--------------------|------------|
| C    | 115,350          | 203,480,000       | 203,441,760,       | -0.02%     |

#### 17.5.4 Estimation Methodology:

Block model grades for Fe, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, MgO, CaO, Na<sub>2</sub>O, K<sub>2</sub>O, TiO<sub>2</sub>, P<sub>2</sub>O<sub>5</sub>, MnO, Cr<sub>2</sub>O<sub>3</sub>, V<sub>2</sub>O<sub>5</sub>, LOI, S, Fe<sub>3</sub>O<sub>4</sub>, S\_Conc and Density (SG or bulk density) were estimated using Ordinary Kriging (OK). Nearest Neighbour (NN) estimates of the same elements provided declustered sample grades for block model validation.

Anisotropic searches were performed, using the variogram model ranges for each element as a guide for each of the 3 axes, orthogonal to the unfolded plane of the deposit. The search parameters for all elements are summarized in Table 17-10. Note that as with the variogram ranges, these search parameters are used in unfolded space during the interpolation process, where X is across the deposit, Y is down-dip, and Z is in the strike direction.

Table 17-10: Estimation Search Parameters

| Element  | 1st Search |         |         |              |              | 2nd Search |         |         |              |              | 3rd Search |         |         |              |              |
|----------|------------|---------|---------|--------------|--------------|------------|---------|---------|--------------|--------------|------------|---------|---------|--------------|--------------|
|          | X-Range    | Y-Range | Z-Range | Min. Samples | Max. Samples | X-Range    | Y-Range | Z-Range | Min. Samples | Max. Samples | X-Range    | Y-Range | Z-Range | Min. Samples | Max. Samples |
| FE_FE2O3 | 20         | 200     | 250     | 20           | 32           | 40         | 400     | 500     | 12           | 32           | 80         | 800     | 1000    | 5            | 20           |
| SIO2     | 15         | 145     | 150     | 20           | 32           | 30         | 290     | 300     | 12           | 32           | 60         | 580     | 600     | 5            | 20           |
| AL2O3    | 20         | 200     | 250     | 20           | 32           | 40         | 400     | 500     | 12           | 32           | 80         | 800     | 1000    | 5            | 20           |
| MGO      | 30         | 145     | 250     | 20           | 32           | 60         | 290     | 500     | 12           | 32           | 120        | 580     | 1000    | 5            | 20           |
| CAO      | 35         | 200     | 250     | 20           | 32           | 70         | 400     | 500     | 12           | 32           | 140        | 800     | 1000    | 5            | 20           |
| NA2O     | 40         | 200     | 200     | 20           | 32           | 80         | 400     | 400     | 12           | 32           | 160        | 800     | 800     | 5            | 20           |
| K2O      | 20         | 100     | 250     | 20           | 32           | 40         | 200     | 500     | 12           | 32           | 80         | 400     | 1000    | 5            | 20           |
| TIO2     | 20         | 200     | 250     | 20           | 32           | 40         | 400     | 500     | 12           | 32           | 80         | 800     | 1000    | 5            | 20           |
| P2O5     | 20         | 150     | 200     | 20           | 32           | 40         | 300     | 400     | 12           | 32           | 80         | 600     | 800     | 5            | 20           |
| MNO      | 25         | 200     | 250     | 20           | 32           | 50         | 400     | 500     | 12           | 32           | 100        | 800     | 1000    | 5            | 20           |
| CR2O3    | 25         | 200     | 250     | 20           | 32           | 50         | 400     | 500     | 12           | 32           | 100        | 800     | 1000    | 5            | 20           |
| V2O5     | 50         | 75      | 200     | 20           | 32           | 100        | 150     | 400     | 12           | 32           | 200        | 300     | 800     | 5            | 20           |
| LOI      | 40         | 50      | 250     | 20           | 32           | 80         | 100     | 500     | 12           | 32           | 160        | 200     | 1000    | 5            | 20           |
| S        | 30         | 100     | 200     | 20           | 32           | 60         | 200     | 400     | 12           | 32           | 120        | 400     | 800     | 5            | 20           |
| FE3O4    | 20         | 200     | 250     | 20           | 32           | 40         | 400     | 500     | 12           | 32           | 80         | 800     | 1000    | 5            | 20           |
| S_CONC   | 25         | 200     | 250     | 20           | 32           | 50         | 400     | 500     | 12           | 32           | 100        | 800     | 1000    | 5            | 20           |
| DENSITY  | 20         | 200     | 250     | 20           | 32           | 40         | 400     | 500     | 12           | 32           | 80         | 800     | 1000    | 5            | 20           |



Three basic searches were utilized to Krige as many blocks in the model as possible. The first search reflected the ranges determined in the variogram modelling, the second search factored these ranges by 2, and the third search by a factor of 4. Each of these searches used octant restriction to assist in de-clustering the data used for the interpolation. For this restriction, the search volume (ellipse) is divided into eight segments (octants), with a minimum of 5 octants requiring a minimum of 1 sample and a maximum of 5 before interpolation can occur.

Octant restrictions can tend to cause blocks along the contacts to remain un-graded. To compensate for this, ungraded blocks from the interpolations using the searches in Table 17-10 were retrieved from the model and the estimation re-run using the same search parameters, but without octant restriction.

The cell discretization used in all estimates was 2x10x5.

As part of the Kriged estimate, the search volume used in the interpolation of each block was written to the model file. This information was used to show that the amount of resource model interpolated without the octant restriction is very small. Table 17-11 shows the percentage of the model (by tonnage) graded by each search.

**Table 17-11: Blocks Graded per Search**

| Octants Used | Search | Total Blocks | Blocks Graded | Total Tonnes | % Tonnes |
|--------------|--------|--------------|---------------|--------------|----------|
| Yes          | 1      | 24494        | 13868         | 434,639,888  | 67%      |
|              | 2      | 24494        | 5332          | 144,439,378  | 22%      |
|              | 3      | 24494        | 1781          | 39,415,472   | 6%       |
| No           | 1      | 24494        | 2459          | 27,328,350   | 4%       |
|              | 2      | 24494        | 995           | 5,834,308    | 1%       |
|              | 3      | 24494        | 59            | 79,170       | 0%       |

### 17.5.5 Variance Analysis/Correction

The variability of individual block grades in the model must be close to that of the declustered sample data (NN), otherwise estimates of tonnages above a cut-off from the block model may be slightly inaccurate. If the actual variance is too low, tonnages will tend to be overstated and grade understated, while if the variance is too high, tonnages will tend to be understated and grade overstated. This comparison of actual variance to the theoretical variance can be called the Smoothing Ratio (SR). A smoothing ratio of >1 indicates over-smoothing, and a smoothing ratio of <1 indicates under-smoothing.

The amount of smoothing in a grade interpolation is determined by a number of items, including the block model cell size, variography, grade estimate search parameters, and the cell discretization used in the interpolation.

It is generally accepted that if the difference between the block model global variance and the NN global variance is greater than approximately 20%, a variance correction should be considered. As can be seen in Table 17-12, in general, the smoothing ratio for most of the elements interpolated is close to or within the 20% accepted smoothing limits. Since Fe is the cut-off element used in the Roche Bay resource reporting, and the smoothing ratio for Fe was 1.15, no smoothing correction was necessary.



Table 17-12: Smoothing Ratio Analysis

| Element | SR   | Element | SR   | Element | SR   | Element | SR   |
|---------|------|---------|------|---------|------|---------|------|
| Fe      | 1.15 | CAO     | 1.40 | P2O5    | 1.57 | LOI     | 1.27 |
| SiO2    | 0.75 | NA2O    | 1.65 | MNO     | 1.16 | S       | 1.30 |
| AL2O3   | 1.13 | K2O     | 0.88 | CR2O3   | 1.71 | FE3O4   | 1.23 |
| MGO     | 1.74 | TIO2    | 3.10 | V2O5    | 1.25 | SCONC   | 1.26 |
| DENSITY | 1.08 |         |      |         |      |         |      |

## 17.6 Mineral Resource Classification

To support the mineral resource classification, a drilling density / production volume study was conducted. This is based on industry best practice, where an Indicated Resource can be established by re-modelling with approximately half of the data and the resulting change in the resource is less than 15% for a volume equal to the proposed annual production rate.

The mineral resource estimate reported in the above section is based on 85 drill holes, on approximately 200 m spaced sections, extending from 9,200 N to 14,000 N. For the purpose of the drilling density / production volume study, drill holes on approximately every second section were removed and a new block model created using 55 drill holes, on approximately 400 m spaced sections. A visual representation of the drill holes removed is provided on Figure 17.11 (where red drill holes were removed). Note that intermediate sections at the ends of the deposit were not removed as these areas were not included in the Davis Tube test program (see Section 13.5). Golder recommends that these areas also have Davis Tube validation tests conducted before reclassification from Inferred to Indicated is considered.

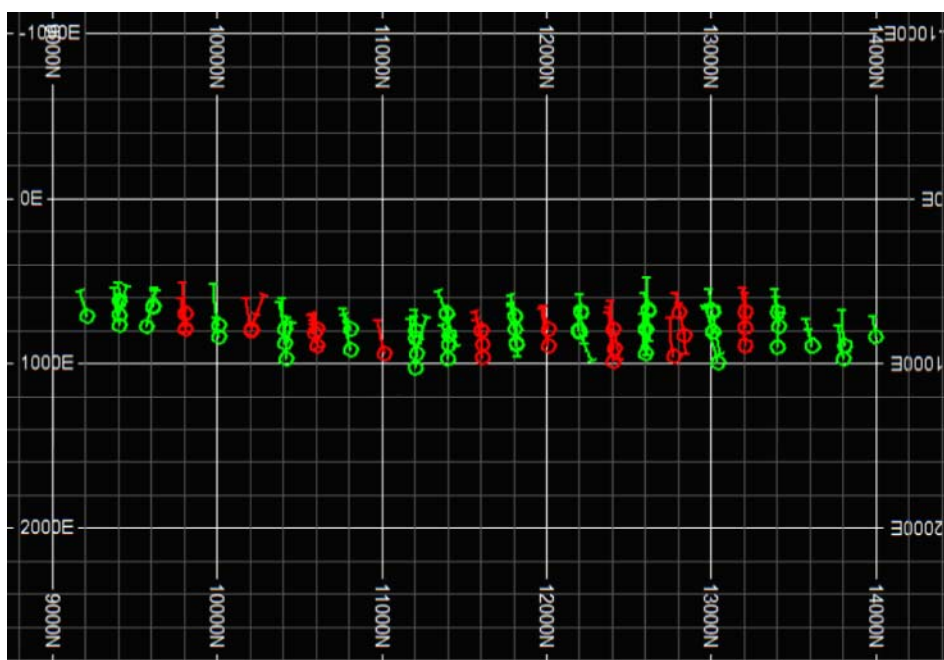


Figure 17-11: Visual Representation of the Drill Hole Removed (Red) to Create the 400 m Model



Summary statistics of (Total) Fe in the 2.5 m drill hole composite data used for both models are provided in Table 17-13 and histograms of the (Total) Fe distribution are provided on Figure 17-12. Both the statistics and the histograms are weighted by length \* density.

**Table 17-13: Comparison of Statistics between the Drill Hole Composites used in the 200 m Section Model and the 400 m Section Model**

|                            | 200 m Section Model | 400 m Section Model |
|----------------------------|---------------------|---------------------|
| Number of holes            | 85                  | 55                  |
| Number of composites       | 5,301               | 3,279               |
| Total composite length (m) | 13,257              | 8,202               |
| Total %Fe mean             | 25.15               | 25.00               |
| Total Fe variance          | 78.76               | 76.11               |

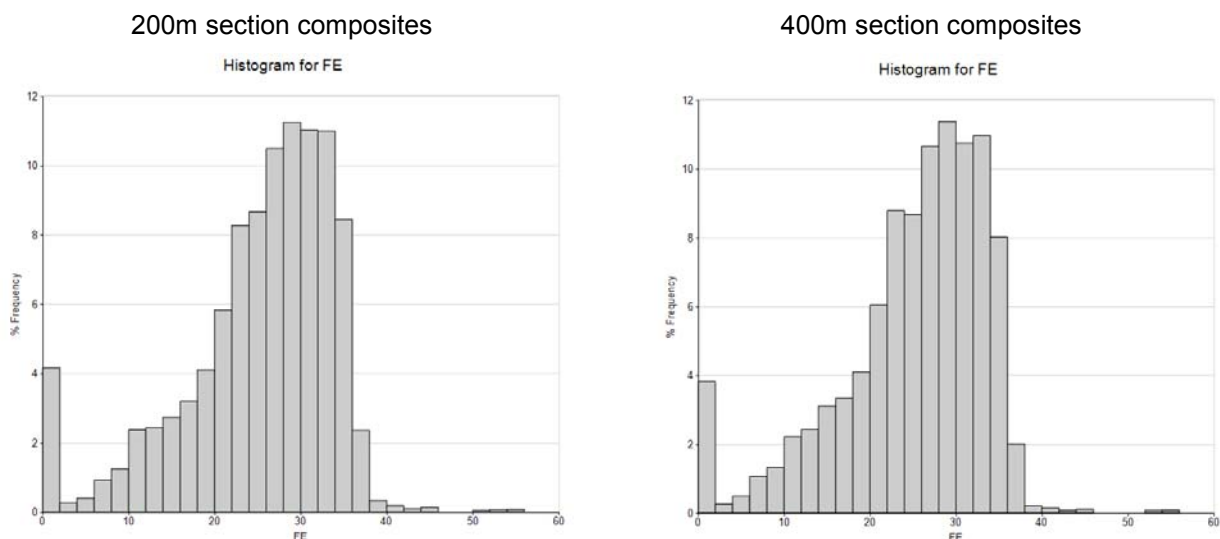


*Figure 17-12: Comparison of the Distribution of Total Fe between the 200 m Section Drill Hole Composites and the 400 m Section Drill Hole Composites*

A resource block model based on the 400 m section drill hole composites was created using exactly the same search volume parameters, estimation and variogram parameters as the final resource block model (based on 200 m drilling).

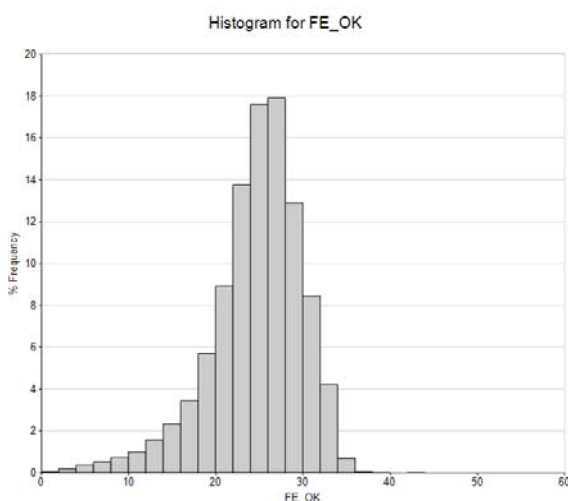
Summary statistics of the (Total) Fe (Ordinary Kriging - OK) for both the 200 m section and 400 m section block models are provided in Table 17-14 and histograms of the (Total) Fe distribution are provided on Figure 17-13. Both the statistics and the histograms are weighted by tonnes. The variation in global grade and tonnage, based on different cut-offs is provided in Table 17-15. A swath plot showing the variability of grade with northing (along strike) is provided on Figure 17-14.



**Table 17-14: Comparison of Statistics between the Blocks in the 200 m Section Model and the 400 m Section Model**

|                   | 200 m Section Model | 400 m Section Model |
|-------------------|---------------------|---------------------|
| Number of blocks  | 24,494              | 24,494              |
| Total tonnage     | 651,740,000         | 677,360,000         |
| Total Fe mean     | 24.67               | 24.45               |
| Total Fe variance | 27.27               | 21.69               |

200m section OK model



400m section OK model

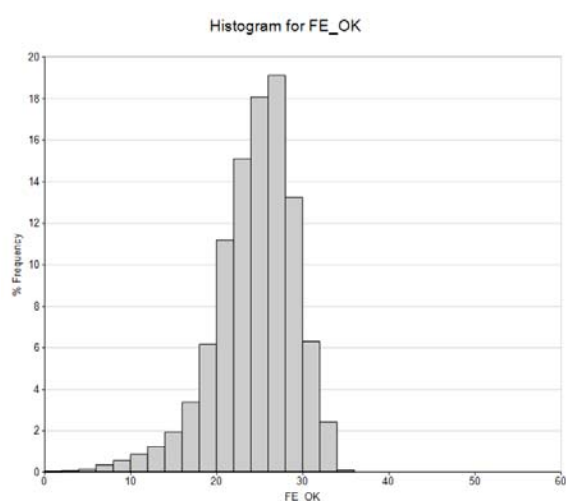


*Figure 17-13: Comparison of the Distribution of Total Fe between the 200 m Section OK Model and the 400 m Section OK Model*

**Table 17-15: Comparison of Grade Tonnage Cut-offs in the 200 m Section Model and the 400 m Section Model**

| Cut-off<br>Total<br>%Fe | 220 m Section Model |       | 400 m Section Model |       |
|-------------------------|---------------------|-------|---------------------|-------|
|                         | Tonnes/1000         | %Fe   | Tonnes/1000         | %Fe   |
| 20                      | 549,447             | 26.36 | 578,548             | 25.85 |
| 21                      | 524,659             | 26.64 | 544,282             | 26.19 |
| 22                      | 491,451             | 26.99 | 502,829             | 26.57 |
| 23                      | 452,235             | 27.37 | 455,544             | 26.99 |
| 24                      | 401,924             | 27.86 | 400,682             | 27.47 |
| 25                      | 346,880             | 28.39 | 340,000             | 28.00 |

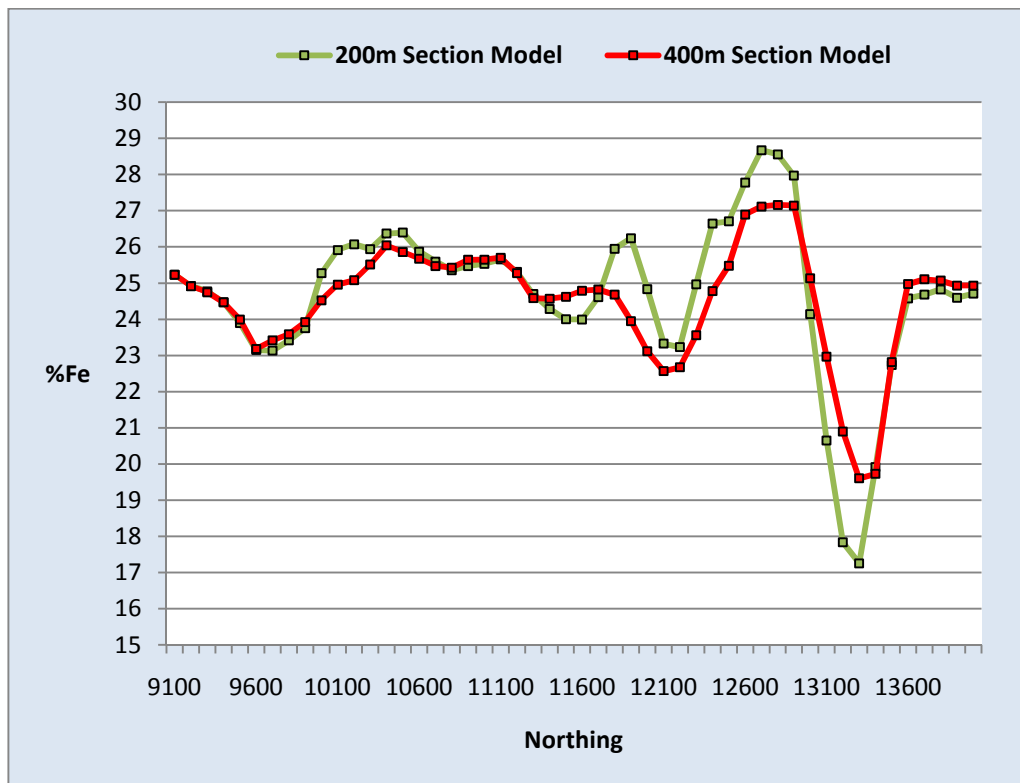


Figure 17-14: Comparison of the Variability of Total Fe along Strike between the 200 m Section OK Model and the 400 m Section OK Model

A volume of 80 m (East, across thickness) by 700 m (North, along strike) by 60 m (Elevation, depth) and an average density of  $3.2 \text{ kg/m}^3$  was used to represent an annual production of approximately 10,000,000 tonnes ( $80 * 700 * 60 * 3.2 = 10,752,000$ ). The shape of the volume was chosen to be a reasonable representation of what might be extracted in one year.

This volume was evaluated against both the 200 m section OK model and the 400 m section OK model and the results compared. If the difference between the total Fe metal content, at a defined cut-off grade of 25%, was less than 15%, the volume “passed” the test, if not it “failed”. Figure 17-15 shows a schematic representation of this test.

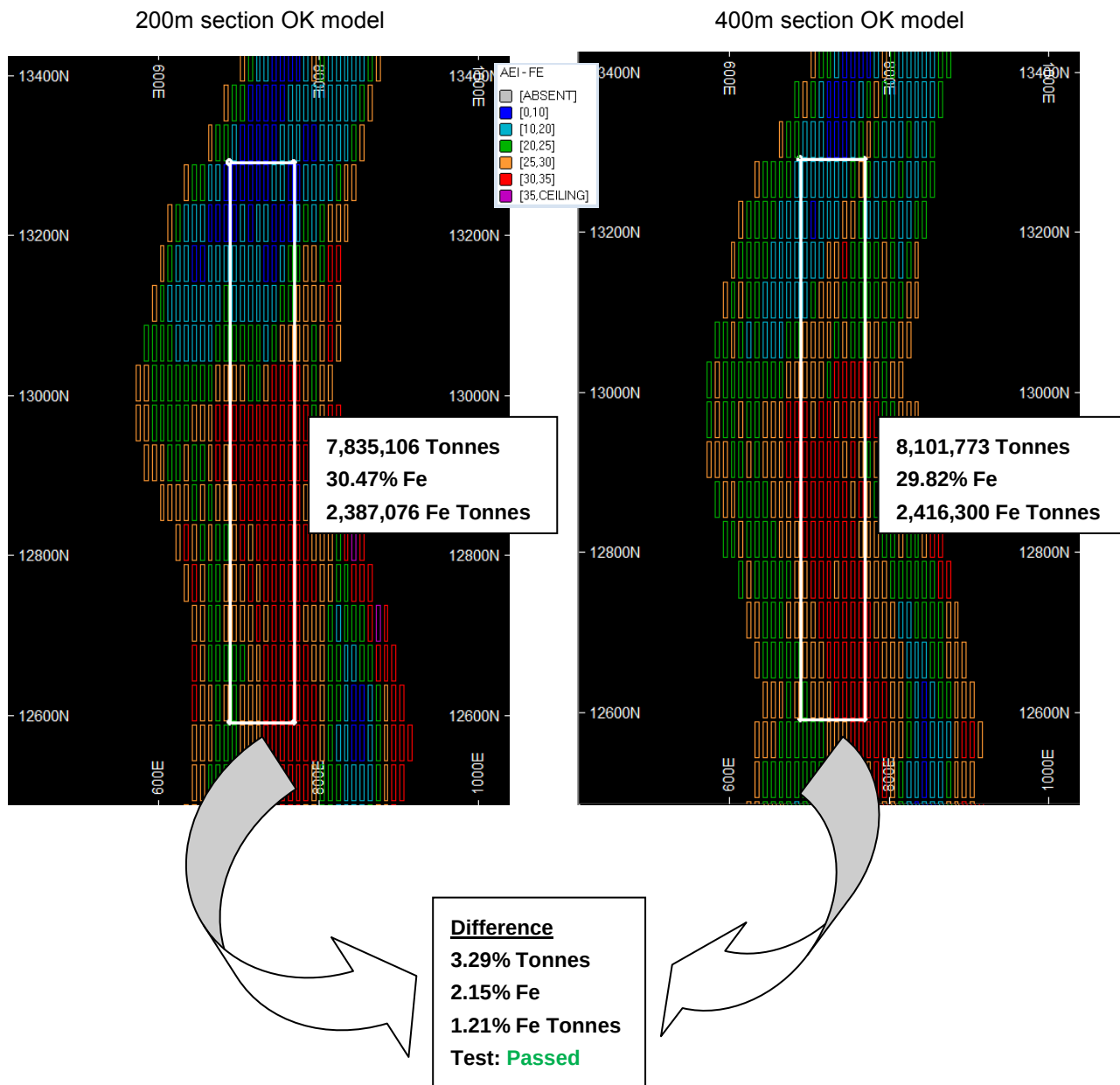


Figure 17-15: Schematic Representation of the Production Volume Test

An Indicated Mineral Resource classification was determined by a combination of the following factors and is depicted on Figure 17-16:

- Representative production volumes passed the test where remodelling with approximately half of the data resulted in a less than 15% change in the metal content (Fe tonnes) of the resource.
- It is within the volume where Davis Tube Test samples were taken to validate the Satmagan values.
- It is within the volume of blocks graded within the Fe variogram ranges.



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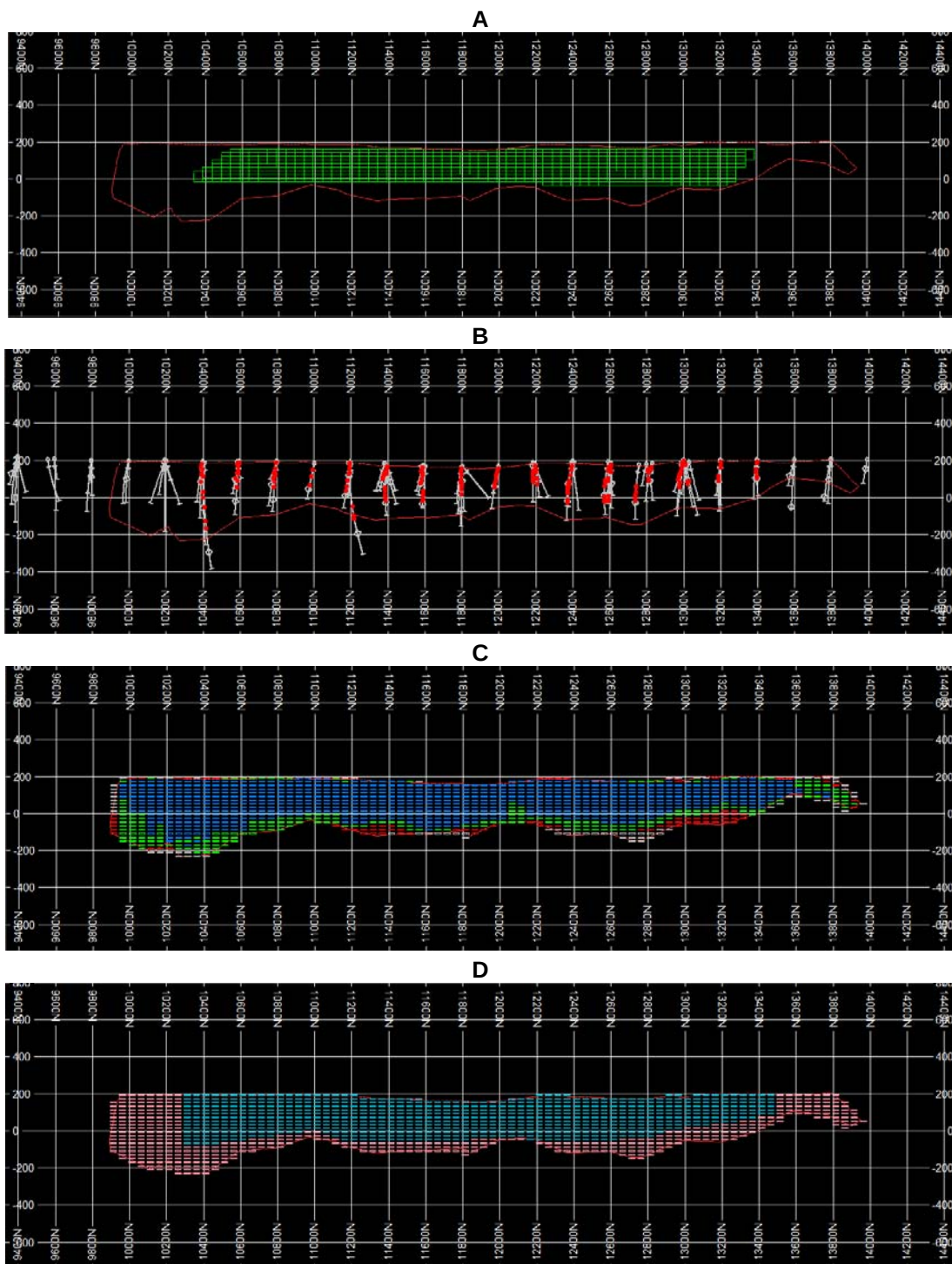


Figure 17-16: Longitudinal Section at 800E showing Production Volumes that Passed the Test (Frame A, green), the Location of the Davis Tube Test Samples (B, red), Blocks Graded within the Variogram Ranges (C, dark blue) and Resource Classification (D, cyan=Indicated Mineral Resource)



## 17.7 Block Model Validation

### Visual Checks

The Kriged block model was visually inspected in plan and section to ensure reasonable estimates when compared to the composite sample file. Figure 17-17 shows Fe on a typical section and plan for the Roche Bay deposit. Note particularly in the plan view, higher grade (orange-red) following the contact as a result of the unfolding option.

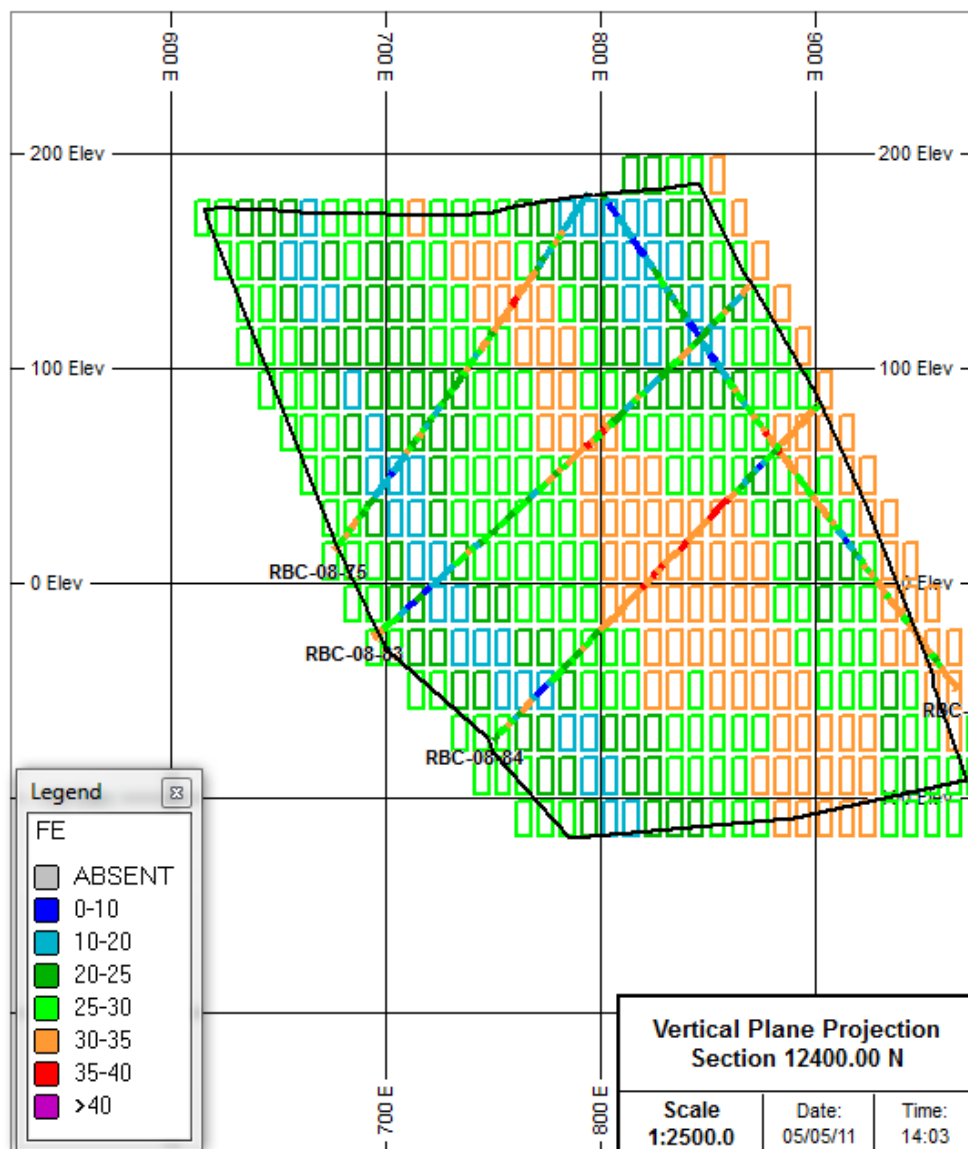
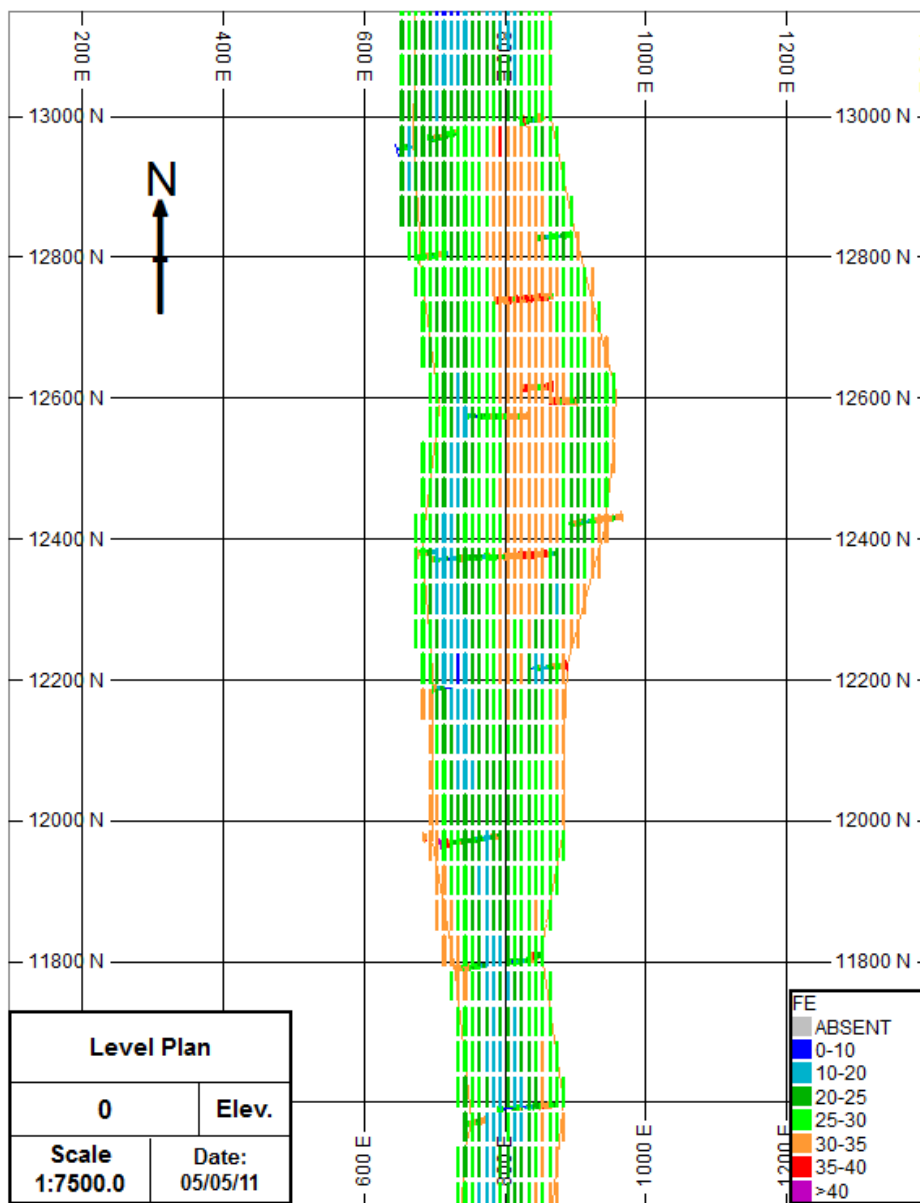


Figure 17-17: Block Model Visual Validation  
(Typical West-East Section)



(Typical Plan View)

## Statistics

Statistical comparisons between the composite samples, NN estimates, and Kriged grade interpolations for each element are presented in Table 17-16. The NN represents the de-clustered composite data. Clustering of the drill hole data can result in differences between the global means of the composites and NN estimates, which in the case of Roche Bay C-Zone is not an issue. The global means of the NN and Kriged estimates should also be very similar and, for the most part, this is the case for the Roche Bay estimate.



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**Table 17-16: Block Model Validation Statistics**

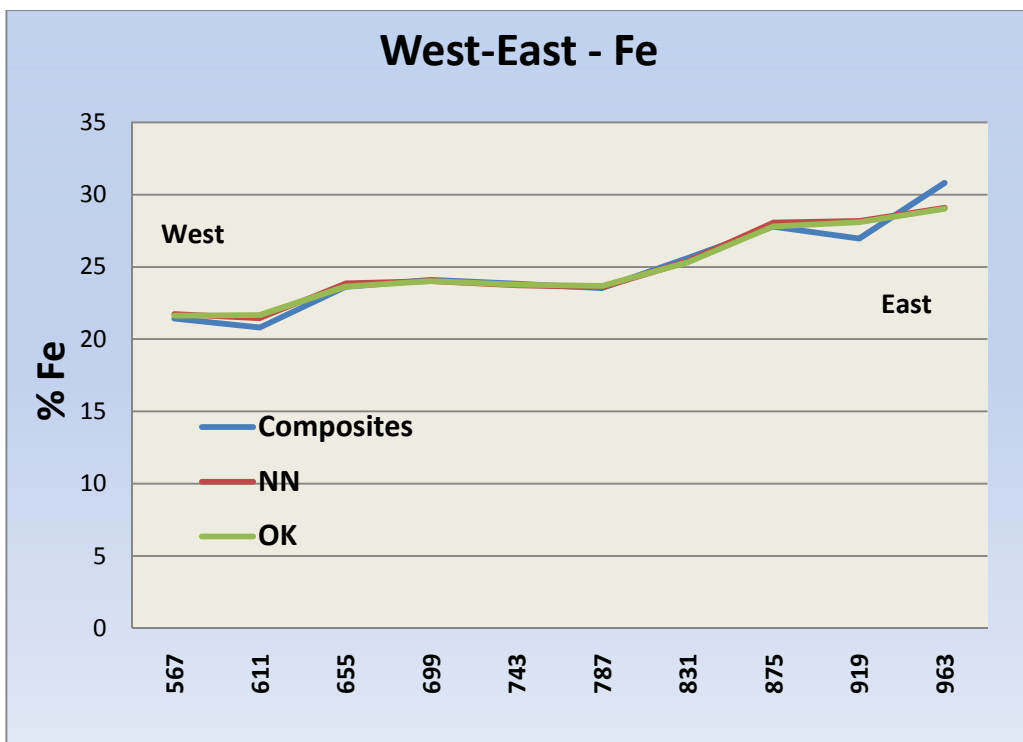
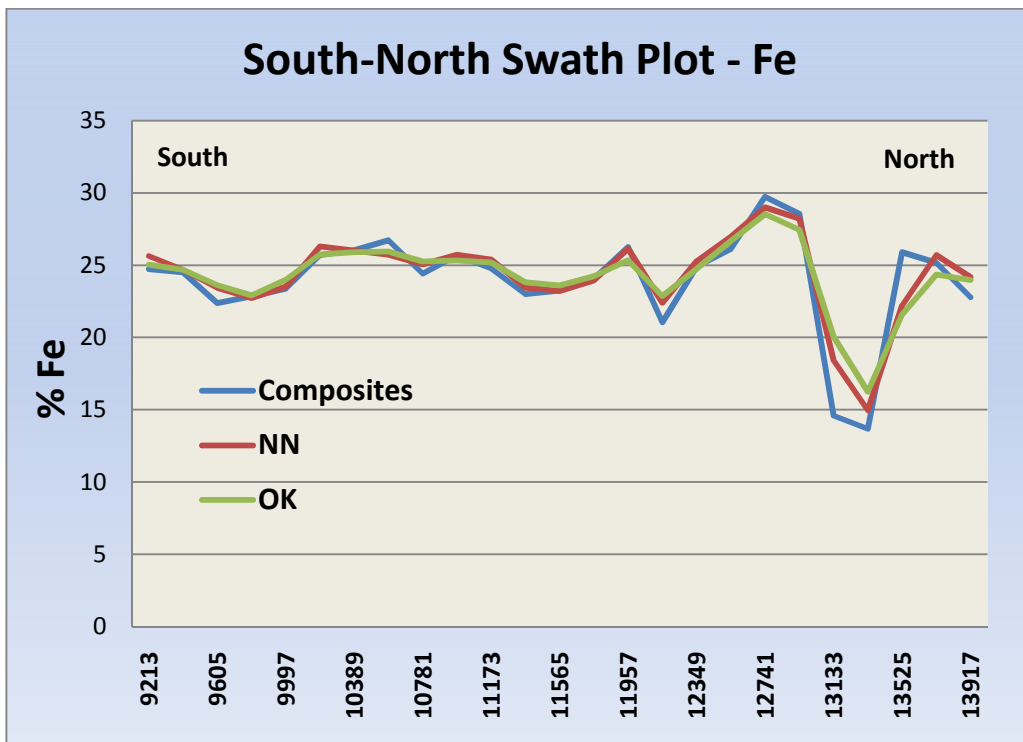
| FIELD | SOURCE     | SAMPLES | MIN   | MAX   | MEAN  | VAR.  |
|-------|------------|---------|-------|-------|-------|-------|
| FE    | Composites | 5301    | 0.00  | 55.75 | 25.15 | 78.76 |
|       | NN         | 24494   | 0.00  | 55.75 | 24.70 | 81.49 |
|       | OK         | 24494   | 0.00  | 42.57 | 24.67 | 27.27 |
| SIO2  | Composites | 5037    | 9.33  | 77.06 | 51.48 | 32.28 |
|       | NN         | 24490   | 9.33  | 77.06 | 51.51 | 29.68 |
|       | OK         | 23596   | 38.51 | 61.87 | 51.60 | 7.82  |
| AL2O3 | Composites | 5037    | 0.20  | 14.74 | 3.15  | 7.85  |
|       | NN         | 24494   | 0.22  | 14.74 | 3.28  | 8.34  |
|       | OK         | 24493   | 0.68  | 11.03 | 3.29  | 2.39  |
| MGO   | Composites | 5037    | 0.46  | 18.56 | 2.15  | 1.22  |
|       | NN         | 24494   | 0.46  | 18.56 | 2.21  | 1.24  |
|       | OK         | 24493   | 1.26  | 11.03 | 2.22  | 0.26  |
| CAO   | Composites | 5037    | 0.19  | 10.29 | 2.12  | 1.57  |
|       | NN         | 24494   | 0.19  | 10.29 | 2.24  | 1.92  |
|       | OK         | 24494   | 0.83  | 7.81  | 2.22  | 0.53  |
| NA2O  | Composites | 5037    | 0.01  | 4.69  | 0.36  | 0.27  |
|       | NN         | 24494   | 0.01  | 4.69  | 0.40  | 0.33  |
|       | OK         | 24342   | 0.02  | 2.65  | 0.41  | 0.07  |
| K2O   | Composites | 5037    | 0.01  | 9.91  | 1.34  | 1.35  |
|       | NN         | 24494   | 0.01  | 9.91  | 1.34  | 1.37  |
|       | OK         | 24489   | 0.14  | 4.54  | 1.36  | 0.33  |
| TIO2  | Composites | 5301    | 0.00  | 1.96  | 0.11  | 0.02  |
|       | NN         | 24494   | 0.00  | 1.96  | 0.11  | 0.02  |
|       | OK         | 24494   | 0.00  | 0.87  | 0.11  | 0.00  |
| MNO   | Composites | 5301    | 0.00  | 0.85  | 0.07  | 0.00  |
|       | NN         | 24494   | 0.00  | 0.85  | 0.07  | 0.00  |
|       | OK         | 24494   | 0.00  | 0.18  | 0.07  | 0.00  |
| P2O5  | Composites | 5037    | 0.04  | 1.08  | 0.20  | 0.00  |
|       | NN         | 24494   | 0.04  | 1.08  | 0.20  | 0.00  |
|       | OK         | 24211   | 0.10  | 0.38  | 0.20  | 0.00  |
| CR2O3 | Composites | 5301    | 0.00  | 0.28  | 0.02  | 0.00  |
|       | NN         | 24494   | 0.00  | 0.28  | 0.02  | 0.00  |
|       | OK         | 24494   | 0     | 0.15  | 0.02  | 0.00  |
| V2O5  | Composites | 5301    | 0.00  | 0.07  | 0.01  | 0.00  |
|       | NN         | 24494   | 0.00  | 0.07  | 0.01  | 0.00  |
|       | OK         | 24333   | 0     | 0.04  | 0.01  | 0.00  |



| FIELD   | SOURCE       | SAMPLES | MIN   | MAX   | MEAN  | VAR.   |
|---------|--------------|---------|-------|-------|-------|--------|
| LOI     | Composites   | 5037    | -1.28 | 21.78 | 0.86  | 2.06   |
|         | NN           | 24494   | -1.28 | 21.78 | 0.94  | 2.14   |
|         | OK           | 24315   | -0.78 | 5.80  | 0.95  | 0.43   |
| S       | Composites   | 5301    | 0.00  | 4.75  | 0.74  | 0.29   |
|         | NN           | 24494   | 0.00  | 4.75  | 0.75  | 0.30   |
|         | OK           | 24314   | 0.00  | 2.12  | 0.75  | 0.08   |
| FE3O4   | Composites   | 5301    | 0.00  | 70.74 | 24.12 | 208.88 |
|         | NN           | 24494   | 0.00  | 70.74 | 23.41 | 205.84 |
|         | OK           | 24494   | 0.00  | 53.19 | 23.36 | 82.20  |
|         | Davis Tube * | 24494   | 1.14  | 50.43 | 22.79 | 70.59  |
| SCONC   | Composites   | 4313    | 0.00  | 31.26 | 3.53  | 14.27  |
|         | NN           | 24494   | 0.00  | 31.26 | 3.56  | 14.45  |
|         | OK           | 23411   | 0.06  | 13.92 | 3.56  | 4.29   |
| DENSITY | Composites   | 5301    | 2.44  | 3.98  | 3.20  | 0.05   |
|         | NN           | 24494   | 2.44  | 3.98  | 3.21  | 0.05   |
|         | OK           | 24494   | 2.60  | 3.62  | 3.21  | 0.02   |

### Swath Plot

Swath plots comparing the various grade interpolations along with the composites were generated to further validate the general accuracy of the estimate. Figure 17-8 shows Au g/t in the north-south and east-west directions.



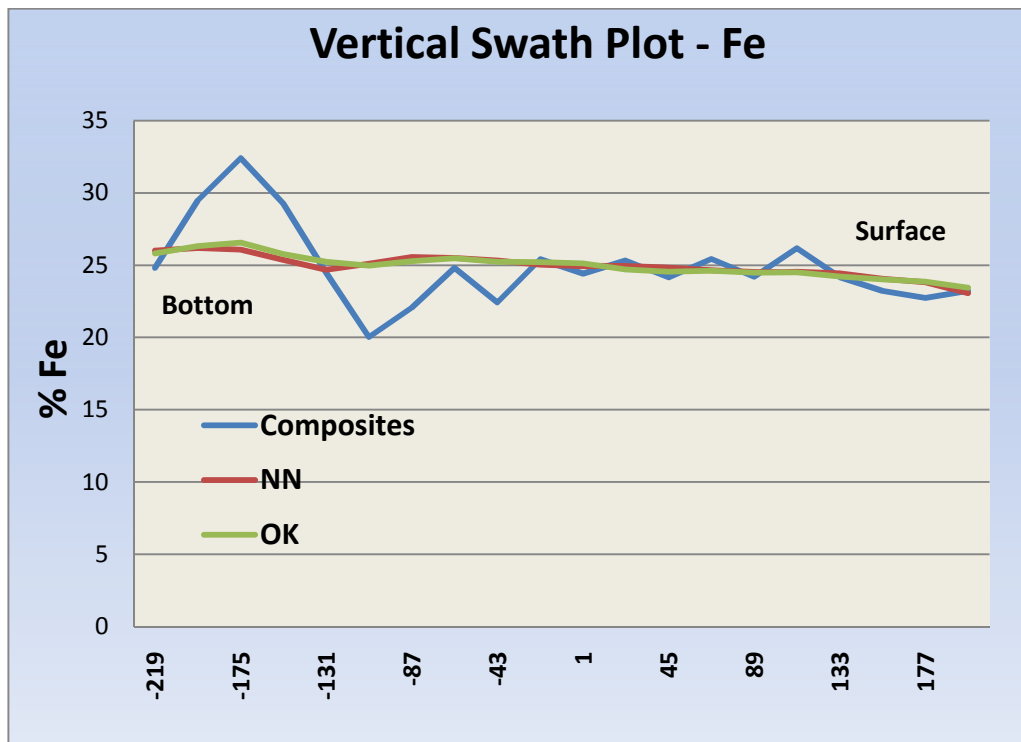


Figure 17-18: Block Model Swath Plots

## 17.8 Cut-off Grade

The cut-off grade current used for the updated mineral resource estimate is 20% Fe and previously was defined as 25%. This cut-off grade has been modified primarily based on the change in processing method from nugget to a fine iron concentrate as outlined in Section 16 which does not require as high as ROM iron grade as the nugget method. The nugget production, based on MIDREX quality specification, required maximum 0.15% S in magnetic concentrate. The SGS sulphide flotation tests demonstrated the necessity of using ores (ROM) of maximum 0.63% S, necessary to the obtaining, in final concentrate after sulphide flotation, of maximum 0.15% S. Based on the data in Table 17-18, in the case of the Indicated ore resources, the necessary ROM iron grade is 28.74% and, consequently, 25% Fe ore cut-off. The last COREM sulphide flotation test results demonstrate the possibility of obtaining 0.03% to 0.04% S from the ores (ROM) of 0.70% to 0.72% S. As per Table 17-18 and Figure 17-18, the ROM required iron grade is 26.73% or 20% Fe cut-off. Under these conditions, the selection of the current ore cut-off of 20% Fe is a judicious decision, taking into account the increase of the ore resources in the Indicated category from 211.7 Mt (25% Fe cut-off) to 323.2 Mt (20% Fe cut-off).

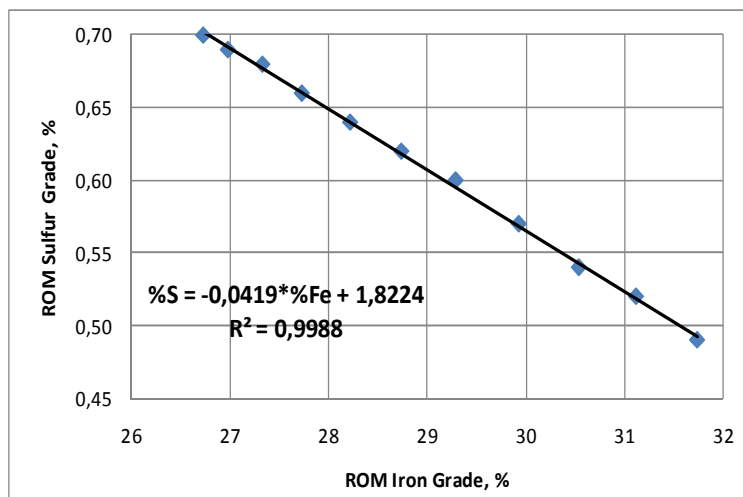


Figure 17-19: ROM Sulphur Grade vs. ROM Iron Grade

## 17.9 Resource Statements

The mineral resources for the Roche Bay C-Zone deposit are reported in accordance with Canadian Securities Administrators' NI 43-101 and have been estimated in conformity with generally accepted CIM "Estimation of Mineral Resource and Mineral Reserves Best Practices" guidelines. Mineral resources are not mineral reserves and do not necessarily demonstrate economic viability. There is no certainty that all or any part of this mineral resource will be converted into mineral reserve. The resource estimate was completed by Greg Greenough, P.Geo. (APGO #0825), an independent qualified person as this term is defined in NI 43-101. The effective date of this resource estimate is April 6, 2011 which supports the press release published by AEI on April 6, 2011.

The mineral resources are reported at a total Iron (Fe) cutoff to reflect the "reasonable prospects" for economic extraction, and the assumption that the C-Zone deposit can be extracted through open pit methods. The resources reported are based on a 'blocks above cut-off' basis; however, these blocks were examined visually for any significant non-contiguous occurrences (outliers) and none were found.

Table 17-17 reports the Indicated and Inferred Mineral Resources for Roche Bay C-Zone, effective April 6, 2011, and Table 17-18 is presented to show resource sensitivities to increasing Fe cut-offs.

**Table 17-17: Mineral Resource Statement – Roche Bay C-Zone (April 6, 2011)**

|                  | Tonnes<br>(000,000) | Fe    | Fe <sub>3</sub> O <sub>4</sub> * | SiO <sub>2</sub> | Al <sub>2</sub> O <sub>3</sub> | MnO  | P <sub>2</sub> O <sub>5</sub> | S    | LOI  | Cr <sub>2</sub> O <sub>3</sub> | Fe <sub>3</sub> O <sub>4</sub> |
|------------------|---------------------|-------|----------------------------------|------------------|--------------------------------|------|-------------------------------|------|------|--------------------------------|--------------------------------|
| <b>Indicated</b> | 323.181             | 26.73 | 25.77                            | 50.85            | 2.86                           | 0.07 | 0.20                          | 0.70 | 0.81 | 0.02                           | 26.58                          |
| <b>Inferred</b>  | 226.264             | 25.85 | 23.85                            | 51.83            | 3.09                           | 0.07 | 0.20                          | 0.81 | 1.04 | 0.02                           | 24.51                          |

\*Magnetics (Fe<sub>3</sub>O<sub>4</sub> %) are the Satmagan results corrected to reflect Davis Tube test work.

Notes: Resources based on Fe Cut-off = 20%.

All grades in %.

No mining recoveries or dilution factors have been considered.



## TECHNICAL REPORT - ROCHE BAY MAGNETITE PROJECT C-ZONE

**Table 17-18: Resource Sensitivities – Roche Bay C-Zone (April 6, 2011)**

|           | <u>Cut-off</u> | Tonnes<br>(000,000) | FE    | FE <sub>3</sub> O <sub>4</sub> * | SiO <sub>2</sub> | Al <sub>2</sub> O <sub>3</sub> | MNO  | P <sub>2</sub> O <sub>5</sub> | S    | LOI  | CR <sub>2</sub> O <sub>3</sub> |
|-----------|----------------|---------------------|-------|----------------------------------|------------------|--------------------------------|------|-------------------------------|------|------|--------------------------------|
| INDICATED | 20             | 323.182             | 26.73 | 25.77                            | 50.85            | 2.86                           | 0.07 | 0.20                          | 0.70 | 0.81 | 0.02                           |
|           | 21             | 310.337             | 26.98 | 26.21                            | 50.74            | 2.78                           | 0.07 | 0.20                          | 0.69 | 0.79 | 0.02                           |
|           | 22             | 291.551             | 27.33 | 26.86                            | 50.57            | 2.68                           | 0.07 | 0.20                          | 0.68 | 0.76 | 0.02                           |
|           | 23             | 269.337             | 27.73 | 27.64                            | 50.36            | 2.56                           | 0.06 | 0.20                          | 0.66 | 0.74 | 0.02                           |
|           | 24             | 241.326             | 28.22 | 28.64                            | 50.10            | 2.41                           | 0.06 | 0.20                          | 0.64 | 0.71 | 0.02                           |
|           | 25             | 211.666             | 28.74 | 29.71                            | 49.75            | 2.27                           | 0.06 | 0.20                          | 0.62 | 0.67 | 0.01                           |
|           | 26             | 180.750             | 29.29 | 30.89                            | 49.34            | 2.14                           | 0.05 | 0.20                          | 0.60 | 0.63 | 0.01                           |
|           | 27             | 146.891             | 29.93 | 32.29                            | 48.85            | 2.00                           | 0.05 | 0.20                          | 0.57 | 0.58 | 0.01                           |
|           | 28             | 117.259             | 30.54 | 33.59                            | 48.43            | 1.86                           | 0.05 | 0.20                          | 0.54 | 0.51 | 0.01                           |
|           | 29             | 91.469              | 31.12 | 34.84                            | 47.99            | 1.74                           | 0.05 | 0.20                          | 0.52 | 0.42 | 0.01                           |
|           | 30             | 66.195              | 31.74 | 36.09                            | 47.59            | 1.61                           | 0.04 | 0.20                          | 0.49 | 0.32 | 0.01                           |
| INFERRED  | 20             | 226.265             | 25.85 | 23.85                            | 51.83            | 3.09                           | 0.07 | 0.20                          | 0.81 | 1.04 | 0.02                           |
|           | 21             | 214.322             | 26.15 | 24.37                            | 51.71            | 3.00                           | 0.07 | 0.20                          | 0.79 | 1.02 | 0.02                           |
|           | 22             | 199.900             | 26.48 | 24.98                            | 51.56            | 2.89                           | 0.07 | 0.20                          | 0.78 | 1.01 | 0.02                           |
|           | 23             | 182.897             | 26.85 | 25.69                            | 51.40            | 2.77                           | 0.07 | 0.20                          | 0.76 | 0.99 | 0.02                           |
|           | 24             | 160.598             | 27.31 | 26.59                            | 51.15            | 2.63                           | 0.07 | 0.21                          | 0.74 | 0.96 | 0.02                           |
|           | 25             | 135.215             | 27.84 | 27.63                            | 50.84            | 2.48                           | 0.06 | 0.21                          | 0.72 | 0.93 | 0.02                           |
|           | 26             | 106.697             | 28.46 | 28.88                            | 50.42            | 2.31                           | 0.06 | 0.21                          | 0.70 | 0.90 | 0.01                           |
|           | 27             | 79.326              | 29.14 | 30.20                            | 49.97            | 2.17                           | 0.06 | 0.20                          | 0.67 | 0.86 | 0.01                           |
|           | 28             | 53.548              | 29.93 | 31.75                            | 49.39            | 1.99                           | 0.05 | 0.20                          | 0.63 | 0.82 | 0.01                           |
|           | 29             | 35.040              | 30.69 | 33.33                            | 48.73            | 1.83                           | 0.05 | 0.20                          | 0.60 | 0.75 | 0.01                           |
|           | 30             | 20.601              | 31.56 | 35.07                            | 48.08            | 1.66                           | 0.04 | 0.19                          | 0.56 | 0.63 | 0.01                           |

\*Magnetics (Fe<sub>3</sub>O<sub>4</sub> %) are the Satmagan results corrected to reflect Davis Tube test work.

Notes: Resources based on Fe Cut-off = 20%.

All grades in %.

No mining recoveries or dilution factors have been considered.



### 18.0 OTHER RELEVANT DATA AND INFORMATION

To the knowledge of the authors of this report, there is no other relevant data and information concerning the current property.

### 19.0 CONCLUSIONS

A second time independent NI 43-101 mineral resource has been completed for the Roche Bay Magnetite Property for AEI and is based on drilling information collected in the 2007-2008 exploration programs under the direction of AEI, additional magnetite test work, mineral interpretation and resource classification studies. A 2011 exploration drilling program is planned to continue to defined additional resources and update existing resources. A Feasibility Study is currently underway and will be completed after the 2011 drilling campaign has been completed.

### 20.0 RECOMMENDATIONS

The following recommendations are provided for ongoing development of the Roche Bay Magnetite Property and C-Zone:

- Davis Tube metallurgical testing should be continued during the 2011 drilling campaign (1 in 20 or 25) to be representative of samples from the C-Zone as the project is advanced. Additional Davis Tube testing of 2007/2008 and 2011 samples are required in the fringes of the C-Zone (Sections 9200N to 9600N and 13400N to 14000N) prior to increasing the classification of these areas.
- Future drilling should consider further testing the BIF footwall zones areas in order to fully define the BIF mineralization and potentially increase the width of the overall C-Zone.
- Blanks and standards should be routinely included in all future sampling programs to validate the sample preparation and assaying. A site standard can be used from coarse rejects if sufficient testing is completed on the site standard.
- A selection of stored pulp (as a minimum 100 samples) should be selected from the 2007 and 2008 exploration programs for umpire testing as part of the AEI QA/QC program.
- Down hole surveys (non-magnetic) should continue to be carried out for all future drill holes.
- Future drilling programs should continue collecting geotechnical data in critical areas (i.e. proposed pit walls and known hydrogeological areas).
- Completion of the C-Zone surface geological mapping project that was initiated during the 2008 exploration program.

In addition to the above recommendations by Golder, AEI has ongoing studies. The work proposed includes an NI 43-101 mineral resource update, and continuation of environmental studies in support of the development of the Environmental Impact Study (EIS). AEI has initiated the development of the project feasibility study.

The Phase 2 work plan study includes a mineral resource update, completion of metallurgical test work for concentrating plant and direct reduction plant, an optimization project and mine design project, preparation of a



project report description and submissions to regulators, commencement of the permitting, consultation and agreement process. The cost of the Phase 2 study is estimated by AEI to be US \$20,000,000.

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## Report Signature Page

The report was prepared and signed by Paul Palmer, P.Eng., P.Ge., and Greg Greenough, P.Ge., of Golder. Both authors are qualified persons as outlined by NI 43-101. The effective date of this technical report is May 20, 2011.

**GOLDER ASSOCIATES LTD.**

**Original signed and stamped by:**

Greg Greenough, P.Ge.  
Associate/Senior Resource Geologist

GW/GG/PP/lb

**Original signed and stamped by:**

Paul Palmer, P.Eng., P.Ge.  
Associate/Senior Geological Engineer

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# APPENDIX A

## Certificates of Qualification

**GREG GREENOUGH  
CERTIFICATE OF QUALIFICATION**

I, Gregory F. Greenough, P.Geo., do hereby certify that:

- 1) I am employed as a Senior Resource Geologist at:  
Golder Associates Ltd.  
6700 Century Avenue, Mississauga, Ontario, Canada L5N 5Z7  
Telephone: 905-567-6100; Fax: 905-567-6561  
Email: ggreenough@golder.com
- 2) I graduated from Laurentian University in 1976 with a Hons B.Sc. degree in Geology.
- 3) I am registered as a Professional Geoscientist in the Province of Ontario (APGO Licence #825).
- 4) I have worked as a geologist in the mineral resource industry for a total of thirty-six years since my graduation from university. My relevant experience for the purpose of this resource estimate is:
  - a) Thirty years of geological experience with INCO Limited in the Sudbury Basin Cu, Ni PGE deposits, including: Senior geologist at various mines responsible for exploration projects and resource/reserve estimation; Nine years as Chief Evaluation and Design Geologist for the Ontario Division, responsible for the resources and reserves, standards, and auditing of the Sudbury Operations deposits.
  - b) Consulting resource estimation experience on various projects, including laterite nickel deposits, James Bay district gold deposits, and James Bay Lowlands Ni-Cu-PGE and Chromite deposits.
- 5) I have read the definition of "Qualified Person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.
- 6) I am responsible for Section 17 (Mineral Resource and Mineral Reserve Estimates) of the technical report titled "Technical Report, Roche Bay Magnetite Project C-Zone, Nunavut, Canada" with an effective date of May 20, 2011 (the "May 20, 2011 Technical Report"). I have not visited the property.
- 7) I have not had prior involvement with the property that is subject to the Technical Report.
- 8) As of the date of this certificate, to the best of my knowledge, information and belief, the May 20, 2011 Technical Report contains all scientific and technical information that is required to be disclosed to make it not misleading.
- 9) I am independent of the issuer applying all the tests in Section 1.4 of the NI 43-101.



10) I have read NI 43-101 and Form 43-101F1, and the Roche Bay Magnetite Project C-Zone resource estimate has been prepared in compliance with that instrument and form.

Dated this 20<sup>th</sup> Day of May, 2011.

**Original signed and stamped by:**

Greg Greenough, H.BSc., P.Geo.

**PAUL PALMER  
CERTIFICATE OF QUALIFICATION**

I, Paul Palmer, P.Geo., P.Eng., do hereby certify that:

1. I am employed as a Senior Geological Engineer at:  
Golder Associates Ltd.  
1010 Lorne Street, Sudbury, Ontario P3C 4R9  
Telephone: 705-524-6861; Fax: 705-524-1984; Email: ppalmer@golder.com
2. I graduated with a Bachelor's degree in Geology from Memorial University of Newfoundland. In addition, I have obtained a Bachelor's degree in Geological Engineering from University of Toronto.
3. I am a member in good standing of the Association of Professional Engineers Ontario, the Association of Professional Engineers and Geoscientists of the Province of Manitoba and the Association of Professional Engineers, Geologists and Geophysicists of the Northwest Territories.
4. I have practised my profession continuously since graduation. My relevant experience with respect to this project is over sixteen years of experience in exploration and mineral resource evaluation of mineral projects nationally and internationally in a variety of commodities. I also authored the February 14, 2007 and April 24, 2009 Technical Reports.
5. I have read the definition of "Qualified Person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purpose of NI 43-101.
6. I am responsible for all sections of the technical report titled "Technical Report, Roche Bay Magnetite Project C-Zone, Nunavut, Canada" (the "Technical Report") with an effective date of May 20, 2011. I visited the Roche Bay Magnetite Project site October 15, 2006 and August 26, 2009.
7. I have not had prior involvement with the property that is subject to the Technical Report other than what is stated in Bullet 4.
8. I am not aware of any material fact or change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.
9. I am independent of the issuer applying all the tests in section 1.4 of the National Instrument (NI) 43-101.
10. I have read NI 43-101 and form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Dated this 20<sup>th</sup> Day of May, 2011.

**Original signed and stamped by:**

Paul Palmer, P.Geo., P.Eng.



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