P&E MINING CONSULTANTS INC.
Geologists and Mining Engineers

UPDATED RESOURCE ESTIMATE AND PRELIMINARY ECONOMIC ASSESSMENT ON THE OOTSA PROPERTY BRITISH COLUMBIA, CANADA

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FOR

GOLD REACH RESOURCES LTD.

By

P & E Mining Consultants Inc.

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1.0 SUMMARY

1.1 EXECUTIVE SUMMARY

This report is an independent updated mineral resource estimate and Preliminary Economic Assessment ("PEA") on Gold Reach Resources Ltd.'s 100% owned copper-gold-molybdenum Ootsa Project in west-central British Columbia. The conceptual PEA demonstrates the potential to develop the Ootsa Project by means of contract mining and toll milling at low initial capital cost to deliver a base case after-tax NPV and IRR of C$186 million and 81%, respectively. P&E Mining Consultants Inc. was the lead engineering firm for the PEA, which also included input from Knight-Piesold Consulting, ERM Consultants Canada Ltd., and Gold Reach personnel.

Base Case Operating Highlights and Project Performance

Metal Price:	US$3.00/lb Cu, US$1,260/oz Au, US$10.30/lb Mo, US$17/oz Ag
Mill Feed*:	65 Mt @ 0.37% Cu Eq
	(0.25% Cu, 0.13 g/t Au, 0.016% Mo, 2.3 g/t Ag)
Resource Quality:	94% Measured, 6% Indicated Classification
Production:	324 M lbs Cu, 185 K oz Au, 15.8 M lbs Mo, 3 M oz Ag
Mine Life	12 years
Initial CAPEX:	C$64 million (including contingency)
NPV @ 5% (after-tax)**:	C$186 million
IRR (after-tax):	81%
Payback:	1 year
Resilience:	31% IRR at US$2.25/lb Cu

**Consists of 61 M tonnes of the Measured portion of the mineral resource at grades of 0.37% Cu Eq (0.25% Cu, 0.13 g/t Au, 0.016%Mo, and 2.3 g/t Ag), plus 4 M tonnes of the Indicated portion of the mineral resource at grades of 0.33% Cu Eq (0.24% Cu, 0.07 g/t Au, 0.015%Mo, and 2.3 g/t Ag).*
***NPV includes by-product credits for gold, molybdenum, and silver. A discount rate of 5% was applied to generate NPV based on the lower risk of the development relative to that of similar projects. A contingency factor of 30% was included in the initial capital cost estimate. Exchange rate of US$0.80=CDN$1.00 was utilized.*

The PEA is based on the open pit development of the Ootsa Property by a contract miner, toll milling of Ootsa mill feed at the adjacent Huckleberry Mill at the end of current operations, and use of the existing site facilities on a fee-basis. There are currently no agreements in place to conduct toll milling of Ootsa mill feed at the Huckleberry facilities, nor is there any guarantee that the required agreements can be established on commercially acceptable terms to support the proposed development plan.

The projected mining method, potential production profile and other Ootsa Project economics referred to in this PEA are conceptual in nature and additional technical studies will need to be completed in order to fully assess the Ootsa Project's viability. The PEA should not be considered a Pre-feasibility or Feasibility Study, since the economic and technical viability of the project has not been demonstrated to that level. There is no certainty that a potential mining operation will be realized or that a production decision will be made. A mine production

decision that is made prior to completing a Feasibility Study carries potential risks that include, but are not limited to, the inclusion of Inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. Among other things, mine design and mining schedules, metallurgical flow sheets and process plant designs may require additional detailed work and economic analysis and internal studies to ensure satisfactory operational conditions and decisions regarding future targeted production. Capital cost estimates presented in this study are preliminary in nature and will require a more detailed assessment in subsequent economic studies. Furthermore, the advancement of the Ootsa Project is subject to requisite consents, permits and approvals, regulatory or otherwise for the Ootsa Project and there is no guarantee that Gold Reach would be successful in obtaining any or all of them.

1.2 INTRODUCTION

The following is a summary of the report titled, "Updated Resource Estimate and Preliminary Economic Assessment on the Ootsa Deposit, British Columbia, Canada". This report was prepared by P&E Mining Consultants Inc. ("P&E") at the request of Mr. Dwayne Melrose, President and CEO of Gold Reach Resources Ltd. ("Gold Reach") and is considered current as of January 1, 2016. The purpose of this report is to provide an independent Technical Report and PEA compliant with NI 43-101 disclosure guidelines for the Ootsa Project.

1.3 RELIANCE ON OTHER EXPERTS

P&E has assumed that all of the information and technical documents listed in the References section of this Report are accurate and complete in all material aspects. While P&E has carefully reviewed all of the available information presented, P&E cannot guarantee its accuracy and completeness.

A draft copy of this Technical Report has been reviewed for factual errors by Gold Reach management. Any changes made as a result of these reviews did not involve any alteration to the conclusions made in this report. Hence, the statement and opinions expressed in this Report are given in good faith and in the belief that such statements and opinions are not false and misleading at the date of this report.

1.4 PROPERTY DESCRIPTION AND LOCATION

The Ootsa Property is located in west central British Columbia on the south shore of Nechako Reservoir, approximately 120 km by road south of the town of Houston. The Property consists of 120 contiguous non-surveyed mineral claims 100% owned by Gold Reach and its subsidiaries.

1.5 ACCESS, CLIMATE, PHYSIOGRAPHY, LOCAL RESOURCES, AND INFRASTRUCTURE

The Ootsa Property is accessed via well-maintained, all-weather gravel roads extending south from Houston to the Nechako Reservoir. A two tractor trailer-sized barge provides access across the reservoir and logging roads permit travel throughout the site. The Ootsa Property has a cool, damp climate with short summers and relatively mild winters. Annual temperatures vary from approximately -25°C to +25°C. Precipitation is approximately 1,000 mm per year with half of

that amount falling as snow. The southern shore of Tahtsa Reach is characterized by heavily forested, flat or gently rolling ground with higher mountains to the south.

The closest major communities to the Ootsa site are the towns of Houston 120 km north and Smithers, 63 km west of Houston. Combined they have a population of over 9,000 with a further 8,000 residents in the surrounding Bulkley Valley. Both towns are served by major railways and highways. Smithers has an airport with daily scheduled air service to Vancouver. Port facilities are available in Stewart (510 km by road), Prince Rupert (530 km by road), and Kitimat (440 km by road). The Huckleberry open pit mine and mill complex ("Huckleberry" or "HB") is located 6 km northwest of the Ootsa Property on the north shore of the Nechako Reservoir.

1.6 HISTORY

Documented mineral exploration in the area started in the early part of the 20th century at the Emerald Glacier and Captain mines. Silver, lead, and zinc was mined underground at these sites periodically from 1920-1980. Exploration during the 1960s and 1970s resulted in the discovery of the Ox, Seel, and Huckleberry porphyry deposits.

Huckleberry was later developed into a copper-molybdenum mine in the 1990s and continues to operate today. As of December 31, 2014, the Huckleberry Mine had probable reserves of 42.1 million tonnes grading 0.327% Cu and 0.010% Mo.

1.7 GEOLOGY AND MINERALIZATION

The Ootsa Property is located within the Stikine tectono-stratigraphic terrane, near the western margin of the Coast Plutonic Complex and sits at the southeast end of a southeast-trending belt of porphyry deposits and prospects that include the Lucky Ship, Berg, Huckleberry Mine, and Whiting Creek deposits.

The Ootsa Property is underlain by a series of juxtaposed fault blocks containing tilted and locally folded strata of the Telkwa, Nilkitkwa, Whitesail and Smithers formations. These rocks are cut by multi-phase intrusive complexes composed of diorite, granodiorite, quartz diorite, porphyritic quartz monzonite, porphyritic granodiorite, feldspar porphyry, and quartz feldspar porphyry.

Compressional stresses from the amalgamation of the Stikine Terrane with ancestral North America led to the development of deep seated faults in the region. Relaxation and extension following amalgamation were accompanied by the emplacement of calc-alkaline intrusive rocks with their accompanying zones of hydrothermal alteration and mineralization.

The East Seel deposit contains porphyry style Cu-Au mineralization hosted within a coarse feldspar-biotite porphyry. Mineralization is associated with quartz-chalcopyrite-magnetite-pyrite veins and strong potassic alteration. The West Seel deposit contains porphyry Cu-Au-Mo-Ag mineralization and is hosted in a variety of porphyritic intrusive rocks and in fine grained clastic sedimentary rocks along the intrusive margins. The Ox deposit, located 4 km northeast of the East Seel deposit, hosts porphyry Cu-Mo mineralization in altered sedimentary rocks near the western margin of a granodiorite porphyry stock and has characteristics similar to the Huckleberry Mine.

1.8 DEPOSIT TYPE

The Ox, East Seel, West Seel and the adjacent Huckleberry Mine are classified as porphyry copper deposits as they share features characteristic of porphyry copper systems, based on their geometry, association with intrusive rocks, nature of disseminated and veinlet controlled mineralization, alteration assemblages, alteration zonation patterns, and metal associations.

1.9 EXPLORATION

Exploration was conducted at the Ox and Seel deposits by Gold Reach from 2004-2015 employing a number of traditional exploration methods including prospecting and surface sampling, outcrop mapping, geochemical soil and stream sediment sampling, induced polarization geophysical surveys, and diamond drill coring. Exploration has been comprehensive with the methods employed proving to be appropriate and effective.

1.10 DRILLING

All drilling conducted prior to 2004 is considered historic and has not been used to generate the current resource estimate. A total of 122,000 m of drilling has completed on the Property by Gold Reach from 2004-2015. Of that amount, 103,000 m was used in the current mineral resource estimate; approximately 81,000 m at Seel and 22,000 m at Ox. 7,311 m of drilling in 11 holes at Seel were performed after a 2014 NI 43-101 mineral resource update by Boyce and Giroux.

1.11 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

Core from drilling was photographed, measured, and logged by Gold Reach personnel at the Ootsa Property. Each section was sawn longitudinally with half bagged and shipped to an accredited laboratory for analysis and the other half stored on site as a permanent record. Cut core samples were crushed, split, and pulverized to P80 200 mesh (75µ) in Telkwa, BC, at the assayer's facility prior to shipping to Vancouver for analysis.

Analyses were performed in Vancouver including ACME, SGS, and most recently, AGAT Laboratories. Analyses consisted of acid digestion of sample pulps followed by multi-element ICP-OES analysis. Gold determinations were conducted using fire assay with an AA finish. It is P&E's opinion that the sample preparation, security and analytical procedures for the Ootsa Project drill programs were adequate for the purposes of the updated mineral resource estimate and PEA.

1.12 DATA VERIFICATION

The Ootsa Project was visited by Mr. Eugene Puritch, P.Eng., of P&E on October 1, 2015 for the purpose of completing the required site visit and to conduct due diligence sampling. Gold Reach employed an independently monitored quality control program for its drill core assays consisting of the routine insertion of standards, duplicates, and blanks. P&E is of the opinion that the quality control protocol implemented by Gold Reach is thorough and acceptable and that the results are suitable to support the updated mineral resource estimate and PEA.

1.13 MINERAL PROCESSING AND METALLURGICAL TESTING

Three metallurgical test programs were conducted in 2013 and 2014 to examine the amenability of material from all three deposits to bulk flotation and molybdenum separation. Flotation test work results indicated that at grinds ranging from 90-130 µm, copper and molybdenum bulk rougher recoveries consistently exceeded 90%. Concentrate grades of 23-31% for copper and 51% for molybdenum were achieved.

The preliminary testwork has demonstrated general amenability of the Seel and Ox deposits to processing at the Huckleberry process plant. High recoveries of copper and molybdenum to flotation rougher concentrate are indicated. Saleable copper concentrates can be readily produced at high recoveries and initial testwork suggests that a separate marketable molybdenum concentrate can also be produced at reasonable recoveries. The copper concentrate will carry significant gold and silver credits. More detailed metallurgical testwork is required to confirm and optimize performance.

Based on the testwork status and a review of historic Huckleberry process plant data, selected mill recoveries for this PEA are presented in Table 1.1.

TABLE 1.1
OOTSA PROCESS PLANT RECOVERIES

Deposit	Recovery (%)			
	Cu	Mo	Au	Ag
West Seel	92	70	65	60
Ox	91	70	70	65
East Seel	90	n/a	70	60

1.14 MINERAL RESOURCES

A total of 26,995 assays from 258 drill holes were utilized for the mineral resource estimate. Mineralized domains for each deposit were defined in cross-section and subsequently modeled in three dimensions to form the basis of the resource model. Variography was performed on domain-constrained, capped composites for Cu, Mo, Au and Ag to establish search ellipsoid parameters. Metal grades and bulk densities for all mineralized blocks were interpolated using the Inverse Distance Squared method.

The mineral resource estimate presented in Table 1.2 was derived from applying a C$8.50/t NSR cut-off value to the block model and reporting the resulting tonnes and grade for potentially mineable areas within a pit constrained shell. Resource classifications were defined by the number of samples available to interpolate a block grade. The mineral resource has an effective date of January 1, 2016.

TABLE 1.2 OOTSA PROJECT PIT CONSTRAINED UPDATED MINERAL RESOURCE ESTIMATE AT $8.50/T NSR CUT-OFF VALUE(1-5)												
Deposit	**Category**	**Tonnes ('000's)**	**CuEq %**	**Cu %**	**Au g/t**	**Mo %**	**Ag g/t**	**CuEq M lbs**	**Cu M lbs**	**Au K oz**	**Mo M lbs**	**Ag K oz**
Ox	Measured	30,492	0.37	0.26	0.04	0.028	1.5	249	175	39	19	1,471
	Indicated	3,204	0.32	0.23	0.04	0.021	1.4	23	16	4	1	144
	M&I	**33,696**	**0.37**	**0.26**	**0.04**	**0.027**	**1.5**	**272**	**191**	**43**	**20**	**1,615**
East Seel	Measured	22,165	0.43	0.28	0.26	0.002	2.5	210	137	185	1	1,782
	Indicated	1,422	0.38	0.28	0.14	0.003	4.4	12	9	6	0	201
	M&I	**23,587**	**0.43**	**0.28**	**0.26**	**0.002**	**2.6**	**222**	**146**	**191**	**1**	**1,983**
West Seel	Measured	134,491	0.37	0.21	0.16	0.022	3.2	1,097	623	692	65	13,837
	Indicated	32,415	0.36	0.21	0.13	0.024	2.9	257	150	135	17	3,022
	M&I	**166,906**	**0.37**	**0.21**	**0.15**	**0.023**	**3.1**	**1,354**	**773**	**827**	**82**	**16,859**
	Inferred	5,212	0.30	0.18	0.09	0.019	2.6	34	21	15	2	436
Total	Measured	187,148	0.38	0.23	0.15	0.021	2.8	1,568	934	916	85	17,089
	Indicated	37,041	0.35	0.21	0.12	0.023	2.8	286	175	146	19	3,368
	M&I	**224,189**	**0.37**	**0.22**	**0.15**	**0.021**	**2.8**	**1,854**	**1,109**	**1,062**	**104**	**20,457**
	Inferred	5,212	0.30	0.18	0.09	0.019	2.6	34	21	15	2	436

(1) Mineral Resources, which are not mineral reserves, do not have demonstrated economic viability. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.

(2) The quantity and grade of reported Inferred Resources in this estimation are uncertain in nature and there has been insufficient exploration to define these Inferred Resources as an Indicated or Measured Mineral Resource and it is uncertain if further exploration will result in upgrading them to an Indicated or Measured Mineral Resource category.

(3) The Mineral Resources in this report were estimated using the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), CIM Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by the CIM Council.

(4) The $8.50/t NSR resource cut-off value was derived from Sep 30/15 three year approximate trailing average US metal prices of: Cu $3.25/lb, Au $1,350/oz, Mo $12/lb and Ag $22/oz and a US$:CDN$ exchange rate of 0.85. Process recoveries used were Cu 90%, Au 70%, Mo 70% and Ag 65% with respective smelter payables of 96%, 96%, 96% and 90%. Refining charges in US$ were Cu $0.05/lb, Au $5/oz and Ag $0.50/oz. C$ operating costs used were $2.25/t for mineralized material and waste mining, $1.50/t for overburden mining, $7.50/t for processing and $1.00/t for G&A. An optimized pit shell was utilized for resource reporting that utilized 45 degree slopes and an average mineralized material bulk density of 2.72 t/m^3.

(5) Copper Equivalent (Cu Eq) calculations are based on base case metal price and process recovery assumptions, and take into account smelter payable rates and refining costs.

1.15 MINERAL RESERVES

There are no mineral reserves for the Ootsa Project.

1.16 MINING METHODS

1.16.1 Geotechnical

A geotechnical review of the Seel and Ox deposits was conducted to establish pit slope parameters for mine design. Recommended pit slope angles for the Seel deposit in hard rock were 70° bench face angles, 53° inter-ramp angles, and 41-48° overall slope angles depending on the placement of ramps and presence of overburden in highwalls. Recommended pit slope design

parameters for Ox in hard rock were 65° bench face angles, 45° inter-ramp angles, and 43° overall slope angles.

1.16.2 Mine Design

Pit optimization employing a Lerchs-Grossman algorithm was used to generate a series of nested pit shells for each deposit. The contained mineral resources were subject to discounted cash flow analysis with the shells from each deposit delivering the greatest value in terms of both Net Present Value and resilience at low metal prices selected as the basis for manual pit designs. Manual pit designs incorporated physical design features such as haulage ramps and catch benches and the contained mineral resources were adjusted for dilution and mining losses to arrive at a potentially economic portion of the total mineral resource.

The potentially economic portion of the mineral resource identified for development at the Ootsa Property consists of 61 Mt of the Measured portion of the mineral resource at grades of 0.37% CuEq (0.25% Cu, 0.13 g/t Au, 0.016% Mo, and 2.3 g/t Ag), plus 4 Mt of the Indicated portion of the mineral resource at grades of 0.33% CuEq (0.24% Cu, 0.07 g/t Au, 0.015% Mo, and 2.3 g/t Ag), and totals 65.4 Mt of mill feed grading 0.37% CuEq (0.25% Cu, 0.13 g/t Au, 0.016% Mo, and 2.30 g/t Ag). Total non-mineralized material is 95.8 Mt composed of 31.1 Mt of overburden and 64.7 Mt of waste rock. The total tonnage of all material in all three pits is 161.2 Mt.

1.16.3 Mine Development Plan

The deposits at the Ootsa Property will be mined by conventional truck/shovel open pit methods. Mill feed will be transferred from Ootsa to the mill via a conveyor system. Combined mill feed, waste and overburden mining will be conducted over a period of 12 years at a nominal average rate of 40,000 tpd to supply 5.6 Mt of feed annually at a strip ratio of 1.46:1. Three open pits will be mined in sequence starting with East Seel, then Ox, and finally West Seel. The sequence follows the highest value of the mineralized material, which is primarily a function of grade and strip ratio to maximize Net Present Value ("NPV").

1.16.4 Mining Method/Equipment/Manpower

Mining will be conducted by a mining contractor that will provide its own equipment fleet and will operate the mill feed conveyor system supplied by Gold Reach. The mobile mine equipment fleet has been specified based on the equipment at the HB Mine which could be available for use at the time Ootsa is developed. There is, however, no necessity to use the same type of equipment as the HB equipment to mine Ootsa.

The mining fleet consists of one 300 t hydraulic excavator and one 200 t hydraulic excavator loading 7-9 135 t rigid-frame haul trucks. Drilling will be conducted using rotary blasthole drills working on a nominal 5 m x 5 m pattern for benches 10 m in height. Blasting will employ emulsion explosive. Auxiliary equipment in the form of dozers, graders, utility loaders, and sand, fuel, lube and water trucks will support the mining activities. Mining manpower will comprise about 170 personnel including supervision and maintenance. Planning and technical services will be provided by Gold Reach's engineering group.

1.17 RECOVERY METHODS

Milling is anticipated to be conducted on a toll-basis by the owner of the HB mill. The Project development is predicated on the amenability of Ootsa mill feed to processing using the mill without modification. The process flow sheet will remain unchanged except that mill feed will be hauled to a semi-mobile jaw crusher located at the edge of the Seel and Ox open pits from which it will be conveyed to the mill.

Crushed mill feed will be subject to primary and secondary grinding with the underflow directed to bulk flotation. Copper will be depressed to facilitate flotation of molybdenum as a separate concentrate before both products are dewatered and dried prior to shipment. Tailings will be pumped to a mined-out open pit near the mill for storage.

1.18 INFRASTRUCTURE

1.18.1 Facilities

Field maintenance facilities, offices, lunchrooms, and toilets will be established on the Ootsa site at the Permanent Transfer Point where the Seel and Ox overland conveyors will meet. The site facilities at the adjacent mine will continue to be used to support operations with camp, workshops, warehouses, storage facilities, and offices provided to Gold Reach and the mining contractor on a fee-basis.

1.18.2 Mill Feed Transfer

Based on the results of a trade-off study, an overland conveyor employing a series of floating conveyor units to cross Tahtsa Reach was determined to be the most desirable mill feed transfer alternative. The conveyor system will be 7-9 km in length depending on which pit is being mined and will be reconfigured as mining moves from one area to the next. The conveyor system will have an operating capacity of 850 tph.

1.18.3 Electrical Power

Electrical power will be supplied by the existing 138 kV transmission line feeding the HB Mine. Additional power required to support the Ootsa development is estimated to be less than 2 MW and is minimized by the largely diesel-powered mining fleet and the regenerative nature of the overland conveyor on the Ootsa Property.

1.18.4 Waste Rock Storage

Approximately 96 Mt of waste material will be mined from the Seel and Ox pits. About a third of this material is overburden with the remainder broken hard rock. About 22% of the total waste material is potentially acid generating and will be blended with non-acid generating material in stockpiles to retard the generation of acid drainage.

1.18.5 Water Management

Water run-off and groundwater from open pits will be directed to collection ponds. Run-off from overburden stockpiles will be collected to allow for settlement of suspended solids prior to re-entering the groundwater regime via seepage. Collected mine water and run-off will be

transferred by pipeline from each pit area to holding ponds located at the Permanent Transfer Point where suspended solids will settle out and water quality determined prior to discharge.

1.18.6 Tailings Management

Tailings generated from the milling of Ootsa feed will be stored in the mined-out Main Zone ("MZ") Pit near the mill. The final excavated volume of the MZ Pit is planned to be 62 M m^3, more than sufficient to accommodate the estimated 48 M m^3 of Ootsa tailings. Disposal in this manner is among the most technically simple and safest methods available.

1.19 MARKETS AND CONTRACTS

The Project value is based on metal prices, which represent a discount to long-term metal price forecasts by major financial institutions and financial experts. The Base Case metal price assumptions for the Project are $3.00/lb Cu, $1,260/oz Au, $17.00/oz Ag, and $10.30/lb Mo.

A metal price model was developed which simulates the movement of metal prices and the foreign exchange rate reflecting their historical relationship. The Base Case exchange rate is US$0.80 = C$1.00 which represents the 23-year trailing average.

There are no existing contracts in place related to the Ootsa Project.

1.20 ENVIRONMENTAL/SOCIAL/PERMITTING

1.20.1 Abiotic Environment

The abiotic environment involves all the non-living aspects of the environment including climate, hydrology, water and air quality, noise, and aesthetics. Preliminary investigation of baseline water quality was started in 2014 but more study is required. No data currently exists for surface and groundwater hydrology, air quality, noise, or aesthetics at the Ootsa Project site. All of these aspects of the abiotic environment will require monitoring and study to support environmental assessment and permitting.

1.20.2 Terrestrial Resources

Terrestrial ecosystems comprise vegetation, soil and landscape features that, along with wildlife, are a focus for regulators, Aboriginal groups and other stakeholders during the permitting process. Characterization of the terrestrial ecosystem features (soil, vegetation, rare plants, ecosystems, wildlife habitat) will be required for both environmental assessment and permitting.

Baseline studies will also be required for a suite of wildlife species to support an effects assessment and development of mitigation measures. Specific attention will be required for development planning around habitat issues for key species including Grizzly Bear, Moose, Mountain Goat and Northern Caribou. With early and well-planned mitigation and reclamation of disturbances, it is anticipated that impacts to wildlife in the Project area will not be significant.

1.20.3 Aquatic Resources

Comprehensive studies of aquatic resources will be required to support regulatory approval. Based on preliminary studies of fish populations on the property, the Project is not anticipated to

impact any commercial, recreational, or aboriginal fisheries as defined by the Fisheries Act. The draining of Ox Lake will result in a temporary loss of fish habitat and potential impact on water levels in the outflow stream, however, after the end of mining, it is anticipated that the mined-out pit lake will again support aquatic life.

1.20.4 Water and Waste Management

Preliminary test work for Ootsa indicates that mine water and run-off will not require complex treatment to allow its release to the environment. Settling of suspended solids and pH adjustment may be necessary depending on the chosen management strategy. Additional test work in the form of kinetic testing will be required at the next stage of engineering to determine the long-term potential for acid generation, metals leaching, and appropriate closure strategies.

Management of non-mine waste such as solid refuse, recyclables, and hazardous wastes is anticipated to become part of the existing system at the HB Mine operation and will not present a risk to the environment.

1.20.5 Permitting

The Ootsa Project will trigger a federal and provincial environmental assessment with legislated timeframes and it will also require federal and provincial permits to develop and operate. Engagement and consultation with regulatory agencies, First Nations, the public, and stakeholders will be key requirements. The outcome of the environmental assessment will be a decision on the Project followed by permitting. Most of the major permits required for Project construction and operation are issued by the province.

Many of the permits to construct, operate and reclaim a mining project have already been issued for the HB Mine and these will require amendments to accommodate the Ootsa Project milling and tailings disposal. The Ootsa Project will require separate permits for construction, operation and reclamation. The nature of amendments to the HB permits will be determined through engagement with the HB owner, regulators and Aboriginal groups.

1.20.6 First Nations

The proposed development of the Ootsa Property occur within the consultative area of six First Nations, of which, at least five claim overlapping Aboriginal rights, title and interest to the area. These include the Carrier Sekani Tribal Council (Prince George), Cheslatta Carrier Nation (Burns Lake), Nee-Tahi-Buhn Indian Band (Burns Lake), Skin Tyee Nation (Southbank), Office of the Wet'suwet'en (Smithers), and the Wet'suwet'en First Nation (Burns Lake). Gold Reach has maintained an ongoing dialogue with First Nations stakeholders during the exploration phase of the Project and, as a result of this engagement, has received written support for its activities.

1.20.7 Reclamation and Closure

Reclamation and closure pertain only to the Ootsa Property. Closure of the HB site is a separate issue outside of the scope of the Ootsa development plan. At closure, all infrastructure and equipment will be removed from the site and disturbed areas revegetated. Run-off from waste rock stockpiles and exposed pit walls will flow through the flooded open pits prior to release. Post-closure monitoring for a period of five years will ensure that no legacy issues exist prior to final closure.

The total cost of reclamation is estimated at $9 M, of which $5 M will be posted as the initial reclamation bond prior to the start of development as part of the initial capital costs. Bonding will increase throughout the Project life with the development of each subsequent open pit. Progressive reclamation of $500,000 per year will reduce the outstanding reclamation liability at the end of operations to $3 M.

1.21 CAPITAL AND OPERATING COSTS

1.21.1 Capital Costs

Total initial capital for the project is estimated at C$64 M. This includes direct costs for mine development, mobilization of the mining contractor, and fixed plant and infrastructure. It also covers indirect costs which include, but are not limited to, EPCM and reclamation bonding.

Mine capital costs are approximately $10 M of which about $7 M is for pre-stripping. Infrastructure costs are approximately $23 M. This includes $13 M for the conveyor system, $5 M for the semi-mobile crusher, and $3 M for power distribution. Indirect capital cost total $19 M of which $7 M is for social and environment management including the initial reclamation bond and $5 M is for EPCM. A 30% contingency on all capital costs except pre-stripping and clearing in the amount of approximately $12 M is part of the initial capital cost.

The Project bears a further C$33 M in deferred capital over the life of the mine for changes to infrastructure to support the sequential development of the open pits. This amount also includes the cost of additional reclamation bonding required to address the disturbance from the development of the Ox and, West and East Seel pits.

1.21.2 Operating Costs

<u>Mining Costs</u>

Mining costs have been developed using industry norms and vary by material type and pit. Mill feed mining costs includes the cost of transferring material from the open pit to the mill by conveyor. Overburden mining cost excludes the cost of drill and blast. All mining costs are variable based on haul distance. The average mining cost for all material is $2.67/t mined. These costs are representative of contract mining and as such include provisions for fleet ownership, depreciation, contractor margin, and contractor G&A.

<u>Process Costs</u>

Direct process costs were developed in a similar manner to mining costs. Costs are based on throughput of 5.6 Mtpa and vary from pit to pit primarily due to consumption of reagents used to separate copper and molybdenum. The unit process costs for East Seel, Ox, and West Seel are $9.03/t, 10.13/t, and $11.64/t, respectively. The overall weighted-average unit process cost for the Project is $10.07/t milled. These costs are based on toll-milling and as such include provisions for the ownership of facilities, depreciation, contractor margin, and process related G&A.

G&A Costs

Total G&A costs were estimated to be $1.72/t milled. Two-thirds of this amount is included in the contract mining and toll-milling unit rates discussed above. In the case of the G&A for mining, the cost per tonne milled has been converted to a cost per tonne mined. The remaining portion of the G&A cost borne by Gold Reach is $0.56/t milled. All of the G&A costs reflect a 15% premium paid for services received and the use of infrastructure facilities provided by another party.

Manpower

Total manpower for the project is estimated at 370. The mining contractor and the toll-milling contractor will have workforces of 180 and 136 people, respectively. Gold Reach will employ 54 people of which 30 will be subcontractors operating the camp and the barge and 13 will form the Mine Engineering group.

1.22 ECONOMIC ANALYSIS

1.22.1 Base Case Performance

Base Case results indicate that the Project has an after-tax NPV of C$186 M discounted at 5% and an Internal Rate of Return ("IRR") of 81%. Undiscounted payback of the initial (construction) capital is 1.0 year. Over the 11.8 years of operation, the Project generates C$255 M in free cash flow. A summary of Project parameters and economic performance is presented in Table 1.3.

TABLE 1.3 BASE CASE SUMMARY OF PARAMETERS AND ECONOMIC PERFORMANCE		
Economics		
After-Tax NPV @ 5%	C$ M	186
After-Tax IRR	%	81
Simple Payback	Yrs	1.0
Exchange Rate	US$:C$	0.80
Unit Cost		
Direct Cash	US$/lb Cu	1.33
All-In Sustaining Cash	US$/lb Cu	2.09
Metal Price		
Cu	US$/lb	3.00
Au	US$/oz	1,260
Mo	US$/lb	10.30
Ag	US$/oz	17.00
Initial Capital		
Direct	C$ M	33
Indirect	C$ M	19
Contingency	C$ M	12
Total	C$ M	64
Operating Costs		
Mining	C$/t mined	2.67
Processing	C$/t milled	10.07
G&A	C$/t milled	0.56
Production		
Cu	M lbs	324
Au	K oz	185
Mo	M lbs	15.8
Ag	M oz	3.0
Mining		
Mill Feed	Mt	65
Waste	Mt	96
Total	Mt	161
Strip Ratio	w:o	1.46
Head Grade		
Cu	%	0.25
Au	g/t	0.13
Mo	%	0.016

TABLE 1.3 BASE CASE SUMMARY OF PARAMETERS AND ECONOMIC PERFORMANCE		
Ag	g/t	2.3
Process		
Throughput	Mtpa	5.6
Mine life	Yrs	12
Recovery		
Cu	%	91
Au	%	69
Mo	%	70
Ag	%	62

1.22.2 Cash Costs

The Direct and All-In Sustaining ("AISC") Unit Cash Cost of Copper Production at an exchange rate of US$0.80 = C$1.00 are US$1.32/lb and US$2.09/lb, respectively. No considerations for exploration or corporate costs were used in the determination of AISC costs. The breakeven copper price for the Project on a discounted cash flow basis is approximately US$2.18/lb.

1.22.3 Sensitivity Analysis

Sensitivity analyses were performed on Project economics for metal price, operating, and capital costs. The Project was found to be most sensitive to changes in operating cost due to the added premium paid for contract mining and toll-milling. The Project was slightly less sensitive to changes in metal price and relatively insensitive to changes in capital cost. The results of the metal price sensitivity are presented in Table 1.4.

TABLE 1.4
METAL PRICE SENSITIVITY

Metal Price							
Cu	US$/lb	2.25	2.50	2.75	**3.00**	3.25	3.50
Au	US$/oz	1,140	1,180	1,220	**1,260**	1,300	1,340
Ag	US$/oz	14.75	15.50	16.25	**17.00**	17.75	18.50
Mo	US$/lb	6.70	7.90	9.10	**10.30**	11.50	12.70
FOREX	US$:C$	0.73	0.75	0.78	**0.80**	0.83	0.85
					Base Case		
After-Tax NPV @ 5%	C$ M	21	86	141	**186**	232	274
After-Tax IRR	%	31	54	69	**81**	92	103
Payback	yrs	1.6	1.3	1.1	**1.0**	0.9	0.8

1.23 ADJACENT PROPERTIES

The HB Mine is located 6 km north of the Ootsa Property on the north shore of Tahtsa Reach. The property hosts an open pit mine and mill complex where processing and tailings disposal for

Ootsa mill feed would take place. At the end of 2014, the HB Mine had 42 Mt of mineral reserves remaining in its Main Zone Pit.

The Whiting Creek copper-molybdenum property lies 15 km to the north of the Ootsa Property. A preliminary mineral resource not complying with NI 43-101 standards for the property was calculated for the Whiting Creek deposit at 124 Mt grading 0.06% Cu and 0.025% Mo. Several other known porphyry copper deposits exist in the district but none have the mineral resource status and location that would make them a superior source of feed for the HB mill than Ootsa.

1.24 OTHER RELEVANT DATA

1.24.1 Project Schedule

Development (pre-construction) activities such as engineering, permitting, and financing are expected to take 3-4 years and are not considered part of the Project schedule. The Project schedule begins with a 1-year construction period. Production will follow construction directly but not before mining at HB is complete. Production will continue for 12 years with mining starting at East Seel, transitioning to Ox in Year 3, and again to West Seel in Year 9. Decommissioning will start in Q4 of Year 12 and will take 1-2 years followed by 5 years of monitoring prior to final closure.

1.24.2 Risk

The Ootsa Project bears all the risks associated with any mining project. In particular, the Project is subject to risk from fluctuating metal prices, higher operating costs, and the commercial aspects of establishing contract mining and toll-milling agreements. However, these are offset by a number of factors specific to Ootsa, which are not typical of most new mine developments.

Mineral resource risk is considered very low as 100% of the potentially economic portion of the mineral resource is classified as Measured or Indicated. Project execution and investment risk are lower than usual given the limited scope of construction and the resulting low initial capital cost. In addition, environmental and permitting risk is reduced given the possibility of storing tailings underwater in a mined-out pit at the adjacent site, no indicated need for complex water treatment, and no perceived unmitigated impact to fish or fish habitat.

1.25 INTERPRETATIONS AND CONCLUSIONS

The following summarizes the PEA conclusions, which highlight significant aspects of the Project or define Project value.

- Title on the Ootsa Property is in good order and although royalties exist on both deposits, provisions exist to reduce or eliminate them.
- The Property is readily accessible. Climate and terrain are typical of northern BC and do not present significant obstacles for development. Local communities can provide the skilled workforce and services necessary to develop the Project.
- Regional and local geology which controls mineralization is well understood. The deposit type is well known in BC and similar in many respects to the neighboring HB deposit among others. Exploration of the deposits has been comprehensive.

- Independent review finds that the procedures and practices for sample preparation, analysis, and security are both appropriate and adequate.
- Preliminary metallurgical test results indicate that a finer grind is required than at HB, however, similar recoveries can be expected. Further metallurgical test work is required to confirm the grind size. Saleable concentrates carrying significant gold and silver can be produced at reasonable recoveries.
- The updated mineral resource estimate complies with NI 43-101 disclosure requirements. The quality of the mineral resource estimate is high with 98% considered Measured and Indicated.
- The highest NPV comes from mining the deposits in the order East Seel, Ox, and West Seel. It is possible to transition from pit to pit without interrupting mill feed flow or imposing inordinate additional costs on the Project.
- The HB mill will be able to process feed from the Ootsa deposits without significant modification. Existing infrastructure for power and water will be adequate to support milling of Ootsa feed and a nearby mined-out pit has sufficient capacity to accommodate Ootsa tailings. Any potential development will rely heavily on existing facilities at the HB site.
- Existing roads on the Ootsa site are sufficient to permit a rapid ramp-up of construction. The time required to travel back and forth across the lake by barge will not impact operating efficiency.
- Conveying is the most efficient and cost-effective way to transport feed to the mill. The floating conveyor system that will transport feed across the lake is a proven concept which requires engineering design work to confirm its cost.
- Waste rock stockpiles have been sited so that water run-off will drain back to the pits. Test work indicates that run-off from waste rock stockpiles and inflow to open pits can be discharged without the need for treatment.
- Comprehensive baseline data collection will be required to support Project permitting including an Archaeological Impact Assessment matched to the development footprint. Kinetic testing is required to confirm initial test results regarding metals leaching and acid rock drainage.
- Base Case metal prices are realistic given an upturn in metal markets and represent a discount to long-term price forecasts by major financial institutions.
- The initial capital cost of $64 M is low relative to other new mine developments and result from a plan based on contract mining and toll-milling. Operating costs are higher than they would be in an owner-operator scenario.
- The after-tax Project NPV discounted at 5% of $186 M with an 81% IRR and a 1.0 year payback offers significant value at relatively low risk. The Project retains positive economics at a copper price of US$2.25/lb with an after-tax IRR of 31%.
- Although other porphyry copper deposits exist in the district, none are sufficiently developed, more favorably located, or have the cost/risk profile to serve as viable alternatives to the development of Ootsa as a source of mill feed for HB.
- Ootsa Project risk is significantly lower than that of similar base metal mine developments due to the high quality of the mineral resource, the pre-existing infrastructure, and the low capital cost.

- Despite prevailing low metal prices, engineering and permitting are required to proceed in 2016 in order so that Ootsa can be ready for production whenever mining at HB ends.

1.26 RECOMMENDATIONS

The following recommendations are drawn from this PEA, which identify actions that are required to take the Project forward.

- Request and review a quotation from the toll-milling contractor.
- Conduct comprehensive test work for grinding, flotation, molybdenum separation, and reagent consumption including process simulation.
- Determine the need for and conduct as required metallurgical variability test work.
- Conduct detailed geotechnical and hydrogeological studies supported by field test work.
- Review the mine operating plan based on contractor and equipment fleet availability.
- Conduct a detailed engineering study to confirm specifications of the semi-mobile crusher.
- Develop a detailed specification for the barge and associated transport infrastructure.
- Develop detailed overland and floating conveyor designs.
- Conduct a comprehensive electrical power study based on expected loads and the power distribution plan.
- Conduct a geotechnical review of pit slope waste rock and overburden stockpile designs.
- Develop a detailed engineering design for mine water management infrastructure.
- Develop a detailed tailings management plan.
- Explore opportunities for long-term supply agreements with metal smelters and refiners.
- Monitor and collect baseline data for the abiotic, terrestrial, and aquatic environments.
- Perform an Archaeological Impact Assessment aligned with the Project development footprint.
- Develop a site water balance.
- Develop a detailed plan for draining Ox Lake and re-establishing it after mining.
- Conduct additional testwork, including kinetic testing, to confirm the results of preliminary work regarding metals leaching and acid rock drainage (“ML/ARD”).
- Update the closure plan based on the outcome of additional ML/ARD testwork.

- Continue dialogue with local communities, First Nations, and other stakeholders. Start to align engagement with requirements of the permitting process.
- Determine the nature of the required amendments to the HB mining license that would permit the processing of Ootsa feed at the HB site.
- Develop a comprehensive Project description and permitting plan.
- Re-estimate the capital cost for the Project based on the detailed engineering studies for infrastructure.
- Increase the overall level of accuracy of the capital cost estimate to + 15%.
- Re-estimate the cost of closure based on a detailed plan.
- Request and review quotes from mining contractors.
- Develop operating costs from first principles.
- Estimate the cost and impact of development (pre-construction) costs on the value of the Project.
- Develop a risk matrix that illustrates how the Project risk declines as the level of engineering accuracy increases.
- Based on the detailed permitting plan, review the Project schedule to confirm the earliest reasonable start of production from Ootsa.
- Assess the potential to expand the mineral resource in a subsequent phase of drilling with a focus on the West Seel deposit. A $2.3 M drill program is recommended.

2.0 INTRODUCTION

2.1 Terms of Reference

This report titled "Updated Resource Estimate and Preliminary Economic Assessment on the Ootsa Deposit, British Columbia, Canada" ("Report" or "Technical Report"), was prepared to provide a National Instrument 43-101 ("NI 43-101") Technical Report and Preliminary Economic Assessment ("PEA") on the Ootsa Deposit ("Ootsa Project" or "Project" or "Property"), located 120 km south of Houston, BC, in Canada. The Ootsa Property is 100% owned by Gold Reach Resources Ltd. ("Gold Reach" or the "Company"). Gold Reach is a public, TSX:V listed, company trading under the symbol "GRV", with its head office located at:

Suite 888-700 West Georgia Street
Vancouver, BC
Canada V7Y 1G5
Telephone: 604-718-5454
Fax: 604-662-3791

This Report was prepared by P&E Mining Consultants Inc. ("P&E") at the request of Mr. Dwayne Melrose, President and CEO of Gold Reach and is considered current as of January 1, 2016.

The purpose of this Report is to provide an independent, NI 43-101 Technical Report and Preliminary Economic Assessment ("the Report") on the Ootsa Project. P&E understands that this report may be used for internal decision making purposes and will be filed as required under TSX:V regulations. The Report may also be used to support public equity financings.

The current P&E Updated Mineral Resource Estimate presented in this Report has been prepared in full conformance and compliance with the "CIM Standards on Mineral Resources and Reserves – Definitions and Guidelines" as referred to in NI 43-101 and Form 43-101F, Standards of Disclosure for Mineral Projects and in force as of the effective date of this Report.

Mr. Eugene Puritch, P.Eng., of P&E a qualified person under the terms of NI 43-101, conducted a site visit of the Property on October 1, 2015. A data verification sampling program was conducted as part of the on-site review.

2.2 Sources of Information

In addition to the site visit, P&E held discussions with technical personnel from the Company regarding all pertinent aspects of the Project and carried out a review of available literature and documented results concerning the Property, including internal company technical reports and maps, published government reports, company letters, memoranda, public disclosure and public information, as listed in the References at the conclusion of this PEA. Sections from reports authored by other participating consultants have been summarized in this Report, and are so indicated where appropriate.

Sections 2, 3, 15, 18, 19, 21, 22, and 24 of this Report were prepared by Eugene Puritch, P.Eng., who acting as a QP as defined by NI 43-101, takes responsibility for those sections of the Report as outlined in the "Certificate of Author" attached to this Report. Mr. Puritch also co-authored Sections 1, 14, 16, 25 and 26. Sections 4, 5, 6, 7, 8, 9, 10, 11, 12 and 23 of this Report were

prepared by Jarita Barry, P.Geo., who acting as a QP as defined by NI 43-101, takes responsibility for those sections of the Report as outlined in the "Certificate of Author" attached to this Report, including co-authoring Sections 1, 25 and 26. Sections 1, 14, 25 and 26 of this Report were co-authored by Brian Ray, P.Geo., acting as a QP as defined by NI 43-101, as outlined in the "Certificate of Author" attached to this Report. Sections 13 and 17 of this Report were prepared by Alfred Hayden, P.Eng., who acting as a QP as defined by NI 43-101, takes responsibility for those sections of the Report as outlined in the "Certificate of Author" attached to this Report, including co-authoring Sections 1, 25 and 26.

Daniel Yang, P.Eng., of Knight Piesold Consulting, who acting as a QP as defined by NI 43-101, was a co-author of Sections 1, 16, 25 and 26 of this Report as outlined in the "Certificate of Author" attached to this Report. Rolf Schmitt, P.Geo., of ERM Consultants Canada Ltd. who acting as a QP as defined by NI 43-101, takes responsibility for Section 20 of the Report and was a co-author of Sections 1, 25 and 26 as outlined in the "Certificate of Author" attached to this Report.

This Report is prepared in accordance with the requirements of NI 43-101 and in compliance with Form NI 43-101F1 of the British Columbia Securities Commission ("BCSC") and the Canadian Securities Administrators ("CSA"). The Resource Estimate is prepared in compliance with the CIM Definitions and Standards on Mineral Resources and Mineral Reserves that were in force as of the effective date of this PEA.

2.3 Units and Currency

Unless otherwise stated, all units used in this Report are metric. Gold ("Au") and silver ("Ag") assay values are reported in grams of metal per tonne ("g/t") unless ounces per ton ("oz/T") are specifically stated.

The Canadian dollar is used throughout this Report unless otherwise specified. All metal prices are stated is US dollars and converted to Canadian dollars in the economic analysis.

The coordinate system used by Gold Reach for locating and reporting drill hole information is the Universal Transverse Mercator coordinate system ("UTM"), the datum used is NAD 83, zone 9 north. The coordinates for the centre of the Property claim block are 627,000 E, 5,945,500 N. Maps in this Report use either the UTM coordinate system or latitude and longitude.

2.4 Glossary and Abbreviation Of Terms

The following list shows the meaning of the abbreviations for technical terms used throughout the text of this Report.

Abbreviation	Meaning
"3D"	Three Dimensional
“AA”	Atomic Absorption
"Ag g/t"	Grams Of Silver Per Tonne
"Ag"	Silver
“AISC”	All-In-Sustaining-Cost
“ASL”	Above Sea Level
"Au g/t"	Grams Of Gold Per Tonne
"Au"	Gold
“BCSC”	British Columbia Securities Commission
"CA"	Certificate of Authorization
"CDN"	Canadian
"CDN$"	Canadian Dollars
"CIM"	Canadian Institute Of Mining, Metallurgy And Petroleum
"cm"	Centimetre(s)
"Company"	Gold Reach Resources Ltd.
“CRM”	Certified Reference Material
"CSA"	Canadian Securities Administrators
“CSR”	Corporate Social Responsibility
“Cu”	Copper
"Cum"	Cumulative
"DCF"	Discounted Cash Flow
"DDH"	Diamond Drill Hole
"DGPS"	Differential Global Positioning System
"E"	East
“EA”	Environmental Assessment
"EIA"	Environmental Impact Assessment
“EIS”	Environmental Impact Statement
"EPCM"	Engineering, Procurement, Construction and Management
“ERM”	Environmental Resources Management
"ESE	East-South-East
"E-W"	East-West
"ft"	Foot
"G&A"	General And Administration
"g/t"	Grams Per Tonne
"Gold Reach"	Gold Reach Resources Ltd.
"GPS"	Global Positioning System
"ha"	Hectare(s)
"HB"	Huckleberry Mine
"ICP-AES"	Inductively Coupled Plasma – Atomic Emission Spectroscopy
"IP"	Induced Polarization
"IRR"	Internal Rate Of Return
"ISO"	International Organization for Standardization

"k"	Thousands
"k$"	Thousands Of Dollars
"km"	Kilometre(s)
"km/h"	Kilometers per Hour
"kt"	Thousands of Tonnes
LiDAR	Light Detection and Ranging Survey
"LOM"	Life-Of Mine
"M"	Million
"m"	Metre(s)
"M$"	Millions Of Dollars
"Ma"	Millions Of Years
"MAG"	Magnetometer Survey
"MDA"	Gold Reach's Management Discussion and Analysis
"ML/ARD"	Metal Leaching/Acid Rock Drainage
"mm"	Millimeters
"Mo"	Molybdenum
"MZ"	Huckleberry Main Zone Pit
"N"	North
"N/A"	Not Applicable
"NAG"	Non-Potentially Acid Generating Rock
"NE"	North-East
"NI 43-101"	National Instrument 43-101
"NN"	Nearest Neighbour
"NNW"	North-North-West
"NPV"	Net Present Value
"NSR"	Net Smelter Return
"OK"	Ordinary Kriging
"OP"	Open Pit
"opt"	Troy Ounces Per Ton
"OSC"	Ontario Securities Commission
"oz Au/T"	Troy Ounces Gold Per Ton
"PAG"	Potentially Acid Generating Rock
"P&E"	P&E Mining Consultants Inc.
"PEA"	Preliminary Economic Assessment
"Project"	The Ootsa Deposit
"Property"	The Ootsa Concessions
"PTP"	Permanent Transfer Point
"RC"	Reverse Circulation Drilling
"QA/QC"	Quality Assurance/Quality Control
"QC"	Quality Control
"QP"	Qualified Person as Defined By Canadian National Instrument NI 43-101 Standards Of Disclosure for Mineral Projects
"ROM"	Run-of-Mine Material produced during mining
"RQD"	Rock Quality Designation

"S"	South
“SAR”	Species At Risk
"SEDAR"	Website Developed by the CRA, that Provides Access to Public Securities Documents and Information Filed by Public Companies and Investment Funds in Canada
"t"	Metric Tonne(s)
"t/m^3"	Tonnes per Cubic Metre
“tph”	Tonnes per Hour
"tpd"	Tonnes per Day
“XRF”	X-Ray Fluorescence Spectrometer

3.0 RELIANCE ON OTHER EXPERTS

P&E has assumed that all of the information and technical documents listed in the References section of this Report are accurate and complete in all material aspects. While P&E has carefully reviewed all of the available information presented, P&E cannot guarantee its accuracy and completeness. P&E reserves the right, but will not be obligated, to revise the Report and conclusions therein if additional information becomes known to P&E subsequent to the date of this Report.

P&E has reviewed the land tenure but has not independently verified the legal status or ownership of the Property or the underlying agreements. All of the Gold Reach 120 mineral claims on the Ootsa Property are in good standing as at the effective date of this PEA and claim status, location, and "good to" dates have been verified by P&E on the Province of British Columbia's on-line claim management system.

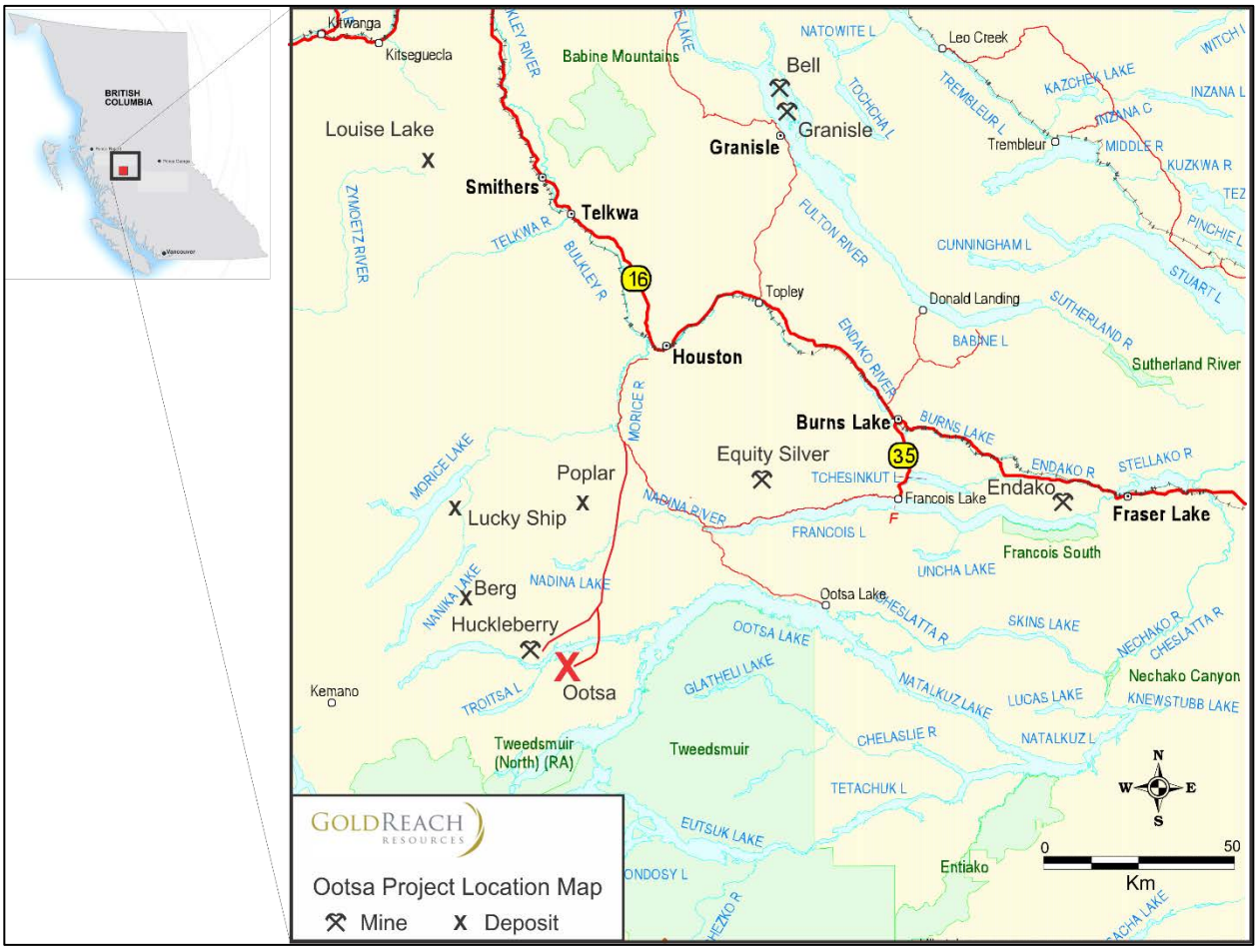
A draft copy of this Technical Report has been reviewed for factual errors by Gold Reach. Any changes made as a result of these reviews did not involve any alteration to the conclusions made. Hence, the statement and opinions expressed in this Report are given in good faith and in the belief that such statements and opinions are not false and misleading at the date of this Report.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 PROPERTY LOCATION

The Ootsa Property is located in west central British Columbia approximately 120 km by gravel road from the town of Houston (Figure 4.1), which has a population of approximately 3,600 people. The Property occurs on the south side of Tahtsa Reach, an arm of Ootsa Lake, which is a large reservoir created for hydroelectric power generation at Kemano. The Property is located immediately adjacent to the operating Huckleberry Mine ("Huckleberry" or "HB"), which produces copper, molybdenum, silver and gold. The Ootsa Property is located on National Topographic System sheets 093E 10 and 11, centered at latitude 53°38'N longitude 127°05'W. Universe Transverse Mercator (UTM) coordinates for the centre of the claim block are 627,000 E, 5,945,500 N (NAD 83 Datum).

Figure 4.1 Ootsa Property Location in West Central British Columbia



4.2 PROPERTY DESCRIPTION

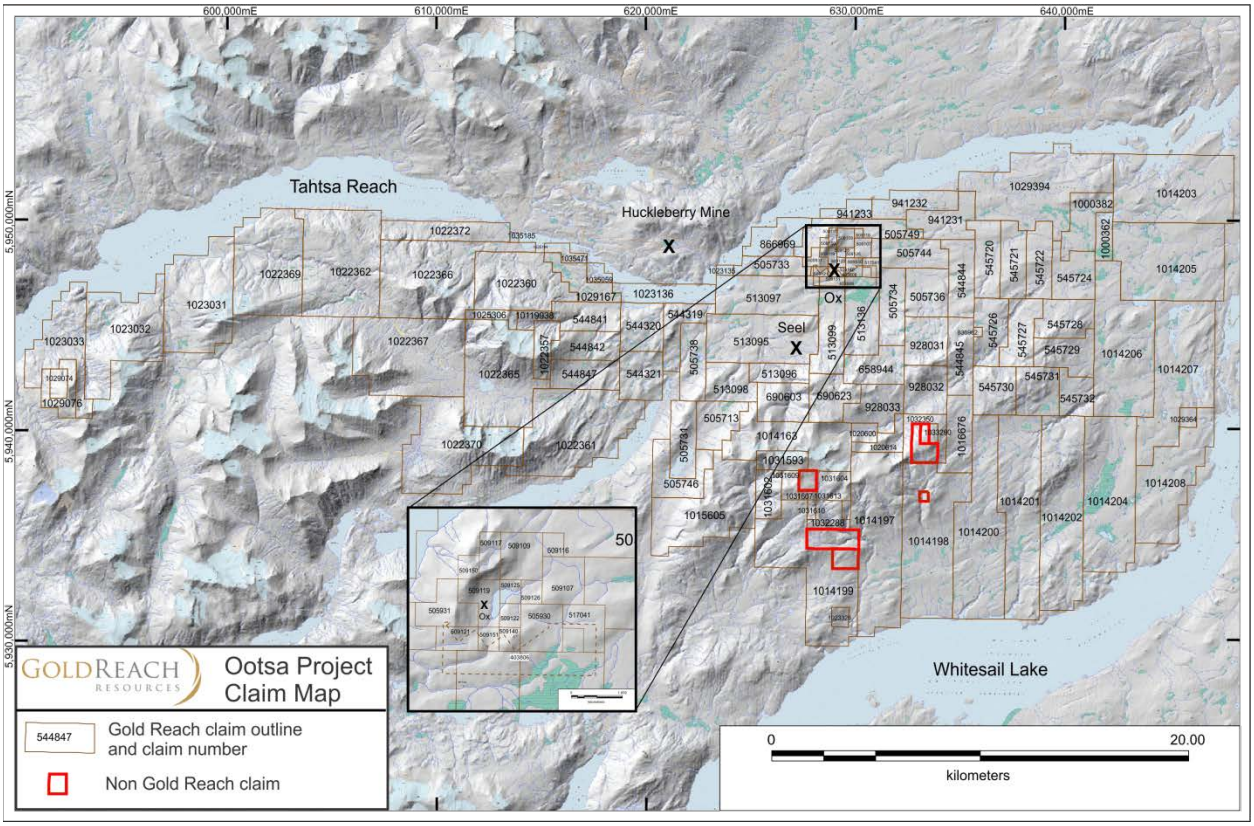
The Ootsa Property lies within the Omineca Mining Division and consists of 120 contiguous non-survey mineral claims totalling 72,537.6 hectares. The claims are 100% owned by Gold Reach Resources Ltd ("Gold Reach") and its 100% wholly owned subsidiary Ootsa Ventures Ltd. The Ootsa Property is on Crown land and the area is open to mineral exploration and

development. Claim staking and claim maintenance in British Columbia is done online through the Government's Mineral Titles Online ("MTO") web site at:

https://www.mtonline.gov.bc.ca/mtov/home.

All of the 120 mineral claims are in good standing as at the date of this PEA and claim status, location, and good to dates have been verified by P&E on the Province of British Columbia's on-line claim management system. Summaries of the claim locations and claim data obtained from the MTO website are shown in Figure 4.2 and Table 4.1.

Figure 4.2 Ootsa Property Claims Map with Mineral Tenure Labels



**The claim data has been derived directly from the Government's MTO website.*

One hundred and four of the 120 claims at the Ootsa Project, and all of the claims over and around the main deposits, have had sufficient exploration expenditures to keep them valid until July 2, 2025. Sixteen claims occurring on the edges and southern portion of the claim package, representing 1,861 hectares, have an expiry date of July 2, 2018.

TABLE 4.1
TENURE AND CLAIM INFORMATION

Tenure #	Claim Name	Owner	Tenure Type	Map Number	Issue Date	Good To Date	Status	Area (ha)
403806	SEEL 9	201965 (100%)	Mineral	093E065	2003/jul/20	2025/jul/02	Good	300
505713	Seel 11	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	441.3
505731	Seel 12	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	460.6

TABLE 4.1 TENURE AND CLAIM INFORMATION								
Tenure #	**Claim Name**	**Owner**	**Tenure Type**	**Map Number**	**Issue Date**	**Good To Date**	**Status**	**Area (ha)**
505733	Seel 13	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	306.5
505734	Seel 13	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	459.9
505736	Seel 15	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	479
505738	Seel 16	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	460.2
505744	Seel 17	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	478.8
505746	Seel 18	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	479.9
505749	Seel 19	201965 (100%)	Mineral	093E	2005/feb/03	2025/jul/02	Good	478.7
513095		201965 (100%)	Mineral	093E	2005/may/19	2025/jul/02	Good	1,226.9
513096		201965 (100%)	Mineral	093E	2005/may/19	2025/jul/02	Good	268.5
513097		201965 (100%)	Mineral	093E	2005/may/19	2025/jul/02	Good	919.8
513098		201965 (100%)	Mineral	093E	2005/may/19	2025/jul/02	Good	421.9
513099		201965 (100%)	Mineral	093E	2005/may/19	2025/jul/02	Good	613.4
513136		201965 (100%)	Mineral	093E	2005/may/20	2025/jul/02	Good	613.3
517041	SEEL 20	201965 (100%)	Mineral	093E	2005/jul/12	2025/jul/02	Good	57.5
658944	SEEL L1	201965 (100%)	Mineral	093E	2009/oct/24	2025/jul/02	Good	460.2
866969		201965 (100%)	Mineral	093E	2011/jul/21	2025/jul/02	Good	421.3
928031		201965 (100%)	Mineral	093E	2011/nov/03	2025/jul/02	Good	479.3
928032		201965 (100%)	Mineral	093E	2011/nov/03	2025/jul/02	Good	479.5
928033		201965 (100%)	Mineral	093E	2011/nov/03	2025/jul/02	Good	479.6
941231		201965 (100%)	Mineral	093E	2012/jan/18	2025/jul/02	Good	478.7
941232		201965 (100%)	Mineral	093E	2012/jan/18	2025/jul/02	Good	421.2
941233		201965 (100%)	Mineral	093E	2012/jan/18	2025/jul/02	Good	172.3
1015605		201965 (100%)	Mineral	093E	2013/jan/01	2025/jul/02	Good	1,478.7
1019938	SWING NORTH	201965 (100%)	Mineral	093E	2013/may/31	2025/jul/02	Good	115
1022357	SWING	201965 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	268.4
1022361		201965 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	1,880.5
1022367		201965 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	1,917.5

TABLE 4.1 TENURE AND CLAIM INFORMATION								
Tenure #	**Claim Name**	**Owner**	**Tenure Type**	**Map Number**	**Issue Date**	**Good To Date**	**Status**	**Area (ha)**
1023031		201965 (100%)	Mineral	093E	2013/oct/13	2025/jul/02	Good	1,590.7
1023032		201965 (100%)	Mineral	093E	2013/oct/13	2025/jul/02	Good	1,437.9
1023033		201965 (100%)	Mineral	093E	2013/oct/13	2025/jul/02	Good	997.1
1023134		201965 (100%)	Mineral	093E	2013/oct/17	2025/jul/02	Good	689.1
1023135		201965 (100%)	Mineral	093E	2013/oct/17	2025/jul/02	Good	38.3
1023136		201965 (100%)	Mineral	093E	2013/oct/17	2025/jul/02	Good	440.7
1025306		201965 (100%)	Mineral	093E	2014/jan/20	2025/jul/02	Good	134.2
1029074		201965 (100%)	Mineral	093E	2014/jun/18	2025/jul/02	Good	115.1
1029076		201965 (100%)	Mineral	093E	2014/jun/18	2025/jul/02	Good	268.6
1029167		201965 (100%)	Mineral	093E	2014/jun/24	2025/jul/02	Good	364
1029364	WHITESA IL	201965 (100%)	Mineral	093E	2014/jul/02	2025/jul/02	Good	76.7
1029394		201965 (100%)	Mineral	093E	2014/jul/04	2025/jul/02	Good	1,914.1
1031593		201965 (100%)	Mineral	093E	2014/oct/16	2018/jul/02	Good	230.3
1035059		201965 (100%)	Mineral	093E	2015/mar/29	2018/jul/02	Good	95.8
1035062		201965 (100%)	Mineral	093E	2015/mar/29	2018/jul/02	Good	19.2
1035184		201965 (100%)	Mineral	093E	2015/apr/02	2018/jul/02	Good	19.2
1035185		201965 (100%)	Mineral	093E	2015/apr/02	2018/jul/02	Good	19.2
1035471		201965 (100%)	Mineral	093E	2015/apr/14	2018/jul/02	Good	114.9
1036288		201965 (100%)	Mineral	093E	2015/may/23	2018/jul/02	Good	153.5
1031602		201965 (100%)	Mineral	093E	2014/oct/16	2018/jul/02	Good	288
1031604		201965 (100%)	Mineral	093E	2014/oct/16	2018/jul/02	Good	230.4
1031607		201965 (100%)	Mineral	093E	2014/oct/16	2018/jul/02	Good	19.2
1031609		201965 (100%)	Mineral	093E	2014/oct/16	2018/jul/02	Good	115.2
1031610		201965 (100%)	Mineral	093E	2014/oct/16	2018/jul/02	Good	38.4
1031613		201965 (100%)	Mineral	093E	2014/oct/16	2018/jul/02	Good	19.2
1032288	TROITSA PEAK	201965 (100%)	Mineral	093E	2014/nov/19	2018/jul/02	Good	211.3
1032350		201965 (100%)	Mineral	093E	2014/nov/22	2018/jul/02	Good	249.5

TABLE 4.1 TENURE AND CLAIM INFORMATION								
Tenure #	**Claim Name**	**Owner**	**Tenure Type**	**Map Number**	**Issue Date**	**Good To Date**	**Status**	**Area (ha)**
1032390		201965 (100%)	Mineral	093E	2014/nov/25	2018/jul/02	Good	38.4
505930		206087 (100%)	Mineral	093E	2005/feb/04	2025/jul/02	Good	76.6
505931		206087 (100%)	Mineral	093E	2005/feb/04	2025/jul/02	Good	76.6
509107		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	76.6
509109		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	76.6
509116		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	19.2
509117		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	38.3
509119		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	57.5
509121		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	38.3
509122		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	19.2
509125		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	19.2
509126		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	19.2
509140		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	19.2
509150		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	19.2
509151		206087 (100%)	Mineral	093E	2005/mar/17	2025/jul/02	Good	19.2
544319	SEEL20	206087 (100%)	Mineral	093E	2006/oct/24	2025/jul/02	Good	402.5
544320		206087 (100%)	Mineral	093E	2006/oct/24	2025/jul/02	Good	479.2
544321	SEEL22	206087 (100%)	Mineral	093E	2006/oct/24	2025/jul/02	Good	479.4
544841	SEEL23	206087 (100%)	Mineral	093E	2006/nov/03	2025/jul/02	Good	440.8
544842	SEEL24	206087 (100%)	Mineral	093E	2006/nov/03	2025/jul/02	Good	441.0
544844	SEEL25	206087 (100%)	Mineral	093E	2006/nov/03	2025/jul/02	Good	479.0
544845	SEEL26	206087 (100%)	Mineral	093E	2006/nov/03	2025/jul/02	Good	460.2
544847	SEEL27	206087 (100%)	Mineral	093E	2006/nov/03	2025/jul/02	Good	460.3
545720	SEEL28	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	478.9
545721	SEEL29	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	440.6
545722	SEEL30	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	440.6
545724	SEEL31	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	478.9

TABLE 4.1 TENURE AND CLAIM INFORMATION								
Tenure #	**Claim Name**	**Owner**	**Tenure Type**	**Map Number**	**Issue Date**	**Good To Date**	**Status**	**Area (ha)**
545726	SEEL32	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	479.2
545727	SEEL33	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	479.2
545728	SEEL34	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	479.2
545729	SEEL35	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	479.3
545730	SEEL36	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	479.5
545731	SEEL37	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	479.5
545732	SEEL38	206087 (100%)	Mineral	093E	2006/nov/22	2025/jul/02	Good	326.1
690603	SEEL 40	206087 (100%)	Mineral	093E	2009/dec/29	2025/jul/02	Good	460.4
690623	SEEL41	206087 (100%)	Mineral	093E	2009/dec/29	2025/jul/02	Good	460.4
836962	XE1	206087 (100%)	Mineral	093E	2010/oct/29	2025/jul/02	Good	19.2
1000362	OOTSA EAST	206087 (100%)	Mineral	093E	2012/jun/22	2025/jul/02	Good	191.5
1000382	OOTSA EAST2	206087 (100%)	Mineral	093E	2012/jun/22	2025/jul/02	Good	478.7
1014163		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,132.2
1014197		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,920.9
1014198		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,901.7
1014199		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,633.4
1014200		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,882.4
1014201		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,805.1
1014202		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,901.2
1014203		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,875.8
1014204		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,824.0
1014205		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,915.5
1014206		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,840.5
1014207		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,898.4
1014208		206087 (100%)	Mineral	093E	2012/nov/01	2025/jul/02	Good	1,343.8
1016676		206087 (100%)	Mineral	093E	2013/feb/04	2025/jul/02	Good	479.7
1020600		206087 (100%)	Mineral	093E	2013/jun/28	2025/jul/02	Good	115.1

TABLE 4.1 TENURE AND CLAIM INFORMATION								
Tenure #	**Claim Name**	**Owner**	**Tenure Type**	**Map Number**	**Issue Date**	**Good To Date**	**Status**	**Area (ha)**
1020614		206087 (100%)	Mineral	093E	2013/jun/29	2025/jul/02	Good	211.1
1022360		206087 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	1,130.5
1022362		206087 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	1,915.8
1022365		206087 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	1,668.5
1022366		206087 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	1,801.0
1022369		206087 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	1,590.1
1022370		206087 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	1,784.9
1022372		206087 (100%)	Mineral	093E	2013/sep/16	2025/jul/02	Good	574.5
1023326		206087 (100%)	Mineral	093E	2013/oct/26	2025/jul/02	Good	76.9
							Total	**72,537.6**

4.3 AGREEMENTS

On January 31, 2003 Grayd Resource Corporation optioned 7 mining claims from Seel Enterprises Ltd. and Mr. Rupert Seel. These claims were termed the Seel Property and Grayd subsequently staked additional claims in the area. On May 27, 2004, Gold Reach Resources (formerly Websmart.com Communications Inc.) entered into an option agreement with Grayd Resource Corporation whereby Gold Reach could earn an initial 61% in 10 mineral claims collectively called the Seel Property by incurring $1 million in exploration expenses. This agreement was subject to an underlying option agreement between Grayd Resources and the original Property owner Seel Enterprises.

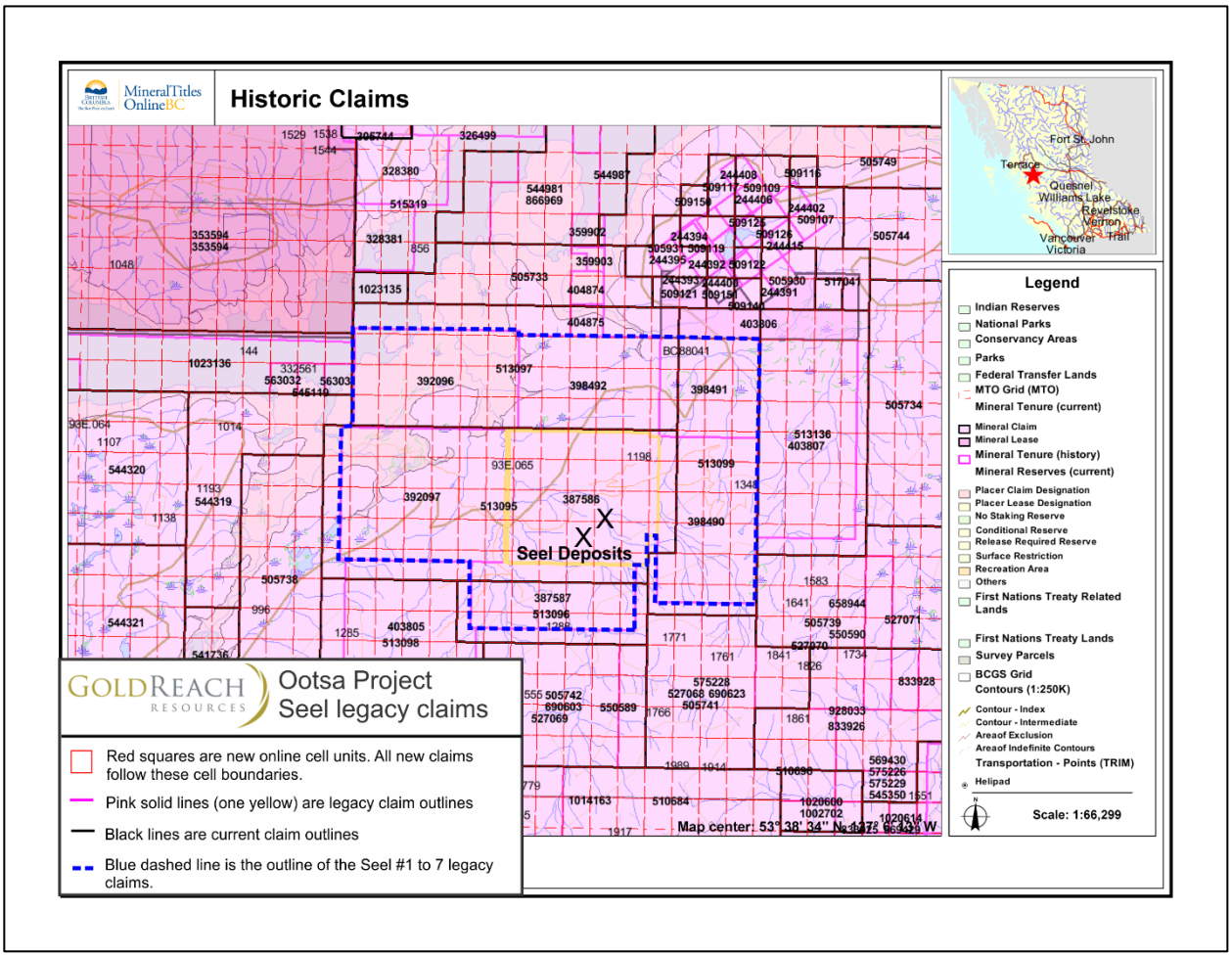
On October 1, 2005, Gold Reach, Grayd Resources, and Seel Enterprises entered into an amended agreement whereby Grayd Resources assigned 100% of its interest and rights in the Seel Property to Gold Reach in exchange for 1.5 million common shares of Gold Reach along with warrants to purchase up to 1.5 million common shares of Gold Reach at a price of $0.25 for up to 2 years. Grayd retained a back in right to earn up to 39% interest in the Seel Property by incurring 2 times the expenditures incurred by Gold Reach after the closing date of the agreement. On October 15, 2007 Grayd declined their back in right allowing Gold Reach to claim 100% ownership of the Seel Property.

An underlying royalty agreement on the Seel Property remains in effect over the Seel 1 to 7 claims, covering the East and West Seel deposits, and a 1% royalty on Net Smelter Returns ("NSR") is payable to Seel Enterprises. Gold Reach is entitled at any time to purchase half of this NSR royalty (0.5%) for $1,000,000. The underlying agreement with Seel Enterprises contains a 1 km area of interest surrounding the external boundaries of the Seel 1 to 7 claims. The Seel 1 to 7 claims were originally staked by the former ground staking method (legacy claims) but were converted to the current cell claims in 2005. As a result, the boundaries of the new claims are different than the original claims (Table 4.2) and they have different claim

numbers (Figure 4.3). The boundaries of the original legacy claims are still available on the MTO website.

TABLE 4.2 SEEL PROPERTY AGREEMENT ORIGINAL CLAIMS VS NEW TENURE NUMBERS		
Claim Name	**Original Tenure Number**	**Closest matching new Tenure Number**
Seel #1	387586	513095
Seel #2	387587	513096
Seel #3	392096	513097
Seel #4	392097	513095
Seel #5	398490	513099
Seel #6	398491	513099
Seel #7	398492	513097

Figure 4.3 Map generated on the MTO website showing the location of the original Seel 1 to 7 legacy claims in the Seel Property option agreement relative to current claims



On January 7, 2007, Gold Reach Resources Ltd and its wholly owned subsidiary, Oosta Resources Ltd., acquired a 100% interest in the Ox Lake Mineral Property from Silver Standard Resources Inc. by issuing to Silver Standard 2 million common shares of Gold Reach Resources Ltd. The Ox Lake Mineral Property consists of 14 claims totalling approximately 538 ha that

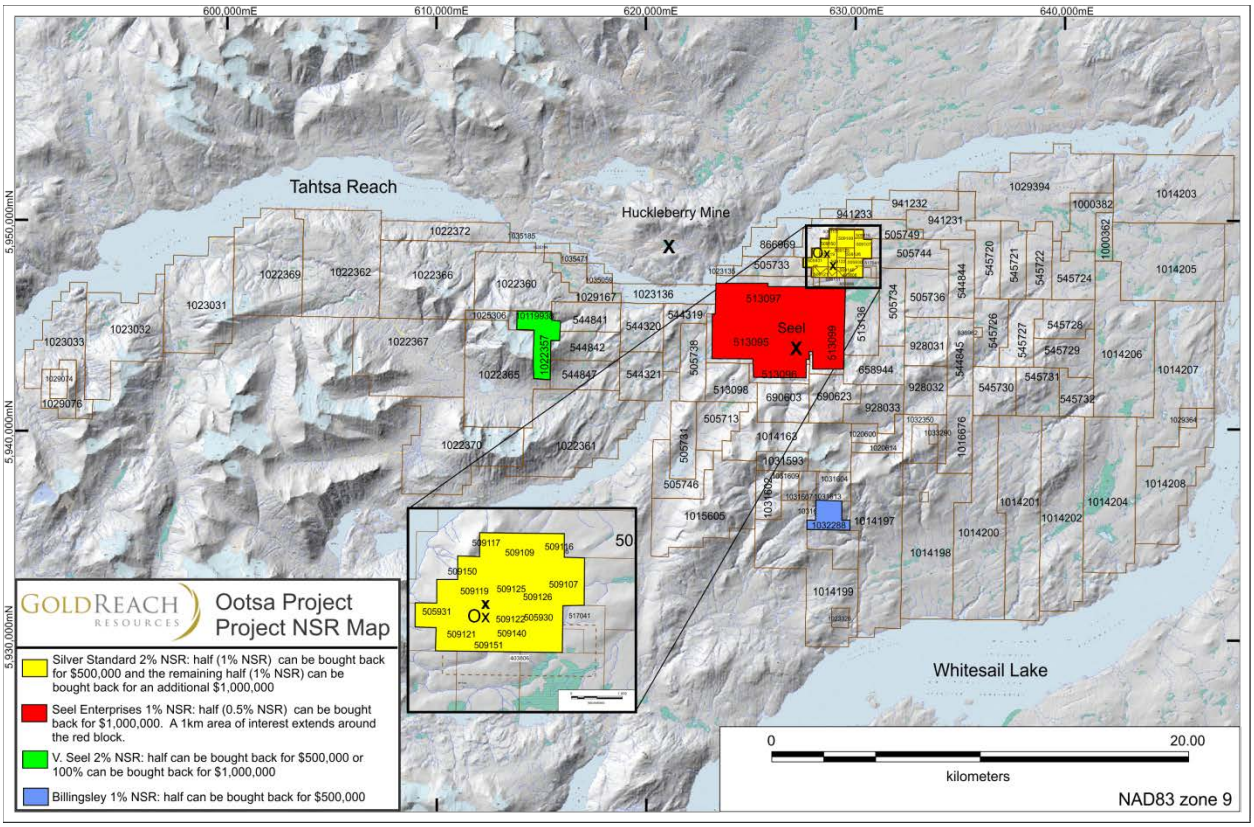
covers the Ox Deposit. Silver Standard Resources Inc. holds a 2% net smelter royalty on these 14 claims (claim numbers 505930, 505931, 509107, 509109, 509116, 509117, 509119, 509121, 509122, 509125, 509126, 509140, 509150, 509151). At any time Gold Reach can repurchase the entire royalty by paying $500,000 for the first half (1% NSR) and $1,000,000 for the remaining half (1% NSR).

In March 2014 two claims known as the Swing claims (claim numbers 1022357 and 1019938) totalling 383.4 hectares and covering the historic Captain Mine were purchased by Gold Reach from Vernon Seel for total consideration of 25,000 shares of Gold Reach. These claims are subject to a 2% net smelter royalty held by Vernon Seel, with Gold Reach entitled to purchase half of the 2% NSR (1% NSR) from Vernon Seel at any time by the payment of $500,000 or Gold Reach can purchase the entire royalty (2% NSR) by the payment of $1,000,000.

In November 2014 Gold Reach purchased the Troitsa Peak claim (claim number 1032288) totalling 211.26 hectares from Richard Billingsley for total consideration of $5,000 cash and 10,000 common shares of the Company. This claim is subject to a 1% NSR, half of which can be bought back at any time by the Company for $500,000. The remainder of the Ootsa Property was acquired by staking and contains no underlying royalties or obligations.

Figure 4.4 presents a map showing claims with underlying net smelter royalties.

Figure 4.4 Ootsa Claim Map Showing Claims with Underlying Net Smelter Royalties (NSR)



4.4 THE BRITISH COLUMBIA MINING ACT

In British Columbia, the owner of a mineral claim acquires the right to the minerals, which were available at the time of claim location and as defined in the Mineral Tenure Act of British Columbia. Surface rights and placer rights are not included. Claims are valid for one year and the anniversary date is the annual occurrence of the date of record (the staking completion date of the claim). To maintain a claim in good standing the claim holder must, on or before the anniversary date of the claim, either: (a) record the exploration and development work carried out on that claim during the current anniversary year; or (b) pay cash in lieu of work. The amount of work required in years one and two is $5 per hectare per year, years 3 and 4 $10 per hectare, years 5 and 6 $15 per hectare, and $20 per hectare for each subsequent year. If the value of work performed and recorded in any year exceeds the required minimum, the value of the excess work can be applied, in full year multiples, to cover work requirements for that claim for additional years, up to a maximum of 10 years. A report detailing work done and expenditures must be filed with, and approved by, the B.C. Ministry of Energy and Mines.

4.5 ENVIRONMENTAL REGULATIONS

Permits required for Project development activities, environmental liabilities associated with the Project, socio-economic issues, and First Nations consultation are discussed in Section 20.

Mineral exploration activities involving site disturbance in British Columbia are overseen by the Ministry of Energy and Mines and a Notice of Work ("NoW") permit is required prior to any exploration activity. Gold Reach's exploration activities are currently authorized under a multi-year area-based ("MYAB") exploration permit. The current exploration permit allows Gold Reach to maintain its own site camp and at the time of writing this PEA allows for an additional 154 drill sites, 183.5 line km of geophysics, 14.8 km of excavated trail, 7 trenches, and 9 helicopter drill pads before a new or amended permit is required. For each year of the multi-year area-based exploration permit, an Annual Summary of Exploration Activities that outlines work conducted over the previous year must be filed by March 31, along with an Annual Update of proposed work activity.

Gold Reach maintains a reclamation plan for the Ootsa Property and tracks all exploration disturbance and reclamation activities done on the site. The main reclamation objective is to return the site to a state similar to its pre-disturbance appearance and functionality. Reclamation activities include re-contouring and restoring drill pads and drill access roads that are no longer needed, restoring prior drainage patterns, scattering woody debris over reclaimed areas, re-establishing natural landscapes, and deactivating roads and trails. The current security deposit for the Ootsa Project reclamation is $169,900.

No significant environmental liabilities have been identified on the Ootsa Property. Surface disturbances made by exploration do not appear to be acid generating and do not pose significant slope stability hazards. Most reclaimed areas are re-vegetating naturally.

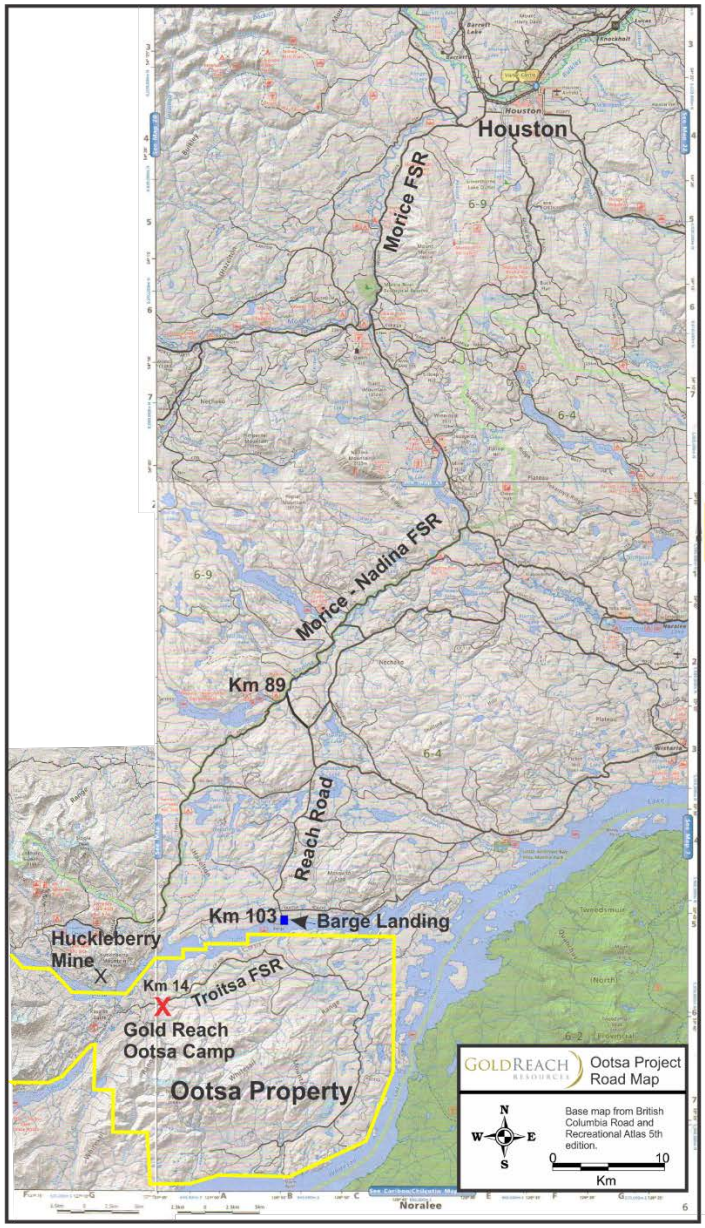
5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES. INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 ACCESS

Access to the Ootsa Property is by well-maintained all-weather gravel roads from the town of Houston in west-central British Columbia. Houston and the community of Smithers located 63 km to the west are both serviced by the CNR transcontinental railway and Trans-Canada Highway 16, and serve as major supply and service hubs for the region. Together Smithers and Houston have over 9,000 inhabitants and the surrounding Bulkley Valley region hosts an additional rural population of approximately 8,000. Smithers and Houston have numerous drilling companies, equipment contractors, and exploration service companies.

The Ootsa Property is roughly 120 km by road from Houston and is accessible by two-wheel drive vehicles and large industrial trucks via a network of well-maintained resource roads (Figure 5.1). From Highway 16 turn South on the Morice Forest Service Road ("FSR") located 3 km west of Houston. Travel south 56.5 km on the Morice FSR then veer southwest on the Morice-Nadina FSR for a further 33 km. At road sign kilometre 89, turn southeast on the Tahtsa Reach FSR and follow to kilometre 103 to the site of the Tahtsa Reach barge landing. A logging camp exists at the north barge landing. Crossing of the 1.6 km wide Tahtsa Reach can be achieved on a private barge operated by Catherwood Towing Ltd., for a sailing fee. Once at the south barge landing follow the Troitsa Main FSR west to road sign kilometre 14 where the Gold Reach exploration camp is located.

Figure 5.1 Road Map to the Ootsa Property



5.2 CLIMATE

The climate at the Ootsa Property is typical of the Coast Ranges and that of the Central Interior Plateau, with short cool summers and long relatively mild winters. Annual temperatures vary from approximately -25°C to +25°C. During winter the snowpack generally ranges from 1 to 4 metres but has been known to reach a maximum of 10 metres at the adjacent Huckleberry Mine. The operating season for ground-based activities such as geological mapping, surface sampling and geophysical surveys would extend from approximately mid-May to late October. Exploration activities such as diamond drilling can be conducted year round, and the adjacent Huckleberry Mine operates year round.

5.3 LOCAL RESOURCES AND INFRASTRUCTURE

The nearby towns of Houston and Smithers contain road and rail facilities and Smithers has an airport with daily scheduled air service to Vancouver. Port facilities are located in Stewart (510 km by road), Prince Rupert (530 km by road), and Kitimat (440 km by road). The adjacent Huckleberry Mine, 6 km NW of the Seel deposit, operates an open-pit mine, a 16,000 tonne per day mill and concentrator and a camp to house employees and contractors. A 138 KVA power line connects the Huckleberry Mine to the BC provincial grid at the Houston substation. Abundant water resource in Tahtsa Reach is readily accessible for mining or process operations. Water use is subject to provincial and federal regulation.

Sufficient low-relief terrain resides within the Property for siting of infrastructure for mining or process operations, such as waste disposal facilities, haul roads and plant site. Land use for exploration and mining purposes is governed by the Mineral Tenure Act, the Mines Right of Way Act, the Mines Act and other applicable laws of the Province of British Columbia. The authors of this PEA are not aware of any private land holdings on the Ootsa Property.

A network of logging roads that connect to the main transportation network from Houston transects the claim block and provides good access to most of the Ootsa Property. Numerous gravel pits and a pit containing clean sand deposits have been developed for the purpose of Forest Service road construction. It is possible that these deposits of sand and gravel may be used to supply aggregate and road construction material for future development at Ootsa. Drill-specific roads have been constructed to access several areas around the Seel and Ox deposits. Gold Reach resurfaced the main Seel drill access road with gravel in 2012 to ensure consistent access to the core of the deposit during wet conditions. In addition, a new bridge was installed to facilitate local creek crossing and minimize impact on the creek.

5.4 PHYSIOGRAPHY

The Ootsa Property occurs in the Tahtsa Ranges physiographic region of west central British Columbia, and is situated at the transition zone between the Coast Mountains and Interior Plateau. It lies at the northern flank of the Whitesail Range on the southern shore of Tahtsa Reach. Relief is moderate and variable on the Property, with elevations rising from a valley base of approximately 900 m to 1,861 m on the highest ranges. The southern shore of Tahtsa Reach is characterized by a large bench of flat to gently rolling topography with higher mountains to the South. Terrain above 1,550 m elevation is alpine in nature, forested with white spruce and pine between 1,350 and 1,550 m and by white spruce and fir below 1,350 m.

Valley bottoms are U-shaped and contain variable thicknesses of till and fluvioglacial debris. Outcrop is patchy in valley bottoms and more abundant along creeks and on steeper slopes and mountain peaks.

6.0 HISTORY

6.1 EXPLORATION AND MINING HISTORY OF TAHTSA REACH

A map showing the main exploration targets in the Tahtsa Reach area is shown in Figure 6.1 and a summary of the exploration history of the area is contained in Table 6.1. Documented mineral exploration in the area started in the early part of the 20th century at the Emerald Glacier and Captain Mines. In 1915 Ag-Zn-Pb veins were discovered at Emerald Glacier, with underground exploration commencing at the end of World War I. The mine was active between 1951 and 1968, producing 8,300 t of ore grading 311 g/t Ag, 9.2% Pb and 10.7% Zn. (these figures are historical in nature and therefore cannot be relied upon and are presented for information purposes only). Veins containing Ag-Pb-Zn were discovered at the Captain Mine in the 1920's and a 100 m long adit was driven along the vein with additional short adits driven in 1980.

The region saw intense exploration activity in the 1960's and 1970's for porphyry style mineralization and large stream sediment and soil sampling programs were conducted. These programs resulted in the discovery of the Ox, Huckleberry, and Berg (located 30 km to the northwest of Ox) porphyries. Huckleberry was initially discovered in 1962 following up stream sediment copper anomalies from streams flowing into Tahtsa Reach. Subsequent prospecting identified native copper around a small pond over what is now known as the Main Zone deposit, and chalcopyrite and malachite were found in nearby bedrock (Christensen et al., 2011). The area was staked by Kennco Exploration Ltd. and drilling in 1962, 1970, and 1971 resulted in the discovery and delineation of the Main Zone deposit. In 1992 New Canamin Resources Ltd. optioned the Property and advanced it toward development. New Canamin was subsequently taken over by Princeton Mining Corporation and a deal was reached with a Japanese consortium to help finance mine construction. Mine construction was initiated in 1996, the Huckleberry Mine was built for a capital cost of $142 million and commenced production in 1997. In 1998 Imperial Metals acquired Princeton Mining's interest in the mine. The mine, which is in production at the time of preparation of this PEA, is a modern mine and mill industrial complex producing copper, molybdenum, silver, and gold. Probable reserves from the Main Zone Optimized pit were stated as 42.1 million tonnes grading 0.327% Cu and 0.010% Mo as of December 31, 2014. This resource was obtained from Imperial Metals ANNUAL INFORMATION FORM (Extracts) – Year Ended December 31, 2014 (obtained from Imperial Metals website (www.imperialmetals.com) and was prepared under the supervision of Kent Christensen, P.Eng., Huckleberry Engineering Manager, designated as the Qualified Person as defined by National Instrument 43-101. The Authors of this PEA have not verified the mineral resources or reserves for the Huckleberry Mine.

The Whiting Creek molybdenum deposit is located 8 km north of the Huckleberry Mine and has seen episodic exploration and drilling between 1963 and 1993. Limited testing on the Ridge Zone has outlined a resource of 123.5 million tonnes at 0.062% Cu and 0.025% Mo (0.043 % MoS2) and contained within this resource is a higher-grade resource of 31.6 million tonnes at 0.06% copper and 0.067% Mo (Cann and Smit, 1995). This resource estimate was prepared prior to the implementation of National Instrument 43-101 Standards of Disclosure for Mineral Projects, and does not comply with that standard. The resources are stated in a published article by Cann and Smit (1995) titled "The Whiting Creek copper-molybdenum porphyry, west central British Columbia" and contained within CIM Special Volume 46. Additional drilling is required to verify the historical estimate and a qualified person has not done sufficient work to classify the historical estimate as current mineral resources or mineral reserves. Neither Gold Reach nor P&E consider the above historical estimate as current mineral resources or mineral reserves.

Figure 6.1 Map Showing Mines and Exploration Targets in the Tahtsa Reach Area

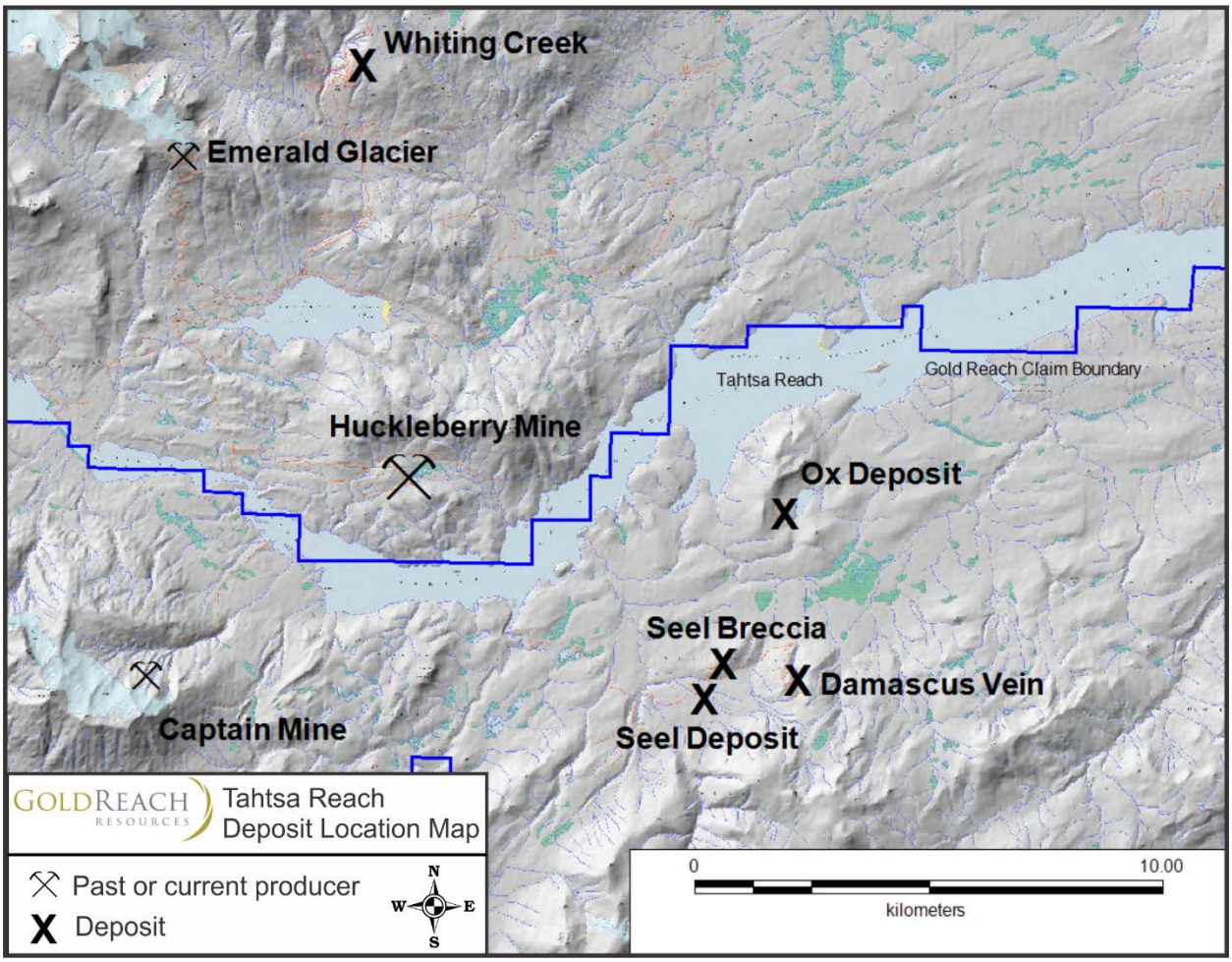


TABLE 6.1 SUMMARY OF HISTORIC EXPLORATION IN THE TAHTSA REACH AREA (BY DEPOSIT)				
Year	**Deposit**	**Commodity**	**Company**	**Exploration**
1915 - 1920's	Emerald Glacier	Ag-Zn-Pb veins	Various owners	Discovery and early prospecting, underground exploration
1951 - 1968	Emerald Glacier	Ag-Zn-Pb veins	Emerald Glacier Mines	Underground mining, produced 8,300 t of ore grading 311 g/t Ag, 9.2%Pb and 10.7% Zn
2003 - 2012	Emerald Glacier	Ag-Zn-Pb veins	Low Profile Ventures	Prospecting, geophysics, limited drilling
1920's	Captain Mine	Ag-Zn-Pb veins	George Seel	Initial discovery and a 115m long adit was driven along the Captain vein
1980	Captain Mine	Ag-Zn-Pb veins	Tahtsa Mining Company	2 smaller adits driven along the Captain vein
1960's-1970's	Regional	Cu-Mo	Numerous	Regional porphyry Cu exploration programs - stream

TABLE 6.1 SUMMARY OF HISTORIC EXPLORATION IN THE TAHTSA REACH AREA (BY DEPOSIT)				
Year	**Deposit**	**Commodity**	**Company**	**Exploration**
				sediment and soil programs - numerous porphyry targets identified
1968	Ox Porphyry	Cu-Mo	ASARCO - Silver Standard	Prospecting gossan zone and initial Ox discovery
1968 - 1981	Ox Porphyry	Cu-Mo	ASARCO - Silver Standard	Mapping, trenching, geochem and geophysical surveying and 37 diamond drill holes
2007	Ox Porphyry	Cu-Mo	Gold Reach Resources	Gold Reach purchases the Ox Porphyry from Silver Standard, drilled 26 holes and completed an initial resource estimate
2012, 2013	Ox Porphyry	Cu-Mo	Gold Reach Resources	Gold Reach completed additional geophysical surveying, geological mapping, metallurgy, and drills 108 holes at Ox. An updated resource estimate is completed
1962	Huckleberry	Cu-Mo	Kenneco Exploration (Western) Ltd.	Huckleberry discovered by stream sediment and soil sampling. Native copper was found at a small pond, chalcopyrite and malachite found in bedrocks. 9 holes were drilled
1970, 1971	Huckleberry	Cu-Mo	Kenneco Exploration (Western) Ltd.	9 holes drilled in 1970, 5 holes drilled in 1971, Main Zone deposit discovered
1972, 1973	Huckleberry	Cu-Mo	Granby Mining Company	Granby optioned the Property and drilled 65 holes over 2 years
1988-1989	Huckleberry	Cu-Mo	Noranda Exploration	Noranda optioned the Property and conducted soil and rock sampling
1992-1994	Huckleberry	Cu-Mo	New Canamin Resources	New Canamin optioned the Property and continued development drilling. In 1993 58 holes were drilled, in 1994 137 holes were drilled. Condemnation drilling for tailings storage discovered the East Zone deposit
1994	Huckleberry	Cu-Mo	New Canamin Resources	New Canamin becomes sole owner of Huckleberry after Kennecott elects not to exercise its back in rights

TABLE 6.1 SUMMARY OF HISTORIC EXPLORATION IN THE TAHTSA REACH AREA (BY DEPOSIT)				
Year	**Deposit**	**Commodity**	**Company**	**Exploration**
1995	Huckleberry	Cu-Mo	Princeton Mining Corp	Princeton Mining acquired New Canamin
1996	Huckleberry	Cu-Mo	The Japan Group	The Japan Group was established to assist in project financing and acquired 40% of Huckleberry. Mitsubishi Materials Corporation, Dowa Mining Co. Ltd. and Furukawa Co. Ltd. entered into a long term copper concentrate contract
1997	Huckleberry	Cu-Mo	Princeton/Japan Group	Mine construction completed at a cost of roughly $142 million and commercial production started
1998	Huckleberry	Cu-Mo	Imperial Metals	Imperial acquired Princeton Mining's 60% interest in Huckleberry and sold an additional 10% interest to the Japan Group
1968-1970	Seel Breccia	Cu-Ag-Pb-Zn	Bethlehem Copper Corp.	Staked REA and TL claims and conducted surface exploration
1972	Seel Breccia	Cu-Ag-Pb-Zn	Bethlehem Copper Corp.	Tote road built and 8 percussion holes drilled
1980 - 1985	Seel Breccia	Cu-Ag-Pb-Zn	Lansdowne Oil and Minerals Ltd.	Lean-To Group. Surface exploration and 38 shallow diamond drill holes in 1982. An IP survey showed chargeability anomaly extended past the limits of the survey. A mineralized breccia zone was discovered. The best intersection contained 18 m grading 1.59 % Cu and 42.2 g/t Ag. In 1985 10 more holes drilled.
1995-2000	Seel Breccia	Cu-Ag-Pb-Zn	Seel Enterprises	Trenching and rock and soil programs.
2003	Seel Breccia	Cu-Ag-Pb-Zn	Grayd Resources	Grayd Resources options the Seel Property
2003-2004	Seel Breccia/East Seel Deposit	Cu-Ag-Pb-Zn	Gold Reach Resources	Gold Reach options the Seel Property from Grayd and conducts geophysical surveys and drills 6 holes. The East Seel deposit was discovered 200 m southwest of the Seel Breccia by drill testing a chargeability anomaly

TABLE 6.1 SUMMARY OF HISTORIC EXPLORATION IN THE TAHTSA REACH AREA (BY DEPOSIT)				
Year	**Deposit**	**Commodity**	**Company**	**Exploration**
2005 to 2008	Seel Deposit	Cu-Au	Gold Reach Resources	3D IP surveying, geologic mapping, prospecting and drilling 74 holes
2011 to 2014	Seel Deposit	Cu-Au	Gold Reach Resources	3D IP surveying, geologic mapping, prospecting, soil sampling, and drilling of 73,218 m in 130 holes. In 2011 Gold Reach discovers the large West Seel deposit
1981 to 1983	Damascus Vein	Ag-Pb-Zn	International Damascus Resources	Ox-A, B, and C claims. Prospecting, geophysics, geochemical surveys. Four diamond holes drilling in 1982, 36 holes drilled in 1983 and Damscus vein discovered with best intercept 3.82 m grading 1,228.6 g/t Ag, 7.32% Pb, and 5.76% Zn
1984	Damascus Vein	Ag-Pb-Zn	Cominco	Ground geophysical surveys, geological mapping, trenching, rock sampling
1984	Damascus Vein	Ag-Pb-Zn	International Damascus Resources	7 diamond drill holes on Damascus and Hilltop veins
1986	Damascus Vein	Ag-Pb-Zn	International Damascus Resources	IP and VLF-EM surveying
1989	Damascus Vein	Ag-Pb-Zn	Granges Inc.	8 diamond drill holes
1963	Whiting Creek	Mo-Cu	Kenneco Exploration Ltd	Staked claims and conducted surface exploration and drilling
1979-1981	Whiting Creek	Mo-Cu	SMD Mininc Co. Ltd.	Optioned Property and conducts surface sampling, geophysical surveys, drilling
1993	Whiting Creek	Mo-Cu	New Canamin Resources Ltd	Acquires 100%, does airborne geophysical survey

Note: *Data for Table 6.1 and Section 6 comes from the following sources: BC Minfile database, Ager (1983), Anderson (1971), Arseneau et al. (2008), Blackwell (1985), Boyce and Giroux (2014), Christensen et al. (2011), Deveaux, (1989), Goldsmith et al. (1984), Holtby (1989), Strickland (2008, 2010, 2013) and Stubens and Veljkovic (2008).*

6.2 HISTORY OF THE OX DEPOSIT

The Ox porphyry copper molybdenum deposit was found in 1968 during a regional prospecting program carried out by American Smelting and Refining Company and Silver Standard Mines

Limited. Prospectors were first attracted to the Ox Lake area due to a prominent gossan associated with small lead, zinc and silver veins on a bluff overlooking Ox Lake. From 1968 to 1981 exploration work included geological mapping, 32.2 km of magnetometer surveying, 14.3 km of I.P. surveying, 2.4 km of VLF-EM surveying, 843 soil samples, 61 km of bulldozer trenching, and 37 drill holes (Holtby, 1989). Gold Reach acquired 100% of the 14 claims known as the "Ox Lake Mineral Property" from Silver Standard Mines Ltd pursuant to an agreement dated January 3, 2007. Exploration done by Gold Reach at the Ox deposit is described in Section 9 of this PEA.

6.3 HISTORY OF THE SEEL BRECCIA AND SEEL DEPOSITS

Between 1968 and 1970, Bethlehem Copper Corp. staked the first claims over what is currently the Seel and Seel Breccia deposits to cover anomalous copper-silver soil geochemistry. In 1972 Bethlehem Copper built a tote-road from the Reach to the prospect area and drilled eight percussion holes. The claims lapsed and in 1980 were re-staked by Lansdowne Oil and Minerals Limited who identified a moderately strong copper anomaly with elevated gold, silver, lead, and zinc. In 1982 Lansdowne drilled 38 shallow diamond holes and delineated a mineralized breccia zone (Ager and Holland, 1983). In 1983 Lansdowne drilled 24 holes, with 10 more holes drilled in 1985. In 1985 an Induced Polarization geophysical survey reported very high chargeability that remained open in various directions. The previous drilling and surface exploration delineated an annular zone of sulphide cemented breccia (Seel Breccia) over a length of 450 m and to a depth of 40 m. Drill highlights include: DH82- 19 with 18 m of 1.59% Cu and 640 ppb Au; DH85-1 with 9.76 m of 2.08% Cu, 47 g/t Ag and 0.3 g/t Au; DH85-9 with 0.46 m of 8.14% Cu, 112.7 g/t Ag and 6 g/t Au, and DH85-10 with 0.9 m of 8.26% Cu, 120 g/t Ag and 9.5 g/t Au.

The claims were allowed to lapse and during 1995 to 2000 the area was staked by Seel Enterprises Ltd. and a program of trenching, rock and soil sampling, and prospecting was conducted. In 2003 the claims were optioned by Grayd Resources, and later that year Gold Reach entered into an earn-in agreement with Grayd Resources, eventually earning 100% ownership of the claims. In 2003 Gold Reach conducted reconnaissance exploration including prospecting, rock, soil, and stream sediment sampling. In 2004 Gold Reach conducted IP and magnetometer surveys, and in late 2004 and early 2005 drilled 9 core holes and discovered the East Seel Cu-Au porphyry. This was followed by significant exploration, which included drilling and the discovery of the West Seel deposit by Gold Reach in 2011. Exploration activities conducted by Gold Reach from 2004 to 2014 are described in Section 9 of this PEA.

6.4 HISTORY OF THE DAMASCUS VEIN

In 1981 International Damascus Resources Ltd. staked claims over the Damascus Vein area and conducted an airborne VLF-EM survey. They conducted prospecting, soil geochemical, ground magnetometer surveys, and minor reconnaissance drilling from 1981 to 1983. During 1983 36 holes were drilled and the Damascus and nearby Hilltop veins were discovered. The best drill interval from the Damascus Vein was in hole Ox-21 where a 3.82 m core length (2.83 m true width) returned assays averaging 1,228.6 g/t Ag, 7.32% Pb and 5.76% Zn.

In 1984 Cominco Ltd. optioned the Property and evaluated the area for bulk-tonnage (Equity-type) mineralization. Of particular interest to Cominco was "a 2,000 m by 600 m high contrast Ag-As-Pb-Zn soil geochemical anomaly upslope from previously tested massive sulphide veins" (Blackwell, 1985). Cominco conducted ground geophysical surveys (VLF-EM and induced polarization), geological mapping, trenching and rock geochemical sampling. Late in 1984

Damascus Resources drilled an additional seven holes on the Damascus Vein and two on the Hilltop Vein.

In 1986 Damascus Resources completed IP and VLF-EM surveying and outlined a strong IP anomaly near the east margin of the Claim. In 1989, Granges Inc. optioned the Property, and drilled 8 holes. Six holes tested the depth extension of the Damascus Vein, 1 hole tested the IP anomaly discovered in 1986 and 1 hole was lost in overburden. The results were encouraging and intersected significant mineralization at depth on the Damascus Vein, the best intersection being 4.5 m (1.5 m true width) grading 194.3 g/t Ag, 0.7 g/t Au, 2.7 % Zn and 1.1 % Pb at a depth of 88 m (DDH-OX51). A historical resource estimate has been reported for the Damascus Vein containing resources of 196,000 tonnes grading 411 g/t Ag, and 7% combined Pb + Zn to a down dip depth of 100 m (Goldsmith et al, 1984). The above resource estimate was prepared prior to the implementation of National Instrument 43-101 Standards of Disclosure for Mineral Projects, and does not comply with that standard. The resource was estimated for Lansdowne Oil and Minerals in a 1984 company report titled "Review of 1982-83 Exploration Lean-To and Panther Groups of Mineral Claims Tahtsa Lake Area Omineca Mining Division BC". The historical estimate was done using a cross sectional method based on drill holes and additional drilling is required to verify the historical estimate. A qualified person has not done sufficient work to classify the historical estimate as current mineral resources or mineral reserves. Neither Gold Reach nor P&E consider the above historical estimate as current mineral resources or mineral reserves.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

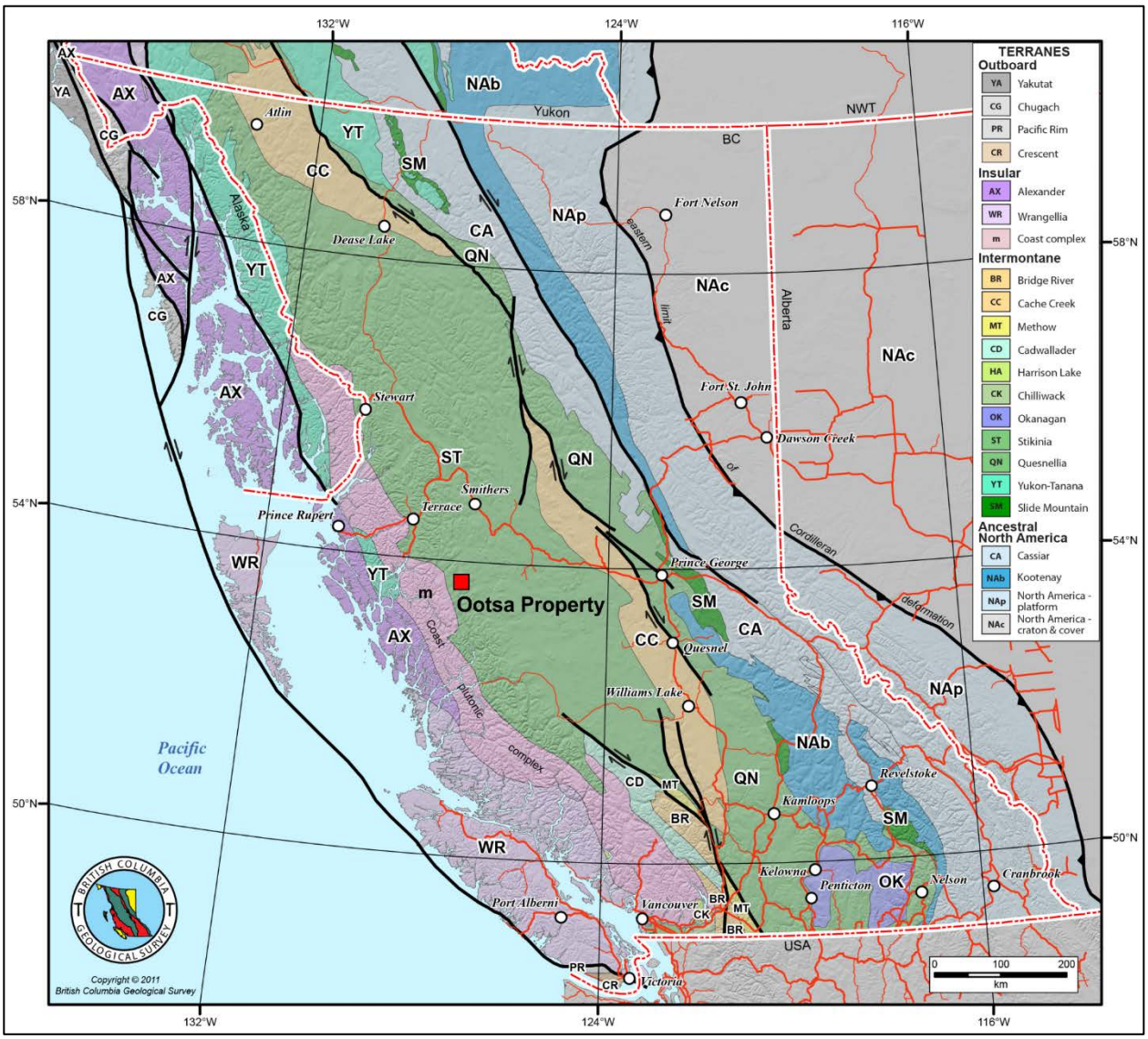
7.1 REGIONAL GEOLOGY

The Ootsa Property is located within the Stikine tectono-stratigraphic terrane, near the western margin of the Coast Plutonic Complex (Figure 7.1). The Stikine terrane is host to numerous porphyry Cu style deposits and is composed of volcanic and marine sedimentary strata of Lower Devonian to Middle Jurassic age (Monger et al., 1991), and supracrustal sequences of Middle Jurassic to Early Tertiary age. These include Triassic volcanic assemblages (Takla, Stuhini and Lewes River groups) which are unconformably overlain by the Lower to Middle Jurassic Hazelton Group volcanic and sedimentary rocks.

The Stikine terrane is intruded by several igneous suites including the Late Triassic Stikine Suite, the Early to Middle Jurassic Topley Suite, the Middle Jurassic Three Sisters Suite, the Late Jurassic to Early Cretaceous Francois Lake Suite, the Late Cretaceous Bulkley Suite, and the Tertiary Nanika, Babine, Quanchus, and Goosly Lake Suites (Woodsworth et al., 1991).

In the region, the Bulkley intrusive Suite (70 to 84 Ma; Carter, 1981) is associated with numerous important mineral occurrences including Huckleberry, Whiting Creek, Emerald Glacier and Bergette. The age of mineralization at Huckleberry is approximately 83.5 Ma (Friedman and Jordan, 1997), the age of the intrusions associated with mineralization at Bergette are around 77.8 Ma, and at Whiting Creek are around 82 Ma (Lepitre et al., 1997). Mineralization at the Ox deposit has been dated at 83 Ma (Richards, 1974). The host East Seel intrusion has returned a U-Pb zircon age of 86.1 ± 0.4 Ma (J. Mortensen pers. com) and a Rb-Sr age of 86.1 ± 1.1 Ma has been obtained for feldspar and biotite from West Seel (Petersen, 2014). The Bulkley Suite has calc-alkaline chemistry suggesting the magmatism formed in an arc setting (MacIntyre 1985).

Figure 7.1 Geologic Terrane Map of British Columbia



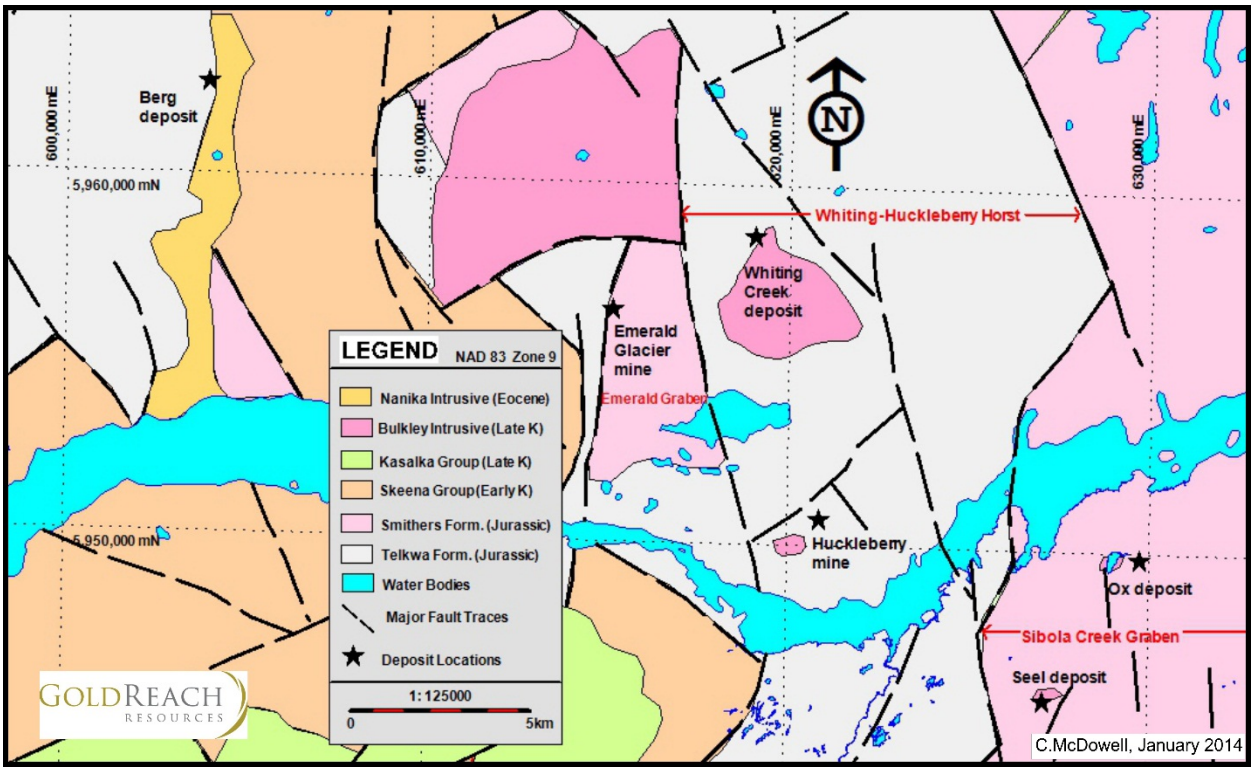
7.2 LOCAL GEOLOGY

7.2.1 Introduction

The Ootsa Project is located at the southeast end of a southeast-trending belt of porphyry deposits and prospects that include the Lucky Ship deposit, the Berg deposit, the Huckleberry Mine, Whiting Creek, Ox, and East and West Seel deposits. The Ootsa Property is underlain by a series of juxtaposed fault blocks containing tilted and locally folded strata of the Telkwa, Nilkitkwa, Whitesail and Smithers Formations of the Lower to Middle Jurassic Hazelton Group. These rocks are cut by multi-phase intrusive complexes that are correlative with the Late Cretaceous Bulkley Intrusive suite. Intrusive phases include diorite, granodiorite, quartz diorite, porphyritic quartz monzonite, porphyritic granodiorite, feldspar porphyry, and quartz feldspar porphyry. The youngest rocks on the Property are gently dipping basaltic and rhyolitic flows of the Eocene Ootsa Lake Group that cap older strata in the Whitesail and Kasalka ranges.

The structural setting of Tahtsa Reach is characterized by dextral shear, compressional faulting, and crustal extension and rifting (Christensen et al., 2011). Compressional stresses from the amalgamation of the Stikine Terrane with ancestral North America led to the development of deep seated faults in the region. Relaxation and extension following amalgamation were accompanied by the emplacement of calc-alkaline intrusive rocks with their accompanying zones of hydrothermal alteration and mineralization. Extension was characterized by the formation of northerly-trending horsts and grabens. Further compression and dextral shear resulting from subsequent collisional events led to the dismemberment of the Huckleberry Main Zone and East Zone deposits along kilometre-scale curved faults that dissect the mineralized zones (Christensen et al., 2011). The Ox and Seel deposits have also been dismembered by post-mineral faulting.

Figure 7.2 Geology of Tahtsa Reach



Note *position of Ox and Seel deposits in down-dropped Sibola Creek graben relative to Huckleberry's location in Whiting-Huckleberry horst.*
Source: *BCGS geoscience map (2006).*

Figure 7.2 shows a simplified geology map of the Tahtsa Reach area. The most extensive rock unit in this region is the Telkwa Formation of the Lower to Middle Jurassic Hazelton Group. These rocks consist of lapilli tuff, lithic tuff, crystal tuff, tuff breccia and minor amounts of porphyritic augite andesite, dacite, tuffaceous siliceous argillite and pebble conglomerate. The Huckleberry Mine is located within the Whiting-Huckleberry horst with mineralization hosted in both hornfelsed Telkwa Formation and intrusive rocks. The Seel and Ox deposits are situated within the down-dropped Sibola Creek Graben and are hosted in Smithers Formation marine sedimentary rocks and intermediate to felsic porphyritic intrusive rocks. The main geologic units in the area are described below.

7.2.2 Telkwa Formation

Widely spaced outcrops of maroon, purple, and red lapilli tuff with lesser crystal, lithic and ash tuff, volcanic breccia and agglomerate interbeds are exposed in the Huckleberry area and west of the Seel and Ox deposits. These rocks, which typically contain 30-60% 1-2 mm feldspar crystal fragments, are lithologically identical to the lower Telkwa Formation elsewhere in central B.C. (MacIntyre, 2005) and are correlated with the Telkwa Formation.

7.2.3 Smithers Formation

Thick zones of fine grained dark gray to black mudstones occur in and around the Seel and Ox deposits along with varying amounts of medium to thin-bedded feldspathic wackes, siltstones and lessor heterolithic granule to pebble conglomerates. Minor amounts of volcanic-tuffaceous beds occur in the section locally. These rocks are assigned to the Smithers Formation based on lithology and apparent stratigraphic position. Some limy beds containing macrofossils have been observed east of the Damascus area.

7.2.4 Ootsa Lake Group

At higher elevations in the ranges, South of the Seel deposit, bedded volcanic rocks are exposed that unconformably overly the Smithers and Telkwa Formations. These volcanic rocks are assigned to the Eocene Ootsa Lake Group and consist of rhyolitic flows and domes, crystal and lithic-crystal tuff, and minor dacite and andesite flows. Phenocrysts identified include plagioclase, biotite, alkali-feldspar, quartz, and rare hornblende. A volumetrically minor set of relatively late felsic and mafic fine-grained dikes have been intersected in some drill holes at Ox and Seel and these may be related to the Ootsa Lake Group. Locally the Ootsa Lake Group hosts large alteration zones, locally structurally controlled, and is considered prospective for precious metal deposits.

7.2.5 Skeena and Kasalka Groups

The Skeena and Kasalka Groups have not been mapped around the main Project area but are shown to occur on the western side of the claim area. The Early Cretaceous Skeena Group is composed of clastic sedimentary rocks, dominantly distal turbidites, that are locally exposed on the south shore of Tahtsa Lake, in the core of the Tahtsa Range, and on Swing Peak ridge (MacIntyre, 2005). The Late Cretaceous Kasalka Group is well exposed in the Kasalka Range, west of the deposit area. This unit consists of rhyolite to dacite porphyritic volcanic rocks, lapilli tuff and lahar breccias, basalts, with volcanic sandstones and conglomerates (MacIntyre, 2005).

7.2.6 Bulkley Intrusive Suite

Cretaceous Bulkley Suite (70 to 84 Ma; Carter, 1981) intrusive rocks are associated with numerous zones of mineralization in the district and within the Property. They crop out in trenches, road cuts, creeks, and along the crest of some ridges. Drilling at the Seel and Ox deposits has intersected large zones of highly altered Bulkley Suite rocks, mainly feldspathic porphyritic intrusive rocks. At least 7 distinct intrusive phases have been recognized at Seel within an intrusive complex that is at least 1.6 km long by 0.5 km wide and is elongate in a northeast direction. The oldest intrusives, determined by cross cutting relationships, are an equigranular feldspar-quartz-biotite intrusive (locally dioritic) and a coarse crowded feldspar porphyry that varies somewhat in grain size and phenocryst abundance. The intrusive complex

also contains medium grained feldspar and feldspar-biotite porphyries and a medium to coarse grained feldspar-quartz porphyry. All of the above intrusive units are observed to host porphyry Cu-Au-Mo mineralization. At the northeast end of the Seel intrusive complex there is a coarse grained quartz porphyry, along with a spatially-related and locally highly altered finer grained feldspar-quartz porphyry.

7.2.7 Nanika Intrusive Suite

Eocene Nanika intrusives have not been identified in the Ootsa Project but are known to occur in the northwest part of the district and host porphyry Cu-Mo mineralization at the Berg deposit. They have a quartz monzonite composition and ages circa 50 Ma (MacIntyre, 2005).

7.3 GEOLOGY AND MINERALIZATION OF THE SEEL DEPOSITS

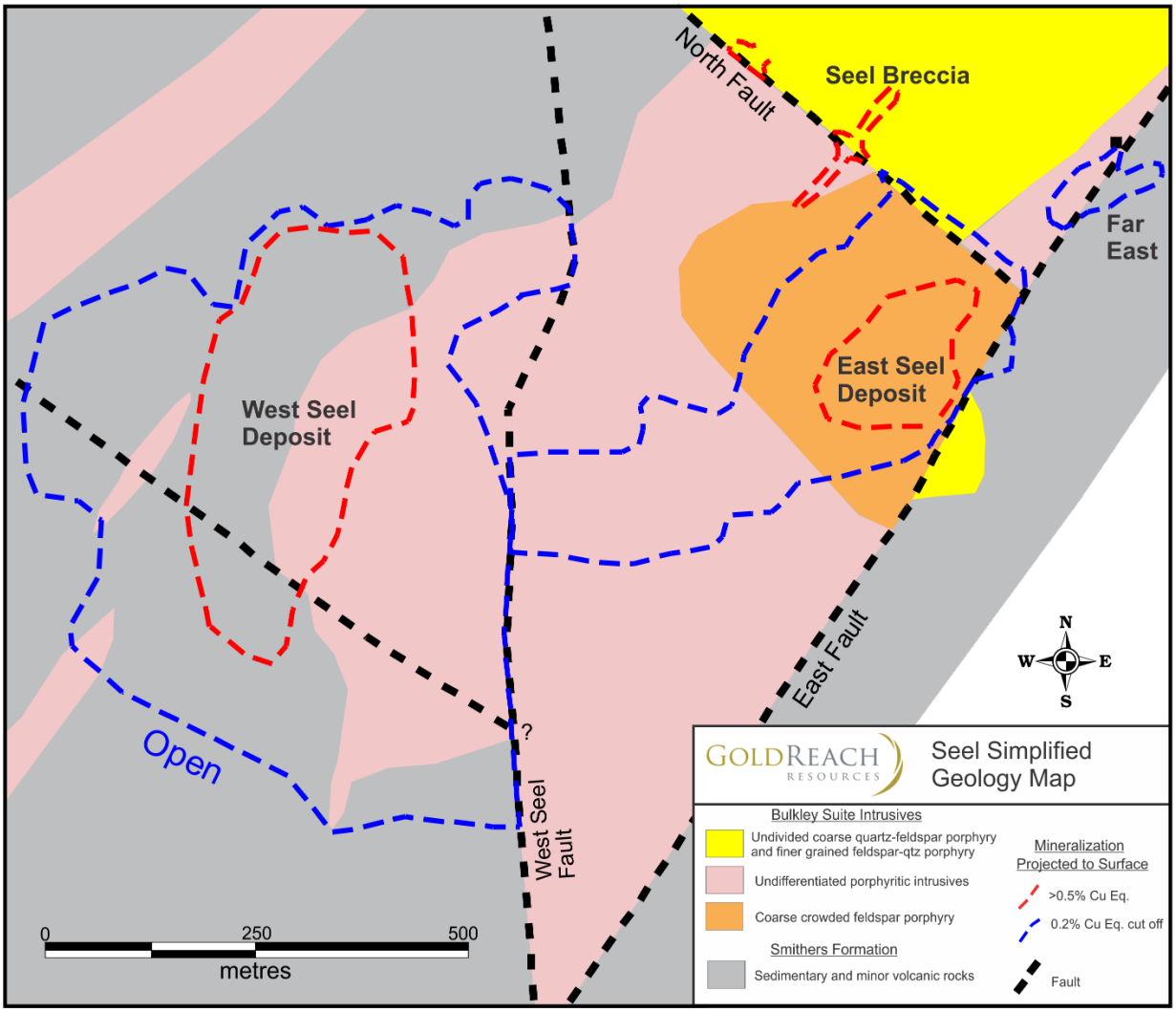
7.3.1 Introduction

The Seel Deposits contain three distinct styles of mineralization. The first two are porphyry-Cu related and occur at the East and West Seel deposits. The third is a later lower temperature event composed of quartz-carbonate+Cu-Zn-Pb-Ag mineralization hosted in breccias and veins and is characteristic of the Seel Breccia zone (Ebert, 2012). The Far East zone has only been partially delineated and contains both porphyry-Cu and later quartz-carbonate+Cu-Zn-Pb-Ag style mineralization. A simplified geology map of the Seel deposits along with the location of the mineralized zones is shown in Figure 7.3.

The East Seel deposit contains porphyry style Cu-Au mineralization hosted within a coarse crowded feldspar-biotite porphyry. Mineralization is associated with quartz-chalcopyrite-magnetite-pyrite veins and strong potassic alteration. The West Seel deposit contains porphyry Cu-Au-Mo-Ag mineralization and is hosted in a variety of porphyritic intrusive rocks and in fine grained clastic sedimentary rocks along the intrusive margins. Mineralization at West Seel is associated with quartz-pyrite-chalcopyrite-molybdenite-pyrrhotite veins as well as potassic and sericitic alteration locally. At depth, the West Seel deposit is hosted by a large weakly porphyritic intrusive containing strong biotite alteration, and a large mineralized hydrothermal breccia zone has been identified. The main Seel deposits are described in detail below.

Evidence of faulting is fairly common in drill holes at Seel and three main faults have been identified during the various drill programs and are labelled in Figure 7.3 as the North Fault, the East Fault and the West Seel Fault. These faults postdate the main episode of porphyry mineralization but locally host younger Seel Breccia style quartz-carbonate base-metal Ag veins and breccias, and associated clay alteration halos. Both the East and West Seel deposits have been truncated by faults, however, the amount and sense of displacement remains poorly constrained and the locations of the missing fault offset portions of the deposits remain unknown. The West Seel fault loosely defines the boundary between the West Seel and East Seel deposits. Drilling has defined this fault by gouge, cataclasite, and brecciated textures, and is often accompanied by quartz-carbonate-sulfide veining with strong clay alteration halos. Locally the West Seel fault has been inferred through subtle criteria such as grade and changes in lithology or alteration and is likely more complex than the simplified interpretation shown in Figure 7.3.

Figure 7.3 Simplified geology map of the Seel Deposits

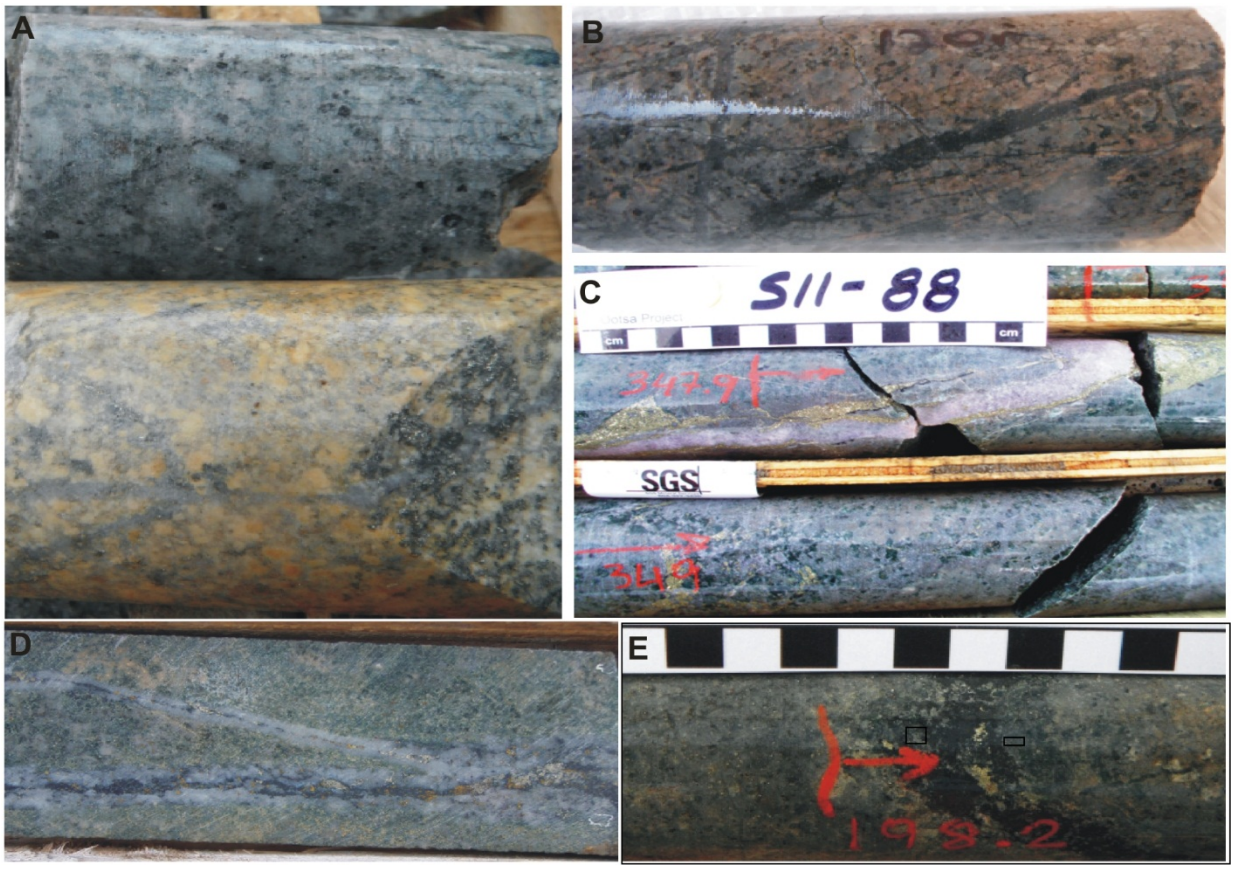


7.3.2 The East Seel Cu-Au Zone

The East Seel deposit contains Cu-Au style porphyry mineralization associated with a coarse crowded porphyry containing 40 to 60% phenocrysts in a fine grained aphanitic matrix. Refer to Figure 7.4 photographs of drill core. Feldspar is the dominant phenocryst consisting of euhedral and sub rounded crystals, 3 to 7 mm in size. Biotite phenocrysts, 2 to 3 mm in size make up about 2 to 5% of the rock but are often completely masked by alteration. The rock is termed a crowded feldspar porphyry. The zone contains early potassic alteration associated with quartz + magnetite + sulfide veining and forms a distinct magnetic high on airborne magnetic survey. Intense alteration causes the color and appearance of this rock to change considerably over short distances, however, the texture and phenocryst composition remain fairly constant. In the mineralized zone, the rock contains 2 to 4% finely disseminated pyrite and chalcopyrite in a variably silica flooded groundmass. Pyrite and chalcopyrite also occur along fractures, and pyrite-chalcopyrite-magnetite occur in quartz veins, locally concentrated in the vein centers. Traces of bornite have been found in the higher-grade portions of East Seel. There are generally 5 to 7 quartz veins per metre, 0.5 to 1 cm in size, within the mineralized zone, but quartz vein densities in excess of 20 veins per metre have been noted. Early high temperature quartz-chalcopyrite veins occur in this zone along with several episodes of later veins. Two main styles

of alteration dominate in the Cu-Au zone. The first is an early potassic alteration characterized by salmon to pink coloured K-feldspar within the porphyry groundmass and as selvages to veins, along with biotite veins and zones, and quartz-pyrite-chalcopyrite-magnetite veins. The second alteration style features sericite alteration overprinting potassic alteration, where the rock is bleached to a light grey green or tan color, mafic minerals have been destroyed, and often the feldspar phenocrysts and porphyry groundmass are soft. In some zones there appears to be similar Cu and Au grades in both sericite altered zones and potassic altered zones, whereas in others copper content is reduced in the sericite altered zones demonstrating the sericite alteration is locally grade destructive. Argillic alteration halos occur around large faults zones and these halos are also grade-destructive.

Figure 7.4 Photos from East Seel Drill Core



***Notes**: A) top-potassic altered crowded porphyry, bottom - sericite to clay altered porphyry. B) Potassic alteration with fine grained disseminated chalcopyrite and pyrite, secondary K-feldspar in the porphyry matrix with minor biotite and quartz-sulfide veinlets. C) Potassic + chlorite altered feldspar porphyry with purple anhydrite vein. D) Mixed potassic and sericite altered porphyry with quartz-magnetite-chalcopyrite veins. E) Magnetite-chalcopyrite vein.*

Figure 7.5 shows section 15NE, a representative cross section through the middle of the East Seel zone with colour-dashed lines showing grade distribution. On the section, mineralization is hosted in the coarse crowded porphyry unit, with a core of >0.75% and >1% copper equivalent, which decreases to the northwest, grading into >0.5% then gradually to <0.2% copper equivalent.

Table 7.1 shows select drill hole results from the East Seel zone with local very strong grades demonstrated by holes such as S13-148 which intersected 146.3 m grading 0.51% Cu and 0.59 g/t Au, including 44.3 m of 0.94% Cu and 1.12 g/t Au.

Figure 7.5 Cross Section 15NE through the East Seel zone Showing Simplified Geology and Copper Equivalent Grade Distribution

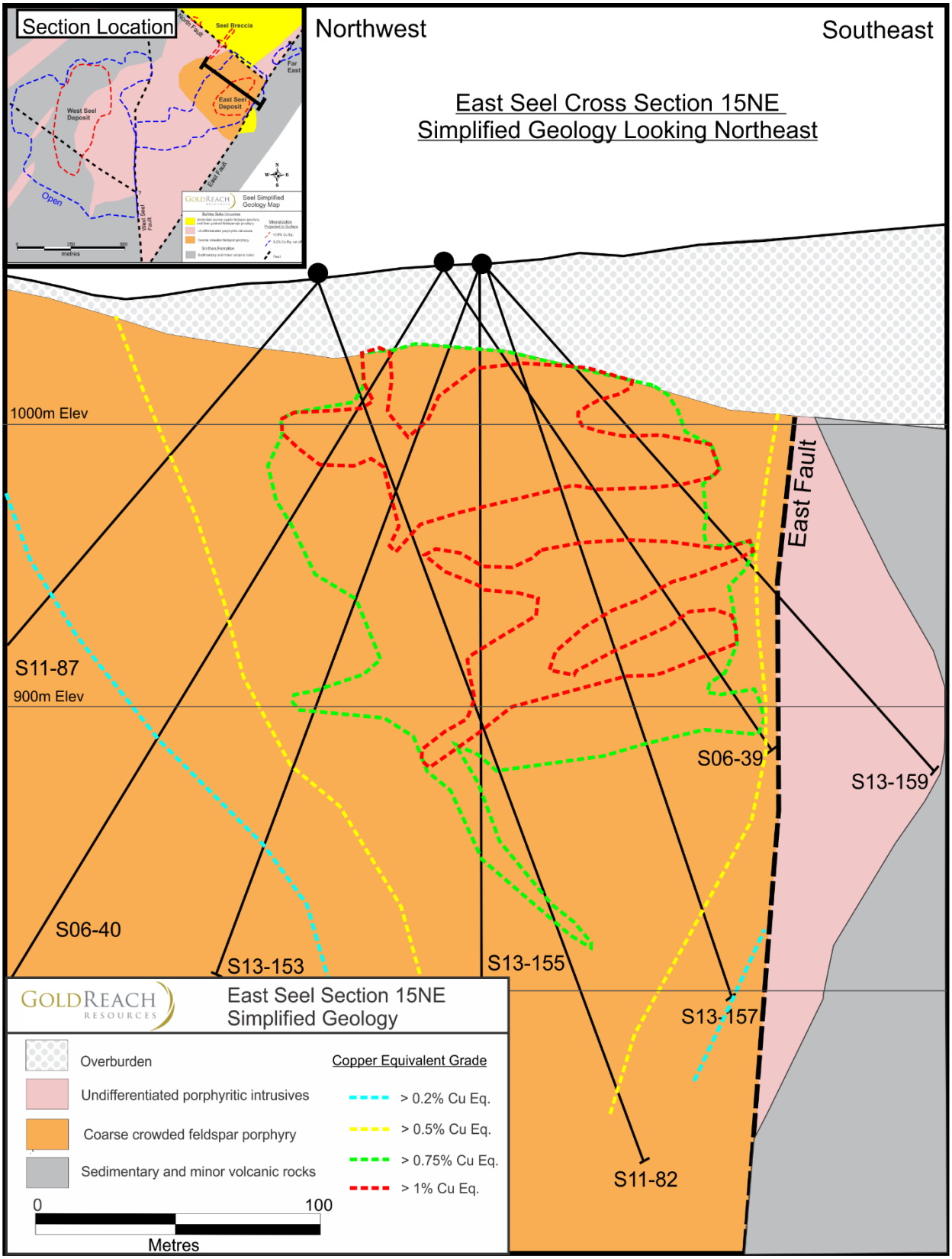


TABLE 7.1 SELECT DRILL HOLE RESULTS FROM THE EAST SEEL DEPOSIT							
Drill Hole	**From (m)**	**To (m)**	**Width (m)***	**Cu %**	**Au g/t**	**Ag g/t**	**Cu Eq%****
S11-81	38.5	176	137.5	0.39	0.34	4.12	0.63
including	38.5	104.5	66	0.42	0.47	1.15	0.75
S11-83	41.6	228	186.4	0.36	0.27	3.86	0.55
including	41.6	148	106.4	0.4	0.41	1.08	0.69
including	162	174	12	0.9	0.08	24	1.17
S13-148	31.7	178	146.3	0.51	0.59	2.33	0.94
including	31.7	76	44.3	0.94	1.12	3.46	1.76
S13-153	64	188	124	0.37	0.37	1.63	0.64
including	68	84	16	0.81	0.76	3.63	1.37
S13-155	30	268 EOH	238	0.38	0.47	1.93	0.73
including	30	190	160	0.44	0.53	1.98	0.83
including	42	86	44	0.62	0.67	2.76	1.11
Including	140	156	16	0.64	0.8	2.74	1.22
S13-157	31.7	218	186.3	0.37	0.41	1.82	0.67
S13-159	45.7	143.6	97.9	0.39	0.49	2.41	0.75
including	45.7	110	64.3	0.44	0.58	2.64	0.87
including	45.7	66	20.3	0.52	0.65	2.61	1
S13-177	26.8	213	186.2	0.39	0.53	1.86	0.78
including	26.8	109	82.2	0.56	0.81	2.43	1.15
S13-183	30.5	210	179.5	0.43	0.5	1.93	0.8
including	38	134	96	0.58	0.62	2.75	1.04
including	76	100	24	1.11	1.22	4.98	2.01

**Width refers to drill hole intercepts, true widths have not been determined. EOH = end of hole.*
***Cu Eq. (copper equivalent) has been used to express the combined value of copper, molybdenum, gold and silver as a percentage of copper, and is provided for illustrative purposes only. No allowances have been made for recovery losses that may occur should mining eventually result. Calculations use metal prices of US $2.50/lb copper, $1200/oz gold, $15 silver, and $10/lb molybdenum using the formula Cu Eq.% = Cu% + (Au g/t x 0.701) + (Ag g/t x 0.0087) + (Mo% x 4.01).*

Mineralization at East Seel is truncated by the East Fault on the southeast side of the deposit, and the copper grade immediately surrounding the East Fault is low due to intense late argillic alteration which is grade destructive. Similarly the North Fault truncates the East Seel zone on the northeast side of the deposit (Figure 7.3).

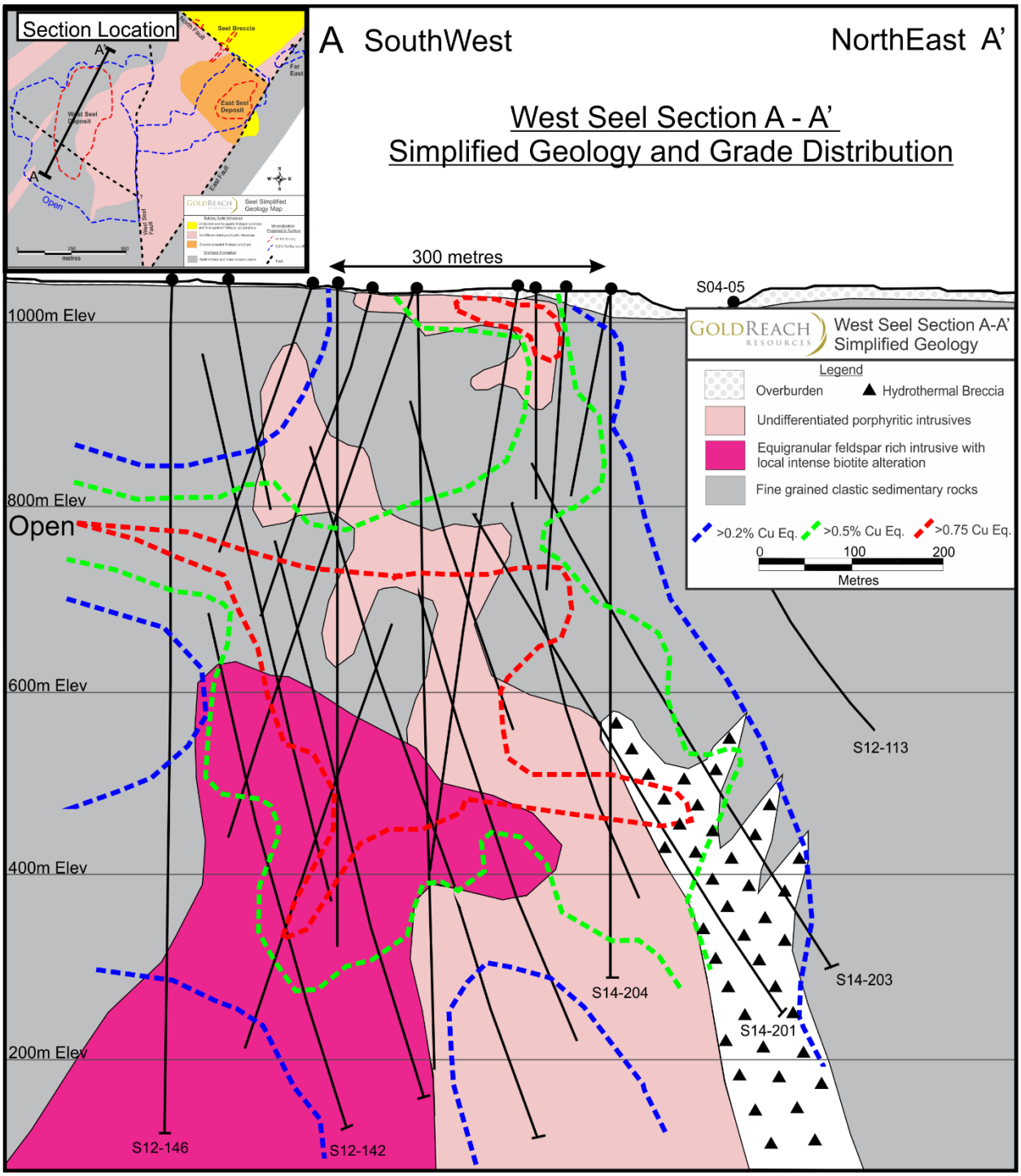
The main zone of mineralization at East Seel is about 250 m by 300 m and extends to around 200 m depth. Mineralization becomes patchy at depth largely due to an increase in grade destructive sericitic and argillic alteration.

7.3.3 The West Seel Cu-Au-Mo-Ag Zone

The West Seel zone was discovered by drilling in 2011 when holes S11-91, 95, 97 and 100 all intersected Cu-Au-Mo-Ag bearing porphyry style mineralization. Mineralization at West Seel is hosted in 4 different lithologies: 1) a suite of undifferentiated porphyritic intrusives, 2) a fine

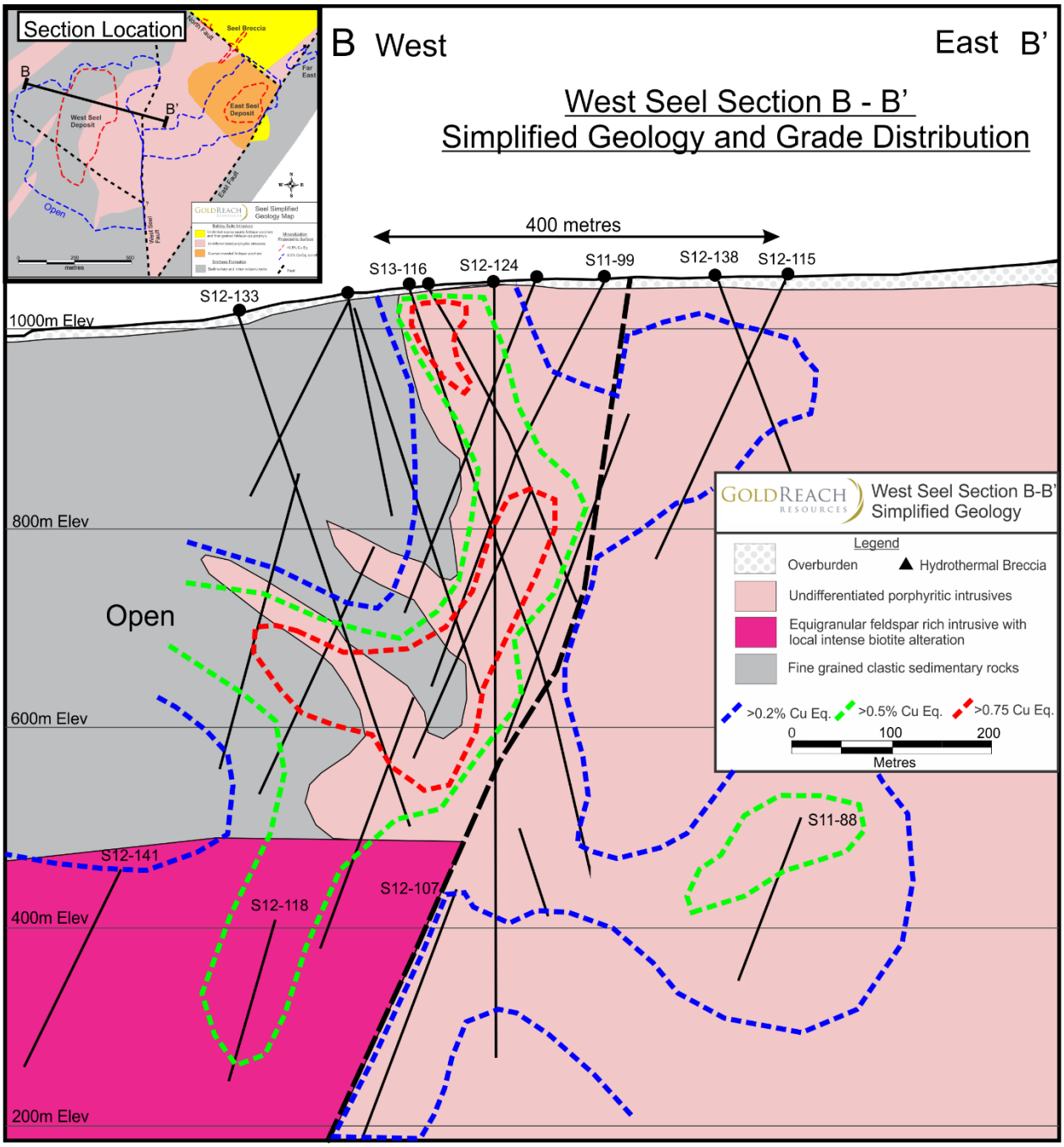
grained clastic sedimentary package with variable biotite hornfelsing, 3) an equigranular to weakly porphyritic intrusive rock with strong biotite alteration that is found at depth, and 4) a hydrothermal breccia pipe with varying clast lithologies, rounding and matrix. The undifferentiated porphyritic intrusives range in grain size from fine to medium, are feldspar dominant (10-30%) with common biotite and rare to minor quartz eyes. Sericite alteration is widespread with intermittent zones of silicic flooding and zones of potassic alteration. Quartz veining varies from 1-2 veins per metre to greater than 15 veins per metre with a sulfide assemblage consisting of pyrite-chalcopyrite-molybdenite-pyrrhotite. The wall rocks to the intrusive complex are composed of fine-grained sedimentary rocks, dominantly mud to siltstone with minor sandstone, and occasional conglomerate that have been variably hornfelsed. This hornfelsed contact zone is manifested by strong biotite alteration with vein-controlled and disseminated sulfide mineralization consisting of pyrite-chalcopyrite-molybdenite-pyrrhotite. The hornfelsed wall rocks around the intrusive typically host the highest grade mineralization at West Seel. The lower West Seel intrusion is equigranular to weakly porphyritic and has moderate to strong biotite (potassic) alteration throughout. This intrusion exerts a strong control on mineralization at West Seel. The sulfide assemblage is notably different from elsewhere at Seel due to an increase of pyrrhotite relative to pyrite, chalcopyrite and molybdenite. Secondary biotite is abundant and widespread at depth in the West Seel zone, and largely masks the original intrusive texture. The West Seel intrusive contains up to 1% disseminated chalcopyrite and minor disseminated molybdenite with 3 to 12 quartz-pyrrhotite-chalcopyrite-pyrite-molybdenite veins per metre, 1-2 mm in size. The rock averages about 2 to 4% pyrrhotite and is strongly magnetic. The mineralized zone at West Seel is volumetrically large and remains open to the south at depth where the mineralized zone is 800 to 1,000 m wide. To date the mineralization has been traced roughly 800 m along a northeast-southwest strike, over widths up to 800 m and to depths in excess of 1,000 m below surface. West Seel mineralization forms a gradational contact on the west side but is truncated on the east side by the West Seel Fault (Figure 7.3). Strong alteration and localized mineralization occurs on the east side of the West Seel Fault. Late quartz-carbonate veins with precious and base metal sulfides are found in fault splays and sub-parallel structures and fractures in and near the fault. The sense of displacement along the West Seel fault remains poorly understood and the faulted east side of the West Seel deposit remains a valid conceptual exploration target.

Figure 7.6 Cross section A-A' Through the West Seel Zone Showing Simplified Geology and Copper Equivalent Grade Distribution



Figures 7.6 and 7.7 show representative cross-sections through the West Seel zone. In Figure 7.6 mineralization is hosted in all lithologies shown including fine grained sedimentary rocks, undifferentiated porphyry, equigranular intrusive (West Seel intrusive) and in a hydrothermal breccia pipe. Figures 7.8 to 7.11 present photographs of various rock types and mineralization.

Figure 7.7 Cross section B-B' Through the West Seel Zone Showing Simplified Geology and Copper Equivalent Grade Distribution



Holes S14-201, 203, and 204 intersected a large hydrothermal breccia pipe at depth (Figure 7.6). The breccia pipe has a sub-vertical geometry, starts about 400 m below surface, and extends at least 400 m vertically and remains open at depth. The pipe contains rounded and milled to angular clasts and is locally matrix supported and locally clast supported. Clast types include sedimentary rocks, intrusive rocks, and quartz veins in a hydrothermal and intrusive matrix. Pyrite-pyrrhotite-chalcopyrite and molybdenite occur in the breccia matrix and locally within mineralized clasts (Figure 7.11).

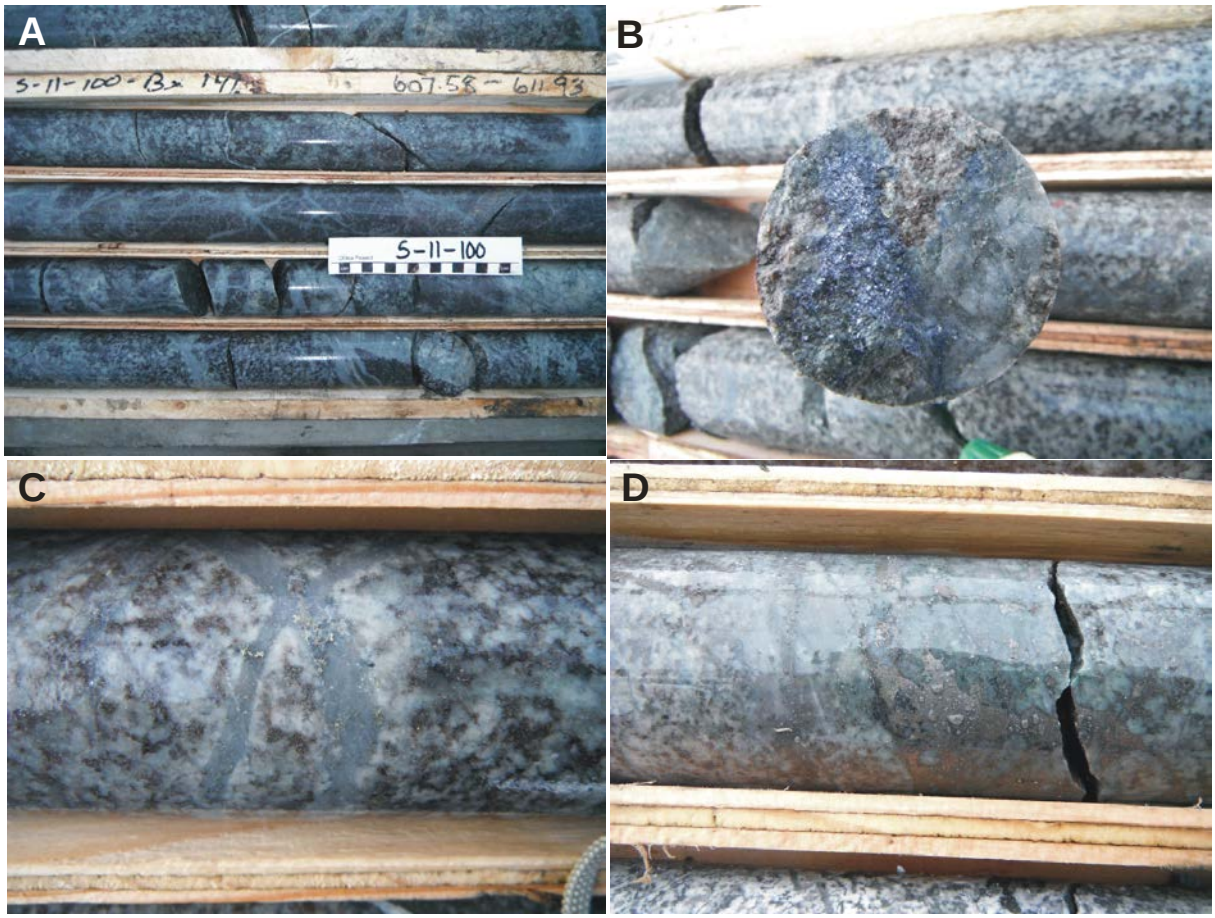
Table 7.2 shows select drill hole results from the West Seel deposit.

TABLE 7.2
SELECT DRILL HOLE RESULTS FROM THE WEST SEEL DEPOSIT

Drill Hole	From (m)	To (m)	Width (m)*	Cu %	Au g/t	Mo %	Ag g/t	Cu Eq.%**
S12-101	262	1079	817.0m	0.2	0.21	0.026	2.24	0.45
including	308	829.8	521.8	0.23	0.3	0.032	2.63	0.57
S12-118	350	887.0 EOH	537	0.27	0.19	0.055	2.69	0.65
including	356	660	304	0.33	0.24	0.065	3.41	0.79
including	356	484	128	0.43	0.33	0.076	4.65	1.01
S12-121	234	987.5 EOH	753.5	0.24	0.12	0.024	2.26	0.43
including	270	602	332	0.32	0.2	0.039	3.58	0.65
S12-130	346	658	312	0.29	0.17	0.035	3.3	0.58
including	444	582	138	0.38	0.22	0.057	3.99	0.8
S12-136	140	494	354	0.23	0.28	0.031	3.01	0.58
including	298	444	146	0.32	0.38	0.044	4.37	0.81
S13-154	18	32	14	0.41	0.09	0.129	12.86	1.1
S13-154	60	356	296	0.23	0.22	0.016	4.44	0.49
including	60	82	22	0.33	1.19	0.021	9.94	1.33
including	218	340	122	0.3	0.17	0.016	4.7	0.52
S14-200	324	531	207	0.31	0.24	0.034	4.45	0.65
including	366	439	73	0.45	0.31	0.059	6.32	0.96
S14-201	76	828	752	0.2	0.1	0.027	3.22	0.41
S14-208	283	591	308	0.28	0.26	0.046	3.5	0.68
including	431	591	160	0.38	0.41	0.056	4.29	0.93
including	485	537	52	0.44	0.64	0.067	5.58	1.21
S14-210	199	867 EOH	668	0.28	0.17	0.033	3.34	0.56
including	361	533	172	0.39	0.29	0.062	4.99	0.89
including	361	415	54	0.47	0.38	0.047	6.89	0.98
and	483	517	34	0.48	0.36	0.058	5.45	1.01

**Width refers to drill hole intercepts, true widths have not been determined. EOH = end of hole.*
***Cu Eq. (copper equivalent) has been used to express the combined value of copper, molybdenum, gold and silver as a percentage of copper, and is provided for illustrative purposes only. No allowances have been made for recovery losses that may occur should mining eventually result. Calculations use metal prices of US $2.50/lb copper, $1200/oz gold, $15 silver, and $10/lb molybdenum using the formula Cu Eq.% = Cu% + (Au g/t x 0.701) + (Ag g/t x 0.0087) + (Mo% x 4.01).*

Figure 7.8 Photos of Mineralized West Seel Intrusion

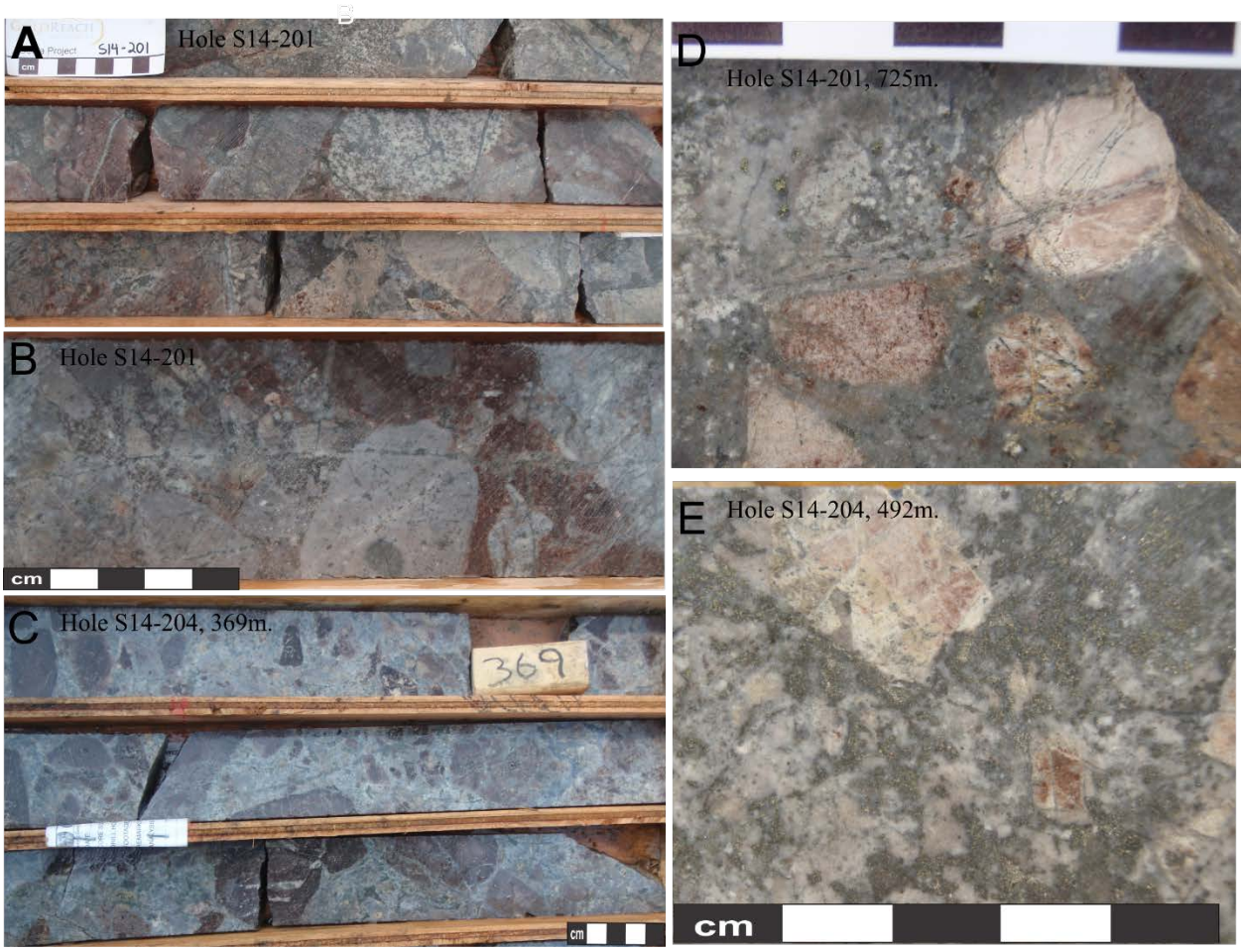


Notes: *A) Biotite altered West Seel intrusive with strong quartz veining and disseminated and vein controlled pyrrhotite-chalcopyrite-pyrite-molybdenite. B) Fracture coated with molybdenite +/- chalcopyrite. C) Quartz veinlets containing pyrrhotite – chalcopyrite - pyrite. D) Large clots and zones of pyrrhotite.*

On Figure 7.6 mineralization comes to surface over a width of 300 m and extends over 900 m vertically and remains open at depth. The highest grade zone indicated by the red dashed line (Cu Eq. >0.75%) forms a roughly 300 m by 400 m core to the deposit starting about 200 m below surface. Figure 7.7 illustrates how the West Seel Fault has truncated lithology and mineralization, with strong Cu Eq. grades extending from surface to 600 m depth.

Figure 7.9 Photos of hornfelsed and mineralized fine grained sedimentary rocks from West Seel, with locally abundant sulfides (pyrrhotite-chalcopyrite-pyrite-molybdenite).

Figure 7.10 Photos of West Seel Hydrothermal Breccia



Notes: *A) Rounded polylithic clast supported breccia with hydrothermal and intrusive matrix and sulfides. B) Rounded and angular clasts in a brown hydrothermal biotite rich matrix with pyrite-chalcopyrite-molybdenite. C) Matrix supported breccia with rounded and angular clast in quartz and rock flour matrix. D) and E) Sulfide rich hydrothermal and intrusive matrix breccia with chalcopyrite, pyrite and minor molybdenite.*

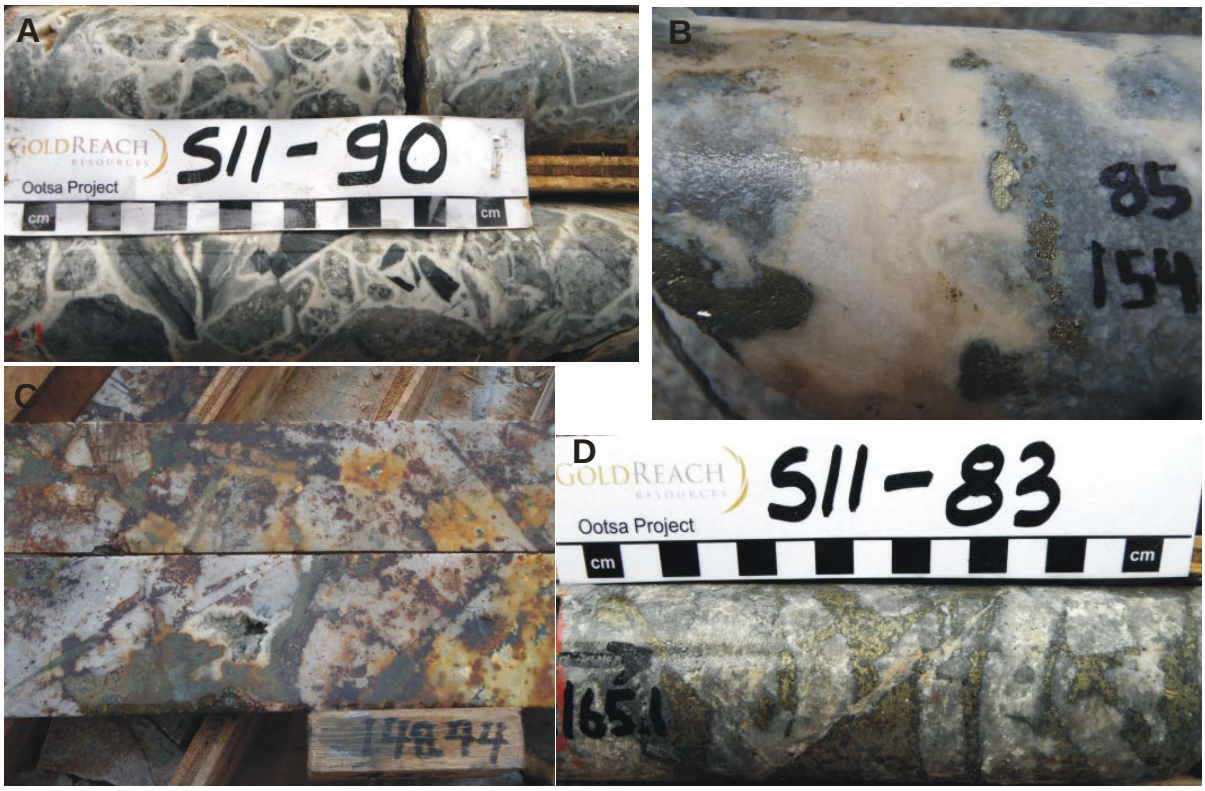
7.3.4 Seel Breccia

A late episode of structurally-controlled veins and breccias containing quartz-carbonate + Cu-Zn-Pb-Ag mineralization occur at the "Seel Breccia" and along some of the more significant faults in the area. This breccia is distinct from the porphyry associated hydrothermal breccia at West Seel described above. Carbonate associated with these zones consists of tan Fe-carbonate, pink Mn-carbonate, and local calcite. Sulfides consist mainly of chalcopyrite, pyrite, sphalerite and galena. Veins contain open spaces, drusy cavities, crustiform banding and cockade textures in places, suggesting they are lower temperature and higher level than the earlier porphyry Cu events that they cut and overprint. Zones of Seel Breccia subcrop on a small knob immediately northeast of the blind East Seel deposit and it is this style of mineralization that first attracted prospectors to the area.

Numerous holes have been drilled into the Seel Breccia area and define linear structurally controlled zones of brecciation and veining a few hundred metres long by 20 to 50 m wide with strong Cu and Ag grades. Several drill holes into the North Fault show this fault locally contains high grade Cu and Ag mineralization associated with these late veins and breccias, returning values such as 8.56% Cu and 223 g/t Ag over 1 m in hole S11-81. Zones of argillic alteration

typically surround larger quartz-carbonate-sulfide veins/zones and this alteration generally destroys the grade in the earlier porphyry.

Figure 7.11 Examples of Late "Seel Breccia" Style Breccias and Veins



Notes: *A) Cockade texture breccia with quartz-carbonate matrix. B) Faint crustiform banded quartz and tan Fe-carbonate vein with pyrite and chalcopyrite. C) 'Seel Breccia", clast supported breccia with pyrite-sphalerite-chalcopyrite + Fe-carbonate matrix (partially weathered core). D) Clast supported breccia with chalcopyrite – pyrite – Fe-carbonate matrix.*

Table 7.3 presents select drill hole results from the Seel Breccia style mineralization.

TABLE 7.3
SELECT DRILL HOLE RESULTS FROM SEEL BRECCIA STYLE MINERALIZATION

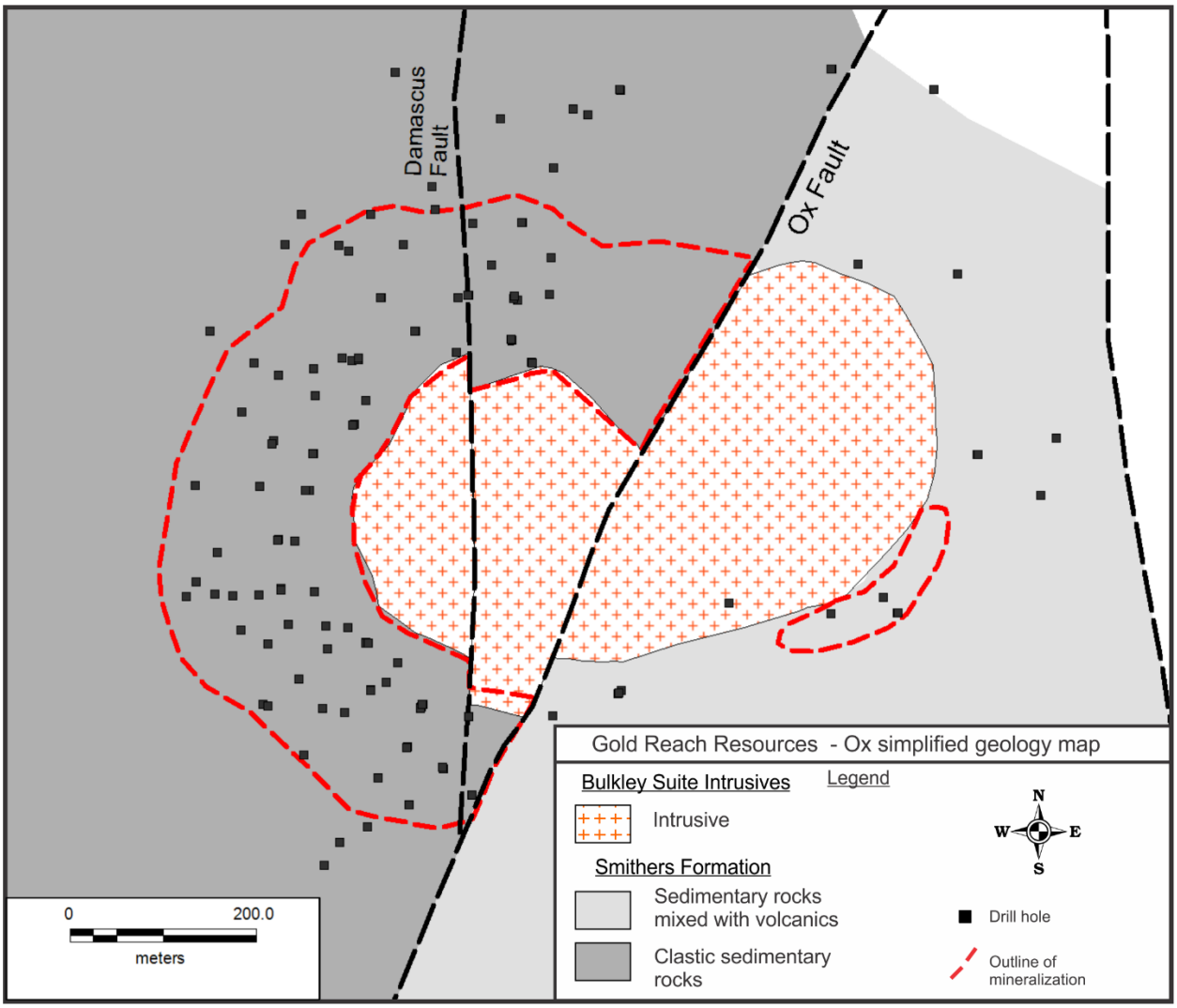
Drill Hole	From (m)	To (m)	Width (m)*	Cu %	Au g/t	Ag g/t	Cu Eq%**
S06-42	22	160	138	0.84	0.06	22.11	1.07
including	22	64	42	1.24	0.13	32	1.61
S06-47	106	120	14	0.7	-	21.7	0.89
S08-61	25	82.5	57.5	0.67	0.08	22.2	0.92
S08-66	7.5	75	67.5	0.4	0.04	11.4	0.53
S11-81	163	164	1	8.56	0.09	223	10.56
S11-84	126	136	10	0.76	0.11	39.1	1.18

**Width refers to drill hole intercepts, true widths have not been determined. EOH = end of hole.*
***Cu Eq. (copper equivalent) has been used to express the combined value of copper, molybdenum, gold and silver as a percentage of copper, and is provided for illustrative purposes only. No allowances have been made for recovery losses that may occur should mining eventually result. Calculations use metal prices of US $2.50/lb copper, $1200/oz gold, $15 silver, and $10/lb molybdenum using the formula Cu Eq.% = Cu% + (Au g/t x 0.701) + (Ag g/t x 0.0087) + (Mo% x 4.01).*

7.4 GEOLOGY AND MINERALIZATION OF THE OX DEPOSIT

The Ox deposit is located 4 km northeast of the Seel deposit and 6 km east of the Huckleberry Mine. The Ox deposit hosts porphyry Cu-Mo mineralization in hornfelsed sedimentary rocks near the western margin of a granodiorite porphyry stock (Figure 7.12) and has characteristics similar to the Huckleberry Mine. The mineralized zone at Ox is roughly crescent-shaped and wraps around the porphyry stock both of which are truncated and offset by the Ox Fault. It is speculated that the Ox Fault has down-faulted the rocks on the east side and that Ox style mineralization could occur to the east at depth. Limited drilling has intersected mineralization at depth on the east side.

Figure 7.12 Ox deposit-Simplified Geology Map



The main host rock for mineralization at Ox is a hard siliceous fine-grained clastic sedimentary rock with patchy zones of strong biotite hornfels, and zones with K-feldspar, biotite, sericite, chlorite, anhydrite, silicification and clay alteration (Ebert, 2012). Blebs and patches of epidote occur throughout the zone, as do patches of albite, especially at depth. Dikes and sills of fine to medium grained feldspar occur within the mineralized sedimentary rocks and are themselves altered and mineralized.

A coarse crowded feldspar biotite porphyry forms the main intrusive body on the east side of the mineralized zone at Ox. This intrusive contains 80 to 90% feldspar crystals, 2 to 10 mm in size (average 6 mm), 5-10% biotite as books to 5 mm, plus minor interstitial quartz, and has a granodiorite composition. The crowded porphyry does not contain significant zones of mineralization or quartz veining but does have variable K-feldspar, sericite, chlorite, pyrite, and clay alteration with weak copper and molybdenum locally. Several drill holes indicate the crowded porphyry to be locally in fault contact with the adjacent mineralized sedimentary rocks. Refer to Figure 7.13 for photographs of Ox drill core.

Figure 7.13 Photos of Drill Core from the Ox Deposit

Notes: *A) Brecciated sedimentary rock with strong chalcopyrite mineralization and late white calcite veinlets. B) Altered fine grained feldspar porphyry sill with sulfide mineralization. C) Chalcopyrite and pyrite in dark biotite hornfels sedimentary rock. D) Rubbly mineralized zone, with inferred anhydride dissolution. E) Quartz vein with gray molybdenite in the vein centre and along the vein selvages. F) Coarse crowded feldspar biotite porphyry intrusion that occurs on the east side of the Ox deposit. Note the pink K-feldspar vein in the middle row.*

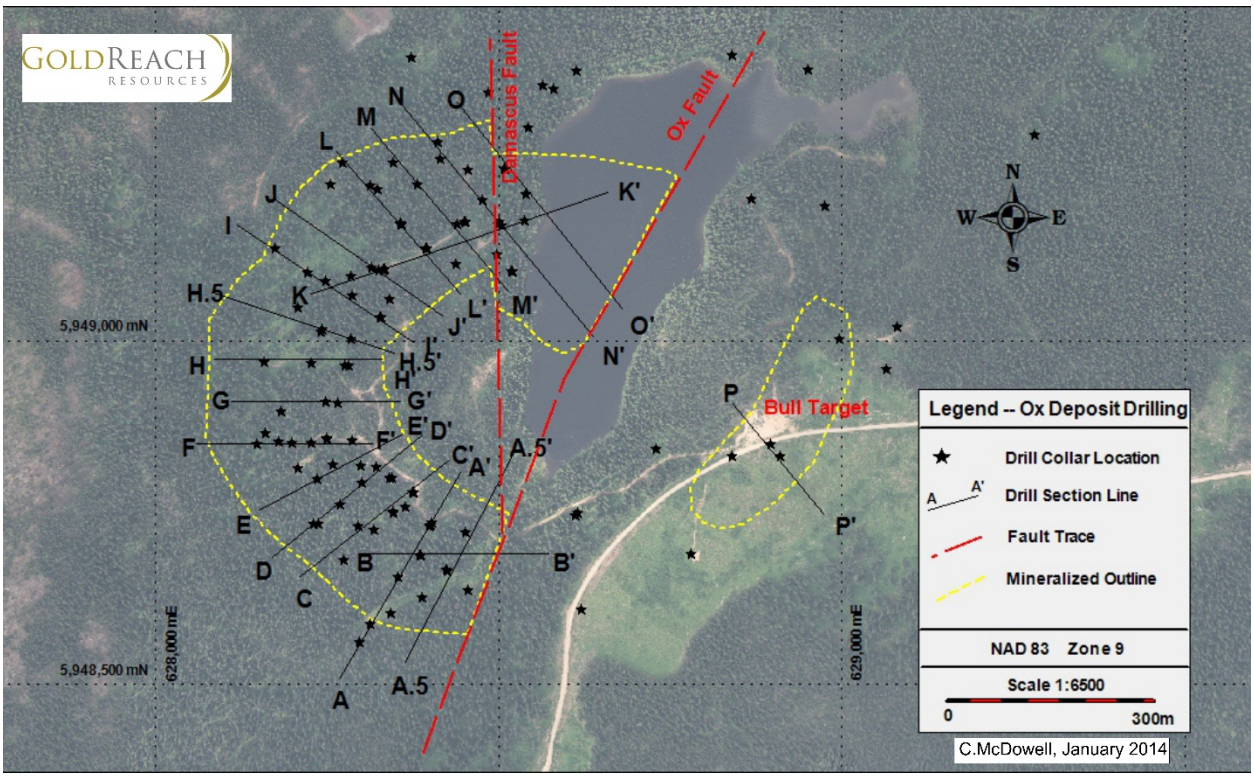
Mineralized zones at Ox contain quartz-sulfide veins along with disseminated and fracture controlled sulfides. Quartz veining is weak to moderate with early quartz-molybdenite veins and later quartz-chalcopyrite-pyrite veins. Pyrite and chalcopyrite are commonly disseminated, in

blebs, and along fractures throughout the rock. Minor magnetite occurs locally. Anhydrite dissolution appears to have left parts of the near surface mineralized zone at Ox relatively friable and broken up. Late pyrite veinlets and late calcite veinlets are abundant locally.

A volumetrically minor episode of post-mineralization mafic dikes, with quartz-carbonate veins and chlorite alteration, occur locally, some controlled by late faults. A late episode of "Seel Breccia"-style fault-controlled calcite-tan Fe-carbonate-quartz and base metal sulfide veins occur at Ox. A 10 m intersection of quartz-carbonate veining (4 m true width) with faint crustiform banding was encountered in Ox12-33 and returned 147 g/t Ag (4.3 ounces per tonne) and 11.1% combined lead and zinc.

Several cross sections have been constructed through the Ox deposit to help illustrate the known geometry of the zone (see www.goldreachresources.com). Three typical sections through the south, central and north portions of the deposit have been included in this PEA (Figures 7.15 to 7.17) and the locations of the sections are shown on Figure 7.14. To date, the mineralized zone at Ox has been identified over a curved length of 1,000 m and typically has widths ranging from 175 to 200 m and extending to depths between 150 and 250 m below surface. Within this mineralized zone lies a higher grade core measuring 850 m x 100 m x 100 m.

Figure 7.14 Ox Deposit--Cross Section Locations



Mineralization is hosted in the sedimentary (grey) rocks and in fine to medium grained feldspar porphyry (pink) on all sections, has a gradational boundary on the west side and is bounded by the coarse crowded feldspar biotite porphyry (orange) on the east side. In general, mineralization appears to be greatest adjacent to the intrusive contact and near surface, with grades decreasing with depth and away from the contact. Mineralization extends from 150 to 250 m below surface then dies out at depth. Significant alteration is still present in the rocks underlying the mineralized zone but Cu and Mo values are generally weak and patchy. It is possible that the Ox

mineralized zone was originally east dipping and has locally been truncated along its length by the Ox Fault. Alternatively, the exposed level at Ox could be near the base of the deposit, inferred from a possible increase in albite with depth.

Figure 7.15 Ox Cross Section A-A' with Drill Holes and Simplified Geology

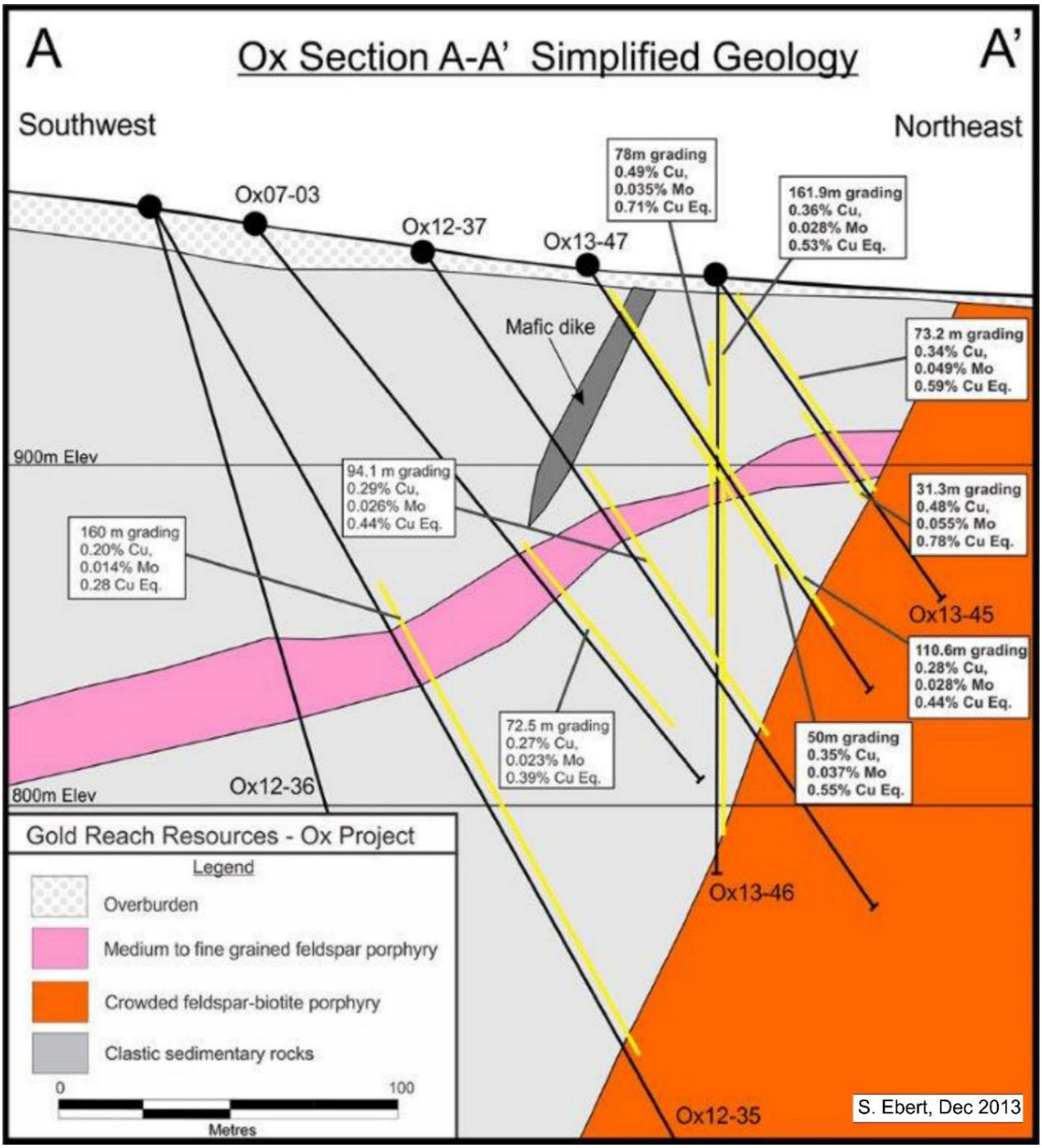


Figure 7.16 Ox Cross Section G-G' with Drill Holes and Simplified Geology

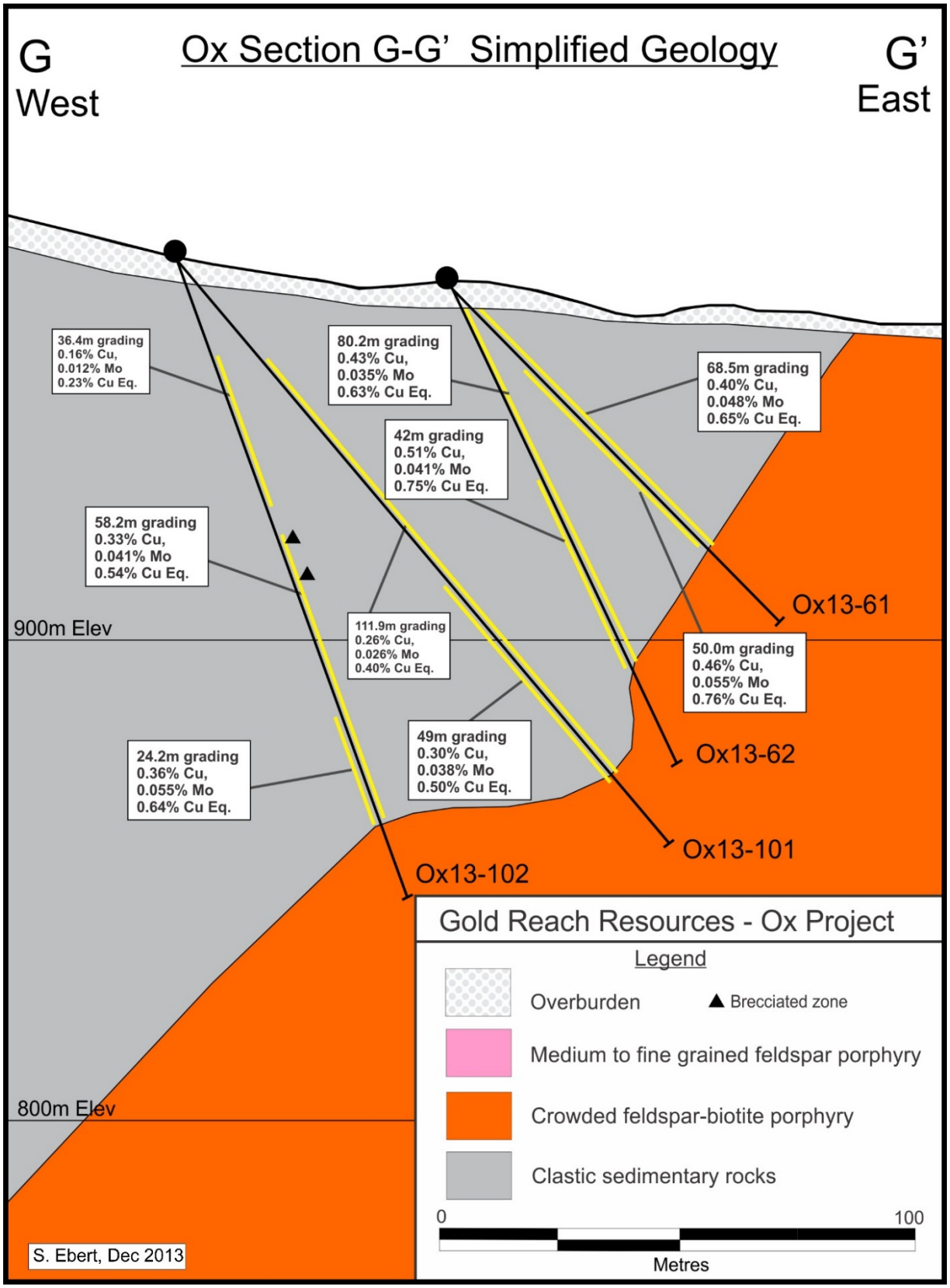
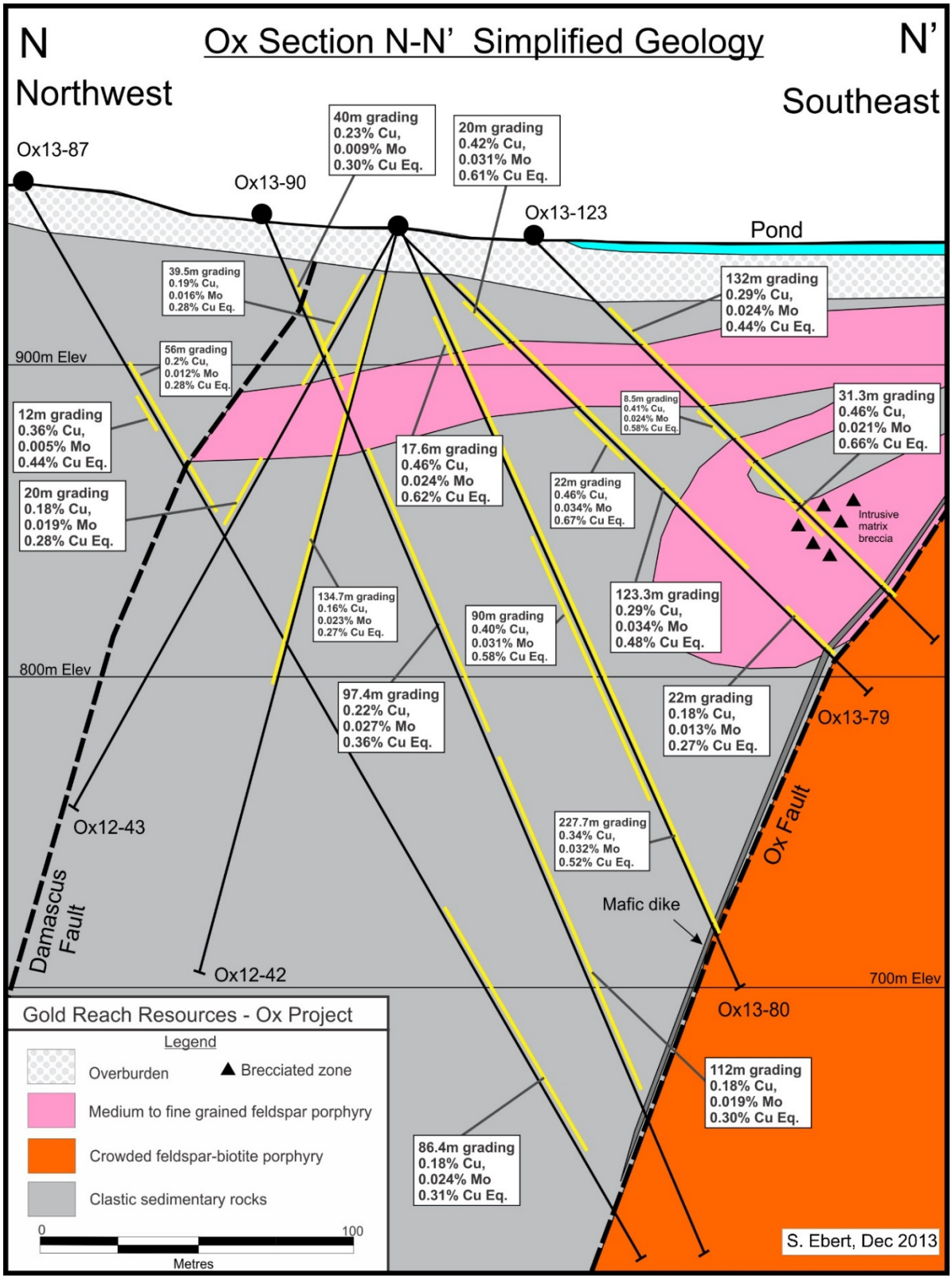


Figure 7.17 Ox Cross Section N-N' with Drill Holes and Simplified Geology



Select drill hole results from the Ox Deposit are presented in Table 7.4.

TABLE 7.4
SELECT DRILL HOLE RESULTS FROM THE OX DEPOSIT

Drill Hole	From (m)	To (m)	Width (m)*	Cu %	Mo%	Au g/t	Ag g/t	Cu Eq.%**
Ox13-46	5.1	167	161.9	0.36	0.028	0.06	1.85	0.53
including	19	97	78	0.49	0.035	0.08	2.15	0.71
Ox13-61	7.7	76.2	68.5	0.4	0.048	0.07	1.46	0.65
including	22	72	50	0.46	0.055	0.09	1.67	0.76
Ox13-62	5.8	86	80.2	0.43	0.035	0.07	1.73	0.63
including	44	86	42	0.51	0.041	0.09	1.99	0.75
Ox13-70	11.1	202	190.9	0.29	0.035	0.05	1.97	0.48
including	122	202	80	0.36	0.039	0.06	2.8	0.58
including	144	158	14	0.81	0.030	0.14	6.66	1.1
Ox13-71	24.6	384	359.4	0.25	0.031	0.04	1.19	0.41
including	24.6	197	172.4	0.32	0.042	0.06	1.87	0.55
including	57	109	52	0.5	0.037	0.09	2.65	0.73
Ox13-78	8.7	234.3	225.6	0.3	0.032	0.05	1.73	0.48
including	74	100	26	0.44	0.032	0.06	2.43	0.63
Ox13-80	18.3	246	227.7	0.34	0.032	0.05	1.73	0.52
including	28	45.6	17.6	0.46	0.024	0.07	2.23	0.62
Ox13-99	15.3	116.5	101.2	0.33	0.035	0.07	1.78	0.53
including	76	116.5	40.5	0.46	0.046	0.1	2.69	0.74
Ox13-110	5.4	108.7	103.3	0.44	0.04	0.06	1.89	0.66
including	5.4	46	40.6	0.57	0.034	0.09	2.62	0.79
Ox13-112	10	125	115	0.39	0.024	0.08	1.91	0.56
including	36	125	89	0.42	0.021	0.08	2.04	0.58
including	52	66	14	0.88	0.015	0.17	4.06	1.09

**Width refers to drill hole intercepts, true widths have not been determined. EOH = end of hole.*
***Cu Eq. (copper equivalent) has been used to express the combined value of copper, molybdenum, gold and silver as a percentage of copper, and is provided for illustrative purposes only. No allowances have been made for recovery losses that may occur should mining eventually result. Calculations use metal prices of US $2.50/lb copper, $1200/oz gold, $15 silver, and $10/lb molybdenum using the formula Cu Eq.% = Cu% + (Au g/t x 0.701) + (Ag g/t x 0.0087) + (Mo% x 4.01).*

8.0 DEPOSIT TYPE

The Ox, East Seel, West Seel, and the adjacent Huckleberry Mine, are classified as porphyry copper deposits as they share features characteristic of porphyry copper systems, based on their geometry, association with intrusive rocks, nature of disseminated and veinlet controlled mineralization, alteration assemblages, alteration zonation patterns, and metal associations.

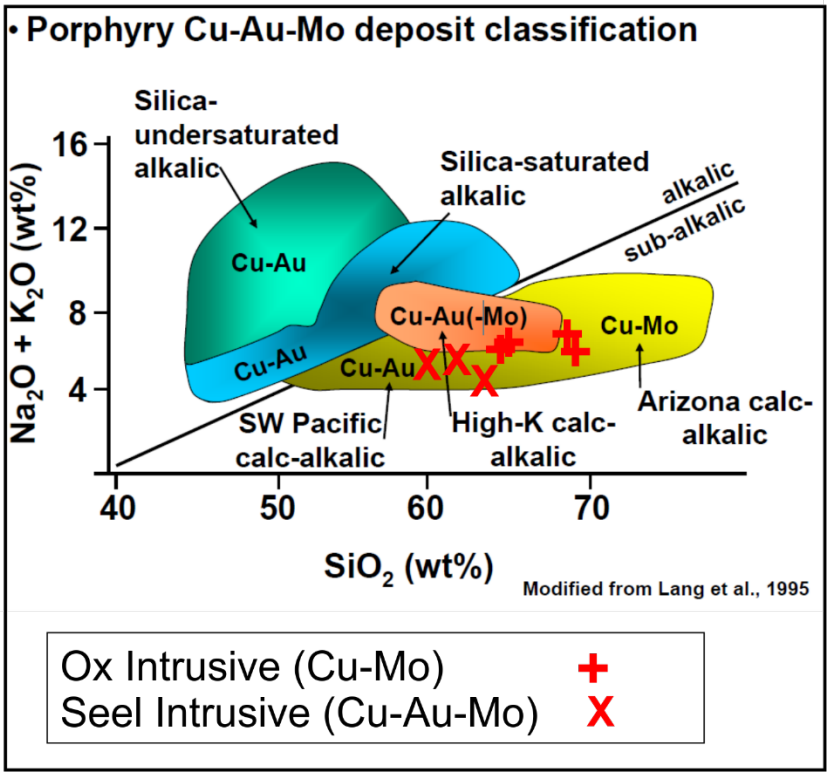
Roughly three-quarters of global Cu production, half of global Mo production and around one-fifth of global Au production come from porphyry Cu systems (Sillitoe, 2010). Significant by-product metals from porphyry systems include Re, Ag, Pd, Te, Se, Bi, Zn, and Pb. Porphyry Cu systems form at convergent plate boundaries and include a wide range of mineralization types, including porphyry deposits centered on intrusions, deposits in wallrocks surrounding intrusions, and a range of vein and replacement style deposits that form at different depths and different distances from intrusions (e.g. Sillitoe, 2010). Porphyry deposits commonly occur along linear trends reflecting structural controls above large composite plutons which supply magmas, fluids, and metals that form porphyry deposits.

Porphyry Cu ± Au ± Mo deposits are generally centered on intrusions or their hornfelsed wallrocks. In non-carbonate bearing rocks, structurally controlled base metal and Ag bearing veins can occur peripheral to porphyry Cu centres and where preserved high-sulfidation epithermal deposits may occur in strongly altered and leached rocks above porphyry Cu deposits. Porphyry Cu deposits display a consistent, broad-scale alteration and mineralization zoning pattern that typically affects several cubic kilometres of rock. Porphyry mineralization typically occurs in quartz-bearing veinlets, and locally sulfide veinlets, as well as disseminated throughout the host rocks. Large pyrite halos are known to occur around mineralized zones in several porphyry districts. The deposits typically contain large alteration zones consisting of deep sodic-calcic alteration, centrally located potassic alteration, and higher level or peripheral chlorite-sericite, sericitic, argillic, and advanced argillic alteration. Younger alteration zones commonly overprint older alteration zones in porphyry systems.

The East and West Seel and Ox deposits contain disseminated and veinlet controlled Cu-Au-Mo-Ag mineralization and large zones of potassic, sericitic, chlorite-bearing, and argillic alteration assemblages, consistent with classification as a porphyry Cu system. Late base metal silver veins at the Seel Breccia and Damascus areas share characteristics with base metal Ag veins known to occur around porphyry deposits.

Whole rock geochemistry on associated intrusive rocks indicate the Seel and Ox deposits fall into the sub-classification of calc alkaline porphyry deposits (refer to Figure 8.1).

Figure 8.1 Total Alkali Vs. Silica Diagram Showing Samples from Ox and Seel Intrusives Superimposed on a Porphyry Classification Scheme from Lang Et Al. (1995)*



**Intrusives associated with the Ox and Seel deposits have calc-alkaline chemistry.*

The large size of porphyry deposits and the large zones of associated sulfide mineralization make them especially amenable to geophysical exploration. Induced polarization surveys are routinely used in porphyry exploration to outline sulfide zones and associated pyrite halos. Resistivity surveys have also been used to successfully outline the large zones of hydrothermal alteration. Conventional soil geochemical exploration is also very effective for identifying drill targets in areas of thin cover.

9.0 EXPLORATION

9.1 INTRODUCTION

Gold Reach optioned the Seel deposit in May 2004 and commenced exploration in the district at that time. All of the work conducted on the Property prior to 2004 is described in Section 6 of this PEA. Work conducted by Gold Reach from 2004 to present, is summarized below. Compilation maps summarizing much of the exploration work completed are shown at the end of this section. Drilling details including drill hole maps and drill hole results are described in Section 10 of this PEA.

9.2 2004 EXPLORATION

During 2004, Gold Reach conducted its initial exploration program on the Seel Property, which included grid cutting, and IP and magnetic surveying, as well as diamond drilling. SJ Geophysics Ltd. conducted 2D/3D IP and magnetic surveying on a single grid consisting of 10 lines, each 2,000 m in length. The 3D-IP lines had a separation of 100 m, while the three 2D lines were spaced at 200 m intervals with pickets placed every 50 m for both surveys. The IP survey was successful in delineating some NNE linear features and showed a zone of high chargeability with a corresponding low resistivity adjacent to the Seel Breccia (Rastad, 2004).

A diamond drill program conducted during the winter of 2004-05 was designed to test the Seel breccia and various IP and magnetic anomalies outlined by the geophysical surveys. The drill program took place between December 7, 2004 and January 20, 2005 when 9 drill holes, totalling 3,370 m, were completed (MacIntyre, 2005). The program successfully discovered Cu-Au porphyry style mineralization at the East Seel deposit, while testing an IP chargeability anomaly.

9.3 2005 EXPLORATION

In 2005, additional diamond drilling, IP surveying, geologic mapping, prospecting and surface sampling was conducted at Seel. An 8-hole diamond drill program was completed at East Seel between February 20 and March 20, 2005 as follow up to the recent East Seel discovery (Daubeny and Smit, 2005).

During June and July 2005, Gold Reach conducted 51.4 line km of 3D/2D induced polarization and magnetometer surveying on a 5 km long, 2 to 4 km wide, and 29-line grid. The 2005 survey consisted of northeast and southwest extensions to the survey conducted in 2004 and together these two surveys defined a 2.3 x 1.3 km strong IP response underlying the SW portion of the grid and a “peripheral” IP feature underlying the NE portion. Details from this survey are included in a report entitled “3D Induced Polarization and Magnetic Survey on the Seel Property for Grayd Resource Corporation and Gold Reach Resources Ltd.” dated July 2005 (Chen and Rastad, 2005).

Reconnaissance exploration was undertaken during 2005, including geologic mapping, prospecting, and rock and stream sediment sampling. A description of this program and the results obtained are included in an assessment report entitled “Diamond Drilling Report on the Seel Property” by D.G. MacIntyre (2005). Geologic mapping was conducted over a nine-day period in September and combined with mapping data from previous exploration programs and federal and provincial surveys to produce a simplified geological compilation map of the district.

9.4 2006 EXPLORATION

During 2006, field activities included two separate diamond drill programs, access trail construction, line cutting, IP and magnetometer geophysical surveys and some limited stream sampling (Welsh, 2007). An NQ diamond drill program commenced in early December 2005 and finished on February 1, 2006, with a total of 3,243 m over 15 drill holes. The program was designed to further test the extent of potentially economic porphyry copper-molybdenum-gold mineralization first intersected in 2004 and 2005 and to test IP and magnetic anomalies defined during the 2004 and 2005 programs.

Later in 2006, during August and September, a 15-hole 3,638 m diamond drill program was carried out designed to further expand on the known porphyry-style mineralization intersected at East Seel. The adjacent Seel Breccia zone was also tested. A 10.5 line km 3D induced polarization and magnetometer survey was carried out over a 1.5 km long by 1.2 km wide (7 lines) expanding earlier surveys. A stream sediment survey was conducted to test the south-eastern portion of the Property, which had no recorded prior sampling.

9.5 2007 AND 2008 EXPLORATION

In January 2007, Gold Reach acquired the Ox deposit from Silver Standard Resources Inc. A 3D induced polarization ("3D IP") and magnetometer survey was conducted with 48.6 line km carried out on the Ox grid and 3.6 line km done to extend the Seel grid. The purpose of the survey was to assist with the geological mapping process by outlining subsurface features, as well as to delineate porphyry Cu-Au-Mo drill targets.

In 2007, Gold Reach drilled 12 holes for 3,232 m at the Seel Breccia and East Seel East zones and 26 holes for 6,142 m at Ox. In 2008 Gold Reach drilled a further 21 holes for 4,408 m at East Seel.

In 2008, Wardrop Engineering Inc. conducted NI43-101 resource estimates for both the Seel and Ox deposits (Stubens et al., 2008; Arseneau et al., 2008) for Gold Reach, and demonstrated significant Cu, Mo, Au, and Ag mineralization within each deposit.

9.6 2009 EXPLORATION

An airborne geophysical survey totalling 1,325 line km was completed on the Ootsa Property between October 4 and 10, 2009. The survey consisted of Airborne Gamma Ray Spectrometer and a magnetometer survey over the entire claim block (Strickland, 2010). The survey was flown at 200 m spacing with the line orientation of due east-west. PRA Metallurgical Division, a subsidiary of Inspectorate America Corp., completed initial flotation tests on 2 composite samples of drill core, one from Seel, and one from Ox. Recoveries of 93% Cu were obtained for Seel, and 93.9% Cu for Ox in rougher flotation concentrates.

9.7 2011 EXPLORATION

During 2011, grid cutting and 44.5 line km of 3D-IP surveying was completed at the Ootsa Project, surface mapping and rock sampling was conducted, and 1,589 soil samples were collected. Several historic core holes were re-logged and simplified geologic and alteration modelling of the Seel deposit was initiated. A total of 10,393.4 m of NQ2 core was drilled over

20 holes at the East Seel Deposit. This drilling resulted in the discovery of the West Seel deposit. Following known mineralization to the west, as well as continuing to test a large IP chargeability anomaly, both played key roles in the discovering the West Seel deposit. However, the presence of increasing potassic alteration intensity at depth was a key factor in allowing the test holes to extend to significant depths (>500 m to 737 m) and continuing to step out to the West. Following the 2011 drilling, a resource update and technical report was completed on the Seel deposit (McDowell and Giroux, 2012).

A total of 1,589 conventional B-horizon soil samples were collected during the 2011 exploration program. Of that total, 859 were analysed for gold by fire assay and ICP aqua regia digestion and 730 were analysed by field portable XRF spectrometer. Several hundred of the samples sent for ICP analyses were also analyzed by XRF and comparison of the two methods showed that Cu and other base metals analysed by XRF return comparable anomalies to those analysed by ICP. The 2011 soil sampling program showed a strong Cu-in-soil anomaly located to the northwest of the Ox deposit over an area roughly 800 m long by 250 m wide and partially coinciding with a historic IP chargeability anomaly. A smaller less pronounced Cu-in-soil anomaly was identified about 2 km west of Ox and partially overlaps a chargeability high.

9.8 2012 EXPLORATION

During 2012, Gold Reach completed diamond drilling, metallurgy, IP surveying, soil sampling, mapping and carried out improvements to Property infrastructure (McDowell and Giroux, 2013). A total of 45,147 m of core over 67 holes were drilled on the Property, of which 46 were drilled at the East and West Seel deposits, 18 were drilled at Ox and 3 holes tested regional targets. An additional 2,179 conventional B-horizon soil samples were taken in 2012 and analyzed on site with a portable XRF spectrometer. Gold Reach completed 42.9 line km of a combined IP and resistivity survey that involved 14 km of line cutting and greater than 28 km of reconnaissance surveying along existing roads. One metallurgy-specific hole was drilled into the Seel Cu-Au zone in 2012 in order to augment metallurgical data already in hand. In 2012, metallurgical flotation test work was performed by Inspectorate Exploration and Mining Services Ltd. on 3 samples, 2 from West Seel and one from East Seel. In July 2012, Eagle Mapping Ltd. performed an aerial Light Detection and Ranging ("LiDAR") survey of the Ootsa Property covering a total of 103 square km around the Ox and Seel deposits.

Gold Reach completed many improvements to infrastructure at the Ootsa Property during the 2012 field season, including the addition of a trailer camp capable of sleeping 21 people and complete with kitchen, bath, laundry, workshop and storage facilities. A new septic system was designed and installed in order to handle the greater camp capacity, as was a pressurized water system. In addition, Gold Reach resurfaced 3.5 km of the Seel access road with gravel sourced locally. A new steel bridge to the West Seel deposit was also installed.

9.9 2013 EXPLORATION

During 2013, diamond drilling, soil, stream sediment and rock grab sampling, geologic mapping and 76 line km of geophysical surveying were completed. A total of 36,135 m of drilling over 147 holes was drilled. Of this total, 17,372 m over 90 holes were drilled at Ox, 16,887 m over 53 holes were drilled at Seel and 1,876 m over 4 holes tested regional targets. The 2013 drilling program resulted in the extension of the Ox mineralized zone roughly 200 m to the northeast, and the delineation of higher grade mineralized zones at Ox, East Seel and West Seel. A single composite metallurgical sample from West Seel was also submitted to Inspectorate Exploration

and Mining Services Ltd. to better define Cu, Au, and Mo recovery by floating methods. After the 2013 drilling program, resource updates were performed on both the Ox and Seel deposits (Boyce and Giroux, 2014).

In 2013, the Company collected 1,330 B-horizon soil samples, 42 stream silt samples, and 25 surface rock samples. A large lead in soil anomaly located east of the Damascus silver-lead-zinc vein was discovered measuring 530 m by 150 m in size and has been termed the East Damascus Target. Two surface rock samples from the Eastern part of the claim block (roughly 18 km east of Seel) have returned 1.63 g/t Au and 2.02 g/t Au from rusty quartz vein and breccia outcrops.

During the 2013 program, 76 line km of new IP geophysical surveying was undertaken at Ootsa in three areas to expand coverage and explore new areas. The main Seel deposit area was also re-surveyed by SJ Geophysics, using their proprietary Volterra Geoimaging Distributed Acquisition System to collect 3D IP data. The new data has proved to have much higher resolution and depth penetration than the previous surveys and has aided in the understanding of the Seel area and defining drill targets.

In 2013, an Archeological field reconnaissance study was conducted over the Ox and Seel deposit areas, as well as select exploration targets. An Archaeological Overview Assessment was also carried out over the permitted exploration area by Archer CRM Partnership.

9.10 2014 EXPLORATION

A total of 9,795 m of drilling was completed in 2014, with 11 holes drilled at the West Seel deposit and 9 short holes drilled on exploration targets located a few kilometres to the East of the Seel deposits. The West Seel drilling successfully delineated the extent of the West Seel deposit to the North and expanded known higher grades trends. A higher grade zone in the core of the deposit has been confirmed. Mineralization at West Seel has been defined over an area 750 m long by up to 400 m wide and extends from surface to depths exceeding 1,000 m. A higher grade core occurs over an area 500 m long by up to 250 m wide and extends from surface to over 600 m depth.

At the end of the 2014 drilling program, 9 short holes (ER14-01 to ER14-09) were drilled to test three separate silver base-metal vein targets, located several kilometres East of the Seel deposit. This drilling did not intersect any significantly mineralized zones, however, several anomalous intervals were encountered and these holes have provided valuable geologic information to help advance exploration targets in these areas. Anomalous intervals were encountered in hole ER14-03 at the Blackjack target, with 2 m of vein mineralization intersected grading 13 g/t Ag, 0.5% Pb and >1% Zn from 158 to 160 m depth. Holes ER14-04 to 09 were all drilled at East Damascus to target a large soil geochemical anomaly coincident with a prominent fault zone. Drilling at East Damascus intersected large continuous zones of highly altered rock and confirmed the presence of a significant fault zone. All of the holes encountered patchy zones of anomalous gold including 0.68 g/t Au over 2 m in hole ER14-08 and 9.2 m grading 0.27 g/t Au in hole ER14-08. Hole ER14-08 also intersected 22 m of 0.24% Zn. The presence of anomalous gold associated with the large alteration zone at East Damascus opens up the possibility for new bulk minable gold targets in the area.

2,441 soil samples were taken during the 2014 exploration program, adding to an existing database now totalling 9,479 soil samples for the Ootsa Property. Several new exploration targets have been identified. Base line water sampling, fish studies, an Archaeological field reconnaissance study and a desktop wildlife study were conducted in 2014 by ERM Consultants Canada Ltd.

9.11 2015 EXPLORATION

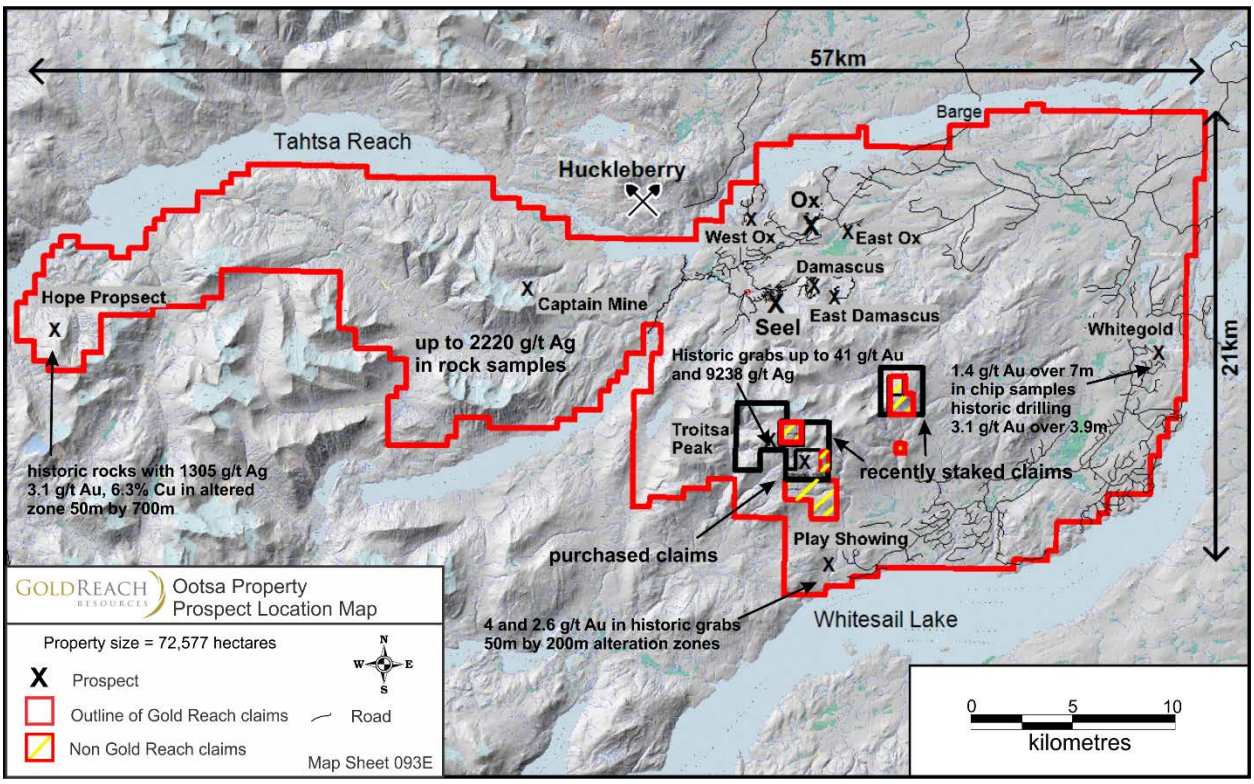
During 2015, limited reconnaissance soil sampling was undertaken at the North Damascus target area. A total of 42 B-horizon soil samples were collected at 25 m spacing, along 2 lines each 500 m in length. The sampling was designed to expand or close a large arsenic (plus Au) in soil anomaly. A preliminary economic assessment of the Ootsa Property was initiated in 2015 and is the subject of this PEA.

9.12 EXPLORATION TARGETS

9.12.1 Property Wide Exploration Targets

The Ootsa Property is up to 57 km long by up to 21 km wide and hosts numerous exploration targets (Figure 9.1), many of which have seen very little recent exploration. These targets are briefly summarized below and then followed by an exploration compilation of the area surrounding the Ox and Seel deposits.

Figure 9.1 Ootsa Property Prospect Location Map Showing the Main Known Exploration Targets on the Property



The Hope prospect is located near the west end of Tahtsa Reach and is 22 km northeast of Kemano. The prospect was intermittently explored from 1982 to 1990 and historic exploration

consisted of sampling, mapping, trenching and geophysical surveys. Historic work has delineated a sulphide-bearing alteration zone within volcanic and intrusive rocks that is 40 to 50 m wide and more than 700 m long. This zone locally carries significant gold, silver and base metals in numerous sub-parallel quartz-calcite veins. Historic assessment reports document a chip sample from within the zone that assayed 1,305 g/t Ag and 3.1 g/t Au across 0.17 m, with values from grab samples containing up to 13 g/t Au and 6.3% Cu. Gold Reach has not yet visited or sampled the prospect and none of the historic results have been confirmed by the Company and they should not be relied upon.

The historic Captain Mine located roughly 10 km West of the Seel and Ox area, contains 3 exploration adits, which follow a high grade silver-lead-zinc vein. One of the adits extends about 100 m into the hillside and remains in good condition. Gold Reach collected 2 samples from the adit, which returned values up to 2,220 g/t Ag (65 ounces per tonne), 9.2% Pb, and 0.27% Cu. The exposed vein at Captain can be readily explored from the underground workings and from surface exposure and the area is considered prospective for both high grade silver base metal veins and porphyry style mineralization.

The Troitsa Peak prospect is located in the south central part of the Ootsa claim block at high elevation roughly 3.5 km West of the nearest logging road. Historic reports indicate epithermal style veins and alteration extend over an area 2 km by 4 km and the zone has good potential to host both high grade vein and disseminated styles of Au-Ag mineralization. Assessment reports describe surface grab samples with values such as 41 g/t Au and 9,238 g/t Ag, 5.9 g/t Au and 4,120 g/t Ag, 36.5 g/t Au and 825.6 g/t Ag, and 11.4 g/t Au and 2,614.4 g/t Ag. A grab sample from a historic trench returned 3.9 g/t Au and 2,356 g/t Ag and thin veins of quartz-chalcopyrite-sphalerite returned values up to 44.7 g/t Au and 2,683.2 g/t Ag. Gold Reach has not yet visited or sampled the prospect and none of the historic results have been confirmed by the Company and they should not be relied upon.

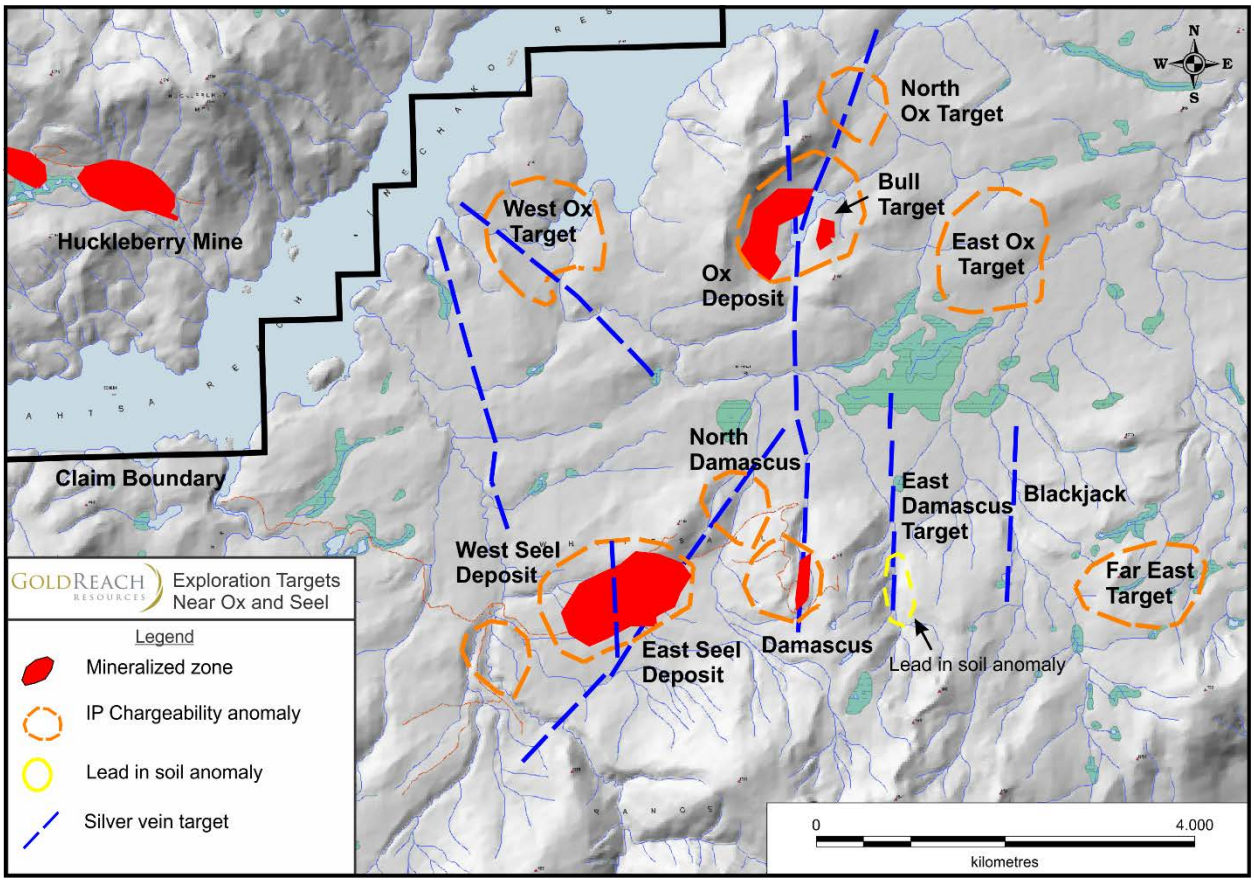
The Play prospect occurs on the Southern edge of the Ootsa claim block roughly 1.2 km west of the nearest logging access road. Alteration and veining have been traced over an area 50 m by 200 m, however limited exploration has been conducted at the zone. Historic sampling in Assessment reports describe surface grab samples containing up to 2.6 g/t Au and 4 g/t Au, however none of the historic results have been confirmed by the Company and they should not be relied upon.

The Whitegold prospect is located at the eastern edge of the Ootsa claim block, and sits roughly 1 km East of the nearest logging access road. The prospect was intermittently explored from 1983 to 1994 (prior to logging road access) with historic exploration work consisting of soil and rock sampling, mapping, prospecting and 13 short diamond drill holes. Historic work has defined a zone 350 m by 130 m containing alteration and quartz veining that remains open for expansion. Historic drilling, as described in a 1984 assessment report by Canamax Resources Inc., intersected numerous mineralized quartz veins with the best interval returning 3.1 g/t Au over 3.9 m. The best historic surface sample was from a quartz and chalcedony vein which graded 7.8 g/t Au. Gold Reach has conducted limited surface soil and rock sampling at Whitegold and successfully traced gold bearing quartz veins for 125 m along strike in a north-northwest direction, with the zone remaining open along strike. Surface chip sampling of outcrop has returned 1.4 g/t Au over 7 m including 4.6 g/t Au over 1 m, and the zone remains open to the southeast. This defines a new drill-ready gold target on the large Ootsa claim block, which can be rapidly advanced by trenching and drilling.

9.12.2 Exploration at the Ox and Seel Deposits

The majority of Gold Reach's exploration work since 2004 has focused on the Ox and Seel Deposits and the immediate surrounding area. Compilation maps summarizing the 2004 to 2015 exploration results are presented below. Drilling details, including drill hole location maps and drill hole results are described in Section 10 of this PEA. Figure 9.2 shows the location of the main exploration targets surrounding the Ox and Seel Deposits and the data to support these targets is presented in Figures 9.3 to 9.10. Two styles of targets are displayed on Figure 9.3, porphyry style targets indicated by dashed orange IP chargeability anomalies and high grade silver base-metal vein targets indicated by dashed blue lines.

Figure 9.2 Location of the Main Exploration Targets Around the Ox and Seel Deposits

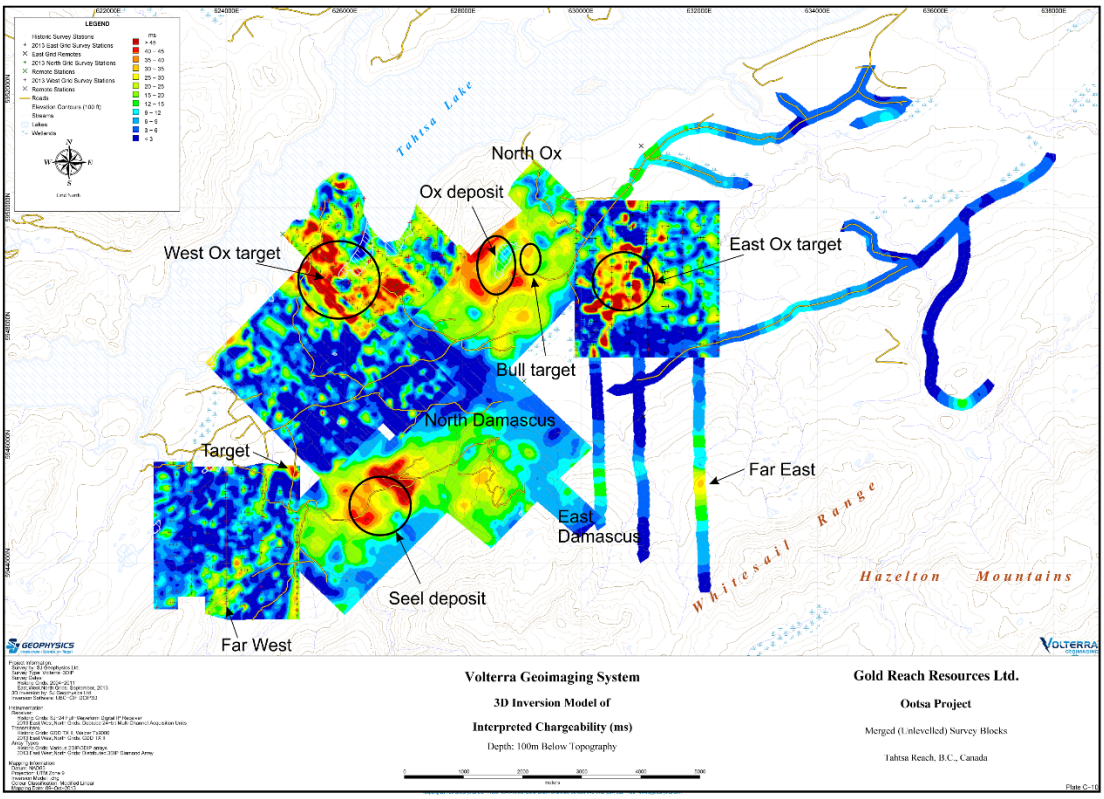


Figures 9.3 and 9.4 show modeled induced polarization ("IP") chargeability and resistive results at 100 m depth for all available IP data. The location of the Ox and Seel Deposits are shown and both coincide with large chargeability highs. There is a large chargeability anomaly located West of the Ox Deposit, termed West Ox, and another East of the Ox Deposit termed East Ox. Together these anomalies form an East-West trend of chargeability highs termed the Ox Trend. The Ox Trend extends over a strike length of 7 km on the Ootsa Property and connects with a similar East-West trend at Huckleberry to the West. To a lesser extent the Seel Deposit area also has chargeability anomalies trending East-West and this has been termed the Seel Trend.

The Seel and Ox Deposits are associated with chargeability highs and resistivity lows (Figures 9.3 and 9.4) and both have low level B-horizon copper in soil anomalies (75 to 200 ppm range) within the overlying glacial till. The East Seel deposit (Cu-Au magnetite association) is

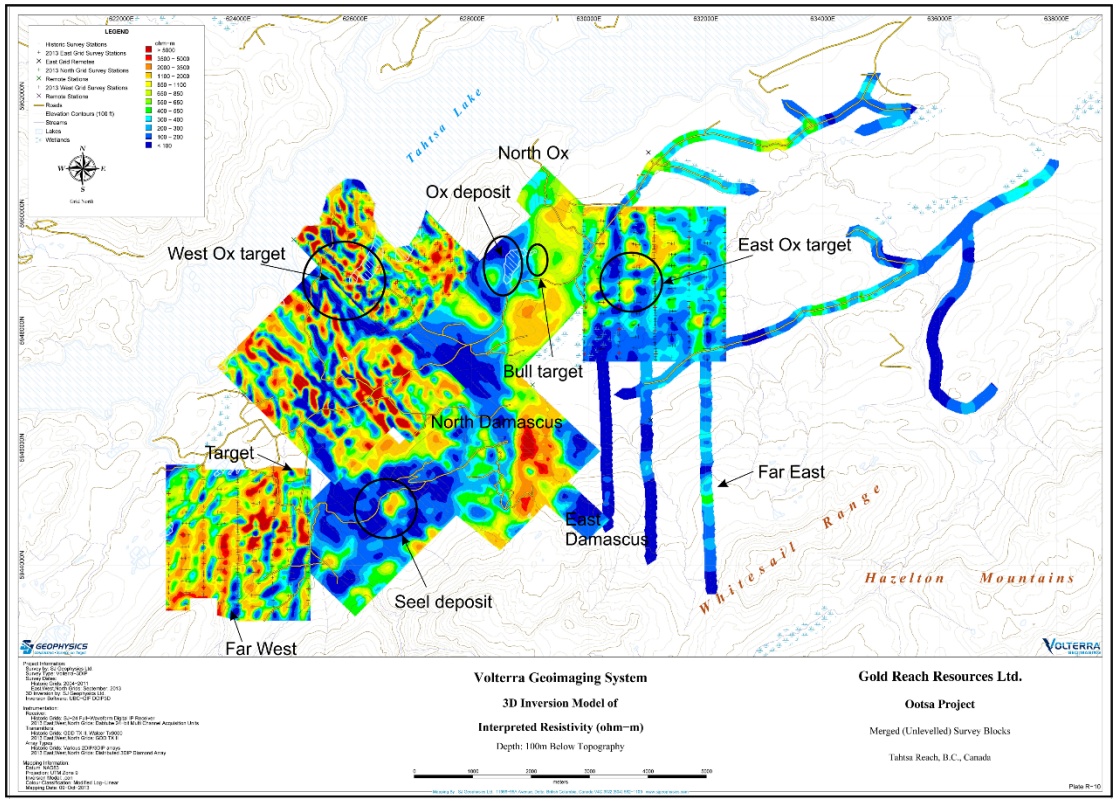
associated with an airborne magnetic high, as is the hornfelsed areole around the Ox deposit (Figure 9.5).

Figure 9.3 Modeled Chargeability Compilation Map, 100 m depth



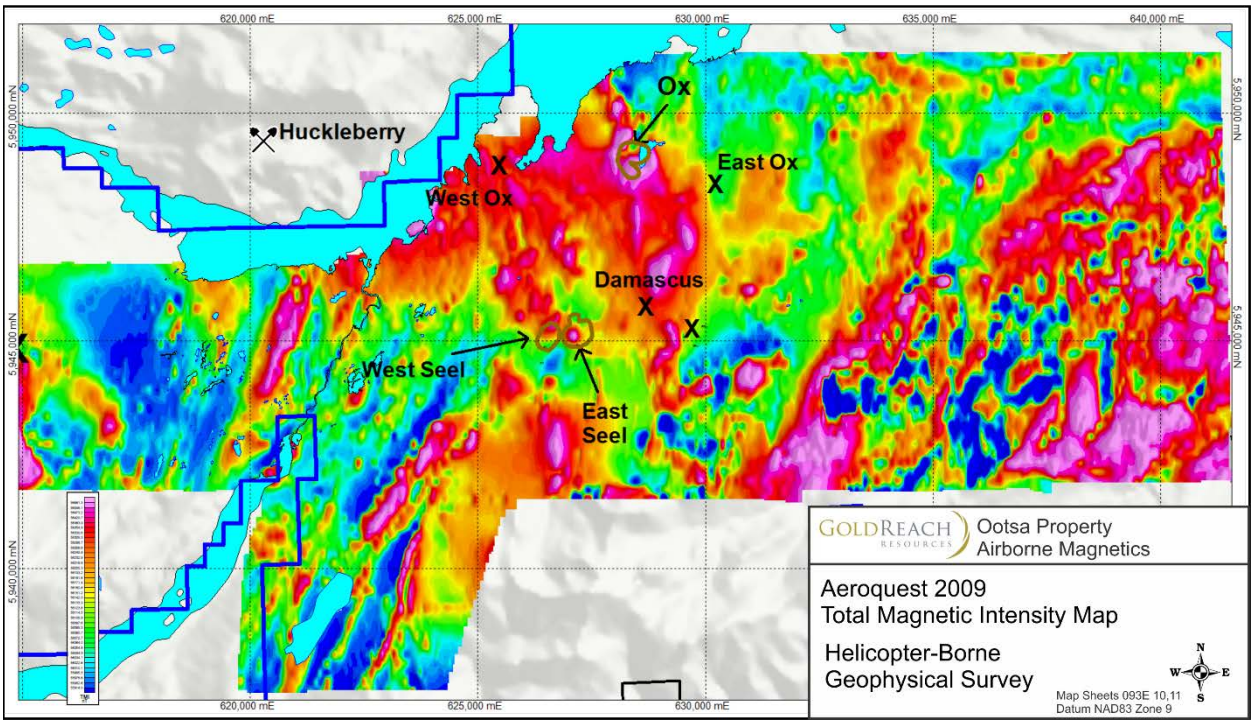
Source: *SJ Geophysics, 2014*

Figure 9.4 Modeled Resistivity Compilation Map, 100 m depth



Source: *SJ Geophysics, 2014*

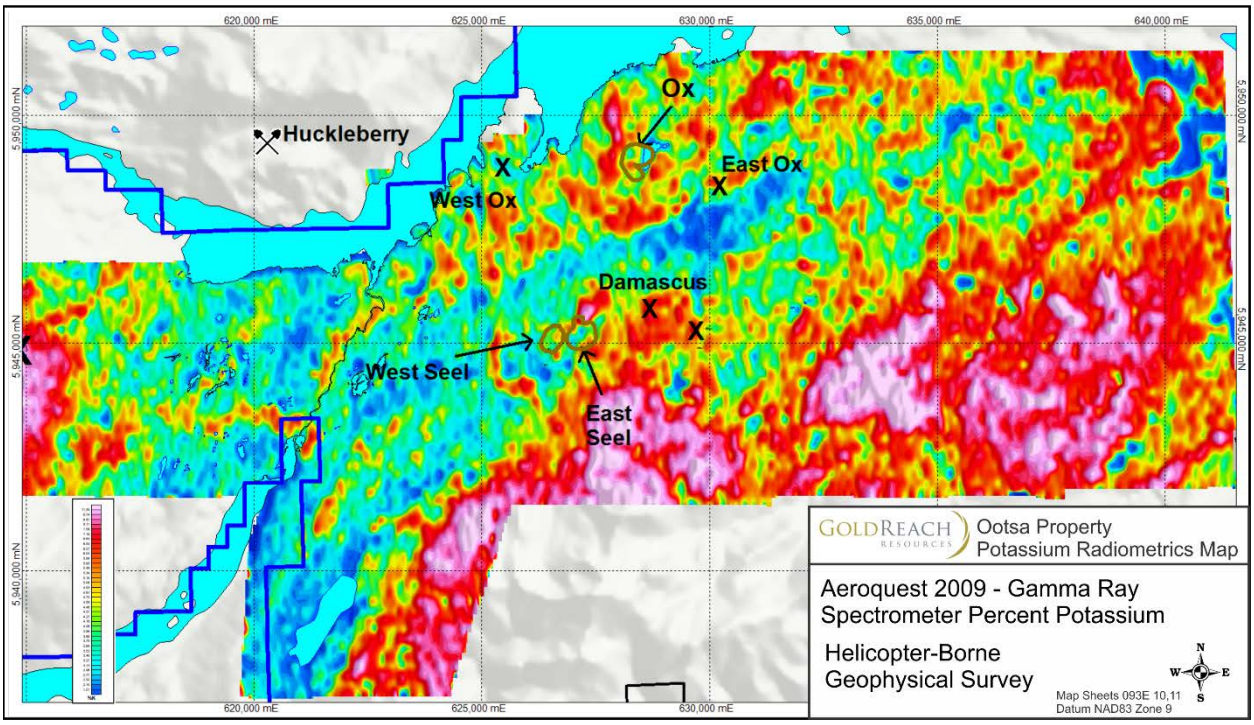
Figure 9.5 Airborne Total Magnetic Intensity Map



Source: *Aeroquest 2009*

Figure 9.6 show potassium distribution from an Aeroquest airborne radiometrics survey. This data has proven useful for mapping rock types in areas of high exposure, such as the ranges to the South and, to a lesser extent, with alteration mapping.

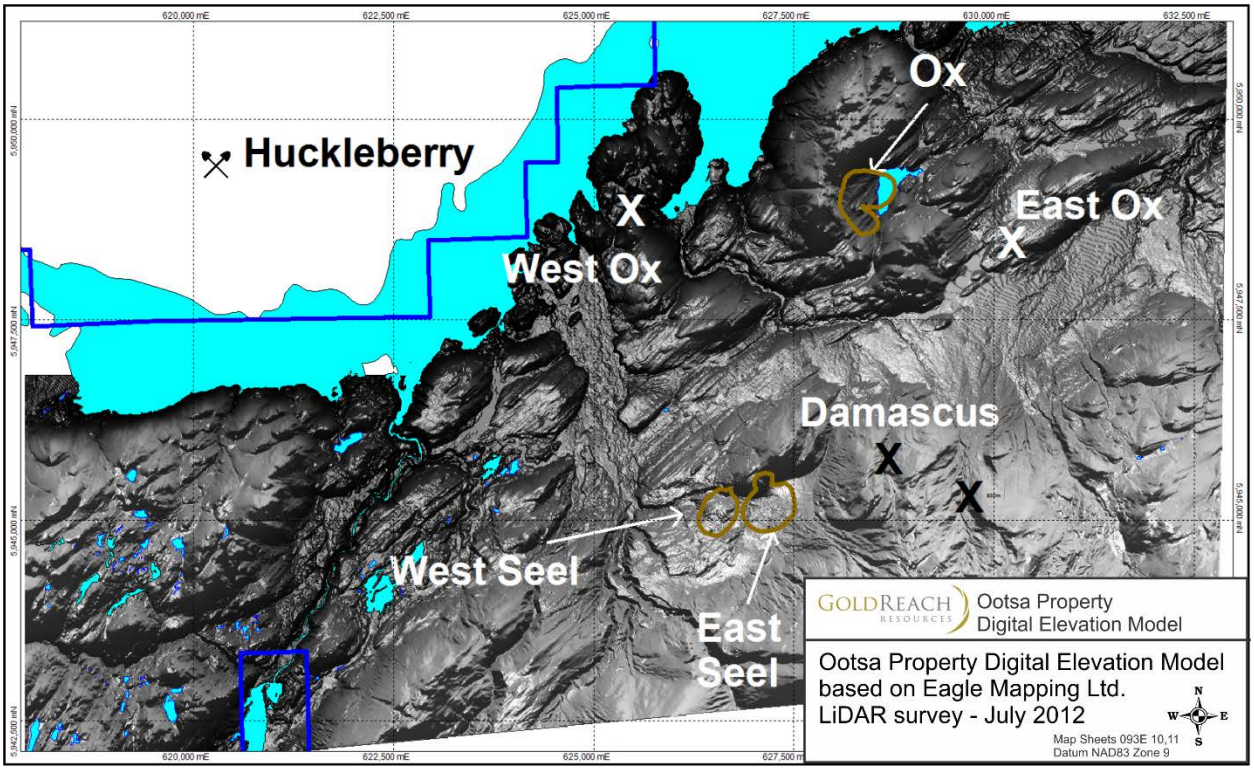
Figure 9.6 Airborne Radiometrics Map Showing Percent Potassium



Source: *Aeroquest 2009*

Figure 9.7 shows a high resolution digital elevation model for the Ootsa Property based on 1 m contour data produced by a LiDAR survey, conducted by Eagle Mapping Ltd. in 2012. This digital elevation model has been used as a base for exploration data collection and has been a valuable tool for mapping structure and surficial glacial features.

Figure 9.7 Digital Elevation Model



Source: *Eagle Mapping, 2012*

Figure 9.8 shows the locations of soil samples from the Ootsa Property. There are a total of 9,522 B-horizon soil samples in Gold Reach's Ootsa Property soil database. Of these 1974 samples are compiled from historic sampling by previous operators and 7,548 samples have been collected by Gold Reach between 2011 and 2015. Some soil samples have been analysed at commercial labs by induced coupled plasma and fire assay methods, some have been analysed on site by Gold Reach after drying and sieving by portable x-ray fluorescence, and some have been analysed by both methods.

Figure 9.8 Soil Sample Location on the Ootsa Property

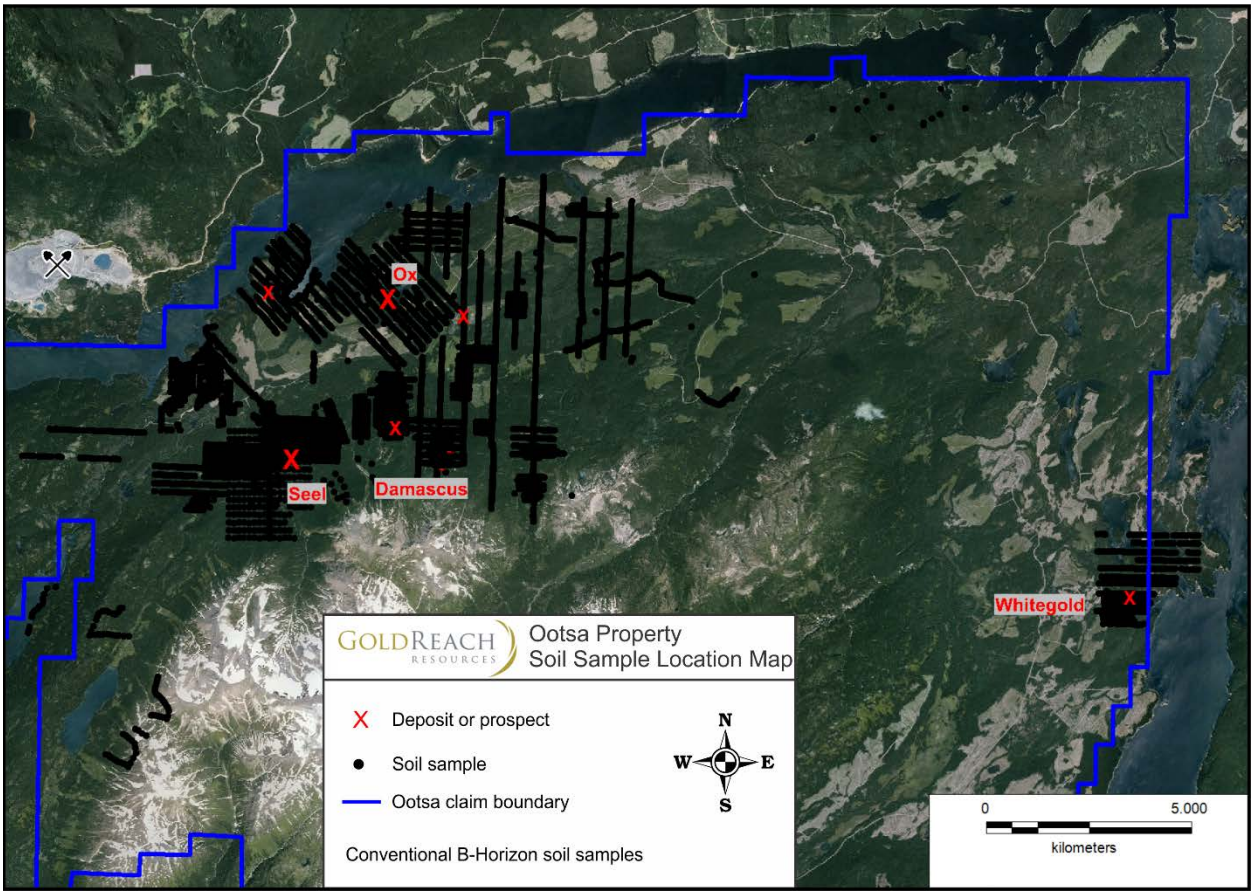


Figure 9.9 shows copper in soil results around the Ox and Seel deposits. The area is dominated by glacial till of varying thickness resulting in B-horizon soil anomalies with varying intensities and erratic distribution over the known deposits. The known deposits, however, stand out well with conventional B-horizon soils. Copper in soil values in the 75 to 200 ppm range (over 3 times to over 8 times background) are considered highly anomalous in soils developed over glacial tills on the Property. The Ox Deposit shows a strong Cu in soil response over the main mineralized zone and also has significant anomalies to the West, East, and North. The Seel Deposit has a more dispersed Cu-in-soil signature with significant anomalies to the southwest (up ice of the deposit) and northeast (down ice of the deposit). Another Cu-in-soil anomaly occurs around the Damascus area.

Figure 9.9 Copper in Soil Results Around the Ox and Seel Deposits

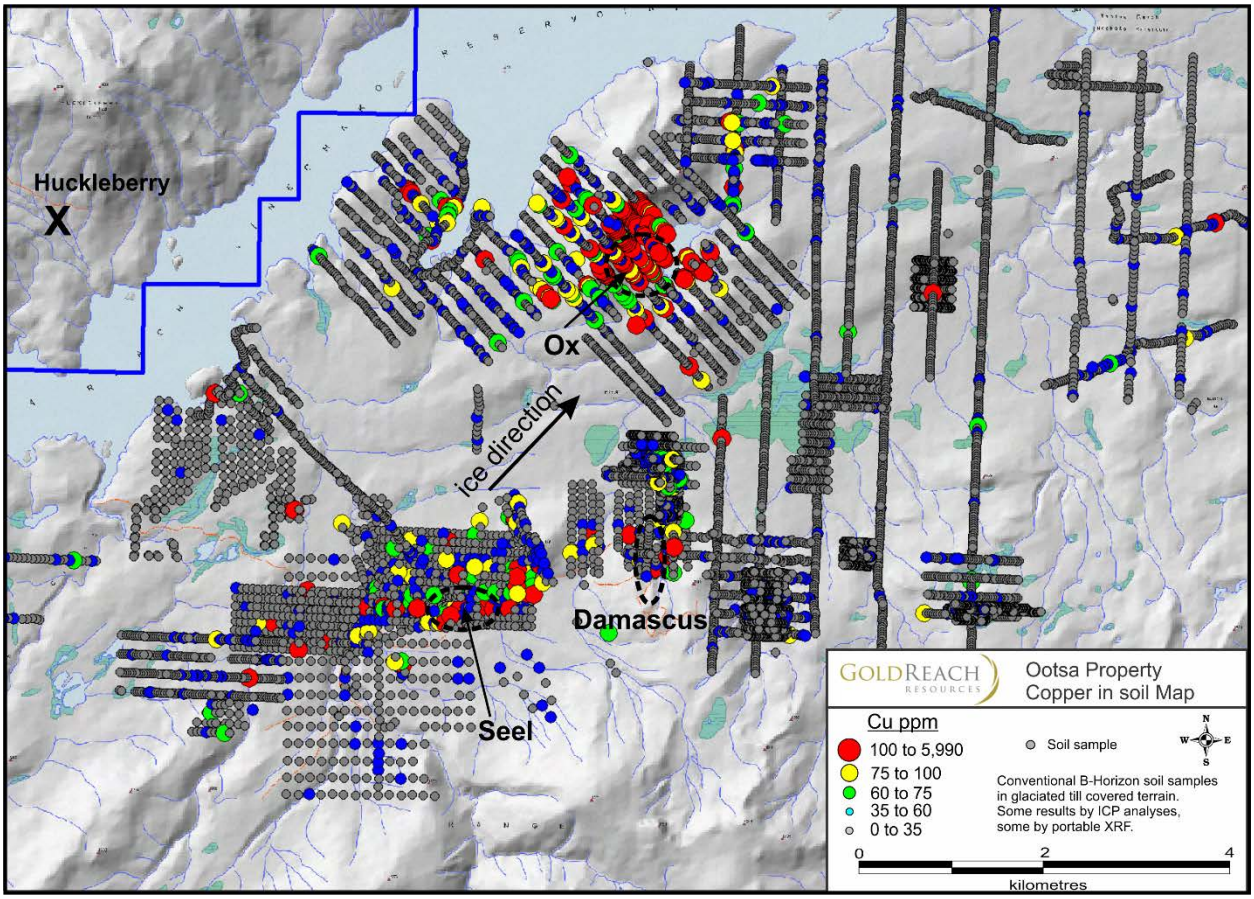
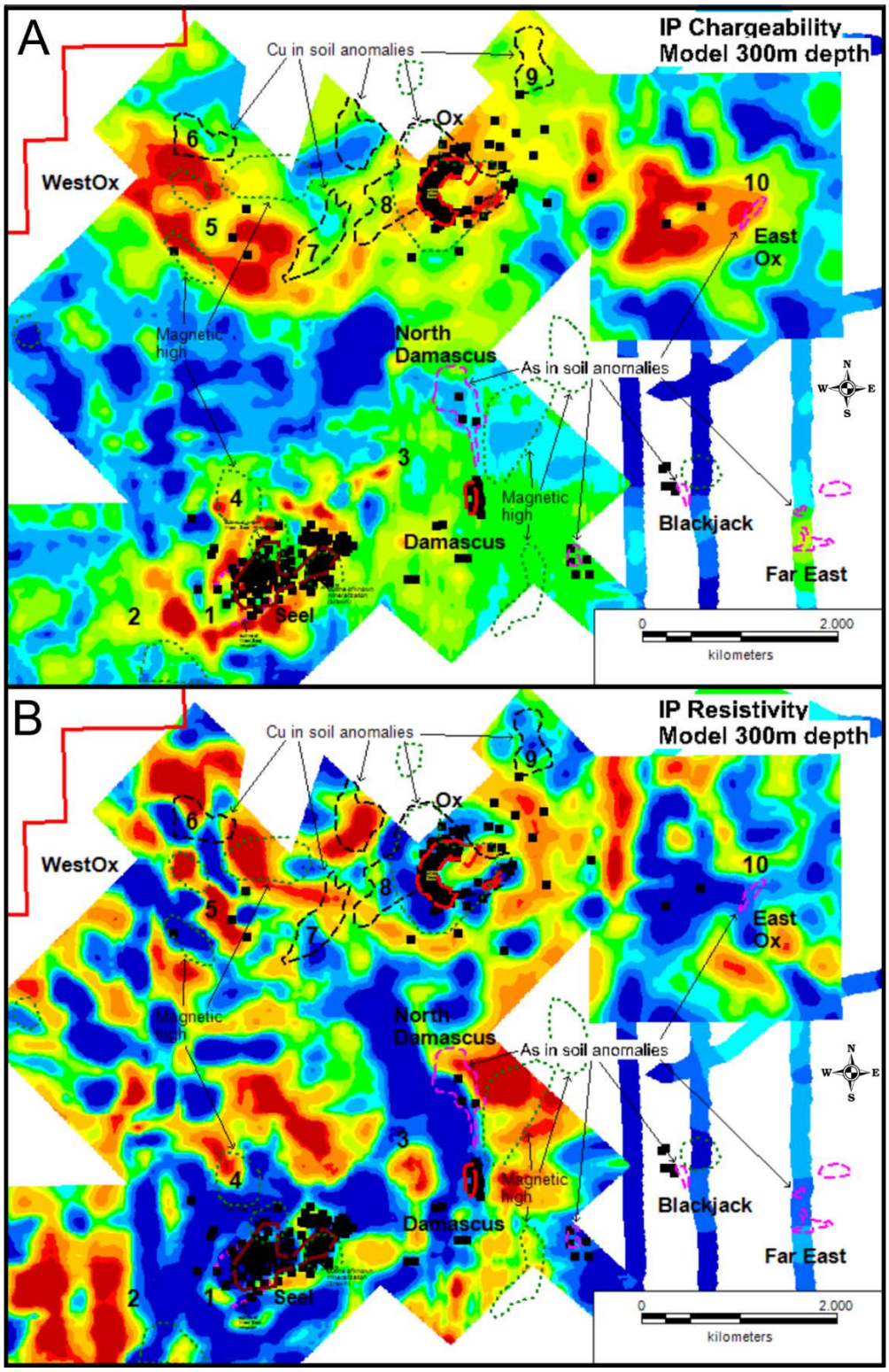


Figure 9.10 shows a simplified compilation of geophysical and geochemical data with the main untested exploration targets labelled 1 to 10. Geophysical targets prospective for porphyry style mineralization in the district ideally should have coincident chargeability highs and resistivity lows (targets 1, 2, 3, 4, 6, 7, 8, 9 and 10), with coincident or ice dispersed low level copper in soil anomalies (targets 6, 7, 8 and 9), with or without associated magnetic anomalies (targets 4, 5 and 8 are in or near magnetic highs).

Figure 9.10 Compilation Maps Showing Ground IP Geophysics, Drill Hole Locations, and Main Soil Anomalies Around the Ox and Seel Deposit Areas



Notes: A) Induced Polarization chargeability model 300 m depth, showing drill holes (black squares), copper in soil anomalies (black dashed lines), arsenic in soil anomalies (pink dashed lines), airborne magnetic highs (green dotted lines), and exploration targets labelled 1 to 10. B) Same as A with Induced Polarization resistivity model at 300 m depth.

10.0 DRILLING

10.1 INTRODUCTION

This Section of the PEA covers drilling by Gold Reach from 2004 to present. All previous drilling is considered historic and has not been used to generate the current resource estimate. Gold Reach conducted drilling programs in the Seel Deposit area in the years 2004 to 2008, and 2011 to 2014. Gold Reach conducted drilling programs on the Ox Deposit area in 2007, 2012 and 2013. Total drilling by Gold Reach on the Ootsa Property is summarized in Table 10.1, with drilling used in the current resource estimates summarized in Table 10.2. Some holes surrounding the deposit areas occurring outside of the resource areas were not used in the resource estimate.

TABLE 10.1
TOTAL DRILLING BY GOLD REACH AT THE OOTSA PROPERTY

Year	Number of Diamond Drill holes	Total Metres (m)
2004	6	1,096
2005	16	3,525
2006	25	5,641
2007	38	9,374
2008	21	4,408
2011	20	10,393
2012	64	43,574
2013	143	34,260
2014	20	9,795
Total	**353**	**122,066**

The 2004 to 2008 drilling programs were carried out by drill contractor Briton Brothers based in Smithers, British Columbia, utilizing skid mounted drill rigs and drilling “NQ” size core. The drilling programs from 2011 to 2014 were completed by Full Force Diamond Drilling, based in Peachland, British Columbia, utilizing skid mounted rigs and drilling “NQ2” size core. All of the drill holes have had their collar locations professionally surveyed by DGPS methods. Downhole reflex surveys have been completed at regular intervals on the majority of drill holes.

TABLE 10.2 DRILLING TOTALS UTILIZED IN CURRENT RESOURCE ESTIMATES			
Year	**Number of Diamond Drill holes**	**Total Metres (m)**	**Location**
2004	4	730	Seel
2005	13	2,902.4	Seel
2006	14	3,557	Seel
2007	3	631.2	Seel
2008	12	3,294.8	Seel
2011	18	9,021.5	Seel
2012	44	37,355.9	Seel
2013	52	16,557	Seel
2014	11	7,311	Seel
Total	171	81,361	Seel
Year	**Number of holes**	**Total Metres (m)**	**Location**
2007	16	3,356	Ox
2012	15	3,676	Ox
2013	77	15,090	Ox
Total	**108**	**22,122**	**Ox**

10.2 SEEL DEPOSIT AREA

Figure 10.1 presents a drill hole location map for the Seel area, and Table 10.3 summarizes select drill hole results.

Gold Reach first drilled at the Seel Deposit area in 2004 when 6 diamond drill holes were completed in the vicinity of the Seel Breccia zone (MacIntyre, 2005). This program first encountered Cu-Au porphyry style mineralization at the East Seel deposit. A second phase of follow-up drilling occurred in 2005 (Daubeny and Smit, 2005).

Two separate drill programs were completed in 2006 (Welsh, 2007). The first was designed to test the extent of potentially economic Cu-Au mineralization and to further test IP and magnetic anomalies defined in previous surveys. The second program featured further testing of porphyry style mineralization at the East Seel deposit.

In 2007 and 2008, a total of 33 diamond drill holes were completed at East Seel and the Seel Breccia zones (Welsh, 2007 and Stubens & Veljkovic, 2008).

A large drill program focused on resource expansion was initiated in 2011 focusing on the East Seel Deposit (McDowell and Giroux, 2012). Late in the 2011 program the West Seel zone was discovered by drilling and a total of 4 holes intersected the West Seel intrusive.

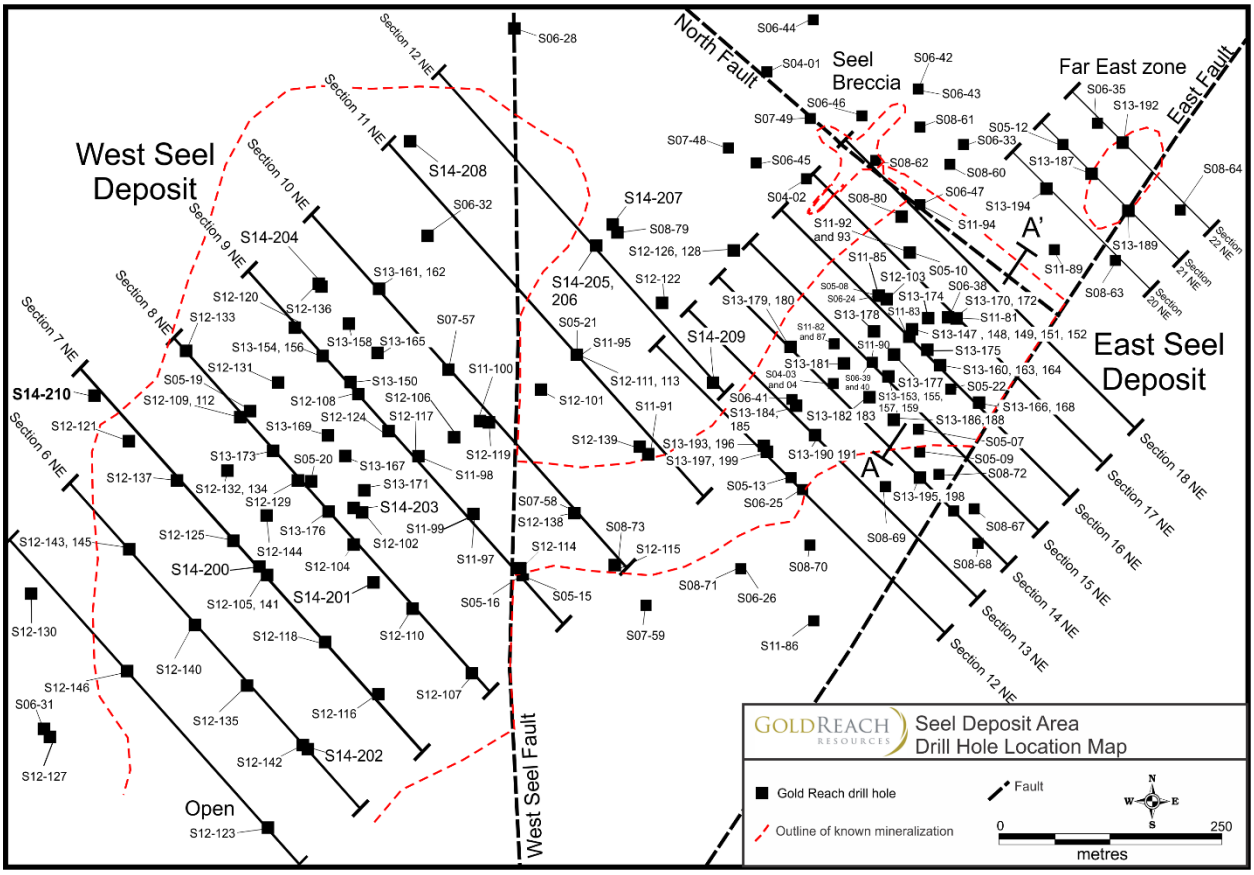
In 2012 drilling focused on delineating the new West Seel zone with 45 of 46 holes drilled that year targeting West Seel (McDowell and Giroux, 2013).

In 2013, a total of 53 diamond drill holes were completed at the Seel deposit. Twelve of the holes were drilled to define a core of near surface Cu-Au-Mo mineralization at West Seel. A further 37 holes were completed at East Seel as infill and expansion of the near surface Cu-Au zone. The

remaining 4 holes were located at the eastern margin of the Seel deposit, in an area called the Far East zone (Figure 10.1).

During 2014, 11 holes were drilled into the West Seel zone targeting a higher grade core to the deposit. Mineralization at West Seel has been defined over an area 750 m long by up to 400 m wide and extends from surface to depths exceeding 1,000 m. A higher grade core occurs over an area 500 m long by up to 250 m wide and extends from surface to over 600 m depth.

Figure 10.1 Drill Hole Location Map for the Seel Deposit Area



An initial NI 43-101 resource for the Seel deposit was estimated in 2008 by Wardrop Engineering Inc. (Stubens and Veljkovic, 2008). Additional resource updates on the Seel deposit areas including the East and West Seel deposits and the Seel Breccia zone were conducted after the 2011, 2012 and 2013 drill programs (McDowell and Giroux, 2012, 2013; Boyce and Giroux, 2014). 7,311 m of drilling in 11 holes were performed after the 2014 mineral resource update by Boyce and Giroux.

TABLE 10.3
SELECT DRILL HOLE RESULTS FROM THE SEEL DEPOSIT AREA

Drill Hole	From (m)	To (m)	Width (m)*	Cu %	Au g/t	Mo%	Ag g/t	Cu Eq%**
S06-42	22	160	138	0.84	0.06	-	22.11	1.07
S06-42	22	64	42	1.24	0.13	-	32	1.61
S06-47	106	120	14	0.7	-	-	21.7	0.89
S08-61	25	82.5	57.5	0.67	0.08	-	22.2	0.92
S08-66	7.5	75	67.5	0.4	0.04	-	11.4	0.53
S11-81	38.5	176	137.5	0.39	0.34	-	-	0.63
S11-81	38.5	104.5	66	0.42	0.47	-	-	0.75
S11-81	160.5	164	3.5	3.2	0.39	-	89.2	4.25
S11-81	163	164	1	8.56	0.09	-	223	10.57
S11-82	29.6	544	514.4	0.19	0.22	-	-	0.34
S11-82	29.6	204	174.4	0.35	0.4	-	-	0.63
S11-82	50	126	76	0.43	0.47	-	-	0.76
S11-83	41.6	228	186.4	0.36	0.27	-	-	0.55
S11-83	41.6	148	106.4	0.4	0.41	-	-	0.69
S11-83	162	174	12	0.9	0.08	-	24	1.17
S11-84	19.2	136	116.8	0.26	0.21	-	-	0.41
S11-84	126	136	10	0.76	0.11	-	39.1	1.18
S11-85	13.7	119	105.3	0.23	0.25	-	-	0.41
S11-88	35.5	810.2	774.7	0.16	0.151	0.014	-	0.32
S11-88	35.5	141.0	105.5	0.41	0.440	-	-	0.72
S11-90	28.0	448.0	420.0	0.24	0.269	-	-	0.43
S11-90	28.0	222.0	194.0	0.37	0.419	-	-	0.66
S11-92	172.0	174.0	2.0	2.95	-	-	66.2	3.53
S11-93	186.0	196.0	10.0	0.46	0.052	-	18.7	0.66
S11-95	241.0	437.0	196.0	0.29	0.194	0.022	4.4	0.56
S11-97	162.0	539.5	377.5	0.25	0.161	0.026	4.1	0.50
S11-98	406.0	623.9	217.9	0.22	0.144	0.030	3.6	0.47
S11-99	66.0	609.9	543.9	0.18	0.120	0.016	3.6	0.36
S11-99	352.0	578.0	226.0	0.22	0.175	0.022	3.5	0.47
S11-100	170.0	736.7	566.7	0.25	0.173	0.028	3.4	0.51
S11-100	374	510	136.0	0.29	0.204	0.033	4.0	0.60
S11-100	548	672	124.0	0.27	0.299	0.051	2.5	0.71
S12-101	262	1079	817.0m	0.2	0.21	0.026	2.24	0.45
S12-101	308	829.8	521.8	0.23	0.3	0.032	2.63	0.57
S12-101	584	778	194	0.22	0.47	0.04	1.85	0.71
S12-102	6.1	653	649.9	0.17	0.09	0.013	3.1	0.31
S12-102	353	505	152	0.27	0.13	0.026	4.2	0.51
S12-103	24.4	170	145.6	0.34	0.4	0.001	1.34	0.63
S12-104	4.8	966	961.2	0.16	0.11	0.019	2.04	0.34
S12-104	368	768	400	0.24	0.19	0.03	2.76	0.52
S12-104	368	482	114	0.4	0.43	0.039	5.4	0.91
S12-106	120	892	772	0.23	0.14	0.028	3.31	0.44
S12-106	400	816	416	0.25	0.16	0.038	2.45	0.51
S12-106	478	578	100	0.36	0.3	0.061	2.92	0.81
S12-106	889.4	890.1	0.7	7.07	3.97	0.039	131	10.02
S12-108	24	340	316	0.28	0.23	0.018	5.28	0.56
S12-108	74	104	30	0.43	0.54	0.023	11.15	1
S12-108	236	312	76	0.45	0.19	0.017	6.94	0.71
S12-108	528	530	2	-	8.75	-	3	6.21
S12-109	262	554	292	0.23	0.21	0.03	2.8	0.52
S12-109	372	492	120	0.29	0.31	0.046	3.7	0.72
S12-110	458	664	206	0.21	0.18	0.028	1.71	0.46
S12-113	186	274	88	0.26	0.1	0.012	4.1	0.41
S12-114	266	298	32	0.32	0.08	0.017	2.06	0.46

TABLE 10.3
SELECT DRILL HOLE RESULTS FROM THE SEEL DEPOSIT AREA

Drill Hole	From (m)	To (m)	Width (m)*	Cu %	Au g/t	Mo%	Ag g/t	Cu Eq%**
S12-116	394	796	402	0.25	0.16	0.023	2.04	0.47
S12-116	494	658	164	0.32	0.24	0.024	2.54	0.61
S12-117	98	774.9	676.9	0.18	0.12	0.022	2.38	0.38
S12-117	361	513	152	0.25	0.14	0.024	3.62	0.48
S12-118	350	887	537	0.27	0.19	0.055	2.69	0.65
S12-118	356	660	304	0.33	0.24	0.065	3.41	0.79
S12-118	356	484	128	0.43	0.33	0.076	4.65	1.01
S12-119	234	807.7	573.7	0.24	0.13	0.026	2.62	0.46
S12-119	254	696	442	0.27	0.14	0.028	2.92	0.51
S12-120	220	530	310	0.23	0.31	0.021	2.73	0.56
S12-120	344	496	152	0.31	0.54	0.034	3.84	0.85
S12-120	494	496	2	0.99	13	0.036	19.7	10.4
S12-121	234	987.5	753.5	0.24	0.12	0.024	2.26	0.43
S12-121	270	602	332	0.32	0.2	0.039	3.58	0.65
S12-121	270	400	130	0.39	0.25	0.051	5.35	0.81
S12-122	200	480	280	0.21	0.12	0.027	1.92	0.41
S12-122	260	378	118	0.31	0.17	0.034	2.76	0.55
S12-124	126	466	340	0.22	0.18	0.019	3.22	0.45
S12-125	344	719.3	375.3	0.3	0.27	0.032	2.58	0.64
S12-125	374	572	198	0.37	0.39	0.047	3.35	0.86
S12-127	742	874.8	132.8	0.21	0.19	0.017	2.18	0.44
S12-129	380	594	214	0.21	0.23	0.032	1.91	0.57
S12-130	346	658	312	0.29	0.17	0.035	3.3	0.58
S12-130	444	582	138	0.38	0.22	0.057	3.99	0.8
S12-130	856	868.7	12.7	0.33	0.22	0.016	0.29	0.57
S12-133	332	594	262	0.21	0.35	0.046	2.14	0.65
S12-133	374	504	130	0.29	0.31	0.055	2.82	0.75
S12-133	548	550	2	-	15	-	-	-
S12-133	736	744	8	-	4.18	-	-	-
S12-134	330	530	200	0.26	0.15	0.03	2.74	0.51
S12-136	140	494	354	0.23	0.28	0.031	3.01	0.58
S12-136	298	444	146	0.32	0.38	0.044	4.37	0.81
S13-147	32	142	110	0.33	0.38	-	1.54	0.61
S13-147	32	106	74	0.4	0.45	-	1.88	0.73
S13-148	31.7	178	146.3	0.51	0.59	-	2.33	0.94
S13-148	31.7	76	44.3	0.94	1.12	-	3.46	1.76
S13-148	256	277.1	21.1	0.3	0.31	-	3.87	0.55
S13-149	37.6	92	54.4	0.33	0.37	-	1.53	0.6
S13-151	32.9	193	160.1	0.33	0.38	-	2.01	0.61
S13-151	67.2	151	83.8	0.42	0.51	-	2.53	0.8
S13-151	113	133	20	0.64	0.84	-	3.65	1.26
S13-152	60	104.3	44.3	0.46	0.54	-	2.5	0.86
S13-152	96	104.3	8.3	0.68	0.87	-	3.62	1.32
S13-153	64	188	124	0.37	0.37	-	1.63	0.64
S13-153	68	84	16	0.81	0.76	-	3.63	1.37
S13-154	18	32	14	0.41	0.09	0.129	12.86	1.1
S13-154	60	356	296	0.23	0.22	0.016	4.44	0.49
S13-154	60	82	22	0.33	1.19	0.021	9.94	1.33
S13-154	218	340	122	0.3	0.17	0.016	4.7	0.52
S13-155	30	268	238	0.38	0.47	-	1.93	0.73
S13-155	30	190	160	0.44	0.53	-	1.98	0.83
S13-155	42	86	44	0.62	0.67	-	2.76	1.11
S13-155	140	156	16	0.64	0.8	-	2.74	1.22
S13-157	31.7	218	186.3	0.37	0.41	-	1.82	0.67

TABLE 10.3
SELECT DRILL HOLE RESULTS FROM THE SEEL DEPOSIT AREA

Drill Hole	From (m)	To (m)	Width (m)*	Cu %	Au g/t	Mo%	Ag g/t	Cu Eq%**
S13-157	31.7	158	126.3	0.42	0.45	-	2.07	0.75
S13-157	36	56	20	0.51	0.5	-	2.67	0.88
S13-159	45.7	143.6	97.9	0.39	0.49	-	2.41	0.75
S13-159	45.7	110	64.3	0.44	0.58	-	2.64	0.87
S13-159	45.7	66	20.3	0.52	0.65	-	2.61	1
S13-160	72.7	177	104.3	0.34	0.42	-	1.54	0.65
S13-160	77	151	74	0.41	0.47	-	1.67	0.75
S13-160	121	149	28	0.47	0.55	-	1.85	0.87
S13-163	56.3	82.1	25.8	0.33	0.31	-	1.66	0.56
S13-163	92.6	185	92.4	0.52	0.2	-	11.89	0.76
S13-163	139	177	38	0.84	0.13	-	25.39	1.15
S13-164	44.1	163	118.9	0.38	0.42	-	2.17	0.69
S13-164	44.1	93	48.9	0.45	0.54	-	2	0.85
S13-166	61	179	118	0.33	0.42	-	2.4	0.65
S13-166	61	107	46	0.4	0.51	-	2.74	0.78
S13-170	59.4	70.4	15.5	0.26	0.23	-	1.5	0.43
S13-170	76.3	81.1	4.8	0.49	0.53	-	2.21	0.88
S13-170	87.5	122	34.5	0.36	0.39	-	1.92	0.65
S13-170	144	208	64	0.26	0.18	0.005	1.26	0.42
S13-172	39.2	135	95.8	0.3	0.35	-	1.07	0.55
S13-172	39.2	75	35.8	0.45	0.54	-	1.64	0.84
S13-172	201	209	8	0.52	0.12	-	15.75	0.74
S13-174	36.5	128	91.5	0.36	0.35	-	1.45	0.62
S13-174	36.5	90	53.5	0.43	0.45	-	1.6	0.76
S13-175	73	85.1	12.1	0.22	0.32	-	1	0.45
S13-175	91.4	98	6.6	0.41	0.54	-	2.56	0.81
S13-175	101.7	148	46.3	0.33	0.56	-	2.08	0.74
S13-177	26.8	213	186.2	0.39	0.53	-	1.86	0.78
S13-177	26.8	109	82.2	0.56	0.81	-	2.43	1.15
S13-177	61	107	46	0.68	1.05	-	2.73	1.44
S13-177	261	283	22	0.24	0.23	-	1.17	0.41
S13-178	26.5	170	143.5	0.46	0.55	-	2.43	0.87
S13-178	26.5	110	83.5	0.53	0.64	-	2.45	1
S13-181	26.3	124	97.7	0.26	0.27	-	1.2	0.46
S13-181	32	60	28	0.32	0.33	-	1.54	0.56
S13-182	39.2	185	145.8	0.27	0.3	-	1.25	0.49
S13-182	39.2	125	85.8	0.32	0.39	-	1.52	0.61
S13-183	30.5	210	179.5	0.43	0.5	-	1.93	0.8
S13-183	38	134	96	0.58	0.62	-	2.75	1.04
S13-183	76	100	24	1.11	1.22	-	4.98	2.01
S13-186	53.1	131	77.9	0.24	0.21	0.003	1.35	0.41
S13-188	40.6	154	113.4	0.32	0.4	-	1.37	0.61
S13-195	154	214	60	0.3	0.28	-	1.27	0.5
S13-198	86	214	128	0.26	0.26	0.002	1.27	0.46
S13-198	92	118.4	26.4	0.3	0.26	0.004	1.35	0.51
S14-200	324	531	207	0.31	0.24	0.034	4.45	0.65
S14-200	366	439	73	0.45	0.31	0.059	6.32	0.96
S14-201	76	828	752	0.2	0.1	0.027	3.22	0.41
S14-208	283	591	308	0.28	0.26	0.046	3.5	0.68
S14-208	431	591	160	0.38	0.41	0.056	4.29	0.93
S14-208	485	537	52	0.44	0.64	0.067	5.58	1.21
S14-210	199	867	668	0.28	0.17	0.033	3.34	0.56
S14-210	361	533	172	0.39	0.29	0.062	4.99	0.89
S14-210	361	415	54	0.47	0.38	0.047	6.89	0.98

TABLE 10.3 SELECT DRILL HOLE RESULTS FROM THE SEEL DEPOSIT AREA								
Drill Hole	**From (m)**	**To (m)**	**Width (m)***	**Cu %**	**Au g/t**	**Mo%**	**Ag g/t**	**Cu Eq%****
S14-210	483	517	34	0.48	0.36	0.058	5.45	1.01

**Width refers to drill hole intercepts, true widths have not been determined. EOH = end of hole.*
***Cu Eq. (copper equivalent) has been used to express the combined value of copper, molybdenum, gold and silver as a percentage of copper, and is provided for illustrative purposes only. No allowances have been made for recovery losses that may occur should mining eventually result. Calculations use metal prices of US $2.50/lb copper, $1200/oz gold, $15 silver, and $10/lb molybdenum using the formula Cu Eq.% = Cu% + (Au g/t x 0.701) + (Ag g/t x 0.0087) + (Mo% x 4.01).*

10.3 OX DEPOSIT

Figure 10.2 presents a drill hole location map of the Ox deposit and Table 10.4 summarizes select drill hole results from the zone. Gold Reach first drilled the Ox deposit in 2007, drilling 16 holes into the zone to confirm and expand upon historic drill results.

In 2012 a further 18 holes were completed at Ox and the surrounding area.

In 2013, Gold Reach conducted a large drill program at Ox designed to infill and expand the mineralized zone. During the program the deposit was successfully extended almost 200 m to the East at its North end. A total of 90 holes were drilled in 2013 (17,372.8 m), and, of these 78 holes (15,255 m) were used in the resource calculation. The remaining 12 holes (2,117 m) were located outside the resource boundaries.

To date, drilling has defined a higher grade core at Ox measuring 850 m long x 100m wide x 100 m deep within a larger mineralized zone approximately 1,000 m long x 185 m wide x 200 m deep.

An initial NI 43-101 resource estimate for the Ox deposit was calculated in 2008 by Wardrop Engineering Inc. (Arsenau et al, 2008). Additional resource updates were conducted at Ox following the 2012 and 2013 drilling programs (McDowell and Giroux, 2013; Boyce and Giroux 2014).

Figure 10.2 Drill Hole Location Map for the Ox Deposit

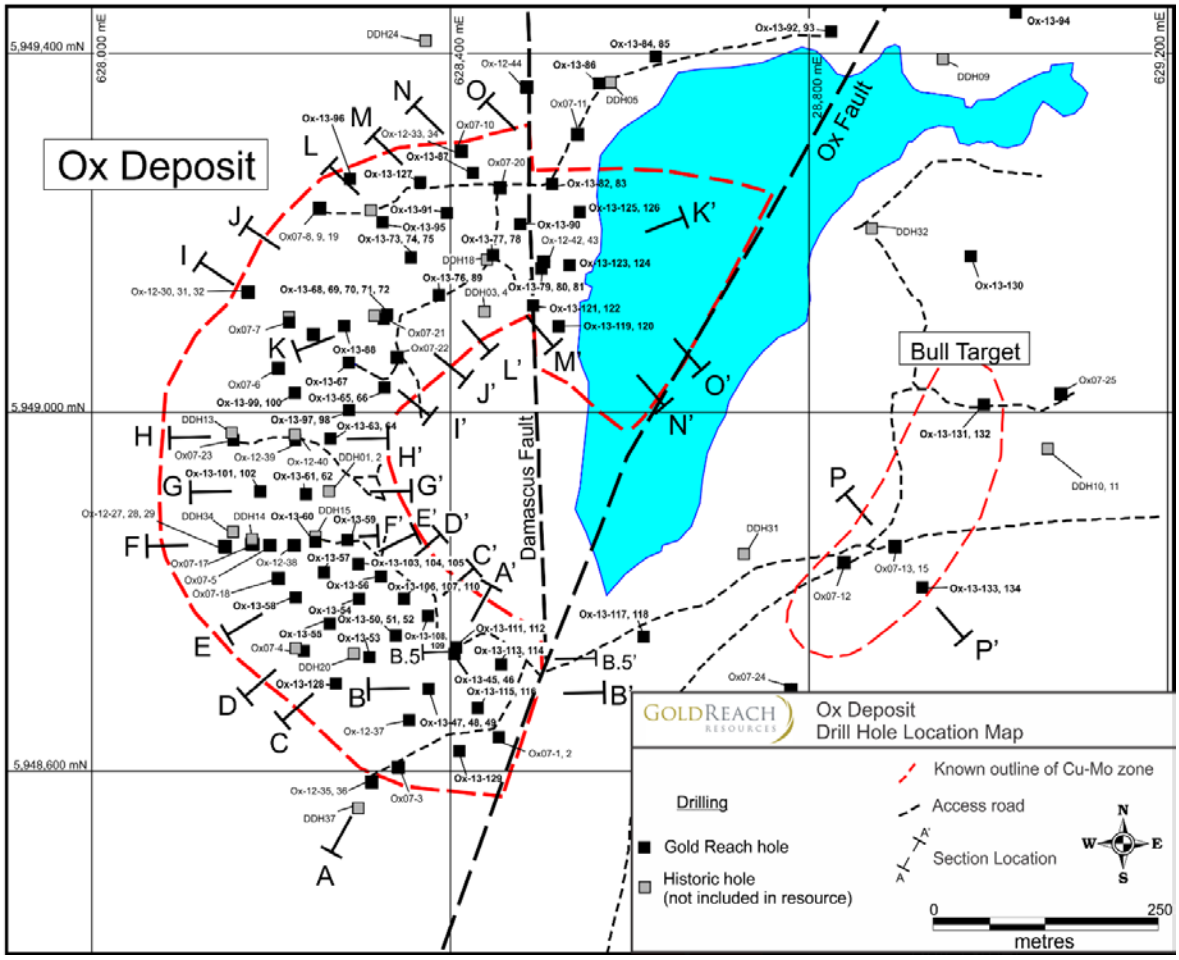


TABLE 10.4
SELECT DRILL HOLE RESULTS FROM THE OX DEPOSIT

Drill Hole	From (m)	To (m)	Width (m)*	Cu %	Mo%	Au g/t	Ag g/t	Cu Eq.%**
Ox07-20	15	200.25	185.25	0.21	0.025	0.028	0.8	0.34
Ox07-22	6.1	72.5	66.4	0.36	0.054	0.07	2	0.64
Ox12-27	116	186	70	0.27	0.042	0.045	-	0.47
Ox12-28	138	165.2	27.2	0.21	0.029	0.032	-	0.35
Ox12-30	156	193	37	0.26	0.035	0.038	-	0.43
Ox12-35	220	275.5	55.5	0.32	0.021	0.05	4.25	0.44
Ox12-37	81.9	176	94.1	0.29	0.026	0.05	-	0.44
Ox12-38	6	113.4	107.4	0.3	0.026	0.04	-	0.44
Ox12-38	58	112	54	0.41	0.033	0.06	-	0.59
Ox12-39	10	92.8	82.8	0.27	0.025	0.06	2.34	0.43
Ox12-39	50	92.8	42.8	0.31	0.035	0.06	-	0.50
Ox12-40	6.2	114	107.8	0.24	0.028	0.04	1.72	0.39
Ox12-40	68	99.1	31.1	0.41	0.027	0.07	-	0.58
Ox12-41	15.2	144	128.8	0.2	0.023	0.03	-	0.32
Ox12-41	74	96.7	22.7	0.32	0.018	0.04	-	0.44
Ox13-45	6.1	79.3	73.2	0.34	0.048	0.07	1.56	0.59
Ox13-45	48	79.3	31.3	0.48	0.055	0.09	2.01	0.78
Ox13-46	5.1	167	161.9	0.36	0.028	0.06	1.85	0.53
Ox13-46	19	97	78	0.49	0.035	0.08	2.15	0.71
Ox13-47	6.1	123	110.6	0.28	0.028	0.05	1.53	0.44

TABLE 10.4 SELECT DRILL HOLE RESULTS FROM THE OX DEPOSIT								
Drill Hole	**From (m)**	**To (m)**	**Width (m)***	**Cu %**	**Mo%**	**Au g/t**	**Ag g/t**	**Cu Eq.%****
Ox13-47	59	109	50	0.35	0.037	0.06	1.8	0.55
Ox13-48	5.7	120	114.3	0.28	0.041	0.04	1	0.48
Ox13-49	40	132	92	0.28	0.034	0.04	1.19	0.45
Ox13-50	12	74.5	62.5	0.34	0.027	0.06	1.42	0.50
Ox13-51	9.5	95.4	85.9	0.34	0.038	0.08	1.19	0.55
Ox13-52	8	142.6	134.6	0.28	0.031	0.04	0.93	0.44
Ox13-52	42	142.6	100.6	0.31	0.035	0.04	1.07	0.49
Ox13-53	27.5	140.6	113.1	0.26	0.028	0.05	0.81	0.41
Ox13-53	91.5	140.6	49.1	0.31	0.036	0.06	1.14	0.51
Ox13-54	4.4	60.1	55.7	0.31	0.031	0.06	0.95	0.48
Ox13-54	32	55	23	0.42	0.036	0.08	1.41	0.63
Ox13-55	45	107	62	0.31	0.03	0.06	0.86	0.48
Ox13-55	91	107	16	0.4	0.031	0.07	1.22	0.58
Ox13-56	6.1	84	77.9	0.4	0.033	0.06	1.06	0.58
Ox13-56	26	72	46	0.47	0.04	0.08	1.25	0.70
Ox13-57	5.6	96	90.4	0.34	0.033	0.05	1.13	0.51
Ox13-57	54	96	42	0.47	0.047	0.08	1.61	0.73
Ox13-58	61	101	40	0.36	0.033	0.04	0.67	0.53
Ox13-59	9.1	62.3	53.2	0.37	0.063	0.07	1.39	0.68
Ox13-59	32	58	26	0.44	0.068	0.08	1.65	0.78
Ox13-60	3.7	88	84.3	0.33	0.034	0.05	1.09	0.51
Ox13-60	46	88	42	0.4	0.042	0.06	1.34	0.62
Ox13-61	7.7	76.2	68.5	0.4	0.048	0.07	1.46	0.65
Ox13-62	5.8	86	80.2	0.43	0.035	0.07	1.73	0.63
Ox13-62	44	86	42	0.51	0.041	0.09	1.99	0.75
Ox13-63	5.6	58.4	52.8	0.41	0.048	0.07	6.84	0.71
Ox13-64	4.6	104	99.4	0.33	0.04	0.05	1.2	0.54
Ox13-65	5.4	30.4	25	0.38	0.037	0.08	1.49	0.60
Ox13-65	23	33.4	7.4	0.58	0.032	0.13	2.15	0.82
Ox13-66	3.2	65	61.8	0.34	0.035	0.06	3.02	0.55
Ox13-67	32	76.2	44.2	0.31	0.039	0.05	1.33	0.51
Ox13-68	15.5	74	58.5	0.33	0.052	0.06	2.04	0.60
Ox13-69	12.2	69	56.8	0.33	0.049	0.06	2.17	0.59
Ox13-69	38	60.6	22.6	0.49	0.055	0.08	3.1	0.79
Ox13-70	11.1	202	190.9	0.29	0.035	0.05	1.97	0.48
Ox13-70	144	158	14	0.81	0.03	0.14	6.66	1.10
Ox13-71	24.6	384	359.4	0.25	0.031	0.04	1.19	0.41
Ox13-71	57	109	52	0.5	0.037	0.09	2.65	0.73
Ox13-72	14	274.2	260.2	0.27	0.034	0.04	2.76	0.46
Ox13-72	56	74	18	0.44	0.019	0.06	2.99	0.58
Ox13-73	17	116	99	0.3	0.024	0.06	1.43	0.45
Ox-13-74	12	160	148	0.3	0.03	0.05	1.59	0.47
Ox-13-75	11.3	105	93.7	0.22	0.012	0.03	1.04	0.30
Ox-13-75	125	225	100	0.23	0.025	0.03	1.27	0.36
Ox13-76	8.4	206	197.6	0.25	0.024	0.04	1.07	0.38
Ox13-76	64	114	50	0.35	0.029	0.06	1.63	0.52
Ox13-77	14.4	162.6	148.2	0.35	0.033	0.07	1.82	0.55
Ox13-77	111	162.6	51.6	0.44	0.036	0.09	2.47	0.67
Ox13-78	8.7	234.3	225.6	0.3	0.032	0.05	1.73	0.48
Ox13-78	74	100	26	0.44	0.032	0.06	2.43	0.63
Ox13-79	26.7	150	123.3	0.29	0.034	0.05	1.79	0.48
Ox13-79	79	101	22	0.46	0.034	0.08	2.56	0.67
Ox13-80	18.3	246	227.7	0.34	0.032	0.05	1.73	0.52

TABLE 10.4
SELECT DRILL HOLE RESULTS FROM THE OX DEPOSIT

Drill Hole	From (m)	To (m)	Width (m)*	Cu %	Mo%	Au g/t	Ag g/t	Cu Eq.%**
Ox13-80	108	198	90	0.4	0.031	0.06	1.84	0.58
Ox13-82	137	233	96	0.32	0.024	0.04	1.25	0.46
Ox13-88	16	186.6	170.6	0.25	0.032	0.04	2.85	0.43
Ox13-88	72	91.4	19.4	0.4	0.025	0.06	25.79	0.77
Ox13-89	7.1	265.4	258.4	0.27	0.034	0.05	1.76	0.46
Ox13-89	7.1	131.5	124.4	0.34	0.041	0.06	2	0.56
Ox13-90	78.6	176	97.4	0.22	0.027	0.03	1.53	0.36
Ox13-91	53	279.8	226.8	0.27	0.03	0.04	1.9	0.43
Ox13-91	206	279.8	73.8	0.35	0.026	0.05	2.4	0.51
Ox13-96	180	290.8	110.8	0.28	0.042	0.04	2.32	0.50
Ox13-96	280	290.8	10.8	0.55	0.041	0.1	3.78	0.82
Ox13-97	8	77.6	69.6	0.35	0.037	0.07	1.48	0.56
Ox13-97	38	77.6	39.6	0.41	0.04	0.09	1.74	0.65
Ox13-98	6	82.3	76.3	0.31	0.038	0.05	1.41	0.51
Ox13-99	15.3	116.5	101.2	0.33	0.035	0.07	1.78	0.53
Ox13-99	76	116.5	40.5	0.46	0.046	0.1	2.69	0.74
Ox13-100	11	100	89	0.31	0.032	0.06	2.45	0.50
Ox13-101	28	139.9	111.9	0.26	0.026	0.04	1.16	0.40
Ox13-102	66	124.2	58.2	0.33	0.041	0.04	2.17	0.54
Ox13-102	100	124.2	24.2	0.36	0.055	0.05	2.48	0.64
Ox13-103	7.6	64.4	56.8	0.31	0.046	0.05	1.31	0.54
Ox13-104	5.3	79.8	74.5	0.25	0.034	0.03	1.03	0.42
Ox13-106	6.5	37.1	30.6	0.36	0.037	0.07	1.43	0.57
Ox13-107	4	68	64	0.37	0.052	0.08	1.57	0.65
Ox13-107	42	66	24	0.43	0.052	0.09	2.04	0.72
Ox13-108	10.5	120	109.5	0.33	0.038	0.06	1.57	0.54
Ox13-108	42	78	36	0.46	0.022	0.07	1.92	0.61
Ox13-108	102	120	18	0.42	0.045	0.07	2.1	0.67
Ox13-109	11.7	81.5	69.8	0.3	0.02	0.04	1.17	0.42
Ox13-109	11.7	22	10.3	0.5	0.024	0.07	1.83	0.66
Ox13-110	5.4	108.7	103.3	0.44	0.04	0.06	1.89	0.66
Ox13-110	5.4	46	40.6	0.57	0.034	0.09	2.62	0.79
Ox13-111	8	40	32	0.41	0.028	0.08	1.98	0.60
Ox13-112	10	125	115	0.39	0.024	0.08	1.91	0.56
Ox13-112	36	125	89	0.42	0.021	0.08	2.04	0.58
Ox13-112	52	66	14	0.88	0.015	0.17	4.06	1.09
Ox13-113	7.5	43	35.5	0.3	0.014	0.07	1.41	0.42
Ox13-114	4.9	130.2	125.3	0.38	0.015	0.07	1.9	0.51
Ox13-114	4.9	37.3	32.4	0.45	0.013	0.09	2.01	0.58
Ox13-114	53	101	48	0.48	0.017	0.09	2.45	0.63
Ox13-115	21.1	122	100.9	0.36	0.028	0.06	1.69	0.53
Ox13-120	22	150.9	128.9	0.29	0.016	0.06	1.46	0.41
Ox13-120	118	150.9	32.9	0.4	0.012	0.08	2.3	0.52
Ox13-121	25.9	88.7	62.8	0.24	0.033	0.06	3.05	0.44
Ox13-122	5.5	280.4	274.9	0.28	0.036	0.05	2.11	0.48
Ox13-122	17	35.7	18.7	0.4	0.025	0.09	1.85	0.58
Ox13-123	36	168	132	0.29	0.024	0.06	1.78	0.44
Ox13-123	94.7	126	31.3	0.46	0.021	0.13	3	0.66

**Width refers to drill hole intercepts, true widths have not been determined. EOH = end of hole.*
***Cu Eq. (copper equivalent) has been used to express the combined value of copper, molybdenum, gold and silver as a percentage of copper, and is provided for illustrative purposes only. No allowances have been made for recovery losses that may occur should mining eventually result. Calculations use metal prices of US $2.50/lb copper, $1200/oz gold, $15 silver, and $10/lb molybdenum using the formula Cu Eq.% = Cu% + (Au g/t x 0.701) + (Ag g/t x 0.0087) + (Mo% x 4.01).*

11.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 2004-2008 DRILL PROGRAMS

The following description has largely been taken from Stubens, et al. (2008).

Drill core from the 2004 to 2008 drill programs was logged and split in the facilities set up at the Tahtsa camp, located approximately 18 km from the Property. Core was temporarily stored at the Tahtsa camp before being moved to the Seel claims for longer term storage.

Drill core samples were split using two hydraulic core splitters. Half of the split core was placed in individually sealed polyurethane bags and half was returned to the original core box for permanent storage.

The 2007/2008 sampling and shipping procedure was handled in a secure manner. The sampling procedure was set-up by Barbara Walsh, P.Geo. and all shipments were brought to Assayers Canada ("Assayers") in Telkwa, BC for crushing and pulverizing. The samples were crushed with a jaw crusher and then put through a secondary crusher so that they were 60% less than 10 mesh in size. The sample was then mixed, and a 250 g sub-sample split was collected. The sub-sample was then pulverized in a ring pulverizer until 90% of the sample measured less than 150 mesh. Assayers was responsible for shipping the pulps to their Vancouver laboratory for analysis.

In Vancouver, samples were processed using Assayers procedure for Multi-Element ICP- AES Analysis using Aqua Regia Digestion. A 0.5 g sample was digested with 5 ml at a 3:1 $HCI:HNO_3$ solution at 95°C for 2 hours and diluted to 25 ml. A lower detection limit for Cu of 1 ppm and Mo of 2 ppm is stated in the procedure. Gold was analyzed using Assayers Fire Geochem Gold procedure. A 15 g sample is fire assayed with an AA/ICP finish. A lower detection limit of 1 ppb and an upper limit of 10,000 ppb is stated in the procedure.

All samples were subjected to quality control procedures that ensured best practices in the handling, sampling, analysis and storage of the drill core. In this case, the procedures consisted of inserting blanks, duplicates and prepared standards (supplied by Assayers Canada) at a rate of one for every 20 samples, on a randomized basis. Individual samples were 2.5 m in length, and 100% of the drill core was sampled. The samples collected at the Seel Property during the 2004 to 2008 drilling seasons were assayed at one of two laboratories:

ACME Analytical Laboratories Ltd. ("ACME") in Vancouver, B.C., was used until February 2006 to analyze the core from the 2004 and 2005 programs. ACME operates 19 offices in 11 countries. A quality system compliant with the International Standards Organization ("ISO") 9001 Model for Quality Assurance and ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories was implemented at each lab. On November 13, 1996, ACME became the first commercial geochemical analysis and assaying lab in North America to be accredited under ISO 9001. The laboratory has maintained its registration in good standing since that time.

In October 2011 the Vancouver laboratory received formal approval of its ISO/IEC 17025:2005 accreditation from the Standards Council of Canada for the tests listed in the approved scope of accreditation. The lab will continue to add methods to this scope.

Assayers Canada ("Assayers") (acquired by SGS in June of 2010), located in Vancouver, B.C., analyzed the samples from the 2006, 2007 and 2008 programs. Assayers laboratory operated according to the guidelines set out in ISO9001/2000 and maintained a quality assurance system compliant with the ISO9001/2000 model.

11.2 2011-2014 DRILL PROGRAMS

The following description has largely been taken from McDowell, et al. (2013).

All drill core from the 2011 to 2014 exploration program at Ootsa was handled in a manner commensurate with industry standards. Core was delivered to the campsite by the drill crew at the end of each shift. Gold Reach personnel would then photograph, measure, log and mark the core for sampling. Gas powered core saws were used to split the core in half, then one half was placed in marked polyurethane sample bags with corresponding sample tags and sealed with plastic zip ties. Individual core samples were typically 2 m in length and 100% of the drill core was sampled. Half of the drill core remains stored in core racks on the Property for verification and reference purposes. Four to five sample bags were inserted into each rice sack and subsequently marked and sealed with plastic zip ties. Samples were shipped by company personnel to either SGS Labs in Telkwa, BC (formerly Assayers Canada) for the 2011 and 2012 drill programs and AGAT Labs in Burnaby, BC for the 2013 and 2014 drill programs. Samples were prepared an analysed in the following manner:

Sample preparation at SGS followed the SGS PRP89 package. The samples were crushed with a Boyd Crusher (jaw crusher) until 75% passed through a 2 mm 10 mesh screen. The sample was then mixed and split into a 250 g sub-sample via a riffle splitter or Stand Alone Rotary Sample Divider. The sub-sample was subsequently pulverized in a ring pulverizer until 85% would pass a 75µ 200 mesh screen. SGS was responsible for shipping the pulps to their Vancouver laboratory for analysis.

In Vancouver samples were processed using the SGS procedure for ME-ICP40B, a 32 Multi-Element ICP-OES analysis with multi-acid digestion that uses a combination of HCl (hydrochloric acid), HNO3 (nitric acid), HF (hydrofluoric acid) and HClO4 (perchloric acid).

Gold was analyzed using FAA313, a SGS procedure involving Fire Assay and Flame Atomic Absorption. Pulverized samples are weighed, mixed with flux and fused using lead oxide at 1,100°C followed by cupellation of the resulting lead button (dore bead). The bead is digested by 1:1 HNO3 and HCl and submitted for analysis by the Flame Atomic Absorption Spectrometer ("AAS"). SGS claims a lower detection limit of 5 ppb and an upper limit of 10,000 ppb for this procedure.

SGS operates 1,650 offices and labs throughout the world. Sample processing services at SGS are ISO 17025 accredited by the Standards Council of Canada. Quality Assurance procedures include standard operating procedures for all aspects of the processing and also include protocols for training and monitoring of staff. Online LIMS is used for detailed worksheets, batch and sample tracking including weights and labeling for all the products from each sample.

Samples were prepped in AGAT's Burnaby lab before being sent to Mississauga, Ontario for analysis. Samples received at the prep lab are dried then crushed with 75% passing 10 mesh (2 mm) and split to 250 g. Samples are subsequently pulverized to 85% passing 200 mesh. (75 µm). All equipment is cleaned using quartz and air from a compressed air source. Blanks, sample

replicates, duplicates, and internal reference materials (both aqueous and geochemical standards) are routinely used as part of AGAT Laboratories quality assurance program.

Samples were analyzed for copper, silver and molybdenum by 4-Acid Digestion with an ICP-OES finish and for gold by fire assay with AAS-OES finish.

AGAT has developed and implemented at each of its locations a Quality Management System ("QMS") designed to ensure the production of consistently reliable data. The system covers all laboratory activities and takes into consideration the requirements of ISO standards.

AGAT is an ISO 9001 and ISO/IEC 17025 certified lab. AGAT maintains ISO registrations and accreditations. ISO registration and accreditation provide independent verification that a QMS is in operation at the location in question.

It is P&E's opinion that sample preparation, security and analytical procedures for the Ootsa Project drill programs were adequate for the purposes of this resource estimate.

12.0 DATA VERIFICATION

12.1 SITE VISIT AND DUE DILIGENCE SAMPLING

The Ootsa Project was visited by Mr. Eugene Puritch, P.Eng., on October 1, 2015, for the purposes of completing site visits and due diligence sampling. General data acquisition procedures, core logging procedures and quality assurance/quality control ("QA/QC") were discussed during the visit.

Mr. Puritch collected 12 samples from seven diamond drill holes during the site visit. A range of high, medium and low-grade samples were selected from the stored drill core. Samples were collected by taking the remaining half core in the core box for the intervals sampled. Samples were placed into plastic bags with a unique tag identification, and were placed into a larger bag for transport, via courier, to AGAT Labs in Mississauga, ON for both preparation and analysis.

Samples at AGAT were analyzed for copper, silver and molybdenum by 4-Acid Digestion with an ICP finish and for gold by fire assay with AAS finish. Specific gravities were also determined on all 12 of the samples.

Results of the site visit due diligence samples are presented in Figures 12.1, 12.2, 12.3 and 12.4.

Figure 12.1 Gold Reach Due Diligence Sample Results for Copper: October 2015

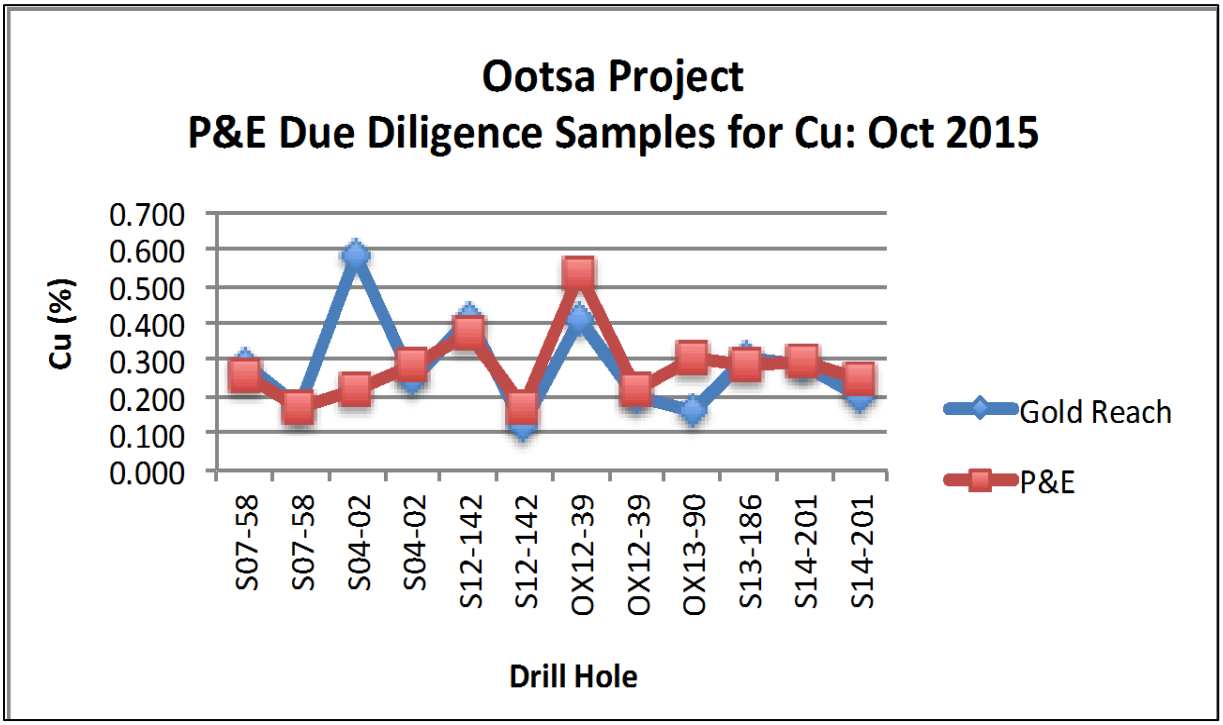


Figure 12.2 Gold Reach Due Diligence Sample Results for Gold: October 2015

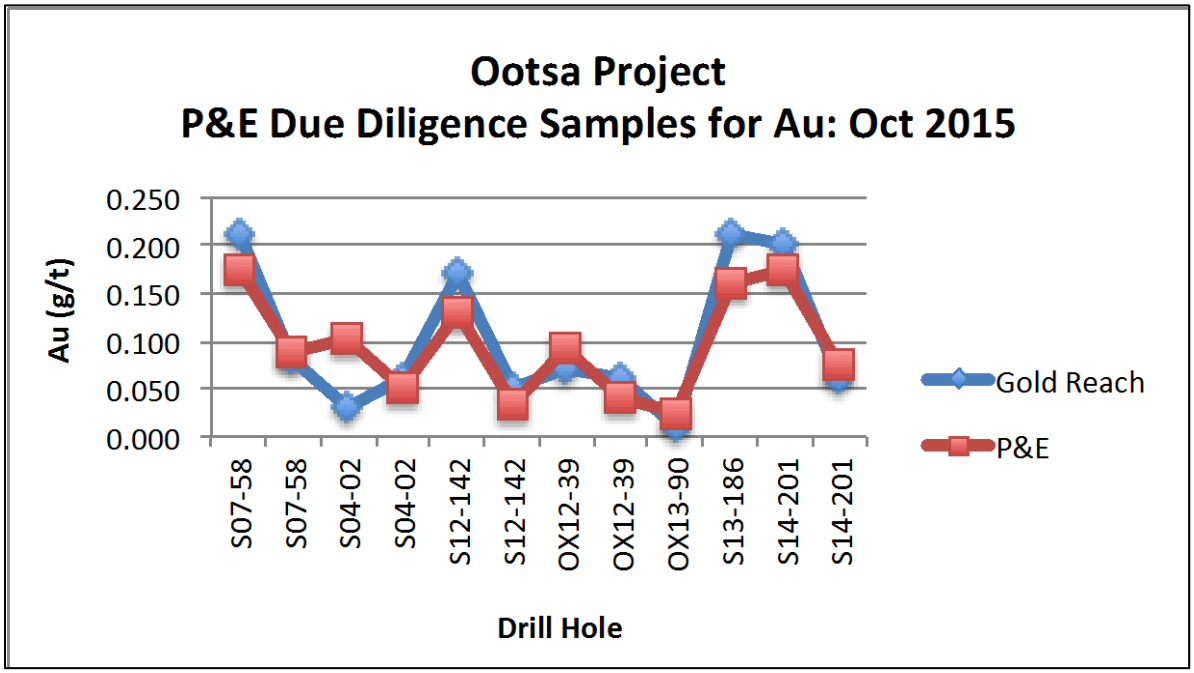


Figure 12.3 Gold Reach Due Diligence Sample Results for Silver: October 2015

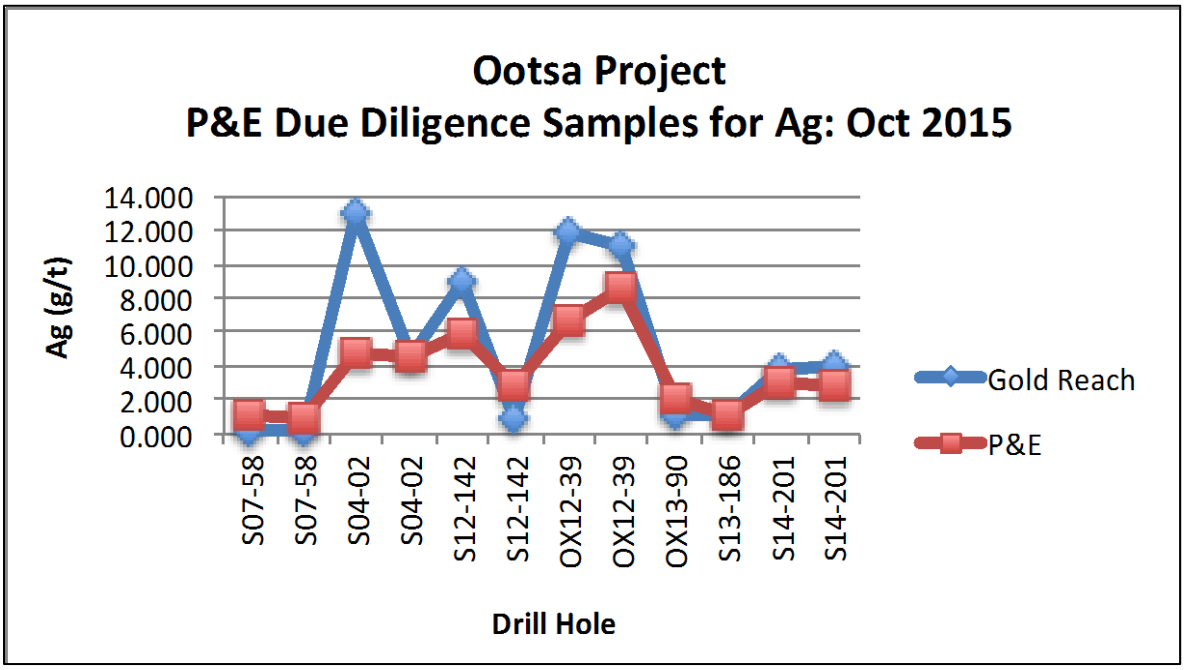
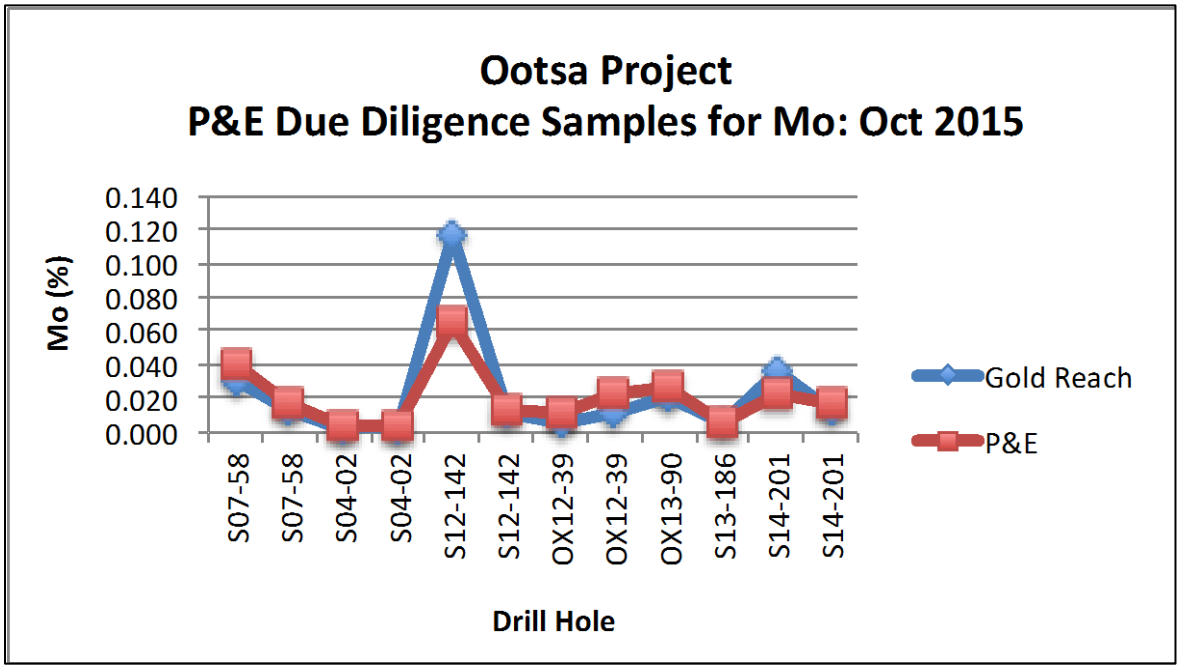


Figure 12.4 Gold Reach Due Diligence Sample Results for Molybdenum: October 2015



12.2 SEEL QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

12.2.1 2008 Seel Drill Program

The following description has largely been taken from Stubens, et al. (2008).

There is little detail on the QC work carried out at the Seel Deposit prior to 2008.

During the 2008 drill program, the Company established an independently monitored quality control program at the Seel Property, consisting of the routine insertion of blanks, standards and duplicates at an approximate rate of 1 in every 20 samples submitted.

A total of 1,625 samples were submitted to the lab, including 83 standards, blanks and duplicates.

<u>Performance of Standards</u>

Gold Reach used three standards during the 2008 drill program at the Seel Deposit: the gold standards 02-11 and 02-18, as well as the multi-element ICP 05 standard. All three standards were purchased from Assayers and were routinely inserted into the sample stream.

The 02-11 and 02-18 gold standards performed very well with only two failures recorded for the 02-18 standard. A high bias was also noted for the 02-18 standard. Recommendation was made to cease using this gold standard.

The ICP 05 standard was used to monitor copper and silver and was found to perform well with only two failures for silver. These failures were considered to be due to misallocated samples rather than the actual standard result being high.

Performance of Duplicates

Duplicate analysis was carried out on a total of 22 samples during the 2008 drill program. All data was analyzed for gold, copper, silver and molybdenum.

Precision for Gold Reach's duplicates was acceptable for all four elements.

12.2.2 2011 Seel Drill Program

The following description has largely been taken from Ebert, et al. (2012).

For drilling season 2011 an independently monitored quality control program was established at an approximate rate of 1 quality control sample for every 10 core samples submitted. A total of 5,383 samples were submitted to the lab, this number including 484 QC samples (standards, blanks and duplicates).

Performance of Standards

Gold Reach used five different Certified Reference Materials ("CRMs"), also referred to as Standards, during the 2011 program to monitor copper, gold, silver and molybdenum: the CDN-CGS-27, CDN-GS-1P5C, HGS2, CDN-CM-13 and CDN-CM-1 standards. Multiple standards were included in every sample batch sent to the laboratory.

Data falling within ± 2 standard deviations from the mean tolerance limits were passed and failed if ± 3 standard deviations from the mean, or if two consecutive data points fell between ± 2 and ± 3 standard deviations on the same side the mean.

All five standards display satisfactory results for gold, copper and molybdenum, with the exception of a few scattered outliers. Most data are grouped within 2 standard deviation tolerance limit from the accepted mean value.

Standard HGS2 returned 4 of 12 samples that were above the accepted range for gold. Other standards in the same batches returned values within acceptable ranges and a homogeneity problem with this standard was suspected. The use of the HGS2 standard was discontinued part way through the drill program.

Standard HV-2 consistently failed low for copper and molybdenum and SGS was notified of the problem. A review of the lab's in house standards was conducted and a small negative bias for copper was found but overall the results were within acceptable limits. Re-testing suggested a problem with the HV-2 standard itself and its use was discontinued. The analyses for the sample batches in question were determined to be acceptable.

Gold analyses for standard GS-IP5C were all within acceptable limits.

Performance of Blanks

Gold Reach used two different blanks during the 2011 program: a mafic and a felsic blank. The blanks were locally sourced from rock quarries exposing unaltered volcanic rocks located along the Whitesail Main Forest Service Road. Approximately one blank was inserted for every 20 samples.

The mafic blank returned acceptable results for both gold and molybdenum, however the background level for copper was found to be fairly high, making it less effective to monitor contamination for copper. Part way through the 2011 drilling program a felsic blank was located with very low background values for Cu and Au, and Mo.

A few of the felsic blank samples show minor amounts of copper, molybdenum or gold contamination, especially following strongly mineralized samples. Minor contamination, due to inadequate cleaning of crushing equipment is evident in a few samples, however the blank results are within acceptable and normal ranges.

Performance of Field Duplicates

Duplicates were inserted at a rate of approximately one in 20 samples and precision was monitored for copper, gold and molybdenum.

Scatter plots of the original versus duplicate samples revealed moderate precision for copper and poor precision for both gold and molybdenum, acceptable at this level of analysis.

12.2.3 2012 Seel Drill Program

The following description has relied upon certain information contained within McDowell, et al. (2013).

An independently monitored quality control program was established and implemented for the 2012 drill program at the Seel Deposit. A total of 21,118 samples were submitted to the lab for assay of which 2,060 (greater than 10% of all samples) were certified reference materials (standards or CRMs), blanks or field duplicates.

Blanks and duplicates were routinely inserted into the sample stream at a rate of one in twenty samples.

Performance of Standards

Gold Reach utilized two CRMs during 2012 drilling at Seel Deposit, the CDN-CM-13 and CDN-CM-25 standards. Two to three CRMs were included with each sample shipment to the lab.

A total of 166 certified standards were inserted into the sample stream throughout the Seel drill program, with gold, copper and molybdenum monitored.

Overall, the assay results show a significant number of values at or below the lowermost threshold for all elements and particularly more so for molybdenum. Gold Reach requested several pulps to be sent out to AGAT laboratories for check-assaying. A total of 208 pulps were chosen from a variety of drill holes and lithologies and sent in two separate batches in August and October of 2012.

Secondary analyses by AGAT laboratories presented higher values for both Au and Cu of around 60%, with an average increase of 0.02 ppm and 250 ppm respectively. Molybdenum check-assay results revealed the most difference of around 80%, averaging around 50 ppm higher than the original assays.

AGAT's secondary analyses revealed the tendency for SGS's results to be slightly under-reported, more so for molybdenum than for copper and gold, with no significant impact on the resource.

Performance of Blanks

The same locally-sourced felsic and mafic blanks used in the 2011 drill program were used for the 2012 QC program. The felsic blank accounted for 96% of the blank material used this year, with the discontinued mafic blank used only when access to the felsic material was prohibited due to snowfall.

A total of 928 field blanks (891 felsic and 37 mafic) were routinely inserted into the sample stream in the 2012 QC program.

The felsic blank performed well, returning acceptable levels for all elements, except for two exceptionally high and two moderately high values noted for gold. Three elevated copper samples and a single molybdenum sample were also reported. The mafic blank also consistently returned background levels for both copper and molybdenum values.

The blank results are within acceptable and normal ranges.

Performance of Field Duplicates

Gold Reach submitted a total of 958 field (1/4 core) duplicates throughout 2012. Original and duplicate results for copper, gold and molybdenum were plotted on scatter plots and a decrease in precision is evident from copper to molybdenum to gold. This is consistent with mineralization styles observed in the core for these three separate elements: copper is often disseminated throughout the rock, molybdenum is either disseminated or vein-hosted and gold is often vein-hosted.

12.2.4 2013 Seel Drill Program

The following description has relied upon certain information contained within Boyce, et al. (2014).

An independently monitored quality control program was established and implemented for the 2013 drilling at the Seel Deposit. A total of 8,195 samples were submitted to the lab for assay of which 782 (10.6% of samples) were blanks, duplicates or CRMs.

Performance of Standards

The Company used four different CRMs purchased from Canadian Resource Laboratories Ltd., of Langley, BC, during drilling undertaken at Seel in 2013: CDN-CM-13 and CDN-CM-29, both high grade standards, and CDN-CM-23 and CDN-CM-25, moderate and low grade standards respectively. Up to four standards were included with each sample shipment to the lab.

A total of 57 standards were submitted for analysis during the 2013 program, with 11 data points for CDN-CM-13, 32 for CDN-CM-23, 13 for CDN-CM-29 and one only for CDN-CM-25.

CDN-CM-13 standard is certified for gold, copper and molybdenum and this standard performed well for all three elements with no failures. A slight low bias was observed in this standard.

Standard CDN-CM-23 also performed well, however one sample failed high and one low for all elements. Both failures were found to be misallocated samples, with the high failure results correlating with either the CDN-CN-13 or CDN-CN-29 standard and the low failure being a blank sample.

Standard CDN-CM-25 was discontinued after it performed poorly during the Ox drill program in 2013. The one sample passed for copper, failed slightly low for gold and failed high for Mo. In both failures, at least one other standard in the batch passed for that particular element and no further action is considered necessary.

The CDM-CM-29 performed well for both gold and copper, with only one low failure for copper. There were 8 low failures for molybdenum, as well as a low bias for this element noted. None of these low failures are considered to be of significant impact to the current resource.

Performance of Blanks

Gold Reach continued to use the same locally sourced felsic blank and routinely inserted a total of 349 blanks into the sample stream for the 2013 Seel drill program. Blank samples were inserted at a rate of around 1 in 20 samples, with particular care taken to insert blanks in any zones with moderate to strong mineralization apparent.

Mean and standard deviation were calculated for all three elements for the 2013 drilling and two standard deviations away from the mean was used as a tolerance limit for blank results. The majority of blanks were within two standard deviations of the calculated mean.

The vast majority of blanks tested at acceptable levels, with only two instances of very high results noted. One sample was likely a misallocated sample and the remaining sample and the other was possibly due to contamination. Overall, the felsic blank performed very well for all three elements and P&E does not consider these failures to be of any impact to the current resource.

Performance of Field Duplicates

Gold Reach submitted a total of 376 field duplicates throughout 2013 that were inserted at a rate of about 1 in 20 samples. Original and duplicate results for copper, gold and molybdenum were plotted on scatter plots, with copper showing good precision and both molybdenum and gold showing less precision, which is consistent with the mineralization styles of these three elements.

12.3 OX QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

12.3.1 2007 Ox Drill Program

The following description has largely been taken from Arseneau, et al. (2008).

Performance Of Standards

Up to three standards were submitted with each batch of samples sent to Assayers for the 2007 drill program. A total of three standards were used in the program: the AuAg5, ICP and 1110 standards. All three standards were used to monitor copper, molybdenum and gold results.

All three standards displayed reasonably repeatable results for each of the three elements. The 1110 standard however returned copper results exceeding the upper measurable limit of 1% and its performance for copper was therefore unable to be monitored. There was a single outlier noted for the AuAg5 standard and one sample for the ICP standard (sample number 7S0065) was likely a misallocated blank sample.

In addition to submitting sample standards to the laboratory, Assayers also inserted and monitored their own standards during gold analyses and all three types of standards used performed well.

Performance Of Duplicates

Duplicate samples were submitted for analysis in the 2007 QC program and analysed for copper, molybdenum and gold. Original and duplicate results were plotted on scatter plots to assess precision. Copper showed good precision, gold showed moderate precision and molybdenum displayed poor precision.

12.3.2 2012 Ox Drill Program

The following description has relied upon certain information contained within McDowell, et al. (2013).

Performance of Standards

The Company used only one type of standard during the 2012 drill program at Ox: the CDN-CM-13. Two to three of this CRM were included in each batch of samples submitted to the lab for analysis, with a total of 16 samples sent for testing.

The standard performed well for each of the three elements, with only one or two low failures apiece. Low biases were evident for both copper and molybdenum however, and Gold Reach consequently requested 50 pulp samples to be sent to AGAT for check-assaying.

Check-assay analyses carried out at AGAT demonstrate the tendency for SGS to slightly under-report results in several samples. A slight negative bias was also evident for both copper and molybdenum. This is not considered to be a significant impact and the results have been deemed acceptable for the purpose of this resource estimate.

Performance of Blanks

A total of 108 felsic blanks were inserted into the sample stream throughout the 2012 Ox Deposit drill program. Blank results for gold, copper and molybdenum were at acceptable levels.

Performance of Duplicates

The Company submitted a total of 114 field duplicate samples during the 2012 Ox drill program. Original and duplicate results for copper, gold and molybdenum were plotted on scatter plots and all three elements showed acceptable precision.

12.3.3 2013 Ox Drill Program

The following description has relied upon certain information contained within Boyce, et al. (2014).

An independently monitored quality control program was established and implemented for all of the 2013 drilling at the Ox Deposit. A total of 8,997 samples were submitted to the lab for assay of which 884 (10.9% of samples) were blanks, duplicates or CRMs.

Performance of Standards

The Company used three different CRMs purchased from Canadian Resource Laboratories Ltd., of Langley, BC, during drilling undertaken at Ox in 2013: CDN-CM-13, a high grade standard, and CDN-CM-23 and CDN-CM-25, moderate and low grade standards respectively. Up to three standards were included with each sample shipment to the lab.

A total of 98 standards were submitted for analysis during the 2013 program, with 35 data points for CDN-CM-13, 23 for CDN-CM-23 and 40 for CDN-CM-25.

CDN-CM-13 standard is certified for gold, copper and molybdenum and this standard performed well for all three elements with no failures recorded. A slight high bias was observed for molybdenum for this standard.

Standard CDN-CM-23 also performed well, with no failures noted for any of the three elements.

The CDN-CM-25 standard performed well for both gold and molybdenum, however a high bias was noted for molybdenum. This standard performed poorly for copper with 7 high failures and 4 low failures noted. In each batch where failure was noted, there was at least one and up to four other standards passing and no action is considered necessary. The use of the CDN-CM-25 standard was discontinued after the scattered results were noted.

Performance of Blanks

Gold Reach continued to use the same locally sourced felsic blank and routinely inserted a total of 385 of blanks into the sample stream for the 2013 Ox drill program. Blank samples were inserted at a rate of around 1 in 20 samples, with particular care taken to insert blanks in any zones with moderate to strong mineralization apparent.

Mean and standard deviation were calculated for all three elements for the 2013 drilling and two standard deviations away from the mean was used as a tolerance limit for blank results. The majority of blanks were within two standard deviations of the calculated mean.

There were three samples reported for copper with results exceeding two standard deviations from the calculated mean. Two of these were misallocated samples and another was likely from contamination but not considered to be of significant impact to the current resource.

Molybdenum returned several results above the warning limit, one of which corresponded to a misallocated sample. There was also a group of results greater than two standards deviations away from the mean that could have been due to contamination, however these results were still not considered of significant impact to the current resource.

There were a total of 10 samples that returned results greater than two standard deviations above the calculated mean for gold. None of these results were considered of significant impact to the calculated resource.

Performance of Duplicates

Gold Reach submitted a total of 401 field duplicates throughout 2013 that were inserted at a rate of about 1 in 20 samples. Original and duplicate results for copper, gold and molybdenum were plotted on scatter plots, with copper showing good precision and both molybdenum and gold displaying less precision, consistent with the mineralization styles of these three elements

12.4 WEST SEEL QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

12.4.1 2014 West Seel Drill Program

The following description has relied upon certain information contained within Boyce, et al. (2014).

An independently monitored quality control program was established and implemented for all of the 2014 drilling at the West Seel. A total of 3,560 samples were submitted to the lab for assay of which 384 (9.7% of samples) were blanks, duplicates or CRMs.

Performance of Standards

The Company used three different CRMs purchased from Canadian Resource Laboratories Ltd., of Langley, BC, during drilling undertaken at West Seel in 2014: CDN-CM-13 and CDN-CM-29, both high grade standards, and CDN-CM-23, a moderate grade standard. Up to four standards were included with each sample shipment to the lab.

A total of 42 standards were submitted for analysis during the 2014 program, with 10 data points for CDN-CM-13, 14 for CDN-CM-23 and 18 for CDN-CM-29.

The CDN-CM-13 and CDN-CM-23 standards are certified for gold, copper and molybdenum and both of these standards performed very well for all three elements with no failures recorded.

The CDM-CM-29 also performed very well for all three elements. One low failure was noted for copper, gold and molybdenum, however the recorded weight for this sample corresponds to a

core sample and the previous sample is recorded as having the sample weight expected for a CRM. This is a misallocated sample and no follow up is required.

Performance of Blanks

Gold Reach continued to use the same locally sourced felsic blank and routinely inserted a total of 166 blanks into the sample stream for the 2014 West Seel drill program. Blank samples were inserted at a rate of around 1 in 20 samples, with particular care taken to insert blanks in any zones with moderate to strong mineralization apparent.

Mean and standard deviations were calculated for all 2014 results and all blanks were within two standard deviations of the calculated mean, except for one result for molybdenum which is still considered to be of no significant impact to the current resource.

Performance of Field Duplicates

Gold Reach submitted a total of 176 field duplicates throughout 2014 that were inserted at a rate of about 1 in 20 samples. Original and duplicate results for copper, gold and molybdenum were plotted on scatter plots, with copper showing good precision and both molybdenum and gold showing less precision, which is consistent with the mineralization styles of these three elements

12.5 RECOMMENDATIONS AND CONCLUSIONS

It is P&E's opinion that QC protocol implemented by Gold Reach is thorough and acceptable. The only recommendation made for future drilling at the Project is to include both coarse reject and pulp duplicates into the sample stream, in addition to the field duplicates already taken.

Based upon the evaluation of the QA/QC program undertaken by the Company, as well as P&E's due diligence sampling, it is P&E's opinion that the results are suitable for use in the current resource estimate.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 INTRODUCTION

Preliminary flotation testwork on two composite samples from the West Seel and one composite from the East Seel deposit was conducted by Inspectorate Exploration and Mining Services Ltd. ("Inspectorate") and documented in their report "Metallurgical Testing of Samples from the Gold Reach Resources Ltd., Ootsa Project", dated April, 2013. This testwork investigated the copper flotation characteristics of the composites, including roughing, cleaning and locked cycle tests. One test on Composite 2 investigated the separation of molybdenum (moly) from copper.

A second preliminary testwork program by Inspectorate was conducted primarily on a composite sample of material from the Ox deposit and is detailed in a report "Metallurgical Testing of Ox deposit Samples from the Gold Reach Resources Ltd., Ootsa Project", dated November, 2013. Standard copper rougher and cleaner flotation tests are reported, along with moly separation tests. A gravity gold recovery test was also conducted on two Seel samples, with negative results.

Inspectorate conducted a further flotation test series on a single composite of West Seel material and detailed the results in a report "Metallurgical Testing of West Seel Deposit Samples from the Gold Reach Resources Ltd., Ootsa Project", dated May, 2014. The objective of this program was to optimize the recovery of copper and moly, along with the contained precious metals.

13.2 SEEL DEPOSIT METALLURGY 2013

Head grades for the three tested composites are summarized in Table 13.1.

TABLE 13.1
2013 SEEL SAMPLE HEAD GRADES

	Cu, %	Mo, %	Au, g/t	Ag, g/t
Comp 1	0.28	0.028	0.17	4.09
Comp 2	0.29	0.047	0.20	2.12
Comp 3	0.42	0.0007	0.47	1.94

ICP analyses returned low concentrations of deleterious elements indicating a clean material unlikely to cause significant environmental or product quality concerns.

A brief characterization of mineralogy was conducted and reported as follows:

"The samples #1 and #2 from West Seel are distinguished by their main constituents. While the first sample carries predominant pyrite in association with chalcopyrite the second sample contains important amounts of pyrrhotite and magnetite in addition to pyrite and chalcopyrite. In both samples there is also accessory molybdenite. The locking textures of the West Seel minerals hardly exceed dimensions of 150 microns. A substantial amount of chalcopyrite and most molybdenite are locked in dimensions below 50 microns. Sample #3 from Seel represents a pyrite-magnetite-chalcopyrite mineralisation in which magnetite is often replaced by presumably hypogene hematite. The mineralized textures tend to be somewhat coarser than those of the previous two samples, possibly because of a higher portion of vein mineralisation."

The flotation program consisted of 30 batch tests, 3 locked cycle tests performed on all three composites, and a bulk 100 kg float to produce copper 3rd cleaner concentrate for molybdenum separation using composite 2.

Rougher kinetic tests at grinds ranging from 96 to 128 microns indicated somewhat slow flotation rates, particularly for precious metals. Within this size range there was little difference in copper and moly recovery, ranging from 92 – 97% for copper and over 90% for moly.

Open circuit cleaner tests indicated the need for regrinding of rougher concentrate, and a regrind (K80) of about 25 microns was adopted. Table 13.2 summarizes the results of representative cleaner tests on the three composites.

TABLE 13.2
OPEN CIRCUIT CLEANER FLOTATION TESTS

F27, 115 µ	**Grade, %, g/t**				**Distribution, %**			
Comp2	Cu	Mo	Au	Ag	Cu	Mo	Au	Ag
Cl 3	18.4	2.2	7.7	123.0	78.9	82.0		
Cl2	23.5	1.9	6.8	104.8	82.5	85.7		
Cl1	27.89	1.415	0.79	81.71	85.5	88.2		
RC	2.77	0.324	1.42	20.18	91.3	92		
Calc head	0.28	0.033	0.19	2.11				
F25, 119 µ	**Grade, %, g/t**				**Distribution, %**			
Comp1	Cu	Mo	Au	Ag	Cu	Mo	Au	Ag
Cl 3	31.3	2.0	11.9	213.0	73.7	59.3	47.1	32.1
Cl2	27.3	1.8	10.9	201.0	80.0	68.1	54.0	37.9
Cl1	15.4	1.01	6.57	126	86.3	76	61.9	45.3
RC	2.01	0.15	1.1	25.1	92.6	85.8	84.9	74.1
Calc head	0.29	0.023	0.17	4.51				
F23, 128 µ	**Grade, %, g/t**				**Distribution, %**			
Comp2	Cu	Mo	Au	Ag	Cu	Mo	Au	Ag
Cleaner 3 concentrate	24.6	5.3	9.7	136.9	63.3	70.6	35.7	28.7
Cleaner 3 concentrate	20.0	3.8	8.5	113.3	72.7	72.0	44.3	33.4
Cleaner 3 concentrate	13	2.62	6.14	76.9	79.5	83.7	53.6	38.2
Rougher concentrate	2.83	0.56	1.59	16.2	89.8	94.6	72.3	48.9
Calculated head	0.27	0.057	0.19	3.29				
F29, 106 µ	**Grade, %, g/t**				**Distribution, %**			
Comp3	Cu	Mo	Au	Ag	Cu	Mo	Au	Ag
Cl 3	28.9		28.5	49.9	54.4		44.4	20.3
Cl2	13.4		13.9	26.4	85.6		76.3	37.7
Cl1	7.4		8.01	16.4	89.2		82.8	44.1
RC	3.17		3.56	8.71	94.8		91.2	58.2
Calc head	0.5		0.58	2.24				

The above cleaner tests understate expected copper recoveries because the contributions of the recoverable copper in the tailings streams at each cleaning stage are not accounted for.

Locked cycle tests, which incorporate recycle of intermediate tailings streams were performed on the three composites. Copper recoveries ranged from 86% to 90 % at grades of 23% Cu to 31% Cu. Stability in the tests was relatively poor and these results should be used with caution.

13.3 SEEL DEPOSIT METALLURGY 2014

A second series of flotation tests were undertaken on material from the West Seel deposit in 2014. A single composite sample was prepared for the purpose of investigating and optimizing flotation conditions for that material. Reported head assays for the composite are shown in Table 13.3.

TABLE 13.3
2014 SEEL SAMPLE HEAD GRADE

	Cu, %	Mo, %	Au, g/t
Comp 1	0.32	0.0408	0.27

General flotation behavior was similar to material tested in the 2013 program except that Cu and Mo rougher flotation kinetics were somewhat faster.

Rougher flotation kinetics are illustrated in Figures 13.1 and 13.2 for primary grinds of 92 – 100 microns. Good copper and moly rougher recoveries were demonstrated while gold recovery kinetics were typically slower with lower recoveries.

Figure 13.1 Seel Rougher Flotation, Test F1, 100 µ

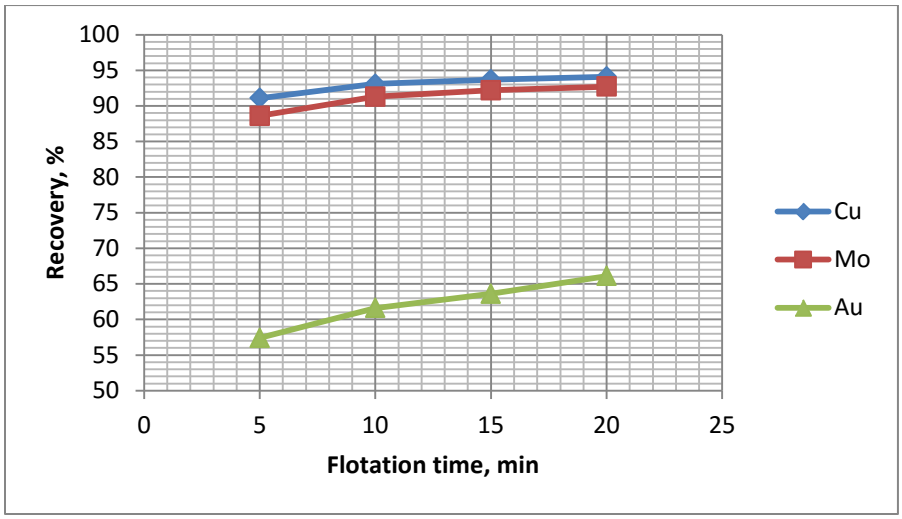
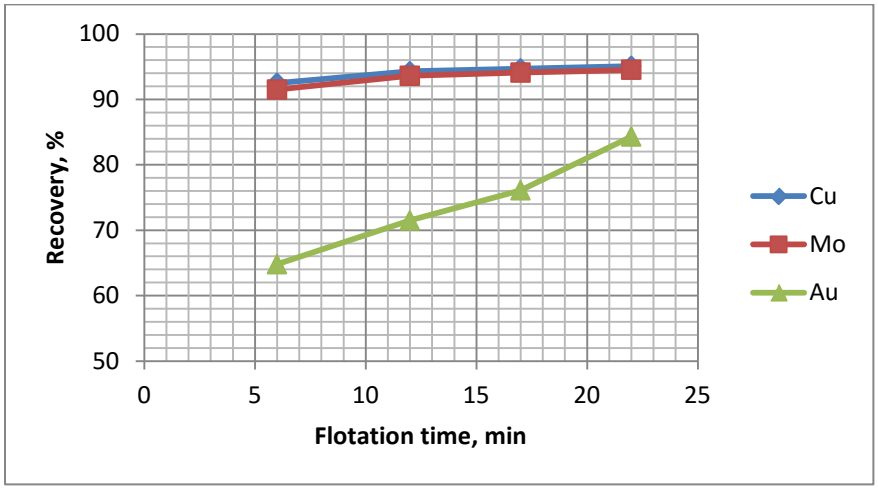


Figure 13.2 Seel Rougher Flotation, Test F2, 92 µ



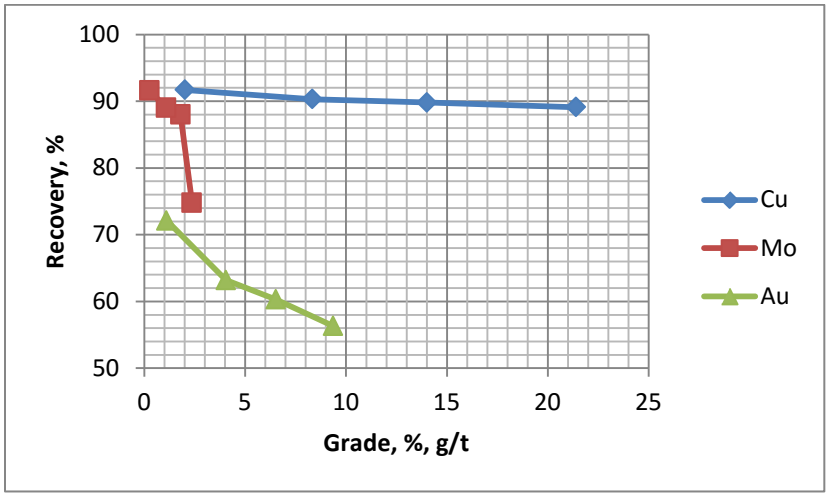
Two open circuit standard cleaner tests and one bulk float were conducted at a regrind (K80) of 30 microns. The smaller two cleaner tests evaluated two different collectors while the bulk float was performed to generate sufficient concentrate for a moly separation/cleaner test. Table 13.4 summarizes the results of the tests.

TABLE 13.4
SEEL OPEN CIRCUIT CLEANER FLOTATION TESTS

Test	Grade, %, g/t			Distribution, %		
	Cu	Mo	Au	Cu	Mo	Au
F3	24.3	3.3	8.9	82.9	82.4	46.9
F4	28.0	3.3	9.1	75.1	81.0	38.0
BF1 (bulk Float)	21.4	2.36	9.37	89.1	74.8	56.3

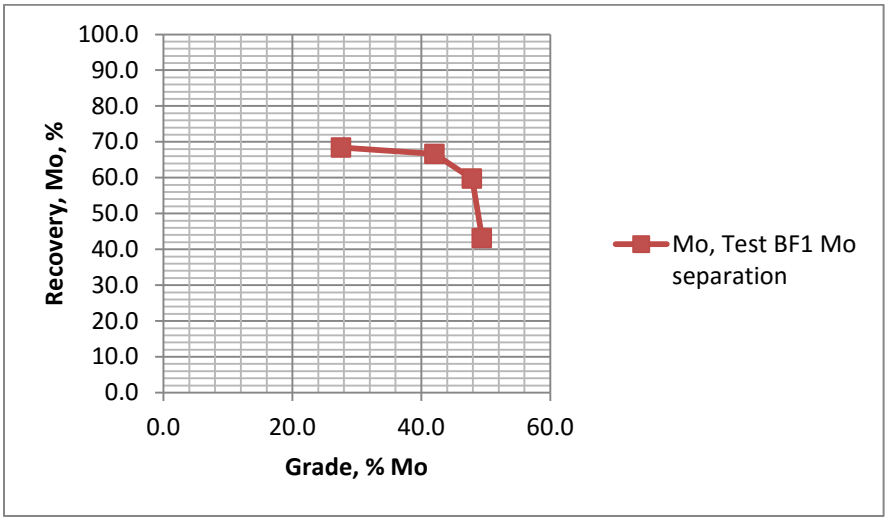
Figure 13.3 summarizes the grade-recovery curve for the bulk flotation test. Satisfactory flotation performances were obtained in these tests.

Figure 13.3 Seel Cleaner Flotation



Two moly separation tests were conducted on the copper cleaner concentrate from test BF1. The average performance for the two tests is shown graphically in Figure 13.4.

Figure 13.4 Seel Mo Separation and Cleaner Flotation



Final molybdenum concentrate grade approached saleable grade. Additional testwork should yield a marketable concentrate.

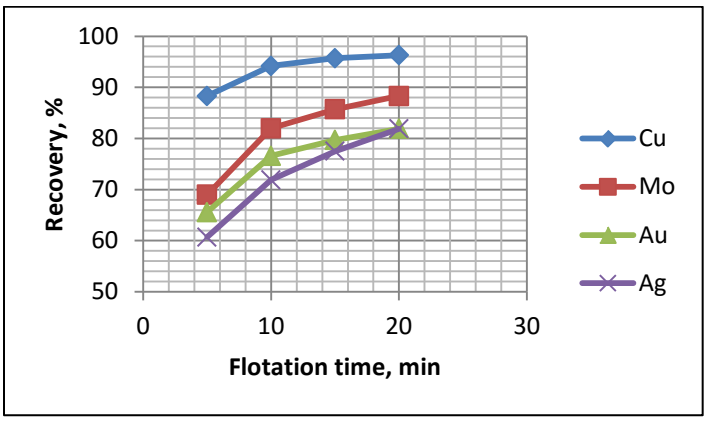
13.4 OX DEPOSIT METALLURGY 2013

Preliminary metallurgical testing was conducted in 2013 on a 323 kg composite sample from the Ox deposit to investigate flotation recovery of copper, molybdenum and precious metals.

A total of four rougher and four cleaner tests were completed, followed by two bulk flotation tests to provide sufficient copper concentrate for two Cu - Mo separation tests followed by two molybdenum cleaning stages.

Rougher tests at grinds between 145 and 95 microns (K80) returned copper recoveries ranging from 93% to 96% with the best results at 95%; similar to the grind adopted for Seel material. Kinetics, particularly for Mo, were slower than experienced with the Seel sample. The test at 95 microns is illustrated in Figure 13.5.

Figure 13.5 Ox Rougher Flotation 2013, Test F3, 95 microns

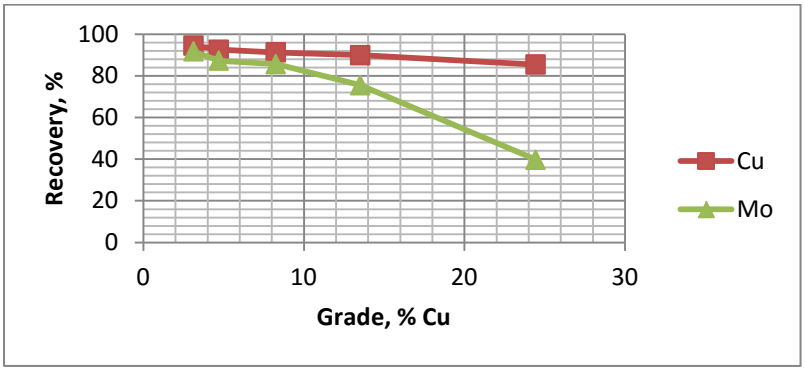


The results of cleaner tests on reground rougher concentrates are presented in Table 13.5. Bulk float BF2 yielded the best results and is illustrated in Figure 13.6 (plotted as recovery vs copper grade).

TABLE 13.5
OX OPEN CIRCUIT CLEANER FLOTATION TESTS

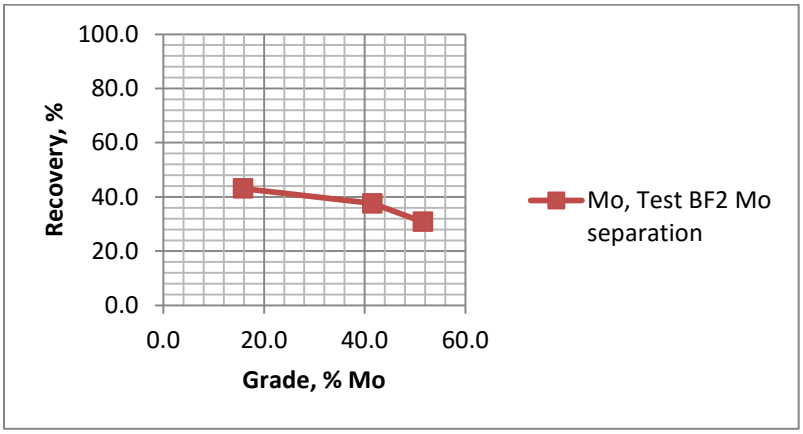
Test	Grade, %, g/t				Distribution, %			
	Cu	Mo	Au	Ag	Cu	Mo	Au	Ag
FC6	26.4	2.9	4.5	116.4	69.7	67.1	41.5	45.3
FC8	31.9	2.7	3.5	123.2	48.7	35.5	28.9	42.7
BF1	24.45	1.25	3.96	107.1	85.4	39.7	59.4	61.3
BF2	23.61	1.59	3.32	97.7	85.9	54.7	46.8	58.1

Figure 13.6 Ox Bulk Cleaner Float BF2



Moly separation test BF2 with two stages of Mo cleaning yielded encouraging results, producing a final Mo concentrate of saleable grade. The test results are recorded in Figure 13.7.

Figure 13.7 Test BF2 Mo Separation



13.5 SUMMARY

Preliminary testwork has demonstrated general amenability of the Seel and Ox deposits to processing at the Huckleberry mill. High recoveries of copper and molybdenum to flotation

rougher concentrate are indicated. Saleable copper concentrates can be readily produced at high recoveries and initial testwork suggests that a separate marketable molybdenum concentrate can also be produced at reasonable recoveries. The copper concentrate will carry significant gold and silver credits. More detailed metallurgical testwork is required to confirm and optimize performance.

Based on the testwork status and a review of historic Huckleberry process plant data, selected mill recoveries for this PEA are presented in Table 13.6.

TABLE 13.6
OOTSA PROCESS PLANT RECOVERIES

Deposit	Recovery (%)			
	Cu	Mo	Au	Ag
West Seel	92	70	65	60
Ox	91	70	70	65
East Seel	90	n/a	70	60

14.0 UPDATED MINERAL RESOURCE ESTIMATE

14.1 INTRODUCTION

The Updated Mineral Resource estimate presented herein is reported in accordance with the Canadian Securities Administrators' National Instrument 43-101 and has been performed in conformity with generally accepted CIM "Estimation of Mineral Resource and Mineral Reserves Best Practices" guidelines. Reported Mineral Resources are not mineral reserves and do not have demonstrated economic viability. There is no guarantee that all or any part of the Updated Mineral Resource will be converted into a mineral reserve. The quantity and grade of the reported Updated Measured, Indicated and Inferred Mineral Resources may not be realized.

This updated mineral resource estimate was prepared by Brian Ray, P.Geo. and Eugene Puritch, P.Eng. of P&E Mining Consultants Inc. and has an effective date of January 1, 2016.

14.2 DATABASE

All drilling data consisting of collar coordinates, survey, lithology, density, assay, and core recovery were provided by Gold Reach in form of MS Excel files. P&E compiled the drilling data into a Gemcom Access database which contains a total of 339 drill holes completed during 2004-2014. A drill hole plan is shown in Appendix-I.

The drilling database of the Ootsa Project contains 54,163 samples all of which were analyzed for Cu, Mo, Au and Ag. A total of 26,995 assays from 258 drill holes have been utilized for this resource estimate. All drill hole survey and assay values are expressed in metric units, with grid coordinates in the NAD 83 UTM system, Zone 9 North.

14.3 DATA VERIFICATION

P&E conducted verification of the drill hole assay database by comparison of the database entries with assay certificates which were obtained in digital format directly from the assay laboratories and compiled.

Assay data ranging from 2004 through 2014 drilling were verified for the East Seel, West Seel and Ox Deposits. 28% (3,486 out of 12,405) of the assay data for the East Seel and West Seel Deposits were checked for Cu, Au, Ag and Mo against the original laboratory certificates from AGAT Labs of Mississauga, Ontario, SGS Labs of Vancouver, B.C., Assayers Canada (acquired by SGS in June of 2010) of Vancouver, B.C. and Acme Analytical Laboratories Ltd., of Vancouver, B.C. 44% (2,934 out of 6,689) of the assay data for the Ox Deposit were checked for Cu, Au, Ag and Mo against the original laboratory certificates from AGAT Labs of Mississauga, Ontario. Very few minor data errors were observed and corrected, with the overall impact to the database being negligible.

14.4 DOMAIN INTERPRETATION

Three mineralized domains for East and West Seel and three sub-domains for Ox were created with computer screen digitizing on drill hole sections in Gemcom. The domain outlines were determined from lithology, structure and NSR value by visually inspecting the drill hole cross sections. Fifty-four (54) drill cross-sections were developed on 25 m spacing. The digitized outlines were influenced by the selection of mineralized material above a cut-off Net Smelter

Return ("NSR") value of C$10/tonne that demonstrated zonal continuity along strike and down dip. In some cases mineralization below C$10/tonne NSR were included for the purpose of maintaining zonal continuity. On each section, polyline interpretations were digitized from drill hole to drill hole but not extended nominally more than 60 m into untested territory. Minimum constrained true width for interpretation was approximately 2.0 m. The interpreted polylines from each section were "wireframed" in Gemcom into 3-dimensional domains. The resulting domains were utilized for statistical analysis, grade interpolation, rock coding and resource reporting purposes. The wireframes of the mineralized domains are displayed in Appendix-II.

Surfaces for the topography and overburden were generated as well using the data provided by Gold Reach.

14.5 ROCK CODE DETERMINATION

The mineralized domain solids were assigned rock codes for purpose of resource estimate are presented in Table 14.1.

TABLE 14.1
DOMAIN ROCK CODES

Domain	Rock Code
East Seel	10*
East Seel NE Extension	20*
West Seel	30*
Ox 1 North Sub Domain	20
Ox 2 Central Sub Domain	30
Ox 3 South Sub Domain	40
Air	0
Overburden	98
Waste	99

**These rock codes are combined in a block model that is separate from Ox*

14.6 COMPOSITES

Figures 14.1 to 14.3 illustrate that approximately 96% of the sample lengths within the constrained wireframe were two metres in length. In order to regularize the sample length for grade interpolation, assay compositing to two metres length was carried out down hole within the constraints of the above mentioned domains and sub-domains. The composites were calculated over a two metre length starting at the first point of intersection between the drill hole and hanging wall of the 3-D zonal constraint. The compositing process was halted upon exiting from the footwall of the aforementioned constraint. Un-assayed intervals and below detection limit assays were set to 0.001% for Cu, 0.0001% for Mo and 0.001 g/t for Ag and Au.

Figure 14.1 Ox Drill Hole Assay Sample Length Distribution

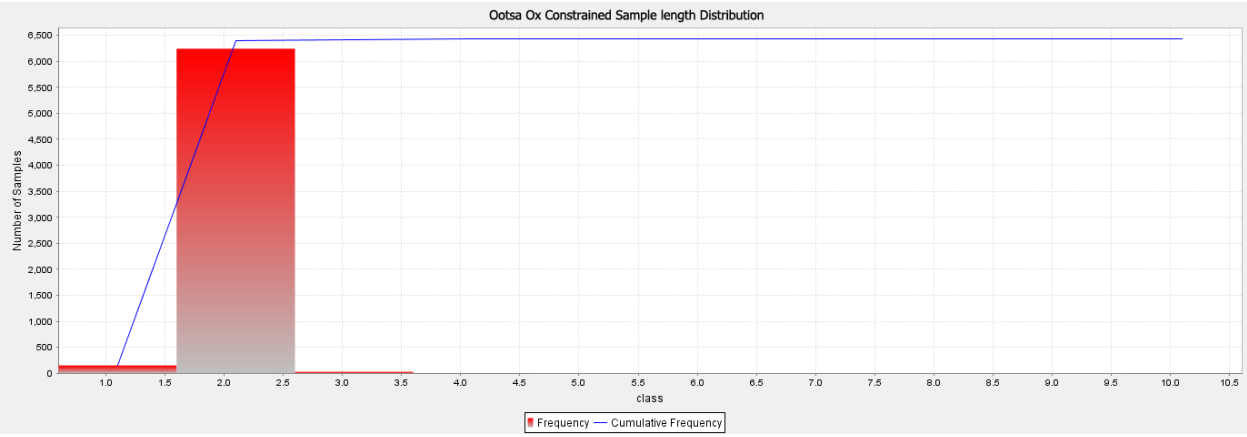


Figure 14.2 East Seel Drill Hole Assay Sample Length Distribution

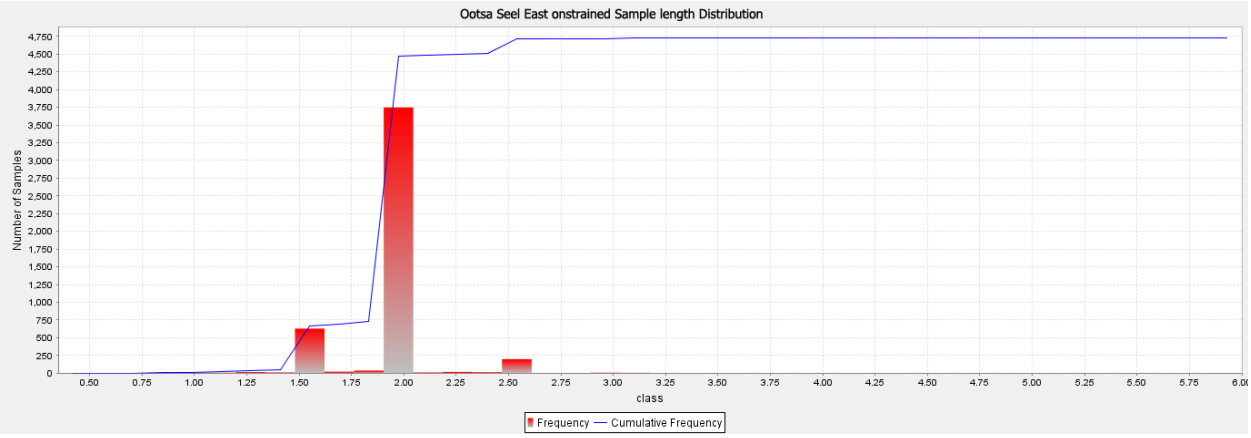
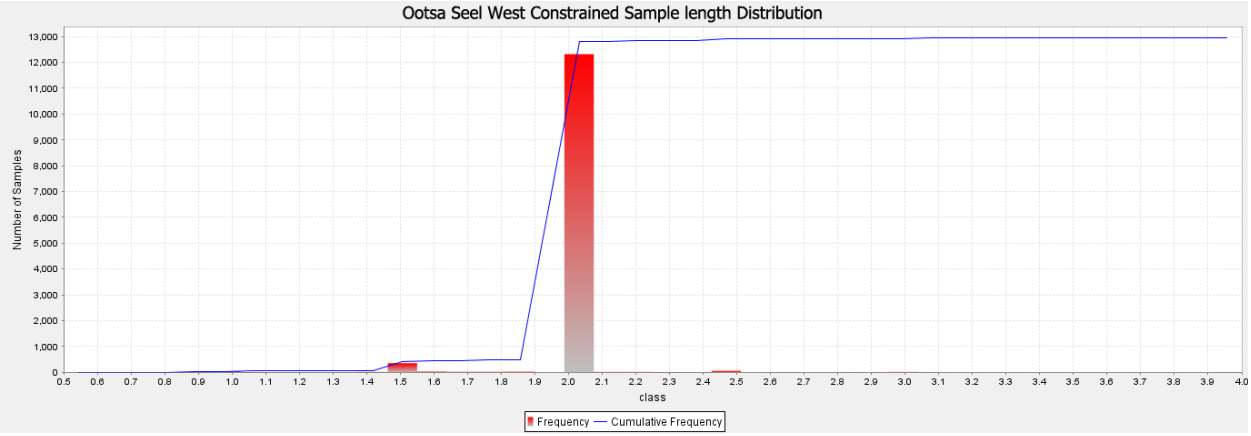


Figure 14.3 West Seel Drill Hole Assay Sample Length Distribution



14.7 GRADE CAPPING

Grade capping was investigated on two metre composite values within the constraining domains to ensure that the possible influence of erratic high values did not bias the database. Log-normal histograms were generated using composites and resulted in the graphs exhibited in Appendix-

III. Based on the log-normal histogram performance, as detailed in Table 14.2 to Table 14.4, the values were capped as follows:

TABLE 14.2
OX COMPOSITE CAPPING STATISTICS

Element	Uncapped				Capped			
	Cu (%)	Mo %	Ag (g/t)	Au (g/t)	Cu (%)	Mo (%)	Ag (g/t)	Au (g/t)
Number of samples	6,723	6,723	6,723	6,723	6,723	6,723	6,723	6,723
Minimum value	0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.001
Maximum value	1.618843	0.2639	299.4879	0.6167	1.3	0.2833	55.00	0.6171
Mean	0.2538	0.0274	1.6275	0.0411	0.2499	0.027	1.5125	0.0404
Median	0.2253	0.0224	1.1000	0.0325	0.2209	0.022	0.0891	0.0317
Variance	0.0218	0.0004	35.1831	0.0011	0.0214	0.0004	6.6113	0.0011
Standard Deviation	0.1478	0.0213	5.9315	0.0344	0.1463	0.0212	2.5712	0.0343
Coefficient of variation	0.58	0.78	3.64	0.84	0.58	0.78	1.70	0.84
Capping Value	1.3	No Cap	55	No Cap				
# Composites Capped	4	0	11	0				
Percentile Capped	99.94	100	99.84	100				

TABLE 14.3
EAST SEEL & EAST SEEL NORTH EAST EXTENSION COMPOSITE CAPPING STATISTICS

Element	Uncapped				Capped			
	Cu (%)	Mo %	Ag (g/t)	Au (g/t)	Cu (%)	Mo (%)	Ag (g/t)	Au (g/t)
Number of samples	5,489	5,489	5,489	5,489	5,489	5,489	5,489	5,489
Minimum value	0.0005	0.0001	0.001	0.001	0.0005	0.001	0.001	0.0005
Maximum value	4.3638	0.062	117.8932	3.3377	2.0	0.062	50.0	3.0
Mean	0.2527	0.002	1.5204	0.2665	0.2521	0.002	1.4926	0.2664
Median	0.2195	0.0009	1.0	0.2106	0.2196	0.001	1.0	0.2107
Variance	0.0389	1.4749	12.4844	0.0545	0.0357	1.4757	8.5034	0.0539
Standard Deviation	0.1972	0.0038	3.5333	0.2335	0.1889	0.0038	2.916	0.23229
Coefficient of variation	0.78	1.83	2.32	0.88	0.75	1.83	1.95	0.87
Capping Value	2	No Cap	50	3				
# Composites Capped	12	0	17	20				
Percentile Capped	99.78	100	99.69	99.64				

TABLE 14.4 WEST SEEL COMPOSITE CAPPING STATISTICS								
Element	**Uncapped**				**Capped**			
	Cu (%)	**Mo** %	**Ag (g/t)**	**Au (g/t)**	**Cu (%)**	**Mo** (%)	**Ag (g/t)**	**Au (g/t)**
Number of samples	14,483	14,483	14,483	14,483	14,483	14,483	14,483	14,483
Minimum value	0.0004	0.0001	0.0431	0.0005	0.0004	0.0001	0.0431	0.0005
Maximum value	2.5009	0.4009	57.4995	13.9027	1.3	0.401	40.0	6.0
Mean	0.1949	0.021	2.7899	0.1358	0.1947	0.021	2.7875	0.1339
Median	0.172	0.0143	2.1055	0.086	0.172	0.0143	2.1056	0.086
Variance	0.0152	0.0004	6.2368	0.089	0.0148	0.0004	6.0258	0.057
Standard Deviation	0.1235	0.0221	2.4973	0.2984	0.1218	0.0221	2.4547	0.2389
Coefficient of variation	0.63	1.05	0.90	2.20	0.63	1.05	0.88	1.78
Capping Value	1.3	No Cap	40	6				
# Composites Capped	4	0	3	8				
Percentile Capped	99.97	100	99.97	99.94				

The capped average composite grade decreased less than 1% from the grade of the uncapped composites. These capped composite values were extracted with Gemcom into a point profile, and then utilized for variography and grade interpolation.

14.8 SEMI-VARIOGRAMS

A semi-variogram study was performed as a guide to the grade interpolation search ellipse strategy. The variography investigation was attempted on the constrained capped composites for Cu, Mo, Au and Ag respectively. Reasonable variograms were attained along strike, down dip and across dip for all elements. The variogram ranges were used as the spherical search ellipse parameters for grade interpolation. The variograms for Cu are illustrated in Appendix-IV.

14.9 BULK DENSITY

The bulk density used for these resource models were derived from 4,077 analyses performed on drill core using wet immersion method by Gold Reach. These densities varied from 2.39 to 3.65 t/m³ and averaged 2.72 t/m³. There were also 12 independent verification samples taken by Eugene Puritch, P.Eng. on Oct 1, 2015 which were analyzed at Agat Laboratories in Mississauga with an average value of 2.72 t/m^3.

The bulk density block models were interpolated with a single pass spherical search ellipse utilizing the constrained Gold Reach bulk density data within the mineralized domains. The average block model mineralized bulk density was calculated to be 2.68 t/m^3 for Ox, 2.76 t/m^3 for East Seel and 2.72 t/m^3 for West Seel.

14.10 BLOCK MODELING

The Ootsa resource block models were constructed using Gemcom modeling software. The Ox block model is oriented with X axis at 22° azimuth (rotated 68° counter clockwise) parallel to the trend of the mineralization domain. The West and East Seel block model is oriented with X axis at 132.607° azimuth (rotated 42.607° clockwise) parallel to the trend of the mineralization domain. The block model parameters are summarized in Table 14.5 and Table 14.6.

TABLE 14.5 OX BLOCK MODEL DEFINITIONS			
Direction	**Origin**	**# of Blocks**	**Block Size (m)**
X	628,782.59	162	10
Y	5,948,000.64	148	10
Z	1,300	80	10
Rotation	68° (counter clockwise)		

TABLE 14.6 WEST AND EAST SEEL BLOCK MODEL DEFINITIONS			
Direction	**Origin**	**# of Blocks**	**Block Size (m)**
X	624,878.77	250	10
Y	5,944,863.80	250	10
Z	1,300	130	10
Rotation	42.607^{o} (clockwise)		

Block models for rock type, density, percent, Mo, Cu, Ag, Au, NSR, and class were created. All blocks in the rock type block models were initially assigned a waste rock code of 99, corresponding to the country rocks. The mineralization domains were utilized to select all blocks within the domain models that contain by volume 1 % or greater mineralization. These blocks were assigned rock codes 10, 20 and 30 for the East and West Seel block model and 20, 30 and 40 for the Ox block model. The overburden and topographic surfaces were subsequently used to assign rock code 0 for air and 98 for overburden to all blocks 50 % or greater above the surfaces.

Volume percent block models were set up to accurately represent the volume and subsequent tonnage that was occupied by each block inside the constraining domains. As a result, the domain boundaries were properly represented by the percent model's ability to measure individual infinitely variable block inclusion percentages within the domains.

The grade (Cu, Mo, Au and Ag) and density models for all mineralized blocks were interpolated using Inverse Distance Squared ("$1/d^2$") method. The NSR C $/t values of the mineralized blocks were derived using the formula below:

NSR = (Cu% x 71.71 + Mo% x 196.08 + Au x 34.19 + Ag x 0.51) – 2.93

Factors applied to the metal grades in this formula are based on metal prices and process recoveries. See Section 14.12.1 of this PEA.

The Ox resource domain was divided into three sub-domains to assure the search ellipsoid orientations were aligned with the trend of the mineralization. 99.89% of the mineralized blocks were interpolated with the first two grade interpolation passes for Cu. Grade blocks were interpolated using the parameters in Table 14.7.

The resulting Cu and Mo grade blocks selected are presented on the block model cross-sections and plans in Appendix-V. The Cu, Mo, Au, Ag grade blocks were combined into an NSR block model which can be seen in Appendix VI.

TABLE 14.7 BLOCK MODEL INTERPOLATION PARAMETERS										
Element	**Pass**	**Strike Dir O**	**Dip Dir º**	**Dip º**	**Strike Range (m)**	**Dip Range (m)**	**Across Dip Range (m)**	**Max # per Hole**	**Min # Sample**	**Max # Sample**
East Seel	1	35	305	-68	70	90	45	2	5	20
	2	35	305	-68	105	130	65	2	3	20
	3	35	305	-68	210	260	130	2	1	20
West Seel	1	45	315	-68	95	120	50	2	5	20
	2	45	315	-68	140	175	70	2	3	20
	3	45	315	-68	280	350	140	2	1	20
Ox North	1	110	200	-90	75	75	35	2	5	20
	2	110	200	-90	110	110	55	2	3	20
	3	110	200	-90	220	220	110	2	1	20
Ox Centre	1	20	200	-90	75	75	35	2	5	20
	2	20	200	-90	110	110	55	2	3	20
	3	20	200	-90	220	220	110	2	1	20
Ox South	1	120	30	-90	75	75	35	2	5	20
	2	120	30	-90	110	110	55	2	3	20
	3	120	30	-90	220	220	110	2	1	20

14.11 RESOURCE CLASSIFICATION

In P&E's opinion, the drilling, assaying and exploration work used for this resource estimate are sufficient to indicate the Ootsa deposit has reasonable potential for economic extraction and thus qualify it as a Mineral Resource under CIM definition standards. The resource classification was determined with the Cu interpolation parameters since Cu generated the highest proportionate NSR value contribution in the block model. Based on the semi-variogram analysis and density of the drilling data, the Measured Resource category was justified for blocks interpolated by the first interpolation pass (1) followed by Indicated Resources with a second interpolation pass (2) and Inferred Resources were categorized with a third pass (3) to code to all un-interpolated grade blocks. Selected classification block cross-sections and plans are attached in Appendix VII.

14.12 MINERAL RESOURCE ESTIMATE

The resource estimate was derived from applying a C$8.50/t NSR cut-off grade to the block model and reporting the resulting tonnes and grade for potentially mineable areas. The following calculation demonstrates the rationale supporting the block NSR values that were used to determine the open pit potentially economic portions of the constrained mineralization.

14.13 OPEN PIT NSR CALCULATION

The 36 month approximate trailing average metal prices as of September 30, 2015 were:

Cu Price	US$3.25/lb
Mo Price	US$12/lb
Au Price	US$1,350/oz
Ag Price	US$22/oz
$US/$C Exchange Rate	$0.85

Cu Concentrate Recovery	90%
Mo Concentrate Recovery	70%
Au Concentrate Recovery	70%
Ag Concentrate Recovery	65%

Cu Concentration Ratio	110:1
Mo Concentration Ratio	3,142:1

Cu Smelter Payable	96%
Mo Smelter Payable	90%
Au Smelter Payable	96%
Ag Smelter Payable	96%

Cu Refining	US$0.05/lb
Au Refining	US$5.00/oz
Ag Refining	US$0.50/oz

Trucking/Storage/Ship Loading	US$120/ WMT
Cu Smelter Treatment Charge	US$100/ DMT
Mo Roaster Treatment Charge	US$1,200/DMT
Humidity Factor	8.0%

These data were derived from metallurgical test work reports and other open pit mining operations similar to that anticipated at Ootsa.

The NSR C$/t block model values were calculated based on the above parameters and the formula below:

NSR = (Cu% x 71.71 + Mo% x 196.08 + Au x 34.19 + Ag x 0.51) – 2.93

14.14 OPEN PIT NSR CUT-OFF BASIS

In the anticipated open pit mining operation, Mill Processing and G&A costs combine for a total of ($7.50 + $1.00) = $8.50 per tonne milled which becomes the NSR cut-off value.

Mineral Resource Constraining Parameters

In order for the constrained open pit mineralization in the Ootsa resource model to be considered potentially economic, a first pass pit optimization was carried out to create a pit shell for resource reporting purposes (Appendix VIII) utilizing the criteria below:

Mineralized Material & Waste mining cost per tonne	$2.25
Overburden mining cost per tonne	$1.50
Process cost per tonne of mill feed	$7.50
General & Administration cost per tonne of mill feed	$1.00
Process production rate (tonnes per year)	5,600,000
Pit slopes (overall wall angle)	45 degrees
Average Mineralized Rock Bulk Density	2.72/m^3
Waste Rock Bulk Density	2.75t/m^3
Overburden Bulk Density	2.00t/m^3

14.15 UPDATED MINERAL RESOURCE ESTIMATE

The resulting updated Ootsa Pit Constrained Mineral Resource estimate is summarized in Table 14.8.

TABLE 14.8
OOTSA PIT CONSTRAINED UPDATED MINERAL RESOURCE ESTIMATE AT C$8.50/T NSR CUT-OFF VALUE(1-5)

Deposit	Category	Tonnes('000's)	CuEq %	Cu%	Au g/t	Mo %	Ag g/t	CuEq M lbs	Cu M lbs	Au K oz	Mo M lbs	Ag K oz
Ox	Measured	30,492	0.37	0.26	0.04	0.028	1.5	249	175	39	19	1,471
	Indicated	3,204	0.32	0.23	0.04	0.021	1.4	23	16	4	1	144
	M&I	**33,696**	**0.37**	**0.26**	**0.04**	**0.027**	**1.5**	**272**	**191**	**43**	**20**	**1,615**
East Seel	Measured	22,165	0.43	0.28	0.26	0.002	2.5	210	137	185	1	1,782
	Indicated	1,422	0.38	0.28	0.14	0.003	4.4	12	9	6	0	201
	M&I	**23,587**	**0.43**	**0.28**	**0.26**	**0.002**	**2.6**	**222**	**146**	**191**	**1**	**1,983**
West Seel	Measured	134,491	0.37	0.21	0.16	0.022	3.2	1,097	623	692	65	13,837
	Indicated	32,415	0.36	0.21	0.13	0.024	2.9	257	150	135	17	3,022
	M&I	**166,906**	**0.37**	**0.21**	**0.15**	**0.023**	**3.1**	**1,354**	**773**	**827**	**82**	**16,859**
	Inferred	5,212	0.30	0.18	0.09	0.019	2.6	34	21	15	2	436
Total	Measured	187,148	0.38	0.23	0.15	0.021	2.8	1,568	934	916	85	17,089
	Indicated	37,041	0.35	0.21	0.12	0.023	2.8	286	175	146	19	3,368
	M&I	**224,189**	**0.37**	**0.22**	**0.15**	**0.021**	**2.8**	**1,854**	**1,109**	**1,062**	**104**	**20,457**
	Inferred	5,212	0.30	0.18	0.09	0.019	2.6	34	21	15	2	436

(1) Mineral Resources, which are not mineral reserves, do not have demonstrated economic viability. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.

(2) The quantity and grade of reported Inferred Resources in this estimation are uncertain in nature and there has been insufficient exploration to define these Inferred Resources as an Indicated or Measured Mineral Resource and it is uncertain if further exploration will result in upgrading them to an Indicated or Measured Mineral Resource category.

(3) The Mineral Resources in this PEA were estimated using the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), CIM Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by the CIM Council.

(4) The $8.50/t NSR resource cut-off value grade was derived from Sep 30/15 three year approximate trailing average US metal prices of: Cu $3.25/lb, Au $1,350/oz, Mo $12/lb and Ag $22/oz and a US$:CDN$ exchange rate of 0.85. Process recoveries used were Cu 90%, Au 70%, Mo 70% and Ag 65% with respective smelter payables of 96%, 96%, 96% and 90%. Refining charges in US$ were Cu $0.05/lb, Au $5/oz and Ag $0.50/oz. C$ operating costs used were $2.25/t for mineralized material and waste mining, $1.50/t for overburden mining, $7.50/t for processing and $1.00/t for G&A. An optimized pit shell was utilized for resource reporting that utilized 45 degree slopes and an average mineralized material bulk density of 2.72 t/m^3.

(5) Copper Equivalent (Cu Eq) calculations are based on base case metal price and process recovery assumptions, and take into account smelter payable rates and refining costs.

The NSR cut-off sensitivity of the pit constrained mineral resource estimate are tabulated in Table 14.9.

TABLE 14.9 OOTSA PIT CONSTRAINED MEASURED AND INDICATED UPDATED MINERAL RESOURCE ESTIMATE SENSITIVITY TO NSR CUT-OFF						
Deposit	**NSR Cut-off C$/t**	**Tonnes ('000's)**	**Cu %**	**Mo %**	**Au g/t**	**Ag g/t**
Ox	15.00	27,136	0.28	0.030	0.05	1.7
	12.50	30,626	0.27	0.028	0.05	1.6
	10.00	33,052	0.26	0.027	0.04	1.5
	8.50	**33,696**	**0.26**	**0.027**	**0.04**	**1.5**
	7.00	33,966	0.26	0.027	0.04	1.5
	5.00	34,134	0.26	0.027	0.04	1.5
	0.01	34,273	0.26	0.027	0.04	1.5
East Seel	15.00	19,824	0.31	0.002	0.28	2.9
	12.50	21,765	0.30	0.002	0.27	2.7
	10.00	23,151	0.29	0.002	0.26	2.6
	8.50	**23,587**	**0.28**	**0.002**	**0.26**	**2.6**
	7.00	23,844	0.28	0.002	0.25	2.6
	5.00	24,028	0.28	0.002	0.25	2.6
	0.01	24,200	0.28	0.002	0.25	2.5
West Seel	15.00	125,476	0.24	0.026	0.18	3.4
	12.50	146,459	0.22	0.024	0.16	3.3
	10.00	161,558	0.21	0.023	0.15	3.2
	8.50	**166,906**	**0.21**	**0.023**	**0.15**	**3.1**
	7.00	169,982	0.21	0.022	0.15	3.1
	5.00	172,089	0.21	0.022	0.15	3.1
	0.01	173,725	0.21	0.022	0.15	3.1
Total	15.00	172,436	0.25	0.024	0.17	3.1
	12.50	198,850	0.24	0.022	0.16	3.0
	10.00	217,761	0.23	0.021	0.14	2.9
	8.50	**224,189**	**0.22**	**0.021**	**0.15**	**2.8**
	7.00	227,792	0.22	0.021	0.14	2.8
	5.00	230,251	0.22	0.021	0.14	2.8
	0.01	232,198	0.22	0.021	0.14	2.8

14.15.1 Confirmation of Updated Estimate

The block model was validated using a number of industry standard methods including visual and statistical methods. These included:

Visual examination of composite and block grades on plans and sections on-screen and review of estimation parameters including:

- Number of composites used for estimation;
- Number of holes used for estimation;
- Distance to the nearest composite;
- Number of passes used to estimate grade;
- Mean value for composites used.

As a test of the reasonableness of the Mineral Resource estimate, the average grade for the block models at a $0.01/t NSR cut-off value were compared to the average grade of length weighted assays and capped composites within the constraining domain solids. As shown in Table 14.10, the block model mean grades of Cu, Mo, Au and Ag are somewhat lower than the length weighted assays and capped composites. In P&E's opinion, the block model grade will be the most spatially representative.

TABLE 14.10
COMPARISON OF LENGTH WEIGHTED ASSAYS & CAPPED COMPOSITES TO BLOCK MODELS

Deposit	Data Type	Cu %	Mo %	Au g/t	Ag g/t
Ox	Length Weighted Assays	0.25	0.027	0.04	1.6
	Capped Composites	0.25	0.027	0.04	1.5
	Block Model	0.24	0.025	0.04	1.5
East Seel	Length Weighted Assays	0.26	0.002	0.26	2.0
	Capped Composites	0.26	0.002	0.26	2.0
	Block Model	0.24	0.002	0.22	2.0
West Seel	Length Weighted Assays	0.20	0.021	0.14	2.8
	Capped Composites	0.20	0.021	0.14	2.8
	Block Model	0.20	0.021	0.14	2.5

A volumetric comparison was performed with the block model volume of the model blocks versus the geometric calculated volume of the domain solids, as detailed in Table 14.11.

TABLE 14.11
COMPARISON OF GEOMETRIC DOMAIN VS. BLOCK MODEL VOLUMES

	Ox	East Seel	West Seel
Block Model Volume	18,864,284m^3	11,081,731m^3	132,664,747m^3
Geometric Domain Volume	19,102,168m^3	11,081,999m^3	132,673,939m^3
Difference	1.26%	0.002%	0.006%

15.0 MINERAL RESERVE ESTIMATES

There are no mineral reserves for the Ootsa Project.

16.0 MINING METHODS

A mining contractor will be engaged by Gold Reach to carry out all mining operations at the Ootsa Property.

16.1 GEOTECHNICAL

A geotechnical review of the Seel and Ox deposits was conducted by consulting engineers Knight Piesold Ltd. to establish pit slope parameters for mine design. The review made use of various information including geological reports, 3D models of deposit geology and structural features, preliminary pit shells, exploration drill core logging of Rock Quality Designation ("RQD") data, geotechnical descriptions from core logs, and core photographs.

The data review for the Seel deposit showed intact rock strength to be strong with an estimated average Unconfined Compressive Strength ("UCS") of 100 MPa. Inspection of core from the Seel deposit at various depths confirmed a rock mass quality of "good" and an RQD of 75-80%.

A similar review of the Ox deposit also indicated strong intact rock strength with an estimated average UCS of 50 MPa. The review determined, however, that the rock mass at Ox was less competent than that at Seel. Rock mass quality at Ox is considered "fair" with an RQD of 40-45%.

Recommendations for slope design parameters were made for each deposit and are shown in Table 16.1. At the Seel deposit in hard rock, bench face angles of 70-75° are expected to be achievable. Double-benching to a height of 24 m with 9.5-11.5 m wide catch berms will result in 53° inter-ramp angles. Overburden at Seel will be mined in 12 m benches with a 45° bench face angle, 12 m wide catchments, and a resulting 27° inter-ramp angle. Overall slopes for the East and West Seel pits are expected to range from 41-48° depending on the depth of overburden and the configuration of ramps (number of ramp widths in the pit wall).

TABLE 16.1
RECOMMENDED GEOTECHNICAL DESIGN PARAMETERS

Pit	Wall Height (m)	Design Sector	Bench Height (m)	Bench Face Angle (°)	Bench Width (m)	Inter-ramp Angle (°)	No. of Ramps	Overall Slope Angle (°)
East Seel	240	Overburden	12	45	12	27	2	41 to 48
		Competent Bedrock	24	70/75	9.5/11.5	53		
West Seel	200	Competent Bedrock	24	70/75	9.5/11.5	53	2	48
Ox	240	Less-Competent Bedrock	24	65	13	45	1	43

At the Ox deposit, a 65° bench face angle is expected in hard rock. Wider catchments of 13 m on 24 m high double benches will result in flatter inter-ramp angles of 45°. Where major overburden slopes exist design parameters will be the same as at Seel. Where overburden occurs as a thin

layer overlying hard rock overburden slopes will be designed at angle of repose of 36°. Overall slopes for the Ox pit are expected to be about 43° depending on ramp configuration.

Although the geotechnical recommendations were for 12 m single height benches and 24 m double benches, it was decided to design the open pits using conservative 10 m single height benches and 20 m double benches since the resource block model was set to 10 m high blocks.

16.2 HYDROGEOLOGY

No hydrogeological investigation was undertaken of the Ootsa Property. Such a program will be conducted at the next stage of engineering. No major aquifers or other water-bearing structures were encountered during exploration drilling therefore there is no reason to believe that groundwater will be a significant factor in terms of either inflow or pit wall stability. An allowance for groundwater inflow of 200 m^3/hr was made for the purpose of this PEA.

16.3 MINE DEVELOPMENT PLAN

The deposits at the Ootsa Property will be mined by standard open pit truck/shovel methods similar to those employed by numerous operating mines in BC. Three open pits will be mined in sequence commencing with East Seel, then Ox, and finally West Seel. The sequence follows the highest value of the mineralized material which is primarily a function of grade and strip ratio to maximize Net Present Value ("NPV").

An alternative schedule was considered which mined both of the pits at the Seel deposit before developing Ox. Mining the East Seel and West Seel pits one after another was perceived to contribute to improved operational efficiency, would allow stripping of West Seel to be balanced with mill feed delivery from East Seel, and reduce the number of crusher and conveyor moves from two to one.

A short trade-off study was done comparing the mining sequence options. It concluded that despite the need to move the crusher earlier in the plan and more times, the ES-Ox-WS sequence delivered incremental NPV almost $10 M higher than the alternative sequence which mined both the Seel pits first. Mining the Ox Pit second also allowed the costs associated with preparing the Ox mining area for development to be deferred from the initial capital cost. The results of the trade-off study can be found in Appendix IX.

The mine development plan calls for pre-stripping of the East Seel pit six months prior to the start of production. During this time, mill feed transfer infrastructure will be installed including both an overland and floating conveyor system and a crusher. The crusher is a Metso C160 jaw crusher or equivalent installed in a skid-mounted, movable arrangement that allows for direct dumping by haul trucks at a capacity of 850 tonnes per hour ("tph").

During the first two years of mining, the crusher will operate at 700 tph. In the third year of mining, the crushing rate will be raised to 850 tph to build a 1.0 Mt stockpile of crushed material. During this time, the Ox Pit will be cleared and the lake drained. A new section of overland conveyor, 1.8 km in length, will be installed from the Permanent Transfer Point (PTP) along the conveyor corridor to the Ox Pit.

When mill feed mining is completed at East Seel, a two month window is allowed for relocation of the crusher and 2.1 km of Seel overland conveyor to connect the crusher at Ox to the newly

installed conveyor to the PTP. During this period, the mill will continue to operate normally feeding from the stockpile of crushed material built up over the previous twelve months.

Mining at the Ox Pit will occur over the subsequent 5 ½ years. In Year 9, the West Seel pit will be cleared, the crushed mill feed stockpile built up again, and the crusher and 2.1 km of overland conveyor moved back to Seel for the final 2 ½ years of operation.

16.4 PIT OPTIMIZATION

The resource block model for each deposit was used as the basis for a pit optimization exercise employing NPV Scheduler software that uses the Lerchs Grossman algorithm. The optimization process generates a series of nested pit shells whose values vary depending on changing metal price. The material contained within each shell represents the highest economic value available given the design parameters applied.

Table 16.2 presents the parameters used for the pit optimization process. Due to the multi-element nature of the deposits, cut-off value was based on a Net Smelter Return ("NSR") which considered the recovered value of all metals in each block less the cost of smelting, refining, and transportation.

Within the pit optimizer, the value for all blocks above cut-off is calculated and compared to the value of the surrounding waste blocks in three dimensions. Subject to slope constraints, blocks which generate a net positive value are mined and in this manner a pit shell is defined. Revenue is varied by applying a variable percentage of the base case metal prices (metal price factors) to generate a series of nested pit shells.

The relative value of each shell is determined by calculating the NPV for the contained resource on a discounted, direct cost basis, mined and processed at the anticipated rate. As the nature of the resource is not fully understood at the outset, this process may be iterative as pit optimization defines the size of the resource which is potentially most economic given the chosen constraints.

It is notable that the NPV calculated by the pit optimizer can only serve as a guide and does not represent absolute value because it does not include the capital costs, financing, or taxes. In the case of projects where capital is deployed once at the start of the project and development proceeds thereafter in a uniform manner, the optimized NPV is a good guide to shell value. In the case of Ootsa, where mining is sequential and capital is deployed accordingly, the value of perspective pit shells was evaluated using a discounted cash flow model.

Discounted cash flow analysis of optimized resources not only serves to provide an absolute measure of potential resource value but also ensures that business considerations are taken into account in the shell selection process. Larger resources which offer greater upside may require higher capital investment in the form of pre-stripping or elevated throughputs for their full potential value to be realized. This may, in turn, entail a need for greater financing capacity and/or a higher appetite for risk.

In the case of Ootsa, the development was constrained by the capacity of the available resources in the form of the mill in order to minimize initial capital cost. However, given these constraints, pit shells were selected based on forecast future metal prices rather than current prices to reflect the earliest time when Ootsa could reasonably be expected to be brought into production. Lastly,

resource upside was balanced against economic resilience at copper prices below US$2.50/lb to take into account future swings in the metal price cycle.

The results of the pit optimization runs can be found in Appendix X with the selected shell for each pit highlighted in yellow.

TABLE 16.2
OOTSA PIT OPTIMIZATION PARAMETERS

OPERATING COSTS

	West Seel	East Seel	Ox	
Mining, OB	1.54	1.54	1.54	C$/t mined
Mining, Mill Feed	2.33	2.27	2.21	C$/t mined
Mining, Waste	1.95	1.90	2.02	C$/t mined
Milling	9.18	9.18	7.87	C$/t milled
G&A	1.50	1.50	1.50	C$/t milled

PIT SLOPES

	IRA		
Rock-type	Seel E	Seel W	Ox
OB	27°	27°	27°
Hard rock	53°	53°	45°

RECOVERY

Pit	Cu	Au	Ag	Mo
East Seel	90%	70%	60%	---
West Seel	92%	65%	60%	70%
Ox	91%	70%	65%	70%

METAL PRICE & FOREX

Case		A	B	C	D	E	F	G
Cu	$/lb	2.25	2.50	2.75	3.00	3.25	3.50	3.75
Au	$/oz	1,100	1,150	1,200	1,250	1,300	1,350	1,400
Ag	$/oz	12.00	14.00	16.00	18.00	20.00	22.00	24.00
Mo	$/lb	5.50	7.00	8.50	10.00	11.50	13.00	14.50
FOREX	US$:C$	0.75	0.78	0.80	0.83	0.85	0.88	0.90

REFINING COSTS

Cu	Au	Ag	Mo
US$/lb	US$/oz	US$/oz	US$/lb
0.05	5.00	0.50	---

CONCENTRATE PARAMETERS

		Cu	Mo
Conc Grade	%	27%	51%
Moisture	%	8%	8%
Treatment	US$/DMT	100	1,200
Road & Port	US$/WMT	60	60
Shipping	US$/WMT	60	60

PAYABLE METAL

Cu	Au	Ag	Mo
%	%	%	%
96	96	96	90

FINANCIAL

		Seel	Ox
Discount Rate	%	5.0%	5.0%
Royalty	%	0.5%	---

16.5 PIT DESIGNS

The selected pit shells for each pit were used as the basis to generate mineable pit designs. Selected shells generated using recommended inter-ramp angles were re-run with appropriate slopes flattened by 5° to reflect the placement of haulage ramps. Final pit shells were subsequently used as a template to guide a "bottom up" manual pit design process.

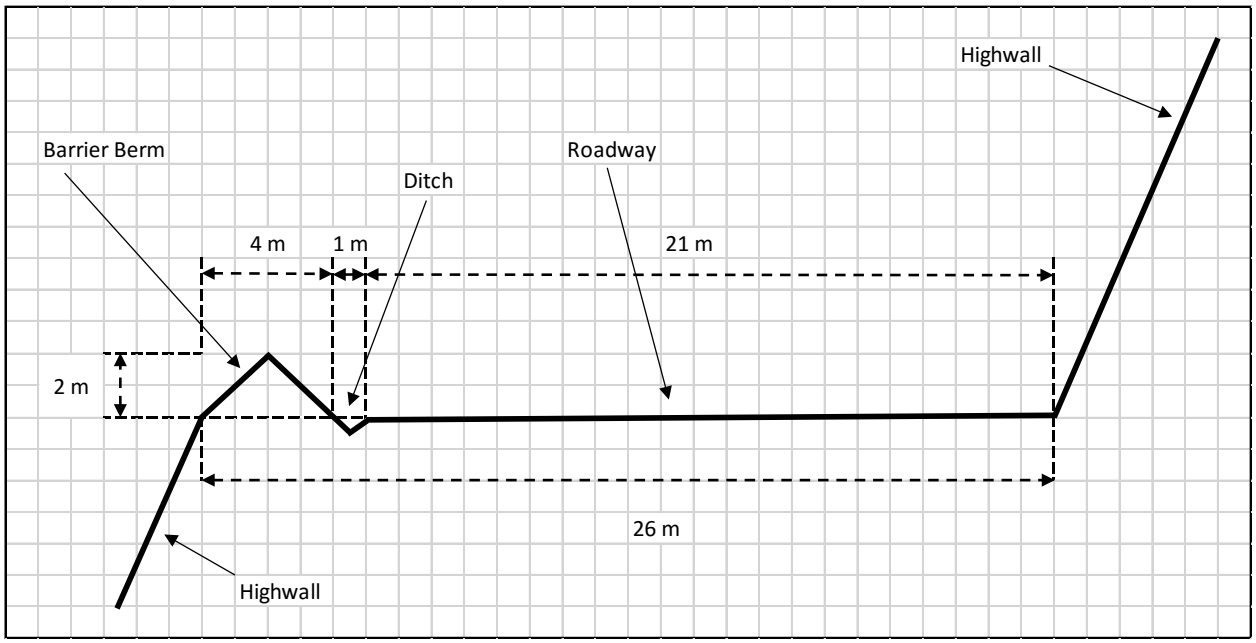
16.5.1 Physical Pit Design Parameters

The physical design parameters were largely based on the slope recommendations from the geotechnical review. Single bench heights were adjusted to 10 m to match the 5 m block height in the resource model. Double benches in hard rock were 20 m in height. In overburden only single benching was employed.

For hard rock benches catchments varied from 10-12 m depending on the height of the adjacent highwall. For full overburden benches, catchments were equal to the 10 m bench height. In partial overburden benches, predominantly at Ox, catchments were reduced to 4 m to achieve a stable angle of repose design slope. Catchments in wall sectors composed of hard rock or deep overburden were designed to accommodate mechanized cleaning as required by mine regulators.

Haulage ramps were designed to permit dual-lane access in and out of each pit for the largest trucks working there. A running surface of 21 m is more than three times the 6.9 m operating width of a CAT 785 haul truck. Allowances for drainage and a barrier berm result in a total haulage ramp width of 26 m. Figure 16.1 shows the configuration of a typical in-pit haulage ramp.

Figure 16.1 Typical In-Pit Haulage Ramp Configuration



Ramps were designed at a grade of 10% inside curve. In the lower portions of each pit, ramps were narrowed to 16 m providing single-lane access for mining when the strip ratio declines. Access to the bottom bench was designed at a grade of 15% and was assumed to be mined out in

retreat by backhoe. A minimum mining width of 20 m was respected in the planning of production benches.

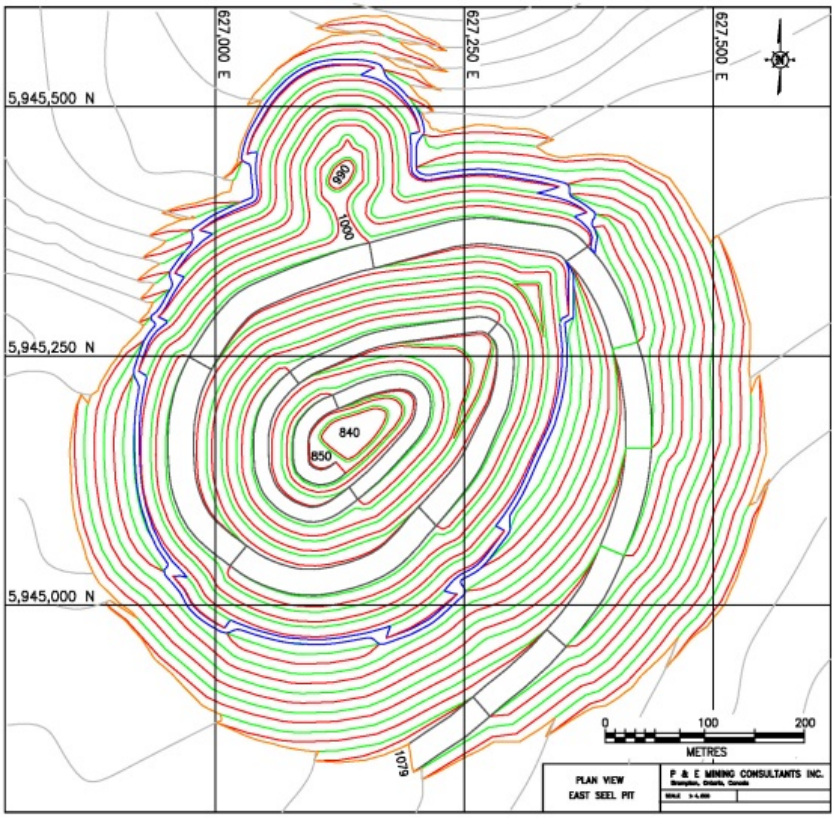
16.6 PIT DESIGN DESCRIPTIONS

A cross-section through the middle of each pit, and a cross-section showing wall angle configurations for each pit can be found in Appendix XI.

16.6.1 East Seel Pit

The East Seel open pit is located on the lower, north-facing slopes of the Troitsa Peak massif. The pit is centred on a narrow drainage which runs between the massif to the south and a smaller hill to the north which hosts the East Seel and East Seel Extension deposits. It is located upslope of the West Seel open pit from which it is separated by a narrow saddle, which remains undisturbed throughout mining.

Figure 16.2 East Seel Open Pit Design



Refer to Figure 16.2 for a plan view of the East Seel open pit design. The East Seel pit is roughly circular with a diameter of approximately 700 m and total area of about 37 ha. The top bench lies at an elevation of 1,120 m ASL with the final pit floor at an elevation of 840 m ASL. The total pit depth is 280 m. A small lobe or sub-pit exists on the northern margin of the excavation where a pocket of high-value, breccia-hosted mineralization occurs. The northeast edge of the lobe lies within 200 m of the planned crusher location which also marks the start of the overland conveyor.

The pit varies from essentially zero overburden on the north side to deep overburden on the south side. As such, the first 60 m are designed as single benches. Once all the benches are in hard rock, double-benching commences. The blue line in Figure 16.2 indicates the overburden-hard rock boundary where the transition from single to double-benching occurs.

The main ramp has a length of 2.5 km and exits the south end of the pit at an elevation of 1,100 m ASL. Exiting at the south end of the pit provides the shortest haul to waste dumps located upslope of the pit. Above the ramp exit, access to benches is via temporary roads which are cut off and left behind as mining proceeds downslope. The main ramp is full width until reaching elevation 950 m ASL below which the ramp narrows to single-lane.

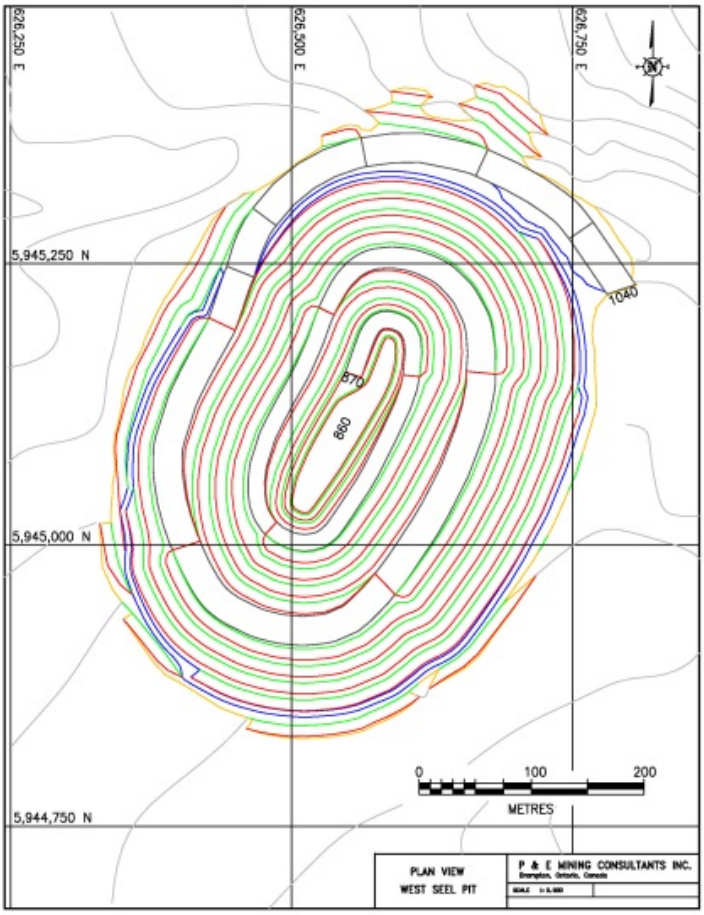
The upper reaches of a drainage known as Seel Creek run through the East Seel pit area. Run-off entering the drainage will be intercepted upslope of the pit by a diversion ditch established around the waste rock stockpile. Design of ditches and other water management infrastructure will be undertaken at the next stage of engineering.

16.6.2 West Seel Pit

The West Seel open pit is located west and downslope of the East Seel pit. It is uniformly oval in shape with a length of 600 m, a width of 400m, and total area of about 19 ha. The top bench lies at an elevation of 1,050 m ASL with the final pit floor at an elevation of 860 m ASL. The total pit depth is 190 m.

Overburden is shallow on most of the West Seel pit. Although the first 60 m of West Seel is also single-benched to accommodate the presence of overburden, the total quantity is significantly less than that at East Seel. By the time mining reaches elevation 1,050 m ASL, benches host sufficient mill feed to satisfy mill throughput on a monthly basis. Double-benching starts at an elevation of 1,000 m ASL at which point the benches are entirely in hard rock. Refer to Figure 16.3 for a plan view of the West Seel pit design.

Figure 16.3 West Seel Open Pit Design



The final pit ramp is approximately 1.7 km in length exiting the pit at the north end at an elevation of 1,040 m ASL. From this location, trucks can haul directly south to the Seel waste rock stockpiles or north to the crusher and overburden stockpiles. The main haulage ramp is full width to elevation 930 m ASL at which point it narrows providing single-lane access to the bottom.

As with the East Seel pit, drainage flowing through the design pit will be diverted prior to entering the mining area. There are no extenuating environmental considerations to managing this flow as the upper reaches of Seel Creek are not fish-bearing.

16.6.3 Ox Pit

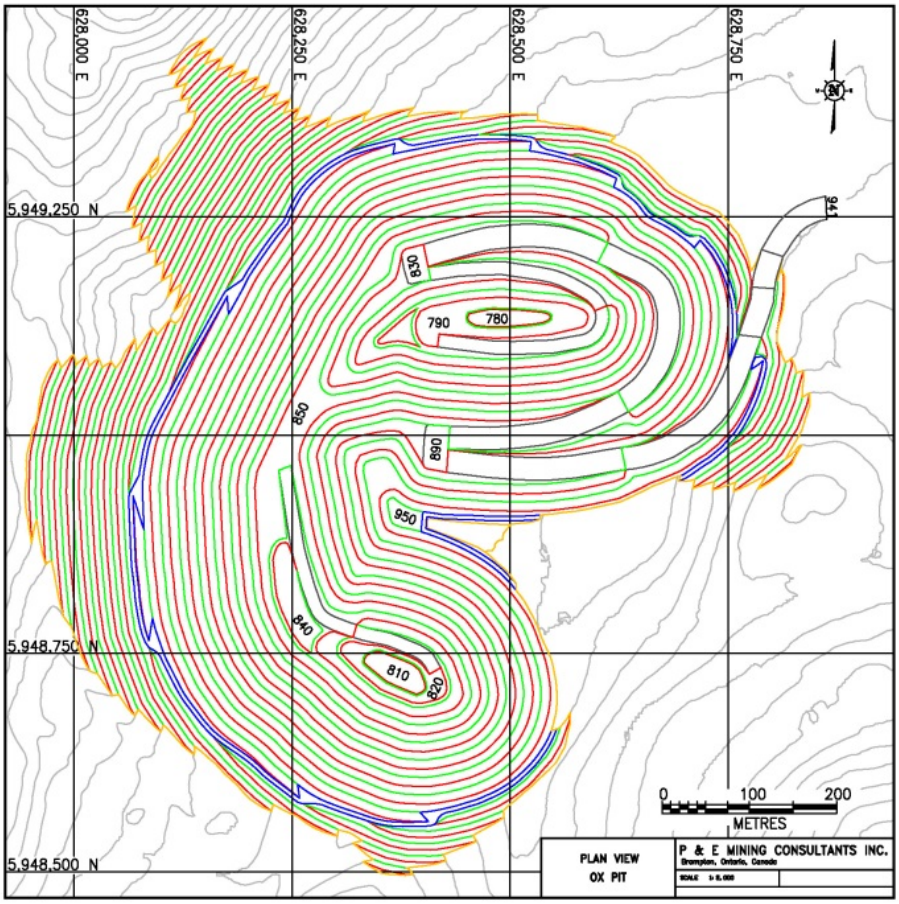
The Ox Pit is situated 4 km north and 2 km east of the Seel Pits in a naturally occurring depression ringed by hills about 200 m in height. The base of the depression is occupied by Ox Lake, a shallow water body 5-20 m in depth. The Ox Pit encompasses the southern 2/3 of Ox Lake which will be drained before the pit is developed.

The Ox Pit has a hybrid shape. On the west side, the pit is oval, being about 1,100 m in length. The east side, however, is formed by two intersecting lobes orientated west to east. The northern lobe is about 1,000 m wide while the southern lobe is slightly smaller with a width of 900 m. On the east side of the pit, a peninsula of barren intrusive rock projects inwards about 500 m

separating the two lobes. The entire pit covers an area of about 85 ha. A plan view of the Ox Pit design is presented in Figure 16.4.

The top bench of the pit lies at an elevation of 1,100 m ASL on the western bounding hillside. The pit drops down to a common elevation of 890 m ASL before resolving into two separate pit bottoms. The bottom of the south lobe is the shallowest lying at elevation 850 m ASL. The north lobe is deeper descending to an elevation of 780 m ASL. The maximum depth of the pit is 320 m.

Figure 16.4 Ox Open Pit Design



Single benches, 10 m in height, extend down to elevation 910 m ASL to accommodate overburden. Double-benching commences below that elevation which is indicated in Figure 16.4 by the blue line. Unlike the East Seel pit, overburden at Ox is shallow in depth, providing thin cover for near-surface bedrock on the surrounding hills.

The main access ramp is 1.4 km in length and exits the northeast corner of the pit at elevation 920 m ASL near the entrance to the overburden and waste rock stockpiles. The main ramp is located entirely in the north lobe and has a double switchback configuration. Dual-lane access exists down to elevation 870 m ASL below which the ramp narrows to single-lane width.

A separate ramp provides access to the bottom of the south lobe from elevation 890 m ASL. This ramp is only 400 m in length and configured entirely as single-lane to the bottom of the south lobe which lies at elevation 850 m ASL. Once mining proceeds below elevation 890 m ASL in

the north lobe, access to the south lobe is cut off, thus the designed access dictates the pit development.

16.6.4 Mining Losses and Dilution

The potentially economic portion of the mineral resource contained within each pit design was adjusted for mining dilution and losses. Dilution and losses were introduced to the tabulated mineable resource arithmetically. No changes to the block model grades were made to create a "diluted" resource block model.

Consideration of mining dilution in the potentially economic portion of the mineral resource reflects the inevitable inclusion of below-cut-off grade material with mill feed when mining along the boundaries of mineralized zones. It should be noted that this is distinct from block grade dilution which may occur as a function of the grade estimation process.

For each deposit, dilution was estimated by defining a zone, 2.5 m wide, around the perimeter of the mineralized envelope on three representative benches. The dilution tonnage and grade was calculated based on the tonnage and grade within the narrow zone.

The average percent dilution in tonnes at the dilution grade was added to the tonnes and grade of above-cut-off material on each bench to arrive at the gross diluted resource. This total was then adjusted downwards 3% to reflect mining losses resulting from above-cut-off material being mined as waste.

The 2.5 m width of the dilution zone is equal to half the width of a resource model block. This is expected to be about half the distance between blastholes from which grade control assays will be generated and is considered the limit of mining selectivity. As all the material within the mineralized envelopes is above cut-off, any internal dilution is considered to manifest in the resource model block grades themselves.

Mining dilution in the Ox and East Seel pits was calculated to be 7.0% and 7.6% respectively. In the smaller West Seel pit where the proportion of the mineralized zone adjacent to the boundary was higher, mining dilution was calculated at 12.3%.

16.6.5 Mining Resources

The potentially economic portion of the mineral resource identified for development at the Ootsa Property consists of 61 Mt of the Measured portion of the mineral resource at grades of 0.37% Cu Eq (0.25% Cu, 0.13 g/t Au, 0.016% Mo, and 2.3 g/t Ag), plus 4 Mt of the Indicated portion of the mineral resource at grades of 0.33% Cu Eq (0.24% Cu, 0.07 g/t Au, 0.015% Mo, and 2.3 g/t Ag), and totals 65.4 Mt of mill feed grading 0.37% Cu Eq (0.25% Cu, 0.13 g/t Au, 0.016% Mo, and 2.30 g/t Ag). Total non-mineralized material is 95.8 Mt composed of 31.1 Mt of overburden and 64.7 Mt of waste rock. The total tonnage of all material types is 161.2 Mt. The strip ratio (w:o) is 1.46.

It is important to note that although average grades are based on the total tonnage of mill feed, not all metals are present in all deposits. Table 16.3 provides a breakdown of tonnes and grade by material type for each pit.

TABLE 16.3
POTENTIALLY ECONOMIC PORTION OF THE MINERAL RESOURCE BY PIT AND MATERIAL TYPE

Pit		East Seel	West Seel	Ox	Total
Mill Feed	kt	20,627	12,606	32,214	65,447
Grade					
Cu	%	0.28	0.18	0.25	0.25
Au	g/t	0.26	0.13	0.04	0.13
Mo	%	0.002	0.014	0.026	0.016
Ag	g/t	2.44	4.12	1.50	2.30
Overburden	kt	19,562	2,414	9,145	31,121
Waste	kt	13,791	17,587	33,291	64,669
Total	kt	53,980	32,607	74,650	161,237
Strip Ratio	w:o	1.62	1.59	1.32	1.46

Note: *All mill feed has been derived from Measured and Indicated Resources*

The potentially economic portion of the mineral resource contained within each pit was defined by applying an NSR cut-off value. The NSR cut-off is the recovered value of the contained metals less costs for smelting, refining, and transportation. The NSR cut-off used to define the mineable resource is approximately $10/t and equates to a copper equivalent grade of about 0.22% Cu. East Seel has the highest average NSR at $27.51/t followed by Ox at $22.54/t and West Seel at $18.45/t.

16.6.6 Mine Production Schedule

The mine production schedule is based on mining of the potentially economic portion of the mineral resource contained in the design pits for East Seel, Ox, and West Seel over a period of 11.5 years plus an initial six month period of pre-stripping. The average annual mining rate for all material types is 14 Mtpa or 40,000 tpd based on 350 operating days per year. The mine will supply a nominal 5.6 Mt of feed to the mill annually mined at an average strip ratio of 1.46. Details of the mine production schedule can be found in Table 16.4.

Mining begins six months prior to the start of production with the pre-stripping of the East Seel pit. 3.8 Mt of material is removed from the East Seel pit during the pre-production period, the majority of which is overburden. During pre-stripping, the crusher and overland conveyor system will be installed allowing feed to be supplied to the mill over the subsequent four years.

TABLE 16.4
OOTSA MINE PRODUCTION SCHEDULE

			Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
East Seel	ES	Totals													
Ovb	t	19,562,382	3,710,818	10,009,021	5,842,543	-	-	-	-	-	-	-	-	-	-
Waste Rock	t	13,880,584	91,710	3,177,950	8,097,232	2,316,867	196,824	-	-	-	-	-	-	-	-
	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Waste	t	33,442,966	3,802,528	13,186,971	13,939,775	2,316,867	196,824	-	-	-	-	-	-	-	-
Strip ratio	w:o	1.63	3,469.76	2.62	2.49	0.41	0.05	-	-	-	-	-	-	-	-
Mill Feed	t	20,538,113	1,096	5,025,434	5,597,691	5,604,225	4,309,667	-	-	-	-	-	-	-	-
Cu	%	0.28	0.19	0.33	0.30	0.26	0.24	-	-	-	-	-	-	-	-
Mo	%	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	-	-
Au	g/t	0.26	0.27	0.33	0.25	0.22	0.25	-	-	-	-	-	-	-	-
Ag	g/t	2.44	1.05	2.24	2.90	2.61	1.85	-	-	-	-	-	-	-	-
NSR	$C/t	24.87	$18.81	$29.65	$26.14	$22.12	$21.19								
Total Material	t	53,981,079	3,803,624	18,212,405	19,537,467	7,921,093	4,506,491	-	-	-	-	-	-	-	-
West Seel	WS	Totals													
Ovb	t	2,414,378	-	-	-	-	-	-	-	-	-	1,629,416	784,962	-	-
Waste Rock	t	17,586,618	-	-	-	-	-	-	-	-	-	2,208,519	9,005,257	5,554,966	817,876
	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Waste	t	20,000,996	-	-	-	-	-	-	-	-	-	3,837,935	9,790,219	5,554,966	817,876
Strip ratio	w:o	1.59	-	-	-	-	-	-	-	-	-	14.00	4.09	0.99	0.19
Mill Feed	t	12,605,677	-	-	-	-	-	-	-	-	-	274,174	2,391,013	5,598,088	4,342,402
Cu	%	0.18	-	-	-	-	-	-	-	-	-	0.19	0.18	0.17	0.17
Mo	%	0.01	-	-	-	-	-	-	-	-	-	0.02	0.01	0.01	0.01
Au	g/t	0.13	-	-	-	-	-	-	-	-	-	0.14	0.12	0.14	0.13
Ag	g/t	4.12	-	-	-	-	-	-	-	-	-	5.21	4.80	4.09	3.70
NSR	$C/t	16.11										$17.66	$16.71	$16.11	$15.69
Total Material	t	32,606,673	-	-	-	-	-	-	-	-	-	4,112,109	12,181,232	11,153,054	5,160,278
OX	OX	Totals													
Ovb	t	9,144,906	-	-	-	2,747,231	2,531,122	3,046,094	820,459	-	-	-	-	-	-
Waste Rock	t	33,290,850	-	-	-	273,092	5,067,487	9,961,218	7,294,824	4,788,486	3,010,203	2,275,291	620,248	-	-
	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Waste	t	42,435,756	-	-	-	3,020,323	7,598,608	13,007,313	8,115,283	4,788,486	3,010,203	2,275,291	620,248	-	-
Strip ratio	w:o	1.32	-	-	-	-	5.87	2.33	1.45	0.85	0.54	0.41	0.21	-	-
Mill Feed	t	32,214,109	-	-	-	-	1,295,573	5,591,448	5,597,028	5,606,225	5,595,941	5,596,376	2,931,519	-	-
Cu	%	0.25	-	-	-	-	0.24	0.26	0.26	0.25	0.25	0.25	0.26	-	-
Mo	%	0.03	-	-	-	-	0.02	0.03	0.02	0.03	0.03	0.03	0.03	-	-
Au	g/t	0.04	-	-	-	-	0.04	0.05	0.05	0.04	0.04	0.04	0.04	-	-
Ag	g/t	1.50	-	-	-	-	1.33	1.38	1.40	1.45	1.57	1.59	1.75	-	-
NSR	$C/t	18.99					$17.66	$19.33	$19.33	$18.61	$18.85	$18.71	$19.76		
Total Material	t	74,649,865	-	-	-	3,020,323	8,894,181	18,598,761	13,712,311	10,394,711	8,606,144	7,871,667	3,551,767	-	-
TOTAL MINE PRODUCTION		Totals	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Ovb	t	31,121,666	3,710,818	10,009,021	5,842,543	2,747,231	2,531,122	3,046,094	820,459	-	-	1,629,416	784,962	-	-
Waste Rock	t	64,758,052	91,710	3,177,950	8,097,232	2,589,959	5,264,311	9,961,218	7,294,824	4,788,486	3,010,203	4,483,810	9,625,506	5,554,966	817,876
	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Waste	t	95,879,718	3,802,528	13,186,971	13,939,775	5,337,190	7,795,433	13,007,313	8,115,283	4,788,486	3,010,203	6,113,226	10,410,468	5,554,966	817,876
Strip ratio	w:o	1.47	3,469.76	2.62	2.49	0.95	1.39	2.33	1.45	0.85	0.54	1.04	1.96	0.99	0.19
Mill Feed	t	65,357,899	1,096	5,025,434	5,597,691	5,604,225	5,605,240	5,591,448	5,597,028	5,606,225	5,595,941	5,870,550	5,322,531	5,598,088	4,342,402
Cu	%	0.25	0.19	0.33	0.30	0.26	0.24	0.26	0.26	0.25	0.25	0.24	0.23	0.17	0.17
Mo	%	0.02	0.00	0.00	0.00	0.00	0.01	0.03	0.02	0.03	0.03	0.03	0.02	0.01	0.01
Au	g/t	0.13	0.27	0.33	0.25	0.22	0.20	0.05	0.05	0.04	0.04	0.04	0.08	0.14	0.13
Ag	g/t	2.30	1.05	2.24	2.90	2.61	1.73	1.38	1.40	1.45	1.57	1.76	3.12	4.09	3.70
NSR	$C/t	$20.28	$18.81	$29.65	$26.14	$22.12	$20.38	$19.33	$19.33	$18.61	$18.85	$18.66	$18.39	$16.11	$15.69
Total Material	t	161,237,617	3,803,624	18,212,405	19,537,467	10,941,416	13,400,672	18,598,761	13,712,311	10,394,711	8,606,144	11,983,776	15,732,999	11,153,054	5,160,278

In Year 3, preparation of the Ox Pit mining area starts. Ox Lake is drained and roughly 3.0 Mt of overburden and waste is removed from the pit. In Year 4, mining of mill feed at the East Seel pit is completed and operations transition to the Ox pit. During the transition when the crusher and conveyor are moved from East Seel to Ox, the mill continues to operate without interruption processing a 1.0 Mt crushed feed stockpile built up over the preceding 12 months.

Mining at the Ox Pit continues for 8 years from Year 3 to Year 10. Generation of mill feed ramps up in Year 4 as initial waste removal is completed and feed is depleted at East Seel. From Years 5-8, Ox is the sole source of mill feed. In Year 9, Ox supplies about half the material processed. Mining of mill feed at Ox is completed by the first half of Year 10.

As mill feed is depleted at Ox, preparatory stripping of the West Seel pit begins in Year 9. When mill feed from Ox is depleted in Year 10, a second crusher move is executed and West Seel becomes the sole source of mill feed for the remainder of the mine life. Mining at West Seel concludes halfway through Year 12.

Throughout the mine life the annual mining fluctuates as dictated by waste removal requirements. The mining rate peaks in Years 1 and 2 at 18-19 Mtpa. It declines to less than 11 Mt in Year 3 before rising again to over 18 Mt as mill feed at Ox is developed. This pattern repeats again in Year 10 when the mining rate exceeds 15 Mt before dropping to 5 Mt in Year 12.

16.7 MINING UNIT OPERATIONS

16.7.1 Drill & Blast

Drilling

Hard rock benches, 10 m in height, will be drilled off on a nominal 5 m x 5 m pattern by two rotary blasthole drills. At this burden and spacing, each blasthole will generate 270 bcm or 730 t/hole. A penetration rate of 30.0 m/hr is expected. Based on 5,740 gross operating hours per drill annually, the average production rate is planned to be 24.5 m/hr.

Only about 90,000 t of material requires drilling during pre-stripping but once production starts 8-15 Mt of material will be drilled annually. In an average year, 200,000 m will be drilled generating 17,000 blastholes and 11 Mt of hard rock ready for blasting. Quantities include allowances for both wall control patterns and redrills. Drilling reaches a peak in Year 5 when 15.6 Mt of hard rock drilling is needed fully utilizing both drill rigs.

Drill production is based on 350 operating days per year, 85% mechanical availability, 80% utilization, and 83% operating efficiency. The last factor takes into account moving from hole to hole and moving between patterns. The drilling design can be found in Appendix XII. Table 16.5 presents the annual estimated drill requirements.

TABLE 16.5
ESTIMATED ANNUAL DRILLING AND BLASTING PERFORMANCE

Yr	Tonnage	Drilling		Drills	Explosive
	Mt	m	GOH	qty	kg
-1	0.1	1,627	65	0.0	23,000
1	8.2	148,258	5,954	1.0	2,095,556
2	13.7	247,699	9,948	1.7	3,501,111
3	8.2	148,258	5,954	1.0	2,095,556
4	10.9	197,074	7,915	1.4	2,785,556
5	15.6	282,051	11,328	2.0	3,986,667
6	12.9	233,235	9,367	1.6	3,296,667
7	10.4	188,034	7,552	1.3	2,657,778
8	8.6	155,490	6,245	1.1	2,197,778
9	10.4	188,034	7,552	1.3	2,657,778
10	14.9	269,395	10,820	1.9	3,807,778
11	11.2	202,498	8,133	1.4	2,862,222
12	5.2	94,017	3,776	1.3	1,328,889
Average*	10.9	196,306	7,884	1.4	2,774,694
* Years -1 and 12 only 6 months in length					

Blasting

A nominal blasthole diameter of 165 mm or 6 ½ inches was selected as the basis for the blast design. Blastholes will be drilled 12 m deep including 2 m of subgrade and loaded with waterproof emulsion explosive. Emulsion will be loaded to a 5 m collar resulting in a 7.0 m explosive column and a 0.69 kg/bcm powder factor.

Production blast patterns of 100 holes will each generate approximately 73,000 t of broken material. Patterns will be tied-in using non-electric shock tubing and surface and downhole delays. Initiation will also be non-electric. Blasts will be shot every second day to meet production requirements. Explosive consumption will vary with the amount of hard rock to be blasted each year and is shown in Table 16.5. Further details regarding the blast design can be found in Appendix XII.

Blasting will be conducted by a contractor. Emulsion explosive will continue to be supplied by the contractor on site, Orica. The bulk emulsion delivery truck and emulsion storage facilities will be supplied by the contractor as part of the explosive supply contract. The explosive magazine on the HB Property will remain the primary magazine. Explosives and blasting materials will be transported to Ootsa by truck and barge daily on an as-required basis.

16.7.2 Load & Haul

Loading

Primary loading will be performed by one 300 t hydraulic excavator configured as a front-shovel and one smaller 200 t hydraulic excavator configured as a backhoe. The larger machine will be equipped with a 15 m^3 bucket while the smaller machine will be equipped with a 10 m^3 bucket. The front shovel will load overburden and blasted hard rock directly into trucks from a 10 m working face. The smaller backhoe will top load trucks mining 10 m benches in two 5 m lifts.

In hard rock, mill feed and waste will be delineated using assays generated from the analysis of blasthole drill cuttings. After blasting, boundaries between mill feed and waste will be surveyed and staked on the muck pile. Excavation will be guided by the flag lines on the muck pile under the direction of mine supervision and grade control personnel.

TABLE 16.6
ESTIMATED EXCAVATOR GROSS OPERATING HOURS BY YEAR

Year		-1	1	2	3	4	5	6
PC-3000	Mt	3.8	11.6	11.6	7.9	8.9	11.6	8.1
	GOH	2,870	5,740	5,740	5,740	5,740	5,740	5,740
PC-2000	Mt	0.0	6.6	7.9	3.0	4.5	7.0	5.6
	GOH	0	5,740	5,740	5,740	5,740	5,740	5,740
Total	Mt	3.8	18.2	19.5	10.9	13.4	18.6	13.7
	GOH	2,870	11,480	11,480	11,480	11,480	11,480	11,480

Year		7	8	9	10	11	12	Total
PC-3000	Mt	10.4	8.6	7.9	11.6	11.2	5.1	118.3
	GOH	5,740	5,740	5,740	5,740	5,740	2,870	68,880
PC-2000	Mt	0.0	0.0	4.1	4.1	0.0	0.0	42.8
	GOH	0	0	5,740	5,740	0	0	45,920
Total	Mt	10.4	8.6	12.0	15.7	11.2	5.1	161.1
	GOH	5,740	5,740	11,480	11,480	5,740	2,870	114,800

Table 16.6 provides details regarding annual production and equipment hours by year and unit for the life of the Project. The production capacity of the large front shovel is estimated at 11.6 Mtpa while that of the smaller machine is roughly 8.2 Mtpa. Peak production occurs in Year 2 when 19.5 Mt of material is mined and both machines are fully utilized. Combined, the two loading units have sufficient capacity to achieve planned production in any single year of the mine schedule.

Over the life-of-mine, loading will require about 115,000 equipment hours to load approximately 161 Mt of material. The PC-3000 will be the primary loading unit and will account for about 60% or 70,000 of these hours with the PC-2000 logging the remainder. The operating plan does not seek to maximize loading unit productivity. Instead, loading units are planned to be run at less than maximum in order to minimize the size of the truck fleet.

When production is in a single pit and does not exceed 11.6 Mtpa only the PC-3000 will be required. It can be seen from Table 16.6 that two excavators are required for only two of the last six years of operation. Details of the loading study can be found in Appendix XIII.

Hauling

Hauling will be performed by a fleet of nine 135 t mechanical drive haul trucks. Trucks will haul overburden, waste rock, and mill feed. Overburden and waste rock will be stockpiled in designated locations as described in Section 18 Infrastructure of this PEA. Mill feed will be hauled to the near-pit crusher where trucks will direct dump. When mill feed cannot be directly dumped at the crusher due to material or operational issues, it will be stockpiled near the dump pocket and rehandled by loader when circumstances permit.

TABLE 16.7
HAUL TRUCK REQUIREMENTS

Year		-1	1	2	3	4	5	6
Tonnage	Mt	3.8	18.2	19.5	10.9	13.4	18.6	13.7
Trucks	calculated	2.8	6.6	8.4	5.6	6.1	7.8	6.5
Trucks	planned	3	7	9	6	7	8	7
Hours	GOH	7,928	38,058	48,161	32,044	35,146	44,636	37,161
Year		7	8	9	10	11	12	Wtd Av
Tonnage	Mt	10.4	8.6	12.0	15.7	11.2	5.1	13.4
Trucks	calculated	4.7	3.8	5.4	6.5	4.3	4.7	6.2
Trucks	planned	5	4	6	7	5	5	7
Hours	GOH	26,955	21,775	31,182	37,506	24,640	13,541	33,228

A simple haulage study was conducted to determine truck requirements. As shown in Table 16.7, an average of seven trucks is required over the mine life. Peak usage occurs in Years 2 and 5 when 9 and 8 trucks are required respectively. Average annual truck hours are estimated at approximately 33,200 hours with a LOM high of 48,200 hours in Year 2 and a LOM low of 7,900 hours during pre-stripping. Details of the haulage study can be found in Appendix XIV.

16.7.3 Support Equipment

A fleet of four 55t tracked bulldozers will be used to manage waste rock and overburden stockpiles. Mine waste in the form of select glacial till will be used to build haul roads. Haul roads will be constructed as a function of waste mining and therefore will not constitute an additional cost over and above that of mining. Bulldozers will also be used for shovel clean-up, road and bench maintenance, preparation of drill patterns, and, where applicable, wall scaling.

Two 300 HP motor graders will maintain the running surface of roads and benches during shift operations. These machines will also grade roads during the winter, spreading road “sand” to ensure good underfoot conditions and plowing roads and benches to permit mining activities to continue unhindered by snow. The graders will be used to maintain all site roads including those outside the immediate mining areas.

A large front-end loader will be available to conduct clean-up around the open pit and crusher. This machine is not intended to be used in a production role given the capacity of the excavator fleet. The loader will also conduct any required rehandle of stockpiled material at the crusher and load trucks with fine rock from the road material stockpiles to maintain roads during the winter months.

Haul trucks converted to tankers will spray water on roads in the summer months to suppress dust. Tankers will load from in-pit sumps recycling water collected within the open pit area. Tankers will also keep blasthole drills supplied with water to suppress dust generated during drilling.

16.7.4 Dewatering

Groundwater and direct precipitation entering the open pits will be directed to sumps for collection. Sumps will be established on each working bench and re-established as mining progresses from level to level. Bench floors and ditches will be sloped at 2% to ensure that

surface water drains away from active working areas and towards sumps. The total inflow anticipated is not expected to exceed 200 m^3/hr. A more precise estimate will be developed at the next stage of engineering.

Skid-mounted, electric pumps will pump water from in-pit sumps to the waste rock stockpile effluent collection pond located near each open pit. At the effluent collection pond, runoff from stockpiles will be diluted with mine water and transferred by pipeline to the Reach for discharge. Most of the effluent transfer from the mining areas to the Reach will be by gravity flow.

16.7.5 Mine Services

Mining operations are served by mine supervision, engineering, and maintenance groups all internal to the Mine Department. Mine supervision directs mining and maintenance activities. Shift foremen supervising each crew report to a General Foreman of Production or Maintenance who, in turn, report to a Mine Superintendent.

Mine Engineering will provide direction and technical oversight to Mine Operations. The engineering group will conduct long and short-range planning, geology, grade control, geotechnical monitoring, and surveying in the open pit and surrounding areas. A primary role is to work closely with mine supervision to ensure that production targets for tonnage and grade are met.

Mine Maintenance provides maintenance for the mobile mining equipment and all other vehicles on the mine site. The main maintenance facilities will remain at the HB site where a three bay shop equipped with overhead cranes is located. Major repairs and overhauls will be conducted there.

At the Ootsa Property, a Field Maintenance Shop capable to accommodating two haul trucks will be located at the Permanent Transfer Point ("PTP"). Minor repairs and scheduled services will be performed at the Field Maintenance Shop so that equipment need not be taken across the lake every time maintenance is required. More details regarding the field maintenance facilities can be found in Section 18 Infrastructure of this PEA.

16.8 MINE EQUIPMENT

The mobile mining fleet used to mine the Ootsa Property has been modeled on standard truck/shovel mining methods employed by numerous operating mines in BC. As the annual mining rate is relatively low, significant flexibility exists in terms of the choice of equipment ultimately used for mining.

The hourly equipment rates for the mobile mining fleet which underlie unit mining rates are based on lifecycle costing and, as such, include a repair reserve factor for future overhauls. Mechanical availability for the Ootsa mining fleet is planned at 85%. Table 16.8 shows the list of major mining equipment to be used to develop the Ootsa Property.

TABLE 16.8 MAJOR MINING EQUIPMENT FOR OOTSA DEVELOPMENT			
Unit Type	**Model**	**Specification**	**Quantity**
Hydraulic Shovel	PC-3000	15 m^3	1
Hydraulic Backhoe	PC-2000	10 m^3	1
Front-end Loader	CAT 992 HL	10 m^3	1
Haul Truck	CAT 785	135 t	9
Drill	PV275	275,000 lb pulldown	2
Bulldozer	D9	55t	4
Grader	16H	300 HP	2

All of the major mining equipment is diesel-powered except for the blasthole drills, which are planned to be electric.

16.9 MINE MANPOWER

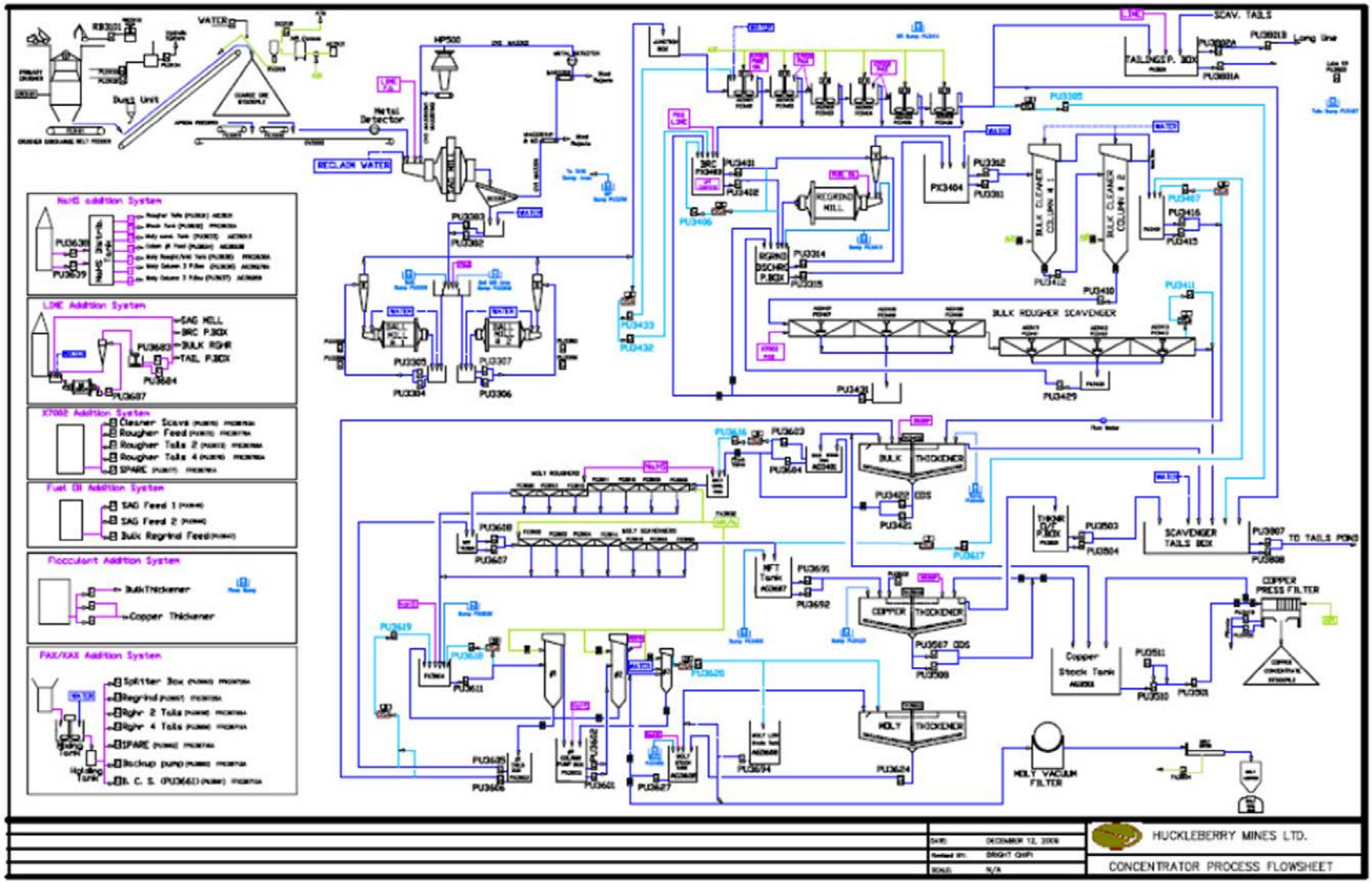
The mining contractor will employ a workforce of 167 including personnel for operations, blasting, maintenance, and supervision on a 12-hour, 7-7 continuous shift schedule. This total represents average manning levels over the life of the mine. Manpower in a given year will rise or fall depending on the number of trucks and loaders required.

The mining contractor will have minimal technical staff and will rely on Gold Reach to provide engineering support in the form of surveying, grade control, and mine planning. Personnel to maintain the conveyor system will work for the mining contractor at Ootsa and for the toll-milling contractor on the HB side of the lake. The mining contractor will employ an additional 13 people engaged in administrative support activities, most of them on a dayshift only basis. Total contract mining manpower including support staff is estimated to be 180. Details can be found in Appendix XV.

17.0 RECOVERY METHODS

The existing mill at HB is assumed to be contracted on a toll-milling basis. The Project development is predicated on the amenability of Ootsa mill feed to processing using the mill without modification. Preliminary test work as discussed in Section 13 of this PEA indicates this to be the case. The following describes the unit operations related to processing Ootsa mill feed with the HB mill. The mill process flowsheet can be found in Figure 17.1. No comminution data have yet been developed for Ootsa and it is assumed that a Bond grindability index of 16 kWh/t applies. At the finer primary grind (95 microns) indicated for all Ootsa material, average throughput capacity is estimated at 15,500 tpd or approximately 5.6 Mtpa.

Figure 17.1 Process Flowsheet



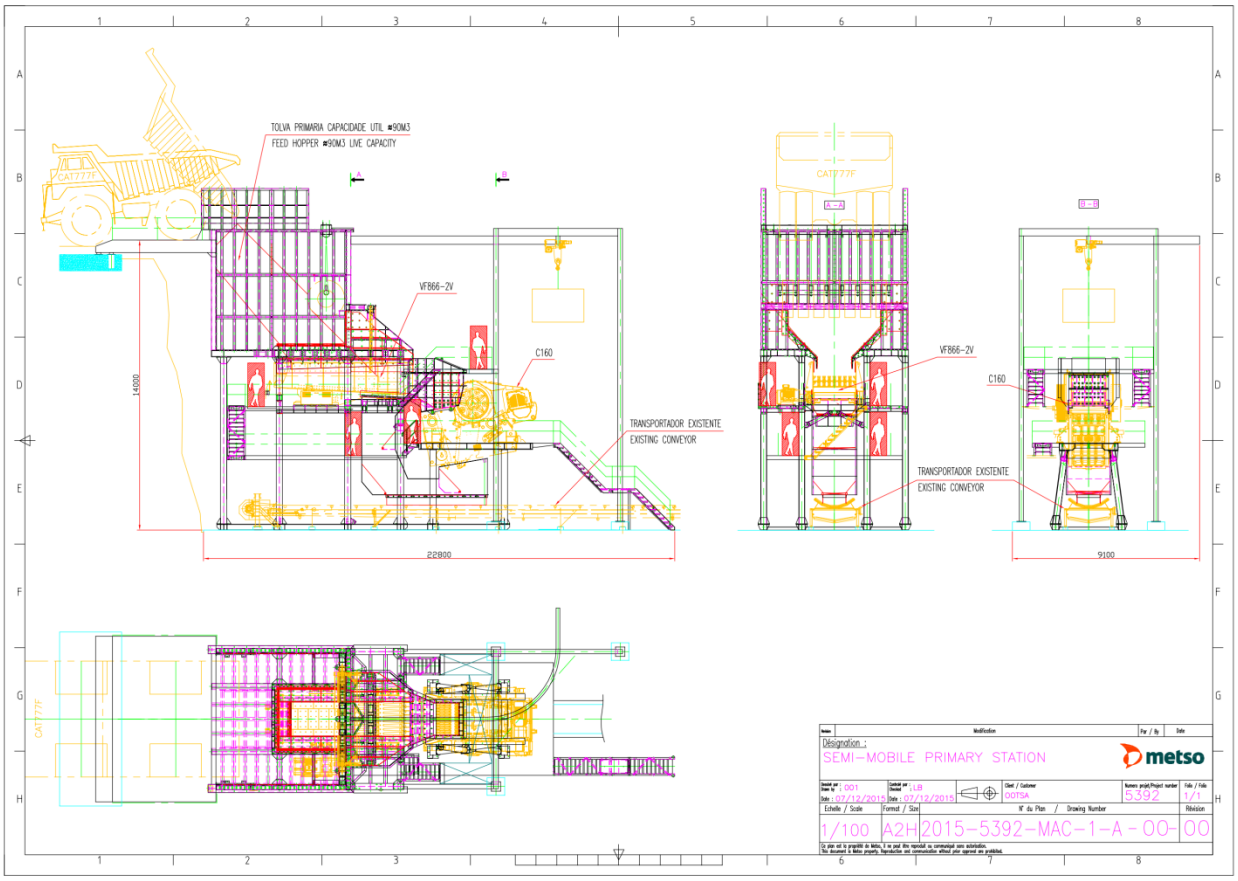
Source: *Technical Report on the Main Zone Optimization, Huckleberry Mine, Omineca Mining Division, British Columbia, Canada" by K. Christensen, G. Connaughton, and P. Ogryzlo, dated Sept 1, 2011, p. 100.*

17.1 PROCESS FLOWSHEET

17.1.1 Crushing

Mill feed excavated in the open pits at Ootsa will be hauled to the crusher station located near the edge of the Seel and Ox open pit(s). The proposed crusher is a Metso C160 or equivalent single-toggle, jaw crusher mounted in a semi-mobile, direct-dump arrangement as shown in Figure 17.2. The crusher is capable of throughput of 700-850 tph generating a crushed product with a P80 of 150-200 mm. The crusher will discharge directly to the overland conveyor which will transfer mill feed from the mining area at Ootsa to the mill.

Figure 17.2 Semi-Mobile Crusher Station



17.1.2 Mill Feed Handling

Mill feed arriving at the plant site will be conveyed to the dump pocket at the existing crusher installation. There are no plans to make use of the existing gyratory crusher for processing Ootsa mill feed although its presence offers the opportunity to maximize the throughput of the jaw crusher and use the existing gyratory in a secondary crushing role to achieve suitable size reduction.

Mill feed discharged at the crusher will be conveyed by the existing conveyor and stacker system to a 30,000 t crushed mill feed surge stockpile. Two apron feeders located beneath the pile draw material onto the reclaim conveyor which carries mill feed into the mill.

17.1.3 Grinding

Feed from the crushed ore stockpile discharges into the SAG mill via the reclaim/SAG mill feed conveyor. The primary grinding mill is a nominal 32’ x 14’ high-aspect semi-autogenous grinding (“SAG”) mill powered by a pair of GE 5,500 HP electric motors. The SAG mill generates a P80 2-3 mm product which is discharged to a 20’ x 8’ Diester vibrating screen deck.

Oversize from the screen deck is directed to a Metso HP 500 pebble crusher installed in close circuit with the SAG mill. Undersize is directed to secondary grinding which is performed by two 30’ x 16’ ball mills. Ball mill discharge is pumped up to a pair of 6 x 26” hydrocyclone clusters where underflow is returned to the ball mills and overflow is directed to flotation.

17.1.4 Bulk Flotation

Flotation feed will have a nominal particle size of 100 µm, delivered as a slurry with a density of 30-40% solids. The rougher flotation circuit is composed of 6 x 100 m^3Outotec Super Cells. Tailings from rougher flotation will go to tails while concentrate will be thickened and reground to about 30 µm prior to cleaning.

Cleaner flotation will be performed by 2 x 10’ diameter flotation columns. Cleaner column overflow is directed to bulk thickening while cleaner tails are sent to the Scavenger Flotation circuit. The Scavenger circuit is composed of 6 x 16 m^3 Outotec U-cells. Concentrate from the scavenger circuit is recycled and scavenger tailings are directed to the tailings pond.

17.1.5 Molybdenum Recovery

Underflow from the bulk thickener is directed to the molybdenum rougher/scavenger flotation circuit. Concentrate from the molybdenum roughers is directed to flotation columns in the molybdenum cleaner circuit. Scavenger circuit tailings reports to the copper thickener. The product generated from the molybdenum cleaner circuit reports to the molybdenum thickener while the underflow from the cleaner circuit is recycled.

17.1.6 Dewatering And Concentrate Handling

When copper and molybdenum are being recovered, copper and molybdenum concentrate is thickened in two separate 60’ diameter thickeners. In each, slurry density is increased to about 70% solids prior to filtration. Final dewatering of copper concentrate is performed with an automatic filter press before the product is stored in bulk in the concentrate storage shed prior being trucked to port. Thickened molybdenum concentrate is dewatered using a vacuum filtration system after which it is bagged and stored in advance of shipping.

17.1.7 Reagents

Lime is used to maintain an appropriately alkaline pH throughout the process to provide suitable conditions for copper flotation and depress the flotation of iron sulfides. The primary flotation collector will be PAX, potassium amyl xanthate. A stable flotation froth will be created with MIBC or an equivalent while the hydrophobic nature of sulfide particles will be promoted during flotation using fuel oil. Sodium hydrosulfide, NaHS, will be used as a depressant during copper-molybdenum separation.

17.1.8 Services

As discussed in Section 18 of this PEA the total connected load for the mill will be about 18.8 Mw including crushing but excluding the mill feed conveyor system. Based on 8,000 operating hours per year, processing will consume about 150,400,000 kw-hrs annually. The mill will utilize approximately two cubic metres of water for each tonne of mill feed processed. Free water associated with tailings will be recycled for processing while entrapped water will be made up from a combination of inflows to the process water pond and pumping from Tahtsa Reach. Fresh water consumption is expected to be similar to that cited in the Huckleberry 2011 LOM Plan of 280,000 m^3 per year.

18.0 PROJECT INFRASTRUCTURE

18.1 FACILITIES

The HB site facilities will be shared by the mining contractor, toll-milling contractor, and Gold Reach. Facilities not used by the toll-milling contractor and needed by the mining contractor and Gold Reach to conduct their activities will be provided by the toll-milling contractor on a fee-basis. These facilities will include the camp, offices, workshops, warehouses, material storage areas, and the dry. In addition, limited temporary facilities will be established on the Ootsa Property by Gold Reach for the contract miner and Gold Reach field engineering staff.

18.1.1 Maintenance Facilities

The existing maintenance shop at the main site will continue to be the base for maintenance activities when Ootsa is developed. The shop has service bays which can accommodate a 150 t haul truck as well as space for welding, light vehicle, and electrical repairs. Equipment requiring major repairs or scheduled overhauls will be transported by barge across the lake and moved to the shop for maintenance.

On the Ootsa Property a Field Maintenance Shop will be located at the Permanent Transfer Point ("PTP") to conduct preventative maintenance services and perform minor repairs. The shop will be constructed from shipping containers with a steel-frame, fabric-covered roof, and compacted gravel floor. An example of this kind of structure is shown in Figure 18.1.

Figure 18.1 Example of Field Maintenance Workshop Structure

The field maintenance facilities at Ootsa will have a second shop dedicated to welding and an outdoor wash pad to allow equipment and light vehicles to be washed before servicing. The field maintenance facilities at Ootsa will be provided by Gold Reach to the mining contractor on a free-issue basis.

18.1.2 Offices

The offices at the main site will house all administrative activities when the Ootsa Property is developed. Site administration, accounting, human resources, purchasing, security, engineering, and environment will continue to be based at the main site so that they can manage activities at both sites.

The field offices of the mining contractor will be located at the PTP. These offices will be constructed from converted shipping containers (Figure 18.2). They will have space for the contractor's supervision and technical staff as well as Gold Reach survey, grade control, and pit engineering personnel. The contractor's field maintenance personnel will also use these offices as a base from which to manage their activities at Ootsa.

Figure 18.2 Typical Office or Lunchroom Container Building

A lunchroom container will be located at the PTP for use by maintenance, mining, and engineering personnel working there. A second lunchroom container will be located near the open pit for use by the operating crews. Lunchrooms near the open pit will be located a safe distance from the pit to permit blasting.

18.1.3 Accommodation & Meals

All personnel engaged in mining, milling and support activities will stay in the main site camp during their shift rotation. The existing camp has the capacity to accommodate 250-300 people working both 12-continuous and 10-hour straight dayshift rosters. Breakfast and supper will be provided in the camp kitchen before or after shift. Personnel working at Ootsa will be provided with a bag lunch supplemented by ready-to-eat meals which can be heated up in the lunchrooms.

18.1.4 Change Rooms

All personnel working at Ootsa will use the dry at the main site. Mining personnel will change at the dry before being transported by bus to the Ootsa site for line-up and shift change. Personnel going off-shift will be transported by bus back to the dry where they will wash and change once their shift is finished.

18.1.5 Water

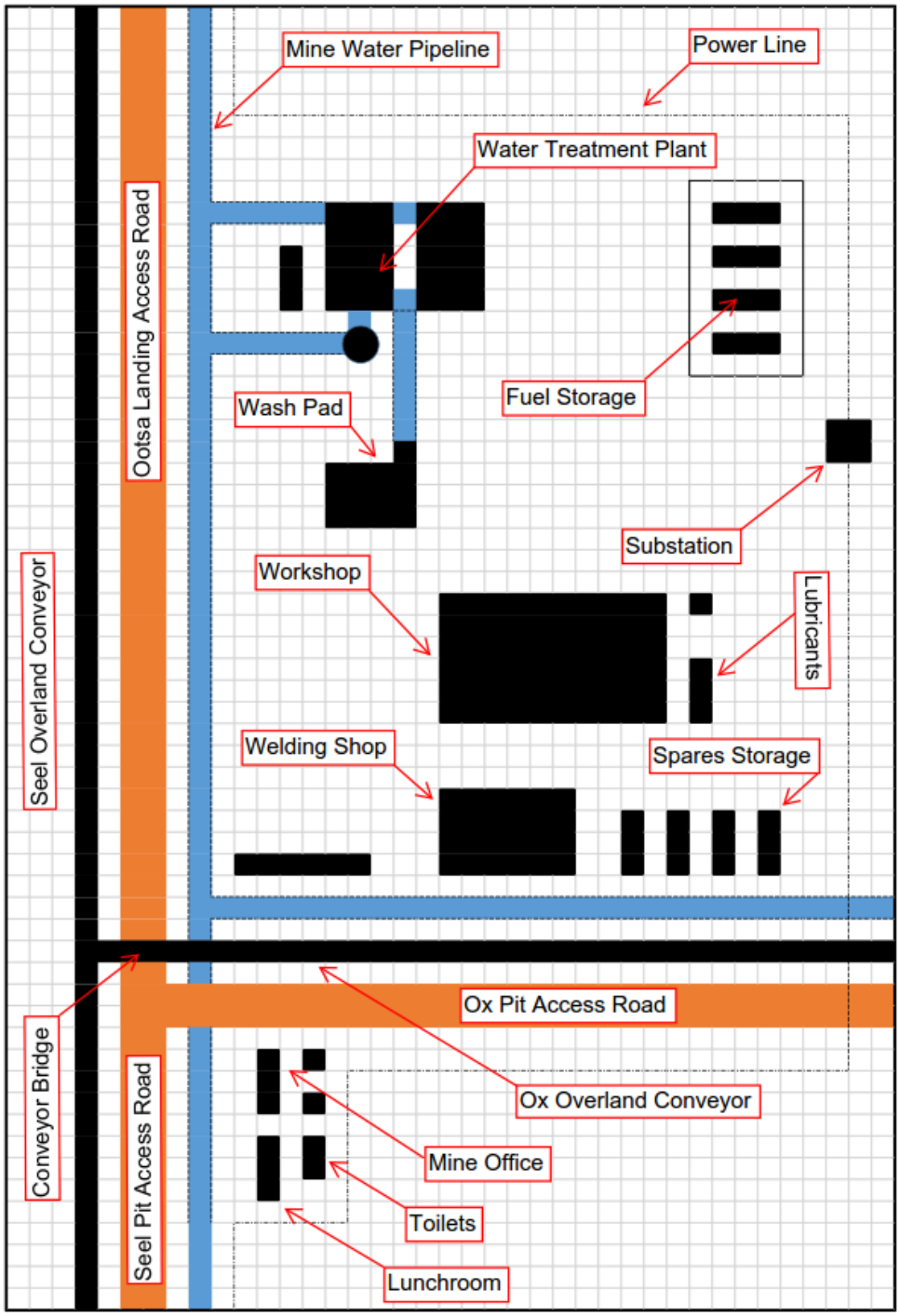
Potable water at the Ootsa site will be sourced from Seel Creek which flows immediately adjacent to the PTP and will be subject to treatment prior to use. Non-potable water will also come from the creek but will not be treated.

A general arrangement of the Ootsa site facilities is presented in Figure 18.3.

18.1.6 Sewage And Waste Water

Toilets will be located at the PTP and the open pit lunchroom. Toilets will flow to holding tanks which will be emptied regularly by tanker truck and transferred to the main site for disposal. The wash pad will be equipped with an oil-water separator. Contaminated water will be periodically pumped out and removed by tanker truck for disposal.

Figure 18.3 General Arrangement of Facilities at the Ootsa Site



Note: *Figure not to scale*

18.1.7 Materials Management

The main warehouse and laydown yards supporting mining at Ootsa will remain at the main site. Consumables and spares routinely required basis will be stored in containers at the Field Maintenance Workshop and replenished according to the service schedule.

Diesel fuel will be stored in four 50,000 litre double-walled, skid-mounted storage tanks located near the Field Maintenance Workshop. The fuel tanks at Ootsa will be filled directly by the

supplier weekly and topped up with fuel from the main fuel storage facility between deliveries if necessary. Routine refueling will occur at shift change in the pit, however, each tank will have built-in fuel dispensing capability.

Engine oil, hydraulic oil, transmission fluid, and coolant will be dispensed from recyclable "lube cubes" located in containerized storage adjacent to the Field Maintenance Workshop. Lubricants will be replenished on an as-required basis with weekly deliveries provided by the supplier.

The existing explosives magazine at the main site will initially continue to be the main explosives storage facility. Explosives will be transported to the Ootsa site as needed. As activities at Ootsa progress a magazine site on the Ootsa Property will be selected, permitted, and constructed. Establishment of a magazine at Ootsa will not be a priority as over half the waste in the first pit, East Seel, is overburden.

Like the main magazine, the Orica emulsion facility will remain at the main site. The transport of non-sensitized emulsion explosive is extremely safe, however, all appropriate safety precautions as prescribed by law will be followed when this material is moved by bulk truck via the barge to the Ootsa open pit.

18.1.8 Effluent Treatment

Preliminary test work indicates that there is no need for complex treatment of water run-off from stockpiles and open pits prior to discharge. Nevertheless, effluent piped from mining areas will flow through settling ponds where suspended solids can be removed and water quality checked before release. The effluent treatment facility will be located near the PTP as shown in Figure 18.3.

18.1.9 Assay Laboratory

The existing assay laboratory will support mining at Ootsa from its location at the main site. Blasthole samples will be delivered to the lab each shift change with the results reported within 36 hours to allow grade control to stay ahead of mining. The lab, which will also analyze mill samples, will be operated by the toll-milling contractor's personnel.

18.1.10 Communications

Operations activities at the Ootsa site will use mobile and hand-held short-range FM radios to communicate. The Field Offices and Field Maintenance Workshop will be connected to the main site via a microwave-based local cell network.

18.1.11 Transportation

Crews will be transported between the main site and the Ootsa sites at shift change by the mining contractor's bus and the barge contractor's ferry. Shift changes for different groups may be staggered to allow the barge to handle the extra traffic during that period. At other times, the barge will move equipment, supplies, and personnel back and forth across the lake on an as-needed basis. A subcontractor will bus employees to and from the main site to their home communities as per the 7-7 or 3-4 shift roster currently worked.

18.2 ACCESS

18.2.1 Roads

Access to the Ootsa site is via the Morice River FSR which runs 116 km south from Houston to the HB Mine. Approximately 1.0 km before reaching the mine site, an all-weather gravel road, 1.5 km in length, will be constructed providing access to the north shore of Tahtsa Reach.

Access on the Ootsa Property itself will be via all-weather gravel roads, 8 m in width, suitable for dual lane light vehicle traffic. Figure 18.4 shows an example of similar roads as they exist on Ootsa Property today. Access roads on site will be constructed out of glacial till which is plentiful across the Property.

Figure 18.4 Typical Existing Access Road on the Ootsa Property

For the initial development, 4.2 km of access roads will be constructed to connect the landing on the south shore of Tahtsa Reach to the Seel pit area. The road will run parallel with and provide access to the Seel overland conveyor. Once mining commences, this road will be widened to accommodate the safe movement of haul trucks and other mobile heavy equipment using overburden generated from the stripping of the East Seel pit.

Prior to the development of the Ox pit, the existing 3.9 km access road will be improved to allow the installation of the Ox overland conveyor. As for Seel, the access road will subsequently be widened using select overburden generated from the Ox pit pre-strip. All heavy equipment roads will have a running width of 21.0 m, will be ditched, and equipped with suitable berms.

18.2.2 Reservoir Crossing

A ferry operated by a subcontractor will be used to move equipment, supplies, and personnel back and forth across the reservoir (Figure 18.5). The ferry will be of the same type presently used to cross the Reach 14 km to the east. The ferry will consist of a barge 60 m in length and 15

m wide. The barge will have a maximum loaded capacity sufficient to handle any envisioned loads.

The barge is equipped with drop ramps at each end allowing it load and unload directly from the beach without the need of a dock or jetty. Cables secured to the shore run through guides on the side of the barge to allow it to track a straight path across the lake. The cables, which lie on the lake floor, will not impede other marine traffic.

Figure 18.5 Barge and Tugboat on Tahtsa Reach

The barge will be pushed back and forth across the lake by a tugboat. The tugboat will be 8 m in length powered by a 600 HP engine. The tugboat can push the barge at a speed of 7-8 kph allowing it to make the 1,000 m crossing in less than 10 minutes. The tug will also be used to manage the floating conveyor units.

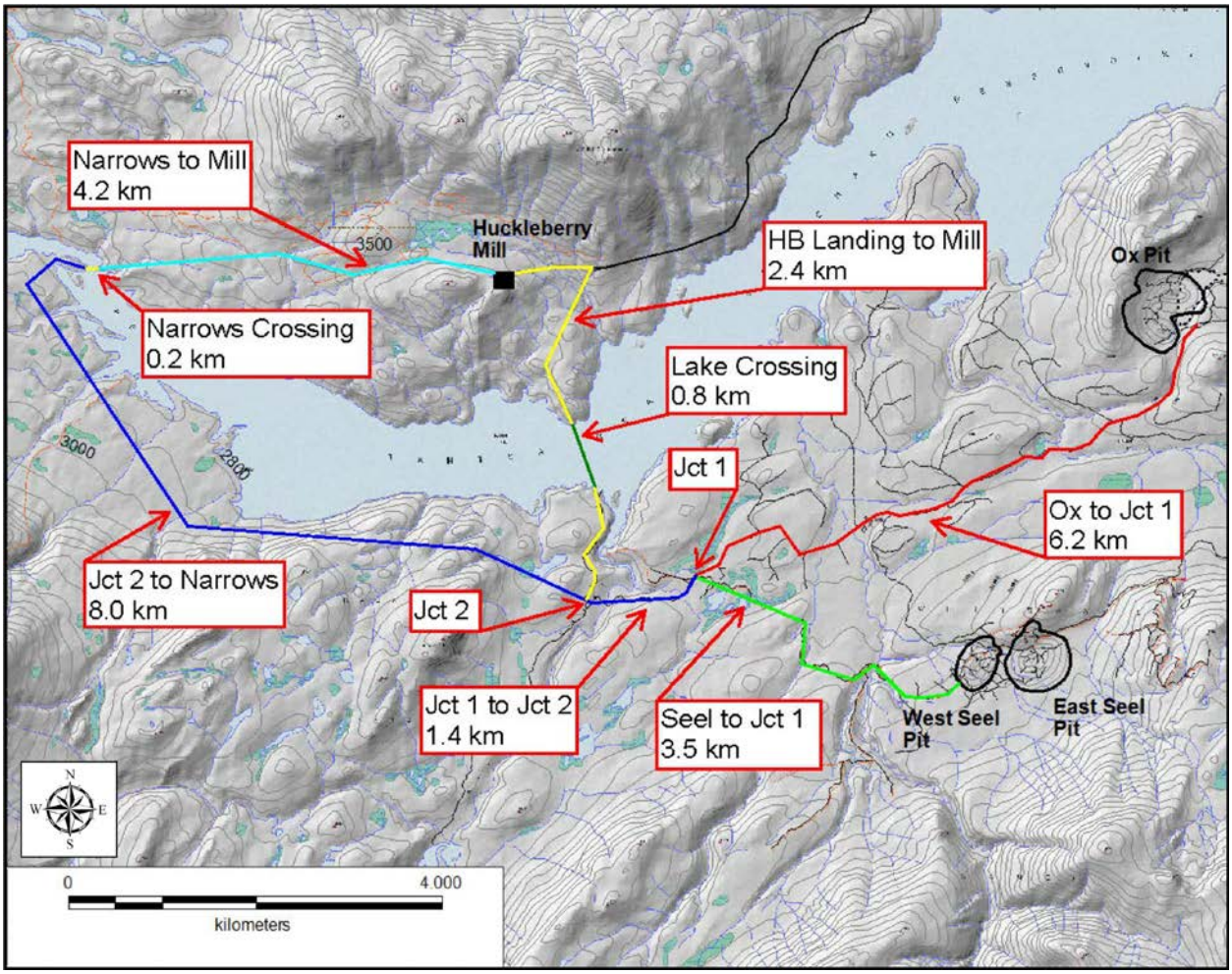
A bubble system will be installed to keep the path of the barge clear of ice in the winter. During break-up, wind-driven ice may affect the barge and/or the floating conveyor system. The ferry will be located on the windward (west) side of the floating conveyor system to help intercept chunks of ice before they become a problem. The tugboat will be equipped to break up or push away ice which could affect the barge and floating conveyors.

18.3 MILL FEED TRANSFER

18.3.1 Trade-Off Study

A trade-off study was conducted to determine the best way to move mill feed from Ootsa across Tahtsa Reach to the mill. Various transportation options were considered including trucking with dump trucks and trailers, trucking with large-capacity purpose-built trucks, and conveying. A number of routes were available for transportation each option as shown in Figure 18.6.

Figure 18.6 Routes and Distances from the Ootsa Property to the Mill



The primary choice of routes was between (1) a short 200 m crossing at the Tahtsa Narrows requiring construction of a 13.8 km road and (2) a longer, direct crossing of 800 m associated with a road less than half the length. The challenge of the direct route was that the distance across the Reach and depth of the water did not lend itself to the cost-effective construction of a conventional bridge.

A number of options were considered for the direct crossing. As shown in Table 18.1, these included a rockfill causeway supporting truck haulage or conveying and several conveyor specific alternatives including conveying to barges, a conveyor suspended above the lake using a system called Ropecon, and floating conveyors.

TABLE 18.1
TRADE-OFF STUDY TRANSPORT AND ROUTE COMBINATIONS EVALUATED

Route	Distance	Crossing		Haulage	Material	
Name	km	Type	Location	Type	Type	Operator
Long Road	13.8	Bridge	Narrows	Truck+Trailer	Whole	Owner
Long Road	13.8	Bridge	Narrows	Truck+Trailer	Whole	Contractor
Long Road	13.8	Bridge	Narrows	HaulMax	Whole	Owner
Long Road	13.8	Bridge	Narrows	Conveyor	Crushed	Owner
Short Road	6.0	Causeway	Direct	Truck+Trailer	Whole	Owner
Short Road	6.0	Causeway	Direct	Truck+Trailer	Whole	Contractor
Short Road	6.0	Causeway	Direct	HaulMax	Whole	Owner
Short Road	6.0	Causeway	Direct	Conveyor	Crushed	Owner
Short Road	6.0	Barge	Direct	Conveyor	Crushed	Owner
Short Road	6.0	Ropecon	Direct	Conveyor	Crushed	Owner
Short Road	6.0	Floating CV	Direct	Conveyor	Crushed	Owner

The objective of the trade-off study was to identify the most desirable approach after which a specific operating plan and associated costs were developed to support this PEA. The evaluation included not only technical and economic factors but also considered more qualitative factors such as potential environmental and social impact.

The economic evaluation of the various mill feed transfer scenarios involved developing capital and operating costs for each alternative and then assessing each using discounted cash flow analysis. Table 18.2 presents the results of the trade-off study economic evaluation.

It can be seen in Table 18.2 that the Net Present Cost ("NPC") for the trucking scenarios was an order of magnitude higher than that for the conveyor scenarios. Despite minimal capital, engaging a contractor to haul mill feed via a bridge across the Tahtsa Narrows would be the most expensive way to transfer material from Ootsa to the mill. Although using large, purpose-built trucks to haul directly across a causeway was the most economic trucking scenario, it was still twice as costly as the best conveyor option.

Among the conveyor options, an overland conveyor laid across a causeway and an overland conveyor feeding a series of floating conveyor units had effectively the same NPC. Conveying to barges was 30% more expensive due to the ongoing cost to load and unload the barges as well move the barges themselves. The Ropecon suspended conveyor was similarly more expensive but primarily due to higher capital rather than operating costs.

TABLE 18.2
ECONOMIC EVALUATION OF MILL FEED TRANSFER ALTERNATIVES

WHOLE MILL FEED						
Scenario			OPEX		CAPEX	NPC
Transport	Route	Crossing	$/t feed	$/t-km	$ M	$ M
Truck & Trailer	Narrows	Bridge	2.13	0.15	15.3	115.1
HaulMax	Narrows	Bridge	1.71	0.12	24.1	103.4
Contractor	Narrows	Bridge	2.92	0.21	9.5	143.7
Truck & Trailer	Direct	Causeway	1.26	0.21	7.4	66.3
HaulMax	Direct	Causeway	1.14	0.19	12.2	65.4
Contractor	Direct	Causeway	1.72	0.29	3.7	84.7
CRUSHED MILL FEED						
Scenario			OPEX		CAPEX	NPC
Transport	Route	Crossing	$/t feed	$/t-km	$ M	$ M
CV	Narrows	Bridge	0.41	0.03	37.2	54.9
CV	Direct	Ropecon	0.34	0.06	29.0	43.6
CV	Direct	Barge	0.48	0.06	21.2	42.7
CV	Direct	Floating CV	0.36	0.06	17.2	33.5
CV	Direct	Causeway	0.34	0.06	18.4	33.4

In order to choose the best option for the Project, the options were ranked in terms of technical, economic, environmental, social, and permitting desirability. The lowest score was considered most desirable. Building a causeway was perceived as undesirable from environmental and social perspectives. The results can be seen in Table 18.3.

TABLE 18.3
RANKING OF MILL FEED TRANSFER OPTIONS ON BASIS OF DESIRABILITY

Scenario			Ranking					
Transport	Route	Crossing	Technical	Economic	Environment	Social	Permitting	Total
Truck	Direct	Causeway	1	6	7	6	7	27
Truck	Narrows	Bridge	4	7	5	1	5	22
CV	Narrows	Bridge	5	5	4	5	4	23
CV	Direct	Causeway	2	1	6	7	6	22
CV	Direct	Ropecon	6	4	1	4	1	16
CV	Direct	Barge	3	3	3	2	3	14
CV	Direct	Floating CV	3	2	2	3	2	12

Table 18.3 shows that an overland conveyor employing a series of floating conveyors to cross the lake was judged the most desirable mill feed transfer alternative. Not only is the option among the simplest and most cost-effective but it is also considered one of the least impactful ways to move mill feed across the lake and therefore more attractive in terms of permitting and public perception.

On the basis of this evaluation, overland conveying using a floating conveyor system to cross the lake was adopted as the basis for the mill feed transfer plan in this Ootsa PEA. Full details of the trade-off study and the addendum evaluating the floating conveyor system can be found in Appendix XVI and XVII.

18.3.2 Conveyor System Description

The conveyor system is typical of overland conveyors used to transport crushed rock over long distances in surface mines throughout the world. The less common aspect of the system is the floating conveyor, which allows material to be conveyed across the reservoir without significant or lasting impact on the environment. Figure 18.7 shows an example of an overland conveyor in similar terrain to that at Ootsa.

Figure 18.7 Example of Overland Conveyor in Terrain Similar to Ootsa

The conveyor belt itself will have a nominal width of 1,000 mm (42”) with 35° troughing idlers spaced every 750 mm. It can be seen from Table 18.4 that the downhill run from Seel to the PTP is regenerative, feeding power back into the system. Net motor horsepower for the system is 1,400 HP from Seel to the mill and 1,800 HP from Ox to the mill.

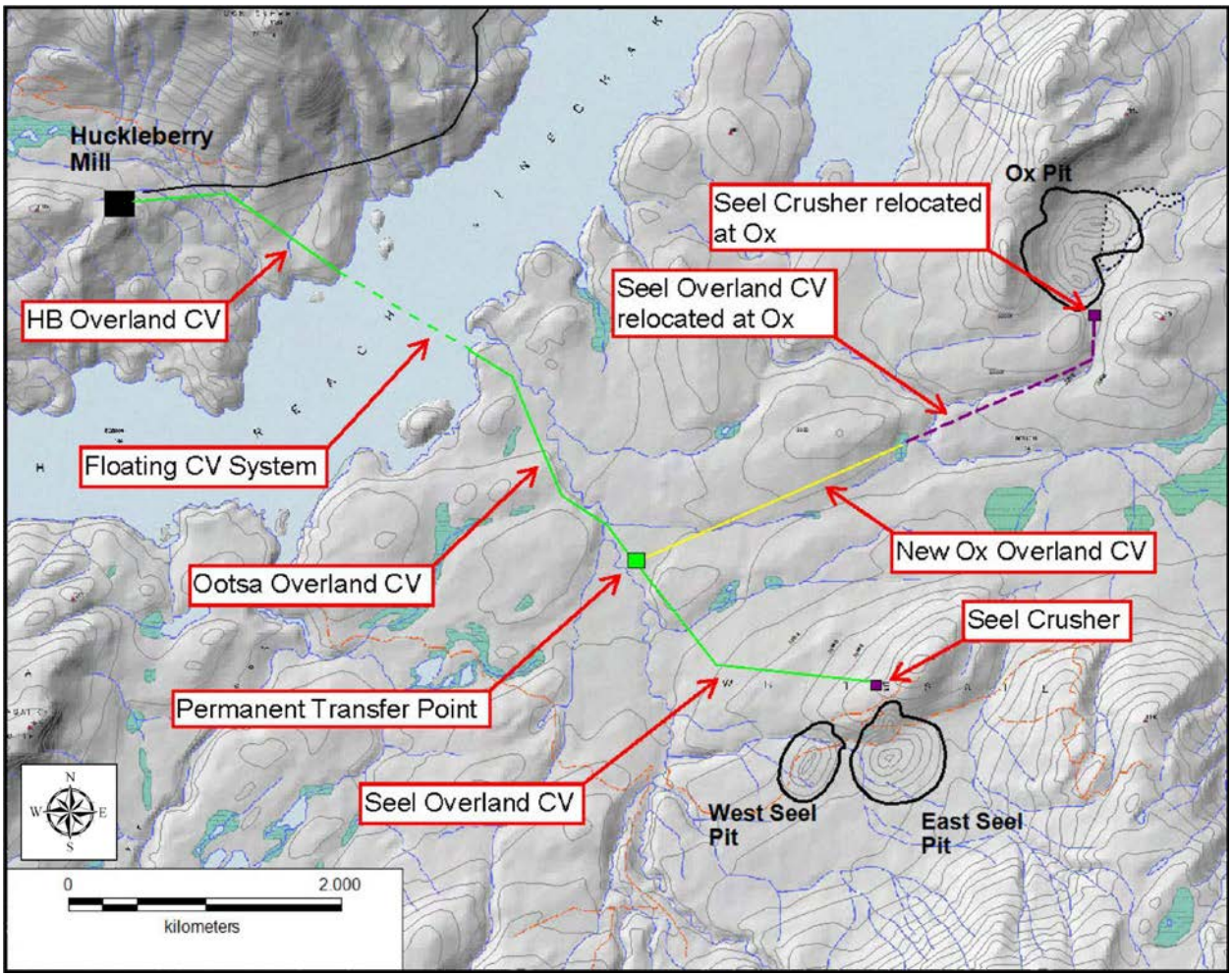
TABLE 18.4
CONVEYOR SYSTEM DETAILS

SECTION	FROM	TO	LENGTH (m)	LIFT (m)	POWER (HP)
1	Seel Crusher	TP1	1,100	-60	-47
1	TP1	TP2	1,000	-60	-58
2	TP2	TP3	2,100	-80	6
3	TP3	TP4	1,000	0	480
4	TP4	TP5	1,000	+120	533
4	TP5	HB Mill	800	+110	479
5	TP6	TP2	3,600	-70	236
6	Ox Crusher	TP6	300	0	50

The system will have an operating capacity of 850 tph, 20% higher than the 700 tph required to achieve planned mill throughput of 5.6 Mtpa. The extra capacity will permit stockpiling of crushed mill feed at the process plant to allow continuous operation during the relocation of the primary crusher and conveyor from Seel to Ox.

Figure 18.8 presents the layout of the entire conveyor system. It should be noted that the primary crusher and Seel overland conveyor will be relocated during the Project life when mining shifts from Seel to the Ox deposit. As such, Figure 18.8 represents all conveyor infrastructure over the life of the Project rather than the system at any single point in time.

Figure 18.8 Mill Feed Conveyor Layout



Section 1 is the Seel Overland Conveyor. It runs from the Seel crusher to the PTP, located at the site of the existing GRV Exploration Camp, a distance of 2.1 km. Section 1 is composed of two belts. A transfer point is located midway through the section to allow the conveyor to change direction as it passes around the Seel northern overburden stockpile. Optimization of the stockpile and conveyor layout could eliminate the need for this transfer point.

Section 2 is the Ootsa Overland Conveyor. It runs from the PTP to the south shore of Tahtsa Reach. This section is also 2.1 km in length. The conveyor curves slightly along its path to minimize stream crossings. A large clear-cut 200 m to the east could host the conveyor eliminating the need to clear about 1,000 m of right-of-way.

Overall, from the Seel crusher to the reservoir shore, the conveyor drops about 200 m in elevation. Power generated by this downhill run reduces the total horsepower required to drive the system. Profiles of the conveyor system sections can be found in Appendix XVIII. An

example of an overland conveyor transfer point such as that envisioned at Ootsa can be found in Figure 18.9.

Section 3 is the Floating Conveyor System. The system is composed of sixteen separate floating conveyor modules linked by a series of transfer chutes designed to connect each unit with the next one in line. Every unit is mounted on three pairs of pontoons with its own self-contained motor, drive, and take-up assembly. A bubble system will be installed to keep the pontoons ice-free during the winter.

Figure 18.9 Example of an Overland Conveyor Transfer Point

Electrical power is supplied to the floating conveyors from a small substation located on the north side of the reservoir. Access for clean-up and maintenance is provided by a walkway attached to the conveyor structure of each unit. Details regarding the design and specifications of the floating conveyor units can be found in Appendix XVI.

Section 4 is the HB Overland Conveyor. This section is 1.8 km in length composed of two belts. A transfer point is located near the HB Mine access road allowing the second belt to be aligned to discharge at the crushed mill feed stockpile. Total rise from the lake shore is about 230 m. This is the only uphill section of the entire conveyor system.

Section 5 is the Ox Overland Conveyor. The overall length of this section is 3.9 km, which is composed of two belts. A short belt, 300 m in length, allows the conveyor to exit the pit area through the surrounding hills where it discharges, via a transfer point, to the main conveyor. The main conveyor then runs straight for 3.6 km where it feeds the Ootsa Overland Conveyor at the PTP. The route from Ox drops about 70 m from the Ox crusher to the PTP and a further 80 m by the time it reaches the lake shore.

The Ox Overland Conveyor is not constructed during the initial mine development. As mining winds down at Seel, 1.8 km of new conveyor will be installed along the conveyor corridor from the PTP towards Ox. When mining at Seel is finished, the primary crusher will be relocated to the edge of the Ox pit and the Seel Overland Conveyor will be relocated to connect the new conveyor to the relocated crusher.

18.4 ELECTRICAL POWER

18.4.1 Electrical Loads

The connected load at the main site is approximately 20 MW. The development of the Ootsa Property will add up to 1.1 MW to the total load. The additional connected load is for the mill feed conveyor system and the facilities at the PTP.

Some elements of the existing load have changed or moved. For example, power for the open pit and crushing will be consumed on the Ootsa Property rather than at the main site. Also, primary crushing at Ootsa with a jaw crusher is less power-intensive than using a gyratory crusher and an entirely diesel-powered loading fleet will offset some of the additional power requirements. Table 18.5 itemizes the various component parts of the total Project connected load.

TABLE 18.5
ESTIMATED CURRENT AND FUTURE CONNECTED LOADS

Load	HB Current	Seel Pit	Ox Pit
	kW	kW	kW
HB Mill	18,500	18,500	18,500
HB Tailings	200	200	200
HB Site	500	500	500
Ootsa Site	0	100	100
Open Pit	400	300	300
Crusher	500	250	250
Conveyor	0	1,050	1,350
Total	20,100	20,900	21,200

18.4.2 Conveyor System Power

Power for the conveyor system includes both the overland conveyors and the floating conveyors. Table 18.6 shows the estimated net power requirements for each portion of the conveyor system. The estimated load presented by the Seel conveyor system is 1.05 MW while that for the Ox conveyor system is 1.35 MW.

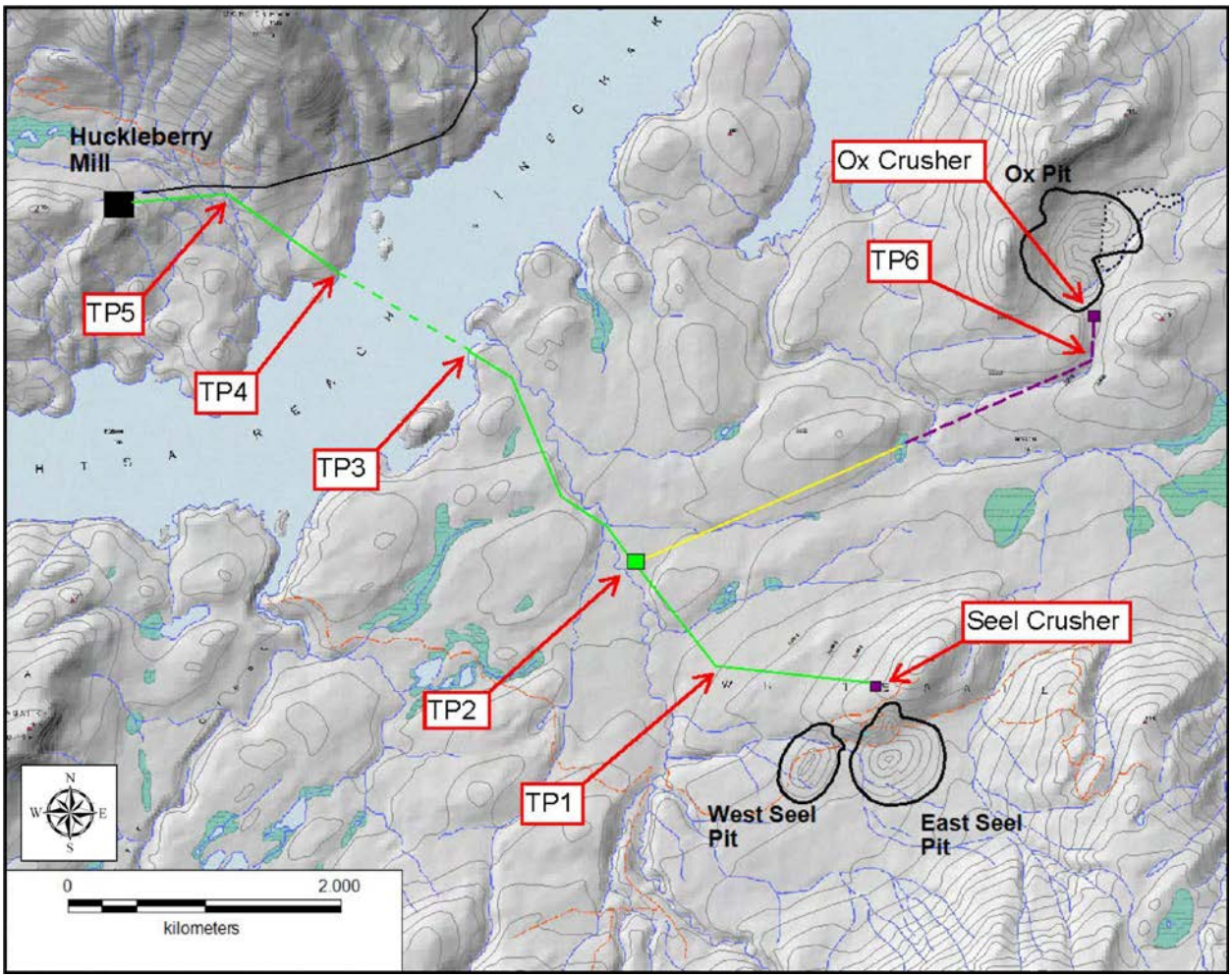
The Seel conveyor benefits from a drop in elevation of 200 m from the pit to the reservoir, which requires no net input to the system. The Ox conveyor requires more power because the run from the pit to the PTP is twice as long with only half the drop in elevation.

The most significant load, which is common to both systems, is the lake crossing and the climb up 230 m to the mill. The conveyors over this portion of the route represent a total connected load of approximately 1.1 MW. Figure 18.10 shows the various transfer points on the conveyor system, which represent the start and finish of individual belts.

TABLE 18.6
ESTIMATED ELECTRICAL LOAD FOR THE MILL FEED CONVEYOR SYSTEM

			LENGTH	LIFT	POWER	
SECTION	FROM	TO	(m)	(m)	(HP)	(kW)
1	Seel Crusher	TP1	1,100	-60	-47	-36
1	TP1	TP2	1,000	-60	-58	-44
2	TP2	TP3	2,100	-80	6	5
3	TP3	TP4	1,000	0	480	358
4	TP4	TP5	1,000	+120	533	405
4	TP5	HB Mill	800	+110	479	364
5	TP6	TP2	3,600	-70	236	179
6	Ox Crusher	TP6	300	0	50	38

Figure 18.10 Mill Feed Conveyor System showing Start and Finish of Each Belt



18.4.3 Power Distribution

Electrical power is supplied to the main site from the BC Hydro grid via a 138 kVA transmission line which runs along the Morice River FSR. A 1 km spur line will be constructed to bring high voltage power to the Landing on the north shore of Tahtsa Reach.

At the Landing, a substation will be established. This facility will step main line power down from 138 kVA to 13.2 kVA for distribution on the Ootsa Property. This substation will also step voltage down to 480 volts to run the floating conveyor units. Due to their proximity to the main site, the overland conveyors carrying feed to the mill will utilize power supplied directly from existing distribution system.

Power will be transmitted across the Reach via an underwater cable laid on the lake bottom. Power will then be distributed on the Ootsa side of the lake via overhead power lines mounted on typical wooden poles. Initially power will only be run to the Seel Pit. When preparations for the development of the Ox Pit start a similar powerline following the overland conveyor corridor will be installed.

A substation will be established at the PTP to supply the facilities there. Substations would also be installed at the crusher location to supply each mining area. Power at the open pits would be stepped down to 4.2 kVA for distribution in the mining area for the crusher, blasthole drills, and pumping systems. Drops would be installed at each transfer point to supply power to conveyor motors and heat tracing on the mine water pipeline.

18.5 WASTE ROCK STORAGE

Waste rock mined from the Seel and Ox pits will be either overburden or broken hard rock. The overburden is predominantly glacial till, a mixture of sand, gravel, and clay containing cobbles up to 150 mm in size. The broken hard rock is the product of blasting the host rock surrounding the mineralized zones in each deposit. Typical blasted waste rock is composed of angular fragments with a P80 of 150 mm and a top size of 1,000 mm.

A portion of the hard rock waste is Potentially Acid Generating ("PAG") while the remainder is Not potentially Acid Generating ("NAG"). NAG has the potential to neutralize acid generated from other material. All of the overburden is considered NAG. PAG and NAG material will be blended whenever possible to retard the generation of acid drainage. NAG material will also be used at the Ox mining area to create a barrier along the outside boundary of the stockpile to ensure that any acid drainage does not reach the surrounding environment.

Table 18.7 shows a breakdown of the tonnage of each kind of waste from each pit by material type. It is notable that at East Seel less than 1% of the waste volume is PAG and that two-thirds of the NAG waste is overburden. At West Seel, PAG material comprises about 28% of the total waste tonnage with the majority of the NAG material being hard rock rather than overburden. At the Ox pit 35% of the waste is PAG with the NAG material split 2:1 between hard rock and overburden.

TABLE 18.7
IN-SITU TONNAGE AND VOLUME FOR WASTE MATERIAL BY TYPE AND PIT

	Overburden		PAG Waste		NAG Waste		Total Waste	
Pit	Mt	M bcm	Mt	M bcm	Mt	M bcm	Mt	M bcm
Ox	9.14	4.57	15.21	5.61	18.08	6.67	42.44	16.86
E Seel	19.56	9.78	0.37	0.14	13.51	4.93	33.44	14.85
W Seel	2.41	1.21	5.52	2.01	12.07	4.39	20.00	7.60
Total	31.12	15.56	21.10	7.76	43.65	15.99	95.88	39.31

18.5.1 Stockpile Design Parameters

Hard rock and overburden will be dumped separately due to their different geo-mechanical properties. Overburden has an angle of repose of 27° while hard rock waste will stand more steeply at 36°. Overburden stockpiles will be constructed in 20 m lifts while lifts for waste rock stockpiles will be 30 m in height.

Both types of stockpile will have a 20 m setback between lifts to manage drainage and facilitate revegetation. Stockpile bases where dumping of PAG material is planned will be lined with clayey till to prevent potentially acidic seepage from entering the groundwater regime.

Stockpile volumes are based on a "net swell" factor which considers the increase in volume of excavated material and its re-compaction as a result of dumping. Net swell factors applied for hard rock waste and overburden were 25% and 15%, respectively. Table 18.8 presents the bulk densities used in the design of the waste stockpiles.

TABLE 18.8
IN-SITU AND IN-PLACE BULK DENSITIES USED FOR DUMP DESIGN

In-Situ Bulk Density

	Mill Feed	Waste	OB
	t/bcm	t/bcm	t/bcm
East Seel	2.76	2.74	2.00
West Seel	2.75	2.75	2.00
Ox	2.67	2.71	2.00

In-Place Bulk Density(1)

	Mill Feed	Waste	OB
	t/lcm	t/lcm	t/lcm
East Seel	2.21	2.19	1.74
West Seel	2.20	2.20	1.74
Ox	2.14	2.17	1.74

(1) In-Place = Dumped in stockpile

18.5.2 Reclamation

For closure, hard rock stockpiles will be covered with overburden after flattening the final slopes to an angle of about 27° so that a final overall slope angle of about 20° will result. Treated with sufficient fertilizer, the overburden will serve as a growth medium for re-vegetating the stockpiles. Whenever the mining sequence permits, overburden will be placed directly on final slopes rather than being stockpiled to promote progressive reclamation. Stockpiles with the potential to generate contaminated run-off have been located so that at closure run-off will drain back to the mined-out open pits.

18.5.3 Seel Waste Stockpiles

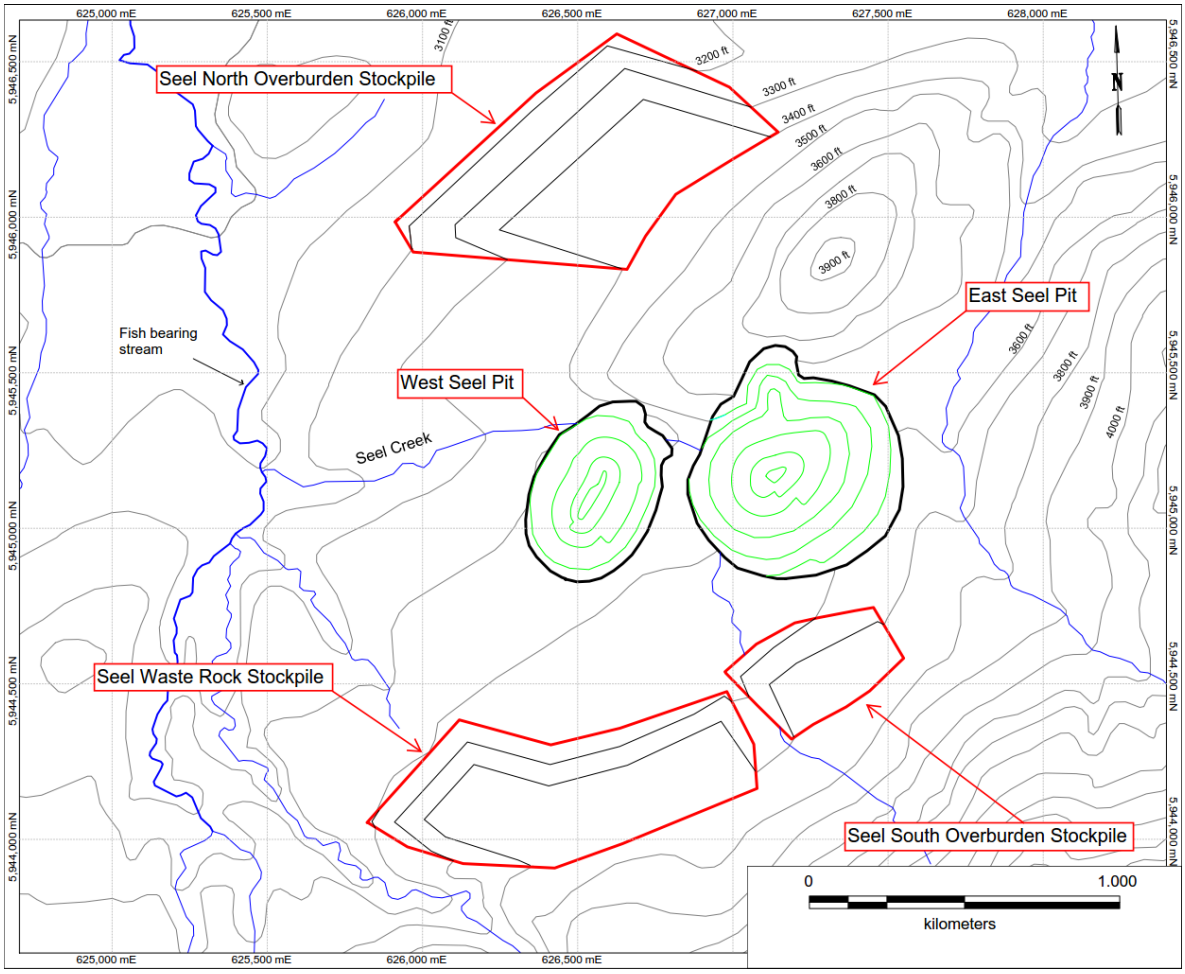
The Seel deposit pits are supported by three waste stockpiles, the Seel North and South Overburden Stockpiles and the Seel Waste Rock Stockpile (Figure 18.11). The South Overburden Stockpile is a small, two-tiered structure 40 m in height. It is located south and upslope of the East Seel pit. It has a design capacity of 1.3M m^3 and is intended to accommodate the majority of the waste generated during pre-stripping. The South Overburden Stockpile covers an area of about 13.5 ha.

The North Overburden Stockpile is located northwest and downslope from the pits and the crusher. It is a large, four-tiered structure approximately 70 m in height covering an area of 55.6

ha. The design capacity of the stockpile is 11.3M m^3, sufficient to accommodate all the remaining overburden from both the East and West Seel pits. The stockpile is located in its entirety north of the overland conveyor. Access will be via a road which runs past the upslope side of the crusher installation pad.

All of the hard rock waste from the Seel open pits will be stored in the Seel Waste Rock Stockpile. This is a single, three-tiered structure approximately 60 m in height located south and upslope of the East and West Seel Pits. The stockpile has a design capacity of 14.3M m^3 and, at completion, will occupy an area of 43.4 ha.

Figure 18.11 Layout of the East and West Seel Pit Waste Material Stockpiles



18.5.4 Ox Waste Stockpiles

The Ox Pit is supported by two waste stockpiles, one for overburden and one for hard rock waste (Figure 18.12). The stockpiles are located at the east end of the natural bowl formed by the hills surrounding the site of the Ox Pit. The location of the stockpiles prevents potentially contaminated run-off water from the open pit area from reaching the fish-bearing stream to the east.

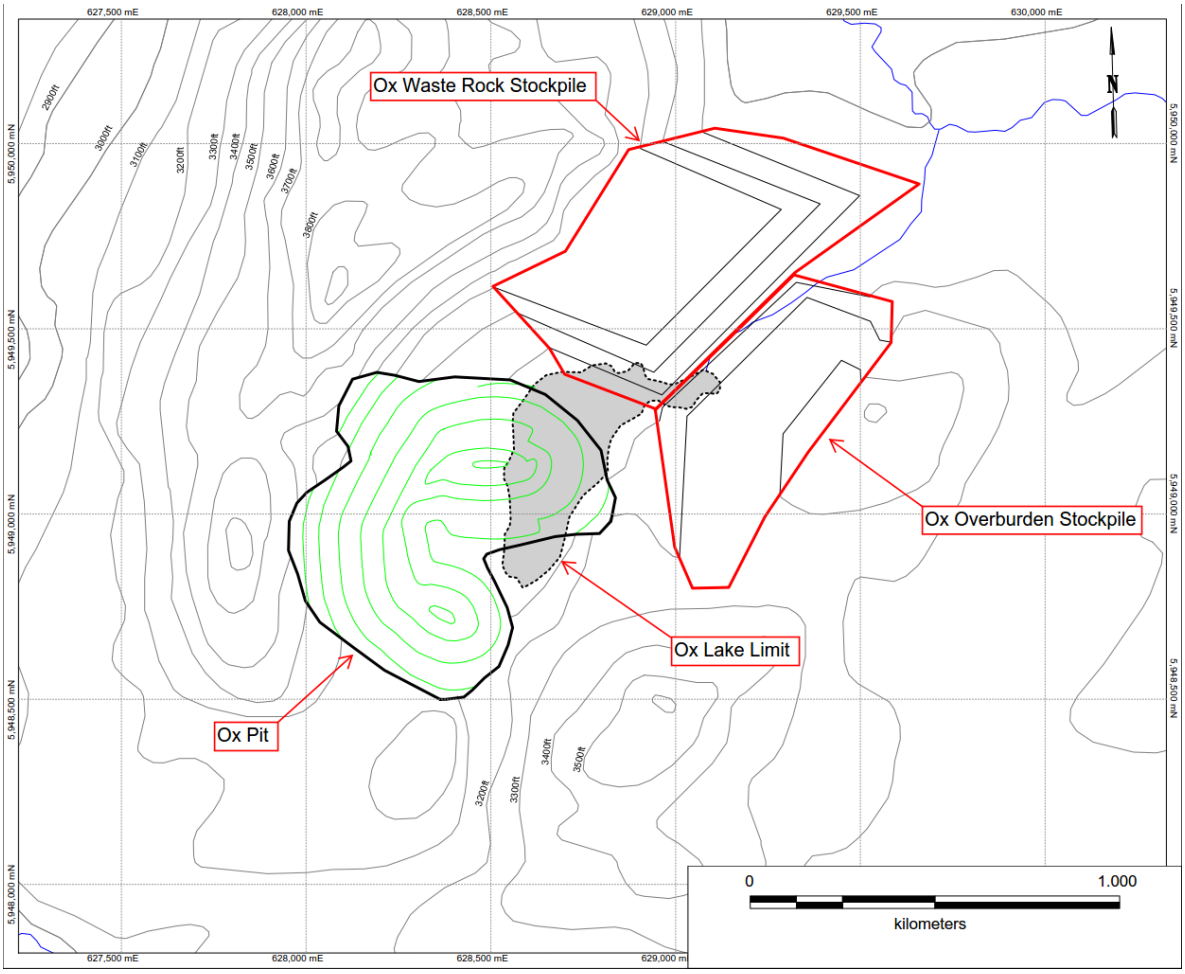
The Ox Overburden Stockpile has a designed capacity of 5.2M m^3. It is located on the northeast side of the pit against the adjacent hillside and covers an area of 29.3 ha. Less competent lake

bottom sediments will be dumped such that their lower bearing strength does not affect the stability of the stockpile. The stockpile is a two-tier structure, nominally 40 m in height.

The Ox Waste Rock Stockpile is located north of the overburden stockpile. Its eastern margin lies adjacent to the overburden stockpile while on the opposite side the stockpile butts up against the hills which run along the northwest side of the pit. The southern edge of the stockpile lies atop the northern end of Ox Lake which will be drained prior to construction.

The Ox Waste Rock Stockpile is the largest of the waste material stockpiles to be developed during the life of the Project. It is a four-tier structure with a nominal height of approximately 80 m and a design capacity of 15.3M m^3. At completion, the stockpile will cover an area of 44.4 ha.

Figure 18.12 Layout of the Ox Pit Waste Rock and Overburden Stockpiles



On a volume basis, about 55% of the material in the Ox Waste Rock Stockpile is NAG and 45% is PAG. NAG material will be used to construct the outer perimeter of the stockpile to ensure that a barrier exists to direct potentially acidic run-off water back towards the pit. PAG and NAG material will be mixed in the body of the stockpile to promote the potential for in-place neutralization.

The volume and area of each stockpile designed for the Project is shown in Table 18.9. Approximately 95.9 Mt of waste material mined will be stored in stockpiles having a total in-place volume of 47.4 M m^3 covering an area of 186.2 ha. By volume, the waste material

stockpiles will be composed of about 38% overburden, of which, about 71% is generated from the mining of the Seel pits. Hard rock waste produced by mining is evenly split between the Ox and Seel mining areas.

TABLE 18.9
WASTE MATERIAL STOCKPILE DESIGN CAPACITIES AND AREAS

	Waste Rock SP		North Overburden SP		South Overburden SP		Total	
Pit	Volume	Area	Volume	Area	Volume	Area	Volume	Area
	M m3	ha	M m3	ha	M m3	ha	M m3	ha
Seel	14.3	43.4	11.3	55.6	1.3	13.5	26.9	112.5
Ox	15.3	44.4	5.2	29.3	---	---	20.5	73.7
Total	29.6	87.8	16.5	84.9	1.3	13.5	47.4	186.2

18.6 WATER MANAGEMENT

Operations will manage water within the mining areas from direct precipitation, run-off, and mine water. Average annual managed water volumes for both mining areas are shown in Table 18.10. Precipitation and run-off volumes were calculated by applying appropriate coefficients to the corresponding surface areas. Figures include an allowance for mine water at 200 m^3/hr.

TABLE 18.10
AVERAGE ANNUAL MANAGED WATER VOLUMES BY MINING AREA AND YEAR

		Contact Water			Non-Contact	Total
Year	Pit	PAG	NAG	OB	Water	Water
		m3 x 1000	m3 x 1000	m3 x 1000	m3 x 1000	m3 x 1000
1-2	East Seel	390	150	210	360	1,110
3-9	East Seel + Ox	1,580	230	280	1,350	3,440
10-12	East Seel + Ox + West Seel	1,920	330	330	1,840	4,420

Contact water is water present in open pits or run-off from waste rock stockpiles. As PAG and NAG material is mixed together in waste rock stockpiles, all of the run-off is treated as PAG although only a portion of it will actually be contaminated. Although the total volume managed is greater than that of the contaminated water alone, this strategy provides for significant dilution, minimizing the need for treatment. At maximum disturbance, the total amount of potentially contaminated water to be managed averages about 250 m^3/hr.

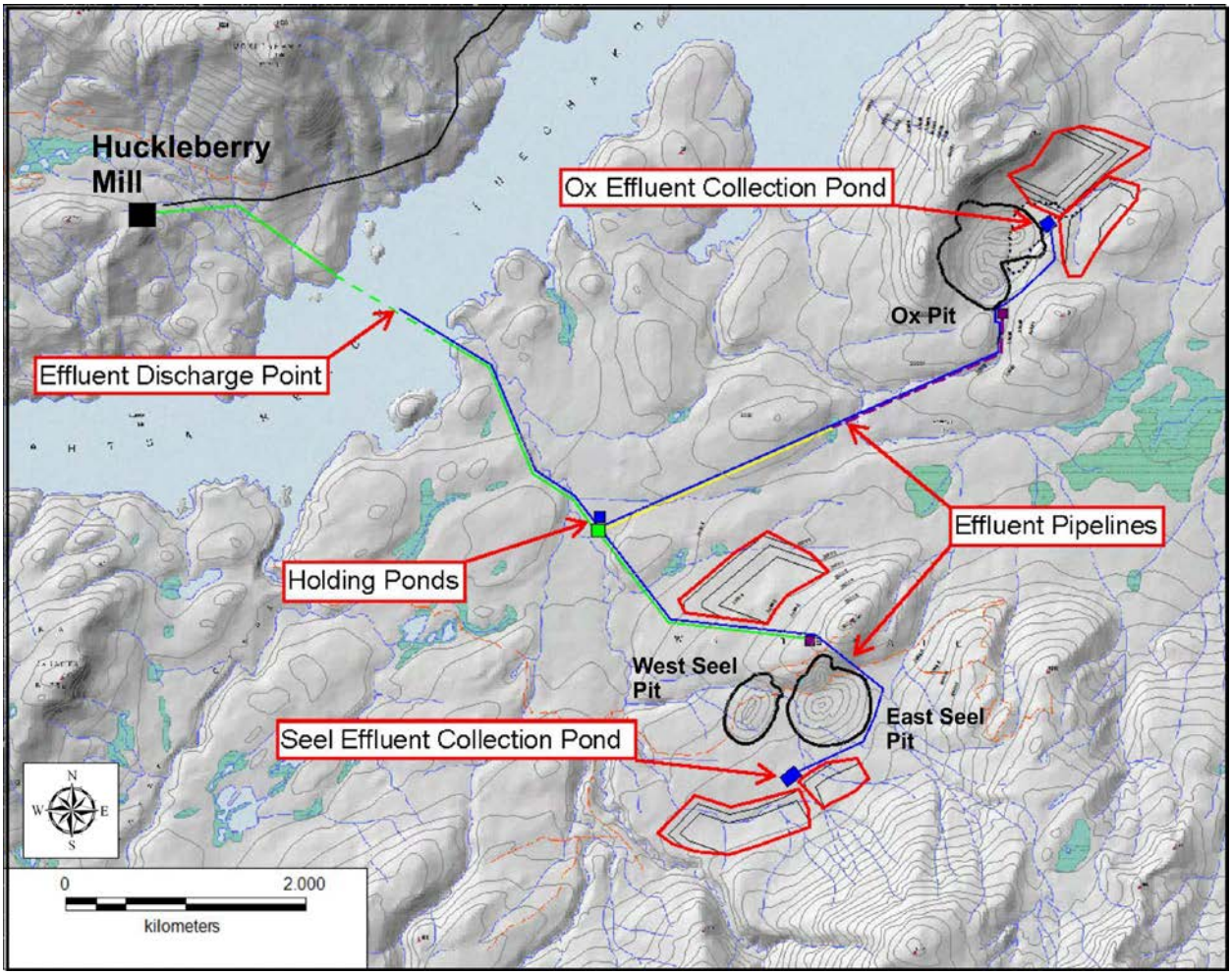
Run-off from overburden stockpiles does not need active management. It will be collected to allow suspended solids to settle and then allowed to seep into the ground or evaporate. Non-contact water is water in the mining area but is diverted by ditches or channels before it contacts any potential source of contamination.

The volume of managed water increases as mining moves from one pit to the next. This is because once an area is disturbed the need for water management persists even after mining is finished. Nevertheless, even at maximum disturbance, 40% of the total volume of water managed is diverted before it becomes potentially exposed to contamination and another 7% collected from the overburden stockpiles doesn't require active management.

Potentially contaminated mine water and run-off will be collected and transferred by pipeline from each pit area to holding ponds located at the PTP. The pipelines will be sized to

accommodate the maximum anticipated flow and will follow the overland conveyor corridors from each pit. Figure 18.13 shows the layout of the mine effluent management system.

Figure 18.13 Ootsa Site Layout Showing Water Management Infrastructure



Preliminary test work indicates that mine water and stockpile run-off do not need complex treatment to meet discharge standards. Mine effluent piped to the PTP will flow through two holding ponds where suspended solids will settle out and final water quality will be checked before the water is released. If necessary, pH adjustment using lime will be implemented on a continuous, flow-through basis.

Effluent of suitable quality will travel via pipeline and gravity flow to a release point at the bottom of Tahtsa Reach. Water quality in the reach will be monitored on an ongoing basis to ensure that discharge limits are met and that there is no adverse impact on the lake or surrounding environment.

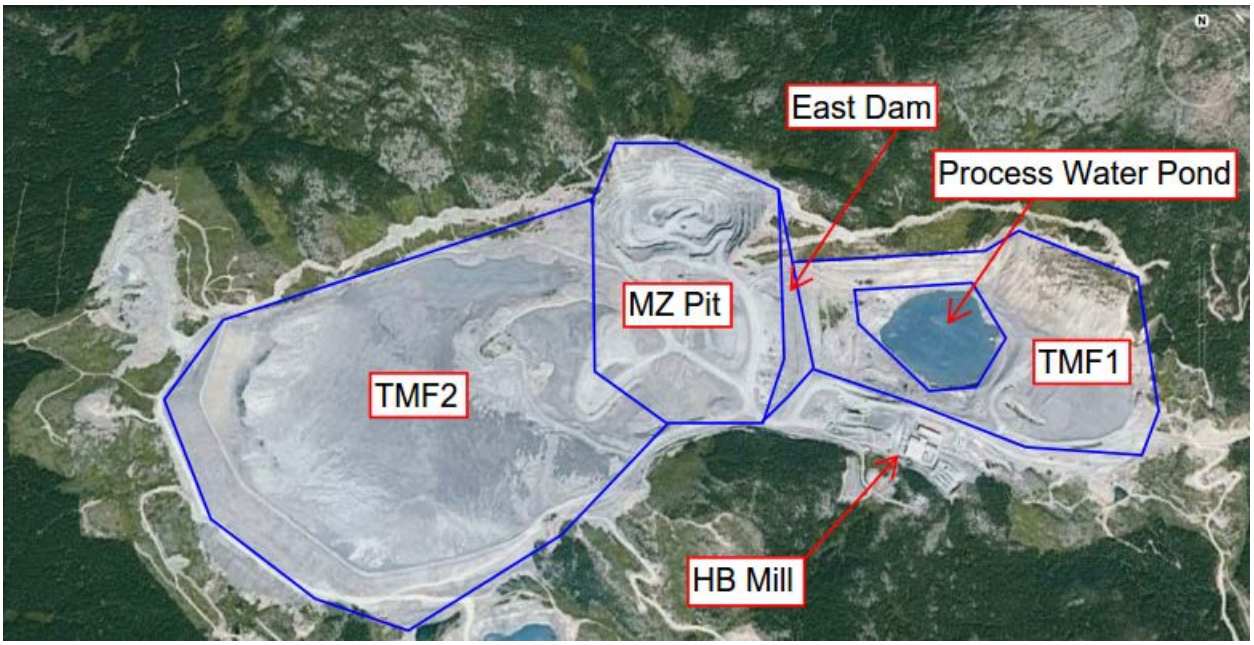
18.7 TAILINGS MANAGEMENT

Tailings generated from the processing of Ootsa mill feed at the mill will be stored in the mined out Main Zone ("MZ") Pit. The MZ Pit is located about 1,000 m west of the mill. It lies directly east of the now mined-out East Zone ("EZ") Pit, which is also used to store tailings.

The EZ Pit is now referred to as TMF1 and is separated from the MZ Pit by the East Dam, a waste rock structure which allowed the continued filling of the EZ Pit with tailings without affecting the MZ Pit development. To the west of the MZ Pit is a second tailings impoundment called TMF2. TMF2 is now filled to capacity and is undergoing reclamation prior to closure.

Figure 18.14 presents a satellite photograph of the HB site during the initial development of the MZ Pit. It should be noted that the current main tailings impoundment, TMF3, scheduled to contain most of the remaining waste and tailings from the MZ Pit, lies further to the west of TMF2.

Figure 18.14 Huckleberry Mine Site Showing the MZ Pit and Surrounding Infrastructure



Mining of the MZ Pit is scheduled to continue until the end of 2019 when mining reserves there will be exhausted. Additional mineralization exists at depth beneath the MZ pit, however, a pit expansion would entail pushing pit walls back into the adjacent tailings facilities which poses technical and regulatory challenges that causes those resources to be considered uneconomic.

When mining is finished in the MZ Pit, the excavated volume is estimated to be 61.5 M m^3. This volume is available for filling with tailings from the processing of Ootsa mill feed. The mineable resource at Ootsa is estimated to be 65.4 Mt. At an in-situ density of 1.35 t/m^3, similar to that at HB, this tonnage will occupy a volume of 48.4 M m^3.

The MZ Pit is presently subject to the inflow of groundwater in the order of 15,000 m^3/d. This water is pumped out of the pit to the process water pond in TMF1. It is likely that a large portion of the inflow to the MZ Pit originates from the free water stored in TMF1, which migrates downwards through the East Dam.

After 6-7 years of filling the MZ Pit with tailings, the differential head between the MZ Pit and TMF1 will reverse with free water migrating back through the East Dam. This situation will keep the process water pond full allowing the mill to reclaim water for processing at reduced cost. Managing a positive water balance through recycling and controlled release of excess water is

part of the current successful operating practice at HB and will continue to be the case when Ootsa mill feed is processed there.

Placement of tailings in the MZ Pit will be via end-of-pipe discharge. No special measures will be required to build a tailings beach as containment will be provided entirely by the walls of the excavation. The walls of the pit are supported to the East by the East Dam, behind which lies the entire mass of TMF1, and similarly to the west by TMF2. Tailings disposal in this manner is among the most technically simple and safest ways to store waste from mill feed processing.

19.0 MARKETS AND CONTRACTS

19.1 METAL PRICES

Metal prices used to value the Project were based, in part, on long-term forecasts obtained from Consensus Economics, a UK-based consultancy that collects and analyzes commodity forecasts from major banks and other financial institutions worldwide. Consensus Economics compiles economic data including monthly commodity forecasts. The information is available on a fee basis

Base Case metal prices used to evaluate Ootsa economics represent a discount to forecast prices for the years 2020 – 2025 as of October 2015. As such, the Project has been valued based on a forward-looking but conservative view of future metal prices relative to that of banks and other major financial institutions. Prices have been projected forward to cover the entire Project life. Prices are expressed in nominal US dollars, unadjusted for inflation. Price forecasts for the year 2020 represent the earliest reasonable expected start of production at Ootsa assuming:

- Four years to engineer, permit, finance, and construct the Project
- Completion of mining at HB
- Deferral of stockpile processing at HB in favour of higher value feed from Ootsa.

TABLE 19.1
BASE CASE METAL PRICE ASSUMPTIONS

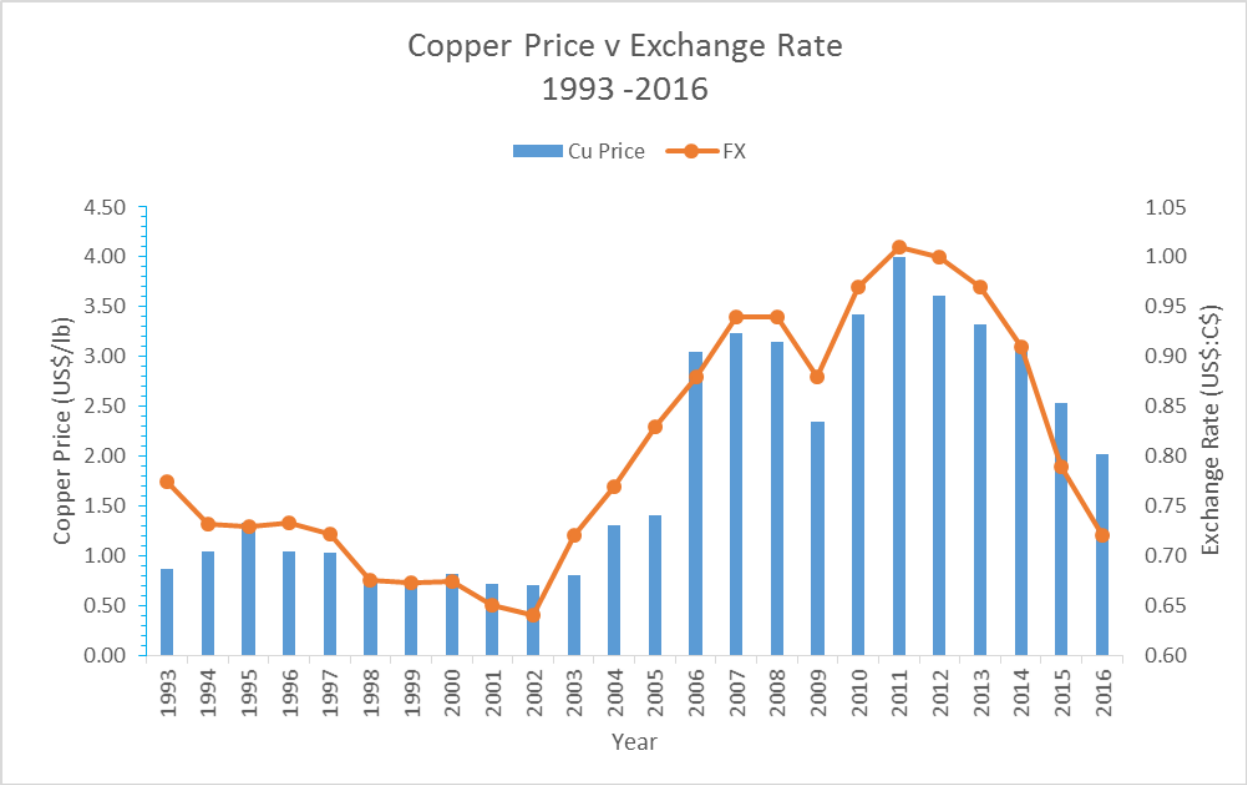
Commodity	Cu	Au	Ag	Mo
Consensus Price	3.25	1,288	19.86	11.47
Base Case Price	3.00	1,260	17.00	10.30

Base Case metal prices are shown in Table 19.1. Values chosen were rounded down from the actual Consensus Economics forecasts to facilitate price and exchange rate modeling for the purpose of sensitivity analysis as described in Section 19.3 of this PEA.

19.2 FOREIGN EXCHANGE

Historically, the Canada-US exchange rate has been highly correlated with metal prices. When metal prices rise the Canadian dollar strengthens and when metal prices fall the Canadian dollar weakens. Figure 19.1 shows how exchange rate and copper price have moved relative to one another since 1993.

Figure 19.1 Copper Price and Exchange Rate 1993 – 2016



The 0.94 coefficient derived from the data shown in Table 19.2 indicates a high degree of correlation between copper price and exchange rate. The relationship, however, is indirect and is subject to the influence of a variety of macro-economic factors. As a result, a prevailing metal price does not dictate a corresponding exchange rate.

TABLE 19.2
COPPER PRICE AND US-CANADA EXCHANGE RATE 1993 - 2016

Year		1993	1994	1995	1996	1997	1998	1999	2000
Cu Price	US$/lb	0.87	1.05	1.33	1.04	1.03	0.75	0.71	0.82
FX	US$:C$	0.78	0.73	0.73	0.73	0.72	0.68	0.67	0.67
Year		2001	2002	2003	2004	2005	2006	2007	2008
Cu Price	US$/lb	0.72	0.71	0.81	1.30	1.40	3.05	3.23	3.15
FX	US$:C$	0.65	0.64	0.72	0.77	0.83	0.88	0.94	0.94
Year		2009	2010	2011	2012	2013	2014	2015	2016
Cu Price	US$/lb	2.34	3.42	4.00	3.61	3.32	3.11	2.53	2.02
FX	US$:C$	0.88	0.97	1.01	1.00	0.97	0.91	0.79	0.72
Correlation Coefficient (Cu Price:FX):				0.94	Average Exchange Rate (US$:C$):				0.80

It can also be seen from Table 19.2 that during the 23-year span from 1993 to 2016 there are numerous instances where copper price varied dramatically while similar exchange rates prevailed. For example, in 2006 and 2009 copper prices were $3.05/lb and $2.34/lb respectively while the annual exchange rate was the same in both years at 0.88 US$:C$.

As a result of the preceding observations, exchange rate for the Project Base Case was set equal to the average exchange rate over the last 23 years, 0.80 US$:C$.

19.3 METAL PRICE – FX MODEL

The relationship of metal prices to exchange rate is critical to BC copper producers and no less so for Ootsa. The fact that payment for product is in US dollars while costs are incurred in Canadian dollars is a fundamental reason why BC copper mines remain globally competitive despite their comparatively low grade.

To reflect this aspect of the Ootsa Project, a model was developed to permit Project economics to be evaluated in a manner which was systematic and respected the real-world relationship between individual metal prices and exchange rate. The Metal Price – FX model for the Project is shown in Table 19.3.

TABLE 19.3
METAL PRICE – FX MODEL

Cu	$/lb	2.00	2.25	2.50	2.75	3.00	3.25	3.50
Au	$/oz	1,100	1,140	1,180	1,220	1,260	1,300	1,340
Ag	$/oz	14.00	14.75	15.50	16.25	17.00	17.75	18.50
Mo	$/lb	5.50	6.70	7.90	9.10	10.30	11.50	12.70
FOREX	US$:C$	0.70	0.73	0.75	0.78	0.80	0.83	0.85

The Metal Price – FX model was constructed by drawing a straight-line between approximate 2015 year-end metal prices at $2.00/lb Cu and forecast long-term metal prices at $3.25/lb Cu as of October 2015. Prices within the range were varied uniformly. Prices outside the range were extrapolated using the same slope.

Foreign exchange was modelled similarly with a straight-line drawn between the approximate actual 2015 year-end rate of US$0.70=C$1.00 at $2.00/lb Cu and the 24-year trailing average rate of US$0.80=C$1.00 at $3.00/lb Cu. Again, rates varied uniformly and extrapolated were outside the range using the same slope.

The Metal Price – FX model is intended to generally represent the future movement of prices for the four metals of interest and the US:Canada exchange rate based on past history. It does not represent any single moment in time, past or future. It is a tool created to examine the sensitivity of the Project to changing economic conditions.

19.4 CONTRACTS

There are no existing contracts in place related to the Ootsa Project. Parameters related to smelting and refining that would form the basis of a smelting and refining agreement are discussed in Section 22 of this PEA.

20.0 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

20.1 ENVIRONMENTAL SETTING

A PEA requires "a summary of the results of any environmental studies and a discussion of any known environmental issues that could materially impact the issuer's ability to extract the mineral resources or mineral reserves."

The proposed Project is the development of three open pits (East Seel, West Seel and Ox) and associated infrastructure to transport crushed material via conveyor from the Ootsa Property across Tahtsa Reach to the mill. This section describes the environmental setting of the Ootsa Property, including a description of the abiotic (non-living) environmental quality (i.e. climate, hydrology, water quality, groundwater, air quality and noise) along with the terrestrial ecosystems, wildlife, aquatic ecosystems and fish information. This summary is based on observations during mineral exploration and publically available reports, including from the nearby Huckleberry Mine (Golder 2011).

20.1.1 Abiotic (Non-living) Environmental Quality

20.1.1.1 Climate

The climate of the Ootsa Property is intermediate between the continental climate of the Nechako Plateau to the east, with much lower precipitation and colder winters, and the maritime climate of the Coast Mountain ranges to the west, with much greater precipitation (4 to 5 times). Regional climate data varies substantially, particularly for precipitation, from the drier Nechako Plateau weather station at Skins Lake 100 km east, to the much wetter and mountainous terrain at Tahtsa Lake, 50 km west (Golder 2011). Climate stations at Huckleberry Mine collected data over the past two decades and provide local climatic context. The data will assist with Ootsa planning to understand precipitation and resulting water management. The Ootsa Property is expected to experience very similar conditions as Huckleberry Mine due to the close proximity.

The adjacent Huckleberry Property has cool snowy winters and cool summers, with mean annual temperatures ranging from 2.4 °C to 3.1 °C (Golder 2011). The mean annual precipitation was 1,043 mm (based on data collected between September 1992 and December 2010, Golder 2011). On average, 57% of the mean annual precipitation fell as snow. October was the month with the highest mean monthly rainfall (mean of 100.9 mm) and December was the month with the highest snowfall (mean of 135.1 mm rainfall equivalent), whereas total precipitation (rain and snow in mm rainfall equivalent) occurred in November (167.7 mm). The majority of precipitation occurred between the months of October and January, with most falling as snow. Snow management will need to be considered in Ootsa Project planning owing to the range of snow (1 to 4 m) and extremes of snow accumulation (up to 10 m) experienced nearby (Golder 2011).

Recommendations for future work include establishing a climate-monitoring program at the Ootsa Property, in conjunction with the existing camp setup, to gather climate and precipitation data. Using an onsite automated meteorological station, snow surveys and air quality monitoring is typical for exploration projects to obtain information needed for future effects assessments as well as engineering studies.

20.1.1.2 Hydrology

The Ootsa Property is on the southern shore of Tahtsa Reach on a bench of gently rolling hills that are bounded by the Whitesail Range of mountains immediately south from the Seel deposits. The Nechako Reservoir is a chain of lakes and a prominent feature of the region formed by flooding of rivers and lakes by Kenney Dam. Tahtsa Reach receives flow from tributaries on both shores, including from Troitsa Lake to the west. Whitesail Reach to the east is part of Ootsa Lake. Aside from Tahtsa Reach, the only large lake within 30 km of the deposits is Troitsa Lake to the southwest. Small unnamed lakes and ponds occur in the Ootsa Property area but aside from Ox Lake, do not occur adjacent to the Ox and Seel deposits.

There are no major rivers in the vicinity of the Seel and Ox deposits, though the area is cross-cut by many second and third order streams. Kasalka Creek is the largest stream just west of the deposits and connects Tahtsa Lake with Troitsa Lake. Numerous small streams drain the steep north flank of the Whitesail Range through the Ootsa Property and into Tahtsa Reach. Streams originate in the alpine areas and descend at steep gradient then transition in low to moderate gradient reaches near the deposits then into Tahtsa Reach. Swampy areas occur where the ground flattens and drainage is poor.

Precipitation is greatest in the winter, falling as snow and leading to the accumulation of a substantial snowpack (Golder 2011). Stream flows peak during the spring run-off while low flows occur in the late summer and winter. Many small streams are ephemeral and are dry in the summer. Similar precipitation patterns are encountered at the Project site.

Stream flow data is critical for understanding potential effects to fish and fish habitat, engineering/process water needs as well as engineering design and operation factors (e.g. water balance, effluent dilution capacity) for managing water. Huckleberry Mine undertook hydrology studies on the north side of Tahtsa Reach over the past two decades and these will be useful to characterize and compare to the streams in the Ootsa Property (Golder 2011).

Several small streams and Ox Lake which interact with the Project will be affected or diverted for the open pits or waste rock stockpiles. Seel Creek flows through the East Seel and West Seel deposits and will be affected by pit and waste rock stockpile development planning. Ox Lake will be drained to provide access to the underlying Ox deposit and this will cut off seasonal flow to the Ox Lake outflow stream (3 km in length) during the operations phase. Ox Lake outflow creek is ephemeral, runs 3 to 4 months a year during spring run-off, and typically dries up in the late summer. Both Ox Lake outflow and Seel creeks have fish habitat downstream of the deposit areas which will require consideration for potential flow impacts. At closure, impacts to stream flows may be reduced as flows may be returned to the original channels through and downstream of the pit lakes if advantageous to managing water quality.

Hydrological studies will be required to characterize the stream flows, water yield, flow paths and interactions or impacts from development on the Ootsa Property. Hydrometric stations on key streams should be established early in the baseline data collection program. This will be essential as substantial water management planning and infrastructure will be needed for the Project. With good baseline data and proper planning and site management, it will be possible to mitigate most impacts on the hydrology of the streams adjacent to the deposits.

20.1.1.3 Water Quality

Surface water quality in streams, wetlands and lakes is an important consideration for stakeholders, regulators and First Nations. Aside from basic water sampling in 2014 by ERM (ERM 2014a), no other water quality data is known for streams near the deposits. Further away from the Property, studies exist for several projects within the reservoir and Tahtsa Reach including data from Huckleberry Mine, which will provide data about regional water quality.

Baseline water quality and fisheries sampling programs were initiated in 2014 at the Ootsa Property (ERM 2014a). Several streams were sampled near the Ox and Seel deposits as well as Ox Lake. Overall, water quality was good in Ox Lake and only copper exceeded Canadian Council of Ministers of Environment ("CCME") or BC water quality guidelines for protection of aquatic life. This is not an unexpected result given the limited run-off from Ox Lake and underlying deposit. Ox Lake was nutrient poor, had neutral pH and clear, soft water. Some variability existed in stream water chemistry, though all streams had neutral pH, clear water and cool temperatures. Water samples from Seel Creek and Ox Lake outflow creek found stream water quality was good; only aluminum exceeded CCME or BC aquatic life guidelines at several stream sites (ERM 2014a). Further sampling of streams, Ox Lake and Tahtsa Reach will be required in the future to characterize seasonal variability in water quality, inform the effects assessment and available assimilative capacity for effluent discharge planning.

Certain components of the development of the Ootsa Property may cause changes to surface water quality and quantity in the adjacent streams, lakes and wetlands. The use of a land conveyor and floating conveyor on Tahtsa Reach to transport crushed material to the mill may generate dust, which may enter local water-ways and affect water quality. This issue may be partially mitigated by a cover on the conveyor. Collection of contact water from within the mining area will occur and, if needed, be treated prior to discharge. Baseline water quality data will help to define the assimilative capacity of streams for Project planning, and if needed, treated or diluted effluent discharged into streams or Tahtsa Reach.

Surface run-off from the mine, waste rock stockpiles, roads and conveyor/crusher infrastructure may enter surrounding watercourses, and may potentially infiltrate soils and interact with ground-water. Non-contact water will be diverted around the Project infrastructure (pits, waste stockpiles) into natural drainages. Effluent from the mine site will be collected, treated if required and discharged into Tahtsa Reach or adjacent creeks within permit limits. Run-off will be mitigated through the use of collection ponds or by re-vegetation of surface covers around water-ways. These mitigation methods will ensure that water is treated or achieves a suitable quality before entering the receiving environment.

Huckleberry Mine is permitted to discharge treated mine effluent, and non-contact surface run-off into small streams and Tahtsa Reach and has monitored water quality for several decades. The water quality data will provide a good record of comparison for future studies at the Ootsa Property and will be helpful for modelling any Ootsa Property discharge of water to Tahtsa Reach. Regulators will require modelling of mixing, currents and seasonal water quality changes which may arise from discharge of Ootsa Property water to the Reach.

Historical surface water quality data show streams near Huckleberry Mine had neutral pH, low conductivity, low hardness, low turbidity and generally low or undetectable concentrations of metals. Most water samples were of good quality with rare exceedances of water quality

guidelines (Golder 2011). Very few parameters in Tahtsa Reach water exceeded guidelines (Golder 2011).

20.1.1.4 Groundwater

No information currently exists for groundwater at the Ootsa Project site. Groundwater quality studies performed at the Huckleberry Mine may be of limited value to the Ootsa Project as groundwater is determined by site-specific aquifers, location, geology and climate. Hydrogeological studies will be required to assess groundwater quantity and quality within the proposed pits, reference areas nearby and at proposed waste rock stockpiles. This will be critical for pit management, water management and Metal Leaching/Acid Rock Drainage ("ML/ARD") planning. Future groundwater, well installation and monitoring could be incorporated into exploration drilling programs, and has the potential to save significant mobilization costs if done concurrently. Hydrogeological data is an essential input to the water balance, water quality effects modelling, ML/ARD characterization, effects assessment and safe discharge management plans.

20.1.1.5 Air Quality

No baseline data currently exists on air quality at the Ootsa Property. Though there is likely some dust production occurring currently from forestry in the area and road traffic, the expectation is that air quality will be good. Existing potential influences may include wildfire smoke, mine emissions, and fugitive road dust. Concerns around air quality typically relate to the generation of air quality contaminants (e.g. fine particulates) and the exposure of receptors (e.g. people, communities, wildlife, soil).

The transportation of crushed material to the mill or mining in the pits may produce dust. This can be mitigated with the installation of a cover for the conveyor and dust suppression. If an incinerator is required to manage combustible, non-hazardous waste at the Ootsa Property, it is unlikely to result in a significant effect on air quality by following the manufacturer operational procedures. As there are no permanent residents in the area and recreational use is limited, air quality is not expected to be a significant issue for the Project. Air quality studies would need to be undertaken to collect baseline data for air quality in support of the environmental assessment.

20.1.1.6 Noise and Visual Quality

No baseline data on noise and visual (i.e. scenic) quality exists. The area is likely at low background levels for noise and contains a variety of visual landscapes. Transportation of crushed material to the mill along with crushing, blasting and hauling material all have the potential to create localized noise and visual disturbances but this is not anticipated to be significant.

The nearest recreational area is located approximately 5 km to the north-east of Huckleberry Mine, on the north (opposite) side of Huckleberry Mountain and Sweeney Lake (BC MLFNRO, 2015). Additionally, Tahtsa Reach and the surrounding area are used recreationally, and a variety of wildlife species occupy the area. Changes are expected in the appearance around the pits and waste stockpiles and will be assessed for potential impacts although no long-term effects are anticipated. Studies will be undertaken on noise and visual impacts to determine the level of influence the mine site will have on noise and visual quality, and the proper way to mitigate potential disturbances.

20.1.2 Terrestrial Ecosystems and Wildlife

Terrestrial ecosystems comprise vegetation, the soils and landscape features and, along with the wildlife within those ecosystems, comprise an important component which regulators, First Nations and other stakeholders value. Consequently, additional study and assessment of potential effects and mitigation tools will be required.

20.1.2.1 Vegetation and Soils

The Project is located in the Nadina Forest District in an area dominated by two bio-geoclimatic subzones; the Engelmann Spruce-Subalpine Fir moist cold subzone and the Sub-Boreal Spruce moist subzone. Elevations range from 840 m above sea level ("ASL") at Tahtsa Reach to around 1,100 m ASL at the Seel deposits. The Seel deposits are located on the lower north slopes of the Troitsa Peak massif, which rises rapidly to a height of over 1,800 m south of the deposits. The vegetation around the Huckleberry Mine area is dominated by mature coniferous forests of subalpine fir and lodgepole pine, which are commercially harvested. Wetland complexes also occur in valley bottoms and depressions across the area (Golder 2011).

Ootsa Property soils are likely similar to those surrounding the Huckleberry Mine site. The soils near Huckleberry Mine are well- to moderately-well drained though tend to be poorly drained at the bottoms of depressions or valley bottoms (Golder 2011). Drilling in the Ootsa Property has encountered a variable thickness of glacial till overlying the bedrock, consisting of clay and silt with intermixed gravel, cobble and boulder. Occasional deposits of gravel occur on the Ootsa Property and provide road surfacing material.

Characterization of the terrestrial ecosystem features (soil, vegetation, rare plants, ecosystems, wildlife habitat) will be required for both the Environmental Assessment ("EA") and permitting. Hence baseline studies are recommended for the Ootsa Property in the vicinity of the development areas. Typically, baseline characterization studies will enable Project planning and effects assessment to occur and mitigate potential short (e.g. rare plant impacts) and long-term (e.g. sedimentation, soil quality, revegetation) risks to vegetation, soils and ecosystem function. Soil studies are fundamental to reclamation and closure planning and infrastructure design (e.g. waste stockpiles, sediment control/erosion protection features, water management). Extensive soil testing has occurred across the Ootsa Property as part of previous exploration work and data will be reviewed as part of the baseline studies.

20.1.2.2 Wildlife

The Ootsa Property contains habitat for many species of wildlife, several of which are considered Species at Risk ("SAR") (e.g. northern caribou, western toad). Study of the wildlife on or near the Property has not occurred yet, but regional studies assessed key wildlife species and habitat nearby.

Huckleberry Mine conducted baseline surveys and effects assessments on SAR and the findings are likely applicable to the Ootsa Property due to similarities in ecosystems, vegetation, terrain and close proximity (Golder 2011). The Golder study found 13 SAR that could potentially occur in the area and one SAR was observed (Western Toad). Some of these 13 species may occur on the nearby Ootsa Property and include mammals (caribou, wolverine, fisher, and grizzly bear), birds (olive-sided Flycatcher, Barn Swallow, American Bittern, Common Nighthawk), an

amphibian (Western Toad), and several plants (back's sedge, Montana larkspur, alp lily and purple oniongrass).

A desktop wildlife overview study in 2014 compiled a list of species or animal groups that had the potential to occur at the Ootsa Property and may require future study (ERM 2014b). The list included moose, mountain goat, northern caribou, grizzly bear, furbearers (e.g. American marten, fisher, and wolverine), bats, landbirds, raptors, waterbirds, and the western toad. These species were identified as important by local First Nations across similar projects in the region, or are species of conservation concern in the province, or are species of regional interest for biological, economic, social or cultural reasons (ERM 2014b).

Habitat management for mountain goat and northern caribou is an issue to be managed because of the proximity of the Seel deposits to provincially designated Ungulate Winter Range ("UWR") for mountain goat (UWR-6-003). Mitigation and management measures will be implemented to avoid or minimize impacts from the development of the Property. Caribou habitat management is an important issue to regulators because of the SAR listed status of the Tweedsmuir-Entiako caribou herd that uses the Whitesail Range. The proposed development will not likely be significantly affected by ongoing efforts for caribou management, as standard mitigation measures will be used to minimize potential impacts.

Baseline studies for a suite of wildlife species will be required to support an effects assessment and development of mitigation measures. Specific attention will be required for development planning around habitat issues for SAR or key species, including grizzly bear, moose, mountain goat and northern caribou. With early and well-planned mitigation and reclamation of disturbances, it is anticipated that impacts to wildlife in the Project area will not be significant.

20.1.3 Aquatic Ecosystems and Fish

20.1.3.1 Aquatic Resources

Aquatic resources include the components (e.g. streams, wetlands, lake, habitat quality, sediment quality) and the organisms, which form the food chain and ecosystem (e.g. invertebrates, phytoplankton, zooplankton, algae, fish, and plants). These resources and organisms are typically inventoried and assessed for potential effects from development projects because of several reasons: the value to stakeholders, regulators and First Nations; or potential impacts which may arise from alterations in flow, habitat, water quality or water quantity from a proposed project; or the nature of existing legislation protecting these ecosystems (e.g. federal Fisheries Act, Metal Mining Effluent Regulations, water quality guidelines for protection of aquatic life).

While little aquatic data exists for the Ootsa Property, some aquatic resources data has been collected for the Huckleberry Mine in streams, wetlands and Tahtsa Reach (Golder 2011). This information is useful as context for aquatic resources in similar ecosystems near the Ootsa Property. Tahtsa Reach is relevant to the Ootsa Property development because of the floating conveyor transport and potential need to discharge mine water via a pipeline to the Reach.

The aquatic habitat in small streams near Huckleberry Mine was of low to moderate quality, and comprised ephemeral streams or streams with low flow during the winter and summer (Golder 2011). Fish barriers were common on streams, preventing fish movement and reducing the quantity of fish habitat available. Similar circumstances are expected, and in some cases known,

for streams on the Ootsa Property. For example, barriers and ephemeral stream flow is known for both Ox Lake outflow stream and Seel Creek (S. Ebert, Gold Reach Resources, pers. comm).

Aquatic resources (phytoplankton, zooplankton, benthic invertebrates, sediment) were sampled at one site in Tahtsa Reach for the Huckleberry Project (Golder, 2011). The results suggest that primary productivity is low. Zooplankton densities were also low, while benthos data suggested medium to high diversity within the Reach, with populations dominated by a few species. Additional characterization of Tahtsa Reach aquatic resources will be required for the EA for the Ootsa Property development.

Diversions of streams and altered water flow patterns are anticipated as part of the Ootsa Property development, particularly for Ox Lake outflow creek and Seel Creek, as these are within or just downstream of the pit/waste rock stockpile footprints. When streams are diverted for installation of mine infrastructure, the aquatic habitat and aquatic resources are likely to be impacted and must be inventoried and assessed. Water quality may also be altered, as well as fish habitat and food sources (periphyton and benthos) in the diverted stream. Mitigation will be an important factor to prevent and manage potential effects and any potential residual effects on aquatic ecosystems and resources.

Characterization of the aquatic ecosystem features at the Ootsa Property will be required for permitting, including the definition of an Aquatic Effects Monitoring Plan. Justification for comprehensive aquatic baseline studies is also provided under the federal Fisheries Act.

20.1.3.2 Fish and Fish Habitat

Compared to other environmental variables, more extensive information exists on fisheries resources for the reservoir and tributaries. Numerous species (16) occur in the Nechako Reservoir watershed including burbot, dolly varden, kokanee, lake chub, lake trout, largescale sucker, longnose sucker, mountain whitefish, northern pikeminnow, prickly sculpin, rainbow trout, and slimy sculpin (Triton 2005). Other species may occur in the Reservoir and are known to utilize the tributary streams including peamouth chub, longnose dace, redside shiner, and white sucker. Dolly Varden and lake trout were recorded in the watershed prior to the creation of the Reservoir in the 1950s and may still exist.

The entire reservoir provides fish habitat as well as reaches of tributary streams, which are accessible to fish from the reservoir up to waterfall barriers. In addition, fish habitat may exist in streams and lakes upstream of barriers to fish passage in tributaries as is the case with Ox Lake overlying the Ox deposit, situated upstream of a 4 m barrier (ERM 2014c). Fish in the Tahtsa Reach make use of tributary streams seasonally for spawning as in the case of rainbow trout, a spring spawning species. Some streams are large enough to support year-round populations (e.g. Kasalka Creek) whereas others are ephemeral and dry during the summer (Ox Lake outflow creek), or have barriers, which prevent fish migration (Seel Creek).

Baseline fisheries studies will be required to confirm the location of fish passage barriers, habitat quality, fish community composition, flows and seasonal use in relation to the proposed development.

Baseline data was collected at the nearby Huckleberry Mine prior to development. Lake chub, rainbow trout, and longnose suckers were found in the small streams adjacent to the TSF area (Golder 2011). Rainbow trout were also found in smaller tributary streams, though many small

streams were non-fish-bearing as a result of barriers preventing fish migration (Hatfield 1997). On the Ootsa Property, BC MOE conducted stream surveys of Kasalka Creek and identified rainbow trout, longnose sucker, northern pikeminnow and peamouth chub at a Tahtsa Reach inflow stream (Hatfield 1997). In Kasalka Creek, rainbow trout, burbot, and prickly sculpin were found in the Reach draining Troitsa Lake into Tahtsa Reach. Small streams near and downstream of the Ox and Seel deposits are expected to support similar fish communities, life stages and spawning, rearing and overwintering habitat use.

The East and West Seel pits intersect a 3 m wide small stream (Seel Creek) upstream of a barrier waterfall to fish passage. Fish are not suspected to occur in the stream at the pit locations (S. Ebert, Gold Reach Resources, pers.comm). Seel Creek and the larger creeks downstream support a variety of fish species and will be inventoried in future studies. During mine development, water in Seel Creek will be diverted and flow reduction may occur since mine area run-off will be collected for assessment of quality then discharged. No direct loss of existing fish habitat is anticipated for the fish bearing reaches of Seel Creek, although flow reductions will likely affect habitat quality and use.

Potential impacts on fish and fish habitat may arise adjacent to or downstream of the development of the Ootsa Property from diversions, instream works, fish access, flow changes, water quality or water temperature changes. To minimize or avoid these or other potential effects, mitigation measures will be incorporated into Project planning and design.

Ox Lake is a small shallow lake, which contains only lake chub (*Couesius plumbeus*) and suitable habitat to maintain a self-sustaining lake chub population. It is isolated from fish populations located in Tahtsa Reach (Ootsa Lake, Nechako Reservoir) by a 4 m waterfall (ERM 2014c). Ox Lake will be drained in order to mine the Ox deposit and a fish salvage program will occur to remove lake chub for re-location. The draining of the lake will be a temporary loss of lake habitat during operations, and at closure the mined out pit will fill with water and re-flood the former lake basin. After re-flooding the former lake basin, the lake may be able to support fish as fish habitat. The outflow creek from the lake contains a 4 m waterfall downstream, which prevents sport fish species (e.g. bull trout, rainbow trout) from immigrating into Ox Lake from Ootsa Lake, 2 km downstream. The outlet stream only flows seasonally during spring run-off, which is concurrent with spring spawning by rainbow trout that may occur downstream of the water falls; the outlet stream is dry for the remainder of the year.

Lake chub are a small minnow species and not a sport fish species in BC, nor listed under the Species at Risk Act and it is unlikely, but not confirmed, that this population of fish would contribute to an Aboriginal, commercial or recreational fishery as defined under the Fisheries Act. No known fishery exists for lake chub in Ox Lake. Sport fish (e.g. rainbow trout, kokanee, burbot, mountain whitefish, dolly varden, lake trout, etc.) are considered species which contribute to the recreational fishery in the reservoir, and potentially to an Aboriginal fishery as well. A small scale commercial fishery in the reservoir may exist but is not known at present. Future studies will investigate the presence of fisheries related to the fish in Ox Lake and potential Tahtsa Reach.

The contribution to any of the three types of fisheries, or as prey species which support those fisheries, is an important determination under the federal *Fisheries Act* that is yet to be made. This will help determine if the habitat protection and Authorization provisions of the *Act* apply to lake chub in Ox Lake and potential habitat impacts from draining the lake or changes to stream flows in the lower reaches. The fish habitat, stream flows and sport fish populations found in the

lower reaches of streams downstream of fish barriers and in the reservoir fall under the *Fisheries Act* and its population and habitat protection provisions. If certain habitat protection and 'serious harm' provisions of the *Fisheries Act* are triggered through this or other Project activities, mitigation and offsetting measures may be required as well as an Authorization under Section 35(2b).

In terms of permitting losses or impacts to fish habitat and fish populations associated with mine development, operation and closure, an Authorization under Section 35(2b) of the federal *Fisheries Act* may be required for any of the following circumstances of potential 'serious harm'. The final determination of which circumstances will require an Authorization will depend on the proposed development plan, feedback from the Department of Fisheries and Oceans ("DFO"), agencies and other stakeholders (in particular around lake chub), timing of works and any mitigation or offsetting to avoid residual effects. Potential impacts requiring Authorization may arise from draining Ox Lake, altering flows in any fish stream, physical losses of instream or riparian habitat.

If circumstances trigger the need for a Section 35(2b) Authorization, a mitigation/offsetting and monitoring plan, and financial security/bond, may be required from the proponent prior to approval for the authorized impact. The mitigation/offsetting plan is the responsibility of the proponent and would be developed in consultation with stakeholders and government agencies.

20.2 WATER MANAGEMENT AND WASTE CONSIDERATIONS

A PEA requires a discussion of the "requirements and plans for waste and tailings disposal, site monitoring, and water management both during operations and post mine closure." A brief summary of issues related to waste, water management and site monitoring is provided in this Section along with recommendations for next steps.

20.2.1 Water Management

Water management is fundamental to development of the Ootsa Property given the high precipitation, run-off, abundant water courses and groundwater around the proposed pits and waste rock stockpiles. It is also a critical operating factor at Huckleberry Mine due to the large volume of water which must be managed, diverted, monitored and discharged across the mine site (Golder 2011). Information from Huckleberry operations will be useful for comparison to Ootsa during the design and development stages including precipitation, run-off, seasonal availability, water yield, water balances, groundwater data and pit water management approaches.

The water management approach, sources and gross volumes are summarized in Section 18 of this PEA. The goal around water management at Ootsa is to develop and close the mining area in such a manner that long-term water management problems and costs are minimized or avoided. This will be accomplished through understanding of the water quality and quantity characteristics of the site, use of efficient designs, effective management during operation and closure phases and use of robust, low maintenance water management infrastructure for the post-closure period. By utilizing this approach, the Proponent will minimize or avoid where possible, additional costs for handling, transportation and treatment of water. Planning of water management, including quantity and quality studies, will be required in the next stages of development.

In general, water related infrastructure will include the following components to minimize and avoid environmental impacts:

- Diversion ditches for clean run-off/non-contact water and small streams around pits, working areas and waste rock stockpiles to prevent contamination;
- Collection ditches around stockpiles, working areas and waste stockpiles to collect run-off which may require treatment in a plant or settling pond prior to discharge to the environment;
- Pumps and small pipelines for dewatering working areas, pits, holding ponds, etc. And transporting for discharge in streams, ponds or Tahtsa Reach or between operating areas;
- Although not anticipated based upon preliminary results, if future testing indicates water quality will exceed discharge criteria, a modular water treatment plant may be required; and
- Settling, collection and holding ponds to temporarily hold water which may require treatment for suspended sediments or other treatment prior to discharge to the environment.

Water management will continue into the closure period since the pits will fill with water and, if required, could provide temporary storage of water requiring treatment or for dilution of contact water run-off to meet discharge criteria. At closure, remaining water management infrastructure will be robust and include stable channels and pit lakes which require little maintenance for long-term function.

To advance water management concepts and inform Project planning, permitting and design stages, environmental baseline studies are recommended which influence water management including:

- Meteorological studies of precipitation and climate for affected watersheds;
- Hydrology studies of affected and reference watersheds to characterize run-off timing and variability and current modelling of Tahtsa Reach for discharge modelling;
- Water quality sampling to characterize the baseline conditions and for input to dilution and effects assessment modelling, permitting and operational planning;
- Groundwater baseline studies to characterize quantity and quality of aquifers in the pits, waste rock stockpiles and reference areas for input to water management models and permitting; and
- Geochemical baseline studies for source term definition as input to modelling water quality and waste management scenarios, permitting and operational handling.

Monitoring of water quality and quantity will be required prior to, during operation and in the post-closure period. Baseline sampling programs will be conducted in accordance with provincial field sampling protocols, and designs will provide the basis for developing operational and closure monitoring needs; these will be specified in both the Mines Act and effluent discharge permits. Baseline and operational monitoring of the surface and ground water as well as the adjacent receiving environment will form the basis of future monitoring. Monitoring will confirm water quality and quantity predictions and ensure potential environmental issues are addressed and in compliance with permit conditions.

20.2.2 Waste Rock Management for ML/ARD

From a provincial regulatory perspective, preventing impacts from Metal Leaching/Acid Rock Drainage ("ML/ARD") is a high priority as it is the most costly, time consuming and technically challenging environmental issue facing the British Columbia mining industry (BCMEM and BCMELP 1998). Environmental concerns regarding waste rock focus on the potential for negative impacts from ML/ARD on water quality in the receiving environment (i.e. streams, lakes, Tahtsa Reach) by avoiding, controlling and mitigating the onset of ML/ARD. Management of ML/ARD can be expensive and challenging for decades (e.g. Equity Mine near Houston, BC).

Waste rock infrastructure and tailings disposal are described in Sections 16 to 18 of this PEA. Approximately 95.9 Mt of waste rock will be produced and consist of Non-potentially Acid Generating ("NAG") (78%) broken hard rock and overburden at all three pits, as well as Potentially Acid Generating ("PAG") broken hard rock (22%) primarily from the Ox and West Seel pits. Waste rock stockpile layouts were located adjacent to pits so that water management included drainage back to pits or collection ditches/ponds from PAG stockpiles and downstream environmental risks were minimized.

A preliminary assessment of the geochemical characteristics and waste rock management options was completed by ERM and factored into the waste rock management approach for the Ootsa Property in the above sections (ERM 2015b). Key outcomes of this assessment include recommended approaches to blending PAG waste rock with NAG waste rock and preliminary indications that treatment of water to remove metals is not anticipated; these are summarized below.

20.2.2.1 Preliminary Geochemical Characterization and Metal Leaching

Preliminary Acid-Base Accounting ("ABA") test work was used to characterize the ARD potential for 15 samples from the East and West Seel and Ox deposits at the Ootsa Property. While only a small number of samples were tested, and is a limitation on the understanding of the entire deposits, the test results were useful to broadly characterize the deposits in consideration of the source geology. Additional testing (i.e. kinetic, static) of more samples is recommended to increase the understanding of ML/ARD for the Ootsa Property, and will be part of future characterization required for assessment and permitting.

Generally, the sedimentary rocks are PAG while intrusive rocks are NAG (ERM 2015b). Data indicates that waste material from all three pits on the Ootsa Property is about 78% NAG and 22% PAG. The distribution of PAG, NAG, and overburden for the waste rock associated with each resource is presented in Table 20.1. Further geochemical characterization is warranted but generally the glacial till which comprises most of the overburden is NAG.

TABLE 20.1 ARD CHARACTERIZATION OF WASTE ROCK AT THE OOTSA PROPERTY								
Material	**East Seel**		**West Seel**		**Ox**		**Total**	
Type	**Mt**	**%**	**Mt**	**%**	**Mt**	**%**	**Mt**	**%**
Overburden*	19.6	58	2.4	12	9.1	22	31.1	32
NAG	13.5	40	12.1	60	18.1	43	43.7	46
PAG	0.4	1	5.5	28	15.2	36	21.1	22
Total	**33.4**	**100**	**20.0**	**100**	**42.4**	**100**	**95.9**	**100**

**-assumed NAG glacial till*

Shake Flask Extraction ("SFE") tests were used to determine the solubility of metals in water from 15 mine waste samples (ERM 2015b). SFE is used to identify Chemicals Of Potential Concern ("COPCs") and are not a direct measure of expected drainage chemistry, but rather are an indication of metals that may be leachable. No exceedances of applicable discharge criteria (Metal Mine Effluent Regulations ("MMER"), British Columbia Pollution Control Objectives ("BC PCO")) were noted. However, screening the SFE results against receiving environment water quality objectives for protection of aquatic life indicated six potential COPCs (sulphate, dissolved aluminum, arsenic, antimony, selenium and zinc) (ERM 2015b). The COPCs are based on preliminary SFE data from the small number of samples and the interpretation of those screening results is that water treatment will not likely be required to remove the COPC prior to discharge to the receiving environment. Rather, the possibility is high at Seel and Ox pits for dilution of collected mine effluent with clean site water to produce acceptable discharge water quality. Additional dilution with clean site water prior to discharge is anticipated to improve water quality for discharge. Future geochemical studies will be required to understand waste rock geochemical characterization, metal leaching and source terms for water quality modelling.

20.2.2.2 Waste Rock Management Options

The management options for ML/ARD associated with waste rock will help avoid, control and minimize the risks from potentially deleterious consequences of acid generation and ML. The blending of PAG and NAG waste rock is recommended as the primary approach for stockpiles to prevent ML/ARD being generated. Blending is employed at many mines for handling of waste rock. For the waste rock stockpiles, the ratio of NAG/PAG broken hard rock is about 1.2:1 at Ox and 2.2:1 (West Seel) while the East Seel deposit has less than 1% PAG rock. When considering the total waste material including overburden, the ratio of NAG/PAG material is even greater at 1.8:1 (Ox) and 2.6:1 (West Seel) while there is negligible PAG at East Seel compared to the total East Seel waste. Some segregation of NAG/PAG waste is recommended to ensure outer faces of stockpiles consist of NAG material and encapsulate the blended material as well as having stockpile run-off diverted back into the empty pits. While blending does not eliminate the potential for neutral pH metal leaching (in contrast to acid reaction ML), the overall metal load in waste dump run-off water will be reduced from using these mitigation techniques, thus minimizing the potential requirement for water treatment. Other key mitigation options to be factored into the site design include capping and lining waste stockpiles with NAG clay till; diverting all non-contact water away and a combination of dilution, or treatment (if required based on future testing).

Closure considerations for waste management include prevention of onset of ML/ARD and setting up passive water dilution of contact run-off with clean run-off, to help achieve discharge

of water at acceptable quality to the receiving environment. Future testing will be needed to confirm that water treatment is not required at closure.

While backfill of PAG material into mined out pits at closure for sub-aqueous storage is a long-term solution to prevent ARD, it is a costly closure management option at Ootsa since re-handling of large waste stockpiles would be required. Unflooded highwalls of mined out pits will need additional geochemical characterization and study for closure planning to understand long-term risks and management options. ERM recommends the following for successful mine waste management at Ootsa:

- Perform additional geochemical test work including static and kinetic testing;
- Line PAG stockpile bases with clay till to inhibit seepage entering groundwater;
- Locate waste rock stockpiles to minimize contact water management;
- Blend PAG and NAG waste rock as available;
- Divert clean run-off around stockpiles to reduce the contact water to be managed;
- Dilute stockpile run-off with pit water;
- Collect run-off from stockpiles and treat/dilute as required prior to discharge; and
- Consider strategies for closure which minimize exposure of PAG materials (e.g. pit highwalls).

Management of non-mine waste (e.g. solid refuse, recyclables, hazardous wastes) is anticipated to become part of the existing system within the mine operation and not present a risk to the environment. Where required, existing permits will be amended, management, handling, recycling and emergency response spill systems updated to mitigate risks from the Ootsa development.

20.3 REGULATORY FRAMEWORK AND PERMITTING

The PEA assumes a development scenario for a 40,000 tpd copper, molybdenum and gold/silver mining and milling operation producing copper and molybdenum concentrates from three open pits. The PEA focuses on mining and transportation of mill feed from the Ootsa Property, with less analysis of milling and tailings disposal at Huckleberry Mine. It is assumed that existing permits for the Huckleberry Mine will be amended for continued milling and tailings disposal at that mine. The regulatory and permitting requirements for processing and tailings disposal will be determined at a future stage.

This section summarizes the anticipated permitting process relevant to the Project under federal and provincial Environmental Assessment ("EA") legislation and policy. There are two main stages. The first stage is the EA over several years, during which the Proponent does technical studies, prepares and submits an Application and government agencies assess the Project to grant an EA Certificate. The second stage is the permitting stage, after issuance of the EA Certificate, in which the permits/authorizations to construct, operate and decommission the Project are applied for and obtained. Inherent in both stages is engagement and consultation with regulatory agencies, First Nations, stakeholders and the public.

The following sections provide an overview of the two stages:

- Stage 1: the EA process;:
  - EA triggers and requirements for BC and Canada;
  - The coordinated provincial and federal EA process and timing;
  - Provincial EA steps; and
  - Federal EA steps;
- Stage 2: permitting requirements after issuance of the EA Certificate:
  - Timing;
  - List of typical authorizations/permits for a mining project;
  - BC and federal authorizations/permits.

20.3.1 Stage 1: EA Regulatory Triggers and Requirements

The provincial and federal regulatory regime governing proposed mines includes the BC *Environmental Assessment Act* (2002) and the *Canadian Environmental Assessment Act*, (2012). Once approved through the EA process, the Project will be subject to permitting under a range of provincial and federal legislation.

Under Section 3(1) of the BC Reviewable Projects Regulation (2002), the anticipated production capacity for the Project will exceed the trigger threshold of 75,000 tpa of mineralized material for a new mineral mine, and will require a provincial EA under the BC *Environmental Assessment Act*.

Federally, the Project would be considered a "designated project" under Section 16 (a) of the Regulations Designating Physical Activities (SOR/2012-147) as a new metal mine with a production rate that will exceed the threshold of 3,000 tpd. Designated projects are subject to the *Canadian Environmental Assessment Act*, 2012. Confirmation of these triggers would occur during the initial stages of engagement with the EA process.

20.3.1.1 EA Requirements – BC

<u>British Columbia *Environmental Assessment Act*</u>

The BC EAA (2002) requires that certain large-scale project proposals undergo an EA and obtain an EA Certificate before they can proceed. Under the BC EAA, projects requiring an EA Certificate must prepare an Application for an EA Certificate that identifies and assesses any potential environmental, social, economic, health, and heritage effects that may result from the proposed project, and to mitigate adverse effects where possible.

The BC EAA and accompanying regulations establish the framework for delivering EAs. Within this framework, the scope, procedures, and methods of the assessment are customized to the circumstances of each project and typically involve working group review and First Nations input. Proponents typically require several years of baseline data to support an EA Application to government. This approach allows each review to focus on relevant issues when determining whether or not the project should proceed.

The decision to approve or reject a provincial EA for a mining project is made by the Minister of Energy and Mines and by the Minister of Environment. In making their ministerial referrals, the British Columbia Environmental Assessment Office ("BC EAO") considers the information

presented in the Application, along with any issues raised throughout the review process by regulators, public and First Nations, to inform their conclusions regarding the potential for the Project to result in significant adverse effects. If the Project is allowed to proceed, an EA Certificate is issued under Section 17 (3) of the BC EAO and is subject to compliance and reporting requirements.

The Certificate describes the physical works of the Project and a Table of Conditions. The EA Certificate specifies a deadline by which the Project must have substantially commenced (i.e. three to five years). Once the Project has substantially started, the EA Certificate remains in effect for the life of the Project unless suspended or cancelled for breaches of the conditions. Proponents may apply to amend their EA Certificate as Project circumstances change.

The BC EAO is supported by five regulations governing the applicable projects, timelines, requirements for public/stakeholder consultation and concurrent permit approvals.

20.3.1.2 EA Requirements – Federal

Canadian Environmental Assessment Act, 2012

The Project will be subject to the *Canadian Environmental Assessment Act* (CEAA 2012), under which two types of EAs may be required: a standard EA or a Review Panel. This Project would likely be subject to a standard EA process, unless determined otherwise by regulators. Prohibitions under the CEAA prevent proponents from carrying out designated projects, in whole or in part, until an assessment is conducted if activities may cause environmental effects in areas of federal jurisdiction (e.g. fish and fish habitat, aquatic species as defined under the *Species at Risk Act* (2002), migratory birds, or Aboriginal persons). The fish and fish habitat, SAR (caribou) and aquatic species aspects are directly applicable for the Ootsa Property development.

Upon submission of a brief Project Description from the Proponent, the Canadian Environmental Assessment Agency ("CEA Agency") undergoes a 10 day period to determine the adequacy of the Project Description, followed by a 45 day screening period to determine whether an assessment for the Project is required. If the determines an assessment is required, a decision under Section 10(1) (b) is rendered and a Notice of Environmental Assessment Determination is issued.

The Proponent typically carries out baseline studies in advance of an effects assessment to prepare an Environmental Impact Statement ("EIS") (similar to the provincial 'Application') which considers similar issues as the provincial process, as well as additional factors not considered under the BC process (e.g. accidents/malfunctions, cumulative effects). Under Section 27(2) of the CEAA (2012), once it has been determined an EA is required, then the Proponent prepares the required EIS document and submits it to government. Once submitted, the CEA Agency undertakes a screening review before formally accepting the EIS for review and a Notice of Commencement (i.e. EA review) is posted.

A time limit of 365 days is established to make a decision on whether the Project should proceed and to issue an EA Decision Statement. The federal decision to approve or reject the EA for a major resource Project is made by the Minister of the Environment. In making their ministerial referral, the CEA Agency considers the information presented in the EIS, along with any issues raised throughout the review process, to inform their conclusions regarding the potential for the

Project to result in significant adverse environmental effects. Proponents may only carry out projects if they are in compliance with conditions contained in an EA Decision Statement. The CEAA 2012 is supported by federal regulations, operational policy statements, and guidance documents.

20.3.2 Stage 1: Coordinated Provincial-Federal EA Process

The Project may be subject to a coordinated provincial-federal EA process conducted under the principles of a now expired *Canada–British Columbia Agreement for Environmental Assessment Cooperation* (the Agreement, CEAA 2004). The Agreement aligns key aspects of the assessment process to minimize duplication and improve efficiency. The BC EAO and the CEA Agency typically establish the EA Working Group. The purpose of the Working Group is to review and comment on key EA documents, including the AIR, the EIS Guidelines, the Application/EIS, and the BC EAO and CEA Agency assessment reports. Typical membership of an EA Working Group includes representatives from all levels of government (federal, provincial, regional, and municipal), potentially affected Aboriginal groups, and other stakeholders as required. Although each Project has specific requirements determined at the initial engagements in the respective processes, the provincial and federal phases of the EA process for a typical mining project are described below.

In 2013, Canada and BC signed a *Memorandum of Understanding*, which enables Substitution of Environmental Assessments with the CEA Agency (EAO 2013). The outcome is that, in applicable assessments, the BC EAO will oversee and coordinate one EA for a proposed project resulting in one Assessment Report by the BC EAO and a decision will be made separately by BC and federal Ministers based on that report. One assessment is anticipated for the development of the Ootsa Property.

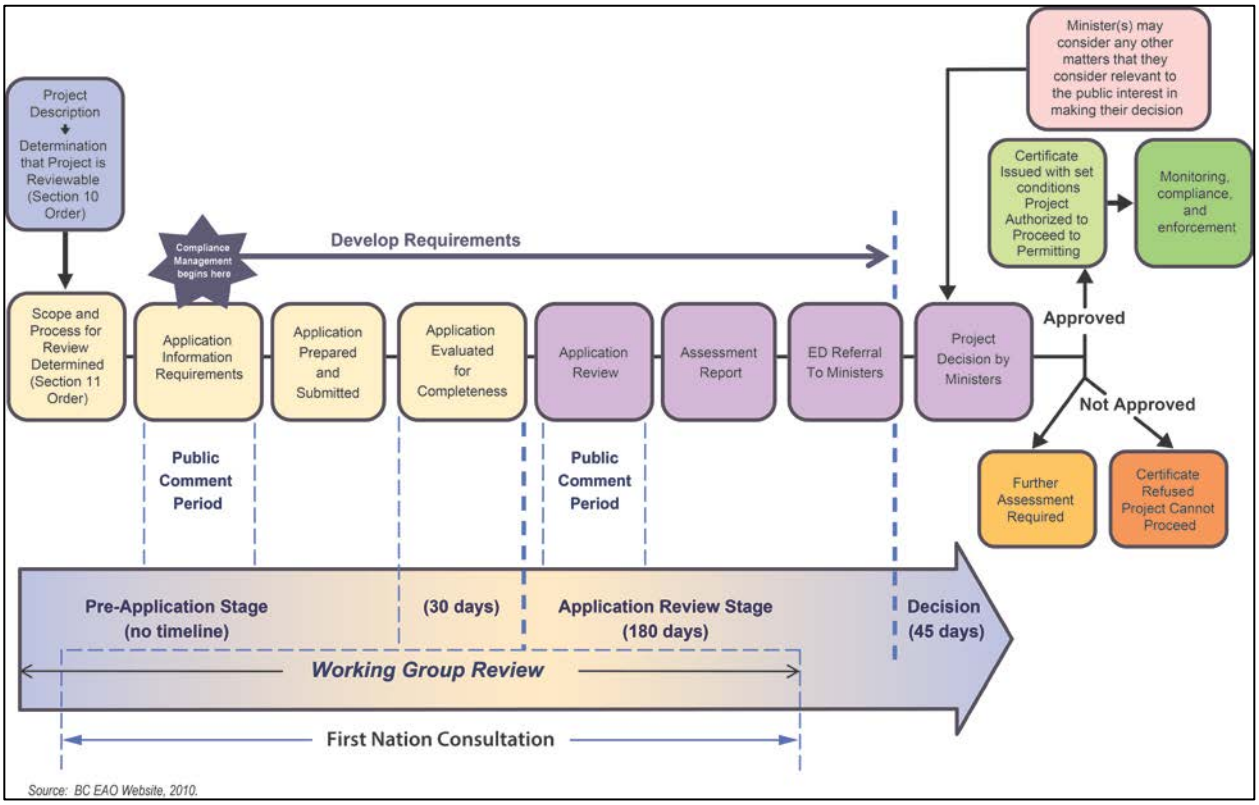
20.3.2.1 Provincial Environmental Assessment Process

The phases and steps of the provincial EA process are shown in Figure 20.1. The EA process is divided into three periods: the Pre-Application, an Application Review Stage, and the Decision.

<u>Pre-Application Stage and Timing</u>

The proponent will prepare a detailed Project Description, which is used to define the Application Information Requirements (“AIR”) describing the information to be submitted in the Application. The Proponent completes technical studies and then prepares an effects assessment and public and Aboriginal consultation. Once submitted, the Application undergoes a 30-day screening period and once accepted, the formal review by the EA Working Group will begin.

Figure 20.1 Typical Provincial Environmental Assessment Process



Application Stage

Once the Application is accepted for review by the BC EAO, a legislated 180-day review period commences which includes a public comment period on the Application. Aboriginal consultation activities continue during the Application review by both the provincial Crown and Proponent. The BC EAO will prepare an Assessment Report referral for the provincial and federal Ministers to summarize the residual effects, mitigation measures, significance of adverse effects, and public concerns and how they will be addressed. The report contains recommendations for the Ministers to consider when deciding if an EA Certificate should be granted. The Ministers decision is made within 45 days of a referral. Once issued, the EA Certificate is a legally binding document granting conditional approval for the Project to proceed.

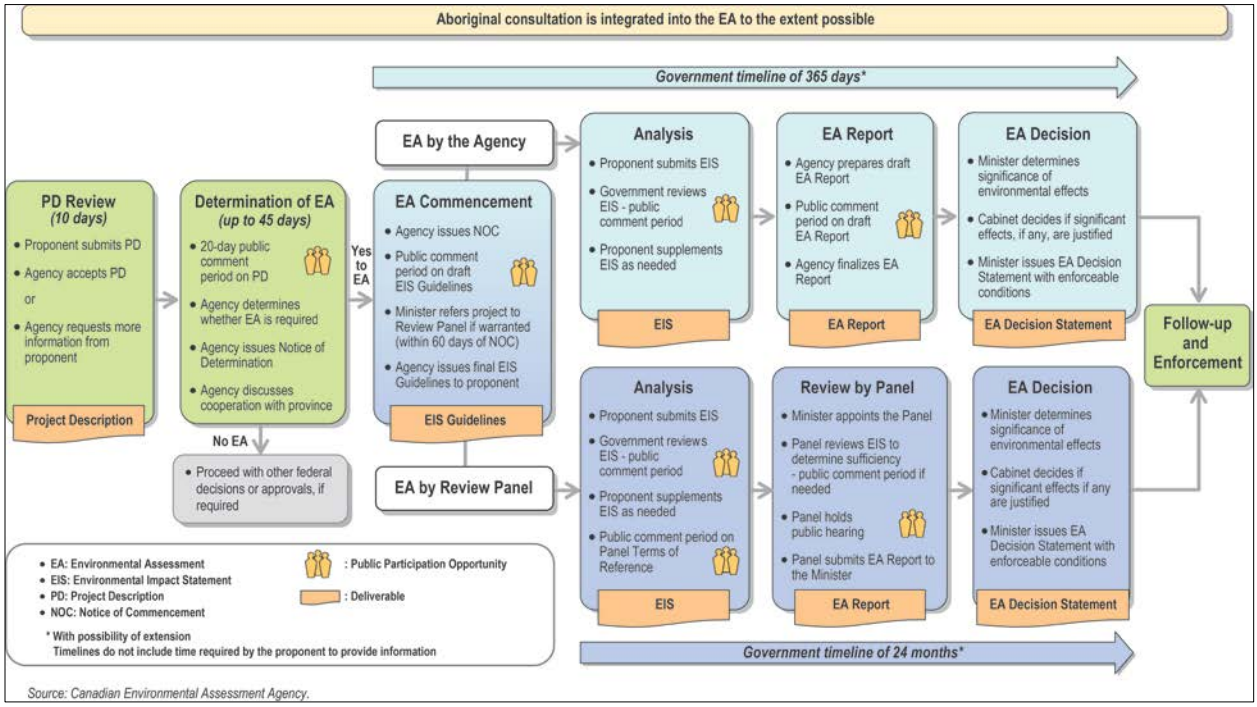
20.3.2.2 Federal Environmental Assessment Process

While there are no prescribed phases of the standard federal EA process, a description of milestones is provided. Should the Substituted process be utilized, steps during the EA will follow the provincial description above and the Ministers decision will be based upon the Assessment Report prepared by BC EAO.

The federal EA process is shown in Figure 20.2 and begins with the submission of a Project Description to the Responsible Authority (i.e., the CEA Agency). The Project Description will be screened for a 45-day review period to determine whether a federal EA is required for the Project. A 20-day federal public comment period also occurs. If a federal EA of the Project is required, then a Notice of Commencement ("NoC") will be issued by the CEA Agency and posted to begin a 365-calendar day government time limit. The CEA Agency will issue draft EIS

Guidelines of the minimum information requirements for the preparation of an EIS for the Project, including the scope, followed by a public comment period of 30 days. Participant funding requirements will be setup.

Figure 20.2 The Standard Environmental Assessment Process under CEAA, 2012



<u>Environmental Impact Statement and Decision</u>

After receiving the final EIS Guidelines, the Proponent will prepare an EIS (referred to as the Application in the provincial process) that presents the assessment of potential effects. It is supported by the field baseline studies. The CEA Agency will prepare an assessment report that summarizes the key findings, mitigation, and consultation issues.

After taking into consideration the EA Report, public comments, and the adequacy of consultation activities conducted with Aboriginal groups by the CEA Agency, the Minister of the Environment is required to issue an EA Decision Statement. Under Section 53(1) of the CEAA 2012, if the Minister finds that the Project is not likely to cause significant adverse effects, then, the Minister will issue an EA Decision Statement that describes the mitigation and follow-up conditions that the Proponent must comply with.

20.3.3 Stage 2: Permitting for Construction and Operation

At the permitting stage, the Proponent will apply for a variety of permits, licenses and authorizations under federal and provincial legislation to enable construction, operation and closure to proceed. While permits, licenses and authorizations applications may be submitted during the EA, the issuance of these by government can only occur once the key milestone has been achieved, i.e. issuance of the EA Certificate for the Project.

Since the majority of permits, licenses and authorizations for the Project will come from the provincial government, a summary of the application timing and list of BC requirements is

provided below. Only a few federal permits, licenses and/or authorizations are typically required for mining projects; these are summarized in the following section.

20.3.3.1 Provincial Permitting/Authorizations

The proposed Ootsa Project will require permitting approval as per part 10.1.2 of the Health, Safety and Reclamation Code for Mines in British Columbia (BC MEMPR 2008). The *Mines Act* permitting process includes information requirements for the mine plan, potential environmental and social effects, hazard and risk abatement, environmental management plans and reclamation and closure plans. A Mine Review Committee ("MRC") will be created by the provincial regulator to oversee the permitting stage. Provincial permit applications will require input and referral to potentially affected First Nations, and other interested parties, and a public notification period.

The newly established (2015) BC Major Mines Permitting Office ("MMPO") is responsible for the co-ordination of major mine authorizations across provincial government. The MMPO will initiate coordinated authorizations once the Project is substantially through the EA process. A Project Description will be provided by the Proponent and a schedule of the required authorizations (permits, licenses, and approvals) will form the basis of discussions with the MMPO. The Chief Inspector of Mines or MMPO will establish a project-specific MRC to coordinate the review of applications and provide advice to statutory decision makers. The MRC is strictly an advisory committee, and the Statutory Decision Makers within each Ministry maintain responsibility for their respective individual permitting decisions.

<u>When to Apply for Permits and Regulatory Timing</u>

The permitting process is separate from but linked to the environment assessment process. Generally permitting for a major project that is reviewable under the *Environmental Assessment Act* happens after the project receives an EA Certificate. The alternate approach for proponents is to apply for permits during the EA process rather than after granting of an EA Certificate. If this alternate approach is selected, proponents may apply for permits during the EA process in one of two streams: concurrent or synchronous permitting.

Concurrent permitting is an option available to proponents to submit eligible provincial permit applications when the EA review commences and requires agencies to review these permits concurrently with the EA review. The permits cannot be issued until the Ministers issue an EA Certificate. Following the issuance of permits, proponents should plan for another 3-6 months before construction can commence.

Synchronous permitting is available to applicants during which regulatory agencies oversee the review and processing of applications in parallel with the environmental assessment process, but a prescribed timeline does not exist to issue permits within 60 days after the EA Certificate is issued. Synchronous permitting provides similar benefits to concurrent permitting but without legislated decisions or timelines.

<u>Lists of Permits, Licences and Authorizations</u>

Tables 20.2 and 20.3 are typical lists of authorizations associated with the major components of a mining project. These lists are not specific to the Ootsa Project and permitting and authorizations

required would occur during a future EA process. First Nations consultation and public engagement opportunities exist within the individual permitting steps.

TABLE 20.2
AUTHORIZATIONS BY RESPONSIBLE FEDERAL AGENCY

Responsible Federal Agency	Project Activity or Component	Authorization
Canadian Environmental Assessment Agency (CEA Agency)	Designated physical activities and project components	Provisions under Canadian Environmental Assessment Act (1992/2012)
Natural Resources Canada (NRCAN)	Storage of explosives	Explosives Act - Explosives Magazine licence
Transport Canada (TC)	Transport of dangerous goods	Transportation Act - Emergency Response Assistance Plan
	Works in navigable waters (e.g. floating conveyors)	Potential to opt-in under Section 5 under Navigation Protection Act
Industry Canada (IC)	On-site radio communication system	Radio Communications Act - Radio licences
Canadian Nuclear Safety Commission (CNSC)	Instrumentation, e.g. flow meters within discharge pipes, nuclear density gauges, x-ray analyzer.	Nuclear Safety and Control Act - Radioisotope licence
Fisheries and Oceans Canada	Authorization for serious harm to fish habitat (e.g. drain lake, alter flows, loss of fish habitat)	Authorization under Section 35, Fisheries Act
Environment Canada	Authorizing the use of a natural water bodies frequented by fish as a tailings impoundment area for qualifying metal mines. (if required)	Fisheries Act - Authorization under Schedule 2 of the Metal Mining Effluent Regulations (MMER).

TABLE 20.3 TYPICAL AUTHORIZATIONS BY PROJECT COMPONENT AND ACTIVITY		
Major Activity or Component	**Description and Agency**	**Authorization**
Mine Site / Waste Stockpiles / Open Pits	Open burning (MOE)	Burning permit
	Construct, operate & close a mine pursuant to definitions in the Mines Act (MEM)	Mines Act s.10 permit
	Convert mineral tenure (MEM)	Mineral Tenure Act - Convert mineral claim to mining lease
	Discharge waste to the environment (MOE)	Environmental Management Act permit or EMA approval if max is 15 months
	Store and use explosives (MEM)	Mines Act - Storage & Use permit
	Store fuel (MOE)	Environmental Management Act - Fuel storage registration
	Cut, remove or destroy crown timber (FLNRO)	Forest Act - Occupant Licence to cut; Notice of forestry operations (Worksafe BC); Burning Permit, if applicable
	Inspect/alter archaeological/heritage sites (FLNRO)	Heritage Conservation Act - Inspection permit; Investigative permit; Site alteration permit
	Change in/about streams or divert/use water (FLNRO)	Water Act - Water licence; Short-term use of water; Approval/notification of changes in or about a stream
	Salvage and remove wildlife (FLNRO)	Wildlife Act - Exemption permit
	Drain lake, alter flows or cause serious harm to fish/fish habitat	Water Act and Federal Fisheries Act, Section 35(2b) Authorization
Road Access	Construct and use road if off tenure (FLNRO), Note: On mine site under Mines Act Permit (MEM)	Provincial Forest Use Regulation – Special use permit; Forest Act - Occupant licence to cut; Notice of forestry operations (Worksafe BC)
	Use of existing industrial road (FLNRO)	Road use permit if Forest Service road; Maintenance agreement with permit holder, if road under permit or special use permit
	Change in/about streams or divert/use water (FLNRO)	Water Act - Water licence; Short term use of water; Approval/notification of

TABLE 20.3 TYPICAL AUTHORIZATIONS BY PROJECT COMPONENT AND ACTIVITY		
Major Activity or Component	**Description and Agency**	**Authorization**
		changes in or about a stream
	Connect to, cross or use highway right of way (MOTI)	Transportation Act - Access permit; Utility permit; Crossing permit
	Inspect/alter archaeological/heritage sites (FLNRO)	Heritage Conservation Act - Inspection permit; Investigative permit; Site alteration permit
Power/Water/Conveyor Lines	Occupy crown land, if off tenure (FLNRO)	Land Act - Temporary permit, investigative permit, Licence of occupation or fee simple
	Power and water lines and poles (MEM)	Mines Act s.10 permit
	Change in/about streams or divert/use water (FLNRO)	Water Act - Water licence; Short term use of water; Approval/notification of changes in or about a stream
	Cut & removal/ destroy crown timber (FLNRO)	Land Act & Forest Act- Land use permit; Occupant licence to cut; Notice of forestry operations (Worksafe BC); Burning Permit, if applicable
	Inspect/alter archaeological/heritage sites (FLNRO)	Heritage Conservation Act - Inspection permit; Investigative permit; Site alteration permit
New Processing / Treatment Plant / Tailings Storage Facility (if building new, otherwise assume that for existing facility, permitting requirements will be determined at a future stage)	Occupy crown land, if off tenure (FLNRO)	Temporary permit; Investigative permit; Licence of occupation or fee simple
	Inspect/alter archaeological/heritage sites (FLNRO)	Inspection permit; Investigative permit; Site alteration permit
	Cut & removal/ destroy crown timber (FLNRO)	Land use permit; Occupant Licence to cut; Notice of forestry operations (Worksafe BC); Burning Permit, if applicable
	Discharge waste to the environment (MOE)	EMA permit or EMA approval if max 15 months
	Change in/about streams or divert/use water (FLNRO)	Water licence; Short term use of water; Approval/notification of changes in or about a stream

TABLE 20.3 TYPICAL AUTHORIZATIONS BY PROJECT COMPONENT AND ACTIVITY		
Major Activity or Component	**Description and Agency**	**Authorization**
	Store fuel (MOE)	Fuel storage permit
Camp and related infrastructure – if separate from other sites (assume will form part of mine site)	Occupy crown land, if off tenure (FLNRO)	Temporary permit; Investigative permit; Licence of occupation or fee simple
	Inspect/alter archaeological/heritage sites (FLNRO)	Inspection permit; Investigative permit; Site alteration permit
	Cut & removal/ destroy crown timber (FLNRO)	Land use permit; Occupant licence to cut; Notice of forestry operations (Worksafe BC); Burning Permit, if applicable
	Discharge waste to the environment (MOE)	EMA permit or EMA approval if max 15 months
	Removing groundwater (MOE)	Well registration; Must comply with groundwater Protection Regulation of Water Act
	Change in/about streams or divert/use water (FLNRO)	Water licence; Short term use of water; Approval/notification of changes in or about a stream
	Construct/operate and remove camp (MEM)	BC Building code and Mine Code
	Construct/operate drinking water system (HA)	Public Health Act- Water supply construction; Public Health Act - Water service operating permit
	Operate a food premise (HA)	Public Health Act - Food premises permit
	Dispose of sewage (MOE/HA)	Municipal Wastewater Regulation - Sewage disposal facility registration (MOE); Certification letter (HA); Regional district bylaws if applicable; Health Act sanitary regulations
	Dispose/incinerate refuse (MOE)	Environmental Management Act (incinerator or solid waste discharge) Refuse permit if incinerator for >100 people; Refuse permit for camp >100 people
	Store fuel (MOE)	Fuel storage permit

20.3.3.2 Federal Authorizations

Table 20.2 presents a list of federal authorizations that may be required to develop the Ootsa Project. Other federal legislation, which affects mine development and operation, includes the *Species at Risk Act* (2002), *Migratory Birds Convention Act* (1994) and the Metal Mining Effluent Regulation (SOR/2002-222) monitoring requirements. These are most relevant to evaluating, monitoring, and reporting on environmental effects of the Project.

Permitting requirements federally may also include a *Fisheries Act* (1985) authorization for potential losses or residual impacts to fish habitat (see Section 20.1.3 for additional details relative to the Ootsa Property development) or a Schedule 2 listing under the MMER (if there was new tailing deposition into fish habitat). For both, additional comprehensive plans, regulatory engagement and information requirements that must be supplied by the Proponent specific to federal information needs will be addressed post-EA.

There are no anticipated authorizations required under the *Navigation Protection Act* (NPA 1985b) since Tahtsa Reach is not a listed waterbody in the legislation, public navigation will be incorporated into the floating conveyor design, and the Proponent is not likely to opt-in under the NPA. Much of the information and consultation related to federal authorizations will occur during the EA review and then continue after issuance of the EA Certificate, typically for less than a year. Mandated timeframes exist which enable the process to proceed through review and decision making by the Statutory Authority, the federal Minister under the *Fisheries Act*.

20.4 CONCEPTUAL RECLAMATION AND CLOSURE SUMMARY

20.4.1 Overview of Mine Reclamation and Closure

Closure and reclamation of mines in BC are governed primarily by the BC Ministry of Energy and Mines through the reclamation requirements and standards in the *Mines Act* and Reclamation Code (MEMPR 2008), including financial requirements for reclamation bonding, as well as the BC Ministry of Environment through effluent discharge permits under the *Environmental Management Act* (2003). Proponents must prepare a Reclamation and Closure Plan during the development and update it during operation phases (i.e. every 5 years), post a reclamation bond to initiate operations, and complete reclamation to achieve end land use objectives at closure and ensure long-term monitoring demonstrates success. Reclamation bonding is staged to the anticipated land disturbance and reclamation costs, and is held by the BC government in the event of default by a Proponent.

This conceptual reclamation and closure plan summarizes the preliminary approach and estimated costs to achieve this activity at the Ootsa Property. Based on the current development plan and understanding of the site, it is achievable to complete the required reclamation, revegetation and decommissioning at the Property within two years of completing operations, assuming water treatment is not needed at closure. Government regulators require a 5-year intensive monitoring period during closure/post-closure after which the Property would transition into a low intensity-monitoring period for a longer period of time.

20.4.2 Land Capability

The land capability and uses at the Ootsa Property consists primarily of forestry values and wildlife habitat. Aside from the permanent pit lakes, all the reclaimed lands at the Ootsa Property are anticipated to be capable of supporting these uses at closure. The site will be reclaimed to restore the functional ecosystem attributes with minimal long-term maintenance.

20.4.3 Reclamation Approach

The Ootsa Property will be developed with a goal of achieving successful reclamation that will minimize long-term environmental liabilities and costs at closure except monitoring. This will be accomplished through effective design, progressive reclamation and minimization of potential liabilities during operations. Aside from the permanent physical changes in the landscape from pits and reclaimed waste rock stockpiles, the Ootsa Project will utilize temporary and portable infrastructure which will be rapidly decommissioned at closure to avoid a permanent footprint on the landscape.

Approximately 400 ha will be disturbed of which 65% (260 ha) will be reclaimed into stable, vegetated land and the remainder (140 ha) will not be reclaimed since it will be the flooded open pits and adjacent open pit walls. Waste stockpiles account for the majority of the area to reclaim (45%, 182 ha of total disturbed area) while linear and infrastructure features account for the remaining 20% (i.e. roads, conveyors, water management features, transfer points, shop/office). Due to the occurrence of thick overburden with thin topsoil at the Property, as well as the unreclaimed area (35%) for the open pits, excess soil volume should be available of these two soil type areas.

During the construction and operations period, salvage and stockpiling of soils will occur as initial steps for eventual reclamation and revegetation of disturbed areas. Temporary stockpiles will be created and incorporate sediment control and erosion prevention measures like temporary seeding and covers to prevent loss of the precious soil resource and maintain the soil quality as a growing medium. To reclaim the disturbed areas, borrow pits and roads, the stockpiles of salvaged soil will be spread to recreate growing sites for vegetation and soil cover.

The general concept for most disturbed areas is to create stable slopes with low risk of erosion then cover those areas with overburden and the topsoil growing medium of sufficient thickness. This will create ideal growing conditions followed by revegetation with appropriate mixtures of ground cover, shrubs and trees that will be successful in the site's climate.

The timeframe for active reclamation and closure at the site is short, and concentrated on the two years immediately following cessation of operations. Progressive reclamation during the 12-year operation period will simplify the reclamation and revegetation obligations in the two year closure period. Decommissioning of the primary infrastructure (conveyors, shops, warehouses, accommodations, offices, rolling stock) will occur in the year after operations cease, while secondary infrastructure (powerline, emergency site services, main access road, water management features) may be retained for several years until the site is revegetated and transitions into the post-closure phase.

The preliminary geochemical understanding of the waste rock and pit materials was used to develop preliminary management approaches to address potential risks from ML/ARD. Long-term water treatment may not be required for pit and waste rock stockpile run-off since the

dilution within pit lakes may result in effluent of adequate quality for discharge to streams or Tahtsa Reach. Water quality modelling will need to be done during the next stage of development for the Project to confirm this preliminary understanding and confirm that long-term water treatment is not required. Hence, this conceptual closure and reclamation plan does not include the costs or associated bonding relative to long-term water treatment.

Progressive reclamation during operations will be a key tool to minimize risks to the environment and accelerate attainment of reclamation standards. By instituting progressive reclamation and revegetation during and immediately after a pit and related waste stockpiles are completed (i.e. years 4 and 10 for East Seel and Ox, respectively), the associated monitoring period can be initiated sooner than waiting until the end of the full operation period in year 12. Waste stockpiles, linear corridors and disturbed areas will be reclaimed and revegetated with stockpiled soil as they are no longer needed or within one year of the end of operations.

Stable land forms and drainage courses will remain at closure to minimize risks of erosion and impacts on water quality. Since the mining and transportation infrastructure is all portable, no unreclaimed footprint will occur aside from portions of the unflooded pit lake walls.

20.4.4 Infrastructure Removal and Reclamation

The infrastructure required for operations will be portable with temporary foundations that minimize decommissioning issues. No permanent steel buildings will be erected at the Ootsa Property hence accommodations trailers, offices, workshops and storage units will be easily transported off-site by tractor-trailer when no longer needed. Linear infrastructure includes power lines, pipelines and the conveyors will be dismantled and moved off-site during the closure period. The relocation and decommissioning of the conveyor and crusher were investigated and are well-understood as it requires a straight forward dismantling and hauling offsite, and may include sale of those assets. Rolling stock may be sold, but will be removed from the site.

Roads will be deactivated, de-compacted, and soils pulled back, then revegetated. Non-essential roads will be deactivated and revegetated during operations while a main road will be maintained in the post-closure period. Drainage ditches and ponds will be deactivated and contoured as stable drainage pathways, disturbed areas reclaimed and revegetated. Waste stockpiles will be contoured to suitable slope angles (generally greater than 2:1) followed by addition of soil from stockpiles then revegetated. The final stockpile shapes, surfaces and slopes will incorporate features, which minimize erosion risks and maximize potential for long-term revegetation success. The Proponent will remediate any contaminated areas or soils for future use, typically using a land farm and onsite remediation.

Although not anticipated presently, if water treatment becomes necessary for treating contact water to required standards prior to discharge, then any treatment plant and related road, power and water line infrastructure will be maintained until such time as no longer necessary. The expectation exists presently that dilution of contact/mine water with site run-off will help meet discharge quality standards. Costs for long-term water treatment are not anticipated to be necessary but this will be confirmed during Project planning, geochemical characterization and modelling. If future testing demonstrates that water treatment is required, then additional costs would be necessary. If required after closure, seasonal accumulation of contact water followed by batch water treatment in ponds/pits and discharge during the snow free period would be investigated along with the required technology (i.e. high density sludge, electrocoagulation, in-

pit lime injection and settling). Public access to the site will be limited due to the location of the Property on the south side of Tahtsa Reach, but the deactivation of roads will deter public access.

20.4.5 Monitoring Program

Five years of environmental monitoring is anticipated following the cessation of operations to oversee reclamation, revegetation and decommissioning and ensure reclamation end land use objectives are achieved. This will include annual monitoring of revegetation success once vegetation cover is established, ongoing surface, groundwater and pit lake water quality and flow monitoring, Environmental Effects Monitoring ("EEM")/Aquatic Effects Monitoring Program ("AEMP") monitoring of aquatic, water quality and fish receptors, tissue metal sampling, any offsetting habitat monitoring, wildlife monitoring, annual safety and geotechnical inspections/monitoring, stability of landforms, and geochemical sampling. This will also include reporting to government as required in permits and authorizations (e.g. Annual Reclamation Reports and routine water quality). As land use objectives are achieved, environmental monitoring at reduced cost and intensity will be required by government from 5 years after closure until a point in the future (10 to 20 years after closure) until such time as the site is stable and has no long-term environmental risks.

20.4.6 Preliminary Reclamation and Closure Cost Estimate

Table 20.4 summarizes the preliminary closure and reclamation costs (+/- 30%) and excludes long-term water treatment (if required). Estimated costs will be updated along with development plans at the Pre-feasibility and Feasibility stages. Costing is based on recent experience preparing plans for similar activities at other mines in BC.

An integral part of obtaining a *Mines Act* Permit is the posting by the Proponent of a Reclamation and Closure Bond, which the provincial government would draw against in the event of default or the Proponent becoming incapable of carrying out required reclamation. The determination of the bond amount and timing would most likely depend on the development progression (e.g. East Seel, Ox and then West Seel) and extent of disturbance, although bonds are front-loaded (ie. payable prior to disturbance) and cover the total liability per development stage or pit. Assuming this order of development, BC Ministry of Mines may require a bond to issue the Mines Act permit of between $5 to $6M for East Seel, followed by $2 to $3M for Ox in years 3 or 4, followed by $1 to $2M in year 9 for West Seel. Discussion with BC Ministry of Energy and Mines is required to scope out and define the bonding amounts and breakdown during the permitting stages.

TABLE 20.4 ESTIMATED RECLAMATION LIABILITY FOR THE OOTSA PROPERTY				
	Area (ha)	**Timing**	**Cost Estimate**	**Assumption**
Mine Reclamation Areas				
Roads (10% area contingency)	29	P / C	$435,000	Mainly haul roads
Waste Rock Stockpiles (5% area contingency)	182	P / C	$3,790,000	
Pits	139	P / C	$150,000	East/West Seel, Ox - spillways only
Water Management	7	C / PC	$180,000	Ditch deactivate sediment ponds, sewage lagoon
Project Management (5%)		C	$228,000	
			$4,783,000	
Infrastructure Decommission / Lump Sum Items				
Transfer Point Demob / Contaminated Soil Management		C	$30,000	Demob of buildings, not site reclaim
Conveyor Land (longest section to Ox)		C	$1,560,000	$200,000/km
Conveyor Floating		C	$290,000	Disassembly and removal of all 16 units
Crusher disassembly and removal		C	$370,000	PC estimate
Decommission monitoring wells		PC	$30,000	6-8 groundwater monitoring wells
Project Management (5%)		C	$353,000	Third Party
Contingency (15%)			$395,000	
			$3,028,000	
Environmental Monitoring after Closure				
Reclamation vegetation success		C / PC	$150,000	$30,000/annum for 5 years
Surface water quality and groundwater quality		C / PC	$375,000	$75,000/annum for 5 years
EEM/MMER - aquatic effects		C / PC	$250,000	$50,000/annum for 5 years
Geotechnical (instruments - WRD)		C / PC	$250,000	$50,000/annum for 5 years
Project Management (5%)		C/ PC	$51,000	Third Party
Contingency (15%)		C/ PC	$154,000	
Sub-Total			**$1,230,000**	
Total Estimated Closure Liability			**$9,041,000**	**Note: +/- 30%**

Notes:

(1) P - Progressive reclamation during operations.
(2) C - Closure and reclamation in 2-year period after end of operations.
(3) PC - Post-Closure period 1 to 5 years after closure.
(4) Third-party rates used.
(5) If required based on future testing, water treatment to be factored in.

20.5 FIRST NATION ENGAGEMENT AND HERITAGE FEATURES

This section provides an overview of First Nations engagement for the Ootsa Property, along with work done by Gold Reach to establish relationships, provide employment and receive support for development at the Property. Gold Reach has also undertaken efforts to define heritage or archaeological values during exploration work to understand what heritage features may exist on the Property. Future activities involving First Nations engagement and consultation as well as defining heritage resources are provided in the context of further development of the Property.

20.5.1 First Nations Engagement and Support

No treaties exist in the vicinity of the Ootsa Property and consultation and accommodation of asserted First Nation claims of rights, title and interest based upon strength of claim is the responsibility of the Crown during the issuance of permits and the EA. The Crown must consider potential impacts on asserted or proven claims from issuing permits and granting an EA Certificate.

The proposed development of the Seel and Ox deposits and associated infrastructure on the Ootsa Property occur within the consultative area of six First Nations; of which at least five Nations claim Aboriginal rights, title and interest to the area (Archer 2013). The First Nations are mutually aware of the overlapping claims. These include: Carrier Sekani Tribal Council (Prince George), Cheslatta Carrier Nation (Burns Lake), Nee-Tahi-Buhn Indian Band (Burns Lake), Skin Tyee Nation (Southbank), Office of the Wet'suwet'en (Smithers), and the Wet'suwet'en First Nation (Burns Lake). The First Nations are familiar with mineral exploration and the importance of the mining sector in the region.

During the exploration phase of mineral development for the Ootsa Property, substantial engagement with First Nations is reflected in the extensive relationship building that Gold Reach has undertaken. Exploration by Gold Reach on the Ootsa Property has occurred since 2004. Since then, Gold Reach undertook engagement and information exchange with the First Nations about the Ootsa Property to discuss opportunities for employment, capacity funding and business relationships, future prospects, development approaches and challenges. Gold Reach also conducted site tours, and meetings to learn about First Nation concerns, history, land use and interests (S. Ebert, Gold Reach Resources, pers.comm.). A record of engagement of Gold Reach with First Nations and local communities summarizes these efforts and accomplishments.

Relationships with the First Nations have developed through regular contact via email and phone calls, contract opportunities, employment of members, presentation of Project updates, site tours and meetings with the representatives of First Nations leadership and staff. Significant milestones occurred between Gold Reach and several First Nations to build relationships and sign agreements regarding cooperation and employment, engagement and other issues of mutual interest. These agreements and letters of support demonstrate each party’s commitment towards relationship building and active support for carrying out exploration and ongoing development of the Ootsa Property. Gold Reach has developed agreements with the Cheslatta Nation, Skin Tyee Nation and the Office of the Wet’suwet’en (OW), representing the Gilseyhyu Clan-Kayex/Yextsowiten (Moricetown); these are summarized below.

Cheslatta is a First Nations community located on the south side of Francois Lake near Burns Lake, B.C., and the Cheslatta Nation has rights and title over the Ootsa Property with the Ox and Seel deposits. The Cheslatta Nation underwent forced relocation in 1952 to Francois Lake from villages that were flooded out following creation of the Nechako Reservoir. The Cheslatta Nation has been engaged with Gold Reach since 2005 on site tours and discussions, which lead to formal agreements and ongoing support. In 2010, Gold Reach signed a Letter of Understanding with the Cheslatta Nation, which outlined the terms for a respectful and cooperative business relationship between the parties while exploration was conducted at the Ootsa Property. The Letter of Understanding was amended in 2013 with the Cheslatta Nation and re-affirmed a commitment towards further exploration, business opportunities and development of the Property. The formal agreement was a critical step in securing access to the area and removing Project risk, and formalized an excellent working relationship. The Cheslatta Nation also

provided a Letter of Support in 2013, and re-iterated it in 2015, for the exploration, development and eventual mining operation of the Project in an environmentally sustainable manner. Cheslatta Nation members have been regularly employed at the Project for the exploration work and have provided exploration camp services.

The Office of the Wet'suwet'en (OW) represents the Gilseyhyu Clan-Kayex/Yextsowiten (Moricetown) who lay claim to the Ootsa Property area. Since 2013, Gold Reach and representatives of the OW have met to discuss the Ootsa Property and build a positive working relationship. Gold Reach hosted the OW and Wet'suwet'en members for a site tour in 2013 which lead to signing a Communications and Engagement Agreement to formalize the relationship as well as provide certainty of access to the Property. OW members were employed during seasonal exploration work.

The Skin Tyee Nation has asserted Aboriginal rights, title and interest within its traditional territory and includes the Ootsa Property. The Nation is situated in the community of Southbank, on François Lake. Gold Reach's engagement with the Skin Tyee Nation began in 2014. It resulted in a Cooperation Agreement that year to foster mutual understanding, support, opportunities and an ongoing positive relationship.

Gold Reach will continue development of these relationships and with other First Nations, communities and stakeholders as the Project moves beyond exploration (S. Ebert, Gold Reach Resources, pers. comm.). The strong support, agreements, employment and open communications with Gold Reach are anticipated to benefit the development of the Ootsa Property, which will in turn generate benefits to First Nation communities, members, the Company and the region. These achievements help reduce the risks to the development of Property that could arise from First Nations interests.

During the development of the Ootsa Project, First Nation engagement will be required to support advanced exploration, environmental assessment and permitting processes. Some of these engagement activities are part of the ongoing relationships between Gold Reach and First Nations already; others will become necessary during the environmental assessment or permitting stages. Measures and activities related to First Nation engagement may include some or all of the following:

- Regular communication of annual exploration and development plans, environmental issues and completed program updates or presentations;
- Site visits and tours of the Property and other mines to generate awareness and opportunities;
- Provision of employment, business, training and contracting opportunities to First Nations-related businesses and members;
- Capacity funding and support for First Nation participation in engagement activities, working groups, community surveys, permit review processes, third party technical reviews or technical skill development;
- Capacity or training funding for workforce development/readiness;
- Support for review of exploration or other permit applications, drilling plans and environmental mitigation studies;
- Hosting community information sessions or surveys;
- Conducting studies on First Nations heritage, cultural, traditional knowledge/land use or community/social effects related to development;

- Meetings to renew or develop cooperation/communication and participation agreements;
- Collaboration on the design and extent of environment baseline studies and impact assessments as well as participation in field surveys and information sharing; and
- Negotiation of accommodation and benefits agreements and financial agreements.

20.5.2 Heritage Resources at the Ootsa Property

Since the Ootsa Property overlaps with the consultative areas of six First Nations groups, it may contain archaeological and heritage resources (Craig 2013). Many of these resources are protected under legislation including the *Heritage Conservation Act* ("HCA") and, even if not protected, may be considered by First Nations as important cultural elements of high ethnic significance. The assessment to date of archaeological and heritage resources for the Ootsa Property has been required as part of exploration permits, this will continue for exploration and will become more intensive to support the EA process. Other archaeological work was carried out for forestry development in cut-block and road locations within the Ootsa Property between 1996 and 2004 and will provide useful background data; extensive forestry and road development exists on the Ootsa Property.

An Archaeological Impact Assessment ("AIA") based upon exploration field assessment work for the Property has not occurred, but overview studies to characterize the archaeological potential and field reconnaissance studies of small areas of exploration activity were conducted at the Ootsa Property in 2013 and 2014 as well as an overview assessment that rated archaeological potential (MacLennan 2013, Archer 2013, ERM 2014). The results of these surveys informed subsequent exploration activities and should be referenced for future ground disturbance activities.

In 2013, four previously recorded archaeological, cultural or heritage sites on the Ootsa Property were noted in the 12,307 ha covered by the desktop assessment (Archer 2013); but these are not near proposed infrastructure footprints in this PEA. Preliminary field reconnaissance in 2013 and 2014 of proposed exploration working areas found historical features, some in the vicinity of Ox Lake, which will require management and avoidance during exploration. These features will require further investigation prior to any ground disturbance and will require an AIA field investigation under an HCA permit.

As exploration projects achieve the advanced stage or baseline studies are initiated, First Nations and regulators require inventory, assessment and protection of heritage/archaeological features and values on mineral properties prior to disturbance. This is because ground disturbance from roads, bulk sample programs, clearing, etc. typically increases along with the risk of potential impacts on as yet undiscovered heritage features. All archaeological remains on Crown land in British Columbia (recorded or not) are protected by the HCA regardless of level of disturbance. Under the *Canadian Environmental Assessment Act* (CEAA 2012), effects to cultural heritage resources (which include archaeological sites, cultural landscapes, historical monuments, structures, and buildings, and paleontological sites) are subject to assessment and consideration of Project effects and require baseline studies well in advance of planned disturbance.

While preliminary field archaeological assessments will continue to be required for ground disturbing activities during exploration, studies on the existing and potential heritage and archeological resources within the Ox, Seel, laydown, waste stockpile and linear corridors will

be required and should be factored into Project planning. It is recommended that an AIA be carried out under permit from the Heritage Branch for significant ground disturbance or new road construction as part of intensive exploration activities. By understanding the inventory of archaeological features during the Project design and planning stages, First Nations can be advised of the extent and significance and plans made to recover, mitigate or avoid them as needed. Gold Reach has utilised knowledgeable local First Nations workers to assist in previous field reconnaissance studies and should continue to include First Nation workers in archaeological studies as part of engagement and employment opportunities. A Chance Find Procedure and orientation is currently in place for exploration activities and should be further developed for site workers during the development program as part of a comprehensive Heritage Management Policy. With appropriate measures in place and expert heritage management advice, it is unlikely that the presence of known or yet to be discovered archaeological or heritage features would impair the development of the Ootsa Property.

21.0 CAPITAL AND OPERATING COSTS

21.1 CAPITAL COSTS

Capital costs for the Project have been estimated using a variety of sources including supplier quotes, mining cost services, industry norms and standards, costs from P&E's extensive project database, and the relevant applicable experience of Gold Reach, P&E, and their subcontractors and advisors.

Capital costs have been estimated for direct costs, indirect costs, sustaining capital, reclamation, post-closure activities, and salvage. All capital costs are denominated in Canadian dollars (C$). Estimates derived from foreign currencies were converted to C$ at the base case exchange rate.

21.1.1 Capital Cost Estimate

Total initial capital for the Project is estimated at C$64 M. This includes direct costs for mine development, mobilization of a mining contractor, and fixed plant and infrastructure. It also covers indirect costs which include, but are not limited to, Engineering Procurement and Construction Management ("EPCM") and reclamation bonding. A further C$29 M is estimated for deferred capital with another C$4 M for reclamation bonds over the life of the Project. Details of the overall magnitude and timing of capital costs can be found in Table 21.1.

TABLE 21.1
LIFE-OF-MINE CAPITAL SCHEDULE ($ X 1,000)

Project Year		-1	1	2	3	4	5	6	7	8	9
CAPITAL COST	$ x 1000										
Construction		58,754									
Deferred - Plant											
Deferred - Mine					16,863						12,089
Salvage											
Reclamation		4,970			2,530						1,540
Post-Closure											
TOTAL		63,724	0	0	19,393	0	0	0	0	0	13,629

Project Year		10	11	12	13	14	15	16	17	18	Total
CAPITAL COST	$ x 1000										
Construction											58,754
Deferred - Plant											0
Deferred - Mine											28,952
Salvage					-2,000						-2,000
Reclamation					3,040					-4,520	7,560
Post-Closure						246	246	246	246	246	1,230
TOTAL		0	0	0	1,040	246	246	246	246	-4,274	94,496

Refer to Section 22.1.9 of this PEA for a full explanation of reclamation items. $3 M will be required at the end of production for site reclamation. Post-closure costs are estimated at slightly more than $1 M and revenue from the sale of remaining assets after closure is estimated at $2 M. Taking into account salvage and partial recovery of the reclamation bond, the total undiscounted capital cost for the Project over the entire mine life is approximately C$94 M.

Figures in the text are rounded to the nearest $500,000 to reflect an appropriate level of accuracy. Figures in the tables have been taken directly from the economic model. Their presentation does not imply a greater level of accuracy than those figures in the text. Figures less than $1 M are presented as they were calculated rounded to the nearest $1,000 for convenience.

21.1.2 Mine Capital Costs

Mine direct capital costs include the cost of clearing, pre-stripping, contractor mobilization and mine infrastructure. Total mine capital costs are estimated at $10 M. All initial mine Capex is to be incurred in Year -1. A summary breakdown of mine capital costs can be found in Table 21.2.

TABLE 21.2
SUMMARY BREAKDOWN OF MINE CAPITAL COSTS

MINE	$ M
Clearing	1.16
Pre-strip	7.11
Mobilization	1.00
Mine Infrastructure	0.70
Total	9.97

21.1.2.1 Clearing

Clearing is based on a standard rate of $10,000/ha. To establish the mine at the East Seel pit approximately 116 ha of land must be cleared covering the open pit, waste rock and overburden stockpiles, haul roads, and crusher area at an estimated cost slightly more than $1 M.

21.1.2.2 Pre-Stripping

Pre-stripping is the cost to remove overburden and waste rock overlying the mineralized material such that the mill can be fed uninterrupted once production starts. A total of 3.8 Mt of material must be pre-stripped from East Seel, of which, almost all is overburden. The total cost for pre-stripping is estimated at $7 M.

21.1.2.3 Mobilization

An allowance of $1 M has been made for mobilizing the mining contractor. The contractor is expected to be from the region.

21.1.2.4 Mine Infrastructure

Mine infrastructure entails facilities located on the Ootsa Property at the Permanent Transfer Point ("PTP"). This will include the mine offices, lunchroom, Field Maintenance Shop, wash pad, and settling pond. The total cost of mine infrastructure is estimated at $1 M. The mine infrastructure will be provided for the mining contractor by Gold Reach.

21.1.3 Infrastructure Capital Costs

The initial direct capital cost for infrastructure to develop the Ootsa Property is estimated at just under $23 M and includes the conveyor system, crusher, clearing, roads, electrical power supply, effluent management and other facilities. All of the initial capital costs for infrastructure will be incurred during Year -1. A summary breakdown of the capital costs for infrastructure can be found in Table 21.3.

TABLE 21.3
ESTIMATED INFRASTRUCTURE CAPITAL COSTS

INFRASTRUCTURE	$ M
Conveyor System	13.12
Crushing	5.14
Clearing	0.19
Roads	0.21
Power	3.36
Effluent Mgmt	0.44
Facilities	0.40
Subtotal	22.86

21.1.3.1 Conveyor System

The conveyor system includes the capital cost for both the overland and floating conveyor systems. The overland conveyor cost was based on $1.6 M/km delivered and installed. The initial installation would cover a length of 6.0 km with the total cost being about $10 M.

The floating conveyor system is composed of sixteen (16) separate, connectable, floating conveyor units each 65 m in length. Each unit has an installed cost of $220,000 bringing the total cost for the system to less than $4 M. Altogether, the conveyor system including both overland and floating components is estimated to cost approximately $13 M.

21.1.3.2 Crushing

The near-pit crusher capital cost of $5 M is based on a budgetary quote from Metso Minerals for a C160 jaw crusher mounted in a semi-mobile, direct-dump arrangement. This cost includes an ex-works price of €3 M converted to C$ at a rate of C$1.46/€1.00 plus 7% and 10% for freight and installation, respectively.

21.1.3.3 Clearing

As same for the mine, clearing was cost at $10,000/ha. Clearing for infrastructure includes the conveyor corridors, which accommodate the overland conveyor, access roads, power lines, and effluent pipeline and the PTP where the Ootsa maintenance and administrative facilities are located. The total area cleared for start-up is about 19 ha costing about $190,000.

21.1.3.4 Roads

Access roads which parallel the overland conveyors are constructed 16 m in width at a cost of $40,000/km based on actual experience with contract construction of roads on Ootsa site. The initial cost of access roads is estimated at $210,000.

A total of 5.2 km of access roads will be constructed for initial development. The length of access roads is less than that of the overland conveyor because the last 800 m to the mill parallels the existing access road. Haul roads in the mining areas will be constructed as a function of waste mining and, as such, require no incremental cost to build.

21.1.3.5 Power

The initial capital cost for electrical power supply is estimated at less than $4 M. The cost is based on 6.2 km of power line, including 1.0 km of underwater cable to cross the lake, priced at $300,000/km. A main substation where the Ootsa line branches off the main line is priced at $1 M. Local substations at the PTP and the near-pit crusher are priced at $250,000 each.

21.1.3.6 Effluent Management

The initial capital cost for effluent management is estimated at $440,000. The cost is primarily for the effluent pipeline which runs from the collection pond at Seel below the waste rock stockpile to the Reach where it is discharged in the middle of the lake. The planned pipeline is 7.2 km in length. It will be constructed above ground and heat-traced at an installed cost of $40/m.

The total pipeline including provision to move water out of and the around the pit is $290,000. A further $150,000 has been allowed for construction of the effluent collection pond and pumps to move collected water in the pit area to a point where gravity flow can be employed.

21.1.3.7 Facilities

Facilities in the form of fuel storage, communications, and settling ponds, all located at the PTP, are estimated to cost $400,000. These facilities complement the mine infrastructure considered to be mine capital and are described in Section 18 Infrastructure of this PEA.

21.1.4 Indirect Capital Costs

Initial indirect capital costs for the Project are estimated at $19 M and include EPCM, Owner's Costs, financial facilities, and costs for camp, transport, and environmental and social management. All of the initial indirect capital costs will be incurred during Year -1. A summary breakdown of the initial indirect capital costs can be found in Table 21.4.

TABLE 21.4
INITIAL INDIRECT CAPITAL COSTS

INDIRECT CAPEX	$ M
EPCM	4.97
Owner's Costs	2.33
Financial Facilities	3.00
Camp	1.89
Transport	0.59
CSR	6.47
Total Indirect Costs	19.25

21.1.4.1 EPCM

EPCM is the cost for engineering, procurement, and construction management of the Ootsa infrastructure. This includes the conveyor system, crusher, power, effluent management system, and facilities at the PTP.

Engineering is the detailed construction engineering required to install the infrastructure. Procurement is the purchasing and logistical management involved in buying and shipping to site the required equipment and material. Construction management is the supervision and Project management required to erect, install, and commission the infrastructure.

EPCM is estimated at 20% of the value of the infrastructure to be installed or approximately $5 M. This amount covers the man-hours required to deliver the EPCM services, the contractor's margin, and an additional $0.5 M is included to account for the EPCM contractor's general and administrative costs.

21.1.4.2 Owner's Costs

Owner's Costs for the initial development at Ootsa are estimated at $3 M. Owner's Costs include costs for the owner's Project management team which are estimated at 5% of the value of the infrastructure to be installed. The owner's Project management team supports and oversees the activities of the EPCM contractor.

Owner's Costs also include general and administrative costs in the amount of $1 M. The purchase and operation of six pick-up trucks at a cost of $250,000 is allowed for. At the end of construction, these vehicles will be used by the owner's management team. Owner's Costs allow for the cost to operate communications and IT during construction in an amount of $100,000 and spares for the conveyor system equal to 2.4% of the system's $13 M installed value.

21.1.4.3 Financial Facilities

Insurance for the assets under construction during the construction period in an amount of $500,000 is included in the indirect costs. Also, the cost to buy out the royalties on the Ox and Seel deposits to the maximum allowable in the amount of $2.5 M is part of the indirect capital costs. Once the buy-out is completed, only a 0.5% royalty will remain on the Seel deposit.

21.1.4.4 Camp Costs

An allowance of $500,000 is included to upgrade the camp facilities. Also, camp costs for the personnel involved in construction and mine development at Ootsa are included. It is assumed that 40 men involved in construction will stay in the camp for one year and 100 men involved in pre-stripping will stay in camp for six months. Camp costs are assumed to be $42.50/man/day bringing the total cost to feed and accommodate the pre-production workforce to less than $1.5 M.

21.1.4.5 Transport

Allowances have been made for the cost to provide barge access across the lake to enable activities at Ootsa and to transport personnel to and from the site to their home communities weekly by contract bus service. The annual cost to run the barge and bus personnel is estimated at $490,000 and $100,000 respectively.

21.1.4.6 CSR

CSR costs include costs for environmental and social management. A total of more than $6 M has been allowed in the initial indirect capital costs for CSR. Of this amount, $500,000 each has been included for environmental monitoring, community relations, and obtaining required permits and licenses to undertake construction. It should be noted that the cost for permits and licenses is distinct from those costs incurred to receive environmental approval ("EA"). The EA process occurs prior to construction and, like a feasibility study, are a pre-development cost, which is not part of the Project capital.

Also included in the CSR costs is the cost of the initial reclamation bond. The bond covers the cost of reclamation for the first five years of disturbance and has been estimated at $5 M. The calculation of the reclamation bond includes a contingency factor. For this reason, it is separated from the other capital items in the cash flow to prevent the contingency being applied twice.

21.1.5 Deferred Capital

Deferred capital has been included in the economic model to reflect the need to inject capital into the operation at various times throughout the Project life to support operations. These expenditures are essentially initial Capex whose deployment has been deferred until required by the development plan.

Deferred capital to support the sequential development of the open pits at Ootsa is scheduled in Years 3 and 9. Total deferred capital over the life of the Project is estimated at $29 M with an additional $4 M for reclamation bonds.

21.1.5.1 Ox Pit

In Year 3, over $19 M of deferred capital cost is required to ready the Ox pit for mining. Clearing and pre-stripping of the pit accounts for about $8 M while indirect costs for Project management, amending the mining license, and the draining of Ox Lake account for a further $2 M.

The largest portion of the sustaining capital cost in Year 3 is for changes to infrastructure. The conveyor corridor from the PTP to the Ox crusher site must be established. An additional 1.8 km length of conveyor must be purchased and installed in addition to constructing the access road, power line, and effluent pipeline.

When mining at East Seel is finished, the 2.1 km Seel overland conveyor and crusher must be relocated. Included in the relocation is cost to build the crushed feed stockpile during the preceding 12 months to allow milling to continue while the crusher and conveyor are moved. In total, $7 M in deferred capital for infrastructure is associated with the transition from mining at East Seel to Ox in Year 3.

The last sustaining capital consideration in Year 3 is an increase of the reclamation bond in an amount of $2.5 M to cover the cost of the anticipated disturbance associated with the development of the Ox Pit.

21.1.5.2 West Seel

In Year 9, mining at the Ox pit begins to wind down and pre-stripping of overlying waste at West Seel will begin. During this year, a crushed feed stockpile is again built up at the mill, and during a two month window a portion of the Ox overland conveyor is relocated back to Seel along with the crusher.

The deferred capital required in Year 9 to transition mining from Ox to West Seel is estimated at $12 M. This is significantly lower than that for the move to Ox because the Seel pit area is fully developed. The only added preparations required are clearing of land and pre-stripping. Costs are also incurred again to amend the mining permit, increase the reclamation bond, and provide Project management for the infrastructure move.

21.1.6 Contingency

A contingency factor of 30%, as is appropriate for a study of this nature, has been applied to all direct and indirect capital costs except pre-stripping and clearing in the mine capital budget. No contingency has been applied to deferred capital. As previously mentioned, the calculation of the reclamation bond includes a contingency and as such, no additional contingency has been applied to this item.

21.2 OPERATING COSTS

Operating costs were based on mining cost estimates with provisions added to account for ownership, depreciation, administrative costs, and contract margin. Checks were performed to ensure that the final unit rates remained consistent with industry norms. At a subsequent stage of engineering, operating costs should be developed from first principles with contractor quotes, however, the approach taken is suitable for the purpose of a PEA.

Average unit rates were developed for mining and processing by material type and deposit. As each deposit is relatively short-lived, it is expected that the average cost applied to an entire deposit will reasonably reflect the actual realized cost. All costs are presented in Canadian dollars.

21.2.1 Mining Costs

21.2.1.1 Direct Mining Costs

Unit rates representing the direct cost for mining each deposit were developed for mill feed, waste, and overburden. Mining costs included all unit operations including drilling, blasting, loading, hauling, support equipment, engineering and supervision, and mill feed transfer. The cost of labor and maintenance is included in each of the sub-categories. Table 21.5 presents a breakdown of direct unit mining costs for each deposit by material type.

TABLE 21.5
UNIT MINING RATES BY MATERIAL TYPE AND DEPOSIT

	EAST SEEL			OX			WEST SEEL		
Unit	**Feed**	**Wst**	**OB**	**Feed**	**Wst**	**OB**	**Feed**	**Wst**	**OB**
Operation	**$/t**	**$/t**	**$/t**	**$/t**	**$/t**	**$/t**	**$/t**	**$/t**	**$/t**
Drilling	0.11	0.11	---	0.11	0.11	---	0.11	0.11	---
Blasting	0.31	0.31	---	0.31	0.31	---	0.31	0.31	---
Loading	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Hauling	0.82	0.68	0.74	0.76	0.80	0.74	0.88	0.73	0.74
Ancillary	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Services	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Feed Transfer	0.23	---	---	0.23	---	---	0.23	---	---
Total	**2.27**	**1.90**	**1.54**	**2.21**	**2.02**	**1.54**	**2.33**	**1.95**	**1.54**

Mill feed mining costs cover all unit operations including ore transfer. The mining contractor would be provided with the conveyor system and run it on behalf of Gold Reach. Waste mining costs exclude the mill feed transfer costs and are adjusted to reflect the difference in length of haul to the crusher and stockpiles. Overburden costs exclude mill feed transfer and drilling and blasting costs.

Mill feed mining costs range from $2.33/t at West Seel to $2.21/t at Ox with the difference being largely a function of haul distance to the crusher. Waste mining costs at Seel range from $1.90-$1.95/t between the two deposits but are slightly higher at Ox at $2.02/t, again due the difference in haul distance. The cost of overburden mining is the same for all pits at $1.54/t.

The contribution of each unit operation to the overall mining cost was checked by estimating equipment hours at a high level for drilling, loading, and hauling based on typical productivities. Hourly operating rates were then applied to the calculated operating hours to confirm that the distribution of costs was reasonable and appropriate.

21.2.1.2 Contractor Costs

Direct unit mining costs were adjusted to reflect appropriately the added burden imposed by contract services. The overall tonnage-weighted premium paid for contract mining services is about 32% over and above the direct cost of mining (Table 21.6).

The premium includes a cost of ownership based on a nominal value for the contractor's mining fleet of $10 M. The contractor's margin is based on 15% of direct mining cost. The cost of contractor's G&A was calculated by breaking down the total expected G&A cost for the Project and apportioning a percentage to the mining contractor.

The operating rates used to develop the direct mining costs represent "life-cycle" costing. As such, implicit in those rates is a "repair reserve" which covers the costs of parts required for overhauls at scheduled points throughout the life of each machine. Thus, the cost of depreciation is accounted for in the direct unit mining rate.

TABLE 21.6
BREAKDOWN OF CONTRACTOR MINING COSTS BY PIT

EAST SEEL

		Direct	Ownership	Margin	G&A	Total	Premium
Material	Units	$/t	$/t	$/t	$/t	$/t	%
Mill Feed	C$/t mined	2.27	0.14	0.34	0.20	2.95	30%
Overburden	C$/t mined	1.54	0.09	0.23	0.20	2.06	34%
Waste	C$/t mined	1.90	0.11	0.29	0.20	2.50	32%

WEST SEEL

		Direct	Ownership	Margin	G&A	Total	Premium
Material	Units	$/t	$/t	$/t	$/t	$/t	%
Mill Feed	C$/t mined	2.33	0.14	0.35	0.20	3.02	30%
Overburden	C$/t mined	1.54	0.09	0.23	0.20	2.06	34%
Waste	C$/t mined	1.95	0.12	0.29	0.20	2.56	31%

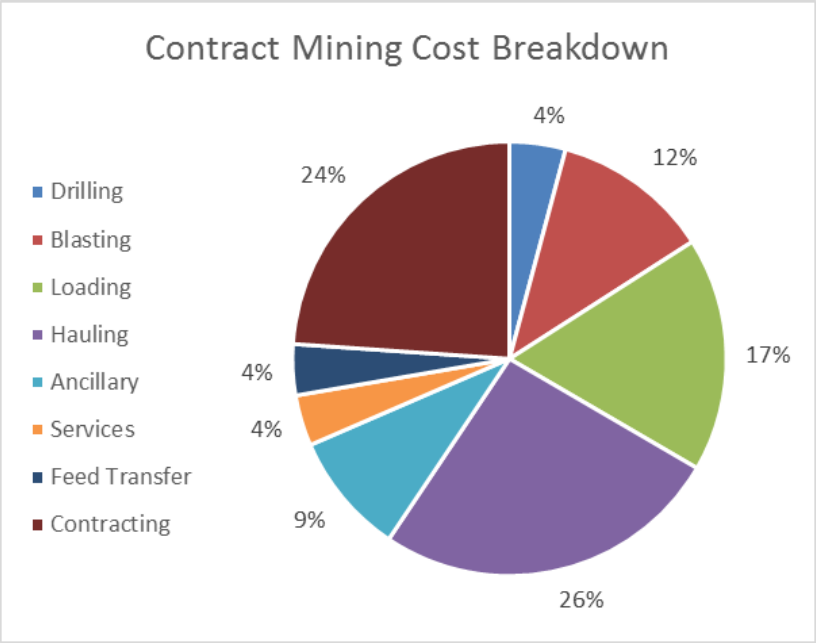
OX

		Direct	Ownership	Margin	G&A	Total	Premium
Material	Units	$/t	$/t	$/t	$/t	$/t	%
Mill Feed	C$/t mined	2.21	0.13	0.33	0.23	2.90	31%
Overburden	C$/t mined	1.54	0.09	0.23	0.23	2.09	36%
Waste	C$/t mined	2.02	0.12	0.30	0.23	2.67	32%

21.2.1.3 Mining Cost Breakdown

The percentage breakdown of mining costs provided in Figure 21.1 is based on industry norms and appropriately reflects the expected distribution of costs at Ootsa. The percentage breakdown is based on the total tonnage mined including pre-strip and production, regardless of material type, for all deposits.

Figure 21.1 Mining Cost Percentage Breakdown



21.2.2 Process Costs

21.2.2.1 Direct Process Costs

Direct process costs were developed in a similar manner to mining costs. Direct process costs were adjusted to consider the expected throughput in the mill with Ootsa mill feed and to ensure consistency with other similar operations. The process costs were also adjusted to reflect reagent consumption using the recent metallurgical test work as a guide. Details of the process costs can be found in Appendix XIX.

Based on a throughput of 5.6 Mtpa or roughly 16,900 tpd, the average process cost for Ootsa mill feed is projected to be $7.82/t. Costs for processing mill feed from the Ox deposit are $7.87/t compared to $6.91/t for feed from the East Seel deposit and $9.18/t for feed from the West Seel deposit. A breakdown of these costs is presented in Table 21.7. The estimates include all processing unit operations including crushing, grinding, flotation, dewatering, concentrate handling, reagents, tailings management, supervision, and metallurgy.

TABLE 21.7
UNIT AND ANNUAL PROCESSING COSTS FOR OOTSA MILL FEED

	EAST SEEL		OX		WEST SEEL	
Expense	**$/t**	**$ M/yr**	**$/t**	**$ M/yr**	**$/t**	**$ M/yr**
Operating Labour	0.66	3.76	0.66	3.76	0.66	3.76
Power	1.48	8.35	1.48	8.35	1.48	8.35
Reagents	2.19	12.39	3.15	17.85	4.45	25.20
Operating Supplies	1.36	7.71	1.36	7.71	1.36	7.71
Maintenance Labour	0.59	3.36	0.59	3.36	0.59	3.36
Maintenance Supplies	0.48	2.72	0.48	2.72	0.48	2.72
Tailings (allowance)	0.15	0.85	0.15	0.85	0.15	0.85
Total	**6.91**	**39.13**	**7.87**	**44.59**	**9.17**	**51.94**

Reagents comprise the single largest contributor to process costs amounting to $12-$25 M annually or between $2.00-$4.50/t milled depending on the source of the feed. The dollar contribution of reagents to the total processing cost was guided by consumptions generated from metallurgical testing and market pricing for materials. This was then checked for reasonableness against similar operations.

The results of preliminary metallurgical testing indicate that West Seel mill feed exhibits higher reagent consumption in order to achieve satisfactory separation of copper and molybdenum bulk concentrates. This accounts for the $1.30/t processing cost difference between feed from the West Seel and Ox pits. As East Seel has no recoverable molybdenum, it has the lowest reagent costs of the three pits.

Electrical power accounts for 17% of the total process costs. On an annual basis this is estimated to amount to $1.48/t or about $8 M. The dollar contribution of power costs was estimated based on a total connected load of 20 MW and a total energy supply rate of $0.06/kW-hr.

Operating supplies account for 16% of the total process cost. On an annual basis this is estimated to amount to about $1.36/t or about $8 M. The dollar contribution of operating supplies was estimated based largely on factors for cost and consumption of crusher liners and grinding media at similar copper mines with consideration given to the nature of the mineralization at Ootsa and planned throughput.

Operating and maintenance labor were based on manpower and labor rates similar to those currently in place and consistent with industry norms. Operating and maintenance labor costs are estimated at $0.66/t and $0.59/t, respectively. Together they total $7 M annually and comprise about 15% of the total processing cost.

The contribution of maintenance supplies to the annual process cost was based on 3% of the estimated installed cost of plant and equipment in the mill. An allowance of $0.15/t milled was made for the cost of managing tailings. The tailings cost is relatively low since the tailings will be placed in the mined-out MZ Pit and will not require extensive dam construction costs. The annual cost of maintenance supplies and tailings management is estimated at $3 M and $850,000 respectively.

21.2.2.2 Toll-Milling Costs

Direct unit processing costs were adjusted to appropriately reflect the added burden imposed by toll-milling. The overall tonnage-weighted premium paid for contract processing services is about 29% over and above the direct cost of processing.

The premium includes a cost of ownership based on a nominal value of the mill and associated facilities of $10 M. The contractor's margin is based on 15% of direct process costs. The cost of contractor's G&A was calculated by breaking down the total expected G&A cost for the Project and apportioning a percentage to the toll-milling contractor. Sustaining capital in the amount of $20 M has been added to the unit rate. The build-up of the total toll-milling cost can be found in Table 21.8.

TABLE 21.8
TOLL-MILLING COST BUILD-UP BY DEPOSIT

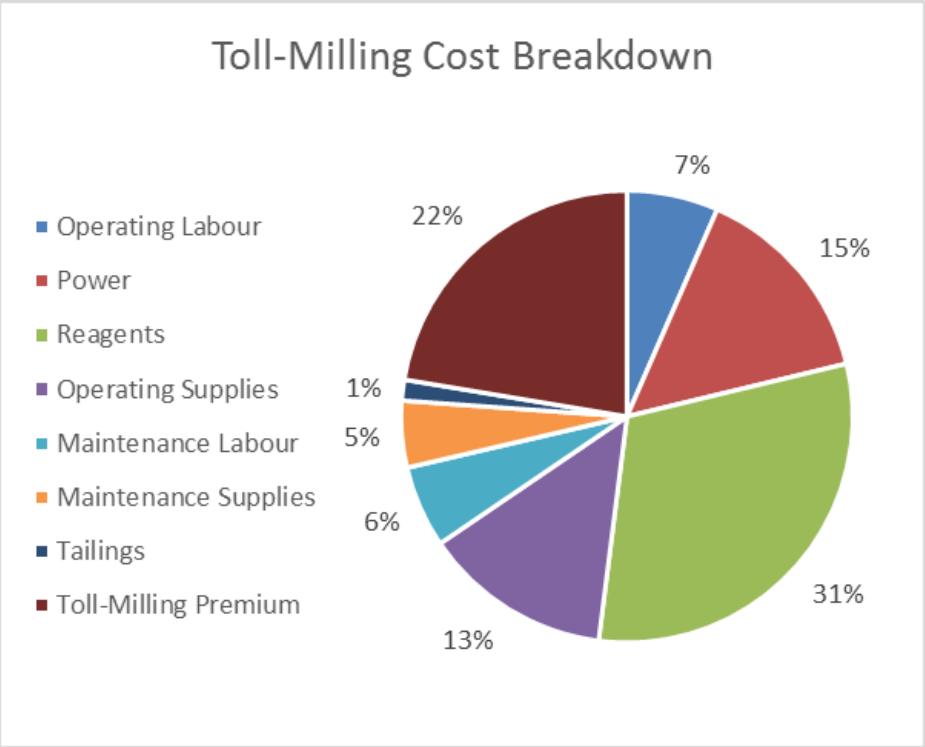
		Direct	Ownership	CAPEX	Margin	G&A	Total
Pit	Units	$/t	$/t	$/t	$/t	$/t	$/t
East Seel	C$/t milled	6.91	0.15	0.30	1.04	0.63	9.03
West Seel	C$/t milled	9.18	0.15	0.30	1.38	0.63	11.64
Ox	C$/t milled	7.87	0.15	0.30	1.18	0.63	10.13

It is important to recognize that most toll-milling agreements are based on utilizing the excess capacity of an otherwise operating plant. In the case of Ootsa, the client's feed represents 100% of the toll-milling contractor's throughput. For this reason, the proposed cost structure, although different from that of typical toll-milling agreements, is appropriate.

21.2.2.3 Process Cost Breakdown

A percentage breakdown of the average estimated process cost for all three deposits can be found in Figure 21.2. It can be seen that after reagents, the premium paid to the toll-milling contractor is the next largest cost component of processing.

Figure 21.2 Process Cost Percentage Breakdown



21.2.3 General & Administrative Costs

General and Administrative ("G&A") costs entail all the costs required to run the mine site which indirectly support mining and processing. These include labor costs for administrative staff, operating expenses, insurance, corporate social responsibility, meals and accommodation, other costs related to the operation and upkeep of the camp and mine site facilities, and transportation costs.

G&A costs were developed for the Ootsa Project by first estimating total G&A based on a high-level knowledge of costs at the adjacent mine and similarities between the proposed development and other projects of a similar size and scope. Costs were added to account for specific circumstances at Ootsa, for example, the need for transport across the lake.

Once total G&A was estimated the cost was distributed between the mining contractor, toll-milling contractor, and Gold Reach. Services which might have been self-performed in an owner-operator scenario were identified and appropriate adjustments made. Finally, costs were adjusted to take into account ownership and margin.

21.2.3.1 Direct G&A Costs

Total annual G&A costs are estimated to be $8 M or $1.50/t milled (Table 21.9). The largest single component of G&A is salaries and wages for administrative staff, estimated to be $3 M annually.

TABLE 21.9
DIRECT UNIT AND TOTAL ANNUAL G&A COSTS

G&A EXPENSE	Unit $/t	Annual $ M
Labor	0.54	3.0
Accommodation & Meals	0.46	2.6
CSR	0.21	1.2
Insurance	0.09	0.5
Operating Expenses	0.08	0.5
Camp Operations	0.06	0.3
Transport	0.06	0.3
TOTAL	1.50	8.4

The second largest direct G&A cost area is meals and accommodation, which totals approximately $3 M on an annual basis. Camp catering is priced as an owner-supplied service in the direct costs, however, in a contract operator scenario it would be provided through a subcontractor. The cost is based on 185 people housed on site 365 days per year at a cost $40/day.

Corporate Social Responsibility ("CSR") costs are estimated at $1 M annually. CSR costs include costs for environmental management, community relations, and consulting expertise to support these activities. Environmental costs support monitoring and reporting to meet legal requirements, programs to eliminate or mitigate the impacts of mining on the surrounding environment, and progressive reclamation.

Community relations costs cover ongoing engagement with First Nations and other local area residents. This may include, but would not be limited to, training and sponsorship programs for aboriginal youth, mining awareness programs for schools and community groups, and assistance for local contractors and entrepreneurs who can supply goods and services to the mine.

An allowance for insurance has been included in the amount of $500,000. Precisely what assets are covered by a third party and which are self-insured has not been determined, never-the-less, this amount is considered appropriate for a Project of this size and scope.

Operating expenses account for another $440,000 of annual G&A spending. These cover all the typical expenses incurred to support the administration of the workforce engaged in mining and processing. This includes communications and IT, office supplies, business travel, minor permits, recruiting, safety supplies, and vehicles required to execute administrative activities. It should be noted that legal costs have not been included and are considered to be addressed at a corporate level.

Camp operating costs are estimated to total $340,000 per year. This covers the cost of cleaning, camp maintenance, access road maintenance, and electrical power for the site facilities.

Transport covers the cost of a subcontractor to bus personnel to and from the site and the barge used to cross the lake. The cost of bussing is about $90,000 annually while the operating portion of the cost for the barge is estimated at $250,000 per year.

21.2.3.2 Total G&A Costs

Costs were distributed between the Mining Contractor, Toll-Milling, and Gold Reach based on manpower, assets, or scope. A full breakdown of the cost distribution can be found in Appendix XX and a summary is presented in Table 21.10. Cost was added and distributed appropriately to reflect the ownership of the camp assets and the buses and barge owned by subcontractors. A 15% margin was added to all costs to reflect the fact that services and facilities need to be shared by all three parties. The contract structure that would minimize cost will be determined during subsequent stages of planning.

Total G&A costs were estimated to be $1.72/t milled, a premium of about $0.22/t to direct G&A costs. Administrative costs for the Mining Contractor, Toll-Milling, and Owner were $0.53/t, $0.63/t, and $0.56/t milled, respectively. The administrative costs for mining and milling were added to the unit rates for each respective area as discussed previously with the mining cost converted to a cost per tonne mined of $0.20/t.

TABLE 21.10
TOTAL ESTIMATED G&A COSTS

Operating Group	Annual Cost	Annual Throughput	Unit Cost
	C$ M	Mt	$/t milled
Mining Contractor	3.0	5.6	0.53
Toll-Milling	3.5	5.6	0.63
Ootsa Owner	3.1	5.6	0.56
Total	9.6	5.6	1.72

21.2.4 Commodity Pricing

As explained previously, operating costs were not developed from first principles, however, the prices for key inputs such as fuel and energy were used to verify that the unit rates applied in the economic model were reasonable and appropriate.

The cost for diesel fuel used to guide the development of operating costs was $0.95/litre based on a quote from a local bulk supplier in the Bulkley Valley. Typically, fuel cost comprises 40-50% of the cost of operating heavy diesel-powered mining equipment and a similar percentage of total mining cost.

The cost for electrical power used to guide the development of process costs was $0.06/kW-hr. This rate was provided by BC Hydro and is composed of a $0.043/kW-hr energy charge and a demand charge based on peak usage amounting to an additional $0.015/kW-hr.

Explosive and reagent costs were based on market supply rates. Ootsa will take advantage of the fact that the mine has an existing bulk emulsion facility.

21.2.5 Manpower

An estimate of operating manpower was made to support the development plan. A total of 370 personnel are anticipated to be required to conduct and support operations for the Ootsa Project. A breakdown of these figures by operating area is provided in Table 21.11.

TABLE 21.11
MANPOWER SCHEDULE BY OPERATING GROUP

CONTRACT MINING		TOLL MILLING		ADMINISTRATION				
DEPARTMENT	TOTAL	DEPARTMENT	TOTAL	DEPARTMENT	MINING	MILLING	OWNER	TOTAL
Operations	97	Operations	53	Accounting	1	2	3	6
Blasting	16	Met/Assay Lab	27	IT & Comms	0	1	0	1
Maintenance	53	Maintenance	35	HR	1	1	1	3
Engineering	1			Management	2	2	2	6
				Engineering	0	0	13	13
				Security	0	5	0	5
				Camp	0	0	22	22
				Purchasing	1	1	0	2
				Materials Mgmt	3	3	1	7
				HSE	5	6	4	15
				Transport	0	0	8	8
TOTAL	167	TOTAL	115	TOTAL	13	21	54	88
				TOTAL	370			

For simplicity, all personnel are considered to work a 7-7 shift rotation either on a 12-hour continuous shift schedule or on 12-hour straight dayshift. The mine works many of its administrative and technical staff on a 4-3 shift rotation. This option will be considered when detailed manpower planning is conducted.

The Mining Contractor will employ a workforce of 167 including personnel for operations, blasting, maintenance, and supervision on a continuous 12-hour shift schedule. An additional 13 people will be engaged in administrative support activities, most of them on a dayshift only basis.

Toll-Milling will employ a complement of 115 people. Operations will be on a continuous shift schedule while maintenance, the assay lab, and management will work straight dayshift. Sample preparation will be conducted on a continuous basis to adequately support both the mill and grade control activities. An additional 21 people will be engaged administrative support activities of which about half will work on a dayshift only basis.

Gold Reach will require a complement of 54 personnel. Of these, 30 people will be subcontractors working for the camp caterer or the barge operator. A further 13 personnel will form the Mine Engineering group who will provide technical support and oversight to the Mining Contractor. All of these personnel will be scheduled on straight dayshift. A detailed schedule of positions by department can be found in Appendix XV.

Employees are assumed to work approximately 2,000 hours annually. A salary and wage model has been applied to those hours to confirm that overall, the labor component of costs used in the economic model are reasonable and appropriate. Wage rates are comparable to existing similar mining operations in British Columbia. Benchmark rates are $30/hr for a haul truck driver and $40/hr for a journeyman with 30% loading for premiums and benefits.

22.0 ECONOMIC ANALYSIS

The economics of the Ootsa Project as described in the previous sections of the study were modeled to determine the value of the Project. The economic model values were based on the Net Present Value ("NPV") from the start of construction.

The model does not consider the pre-construction development period, nominally four years, or the costs to be incurred during that period for engineering, permitting, and financing. This is normal practice at the PEA stage because (1) there is no certainty that the Project will be developed and (2) if the development timeline changes then so does the Project value.

22.1 ECONOMIC MODEL DESCRIPTION

22.1.1 Resources

Project economics are based on developing the potentially economic portion of the mineral resource identified for development at the Ootsa Property that consists of 61 Mt of the Measured portion of the mineral resource at grades of 0.37% Cu Eq (0.25% Cu, 0.13 g/t Au, 0.016%Mo, and 2.3 g/t Ag), plus 4 Mt of the Indicated portion of the mineral resource at grades of 0.33% Cu Eq (0.24% Cu, 0.07 g/t Au, 0.015%Mo, and 2.3 g/t Ag), and totals 65.4 Mt of mill feed grading 0.37% Cu Eq (0.25% Cu, 0.13 g/t Au, 0.016% Mo, and 2.30 g/t Ag). This material contains 357 M lbs Cu, 269,000 oz Au, 23.7 M lbs Mo, and 4.8 M oz Ag. The mill feed is associated with 31.1 Mt overburden and 64.7 Mt waste rock resulting in a strip ratio of 1.46. The Project mineral resources are described in detail in Sections 14 and 16 of this PEA.

22.1.2 Operating Plan

22.1.2.1 Mining

A mining contractor will use a fleet of diesel-powered trucks and excavators to mine the Ootsa deposits by typical open pit methods. Three pits will be mined sequentially over a period of 12 years with mill feed conveyed to the mill for processing. Mining will be conducted at a nominal rate of 13.4 Mtpa with production generally ranging from 10-20 Mt in any given year based on stripping requirements. A detailed description of the mining plan can be found in Section 16 of this PEA.

22.1.2.2 Milling

The owner of the mill will process feed mined at Ootsa on a toll-basis at a rate of 5.6 Mtpa once mining of the Main Zone ("MZ") pit is complete. Feed will be conveyed across the lake from Ootsa to the mill and tailings will be disposed in the MZ Pit. Over a period of 11.8 years, operations will produce copper and molybdenum concentrates for sale and shipment to overseas markets. Additional details regarding processing can be found in Section 17 of this PEA.

22.1.2.3 Production Schedule

Mining starts in the East Seel pit and continues there for four years before operations transition to Ox. Mining concludes at Ox in Year 9 and then switches to the West Seel pit for the remainder of the mine life. Total copper production is 324 M lb and averages about 28 M lbs per year throughout the mine life while by-product production varies from pit to pit.

Molybdenum production starts from the Ox pit once East Seel is finished and then averages about 2 M lb per year totalling 15.8 M lb. Most of the gold production which totals 185,000 oz is produced during the first four years at an average rate of 30,000 oz per year. Silver production averages about 250,000 oz per year. Peak output is during the mining of the West Seel pit resulting in life-of-mine production of 3 M oz. Details can be found in Section 16 of this PEA.

22.1.2.4 Recovery

Based on preliminary metallurgical test results, copper recovery is estimated to range from 90-92% depending on each open pit. Gold recovery is estimated at 70% for East Seel and Ox and 65% for West Seel. Silver recovery is estimated at 60% for both Seel pits and 65% for Ox. Molybdenum recovery is estimated at 70% for West Seel and Ox. Recovery of molybdenum from East Seel is not practical due to the low grade. Details can found in Section 13 of this PEA.

22.1.2.5 Metal Price

Base Case metal prices are $3.00/lb Cu, $1,260/oz Au, $10.30/lb Mo and $17.00/oz Ag. All prices are expressed in US dollars. These prices are 5-10% lower than the October 2015 Consensus Economics long-term price forecast based on the outlook of twenty major financial institutions. A more extensive discussion of metal prices and the Price-FX model can be found in Section 19 of this PEA.

22.1.2.6 Foreign Exchange

The Base Case foreign exchange rate is 0.80 US$/C$. This rate corresponds to a copper price of US$3.00/lb in the Price-FX model described in Section 19 of this PEA which simulates the change in exchange rate with metal prices. The Base Case exchange rate equates to the 24-year trailing average exchange rate as of Q4 2015.

22.1.2.7 Royalties

There is a 1.0% royalty on production from the Seel deposit and a 2.0% royalty on production from the Ox deposit. The Seel royalty can be reduced to 0.5% for a C$1.0 M payment. The Ox royalty can be bought out entirely for C$1.5 M. The model assumes that both royalties are reduced to the minimum possible with the cost of the buyout included in the initial capital costs. The undiscounted cost of the remaining royalty on Seel over the Project life is about C$3.7 M.

22.1.2.8 Capital Costs

Initial capital costs for the Project are estimated at $64 M. This amount is composed of $33 M of direct costs for equipment, construction, and site development; $14 M of indirect costs for EPCM and associated Project management costs; $12 M of contingency; and $5 M for a reclamation bond. A 30% contingency has been applied to all direct and indirect costs excluding pre-stripping. Contingency has also been factored into the reclamation bond estimate separately.

Deferred capital in an amount of $33 M is required to support the sequential development of the three open pits. These costs are incurred in Years 3 and 9 to pre-strip the Ox and West Seel pits, relocate crushing and conveying infrastructure, and augment reclamation bonding. Details regarding capital costs can be found in Section 21 of this PEA.

22.1.3 Salvage

A credit of $2 M is included in the economic model to reflect the resale value of plant and equipment which remains in working order at closure. This figure is based on 10% of the value of fixed plant and equipment worth $22.4 M.

22.1.4 Working Capital

No allowance for working capital is included in the economic model for the Project. It is assumed that a seamless transition occurs between the end of mining at HB and the start of production from Ootsa.

22.1.5 Reclamation & Closure

The cost of the reclamation bond has been calculated for disturbance associated with the initial development at East Seel and subsequent developments at Ox and West Seel in Years 3 and 9, respectively. The total cost of reclamation is the sum of the amounts which make up the reclamation bond or approximately $9 M.

Each year of the mine life, it is assumed that $500,000 worth of progressive reclamation will be performed. Over the life of the Project this amounts to roughly the total required to reclaim the waste rock and overburden stockpiles generated by mining. This amounts to $6.0 M over the life of the mine. As a result, a liability of $3.0 M will remain at the end of operations to decommission and close the site.

It should be noted that the closure cost discussed is only for the Ootsa Property. After decommissioning, post-closure monitoring at the Ootsa Property will be conducted for a period of five years at a cost of approximately $250,000 per year.

It is assumed in the economic model that half of the original reclamation bond or roughly $5 M will be recovered in Year 18 reflecting successful completion of reclamation but there may be potential need for ongoing monitoring beyond the five year post closure period.

22.1.6 Operating Costs

Unit costs are applied in the economic model to the production tonnages on an annual basis to determine the cost of mining mill feed, waste, and overburden. Mining unit costs vary by pit. The rates for mining mill feed are inclusive of conveying costs and vary from $2.90-$3.02/t mined. Waste mining costs, which exclude the cost of conveying, range from $2.50/t-$2.67/t mined. Overburden mining cost is estimated at $2.06/t mined for all pits.

Process operating costs are calculated annually in the model by applying unit rates to planned milled throughput. Process unit rates vary by deposit. The process cost for the East Seel, West Seel and Ox deposits are estimated at $9.03/t milled, $11.64/t milled and $10.13/t milled, respectively, with reagent consumption for copper-molybdenum separation causing the difference in cost between deposits.

G&A costs for the mining contractor and toll-milling contractor are part of the unit rates for mining and processing. Gold Reach G&A is estimated at $0.56/t milled.

22.1.7 Offsite Costs

Offsite treatment and transport costs considered in the economic model include road transport and storage, ocean freight, treatment, and refining. Offsite costs are based on tonnes of copper and molybdenum concentrate produced annually. Concentrate tonnage is calculated from the concentration ratio, the ratio of head grade to concentrate grade, which are assumed to be 27% and 51% for copper and molybdenum, respectively.

For both copper and molybdenum concentrate, the cost of ground transport and storage and ocean freight is calculated at US$60/WMT. Treatment charges applied in the economic model were $100/DMT for copper concentrate based on current spot TC/RC from China. Molybdenum treatment charges of $1,200/DMT concentrate were used based on rates from existing contracts at operating mines. Moisture content for both concentrates was assumed to be 8%.

Payable metal for copper, gold, and silver is 96% in the model with refining costs $0.05/lb, $5.00/oz, and $0.50/oz, respectively. Payable metal for molybdenum in the model is 90%. All parameters are consistent with current market rates.

22.1.8 Taxation

Tax in the economic model has been applied as per guidance from the BC Mineral Tax Handbook, May 2015. Tax is applied in two ways: a 2% Net Current Proceeds ("NCP") tax during the capital recovery period and a 26% tax on net revenue. The capital recovery period in the model is defined as the payback period plus one year to reflect the intent of legislation to allow an owner to recoup its original investment and make a reasonable return.

Net revenue adjusted for depreciation to arrive at taxable income is subject to a 26% combined provincial and federal corporate tax after the capita recovery period. The pool of tax credits used to determine depreciation is equal to the sum of initial and sustaining capital over the life of the mine and is applied straight-line. Tax treatment in the model is considered conservative as the 133% investment tax credit for which the Project is eligible is not included.

22.1.9 Discount Rate

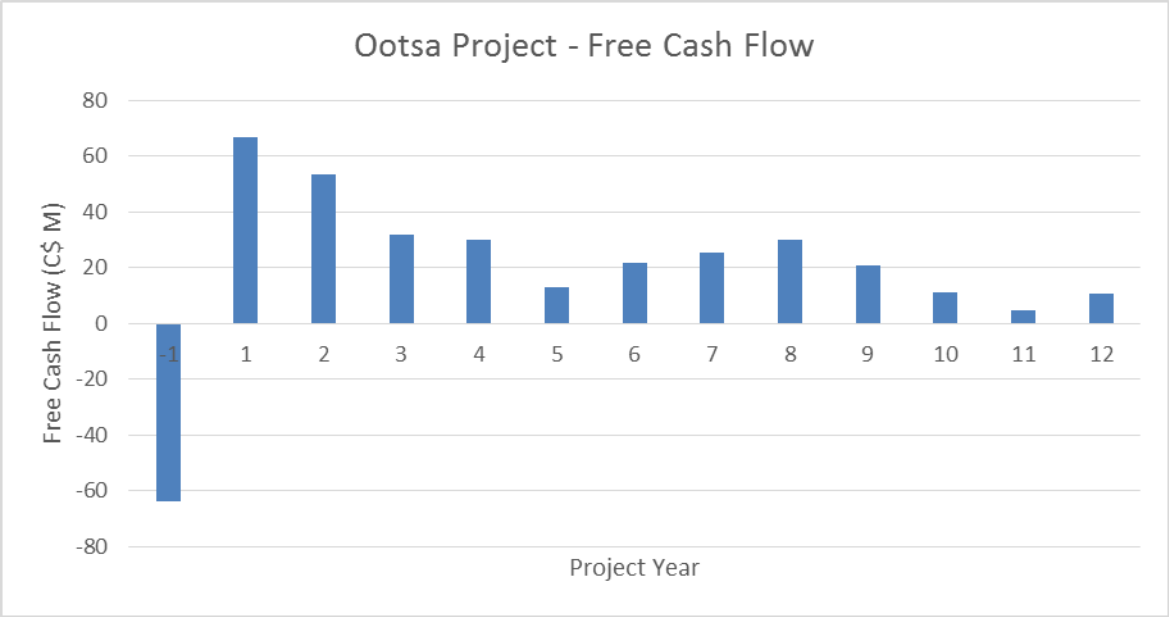
A discount rate of 5% was used to determine net present value for the economic model. Although a factor of 8-10% may be more common for base metal projects, the risks associated with the Ootsa development are significantly lower than those of a typical base metal grassroots mine start-up and therefore warrant a lower discount rate. A detailed discussion of Project risks can be found in Section 24 of this PEA.

22.2 RESULTS

22.2.1 Base Case Performance

Results for the Base Case indicate that the Project has an after-tax NPV of C$186 M discounted at 5% and an Internal Rate of Return ("IRR") of 81%. Undiscounted payback of the initial (construction) capital is 1.0 year. The economic model can be found in Appendix XXI. Figure 22.1 shows that over the 11.8 years of operation the Project generates C$255 M in free cash flow.

Figure 22.1 Annual Project Free Cash Flow



22.2.2 Cash Costs

Cash operating costs over the life of the Project were calculated based on 324 M lbs of copper recovered over the mine life. Costs include direct (C$1,096 M) and offsite (C$277 M) operating costs plus deferred capital (C$33 M) totaling C$1,406 M. By-product credits reduced total costs by C$559 M.

The resulting Direct and All-In Sustaining Unit Cash Cost of Production ("AISC") at an exchange rate of US$0.80 = C$1.00 are US$1.32/lb and US$2.09/lb, respectively. No considerations for exploration or corporate costs were used in the determination of AISC costs. The breakeven copper price for the Project on a discounted cash flow basis is approximately US$2.18/lb.

22.2.3 Sensitivity Analysis

<u>22.2.3.1 Metal Price</u>

The Project economics were evaluated over the full range of metal prices in the Metal Price – FX model. The results are presented in Table 22.1. The Project is highly sensitive to metal prices. A

nominal 8% rise or fall in metal price results in a 25% or C$45 M change in NPV. Project economics remain robust at lower metal prices with a 31% IRR at US$2.25/lb Cu.

TABLE 22.1
METAL PRICE SENSITIVITY

Metal Price							
Cu	US$/lb	2.25	2.50	2.75	**3.00**	3.25	3.50
Au	US$/oz	1,140	1,180	1,220	**1,260**	1,300	1,340
Ag	US$/oz	14.75	15.50	16.25	**17.00**	17.75	18.50
Mo	US$/lb	6.70	7.90	9.10	**10.30**	11.50	12.70
FOREX	US$:C$	0.73	0.75	0.78	**0.80**	0.83	0.85
					Base Case		
After-Tax NPV @ 5%	C$ M	21	86	141	**186**	232	274
After-Tax IRR	%	31	54	69	**81**	92	103
Payback	yrs	1.6	1.3	1.1	**1.0**	0.9	0.8

22.2.3.2 Operating Cost

The effect of varying direct operating costs for the Project was examined at Base Case conditions. Changes in the tax rate resulting from changes in the payback period were ignored as they were deemed to have no significant effect on the results of the analysis. The results are shown in Table 22.2.

TABLE 22.2
OPERATING COST SENSITIVITY

					Base Case		
Operating Cost	C$ M	822	914	1,005	**1,096**	1,187	1,278
% Change	%	-25.0	-16.6	-8.3	**0.0**	8.3	16.6
NPV @ 5%	C$ M	340	289	238	**186**	131	77
IRR	%	122	108	95	**81**	66	50
Payback	yrs	0.7	0.8	0.9	**1.0**	1.1	1.3

The Project is also highly sensitive to operating cost. A nominal 8% change in operating costs results in a 30% or C$55 M change in Project NPV. The Project's sensitivity to operating cost is a function of the premium paid for contract mining and toll-milling.

22.2.3.3 Capital Cost

The effect of changes in initial Project capital cost was examined (Table 22.3). Depreciation was kept constant at $9 M per year for 12 years. The Project is relatively insensitive to changes in capital costs. A nominal 8% change in capital cost resulted in a 3% or $5 M change in NPV. IRR remained above 60% even with a 17% increase in capital cost.

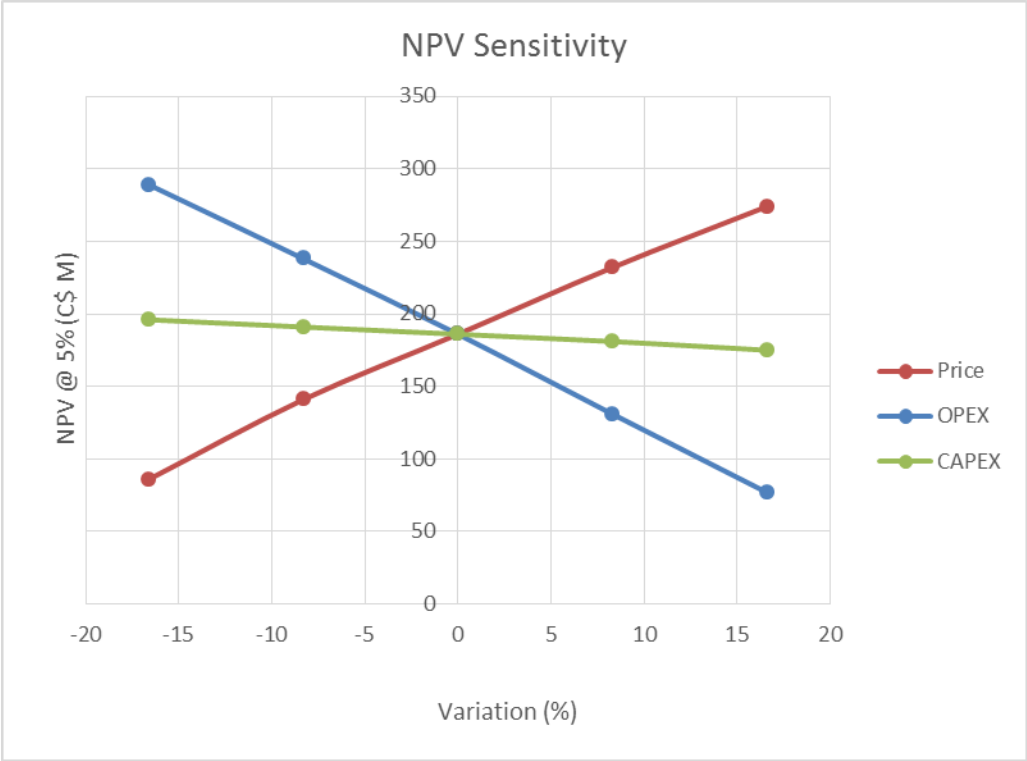
TABLE 22.3
CAPITAL COST SENSITIVITY

					Base Case		
CAPEX	C$ M	48	53	59	**64**	69	75
% Change		-25.0	-16.6	-8.3	**0.0**	8.3	16.6
NPV @ 5%	C$ M	201	196	191	**186**	181	175
IRR	%	116	102	90	**81**	73	66
Payback	yrs	0.7	0.8	0.9	**1.0**	1.0	1.1

22.2.3.4 NPV Sensitivity

The spider diagram in Figure 22.2 illustrates graphically the relative sensitivity of Project economics to changes in metal price, operating cost, and capital cost. The Project is marginally more sensitive to changes in operating cost than metal price and relatively insensitive to changes in capital cost. From this it can be concluded that any capital increase, which can increase efficiency and drop operating costs has the potential to enhance Project value.

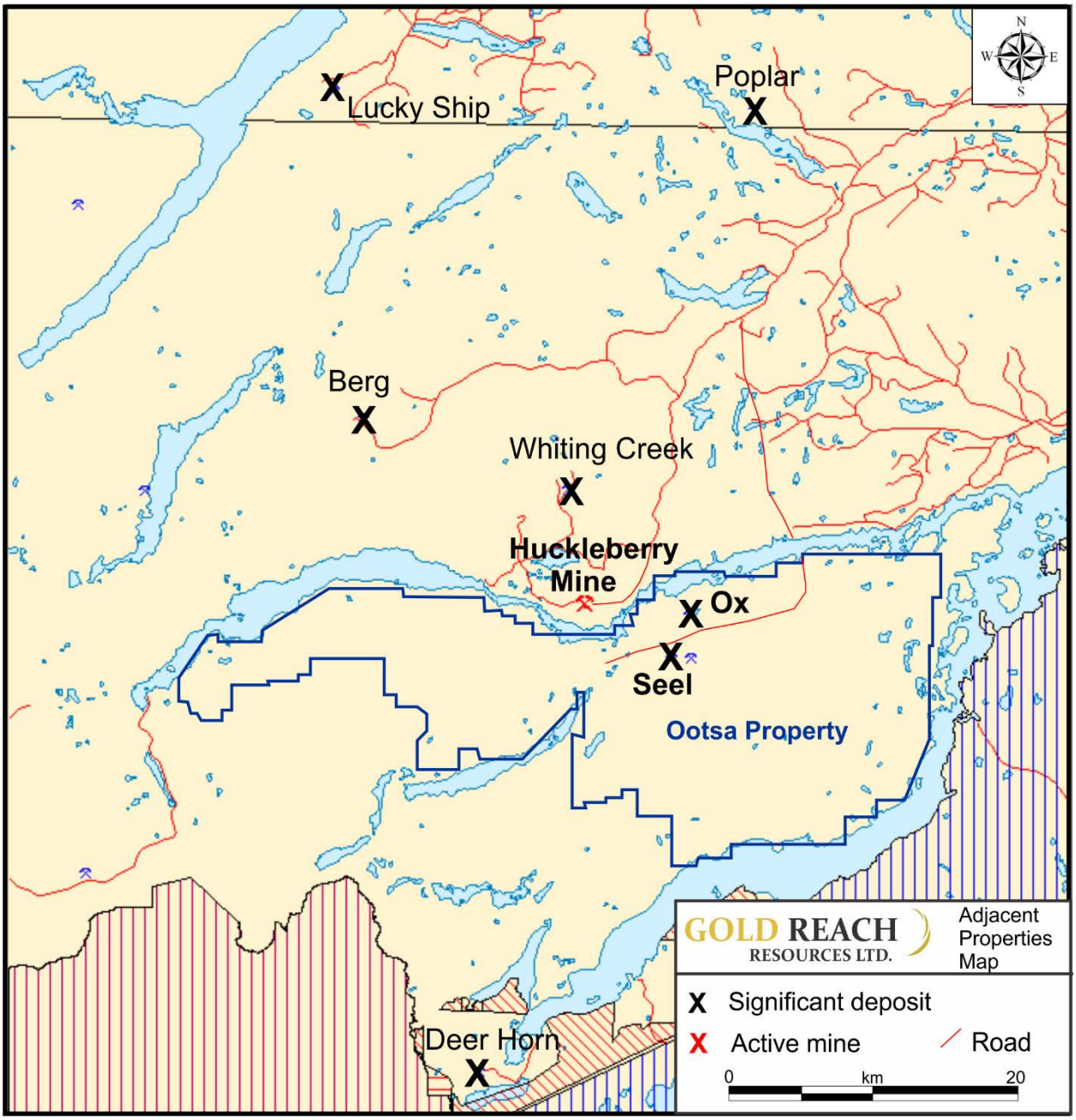
Figure 22.2 NPV Sensitivity Diagram



23.0 ADJACENT PROPERTIES

Figure 23.1 shows all the major deposits surrounding the Ootsa Property which contain established resources. The Huckleberry Mine, which currently produces copper with lessor molybdenum, silver, and gold, is the only active mine in the area and is discussed in detail below. Significant deposits include, Berg, Poplar, Lucky Ship, Whiting Creek, and Deer Horn, and these are briefly discussed at the end of this section.

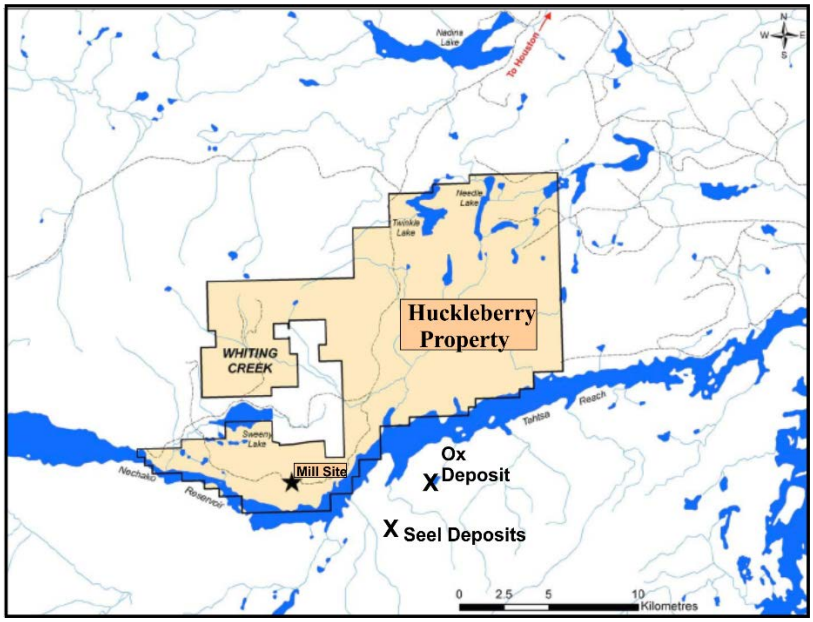
Figure 23.1 Location map of Significant Deposits Located Adjacent to the Ootsa Property



The Huckleberry Mine is an active open pit copper mine located immediately adjacent to the Ootsa Property, with the milling and concentrating infrastructure located about 6 km west of the Ox and Seel Deposits. The mine produces copper and molybdenum, with accessory but lesser

quantities of silver and gold. The Huckleberry Mine Property (Figure 23.2) covers 19,780 hectares, which consists of two mining leases covering 2,422 hectares and 39 mineral claims encompassing approximately 17,358 hectares (from Imperial Metals 2014 Annual Information Form). The mine is 50% owned by Imperial Metals and the remaining 50% is owned by the Japan Group, comprised of Mitsubishi Materials Corporation, Dowa Mining Co. Ltd. and Furukawa. Co. Huckleberry Mines Ltd., is a private company that operates the mine on behalf of Imperial Metals and the Japan Group.

Figure 23.2 Map of the Huckleberry Mine Property



From Imperial Metals 2014 Annual Information Form (www.imperialmetals.com).

The Huckleberry Mine was built in 1996 and 1997 at a cost of roughly $142 million and achieved commercial production in October 1997. The mine is a conventional truck and shovel open pit mine. Ore from the pit is delivered by haul truck to a gyratory crusher. After crushing the ore is ground in a semi-autogenous ("SAG") mill, and then in two ball mills. Froth flotation is used to separate a bulk copper concentrate, which is then reground and floated again to produce a final copper concentrate (www.imperialmetals.com). When the molybdenum grades are high enough a molybdenum concentrate is floated out of the copper concentrate. The copper concentrate is trucked to the Port of Stewart, British Columbia and then shipped to Asia. When produced, the molybdenum concentrate is taken by truck to Vancouver and sold under long term contract.

The mill processes between 15,500 to 19,000 tonnes per day with throughput increased significantly in 2015. Between 2011 and 2014 annual production from the mine has ranged from 34 to 45 million pounds of copper, 183,000 to 238,000 ounces of silver, and 2,500 to 3,195 ounces of gold (data from Imperial Metals Annual Reports). Production data for molybdenum has not been routinely reported from 2011 to 2014.

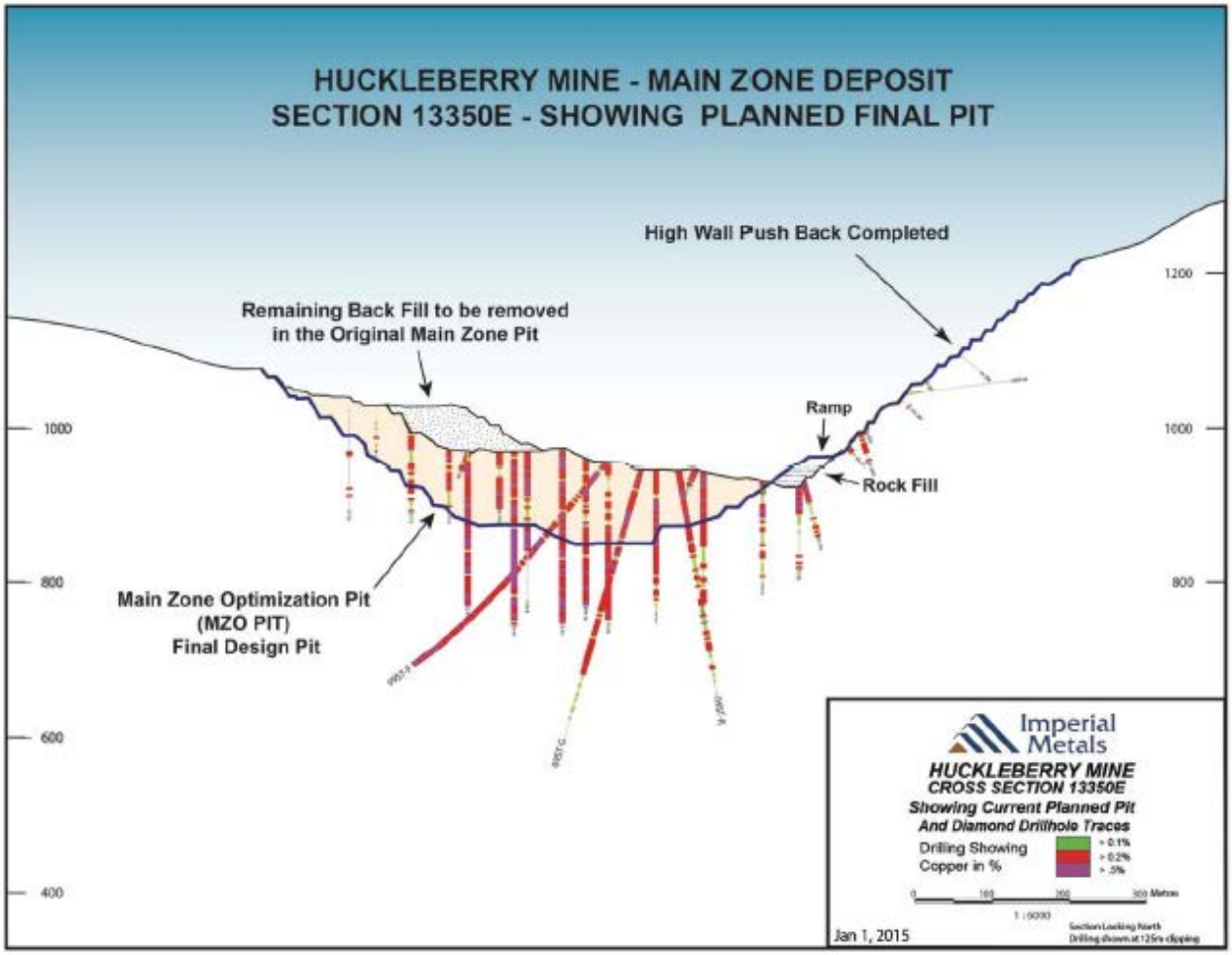
Figure 23.3 Aerial Photograph Of The Huckleberry Mine Showing the Mill Location, The Pits, and the Area for the New Tailings Facility

From Imperial Metals 2014 Annual Information Form (www.imperialmetals.com).

In 2011 Huckleberry Mines published a technical report and a new optimized resource designed to extend the life of the mine from 2014 to 2021 (Christensen et al., 2011). The new resource was constrained within the Main Zone Optimization ("MZO") Pit. The location of the MZO pit is shown on Figure 23.3 and a cross section through it is shown on Figure 23.4. As of December 31, 2014 the total proven and probable mineral reserve estimate for the Huckleberry Mine is 42.2 million tonnes grading 0.327% Cu and 0.010% Mo, using a cut-off grade of 0.15% Cu. These resources are sufficient to support mining operations until 2022. The strip ratio for the remaining reserve is roughly 1.46. This resource was obtained from Imperial Metals ANNUAL INFORMATION FORM (Extracts) – Year Ended December 31, 2014 (obtained from Imperial Metals website www.imperialmetals.com) and was prepared under the supervision of Kent Christensen, P.Eng., Huckleberry Engineering Manager, designated as the Qualified Person as defined by National Instrument 43-101. The Authors have not verified the mineral resources or reserves for the Huckleberry mine.

Huckleberry is a classic porphyry copper-molybdenum deposit spatially associated with Bulkley Suite (Late Cretaceous) intrusive stocks emplaced into a pile of Lower Jurassic volcanic rocks of the Telkwa Formation which have been pervasively altered to a biotite magnetite hornfels (Christensen et al., 2011). Sub-circular zones of Cu-Mo-Ag mineralization and hydrothermal alteration formed around the intrusions and were subsequently dismembered by faulting into a series of fault slices (Christensen et al., 2011).

Figure 23.4 Cross Section Through the Huckleberry Main Zone Optimization Pit Showing Planned Final Pit Design



From Imperial Metals 2014 Annual Information Form (www.imperialmetals.com).

There are two main mineralized centres at Huckleberry, the Main Zone Deposit and the East Zone Deposit which have been exploited by the East Pit and the Main Zone Extension pit (Figure 23.2). Mineralization is similar in both the Main and East zone deposits and is contained within altered volcanic rocks. Copper occurs as chalcopyrite within veinlets and fractures and finely disseminated around veinlets. Molybdenum occurs as molybdenite, which occurs within quartz/anhydrite veins and as disseminations and clusters. Gold has been found as small grains within chalcopyrite and pyrite, and although concentrations of gold and silver are low, they contribute a portion of the revenue stream (Christensen et al., 2011).

The Main Zone deposit is approximately 1,400 m long by 400 m wide and has a vertical extent of at least 380 m. The East zone deposit is approximately 900 m long by 250 m wide, and extends to a depth of at least 300 m. The current dimensions of both the Main Zone and East deposits have been significantly modified by faulting (Christensen et al., 2011). The mineralized zones at Huckleberry are surrounded by a pyrite halo that extends 5,000 m east-west by 1,000 m north-south.

The Berg, Poplar, Lucky Ship, Whiting Creek, and Deer Horn deposits are located in the region surrounding the Ootsa Property, and all contain significant resources. The resources stated below for the Berg, Poplar, Lucky Ship, Whiting Creek, and Deer Horn deposits have been obtained

from public company disclosure. The Authors have not verified the mineral resources or reserves for these deposits.

Thompson Creek Metals Company Inc. owns the Berg Cu-Mo-Ag porphyry deposit which is located roughly 25 km northwest of the Ootsa Property, and roughly 50 km by existing road from the Huckleberry mill. The Berg deposit contains porphyry copper-molybdenum style mineralization hosted within a 50 Ma quartz monzonite intrusion and in adjacent hornfelsed volcanic rocks of the Telkwa Formation (Heberlein and Godwin, 1984). The Berg Property contains Measured and Indicated resources of 506 Mt grading 0.3% Cu, 0.037% Mo, and 3.8 g/t Ag, plus an Inferred resource of 144.6 Mt grading 0.23% Cu, 0.033% Mo, and 2.5 g/t Ag using a 0.3% Cu equivalent cut-off (Thompson Creek website www. Thompsoncreekmetals.com).

Lions Gate Metals owns the Poplar Porphyry Cu-Mo deposit located north of the Ootsa Property between Ootsa and Houston. The deposit is roughly 88 km by existing road from the Huckleberry Mill, and 90 km by road from the town of Houston. The Poplar deposit contains porphyry copper-molybdenum style mineralization associated with a 76 Ma granite to granodiorite intrusion (Carter, 1981) and volcanic rocks of the Kasalka and Hazelton Groups. The Poplar deposit contains an Indicated resource of 129.3 Mt grading 0.31% Cu, 0.009% Mo, 0.09 g/t Au, and 2.38 g/t Ag plus an Inferred resource of 129.5 Mt grading 0.27% Cu, 0.005% Mo, 0.07 g/t Au, and 3.37 g/t Ag at a 0.2% Cu cut-off (Giroux, G., 2012).

Deer Horn Capital owns 50% of the Deer Horn Property located south of the Ootsa Property. Deer Horn has no direct road access but can be accessed seasonally by barge or by helicopter. Deer Horn contains vein style deposits with some broader zones of potentially bulk tonnage material hosted in thrust faults and other structures in foliated diorite and in metavolcanic rocks of the Gamsby Group. The deposit has an Indicated resource of 414,000 tonnes grading 5.12 g/t Au, 157.5 g/t Ag, and 160 ppm Te plus an Inferred resource of 197,000 tonnes grading 5.04 g/t Au, 146.5 g/t Ag, and 137 ppm Te using a 1.0 g/t Au cut-off (Deer Horn Capital website, www.deerhorncapital.ca).

The Lucky Ship porphyry Mo deposit is located north of the Ootsa Property, roughly 135 km by existing road from the Huckleberry Mill. Mineralization is associated with a 50 Ma Nanika rhyolite plug that cuts Hazleton Group volcanic, pyroclastic, and sedimentary rocks (Carter, 1981). Using a 0.03% Mo cut-off the deposit contains an Indicated resource of 65.66 Mt grading 0.064% Mo and an Inferred resource of 10.24 Mt grading 0.054% Mo (New Cantech Ventures Inc. news release May 14, 2008, www.sedar.com).

The Whiting Creek molybdenum deposit is owned by Huckleberry Mines and is located 8 km north of the Huckleberry Mine. In the area intrusions of the Bulkley Plutonic Suite intrude volcanic rocks of the Telkwa Formation. Porphyry style molybdenum and copper mineralization has been identified in several zones. The prospect has seen episodic exploration and drilling from 1963 to the present. Limited testing on the Ridge Zone has outlined a resource of 123.5 Mt at 0.062% Cu and 0.025% Mo (0.043% MoS_2) (Cann and Smit, 1995).

24.0 OTHER RELEVANT DATA AND INFORMATION

24.1 RISK ASSESSMENT

The Ootsa Project faces the same type of risks as many other mine developments. In addition, there is no certainty regarding the establishment of a toll-milling agreement. The Property, however, boasts a number of attributes, which significantly reduce the risk involved in development relative to other projects. These include, but are not limited to, the proximity to an existing mine, the opportunity to commence production from Ootsa whenever operations at HB cease, and the real possibility of using a mined-out pit on the adjacent property to store Ootsa tailings.

Table 24.1 provides a list of the potential risks associated with a new mine development. The risk related to each category for Ootsa is shown ranging from "very low" to "very high" with most mine developments falling somewhere in the middle of the range. It is notable that the risks associated with Ootsa tend to sit in the lower half of the range as explained below.

TABLE 24.1
OOTSA PROJECT RISK ASSESSMENT

	RISK RATING				
RISK	Very Low	Low	Medium	High	Very High
OPERATIONS					
Operating Plan					
Construction Plan					
Labor					
Infrastructure					
ECONOMICS					
Operating Cost					
Capital Cost					
Metal Prices					
Commercial					
TECHNICAL					
Resources					
Geotechnical					
Hydrology					
Metallurgy					
CSR					
Tailings Management					
Environmental					
Social					
Permitting					

24.1.1 Operations

The risk associated with the operating plan for Ootsa is considered very low. The operation will employ a mining contractor with appropriate experience and resources while the toll-milling contractor will be dealing with feed similar which it has been processing for the past 20 years. A comprehensive engineering design will be required for the floating conveyor system, however, it should be noted that similar systems are commonly employed in dredging operations.

The risk associated with construction for Ootsa is considerably lower than most other mine developments. There is no major infrastructure to construct such as a mill or tailings facility which could be subject to significant capital cost or schedule over-runs. The installation of the conveyor system and related infrastructure is relatively simple.

Much of the required infrastructure for the Project such as road access, power, and camp facilities already exists for HB. The mining contractor could choose to employ operators from HB once mining at HB is finished. Engineering design to confirm that the power line feeding HB has sufficient capacity to accommodate the additional power for Ootsa is required, however, there is no indication that the line will not be adequate.

24.1.2 Economics

Operating costs have been modeled to reflect the plan to use a mining contractor and toll-milling. The premium paid for contract mining and toll-milling puts the Project at greater risk at low prices but this is partly offset by greater certainty in terms of operating performance. Operating costs for Ootsa will need to be developed from first principles guided by contractor quotes at the next stage of engineering to confirm their accuracy.

Capital costs for the PEA are based on a mix of quotations, recent industry experience, and factored estimates. The level of accuracy of these estimates will be increased at the next stage of engineering to support financing. The nature of the items which make up the Project capital cost, however, are relatively simple thus more rigorous estimation is not anticipated to change the result significantly. As shown in Section 22 of this PEA, Project value is relatively insensitive to changes in capital cost and therefore represents a minor risk.

Metal price fluctuations always represent a significant risk to mining projects. Ootsa, however, enjoys relatively robust economics with breakeven on an investment basis of US$2.18/lb Cu and All-in Sustaining cash costs of US$2.09/lb.. Entering into long-term concentrate supply agreements with smelters and refiners is an important consideration in mitigating price-related risk.

Uncertainty exists regarding the establishment of an agreement to toll-mill Ootsa mill feed.

24.1.3 Technical

Mineral resource risk is fundamental to mining projects. At the PEA stage one of the biggest risks is related to the quality of the resource which often includes a high proportion of Inferred resource. This is not the case with Ootsa where more than 97% of the resource is Measured and Indicated. As such, mineral resource risk for the Project is low.

Preliminary metallurgical test work has provided positive results, however, more detailed work is required to optimize process recoveries and costs and to address potential variability in the deposits. There have been no indications that mill feed from Ootsa is substantially different metallurgically from HB feed. For this reason, the related risk is considered low.

The geotechnical recommendations for the Ootsa pit designs are consistent with those employed at HB where the geological setting is similar, however, they are based solely on visual inspection of core, core logs, and photographs. Orientated core drilling is required to raise the certainty surrounding the geotechnical design and will be conducted at a subsequent stage of development. For now, all indications are that the geotechnical risk associated with the Project is low.

No hydrogeological investigation or groundwater modeling has been conducted to date. Exploration drilling, however, has not identified any structures or sub-surface conditions, which suggest that groundwater management will present a design or operating issue. Drilling for hydrogeology can be dove-tailed with geotechnical drilling to address this risk which is considered low.

24.1.4 CSR

Corporate social responsibility risk includes risks related to environmental, social, and permitting considerations. Figuring prominently among these is tailings management. In BC, in particular, this has become a major source of public and regulatory concern given recent events in the province. By storing tailings in a mined-out pit, the possibility of a loss of containment is eliminated and questions regarding management practice are already prescribed in the HB mining license. For these reasons, this risk is considered very low.

Other environmental risk is considered low. Preliminary test work indicates that effluent from pits and waste rock stockpiles will satisfy discharge requirements without treatment. Kinetic testing is required and will be conducted at a subsequent stage of engineering. Issues related to wildlife species-at-risk are being dealt with through ongoing engagement between Gold Reach, regulators, and other stakeholders.

Social and community relations risk is also considered low. Two of the First Nations bands that have traditional land claims on the Project area have documented their support for the development. Gold Reach employs numerous First Nations personnel during its exploration programs at Ootsa. In general, the local community has a significant vested interest in the continued operation of the HB mine in the form of jobs for over 300 people and significant business for local suppliers and service providers.

Permitting risk is considered moderate. The permitting process is long and involves many hurdles. However, as the Ootsa development is effectively an extension of an existing operation, permitting may be relatively straight forward for a new mine. Primary issues are the nature of changes to the HB mining license to permit the processing of feed from Ootsa and the storage of tailings on the site. At Ootsa, ensuring that the Project design minimizes impact on fish populations and fish habitat will help in moving the Project through permitting. Based on what is known to date, the Project does not appear to face any permitting challenges, which would prevent the expected value of the investment being realized.

24.2 PROJECT EXECUTION

The Project schedule begins with the start of construction. Engineering, permitting, and financing activities, which occur prior to construction, are considered development and are not part of the Project schedule. This is because the timing and scope of these activities could take many forms depending on how the HB assets become available to develop Ootsa. There is reasonable certainty, however, that permitting will last 3-4 years. This will allow a nominal start of construction in Year -1 with production commencing in Year 1 whenever mining at HB ceases.

During the first half of Year -1, purchasing and site preparation will begin and the mining contractor will be engaged. In the second half of the year, pre-stripping of East Seel will start and the conveyor system will be installed. Any delay in the start of mining at Ootsa will be managed by processing the HB low-grade stockpiles, which contain sufficient feed for about 18 months of milling.

Mining and processing of Ootsa mill feed from East Seel starts in Year 1 at 5.0 Mtpa, increasing to 5.6 Mtpa in Year 2. East Seel continues to be the sole source of mill feed for the next two years until Year 3, when preparation of the Ox pit mining area starts. Ox Lake is drained and roughly 3.0 Mt of overburden and waste is removed from the pit. The conveyor corridor from the PTP to the Ox crusher site is established and 1.8 km of overland conveyor is installed up the corridor from the PTP towards Ox.

In Year 4, mining of mill feed at the East Seel pit is completed and operations transition to the Ox pit. During the transition when the crusher and conveyor are moved from East Seel to Ox, the mill continues to operate without interruption processing 1.0 Mt of crushed feed stockpile built up over the preceding 12 months.

Mining at the Ox pit continues for 8 years from Year 3 to Year 10. Generation of mill feed from Ox ramps up in Year 4 as initial waste removal is completed and feed is depleted at East Seel. From Years 5-8, Ox is the sole source of mill feed. In Year 9, Ox supplies about half the material processed. Mining of mill feed at Ox is completed by the first half of Year 10.

As mill feed is depleted at Ox, preparatory stripping of the West Seel pit begins in Year 9. When mill feed from Ox is depleted in Year 10, a second crusher and conveyor move is executed and West Seel becomes the sole source of mill feed for the remainder of the mine life. The move back to Seel is relatively simple because the crusher site and conveyor corridor are already prepared and feed from accumulated stockpile allows milling to carry on uninterrupted.

Mining at West Seel concludes in Q4 of Year 12. At that point, reclamation of roads and waste rock stockpiles not completed during operations is performed and all facilities and infrastructure not required to support post-closure monitoring are removed. Final reclamation and decommissioning of the site is expected to take 12-18 months after which the site is monitored for a period of five years before a final closure decision is made. Table 24.2 presents the sequence of major events over the Project life.

TABLE 24.2
SEQUENCE OF MAJOR EVENTS DURING THE PROJECT LIFE

Project Year	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Construction																			
Pre-stripping																			
East Seel Mining																			
Prepare Ox for Mining																			
Ox Mining																			
Prepare West Seel for Mining																			
West Seel Mining																			
Decommissioning																			
Post-Closure Monitoring																			
Final Closure																			

25.0 INTERPRETATION AND CONCLUSIONS

P&E concludes that the Ootsa Project has economic potential as an open pit mining operation, utilizing the Huckleberry processing plant to produce copper and molybdenum concentrates. The PEA outlines 65 Mt of mill feed (inclusive of mining dilution and loss factors) averaging 0.37% Cu Eq (0.25% Cu, 0.13 g/t Au, 0.016% Mo, and 2.3 g/t Ag) within 3 pits. The mill feed from the updated mineral resource estimate supporting this tonnage has a high level of confidence with 94% (61 Mt) occurring within the Measured category and 6% (4 Mt) occurring in the Indicated category with no Inferred resources in the mine plan. The Ootsa Project has a low capital cost at C$64 million, a low strip ratio at 1.46:1, and strong economics with an after-tax NPV of C$186 million, an after-tax IRR of 81%, and a one year payback period using base case metal prices.

P&E recommends that Gold Reach advance the Ootsa Project with extended and advanced technical studies with the intention of moving the Project toward a production decision.

The following itemizes the conclusions that can be drawn from the information provided in this PEA. The conclusions highlight facts which characterize the study or are otherwise significant in terms of defining the Project value.

25.1 PROPERTY DESCRIPTION

- Title on the Property is in good order.
- The area to be developed represents only a fraction of the Gold Reach land position.
- Royalties exist on both deposits, however, provisions exist to reduce or eliminate each.

25.2 ACCESS/CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, PHYSIOGRPAHY

- The Property is readily accessible via existing infrastructure.
- Climate and terrain are typical of northern BC and do not present significant obstacles for development.
- Local communities can provide the skilled workforce and services necessary to develop the Project.

- Existing access across the lake will need to be improved to support the development.
- Infrastructure in terms of roads, railways, and ports exist within reasonable proximity to facilitate sale and shipping of concentrate product.

25.3 HISTORY

- The district has seen considerable exploration and mining activity over the past 50 years.

25.4 GEOLOGY AND MINERALIZATION

- Regional and local geology which controls mineralization is well understood.

25.5 DEPOSIT TYPE

- The deposit type is well known in BC and similar in many respects to the neighboring HB deposit, among others.

25.6 EXPLORATION

- Exploration of the deposits has been comprehensive.
- Exploration methodology and practices applied are considered appropriate.

25.7 DRILLING

- Exploratory drilling of the Seel and Ox deposits is extensive with 122,000 m completed since 2004.

25.8 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

- Independent review finds that the procedures and practices for sample preparation, analysis, and security are both appropriate and adequate.
- The laboratory providing analytical services has a QMS system which meets ISO standards.

25.9 DATA VERIFICATION

- A site visit was conducted by an independent QP and Gold Reach QA/QC procedures and practices are considered sufficient to support the mineral resource estimate.
- Samples were taken and check assays performed as part of the QA/QC review.
- Opportunities for improvement exist by including coarse rejects and pulp duplicates in the sample stream.

25.10 MINERAL PROCESSING AND METALLURGICAL TESTING

- Testwork results are preliminary and should be considered indicative and not definitive.
- Preliminary testwork indicates a fine grind (95 µm) is required.

- Recoveries can be expected to be similar to those at HB given similar operating conditions.
- A saleable concentrate can be readily produced at high recovery for copper.
- Copper concentrate will carry significant gold and silver values.
- A saleable concentrate can be produced at reasonable recovery for molybdenum.
- Process simulation may be required to confirm and optimize flotation recovery and molybdenum separation.

25.11 MINERAL RESOURCES

- The mineral resource complies with NI 43-101 requirements.
- An NSR cut-off value, which considers both recovery and off-site costs, was used due to the multi-element nature of the mineral resource.
- Mineralized domains were defined with respect to geologic and lithological boundaries to prevent "smearing" during grade interpolation.
- Composite sample lengths were highly uniform.
- The number of samples capped was negligible.
- Bulk densities were interpolated to model material density in a representative manner.
- Interpolation parameters were based on geostatistical analysis and were appropriate for each deposit.
- Interpolated block model grades reflect the underlying assay data.
- The parameters used to define the resource-constraining pit shell were appropriate for establishing the mineral potential of the deposit(s).
- The West Seel deposit comprises the bulk (75%) of the mineral resource.
- The quality of the mineral resource is high with >80% classified as Measured resource and 98% as Measured and Indicated resource.
- Block model and modeled (wireframe) solids volumes compared well with differences of < 1%.

25.12 MINING METHODS

- The geotechnical review is preliminary.
- The geotechnical recommendations appear appropriate and consistent with those for similar sites.
- A comprehensive engineering review fully supported by a geotechnical drill program is required to confirm the PEA open pit design parameters.
- Although no hydro-geological studies have been conducted there is no evidence that conditions or issues exist that would substantially change the mine design.
- A comprehensive hydro-geological engineering study is required supported by field investigations is required to confirm the assumptions in the PEA.
- The highest NPV for the Project comes from mining the deposits in the order: East Seel, Ox, and West Seel.
- It is possible to transition from pit to pit without interrupting milling or imposing inordinate additional costs on the Project.
- Use of DCF analysis in the open pit optimization shell selection process ensured that the selected pit shell represented optimal value.
- The pit designs are practical and define mineral resources that can be realized by mining.

- The application of mining losses and dilution to the in-pit mineral resources appropriately reflects the effects of mining.
- The potentially economic portion of the mineral resource considered for mining represents <30% of the total mineral resource.
- More than 80% of the potentially economic portion of the mineral resource is composed of material from East Seel and Ox which are the highest economic value pits.
- Pre-stripping is relatively minor with only 3.9 Mt to be moved.
- 50% of the waste at East Seel is overburden that does not require drilling and blasting.
- Ox is the lowest strip pit with a strip ratio 23% less than that of the Seel pits.
- Sufficient engineering rigor has been employed to develop the mining plan to ensure that the results projected in the PEA will be confirmed at the next stage of engineering.
- The mining plan underlying the Project costs and production schedule is practical and achievable.
- Mine manpower is appropriate for the proposed mining plan.

25.13 RECOVERY METHODS

- The HB mill should be able to process feed from the Ootsa deposits without significant modification.
- The semi-mobile crushing arrangement planned for the Ootsa Project appears adequate.
- Finer grind may require a change to ball charge and/or greater retention time as reflected in the planned process plant throughput.
- Molybdenum grade from West Seel and Ox will be consistent enough to permit the plant to achieve acceptable recoveries.
- Existing infrastructure for power and water will be adequate to support milling of Ootsa feed.

25.14 INFRASTRUCTURE

- Facilities at the Ootsa Property site will be minimal but sufficient to support mining. The development will rely heavily on existing facilities at the HB site.
- Sufficient access already exists on the Ootsa site to permit a rapid ramp-up of construction.
- The time required to travel back and forth across the lake by barge will not impact the operating efficiency.
- Overland conveying is the most efficient and cost-effective way to transport feed to the mill.
- The floating conveyor system that will transport feed across the lake is a proven concept which requires comprehensive engineering design work to confirm.
- The drop in elevation from the Seel and Ox pits to the lake will reduce power requirements for the conveyor system.
- Existing infrastructure should be adequate to handle the added electrical load for the Ootsa Project development. This needs to be confirmed by a comprehensive engineering study.

- Waste rock stockpiles have been sited so that water run-off will drain back to the pits.
- Planning for waste rock stockpiles has employed reasonable design parameters and includes provisions to facilitate drainage and reclamation. The design of stockpiles requires geotechnical review.
- Run-off will be diverted around stockpiles and open pits to reduce the volume of non-contact water to be managed in the mining areas.
- Run-off from waste rock stockpiles and inflow to open pits is anticipated to be discharged without the need for treatment.
- Detailed engineering designed is required to support the mine water management plan at the next stage of planning.
- The mined-out MZ pit has sufficient capacity to accommodate Ootsa tailings. An appropriate tailings management plan will need to be developed at the next stage of planning.

25.15 MARKETS AND CONTRACTS

- The Base Case metal prices represent a discount to long-term price forecasts by major financial institutions.
- Exchange rate must be appropriately matched to prices to properly evaluate Project value.
- No significant agreements or contracts exist relative to the development of the Ootsa Property.

25.16 ENVIRONMENT, SOCIAL AND PERMITTING

- Several years of baseline data will be required to support Project permitting.
- An Archeological Impact Assessment will need to be matched to Project development footprint.
- The Project offers important benefits to community stakeholders.
- Consultation with stakeholders as part of the permitting process will be essential to ensure community support and regulatory approval.
- Development of a comprehensive Project description will be required to determine if there are any triggers for federal environmental assessment.
- More testwork, including kinetic testing, is required to confirm the results of preliminary work regarding metals leaching and acid rock drainage.
- The nature of amendments to the HB mining license need to be established in order to determine the permitting process that would permit the processing of Ootsa feed at the HB site.

25.17 CAPITAL COSTS

- The initial capital costs of $64 M are low relative to other new mine developments and are a function of utilizing the existing assets of the nearby HB mine on a toll-milling basis, and using a mine contractor for all mining operations.
- The cost of all elements required to bring the Ootsa Project into production using HB assets have been reasonably accounted for.
- An appropriate contingency (30%) has been imposed on the capital costs.

- The biggest capital cost elements are the crusher/conveyor system and preproduction stripping.
- The sequential development of the deposits reduces the initial capital cost of the development.
- If reclamation is successful and there are no long-term legacy issues from development it is reasonable to conclude that a portion of the reclamation bond will be recovered.

25.18 OPERATING COSTS

- Operating costs are consistent with the activities and they represent industry standards.
- Operating costs need to be developed from first principles at the next stage of engineering, including obtaining quotations from mine contractors.
- A total workforce of about 370 personnel is appropriate for the proposed operating plan.

25.19 ECONOMIC ANALYSIS

- The cost of acquiring the HB assets is not part of the economic model.
- The cost of the HB assets is dependent on the nature of a transaction and the parties involved. A transaction could take many forms which may or may not directly impact the Project economics.
- Not including development (pre-construction) or financing costs in the economic model is typical due to the uncertain nature and timing of those elements.
- Project value is more sensitive to changes in price and operating costs and least sensitive to changes in capital cost.
- The all-in sustaining cash costs for the Ootsa Project, per pound of copper and net of by-products, put the Project in the lower half of copper producers worldwide.
- The Project retains significant positive economics even at copper prices of $2.25/lb Cu (after-tax IRR of 31%).

25.20 ADJACENT PROPERTIES

- Although, there are other properties in the district which could be potentially developed, none are sufficiently developed, located near enough, or of similar cost/risk profile to serve as viable alternatives to the development of the Ootsa Project as a source of mill feed for the HB mill.

25.21 RISK

- Mineral resource risk is low because all of the potentially economic mineable resource is classified as Measured or Indicated resource.
- Investment risk is low because by using the HB mine assets on a toll-basis, and by using a mining contractor, the initial capital cost for the Project is significantly reduced.
- Economic risk is low because the Project plan detailed in the PEA generates robust financial performance which will make the Project resilient during times of periodically low metal prices.

- Operating risk is low as the neighboring HB mine serves as a 'living model' for the Ootsa mine.
- Development risk is low because construction requirements are limited (no mill or tailings pond), infrastructure largely already exists, and pre-striping is small.
- Metallurgical risk is low. Testwork is preliminary but results are consistent with expectations based on performance at HB.
- Tailings risk is low because tailings will be disposed of in a mined-out pit which cannot be subject to failure compared to a tailings dam.
- Environmental risk is low because due to preliminary testwork, there appears to be no need for treatment in order to discharge mine effluent.
- Commercial risk is moderate because although there are many possibilities; there is no agreement in place to secure the HB assets to develop the Ootsa Project.
- Permitting risk is moderate due to the nature of the process itself and because Project impacts have not yet been defined in detail.
- Social risk is low as affected First Nations bands in the area have a positive relationship with Gold Reach and the local community and government have a vested interest in seeing the HB mine continue operating beyond its current planned mine life.

25.22 PROJECT EXECUTION

- The preparation of the Ootsa Property for mining in the space of 12 months is achievable given the nature and extent of work required.
- Completing engineering and permitting of the Ootsa Project in 3-4 years is reasonable given the simple, low-impact nature of the Project.

26.0 RECOMMENDATIONS

P&E recommends that Gold Reach advance the Ootsa Project by undertaking further technical studies, environmental studies, an exploration drill program, and discussions with mine contractors with the intention of moving the Project toward a production decision.

The following itemizes the recommendations which have been drawn from previous sections of this PEA. The recommendations identify actions which are needed to take the Project forward beyond the PEA stage.

26.1 MINERAL RESOURCE DRILL PROGRAM

- Drill 1,000 m at the Ox deposit and 1,800 m at the Seel deposits to expand high grade mineralized zones in or adjacent to the defined open pits. Estimated cost is $0.6 M.
- Drill 2,000 m around the Ox deposit and 6,500 m around the Seel deposits to expand mineralized tonnage in zones near the defined open pits. Estimated cost is $1.7 M.

26.2 DATA VERIFICATION

- Include coarse rejects and pulp duplicates in the sample stream.

26.3 MINERAL RESOURCES

- Assess the potential to expand the mineral resource in a subsequent phase of development.

26.4 MINERAL PROCESSING AND METALLURGICAL TESTING

- Conduct grinding testwork to confirm design parameters.
- Optimize flotation recovery, molybdenum separation, and reagent consumption.
- Perform process simulation testwork to better forecast plant performance.
- Conduct variability testwork to ensure that test results are representative of each deposit.

26.5 MINING METHODS

- Conduct detailed geotechnical studies based on drill program results.
- Conduct hydro-geological studies based on field investigations suitable to serve as a basis for developing a site water balance.
- Develop detailed loading production estimates.
- Develop detailed drill/blast designs.
- Conduct a detailed haulage study.
- Review mine manpower according to the detailed production estimate.

26.6 RECOVERY METHODS

- Conduct a detailed engineering study to confirm specifications of the semi-mobile crusher.

- Study the potential of using one of the existing thickeners as a tailings thickener to maximize tailings storage capacity.

26.7 INFRASTRUCTURE

- Develop a detailed specification for the barge and associated infrastructure.
- Develop a detailed overland and floating conveyor design.
- Conduct a comprehensive electrical power study based on expected loads and the power distribution plan.
- Conduct a geotechnical review of waste rock and overburden stockpile designs.
- Develop a detailed engineering design for mine water management infrastructure.
- Develop a detailed tailings management plan.

26.8 MARKETS AND CONTRACTS

- Explore opportunities for long-term supply agreements with metal smelters and refiners.

26.9 ENVIRONMENT/SOCIAL/PERMITTING

- Monitor and collect baseline environmental data for water quality, climate, flora, and fauna.
- Perform an Archeological Impact Assessment aligned with the Project development footprint.
- Develop a site water balance.
- Develop a detailed plan for draining Ox Lake and re-establishing it after mining.
- Conduct additional testwork, including kinetic testing, to confirm the results of preliminary work regarding metals leaching and acid rock drainage.
- Update the closure plan based on the outcome of additional ML/ARD testwork.
- Continue dialogue with local communities, First Nations, and other stakeholders. Start to align engagement with requirements of the permitting process.
- Determine the nature of the required amendments to the HB mining license that would permit the processing of Ootsa mill feed at the HB site.
- Develop a comprehensive Project description to determine if there are any triggers for federal environmental assessment.
- Develop a detailed permitting plan based on the comprehensive Project description.

26.10 CAPITAL COSTS

- Study the capital cost for the Project based on detailed engineering studies for infrastructure and refurbishment of the mining fleet.
- Increase the overall level of accuracy of the capital estimate to + 15%.
- Study the cost of closure based on a new detailed plan.

26.11 OPERATING COSTS

- Develop operating costs from first principles.
- Request and review a quotation from the toll-milling contractor.
- Obtain quotations from mine contractors.

26.12 ECONOMIC ANALYSIS

- Update the impact of revised development costs on the value of the Project.

26.13 RISK

- Develop a detailed risk matrix that illustrates how the Project risk declines as the level of engineering accuracy increases.

26.14 PROJECT EXECUTION

- Based on the detailed permitting plan, review the Project schedule to confirm the earliest reasonable start of production at Ootsa.

27.0 REFERENCES

1978 - P.M. Mesard did a Master's geological Thesis on the Poplar Property at the University of British Columbia under the direction of Colin I. Godwin, P.Eng. Dr. N.C. Carter, P.Eng examined the Poplar Property for the B.C. Department of Mines and took samples of the porphyry-copper host rocks for potassium-argon age dating.

1985a. Fisheries Act, RSC. C. F-14.

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28.0 CERTIFICATES

CERTIFICATE OF QUALIFIED PERSON

EUGENE J. PURITCH, P.ENG.

I, Eugene J. Puritch, P. Eng., residing at 44 Turtlecreek Blvd., Brampton, Ontario, L6W 3X7, do hereby certify that:

1. I am an independent mining consultant and President of P&E Mining Consultants Inc.
2. This certificate applies to the technical report titled "Resource Estimate and Preliminary Economic Assessment on the Ootsa Property British Columbia, Canada", (the "Technical Report") with an effective date of January 1, 2016.
3. I am a graduate of The Haileybury School of Mines, with a Technologist Diploma in Mining, as well as obtaining an additional year of undergraduate education in Mine Engineering at Queen's University. In addition I have also met the Professional Engineers of Ontario Academic Requirement Committee's Examination requirement for Bachelor's Degree in Engineering Equivalency. I am a mining consultant currently licensed by Professional Engineers and Geoscientists New Brunswick (License No. 4778), Professional Engineers and Geoscientists Newfoundland & Labrador (License No. 5998), Association of Professional Engineers and Geoscientists Saskatchewan (License No. 16216) and Ontario Association of Certified Engineering Technicians and Technologists (License No. 45252) the Professional Engineers of Ontario (License No. 100014010), I am also a member of the National Canadian Institute of Mining and Metallurgy.

   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.

   I have practiced my profession continuously since 1978. My summarized career experience is as follows:
   - Mining Technologist - H.B.M.& S. and Inco Ltd.,.....1978-1980
   - Open Pit Mine Engineer – Cassiar Asbestos/Brinco Ltd.,.....1981-1983
   - Pit Engineer/Drill & Blast Supervisor – Detour Lake Mine,.....1984-1986
   - Self-Employed Mining Consultant – Timmins Area,.....1987-1988
   - Mine Designer/Resource Estimator – Dynatec/CMD/Bharti, ...1989-1995
   - Self-Employed Mining Consultant/Resource-Reserve Estimator,.....1995-2004
   - President – P&E Mining Consultants Inc,..... 2004-Present
4. I have visited the Property that is the subject of this report on October 1, 2015.
5. I am responsible for authoring Sections 2, 3, 15, 18, 19, 21, 22 and co-authoring Sections 14, 16, 25 and 26 of the Technical Report along with those sections of the Summary pertaining thereto.
6. I am independent of the Issuer applying the test in Section 1.5 of NI 43-101.
7. I have had no prior involvement with the Property that is the subject of this Technical Report.
8. I have read NI 43-101 and Form 43-101F1. This Technical Report has been prepared in compliance therewith.
9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: January 1, 2016
Signing Date: March 23, 2016

{SIGNED AND SEALED}
[Eugene J. Puritch]

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Eugene J. Puritch, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

BRIAN RAY M.SC., P.GEO.

I, Brian Ray M.Sc., P.Geo residing at 11770 Wildwood Crescent, Pitt Meadows, BC. V2Y 1L9, do hereby certify that:

1. I am an independent geological consultant contracted by P& E Mining Consultants Inc.
2. This certificate applies to the technical report titled "Updated Resource Estimate and Preliminary Economic Assessment on the Ootsa Property British Columbia, Canada", (the "Technical Report") with an effective date of January 1, 2016.
3. I am a graduate of School of Mining and Geology "Hristo Botev", Pernik, (1980) Specialty – Geology and Exploration of Minerals and University of Mining Engineering and Geology "St. Ivan Rilsky", Sofia. (1990) Specialty – Geology and Exploration of Mineral Resources. I am a geological consultant currently licensed by the Association of Professional Geoscientist of British Columbia (License No 33418). I specialized for the last 20 years in Database managing, 3D modeling and Resource Estimate

   Based on the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") I 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. My relevant experience for the purpose of compiling and preparing a 43-101 compliant Technical Report is:

   - Geological Institut (Bulgarian Academy of Sciences), Senior Geologist.....1982-2002;
   - Barrick Gold Corporation (Williams Mine), Senior Geologist, Marathon, ON 2002-2005;
   - Chief Geologist, Ketza River Gold Mine, Yukon, ...2005-2006;
   - Resource Program Manager (Miramar Mining Corporation), Hope Bay Nunavut 2006-2007;
   - Senior District Geologist, (Newmont Mining Corporation)), Hope Bay Nunavut 2007-2008;
   - Country Exploration Manager, Sandspring Resources Ltd., Guyana 2008-2011;
   - Independent Geological Consultant..... 2011-present;

4. I have not visited the Property that is the subject of this report.
5. I am responsible for co-authoring Sections 14, 25 and 26 of the Technical Report along with those sections of the Summary pertaining thereto.
6. I do have had no prior involvement with the Property that is the subject of this Technical Report.
7. I am an independent of the issuer applying all of the tests in Section 1.5 of NI 43-101.
8. I have read NI 43-101 and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.
9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: January 1, 2016
Signing Date: March 23, 2016

{SIGNED AND SEALED}
[Brian Ray]

_____

Brian Ray M.Sc., P.Geo.
APEGBC # 33418

CERTIFICATE OF QUALIFIED PERSON

JARITA BARRY, P.GEO.

I, Jarita Barry, P.Geo., residing at 3053 Keniris Road, Nelson, British Columbia, V1L 6Z8, do hereby certify that:

1. I am an independent geological consultant contracted by P & E Mining Consultants Inc.
2. This certificate applies to the technical report titled "Updated Resource Estimate and Preliminary Economic Assessment on the Ootsa Property British Columbia, Canada", (the "Technical Report") with an effective date of January 1, 2016.
3. I am a graduate of RMIT University of Melbourne, Victoria, Australia, with a B.Sc. in Applied Geology. I have worked as a geologist for a total of 9 years since obtaining my B.Sc. degree. I am a geological consultant currently licensed by the Association of Professional Engineers and Geoscientists of British Columbia (License No. 40875). I am also a member of the Australasian Institute of Mining and Metallurgy of Australia (Member No. 305397);

   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.

   My relevant experience for the purpose of the Technical Report is:

   - Geologist, Foran Mining Corp. 2004
   - Geologist, Aurelian Resources Inc. 2004
   - Geologist, Linear Gold Corp. 2005-2006
   - Geologist, Búscore Consulting.....2006-2007
   - Consulting Geologist (AusIMM) 2008-2014
   - Consulting Geologist, P.Geo. (APEGBC/AusIMM) .....2014-Present.

4. I have not visited the Property that is the subject of this Technical Report.
5. I am responsible for authoring Sections 4-12 and 23 and co-authoring Sections 25 and 26 of this Technical Report along with those sections of the Summary pertaining thereto.
6. I am independent of the Issuer applying all of the tests in section 1.5 of National Instrument 43-101.
7. I have had no prior involvement with the project that is the subject of this Technical Report.
8. I have read NI 43-101 and Form 43-101F1 and the Technical Report has been prepared in compliance therewith.
9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: January 1, 2016
Signed Date: March 23, 2016

{SIGNED AND SEALED}
[Jarita Barry]

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Jarita Barry, P.Geo.

CERTIFICATE OF QUALIFIED PERSON

ALFRED S. HAYDEN, P. ENG.

I, Alfred S. Hayden, P. Eng., residing at 284 Rushbrook Drive, Ontario, L3X 2C9, do hereby certify that:

1. I am currently President of:
   EHA Engineering Ltd.,
   Consulting Metallurgical Engineers
   Box 2711, Postal Stn. B.
   Richmond Hill, Ontario, L4E 1A7

2. This certificate applies to the technical report titled "Updated Resource Estimate and Preliminary Economic Assessment on the Ootsa Property British Columbia, Canada", (the "Technical Report") with an effective date of January 1, 2016.

3. I graduated from the University of British Columbia, Vancouver, B.C. in 1967 with a Bachelor of Applied Science in Metallurgical Engineering. I am a member of the Canadian Institute of Mining, Metallurgy and Petroleum and a Professional Engineer and Designated Consulting Engineer registered with Professional Engineers Ontario. I have worked as a metallurgical engineer for over 40 years since my graduation from university.

   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.

4. I have not visited the Property that is the subject of this report.

5. I am responsible for authoring of Sections 13 and 17 and co-authoring Sections 25 and 26 of the Technical Report along with those sections of the Summary pertaining thereto.

6. I am independent of the issuer applying the test in Section 1.5 of NI 43-101.

7. I have had no prior involvement with the project that is the subject of this Technical Report.

8. I have read NI 43-101 and Form 43-101F1 and the Technical Report has been prepared in compliance therewith.

9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: January 1, 2016
Signing Date: March 23, 2016

{SIGNED AND SEALED}
[Alfred Hayden]

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Alfred S. Hayden, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

DANIEL YANG, P. ENG.

I, Daniel Y. Yang, P. Eng., residing at 257 Waterleigh Drive, Vancouver, British Columbia, Canada, do hereby certify that:

1. I am a Specialist Geotechnical Engineer with Knight Piésold Ltd with a business address at Suite 1400, 750 West Pender Street, Vancouver, British Columbia, Canada V6C 2T8.
2. This certificate applies to the technical report titled "Updated Resource Estimate and Preliminary Economic Assessment on the Ootsa Property British Columbia, Canada", (the "Technical Report") with an effective date of January 1, 2016.
3. I am a graduate of Tongji University in China (Bachelor degree of Civil Engineering, 1992) and the University of Alberta in Canada (Master degree of Geotechnical Engineering, 2002). I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia, License No. 28936. I have worked as a Geotechnical Engineer over 20 years since my graduation from university. My relevant experience includes geotechnical site investigation, slope stability assessment, open pit slope design, hydrogeological assessment, and pit dewatering plan for a wide range of mining projects. 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.
4. I have not visited the Property that is the subject of this report.
5. I am responsible for co-authoring Sections 16, 25 and 26 of the Technical Report along with those sections of the Summary pertaining thereto.
6. I am independent of the Issuer applying the test in Section 1.5 of NI 43-101.
7. I have had no prior involvement with the Property that is the subject of this Technical Report.
8. I have read NI 43-101 and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.
9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: January 1, 2016
Signed Date: March 23, 2016

{SIGNED AND SEALED}
[Daniel Y. Yang]

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Daniel Y. Yang, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

HAROLD ROLF SCHMITT, P.GEO.

I, Harold Rolf Schmitt, P. Geo., residing at 3167 Pearkes Road, Colwood, British Columbia, do hereby certify that:

1. I am an independent geological consultant contracted by P& E Mining Consultants Inc.
2. This certificate applies to the technical report titled "Updated Resource Estimate and Preliminary Economic Assessment on the Ootsa Property British Columbia, Canada", (the "Technical Report") with an effective date of January 1, 2016.
3. I am a graduate of the University of British Columbia with a Honours Bachelor of Science degree in Geological Sciences (1977), and a Masters of Science degree in Regional Resource Planning (1985), and a graduate of University of Ottawa with a Masters of Science degree in Exploration Geochemistry (1993). I have worked as a geologist, senior project manager, and permitting manager for a total of 35 years since obtaining my B.Sc. degree. I am a geological consultant currently licensed by the Association of Professional Engineers and Geoscientists of British Columbia (License No 19824).

   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.

   My relevant experience for the purpose of the Technical Report is:

   Exploration Geologist, Texasgulf Inc and Kidd Creek Mines.....1975-1981
   Land Use Geologist, BC Ministry of Energy, Mines and Petroleum.....1981-1984
   Regional Survey Geochemist, Geological Survey of Canada.....1985-1989
   Senior Land-Use Geologist, BC Ministry of Energy and Mines, & Economic Development.....1989-2005
   Senior Project Manager, Rescan Environmental / ERM Consultants Canada.....2005-Present

4. I have not visited the Property that is the subject of this report.
5. I am responsible for authoring Section 20 and coauthoring Sections 25 and 26 of the Technical Report along with those sections of the Summary pertaining thereto.
6. I am independent of the Issuer applying the test in Section 1.5 of NI 43-101.
7. I have had no prior involvement with the Property that is the subject of this Technical Report.
8. I have read NI 43-101 and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.
9. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: January 1, 2016
Signed Date: March 23, 2016

{SIGNED AND SEALED}
[Harold Rolf Schmitt]

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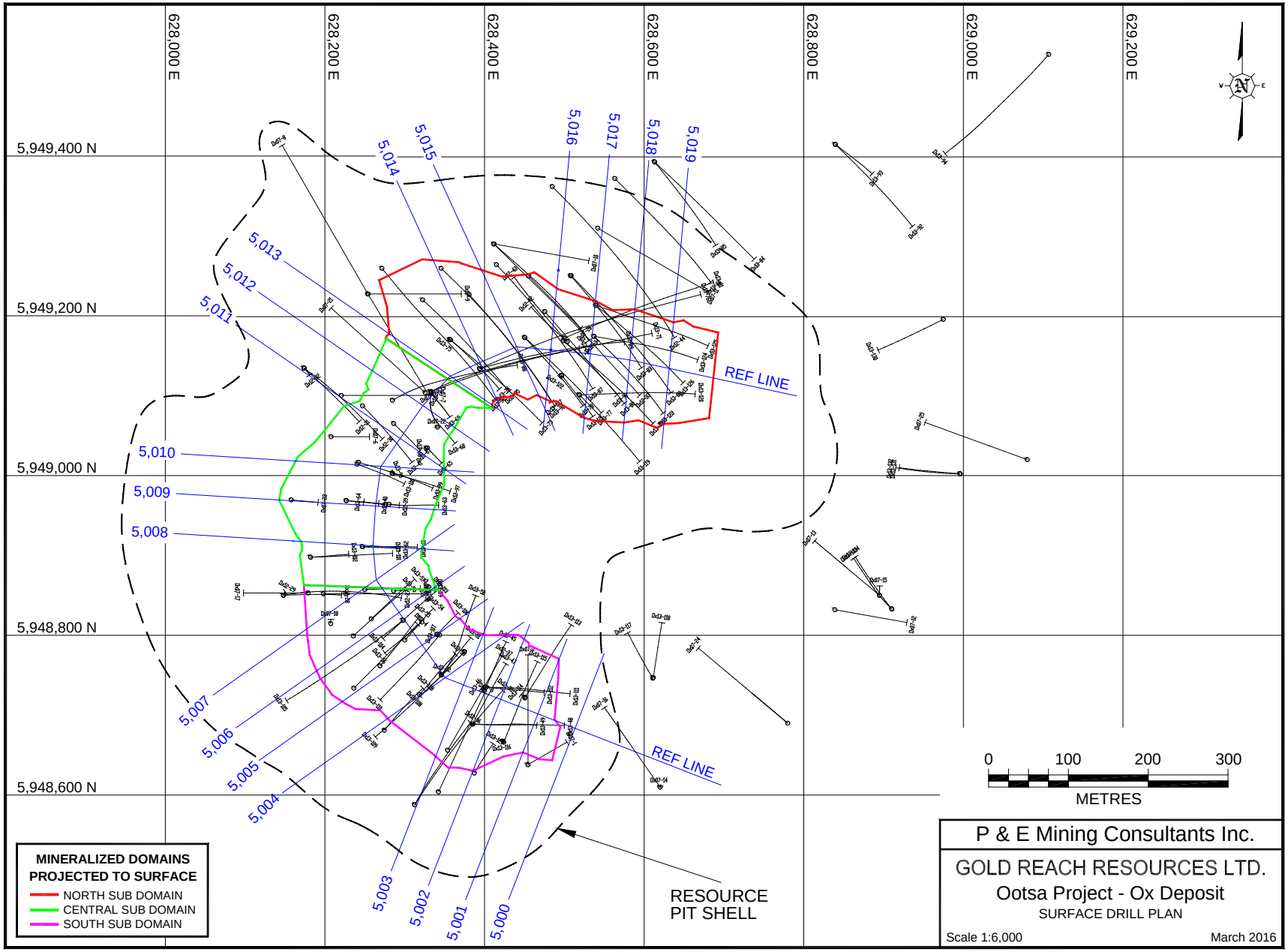
Rolf Schmitt, P.Geo.

APPENDIX I. SURFACE DRILL HOLE PLANS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REF LINE
REF LINE
RESOURCE
PIT SHELL
MINERALIZED DOMAINS
PROJECTED TO SURFACE
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
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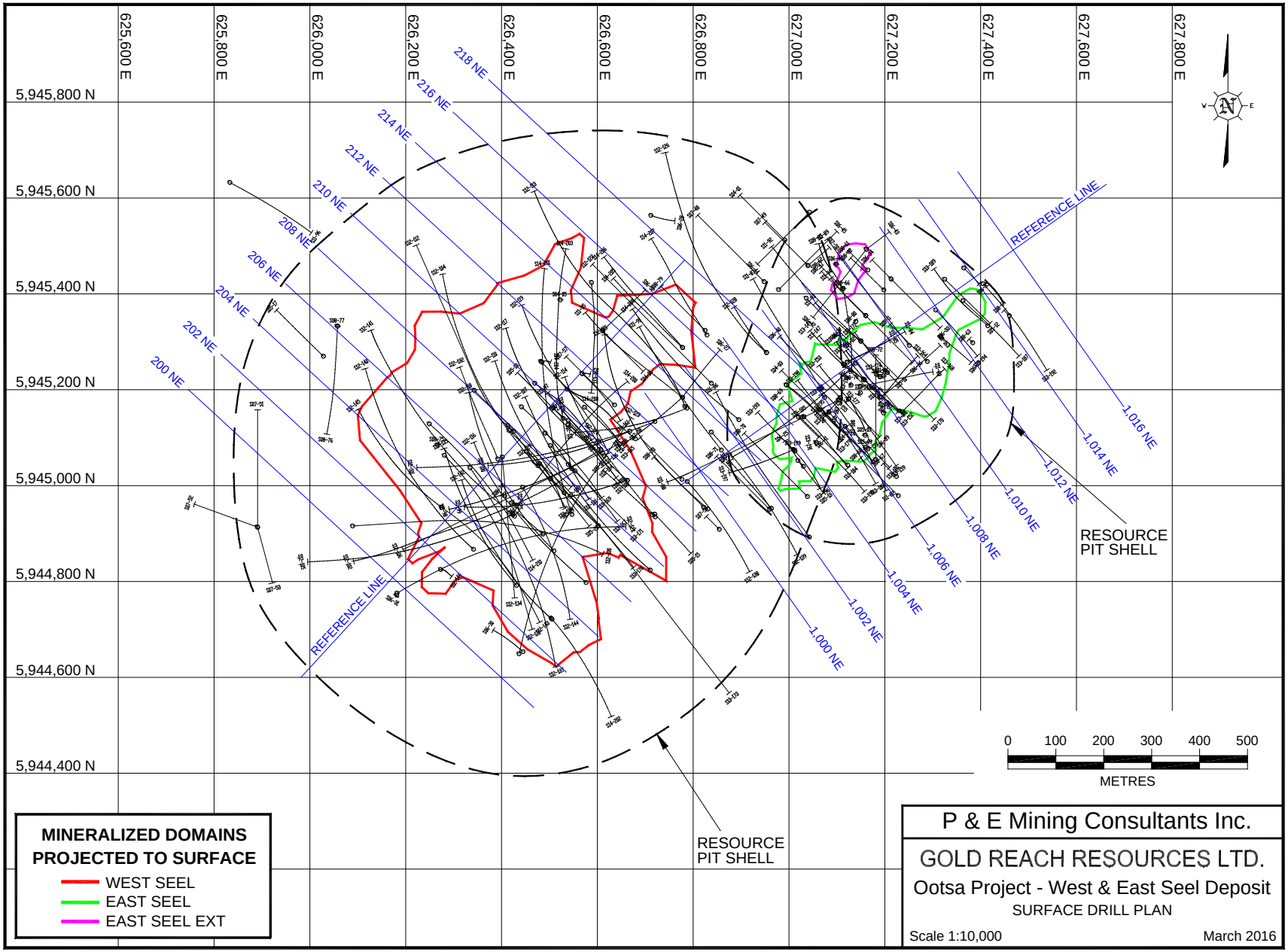
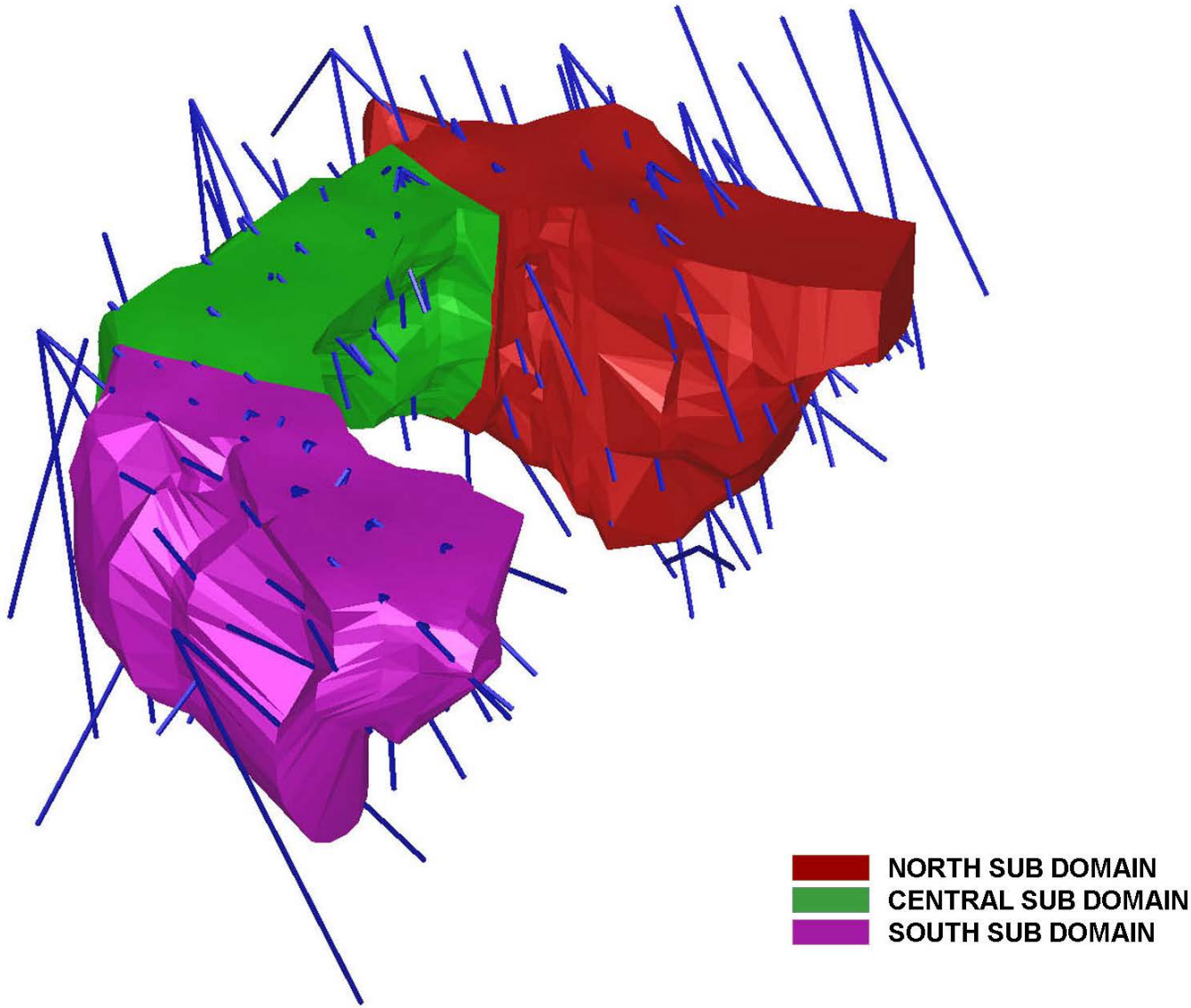
METRES
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
SURFACE DRILL PLAN
Scale 1:6,000
March 2016

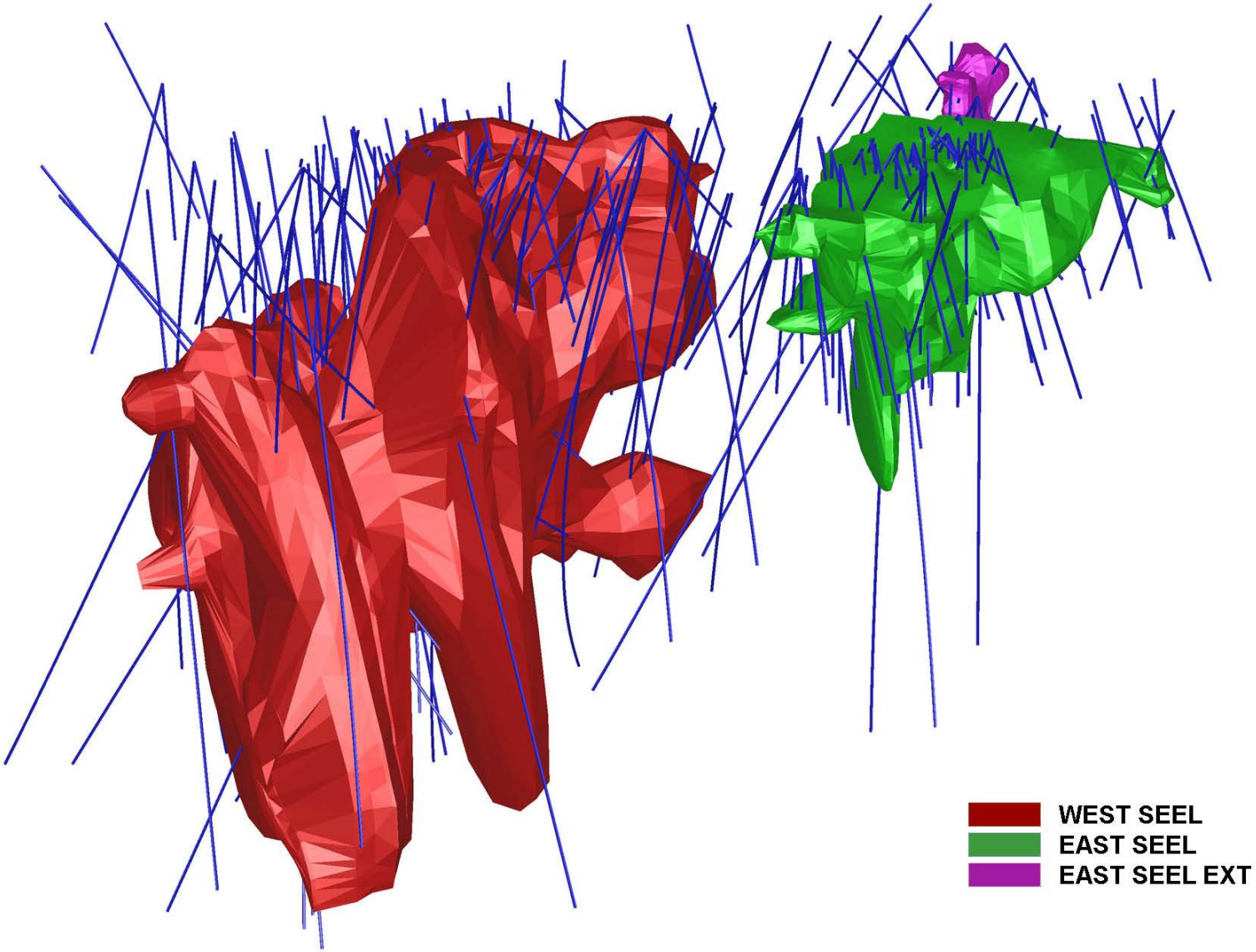

625,600 E
625,800 E
626,000 E
626,200 E
626,400 E
626,600 E
626,800 E
627,000 E
627,200 E
627,400 E
627,600 E
627,800 E
5,945,800 N
5,945,600 N
5,945,400 N
5,945,200 N
5,945,000 N
5,944,800 N
5,944,600 N
5,944,400 N
218 NE
216 NE
214 NE
212 NE
210 NE
208 NE
206 NE
204 NE
202 NE
200 NE
REFERENCE LINE
1,016 NE
1,014 NE
1,012 NE
1,010 NE
1,008 NE
1,006 NE
1,004 NE
1,002 NE
1,000 NE
REFERENCE LINE
RESOURCE PIT SHELL
RESOURCE PIT SHELL
0 100 200 300 400 500
METRES
MINERALIZED DOMAINS PROJECTED TO SURFACE
WEST SEEL
EAST SEEL
EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - West & East Seel Deposit
SURFACE DRILL PLAN
Scale 1:10,000
March 2016

APPENDIX II. 3D DOMAINS

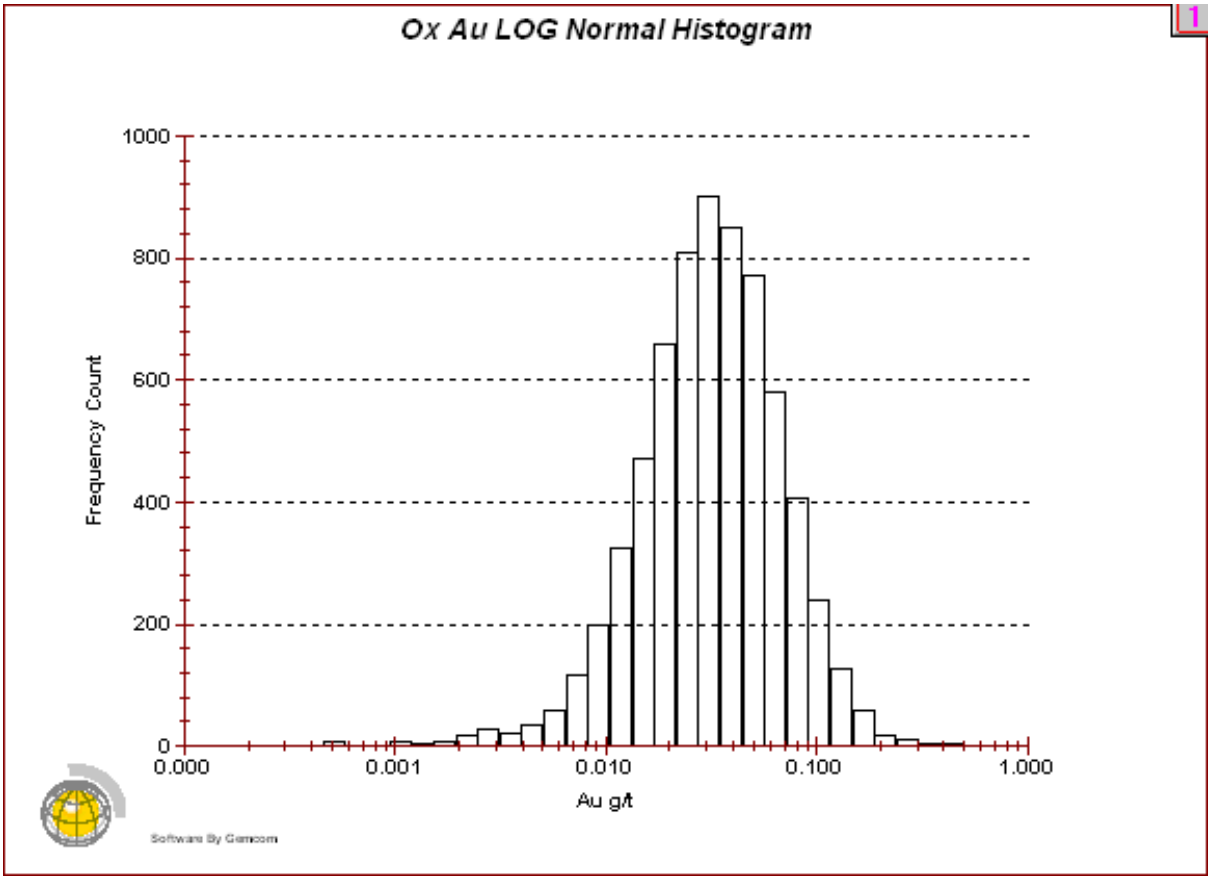
OOTSA PROJECT - OX DEPOSIT - 3D DOMAINS

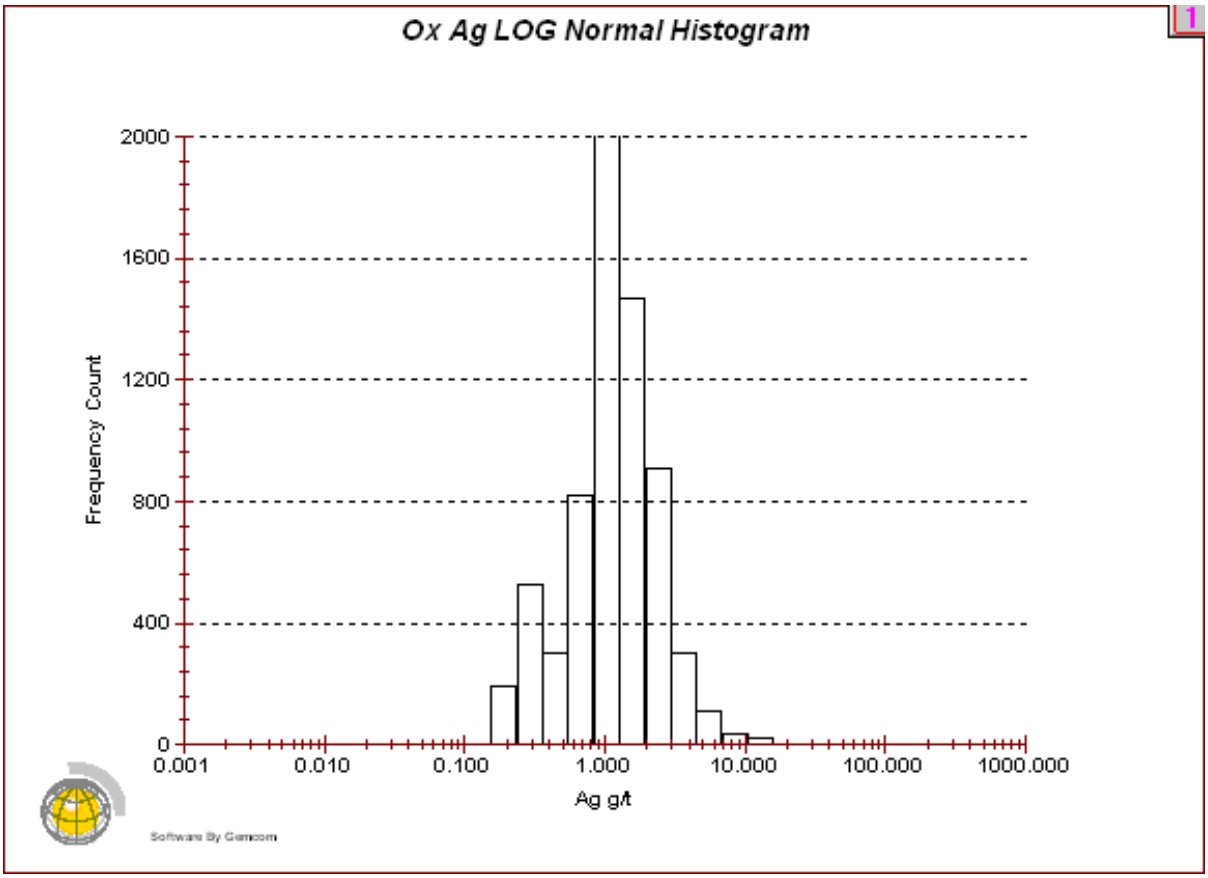


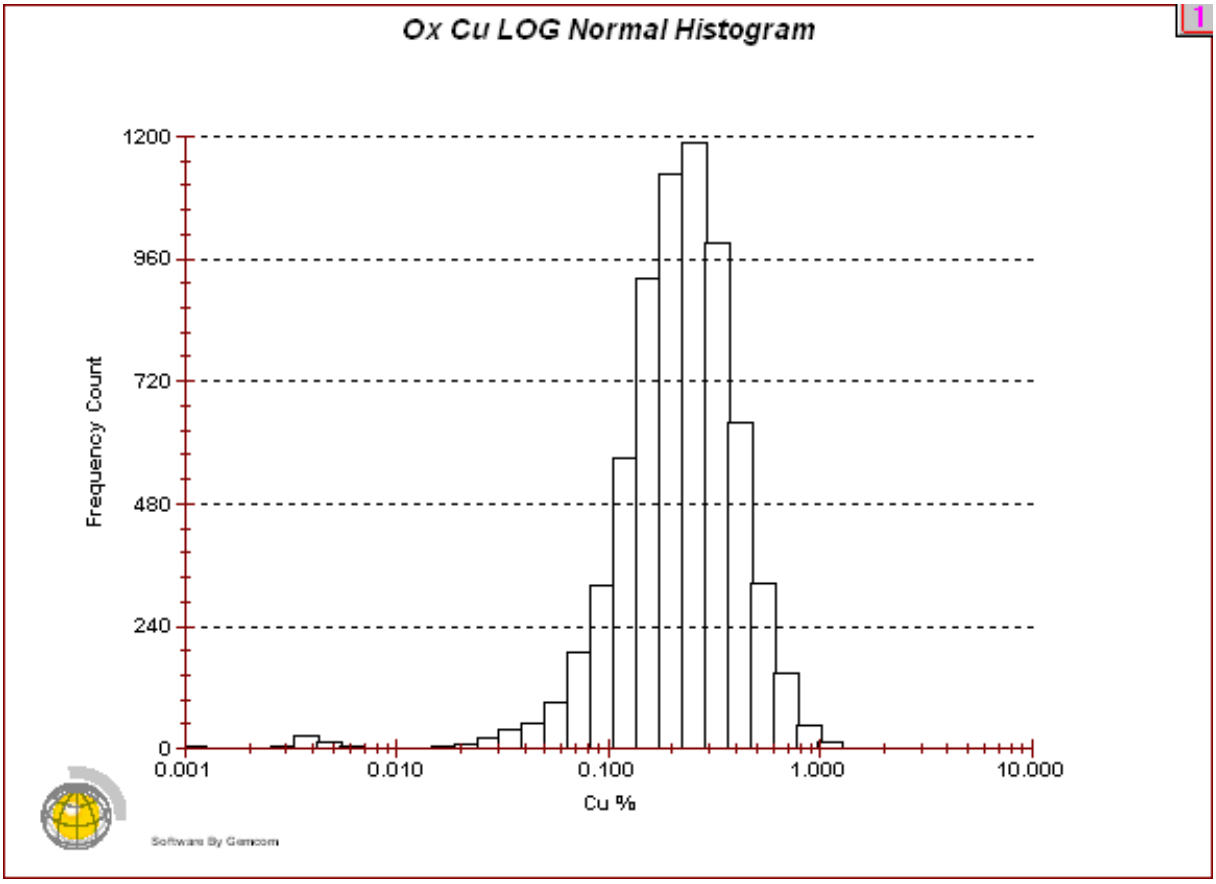
OOTSA PROJECT - WEST & EAST SEEL DEPOSITS
3D DOMAINS

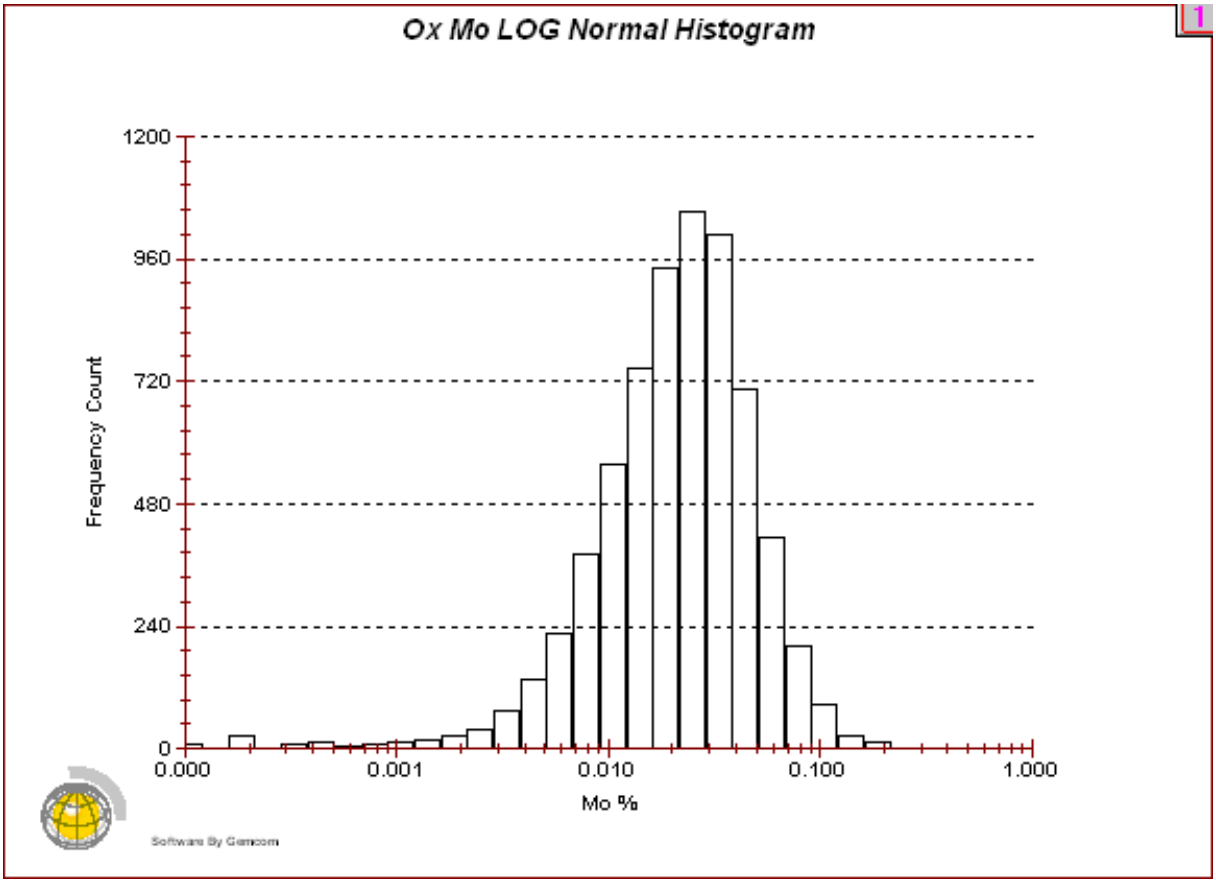


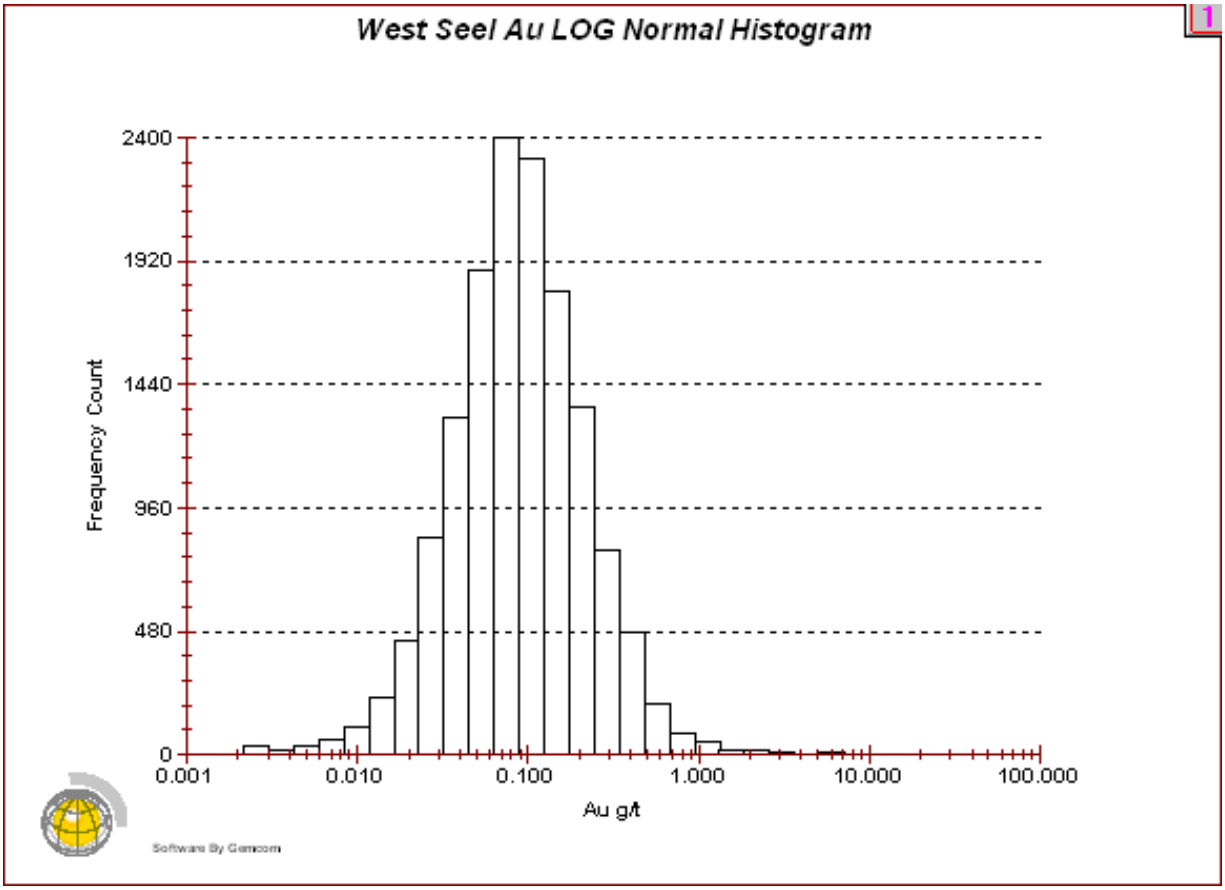
APPENDIX III. LOG NORMAL HISTOGRAMS

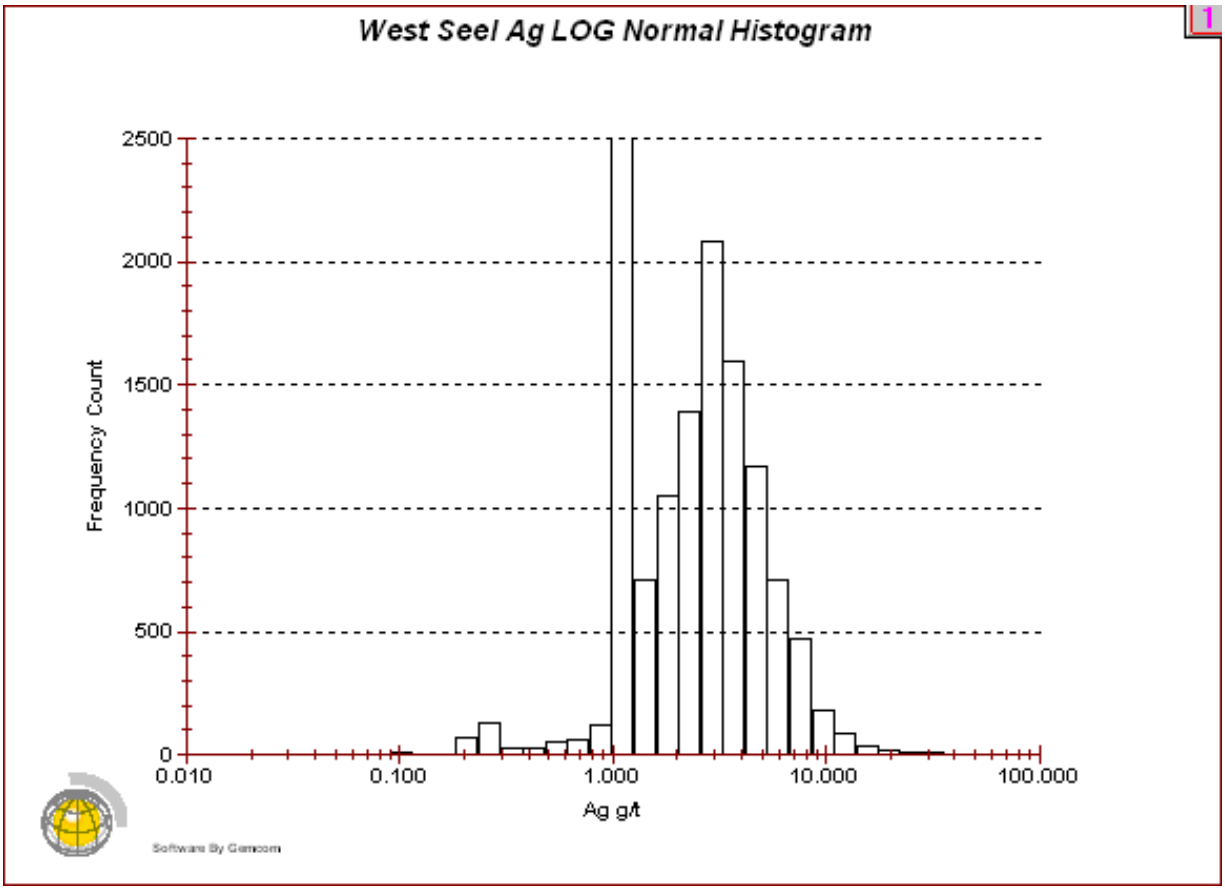

Ox Au LOG Normal Histogram
1
Frequency Count
1000
800
600
400
200
0
0.000
0.001
0.010
0.100
1.000
Au g/t
Software By Gemcom

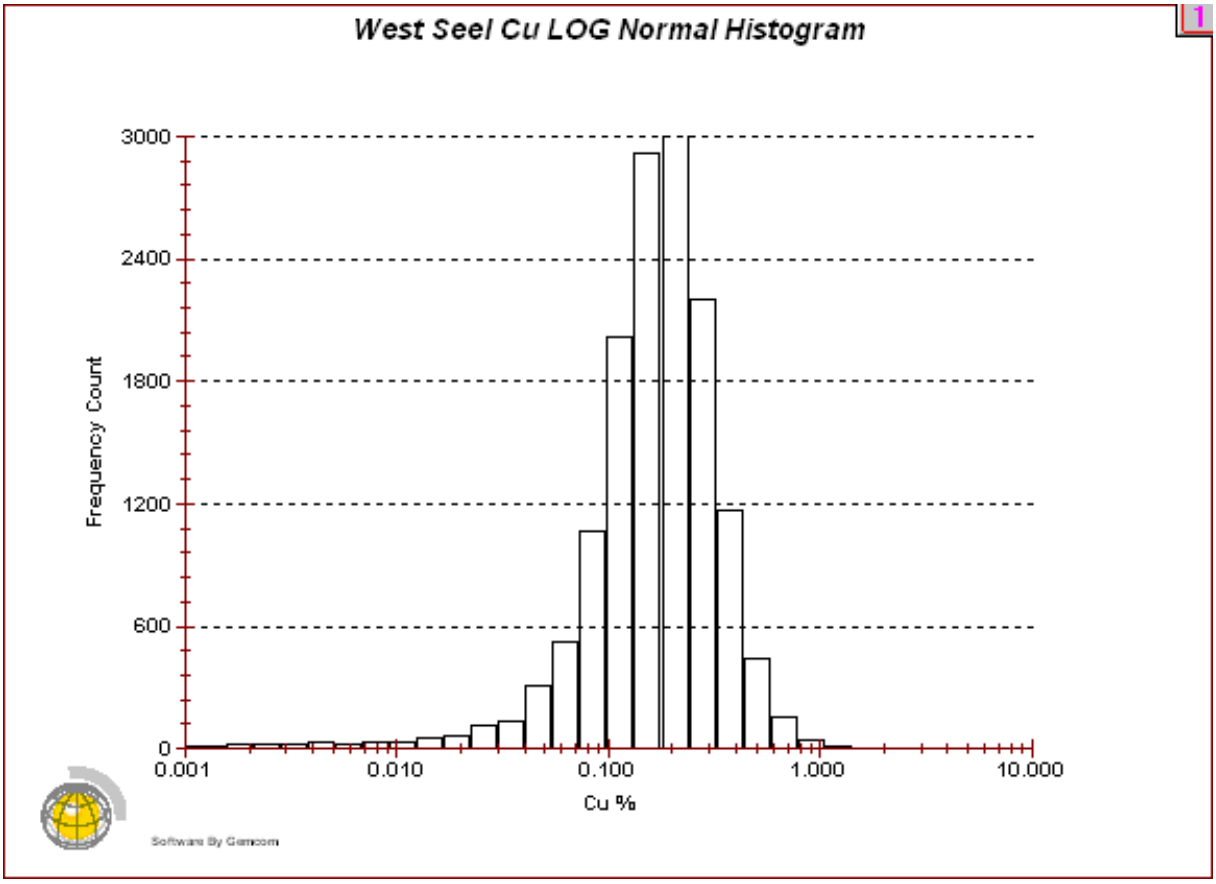

Ox Ag LOG Normal Histogram
1
Frequency Count
2000
1600
1200
800
400
0
0.001
0.010
0.100
1.000
10.000
100.000
1000.000
Ag g/t
Software By Gemcom

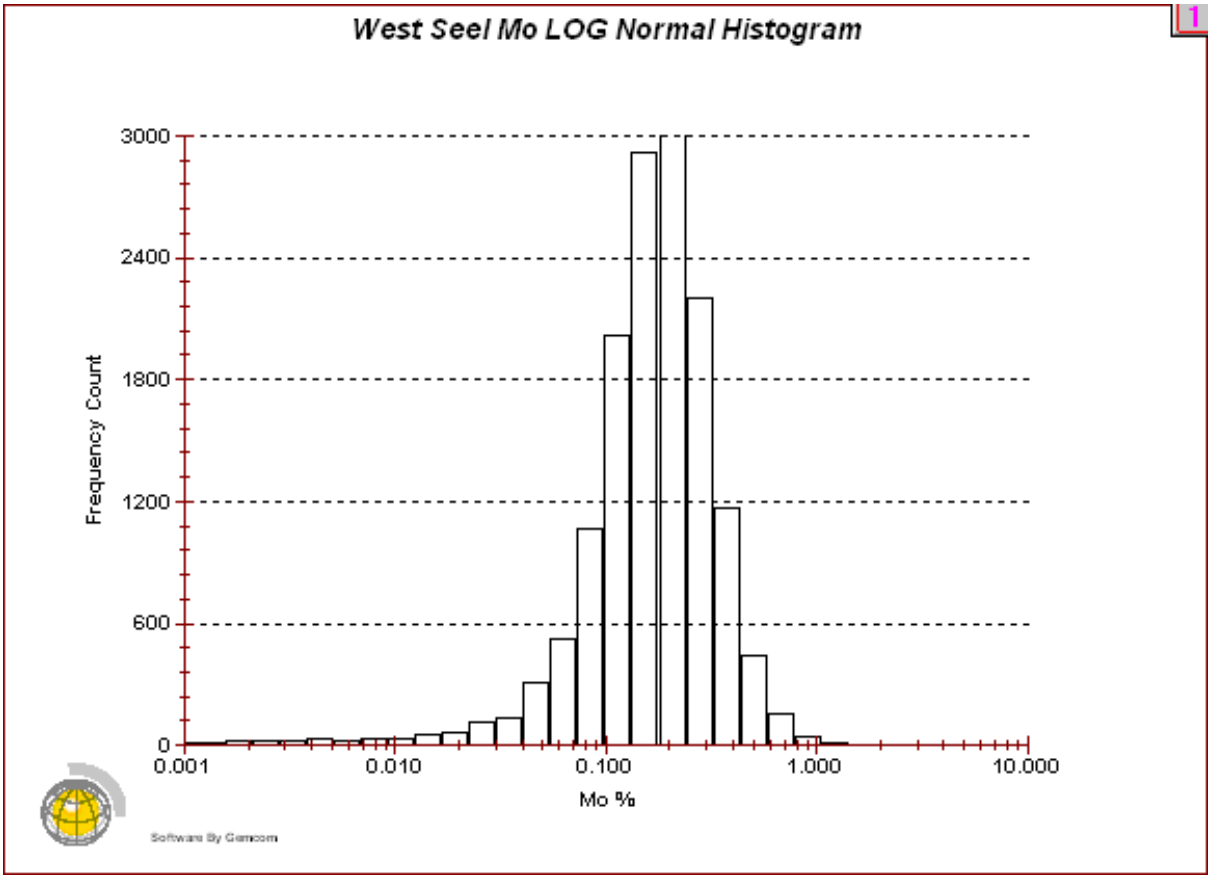

Ox Cu LOG Normal Histogram
1
1200
960
720
480
240
0
Frequency Count
0.001
0.010
0.100
1.000
10.000
Cu %
Software By Geocom

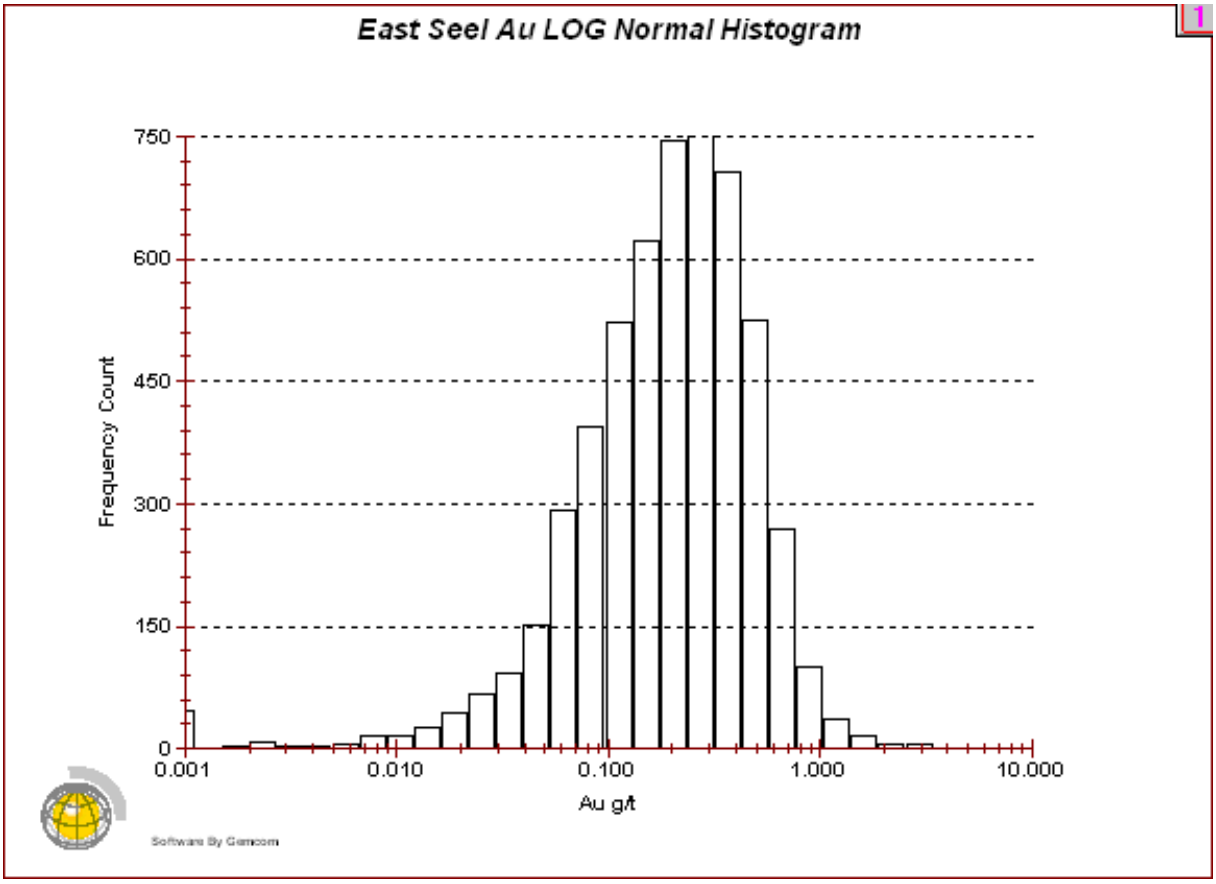

Ox Mo LOG Normal Histogram
1
1200
960
720
480
240
0
Frequency Count
0.000
0.001
0.010
0.100
1.000
Mo %
Software By Geocom

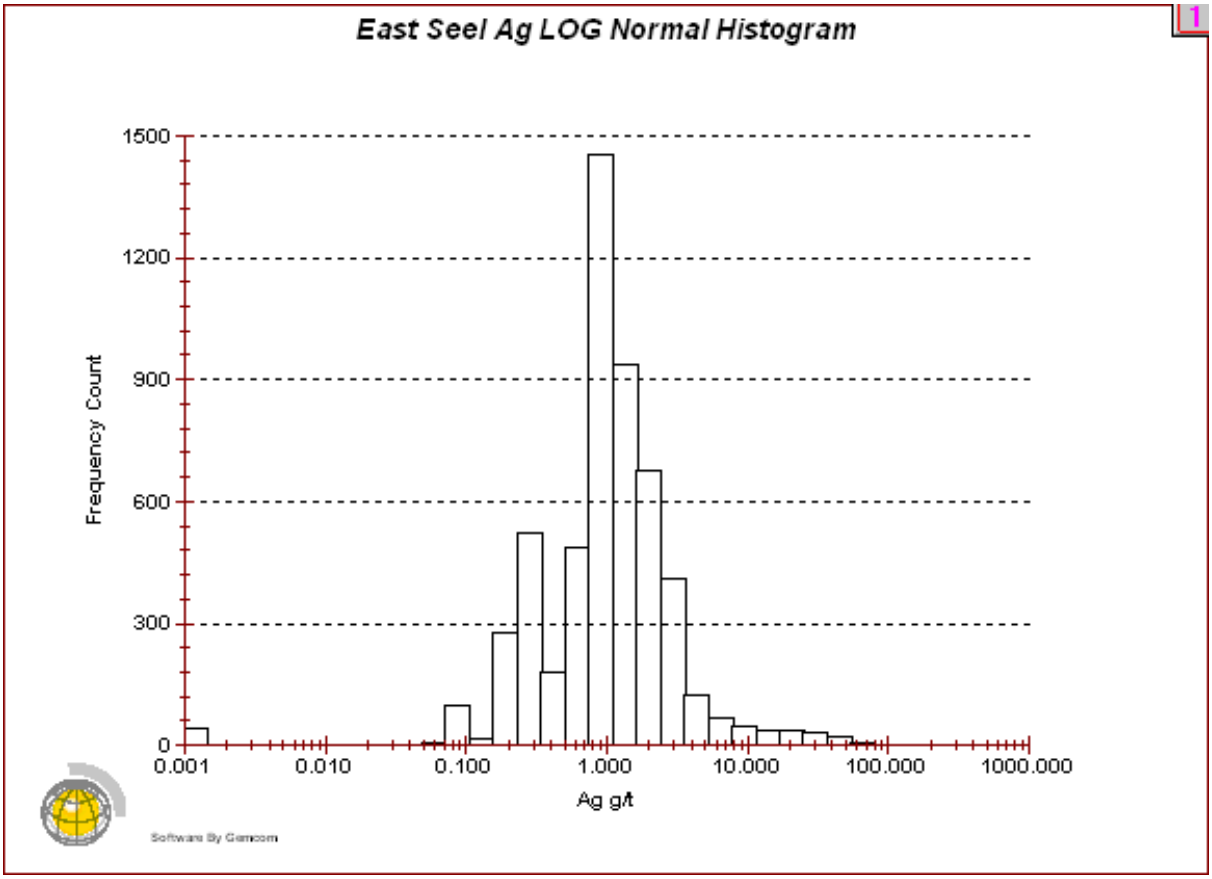

West Seel Au LOG Normal Histogram
1
2400
1920
1440
960
480
0
Frequency Count
0.001
0.010
0.100
1.000
10.000
100.000
Au g/t
Software By Gemcom

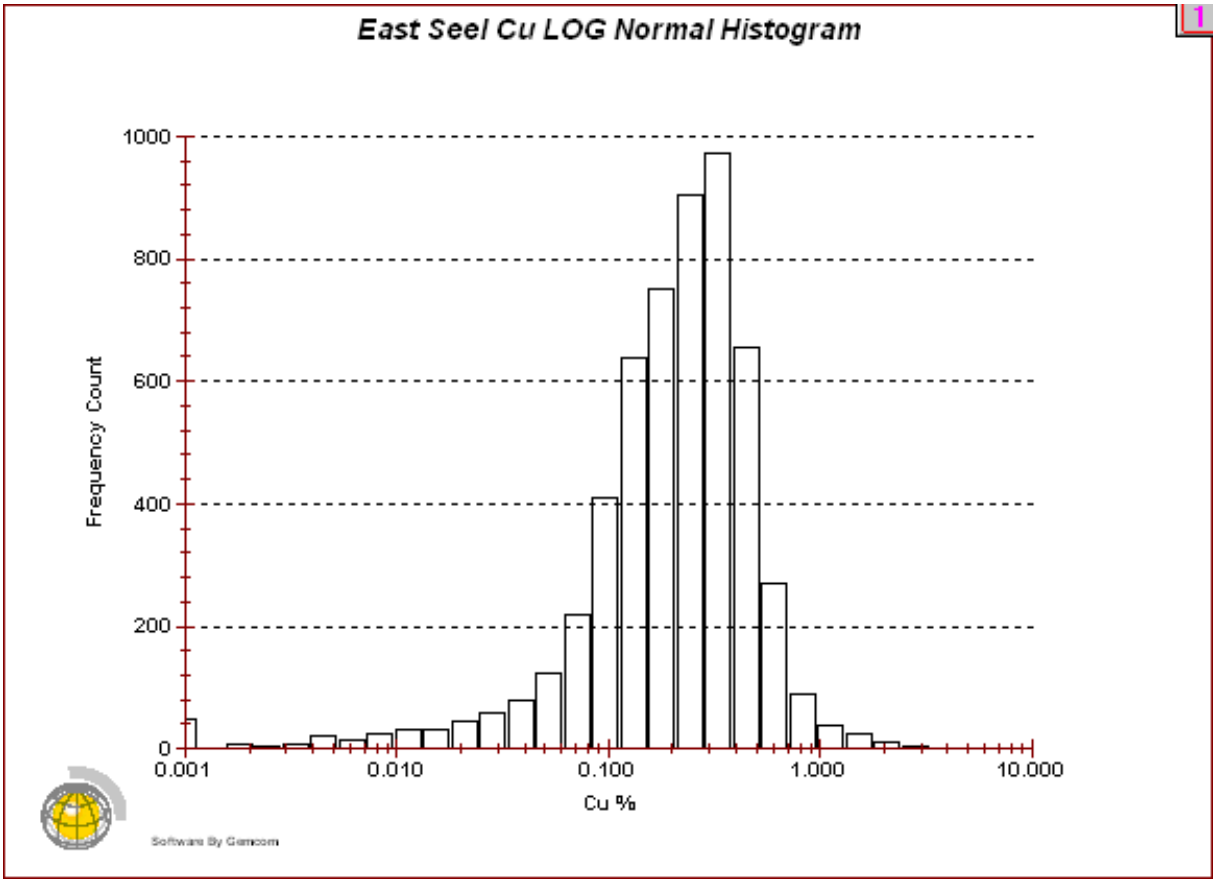

West Seel Ag LOG Normal Histogram
1
2500
2000
1500
1000
500
0
Frequency Count
0.010
0.100
1.000
10.000
100.000
Ag g/t
Software By Gemcom

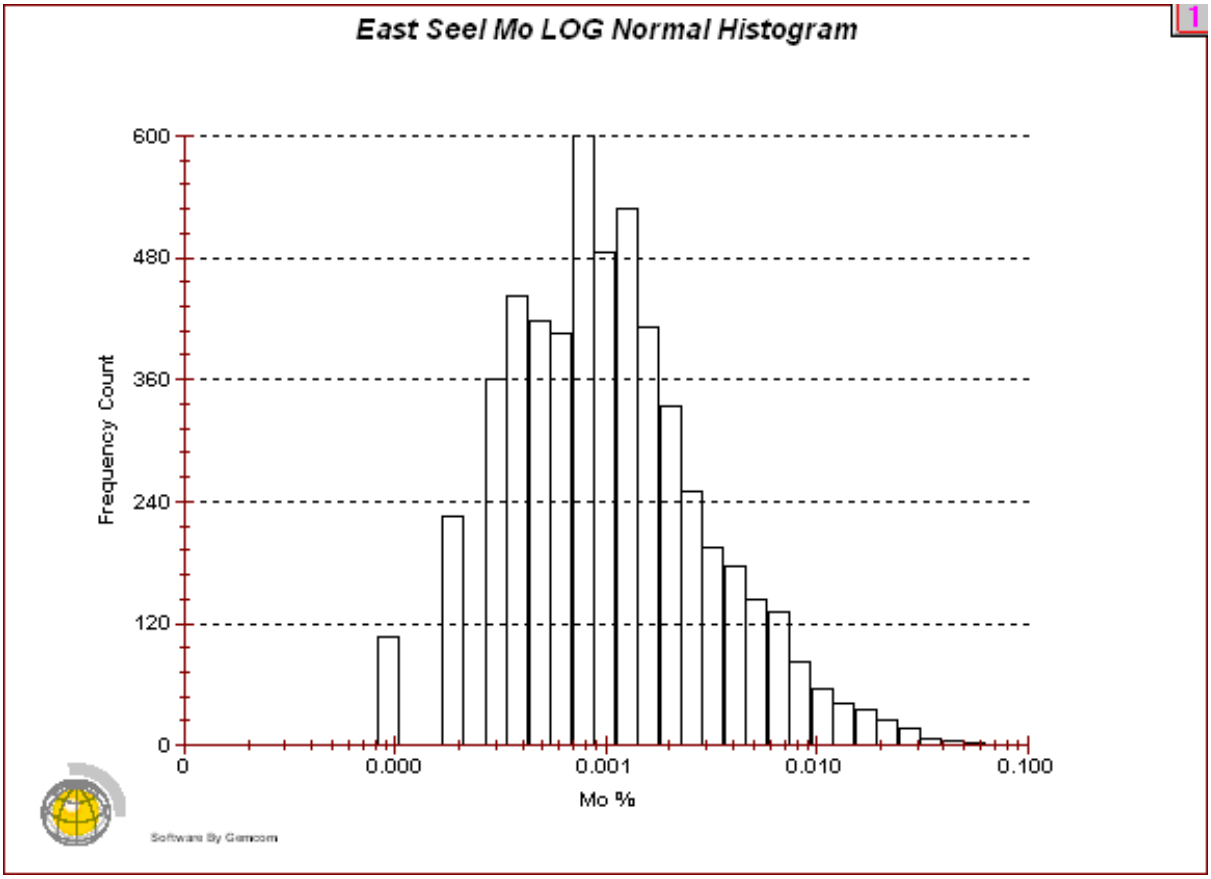

West Seel Cu LOG Normal Histogram
1
3000
2400
1800
1200
600
0
Frequency Count
0.001
0.010
0.100
1.000
10.000
Cu %
Software By Gemcom


West Seel Mo LOG Normal Histogram
1
3000
2400
1800
1200
600
0
Frequency Count
0.001
0.010
0.100
1.000
10.000
Mo %
Software By Gemcom

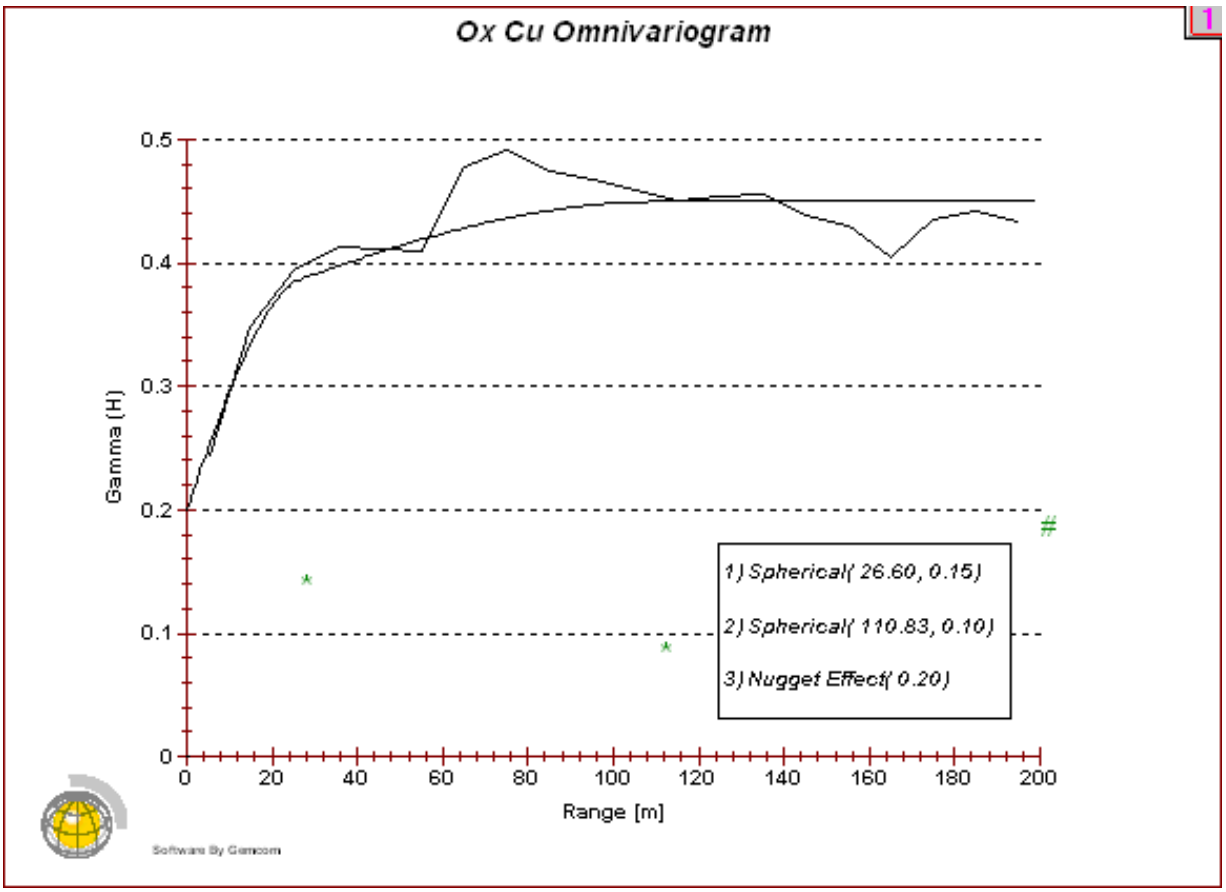

East Seel Au LOG Normal Histogram
1
750
600
450
300
150
0
Frequency Count
0.001
0.010
0.100
1.000
10.000
Au g/t
Software By Gemcom

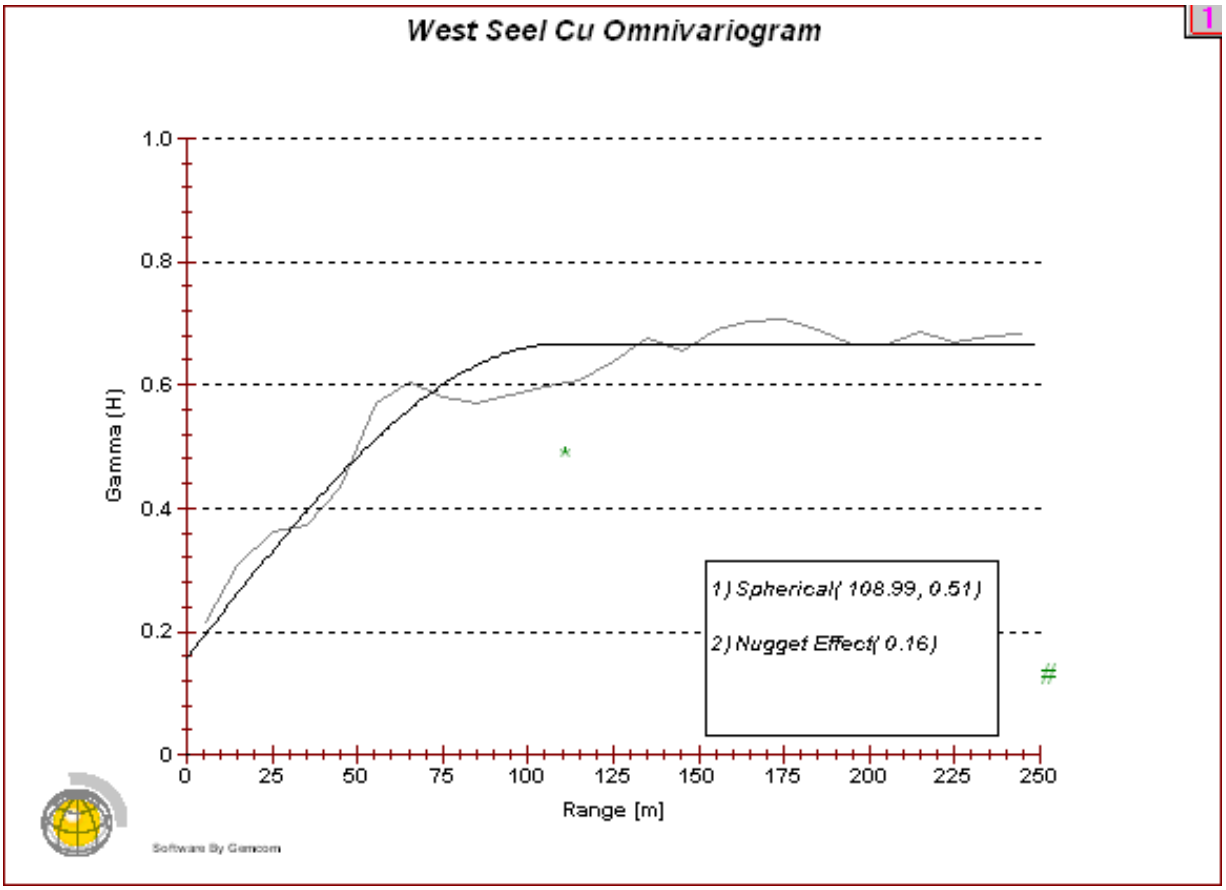

East Seel Ag LOG Normal Histogram
1
1500
1200
900
600
300
0
Frequency Count
0.001
0.010
0.100
1.000
10.000
100.000
1000.000
Ag g/t
Software By Gemcom

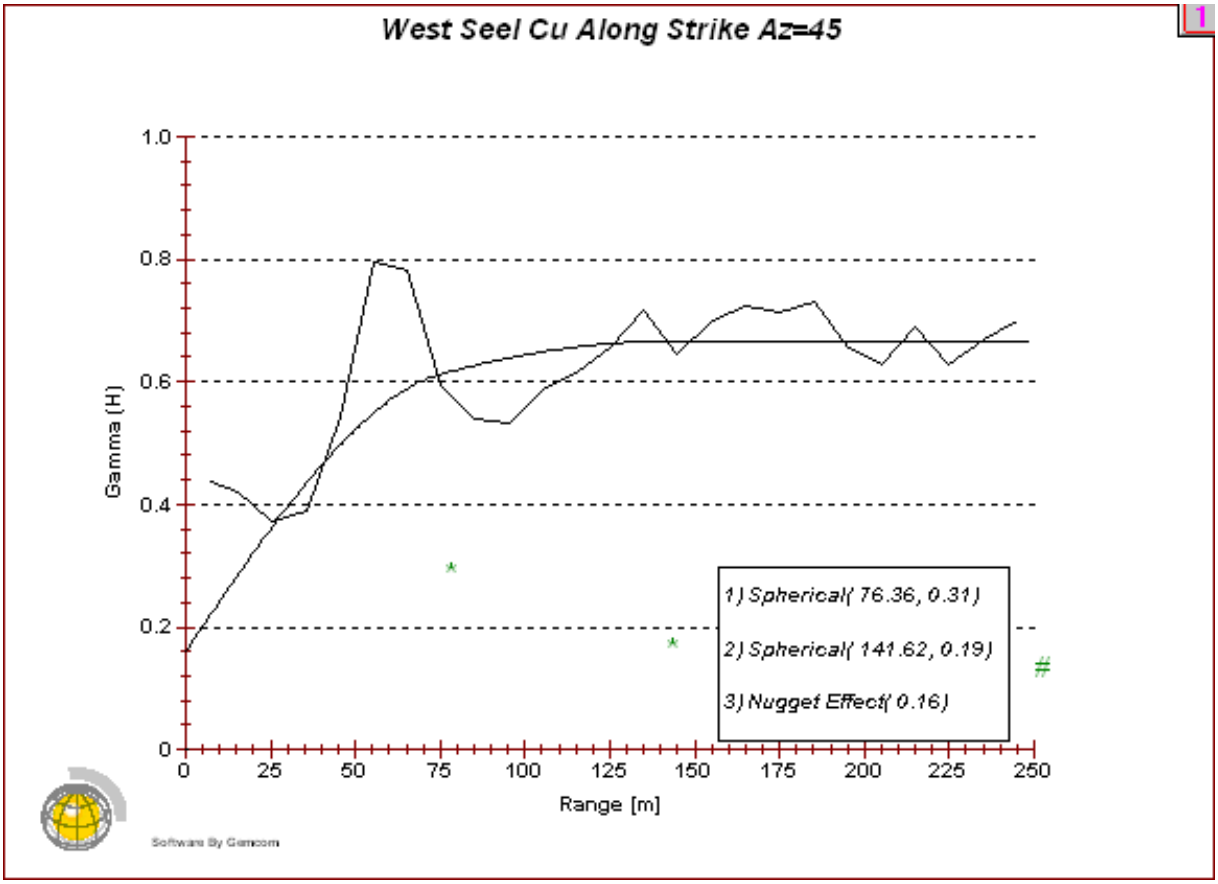

East Seel Cu LOG Normal Histogram
1
Frequency Count
1000
800
600
400
200
0
0.001
0.010
0.100
1.000
10.000
Cu %
Software By Gemcom

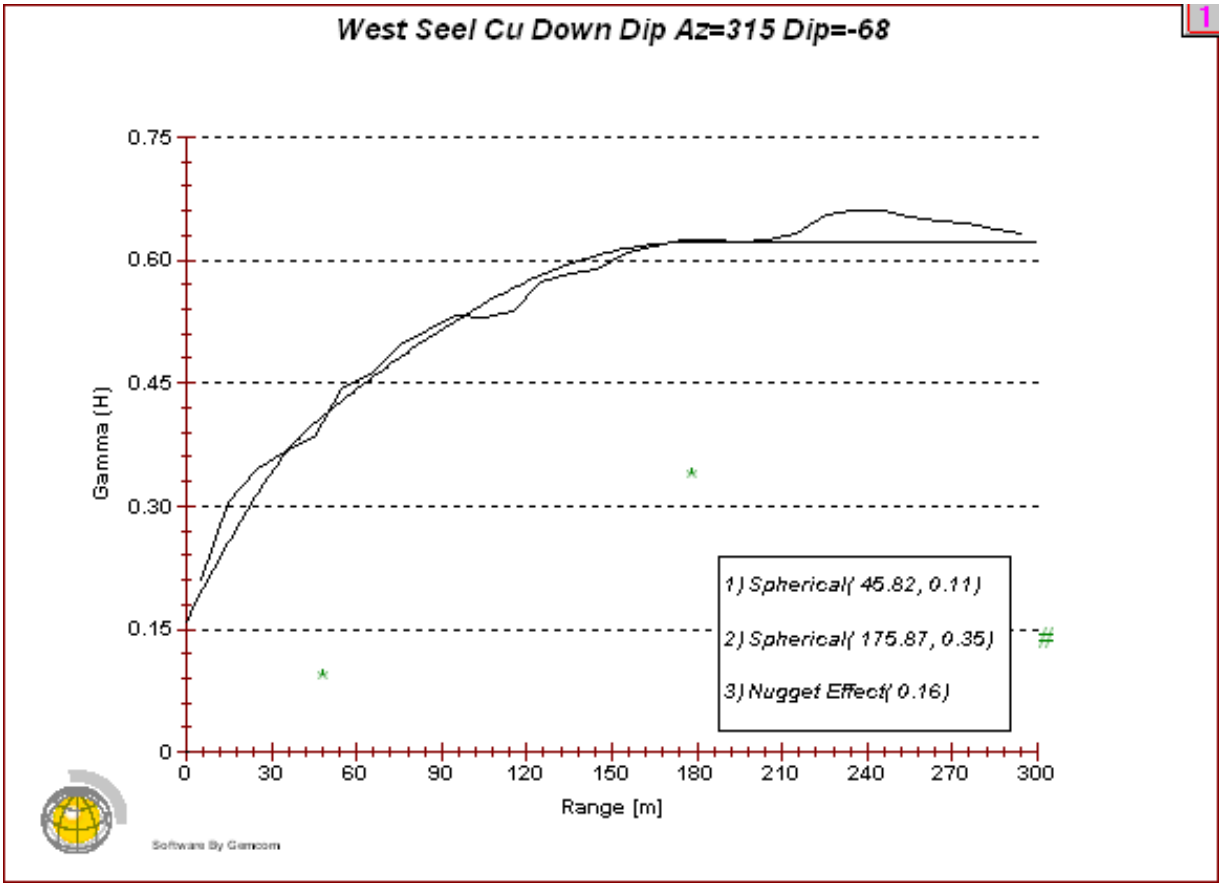

East Seel Mo LOG Normal Histogram
1
Frequency Count
600
480
360
240
120
0
0
0.000
0.001
0.010
0.100
Mo %
Software By Gemcom

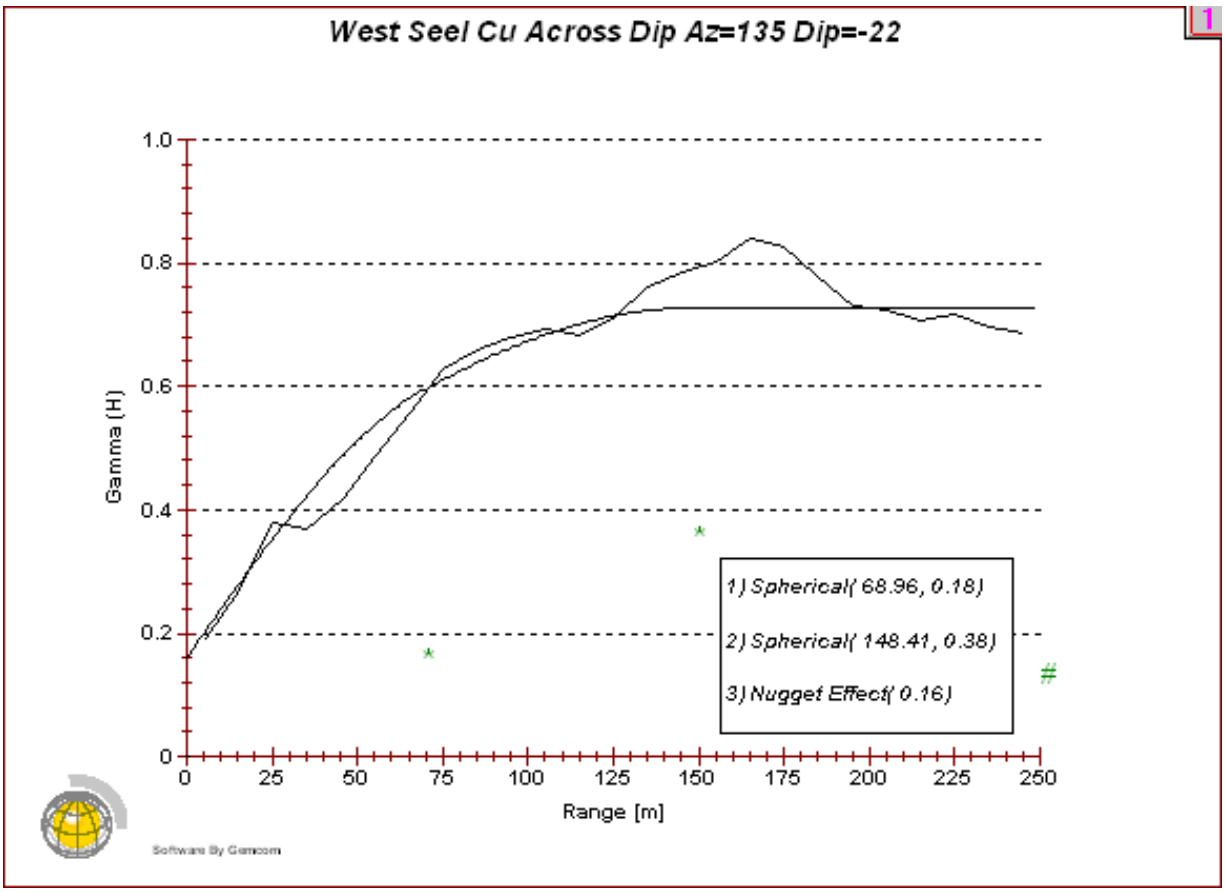
APPENDIX IV. CU VARIOGRAMS

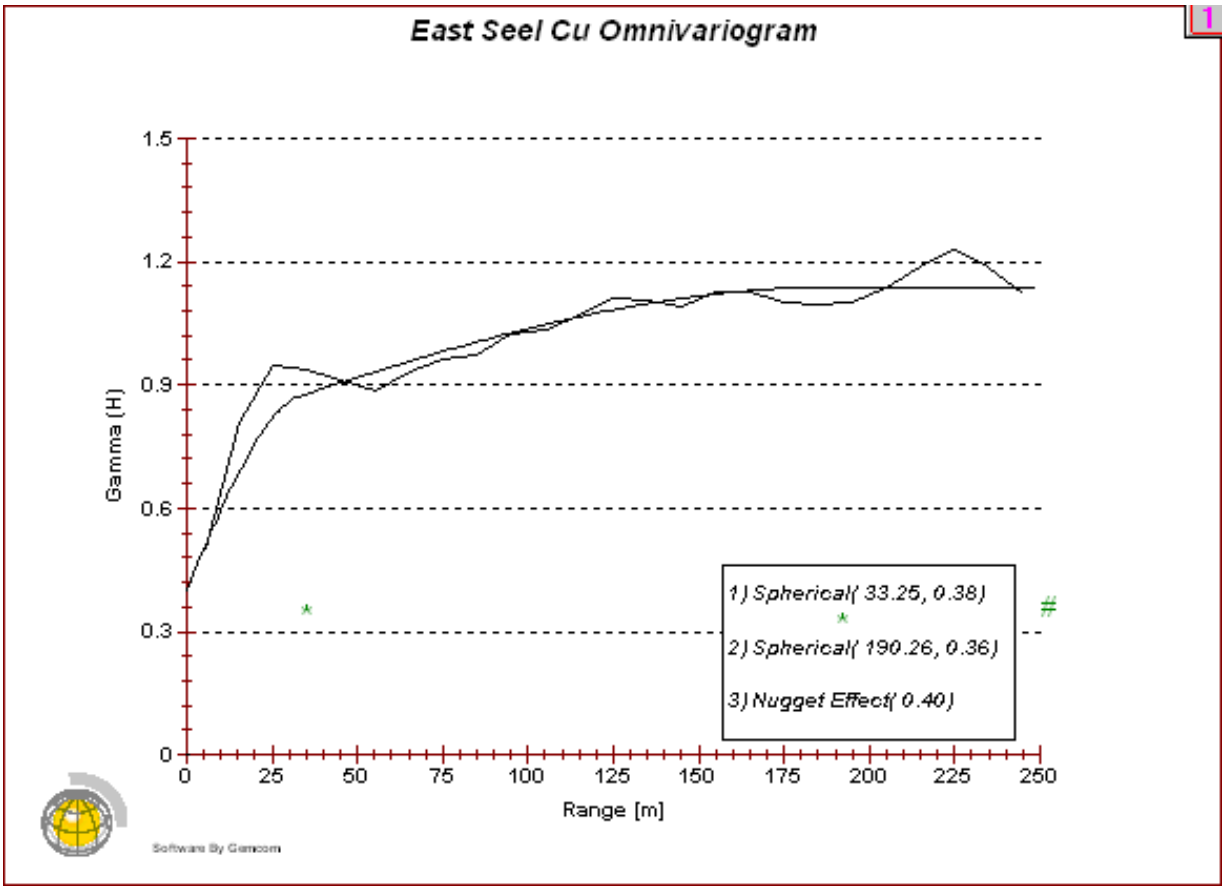

Ox Cu Omnivariogram
Gamma (H)
Range [m]
1) Spherical(26.60, 0.15)
2) Spherical(110.83, 0.10)
3) Nugget Effect(0.20)
Software By Gemcom

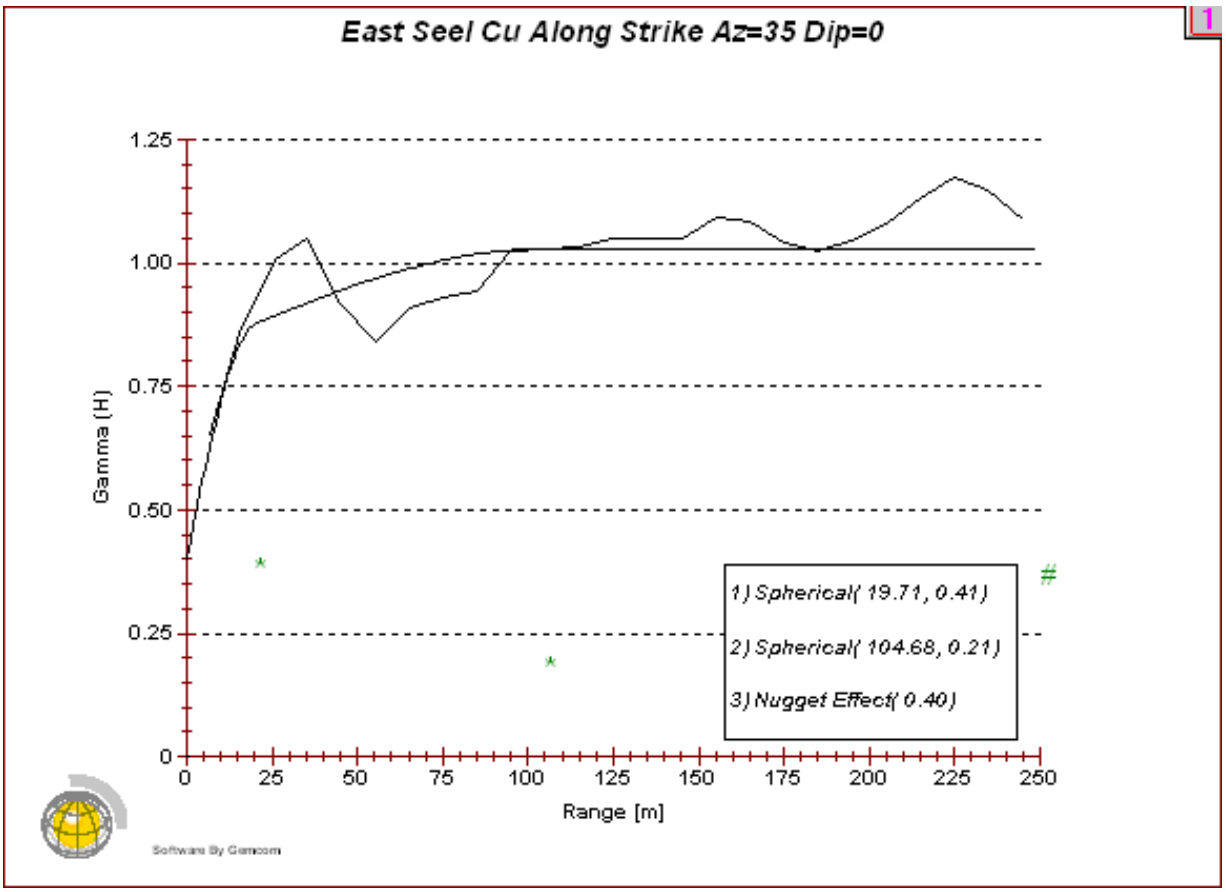

West Seel Cu Omnivariogram
Gamma (H)
Range [m]
1) Spherical(108.99, 0.51)
2) Nugget Effect(0.16)
Software By Gemcom

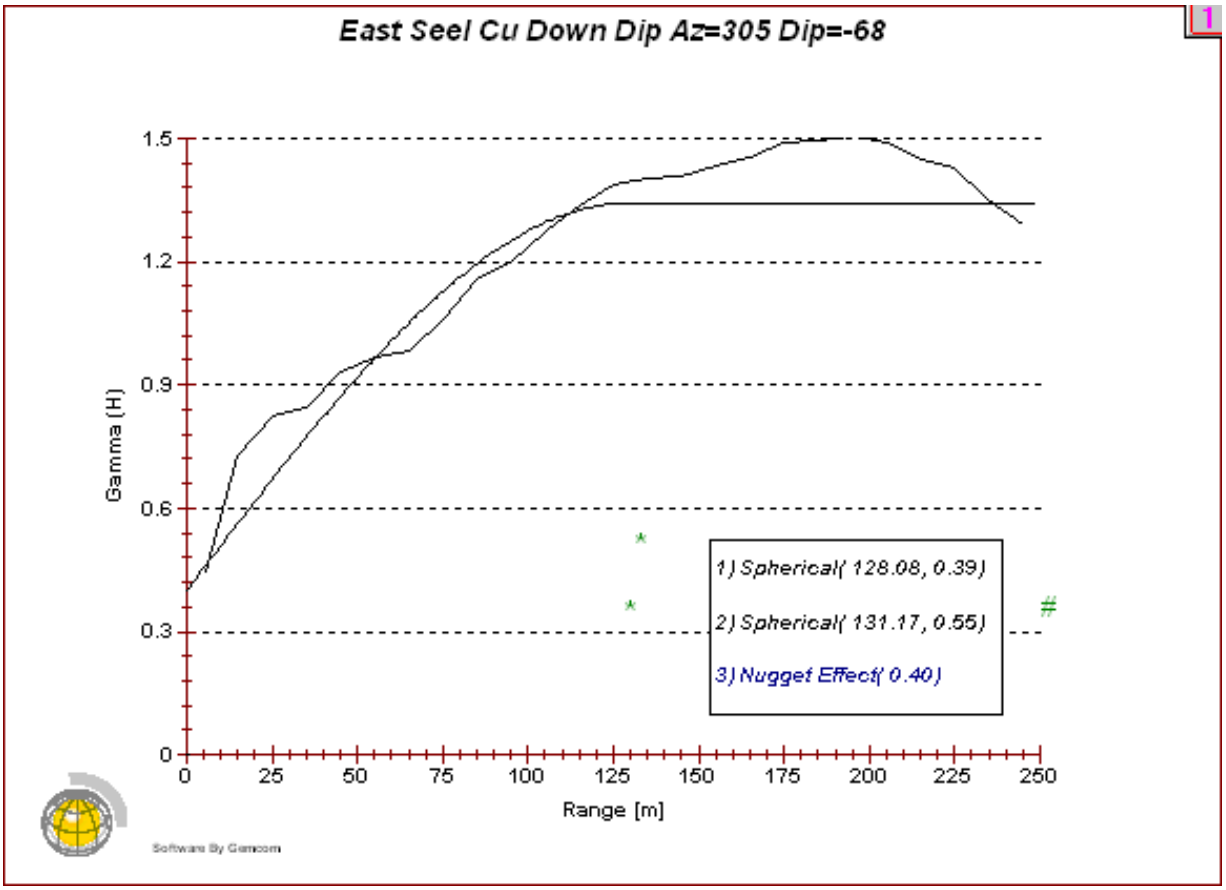

West Seel Cu Along Strike Az=45
1
Gamma (H)
1.0
0.8
0.6
0.4
0.2
0
0
25
50
75
100
125
150
175
200
225
250
Range [m]
1) Spherical(76.36, 0.31)
2) Spherical(141.62, 0.19)
3) Nugget Effect(0.16)
Software By Gemcom

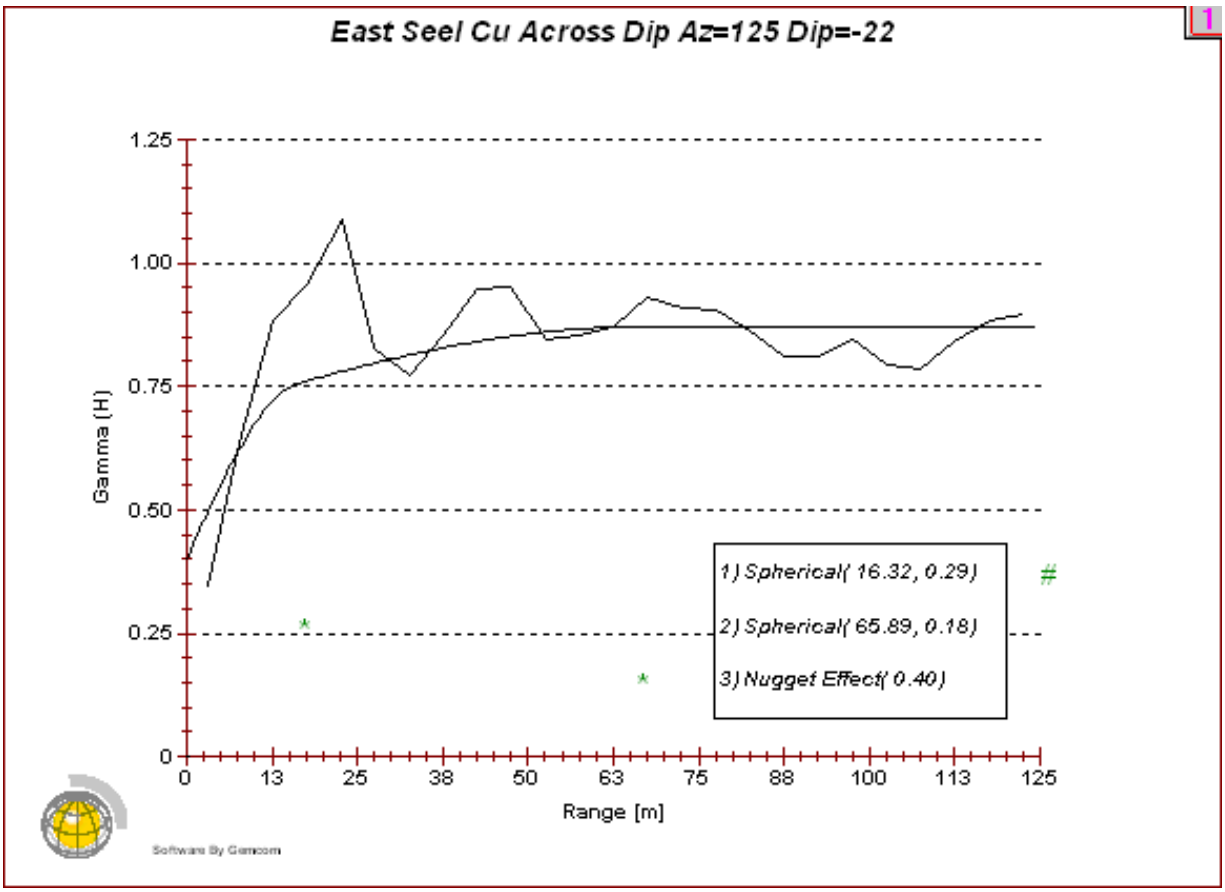

West Seel Cu Down Dip Az=315 Dip=-68
1
Gamma (H)
0.75
0.60
0.45
0.30
0.15
0
0
30
60
90
120
150
180
210
240
270
300
Range [m]
1) Spherical(45.82, 0.11)
2) Spherical(175.87, 0.35)
3) Nugget Effect(0.16)
Software By Gemcom


West Seel Cu Across Dip Az=135 Dip=-22
1
Gamma (H)
Range [m]
1.0
0.8
0.6
0.4
0.2
0
0
25
50
75
100
125
150
175
200
225
250
1) Spherical(68.96, 0.18)
2) Spherical(148.41, 0.38)
3) Nugget Effect(0.16)
Software By Gemcom

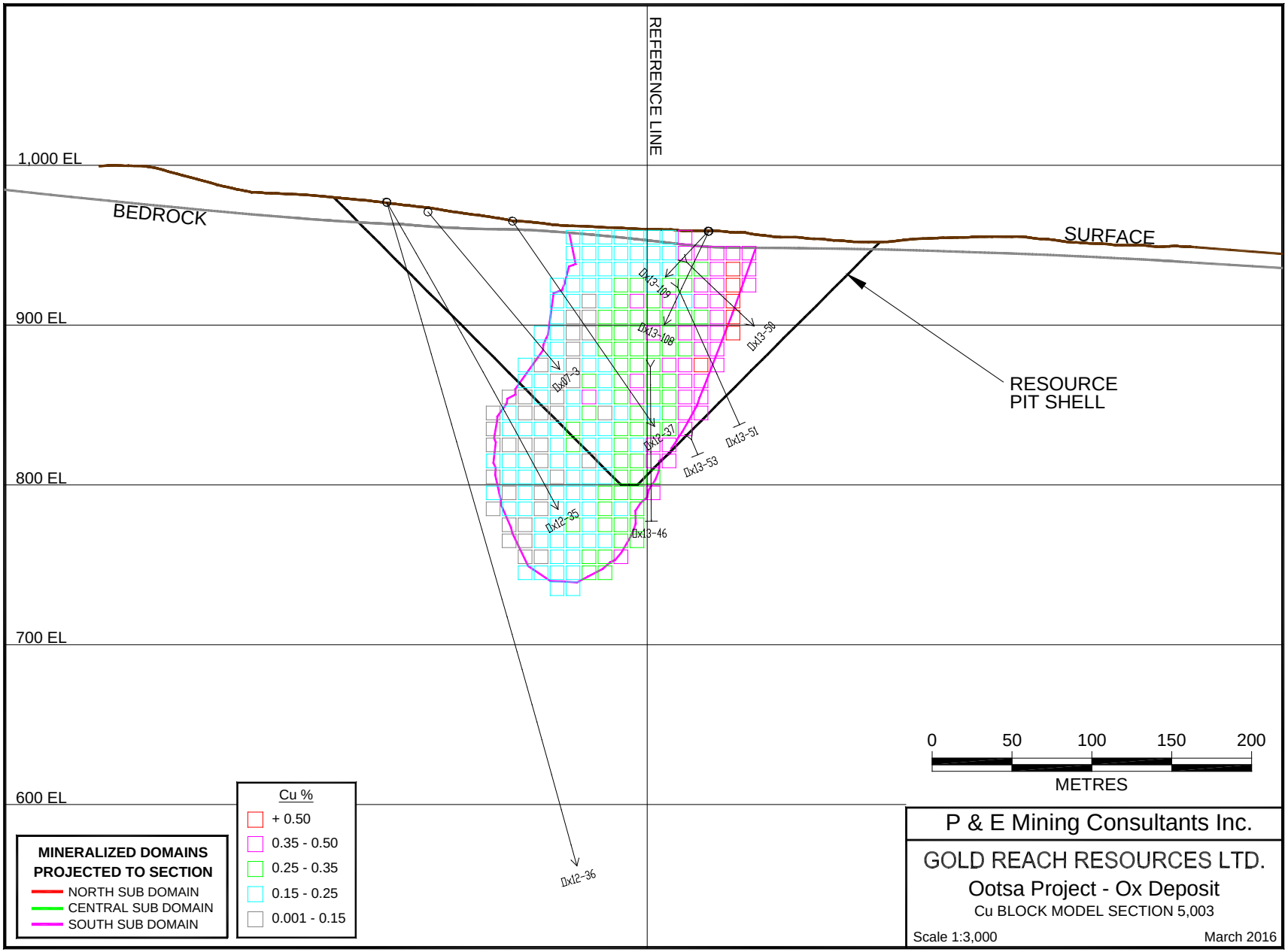

East Seel Cu Omnivariogram
1
Gamma (H)
Range [m]
1.5
1.2
0.9
0.6
0.3
0
0
25
50
75
100
125
150
175
200
225
250
1) Spherical(33.25, 0.38)
2) Spherical(190.26, 0.36)
3) Nugget Effect(0.40)
Software By Gemcom

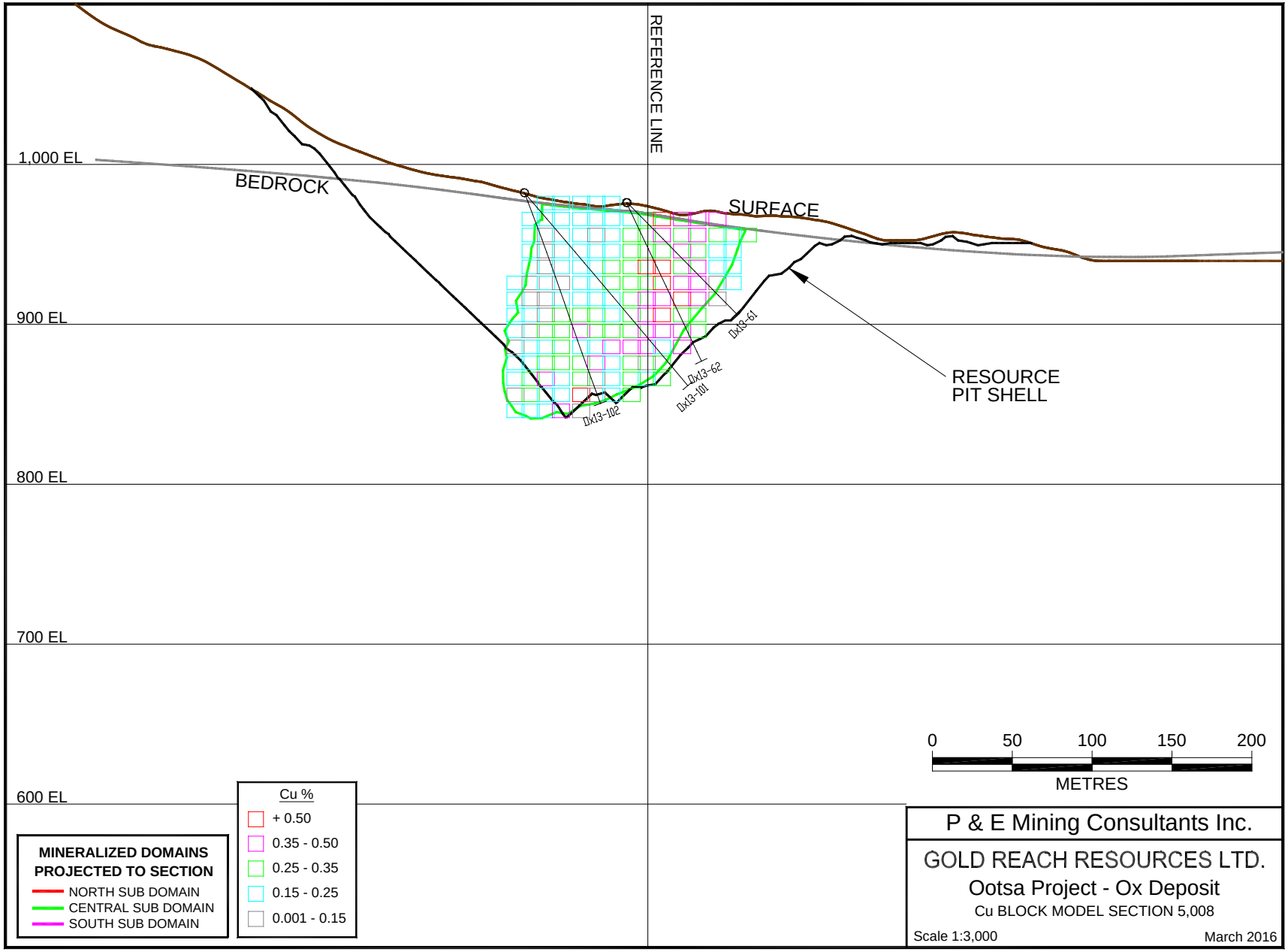

East Seel Cu Along Strike Az=35 Dip=0
1
Gamma (H)
1.25
1.00
0.75
0.50
0.25
0
0
25
50
75
100
125
150
175
200
225
250
Range [m]
1) Spherical(19.71, 0.41)
2) Spherical(104.68, 0.21)
3) Nugget Effect(0.40)
#
Software By Gemcom

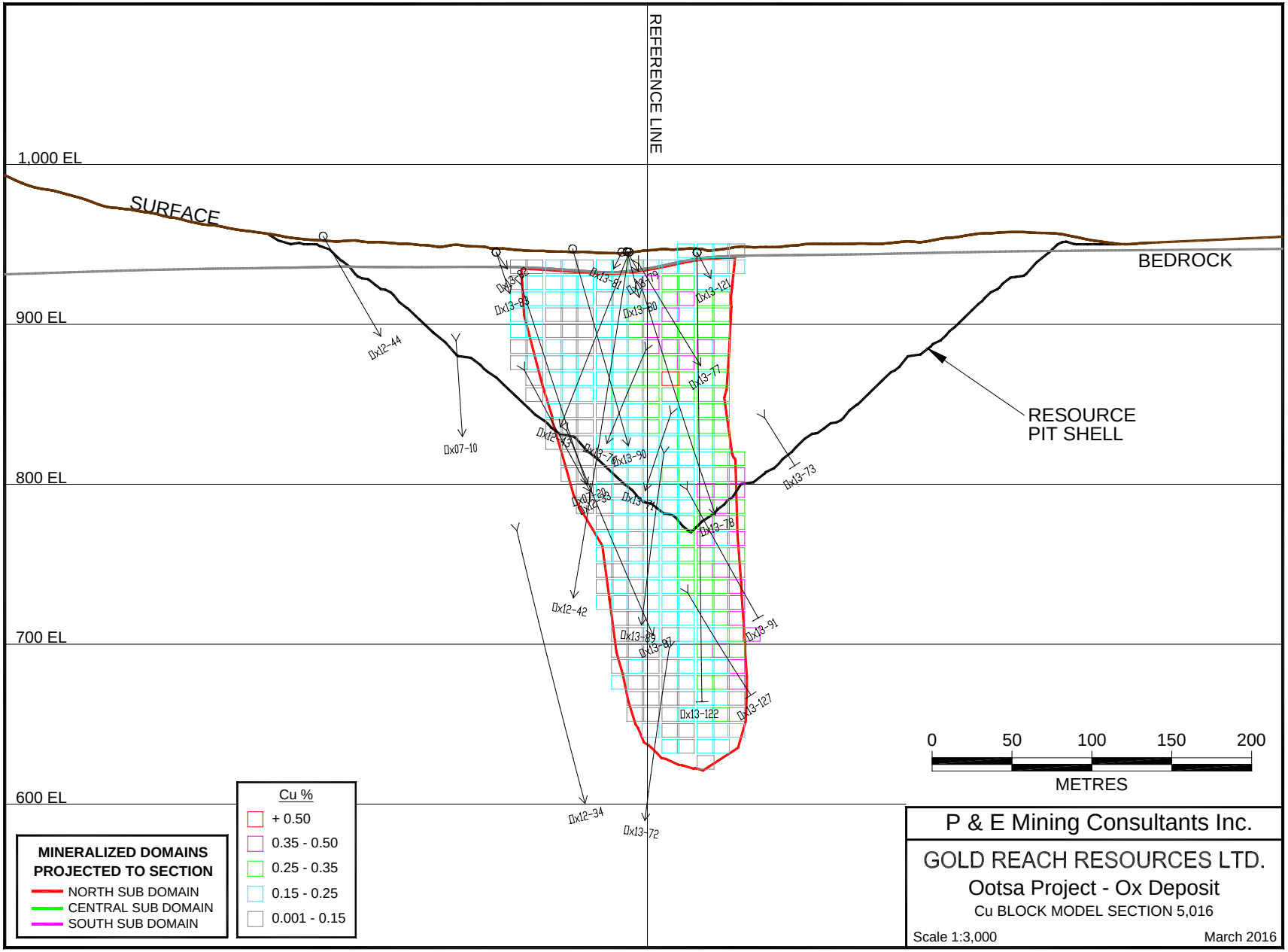

East Seel Cu Down Dip Az=305 Dip=-68
1
Gamma (H)
1.5
1.2
0.9
0.6
0.3
0
0
25
50
75
100
125
150
175
200
225
250
Range [m]
1) Spherical(128.08, 0.39)
2) Spherical(131.17, 0.55)
3) Nugget Effect(0.40)
#
Software By Gemcom

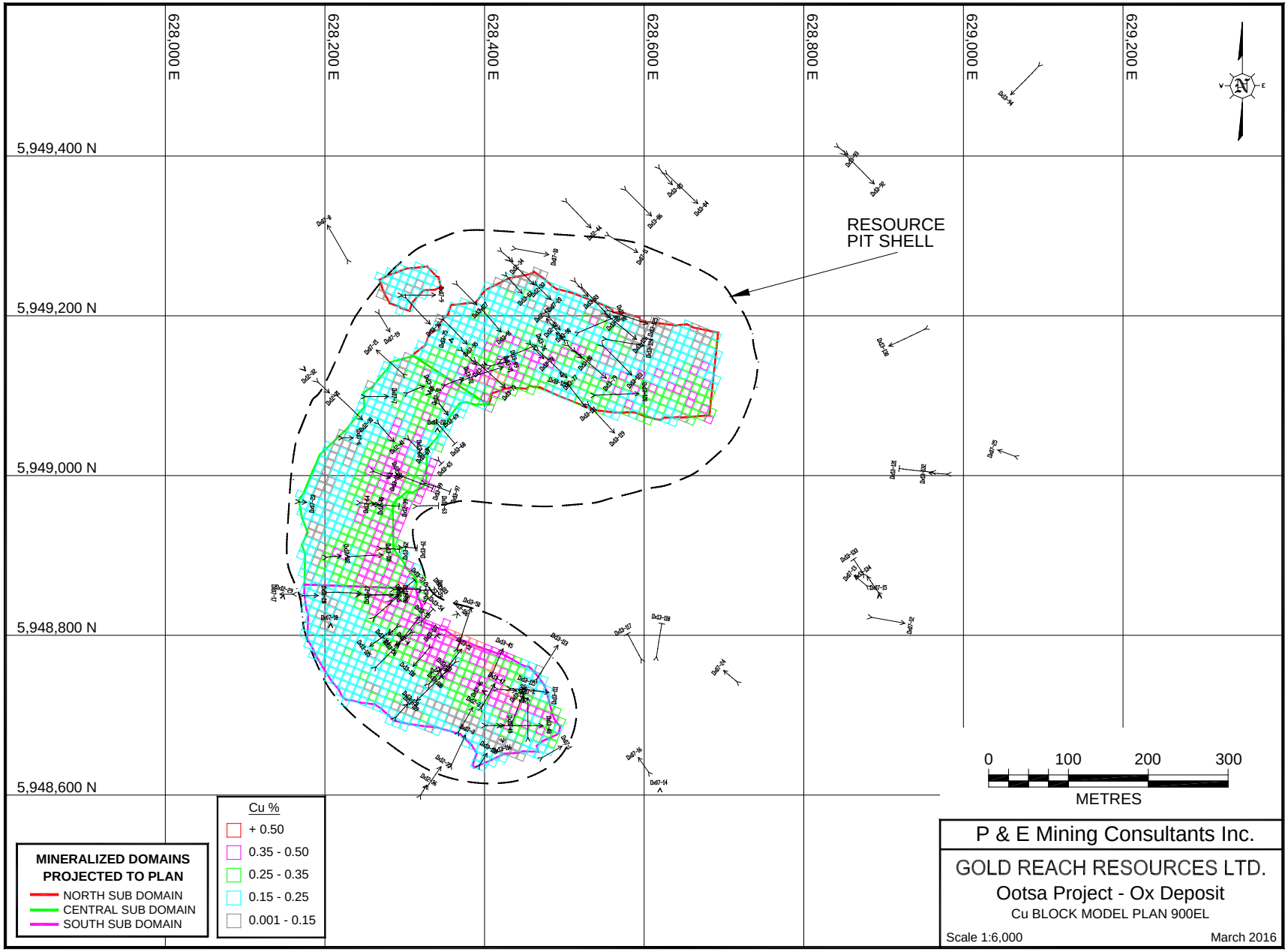

East Seel Cu Across Dip Az=125 Dip=-22
1
1.25
1.00
0.75
0.50
0.25
0
Gamma (H)
0
13
25
38
50
63
75
88
100
113
125
Range [m]
1) Spherical(16.32, 0.29)
2) Spherical(65.89, 0.18)
3) Nugget Effect(0.40)
Software By Geocom

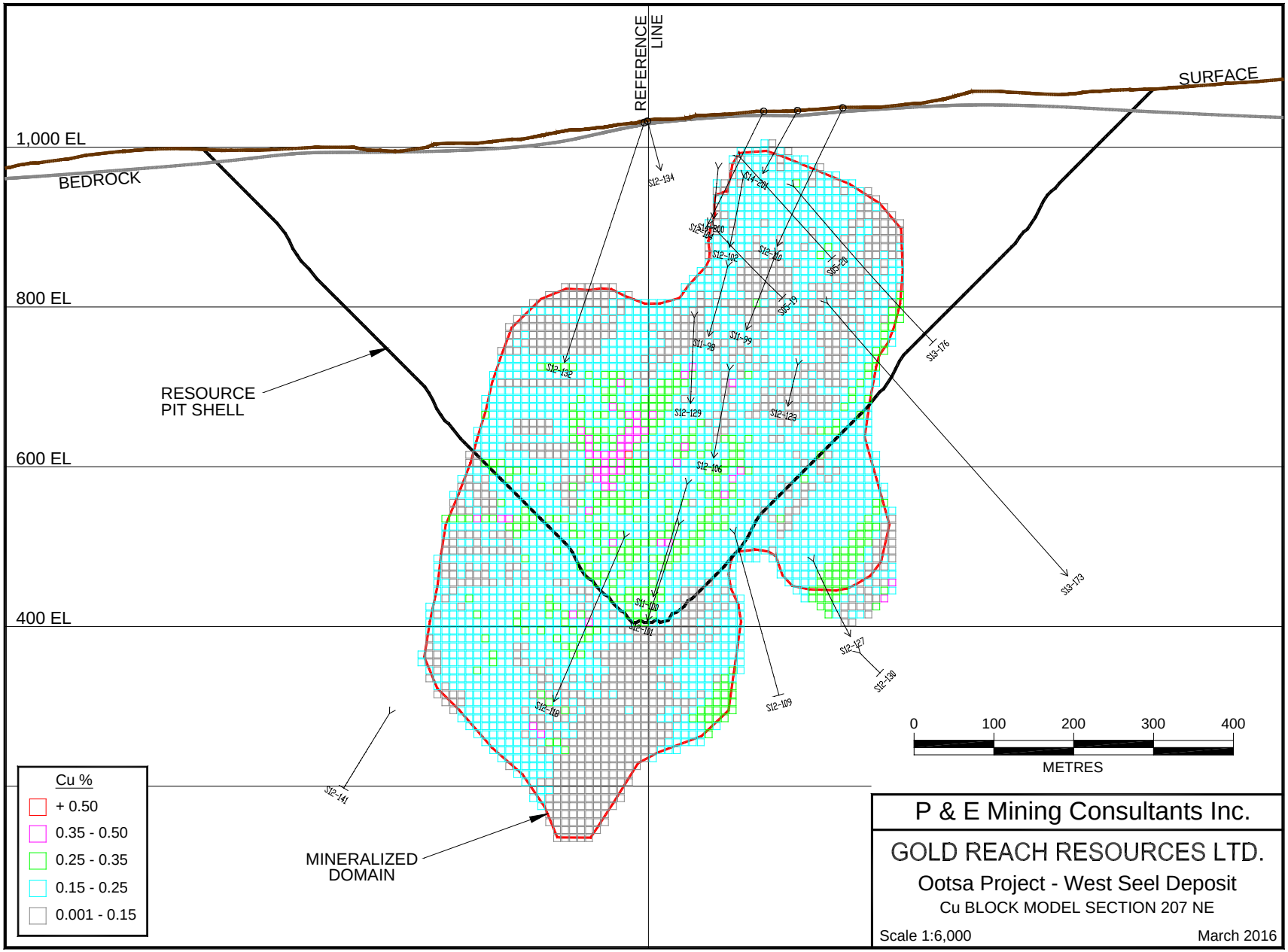
APPENDIX V. CU AND MO BLOCK MODEL CROSS SECTIONS AND PLANS

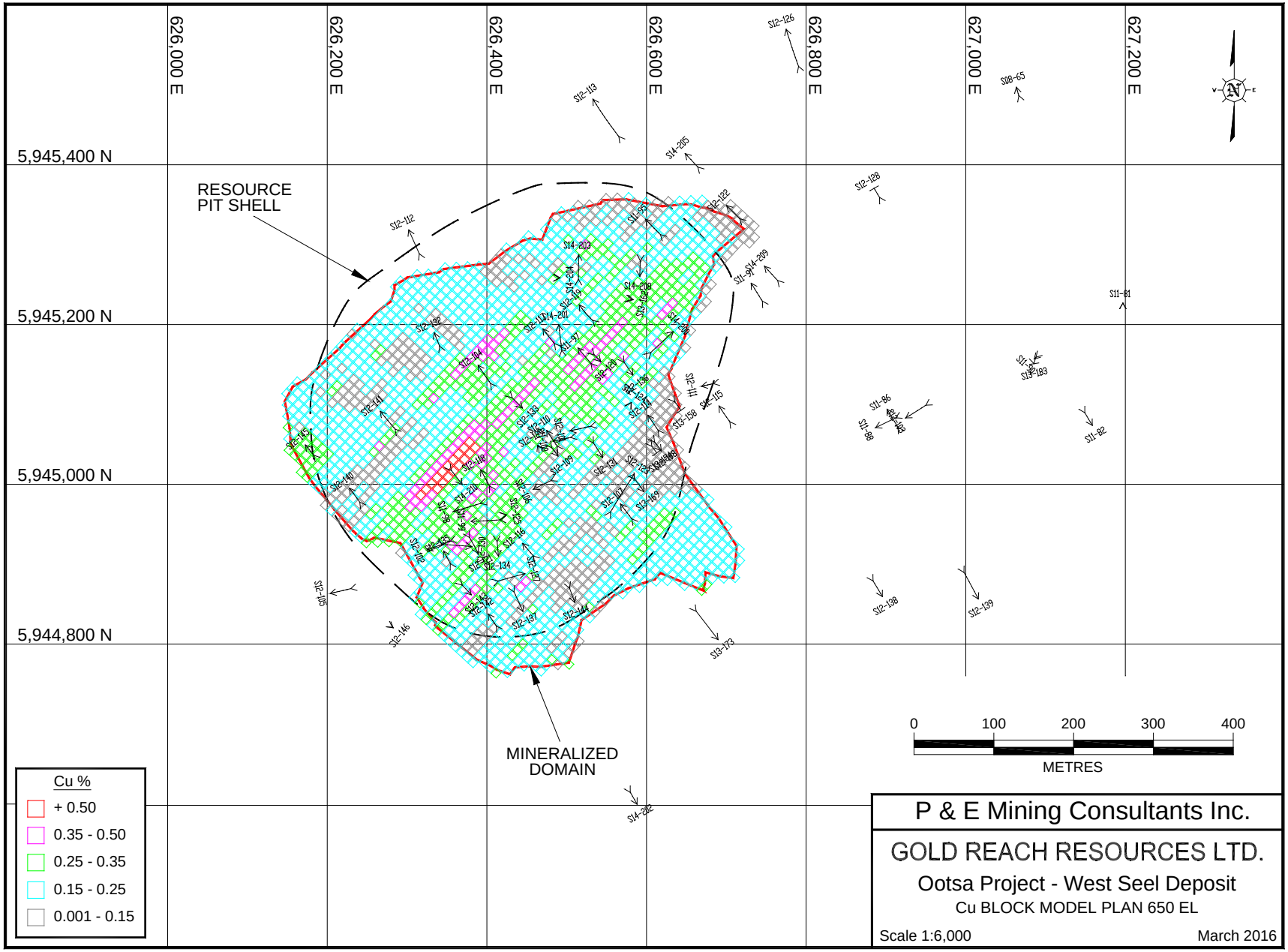

REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
BEDROCK
SURFACE
RESOURCE
PIT SHELL
Dx13-109
Dx13-108
Dx13-50
Dx07-3
Dx12-37
Dx13-51
Dx13-53
Dx12-35
Dx13-46
Dx12-36
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
Cu %
+ 0.50
0.35 - 0.50
0.25 - 0.35
0.15 - 0.25
0.001 - 0.15
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
Cu BLOCK MODEL SECTION 5,003
Scale 1:3,000
March 2016

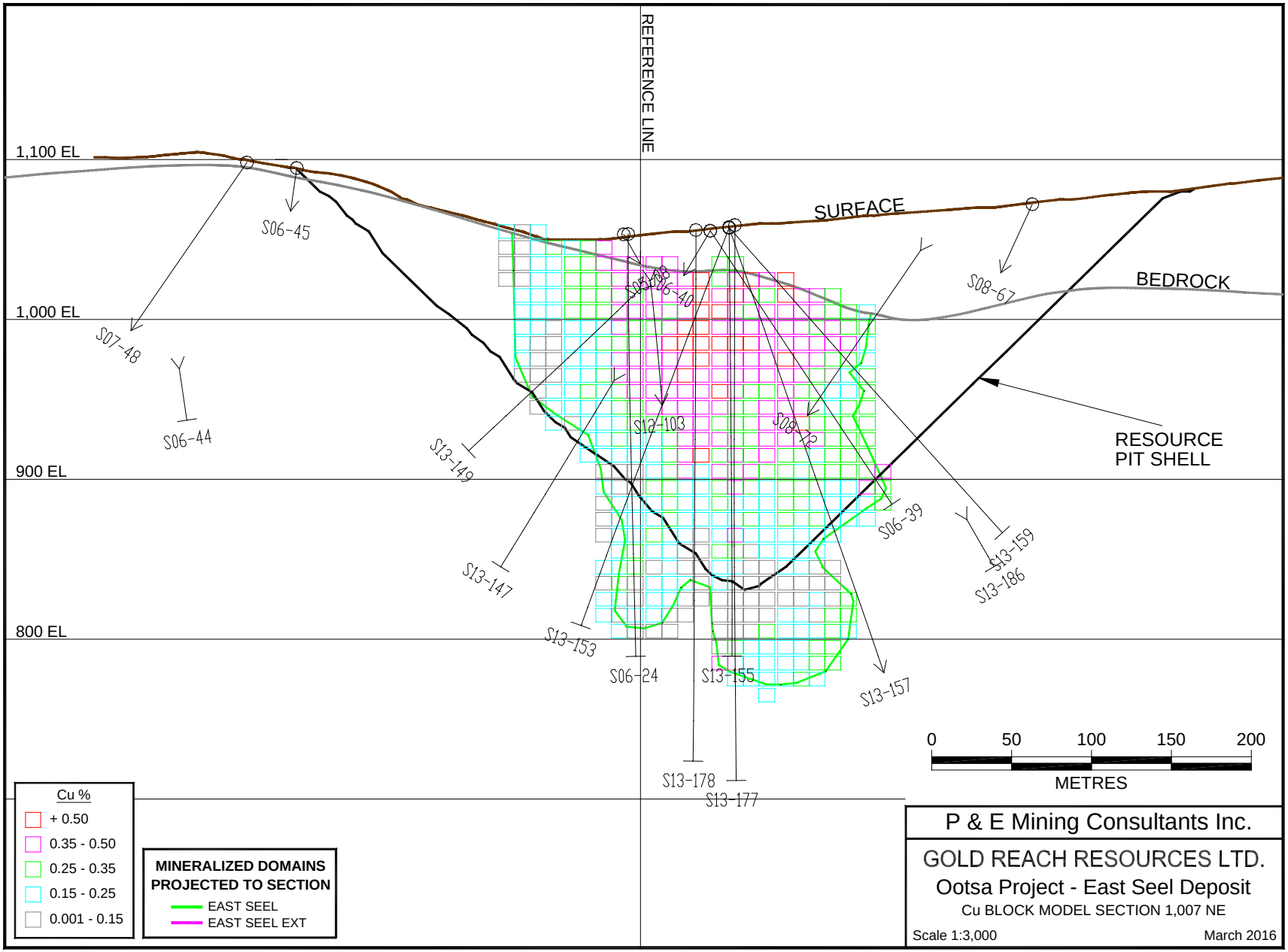

REFERENCE LINE
1,000 EL
BEDROCK
SURFACE
900 EL
800 EL
700 EL
600 EL
Dx13-61
Dx13-62
Dx13-101
Dx13-102
RESOURCE
PIT SHELL
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
Cu %
+ 0.50
0.35 - 0.50
0.25 - 0.35
0.15 - 0.25
0.001 - 0.15
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
Cu BLOCK MODEL SECTION 5,008
Scale 1:3,000
March 2016

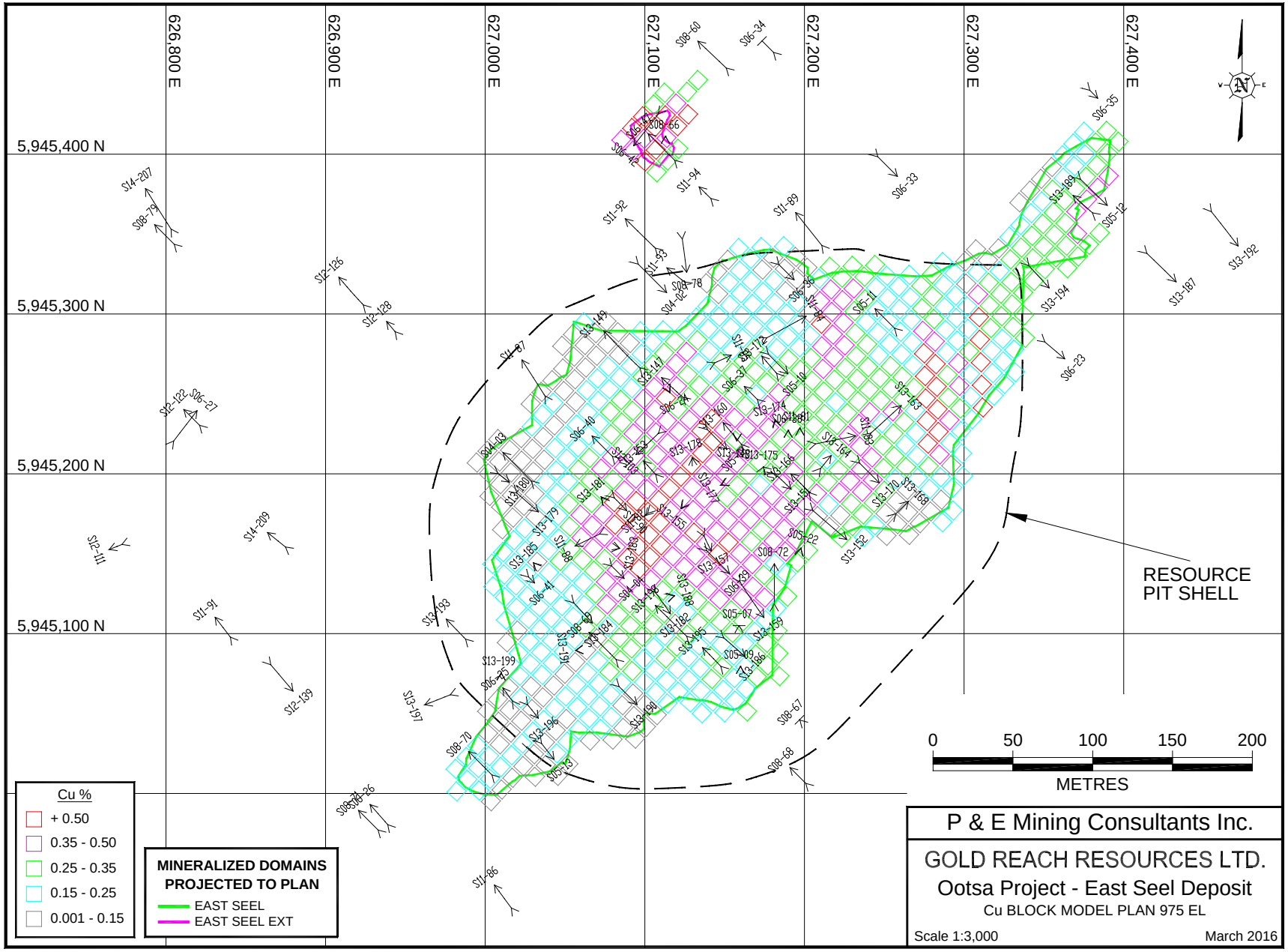

REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
SURFACE
BEDROCK
RESOURCE
PIT SHELL
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
Cu %
+ 0.50
0.35 - 0.50
0.25 - 0.35
0.15 - 0.25
0.001 - 0.15
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
Cu BLOCK MODEL SECTION 5,016
Scale 1:3,000
March 2016

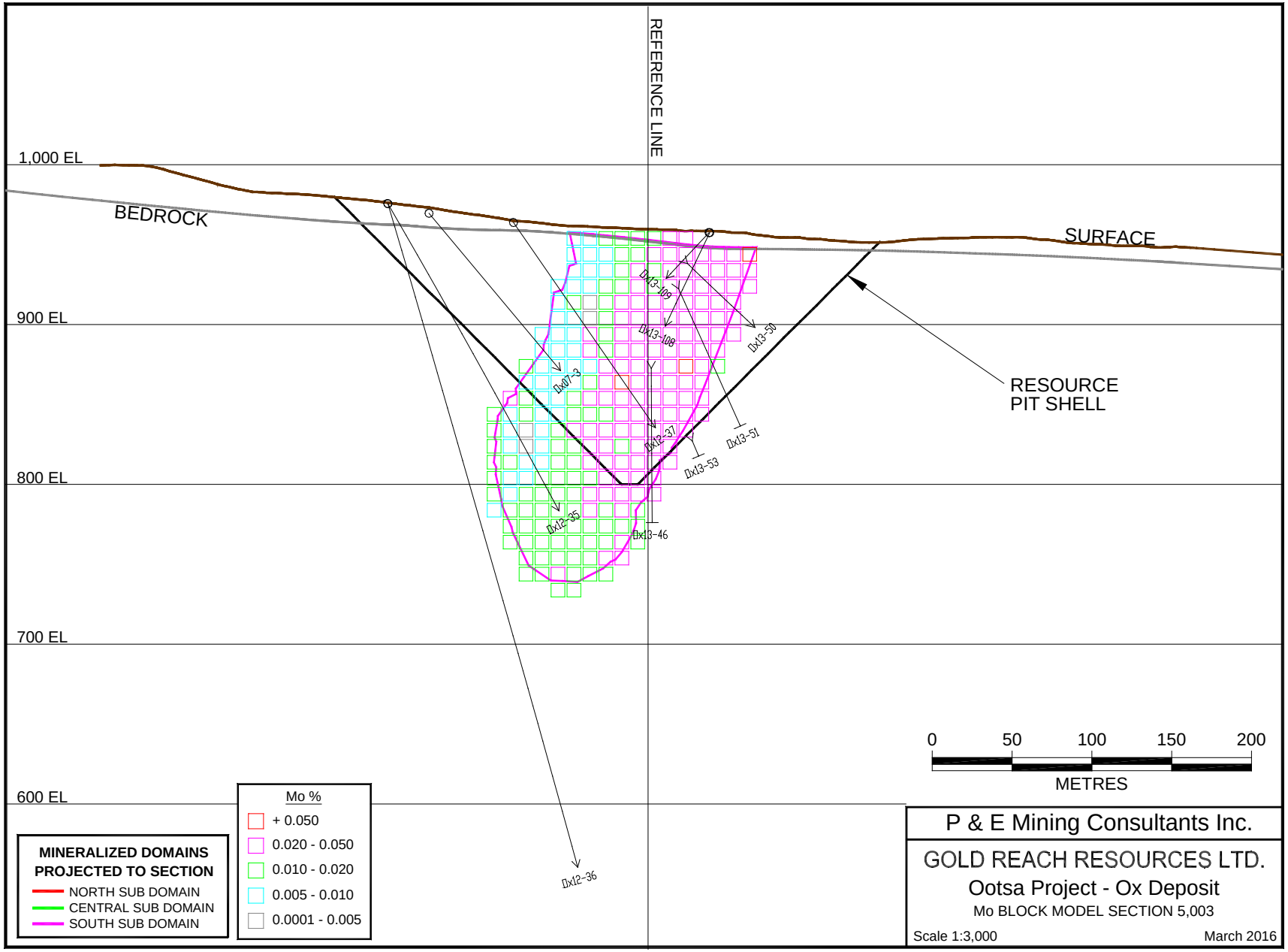

628,000 E
628,200 E
628,400 E
628,600 E
628,800 E
629,000 E
629,200 E
5,949,400 N
5,949,200 N
5,949,000 N
5,948,800 N
5,948,600 N
RESOURCE
PIT SHELL
MINERALIZED DOMAINS
PROJECTED TO PLAN
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
Cu %
+ 0.50
0.35 - 0.50
0.25 - 0.35
0.15 - 0.25
0.001 - 0.15
0
100
200
300
METRES
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
Cu BLOCK MODEL PLAN 900EL
Scale 1:6,000
March 2016

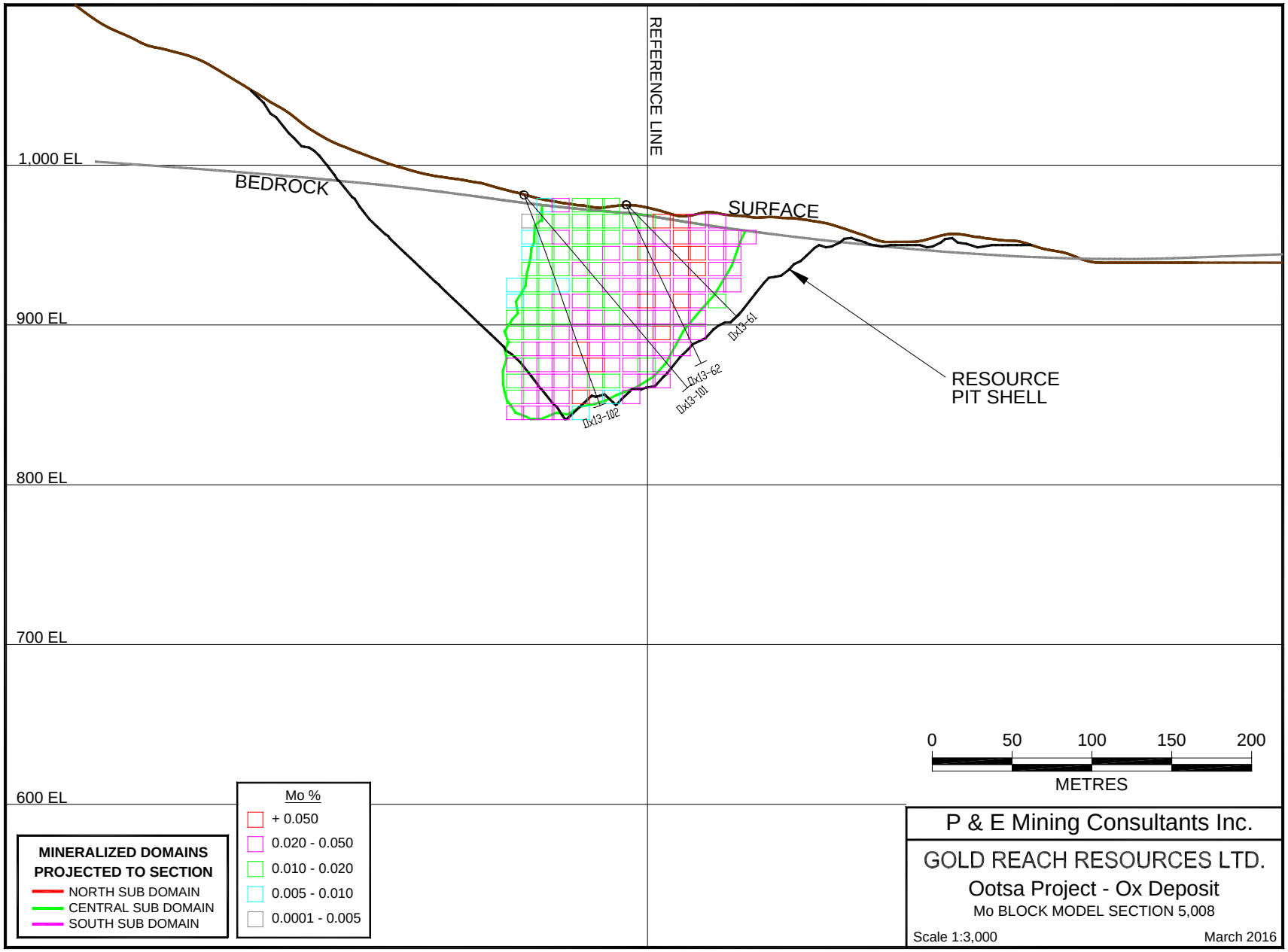

REFERENCE LINE
SURFACE
1,000 EL
BEDROCK
800 EL
600 EL
400 EL
RESOURCE PIT SHELL
MINERALIZED DOMAIN
Cu %
+ 0.50
0.35 - 0.50
0.25 - 0.35
0.15 - 0.25
0.001 - 0.15
0
100
200
300
400
METRES
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - West Seel Deposit
Cu BLOCK MODEL SECTION 207 NE
Scale 1:6,000
March 2016

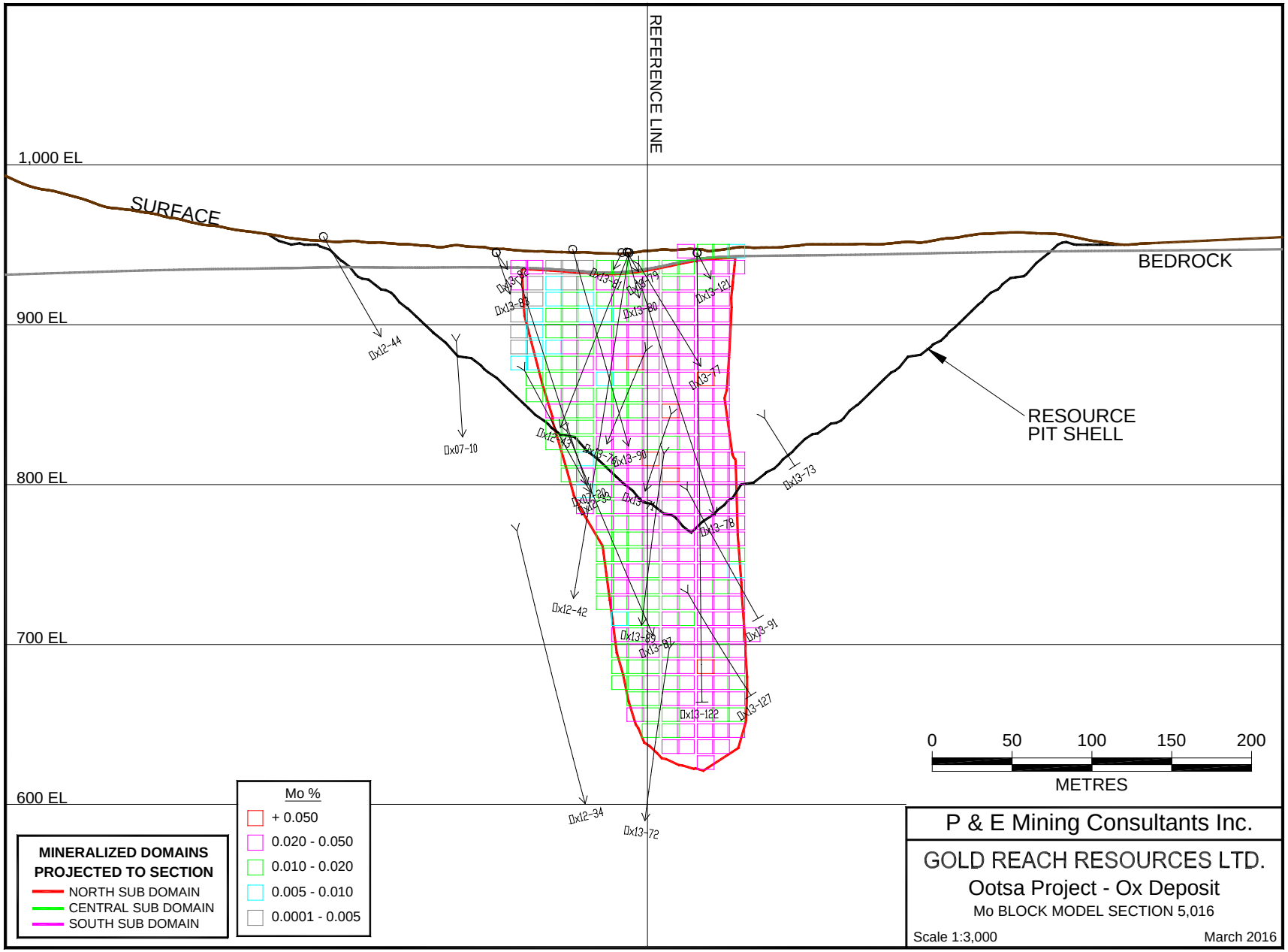

626,000 E
626,200 E
626,400 E
626,600 E
626,800 E
627,000 E
627,200 E
5,945,400 N
5,945,200 N
5,945,000 N
5,944,800 N
RESOURCE
PIT SHELL
MINERALIZED
DOMAIN
0
100
200
300
400
METRES
Cu %
+ 0.50
0.35 - 0.50
0.25 - 0.35
0.15 - 0.25
0.001 - 0.15
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - West Seel Deposit
Cu BLOCK MODEL PLAN 650 EL
Scale 1:6,000
March 2016

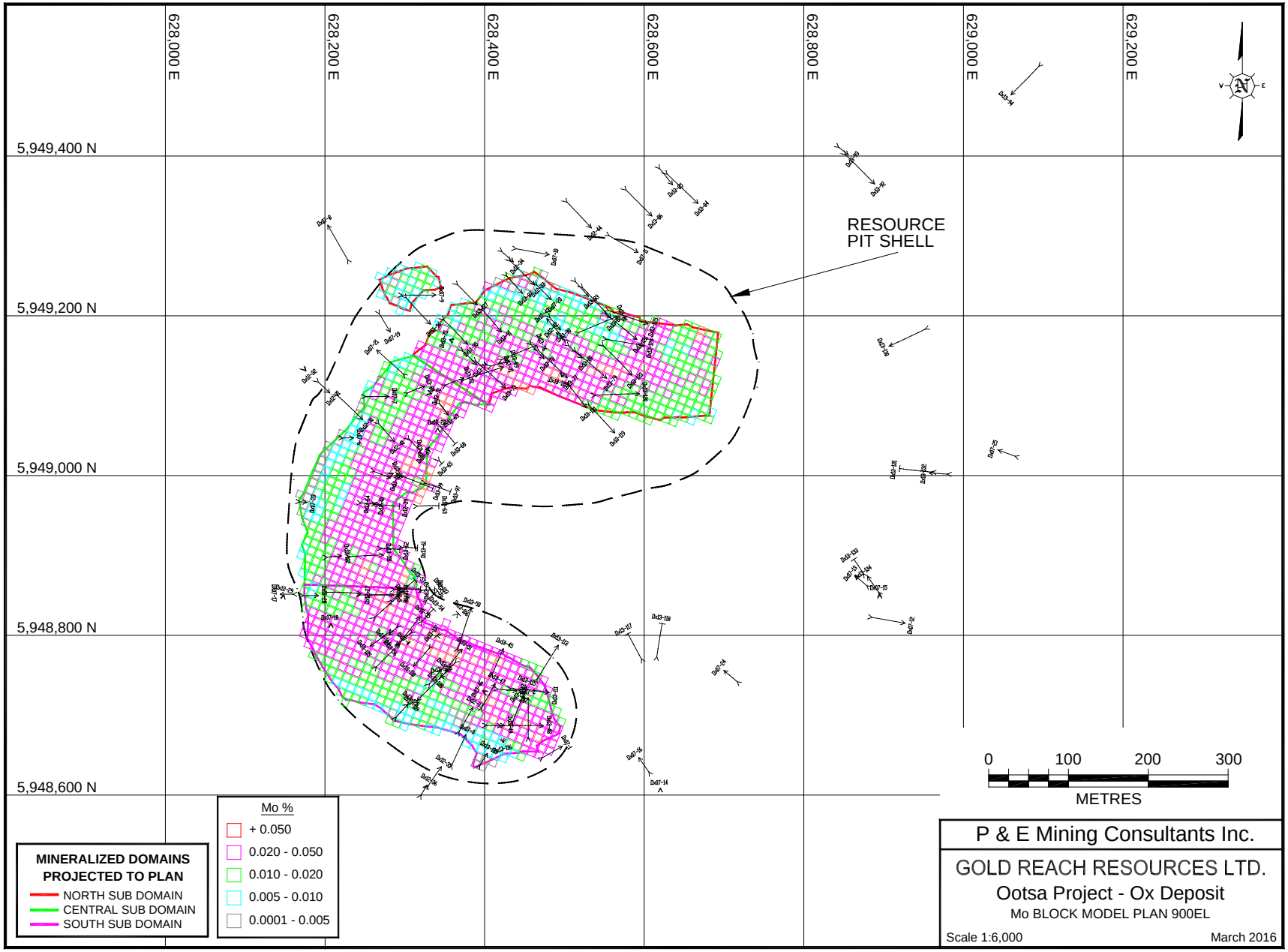

REFERENCE LINE
1,100 EL
1,000 EL
900 EL
800 EL
SURFACE
BEDROCK
RESOURCE
PIT SHELL
S06-45
S07-48
S06-44
S06-40
S08-67
S12-103
S08-72
S13-149
S13-147
S13-153
S06-24
S13-155
S13-178
S13-177
S13-157
S06-39
S13-159
S13-186
0
50
100
150
200
METRES
Cu %
+ 0.50
0.35 - 0.50
0.25 - 0.35
0.15 - 0.25
0.001 - 0.15
MINERALIZED DOMAINS
PROJECTED TO SECTION
EAST SEEL
EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - East Seel Deposit
Cu BLOCK MODEL SECTION 1,007 NE
Scale 1:3,000
March 2016

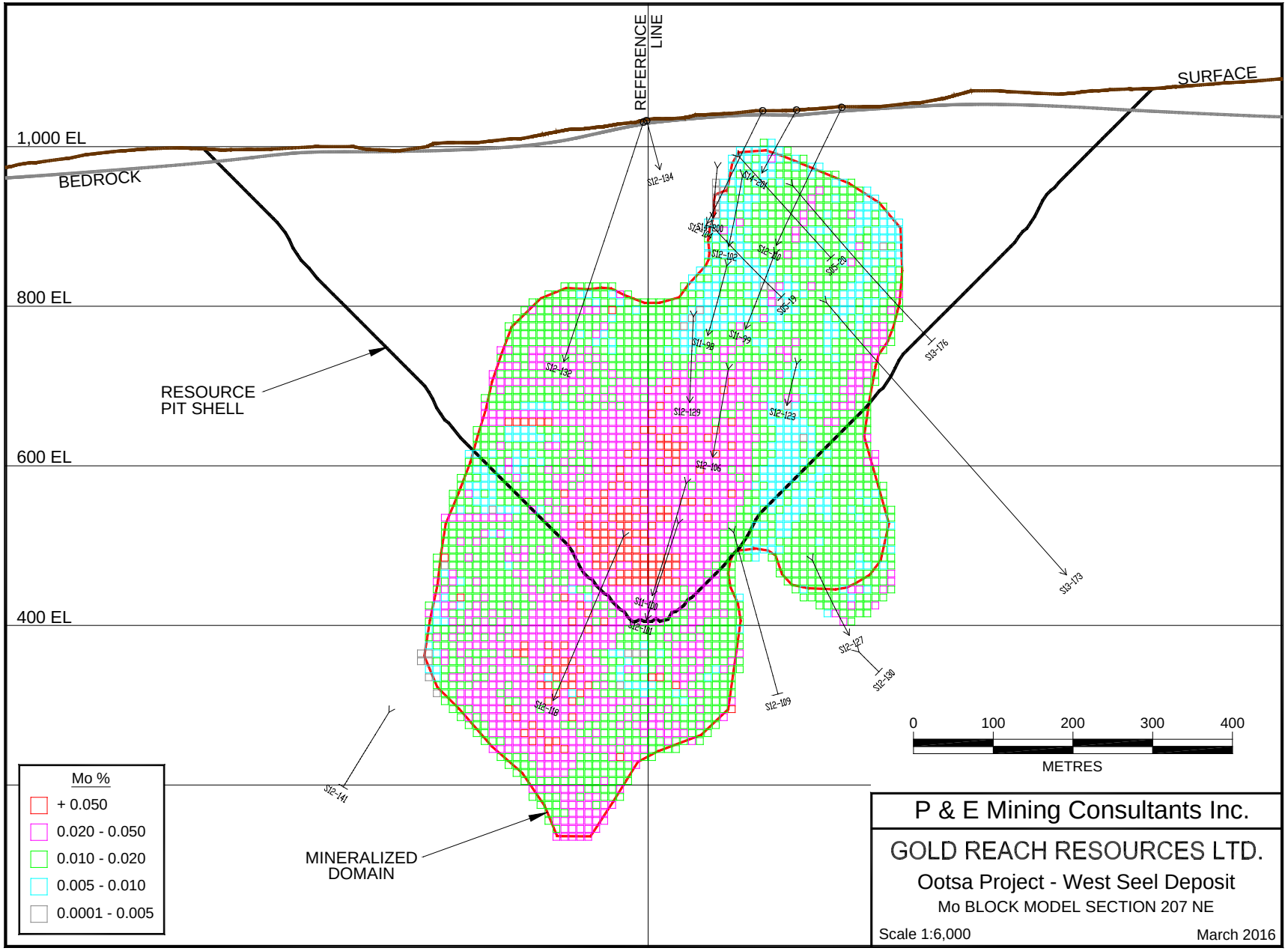

626,800 E
626,900 E
627,000 E
627,100 E
627,200 E
627,300 E
627,400 E
5,945,400 N
5,945,300 N
5,945,200 N
5,945,100 N
RESOURCE
PIT SHELL
0
50
100
150
200
METRES
Cu %
+ 0.50
0.35 - 0.50
0.25 - 0.35
0.15 - 0.25
0.001 - 0.15
MINERALIZED DOMAINS
PROJECTED TO PLAN
EAST SEEL
EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - East Seel Deposit
Cu BLOCK MODEL PLAN 975 EL
Scale 1:3,000
March 2016

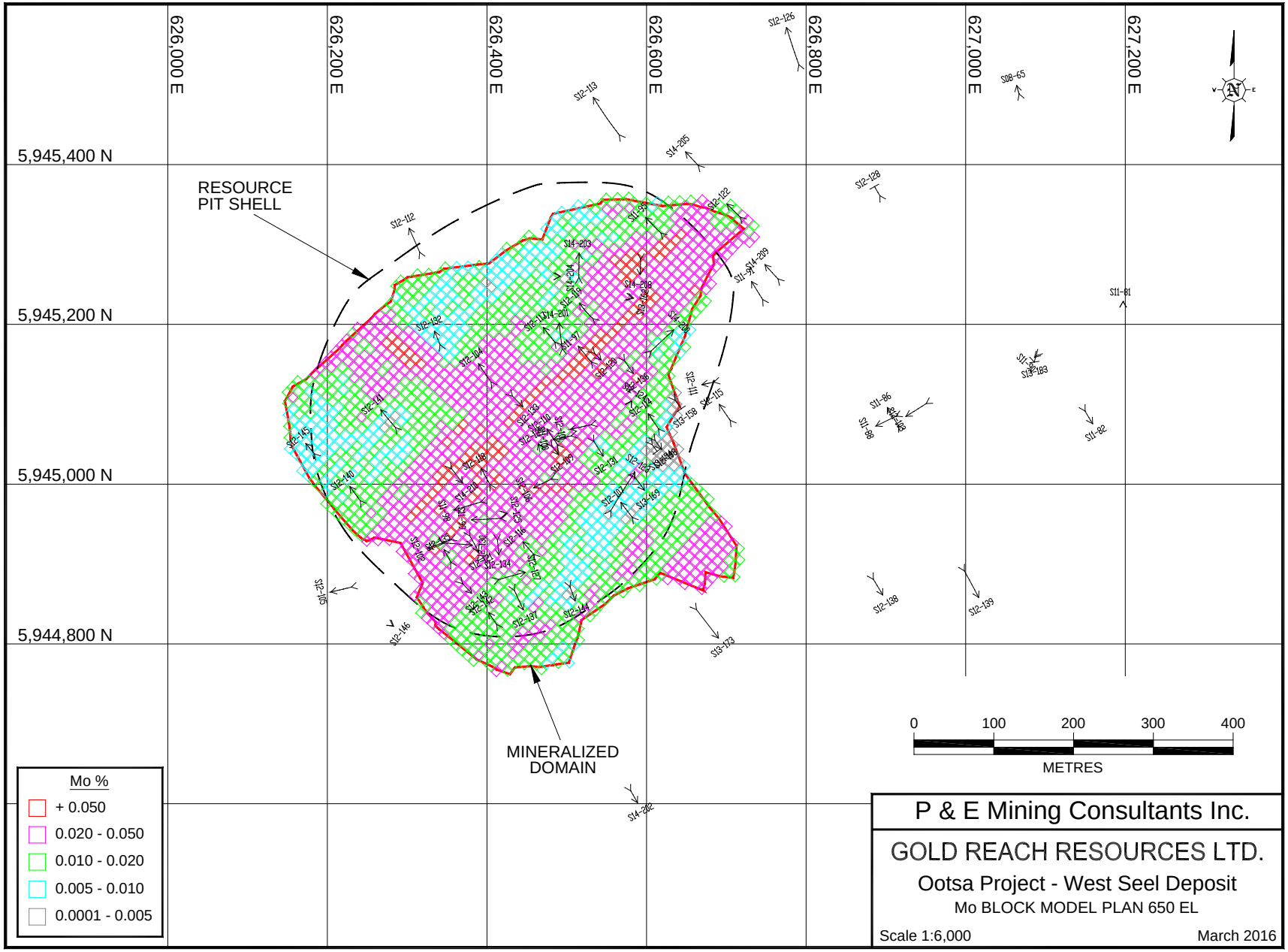

REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
BEDROCK
SURFACE
RESOURCE
PIT SHELL
Dx13-109
Dx13-108
Dx13-50
Dx07-3
Dx12-37
Dx13-51
Dx13-53
Dx12-35
Dx13-46
Dx12-36
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
Mo %
+ 0.050
0.020 - 0.050
0.010 - 0.020
0.005 - 0.010
0.0001 - 0.005
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
Mo BLOCK MODEL SECTION 5,003
Scale 1:3,000
March 2016

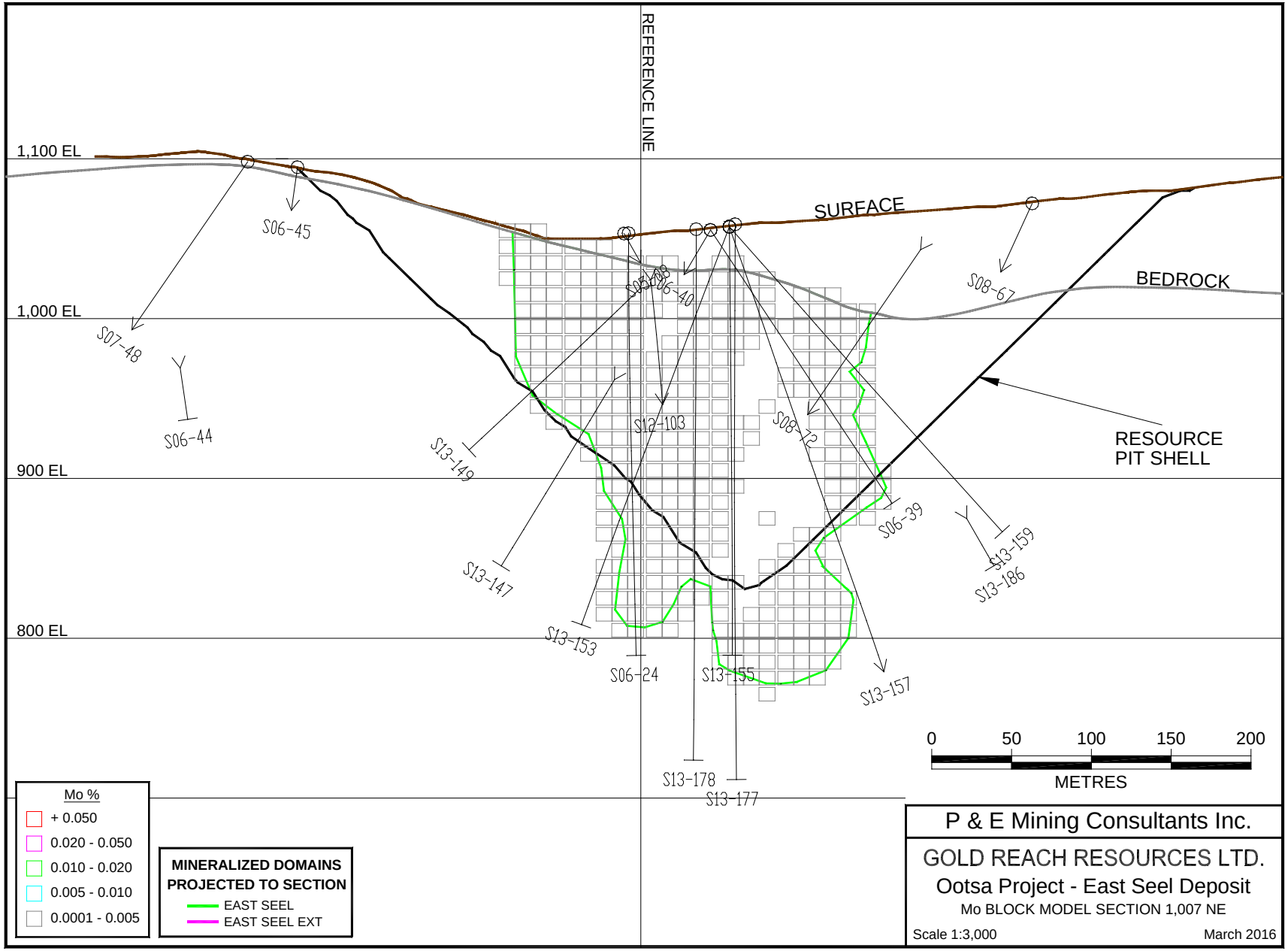

REFERENCE LINE
1,000 EL
BEDROCK
SURFACE
900 EL
800 EL
700 EL
600 EL
Dx13-61
Dx13-62
Dx13-101
Dx13-102
RESOURCE
PIT SHELL
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
Mo %
+ 0.050
0.020 - 0.050
0.010 - 0.020
0.005 - 0.010
0.0001 - 0.005
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
Mo BLOCK MODEL SECTION 5,008
Scale 1:3,000
March 2016

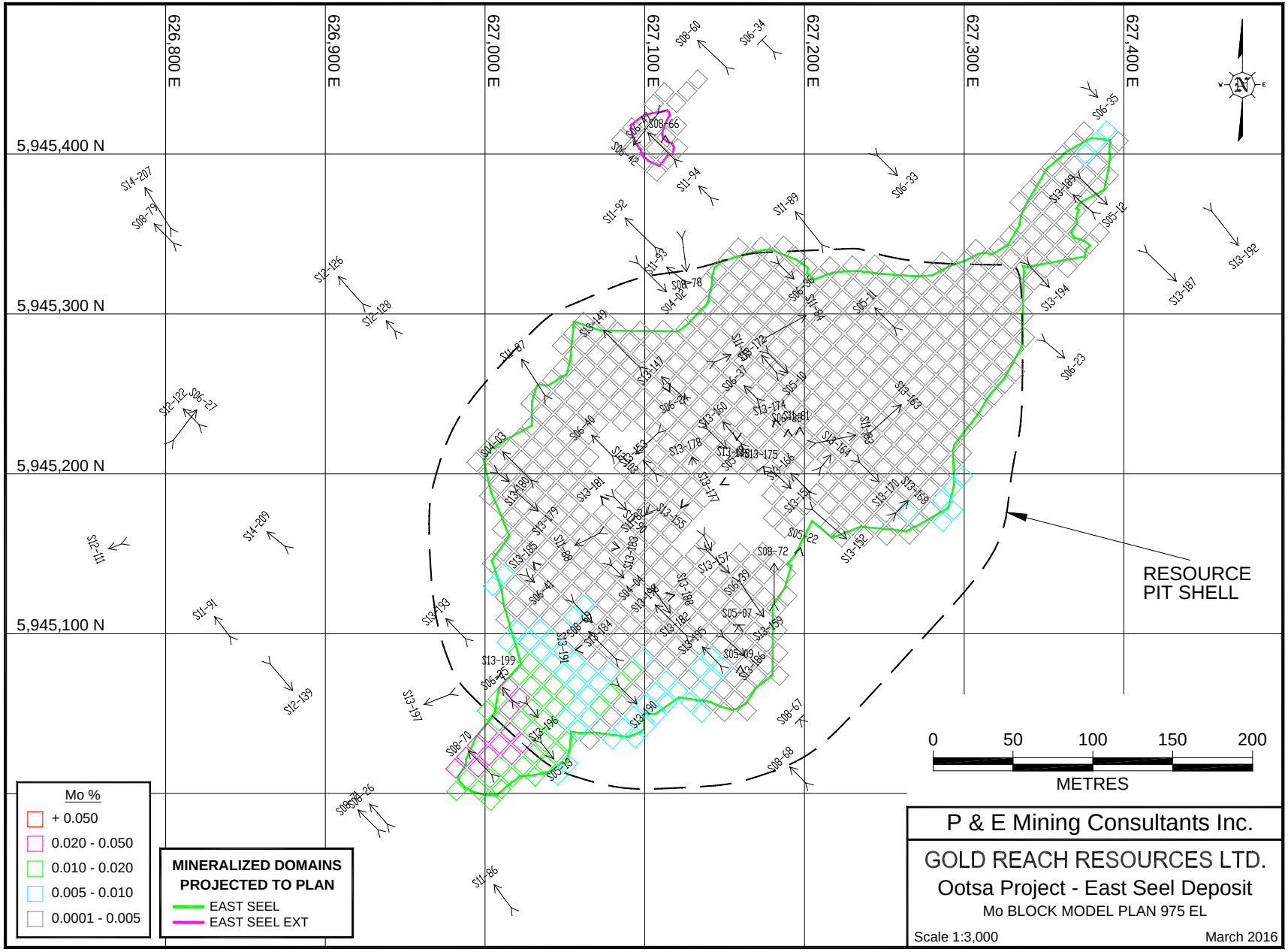

REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
SURFACE
BEDROCK
RESOURCE
PIT SHELL
Dx12-44
Dx07-10
Dx12-42
Dx12-34
Dx13-72
Dx13-73
Dx13-77
Dx13-78
Dx13-90
Dx13-91
Dx13-122
Dx13-127
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
Mo %
+ 0.050
0.020 - 0.050
0.010 - 0.020
0.005 - 0.010
0.0001 - 0.005
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
Mo BLOCK MODEL SECTION 5,016
Scale 1:3,000
March 2016


628,000 E
628,200 E
628,400 E
628,600 E
628,800 E
629,000 E
629,200 E
5,949,400 N
5,949,200 N
5,949,000 N
5,948,800 N
5,948,600 N
RESOURCE
PIT SHELL
MINERALIZED DOMAINS
PROJECTED TO PLAN
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
Mo %
+ 0.050
0.020 - 0.050
0.010 - 0.020
0.005 - 0.010
0.0001 - 0.005
0
100
200
300
METRES
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
Mo BLOCK MODEL PLAN 900EL
Scale 1:6,000
March 2016

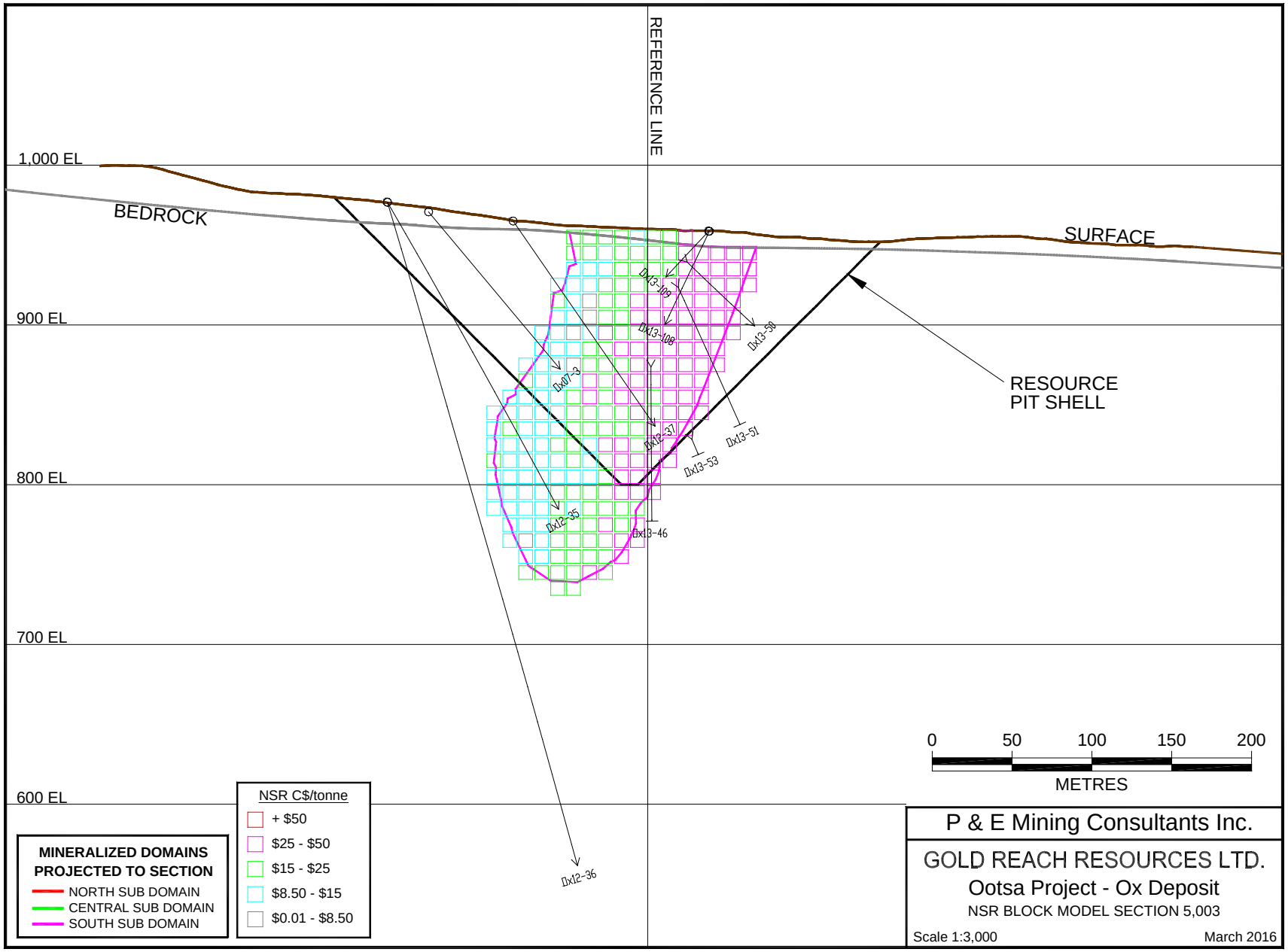

REFERENCE LINE
SURFACE
1,000 EL
BEDROCK
800 EL
600 EL
400 EL
RESOURCE PIT SHELL
MINERALIZED DOMAIN
S12-134
S12-102
S12-132
S12-129
S12-123
S12-106
S12-127
S12-130
S12-109
S12-119
S12-141
S13-176
S13-173
0 100 200 300 400
METRES
Mo %
+ 0.050
0.020 - 0.050
0.010 - 0.020
0.005 - 0.010
0.0001 - 0.005
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - West Seel Deposit
Mo BLOCK MODEL SECTION 207 NE
Scale 1:6,000
March 2016

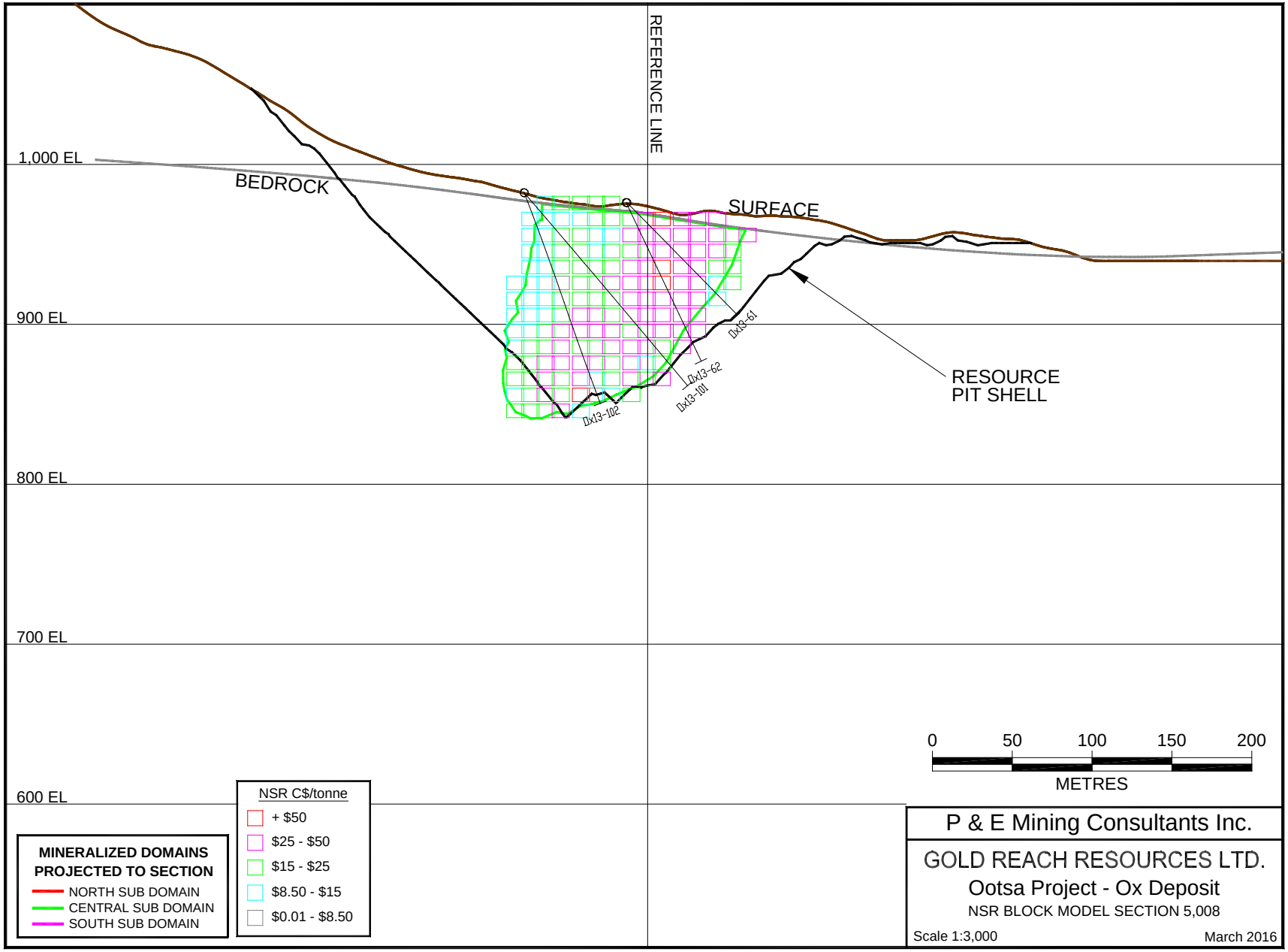

626,000 E
626,200 E
626,400 E
626,600 E
626,800 E
627,000 E
627,200 E
5,945,400 N
5,945,200 N
5,945,000 N
5,944,800 N
RESOURCE PIT SHELL
MINERALIZED DOMAIN
Mo %
+ 0.050
0.020 - 0.050
0.010 - 0.020
0.005 - 0.010
0.0001 - 0.005
0
100
200
300
400
METRES
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - West Seel Deposit
Mo BLOCK MODEL PLAN 650 EL
Scale 1:6,000
March 2016

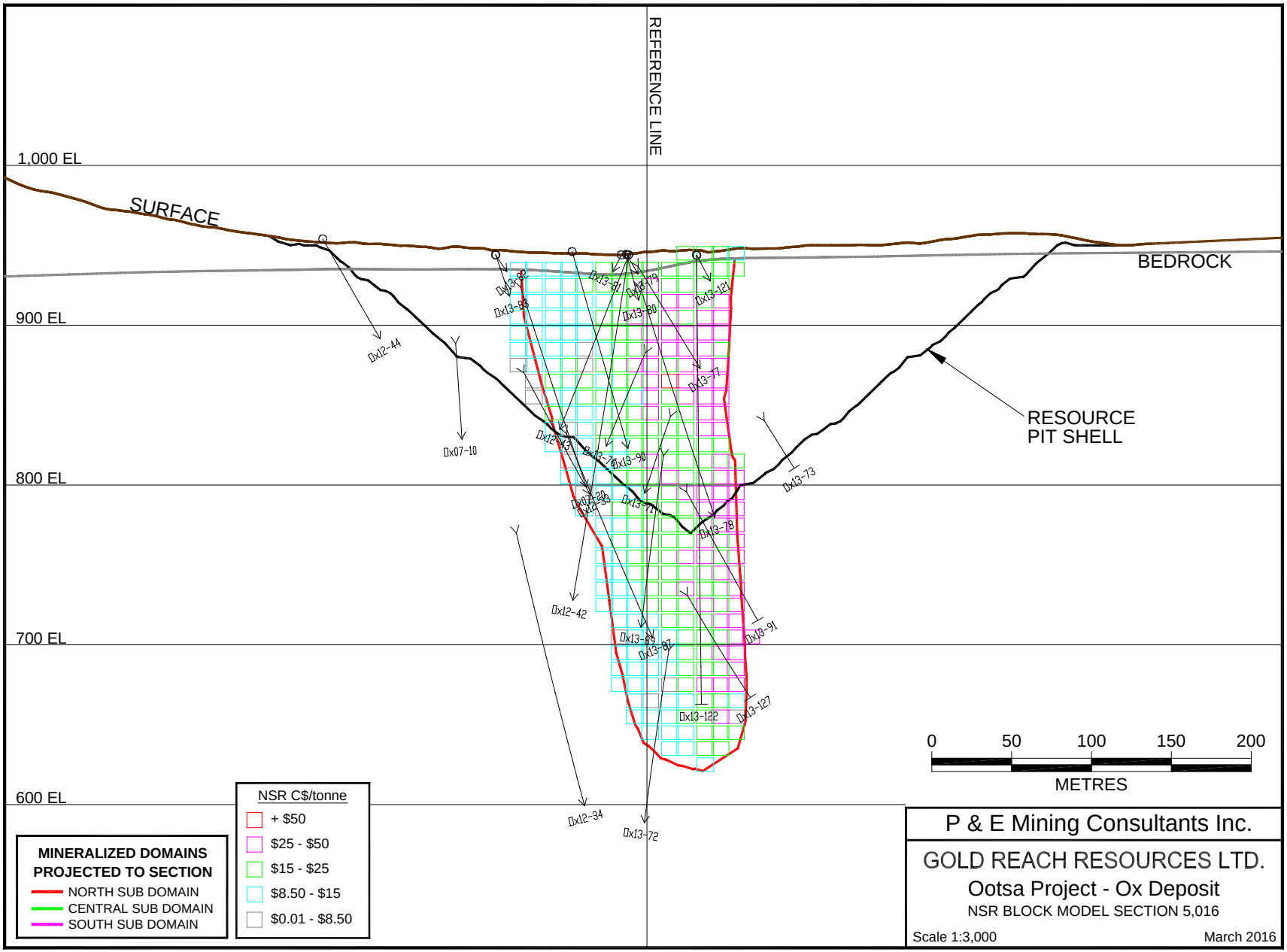

REFERENCE LINE
1,100 EL
1,000 EL
900 EL
800 EL
SURFACE
BEDROCK
RESOURCE
PIT SHELL
S06-45
S07-48
S06-44
S06-40
S08-68
S12-103
S13-149
S13-147
S13-153
S06-24
S13-155
S13-178
S13-177
S08-72
S06-39
S13-157
S13-159
S13-186
S08-67
0
50
100
150
200
METRES
Mo %
+ 0.050
0.020 - 0.050
0.010 - 0.020
0.005 - 0.010
0.0001 - 0.005
MINERALIZED DOMAINS
PROJECTED TO SECTION
EAST SEEL
EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - East Seel Deposit
Mo BLOCK MODEL SECTION 1,007 NE
Scale 1:3,000
March 2016

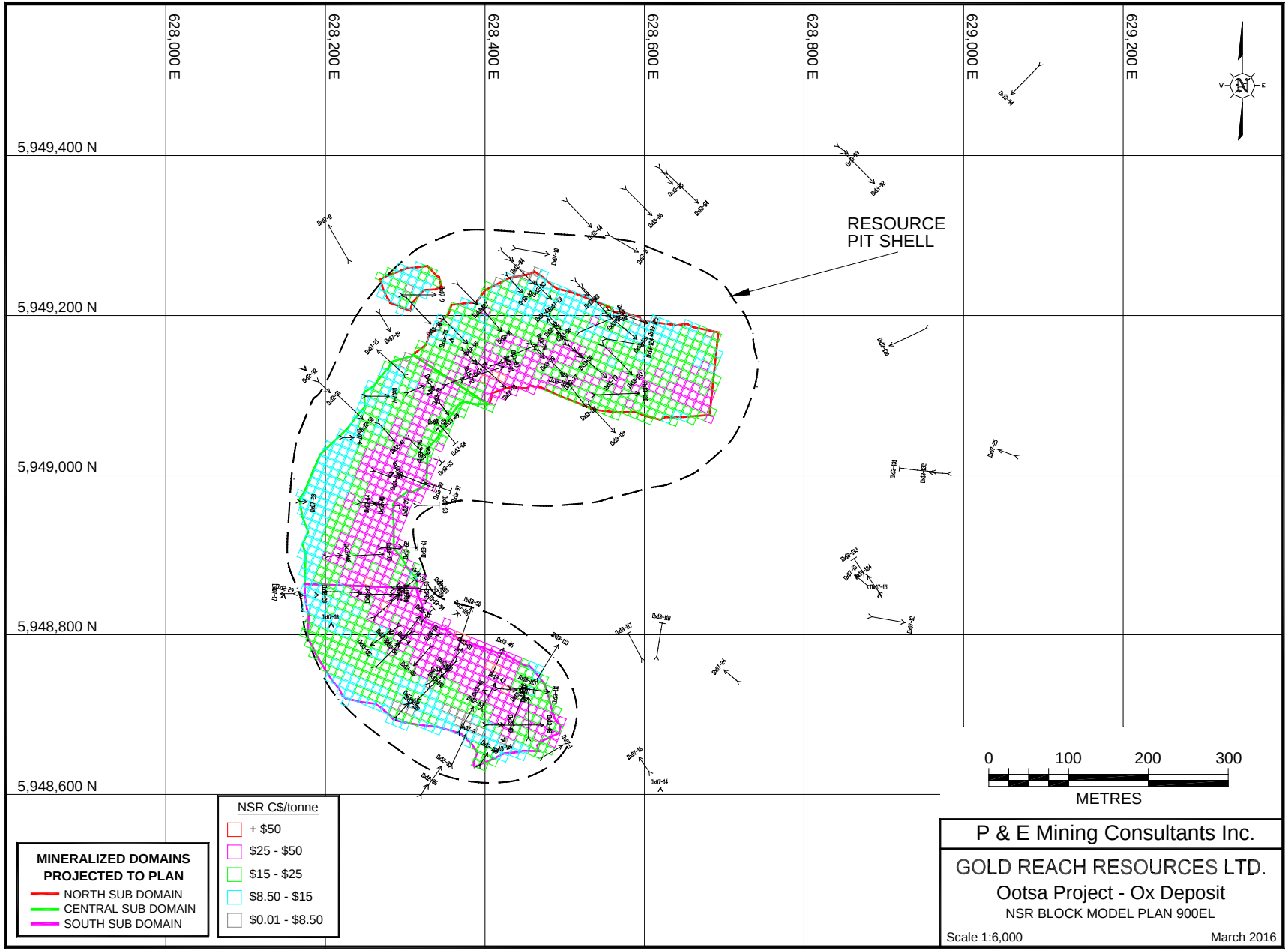

626,800 E
626,900 E
627,000 E
627,100 E
627,200 E
627,300 E
627,400 E
5,945,400 N
5,945,300 N
5,945,200 N
5,945,100 N
RESOURCE
PIT SHELL
0
50
100
150
200
METRES
Mo %
+ 0.050
0.020 - 0.050
0.010 - 0.020
0.005 - 0.010
0.0001 - 0.005
MINERALIZED DOMAINS
PROJECTED TO PLAN
EAST SEEL
EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - East Seel Deposit
Mo BLOCK MODEL PLAN 975 EL
Scale 1:3,000
March 2016

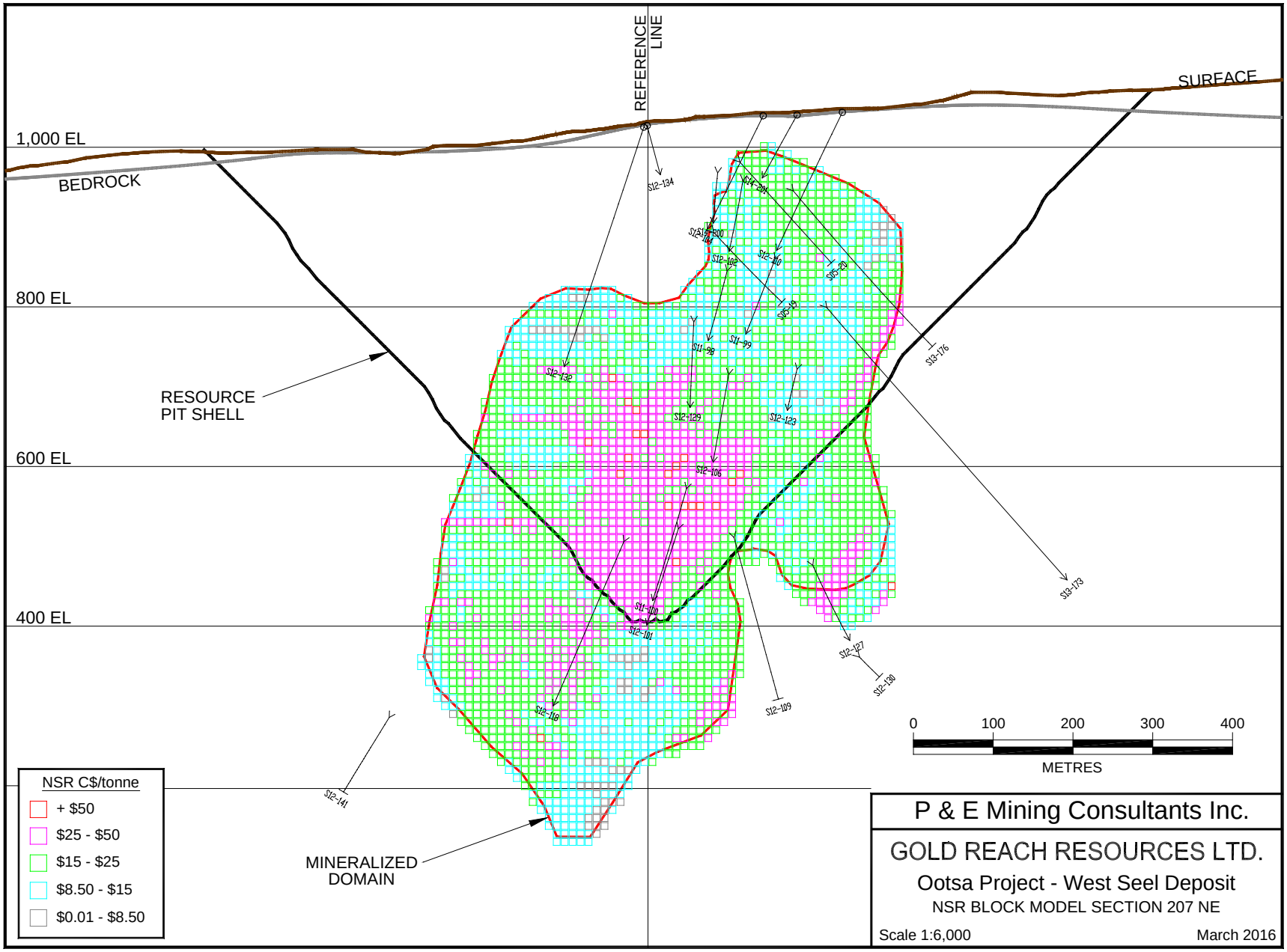
APPENDIX VI. NSR BLOCK MODEL CROSS SECTIONS AND PLANS

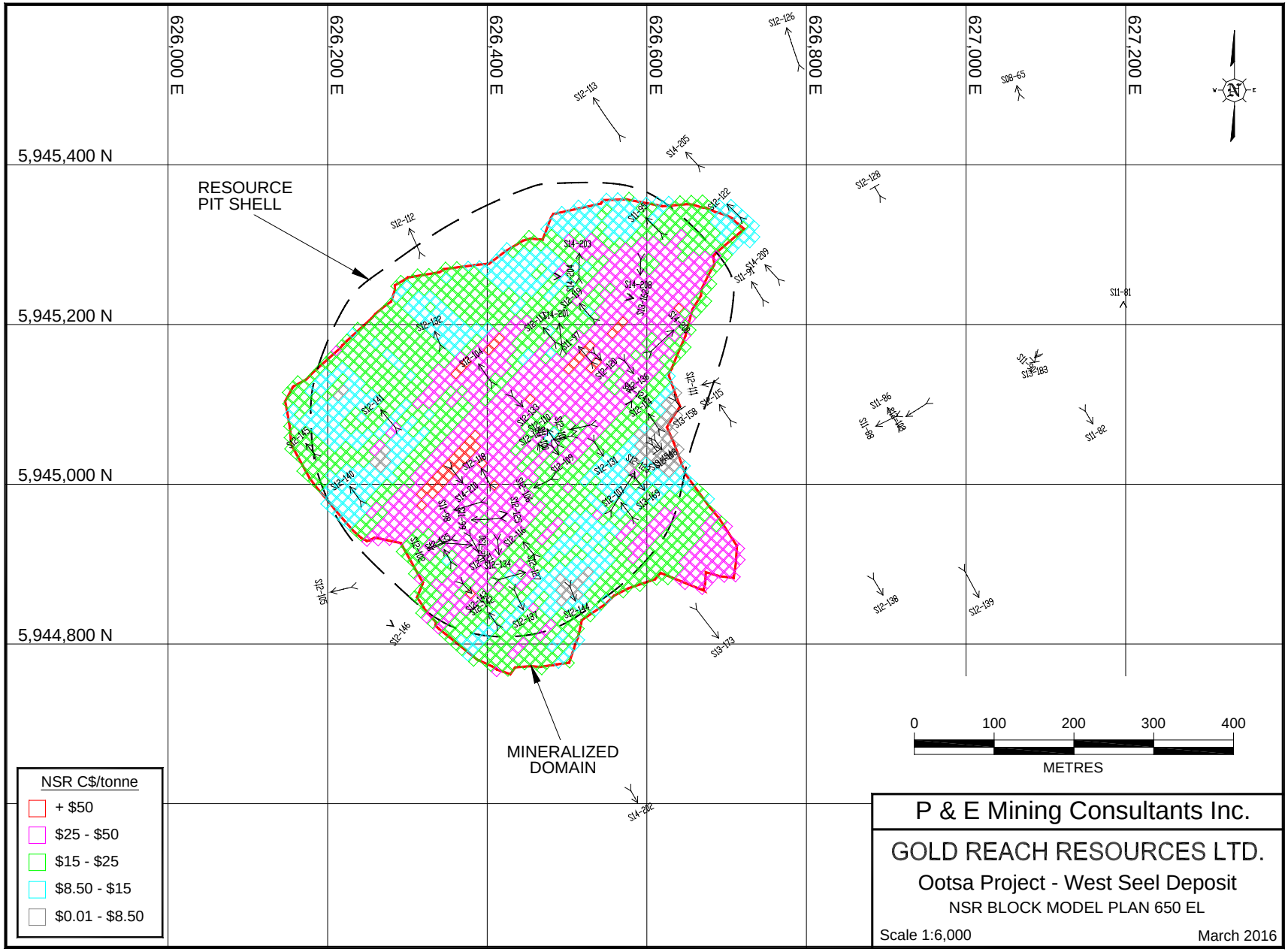

REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
BEDROCK
SURFACE
RESOURCE
PIT SHELL
Dx13-109
Dx13-108
Dx13-50
Dx07-3
Dx12-37
Dx13-51
Dx13-53
Dx12-35
Dx13-46
Dx12-36
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
NSR C$/tonne
+ $50
$25 - $50
$15 - $25
$8.50 - $15
$0.01 - $8.50
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
NSR BLOCK MODEL SECTION 5,003
Scale 1:3,000
March 2016

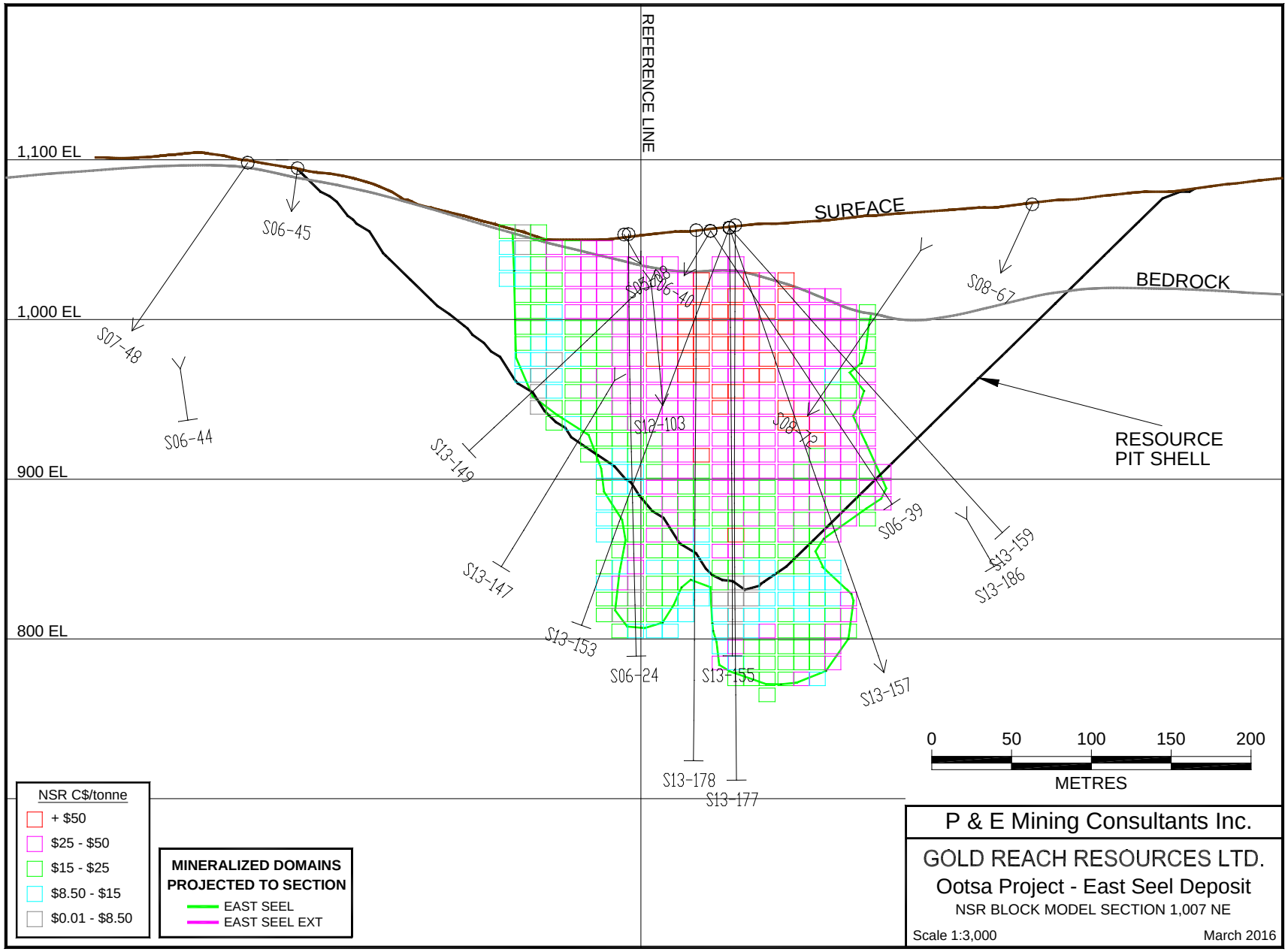

REFERENCE LINE
1,000 EL
BEDROCK
SURFACE
900 EL
800 EL
700 EL
600 EL
DX13-61
DX13-62
DX13-101
DX13-102
RESOURCE
PIT SHELL
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
NSR C$/tonne
+ $50
$25 - $50
$15 - $25
$8.50 - $15
$0.01 - $8.50
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
NSR BLOCK MODEL SECTION 5,008
Scale 1:3,000
March 2016

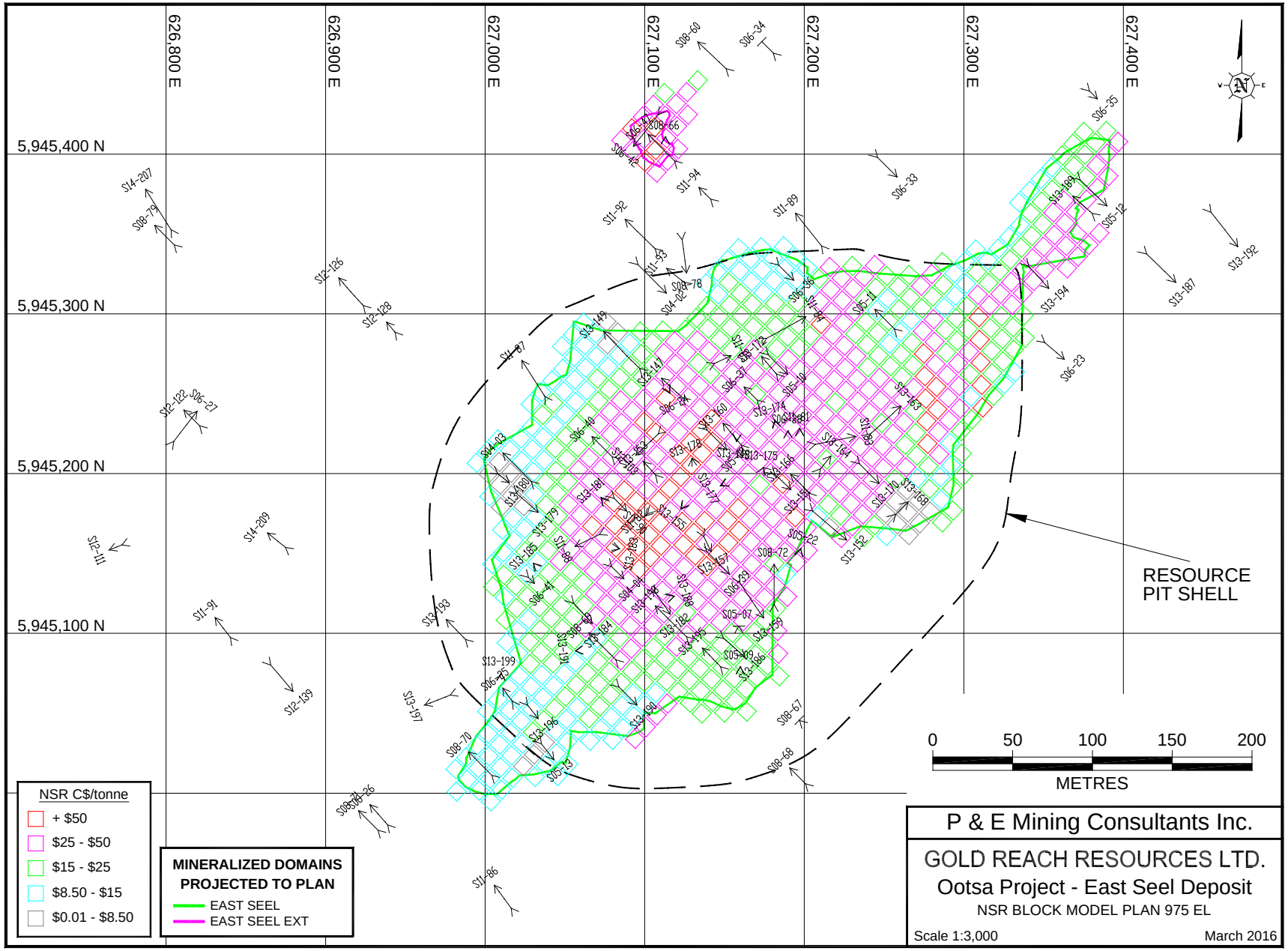

REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
SURFACE
BEDROCK
RESOURCE
PIT SHELL
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
NSR C$/tonne
+ $50
$25 - $50
$15 - $25
$8.50 - $15
$0.01 - $8.50
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
NSR BLOCK MODEL SECTION 5,016
Scale 1:3,000
March 2016


628,000 E
628,200 E
628,400 E
628,600 E
628,800 E
629,000 E
629,200 E
5,949,400 N
5,949,200 N
5,949,000 N
5,948,800 N
5,948,600 N
RESOURCE
PIT SHELL
MINERALIZED DOMAINS
PROJECTED TO PLAN
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
NSR C$/tonne
+ $50
$25 - $50
$15 - $25
$8.50 - $15
$0.01 - $8.50
0
100
200
300
METRES
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
NSR BLOCK MODEL PLAN 900EL
Scale 1:6,000
March 2016

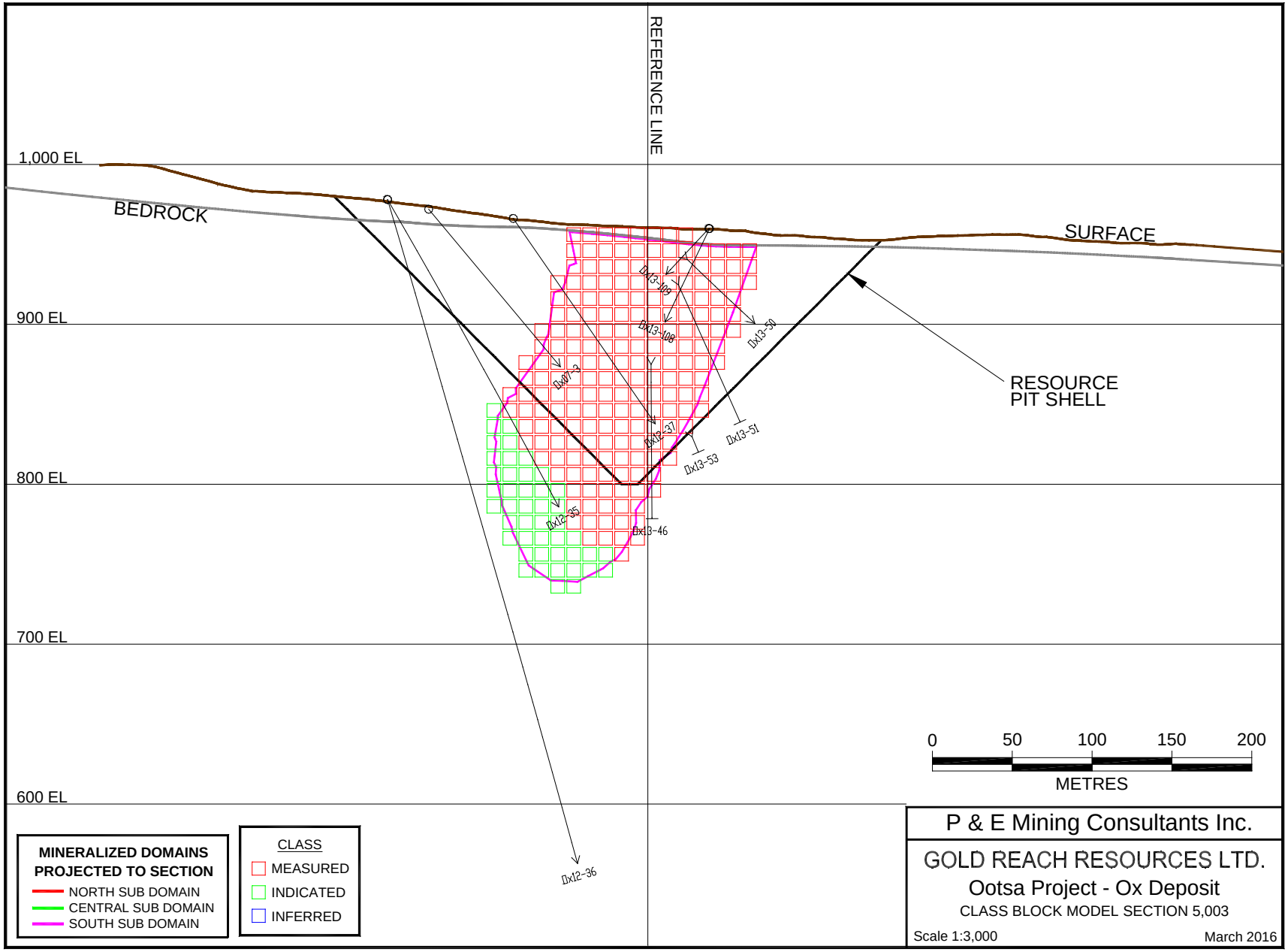

REFERENCE LINE
SURFACE
1,000 EL
BEDROCK
800 EL
600 EL
400 EL
RESOURCE PIT SHELL
MINERALIZED DOMAIN
S12-134
S12-132
S12-129
S12-123
S12-106
S12-101
S12-109
S12-127
S12-130
S12-141
S13-176
S13-173
0 100 200 300 400
METRES
NSR C$/tonne
+ $50
$25 - $50
$15 - $25
$8.50 - $15
$0.01 - $8.50
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - West Seel Deposit
NSR BLOCK MODEL SECTION 207 NE
Scale 1:6,000
March 2016

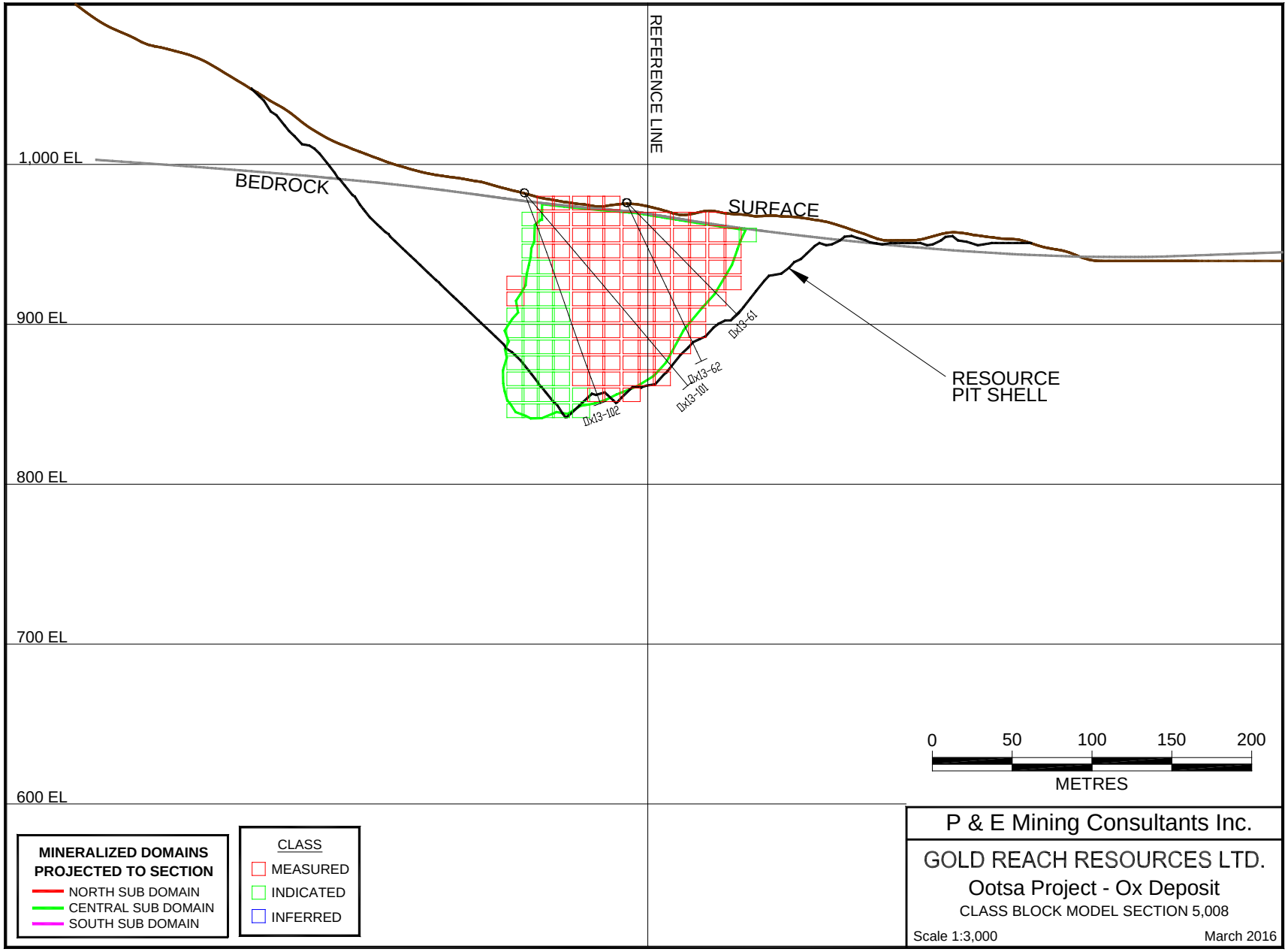

626,000 E
626,200 E
626,400 E
626,600 E
626,800 E
627,000 E
627,200 E
5,945,400 N
5,945,200 N
5,945,000 N
5,944,800 N
RESOURCE PIT SHELL
MINERALIZED DOMAIN
NSR C$/tonne
+ $50
$25 - $50
$15 - $25
$8.50 - $15
$0.01 - $8.50
0
100
200
300
400
METRES
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - West Seel Deposit
NSR BLOCK MODEL PLAN 650 EL
Scale 1:6,000
March 2016

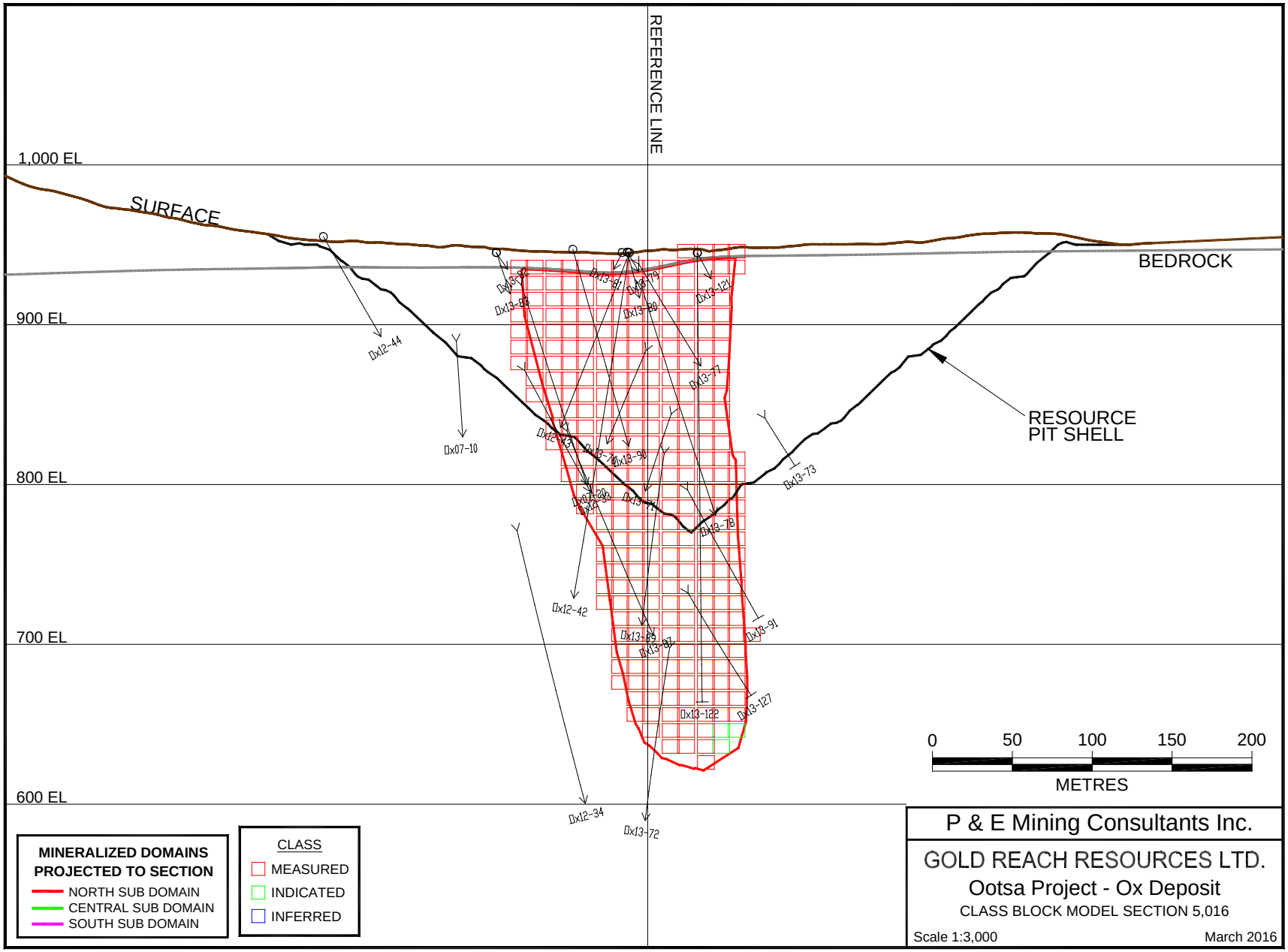

REFERENCE LINE
1,100 EL
1,000 EL
900 EL
800 EL
SURFACE
BEDROCK
RESOURCE
PIT SHELL
S06-45
S07-48
S06-44
S13-149
S13-147
S13-153
S06-24
S13-155
S13-178
S13-177
S12-103
S06-40
S08-75
S06-39
S13-157
S13-159
S13-186
S08-67
0
50
100
150
200
METRES
NSR C$/tonne
+ $50
$25 - $50
$15 - $25
$8.50 - $15
$0.01 - $8.50
MINERALIZED DOMAINS
PROJECTED TO SECTION
EAST SEEL
EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - East Seel Deposit
NSR BLOCK MODEL SECTION 1,007 NE
Scale 1:3,000
March 2016


626,800 E
626,900 E
627,000 E
627,100 E
627,200 E
627,300 E
627,400 E
5,945,400 N
5,945,300 N
5,945,200 N
5,945,100 N
RESOURCE
PIT SHELL
0 50 100 150 200
METRES
NSR C$/tonne
+ $50
$25 - $50
$15 - $25
$8.50 - $15
$0.01 - $8.50
MINERALIZED DOMAINS
PROJECTED TO PLAN
EAST SEEL
EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - East Seel Deposit
NSR BLOCK MODEL PLAN 975 EL
Scale 1:3,000
March 2016

APPENDIX VII. CLASSIFICATION BLOCK MODEL CROSS SECTIONS AND PLANS


REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
BEDROCK
SURFACE
RESOURCE
PIT SHELL
Dx13-109
Dx13-108
Dx13-50
Dx07-3
Dx12-37
Dx13-51
Dx13-53
Dx12-35
Dx13-46
Dx12-36
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
CLASS
MEASURED
INDICATED
INFERRED
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
CLASS BLOCK MODEL SECTION 5,003
Scale 1:3,000
March 2016


REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
BEDROCK
SURFACE
RESOURCE
PIT SHELL
DX13-61
DX13-62
DX13-101
DX13-102
0
50
100
150
200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
CLASS
MEASURED
INDICATED
INFERRED
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
CLASS BLOCK MODEL SECTION 5,008
Scale 1:3,000
March 2016


REFERENCE LINE
1,000 EL
900 EL
800 EL
700 EL
600 EL
SURFACE
BEDROCK
RESOURCE
PIT SHELL
0x12-44
0x07-10
0x12-42
0x12-34
0x13-72
0x13-77
0x13-78
0x13-73
0x13-91
0x13-127
0x13-122
0x13-121
0x13-87
0x13-88
0x13-89
0x13-90
0x13-79
0x13-80
0x13-81
0x13-82
0x13-83
0x13-84
0x13-85
0x13-86
0x13-76
0x13-75
0 50 100 150 200
METRES
MINERALIZED DOMAINS
PROJECTED TO SECTION
NORTH SUB DOMAIN
CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
CLASS
MEASURED
INDICATED
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GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
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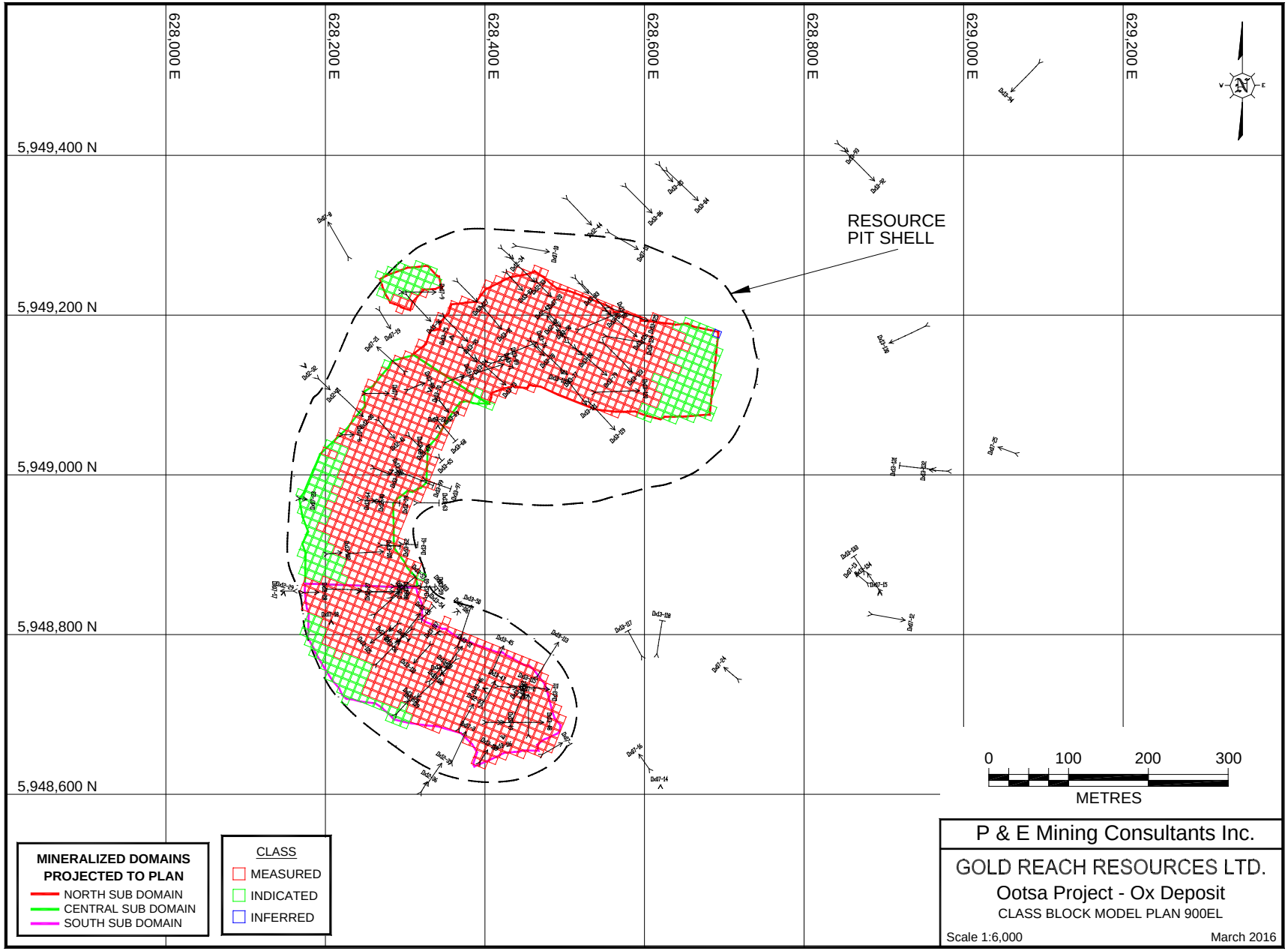
Scale 1:3,000
March 2016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PROJECTED TO PLAN
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CENTRAL SUB DOMAIN
SOUTH SUB DOMAIN
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MEASURED
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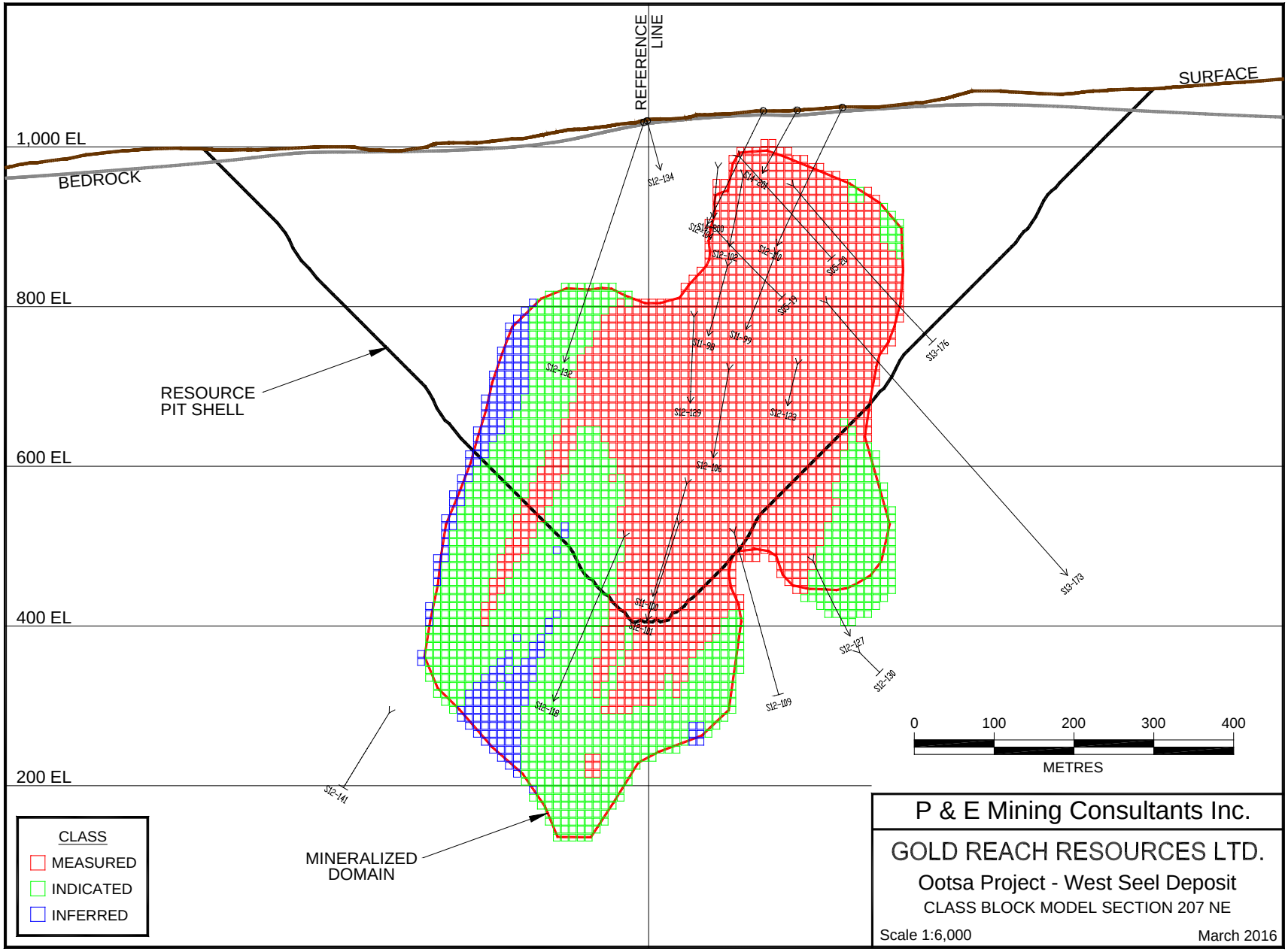
GOLD REACH RESOURCES LTD.
Ootsa Project - Ox Deposit
CLASS BLOCK MODEL PLAN 900EL
Scale 1:6,000
March 2016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Ootsa Project - West Seel Deposit
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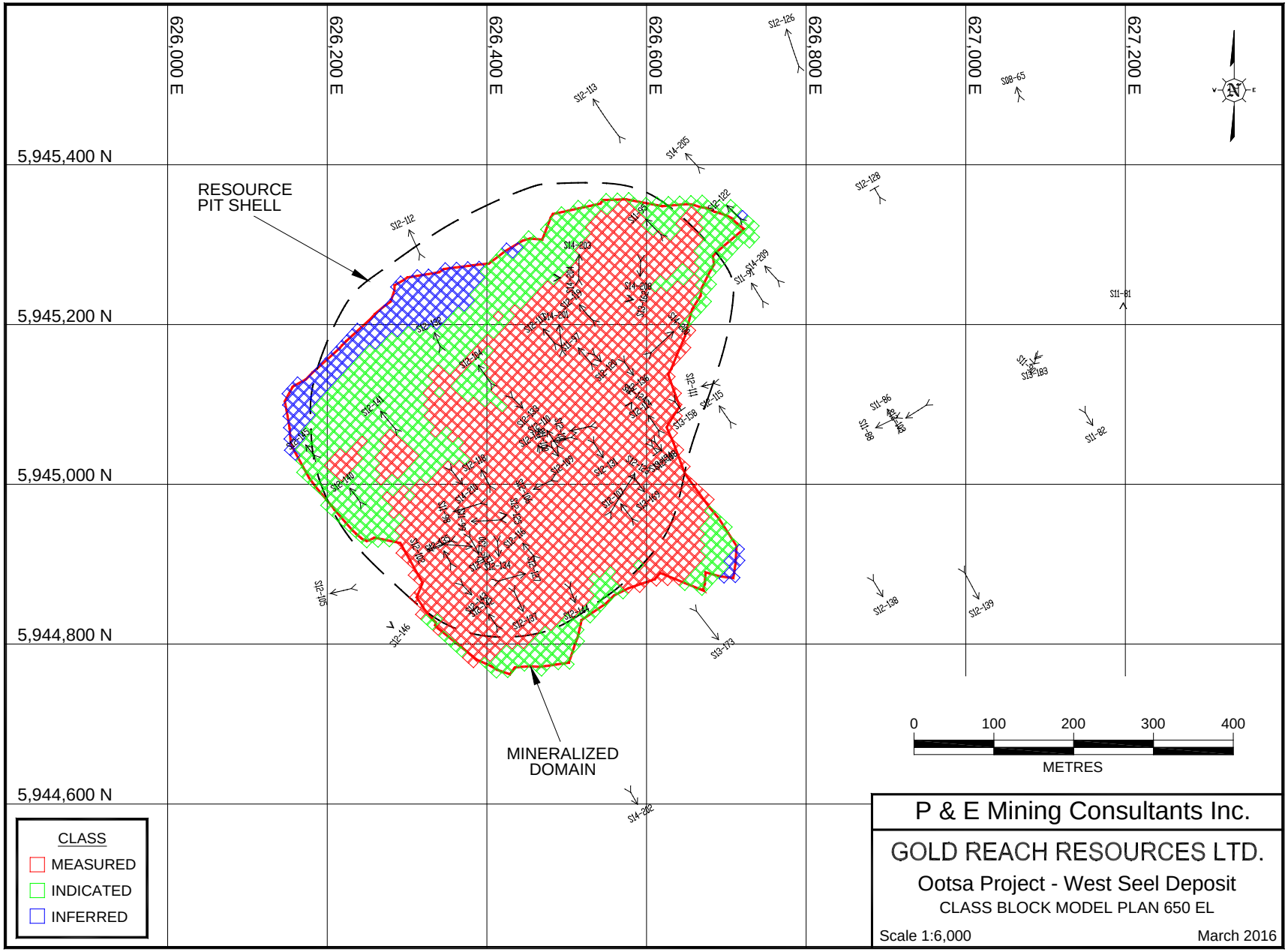
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RESOURCE PIT SHELL
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MEASURED
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INFERRED
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GOLD REACH RESOURCES LTD.
Ootsa Project - West Seel Deposit
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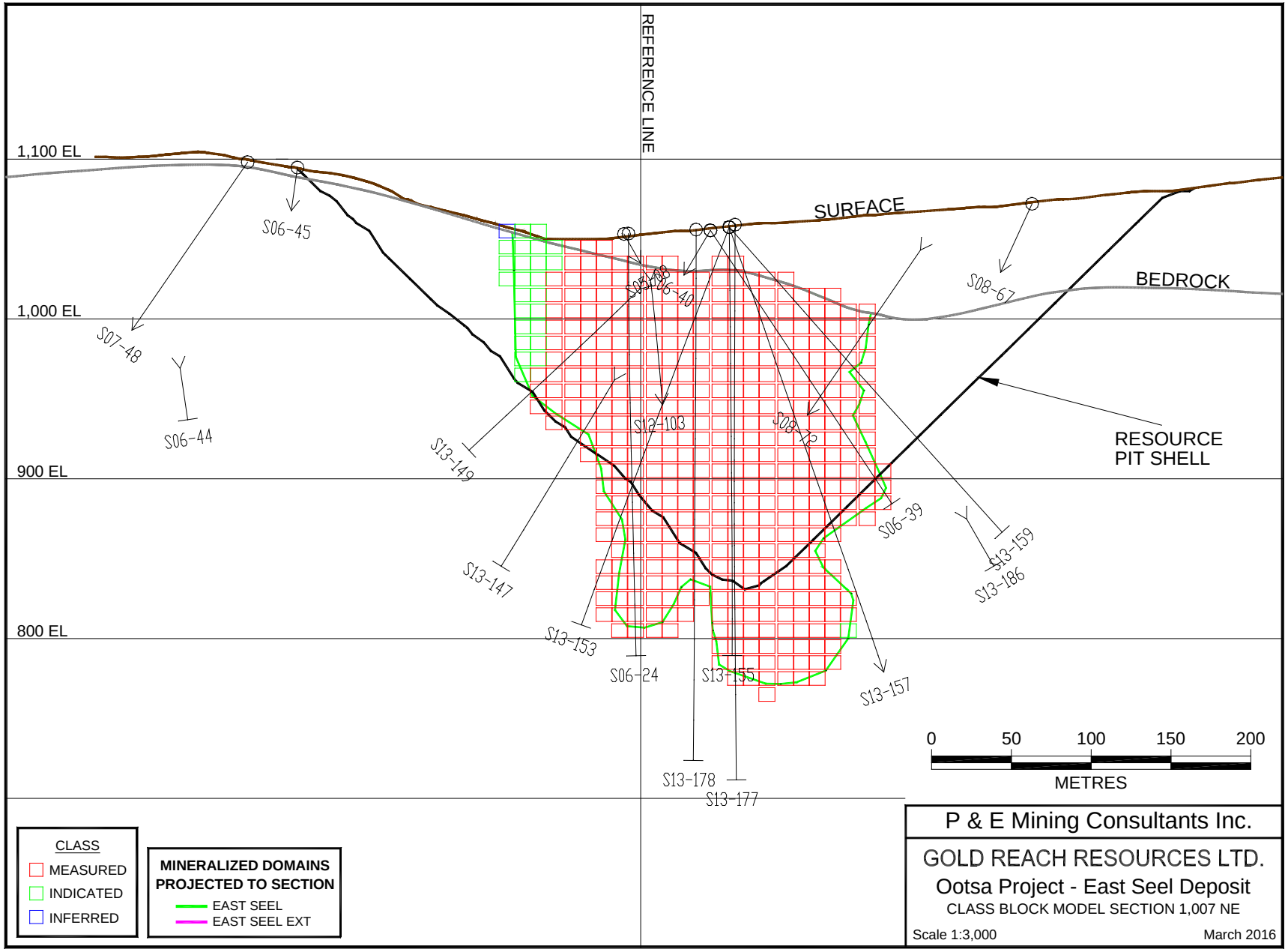
Scale 1:6,000
March 2016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METRES
CLASS
MEASURED
INDICATED
INFERRED
MINERALIZED DOMAINS
PROJECTED TO SECTION
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EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - East Seel Deposit
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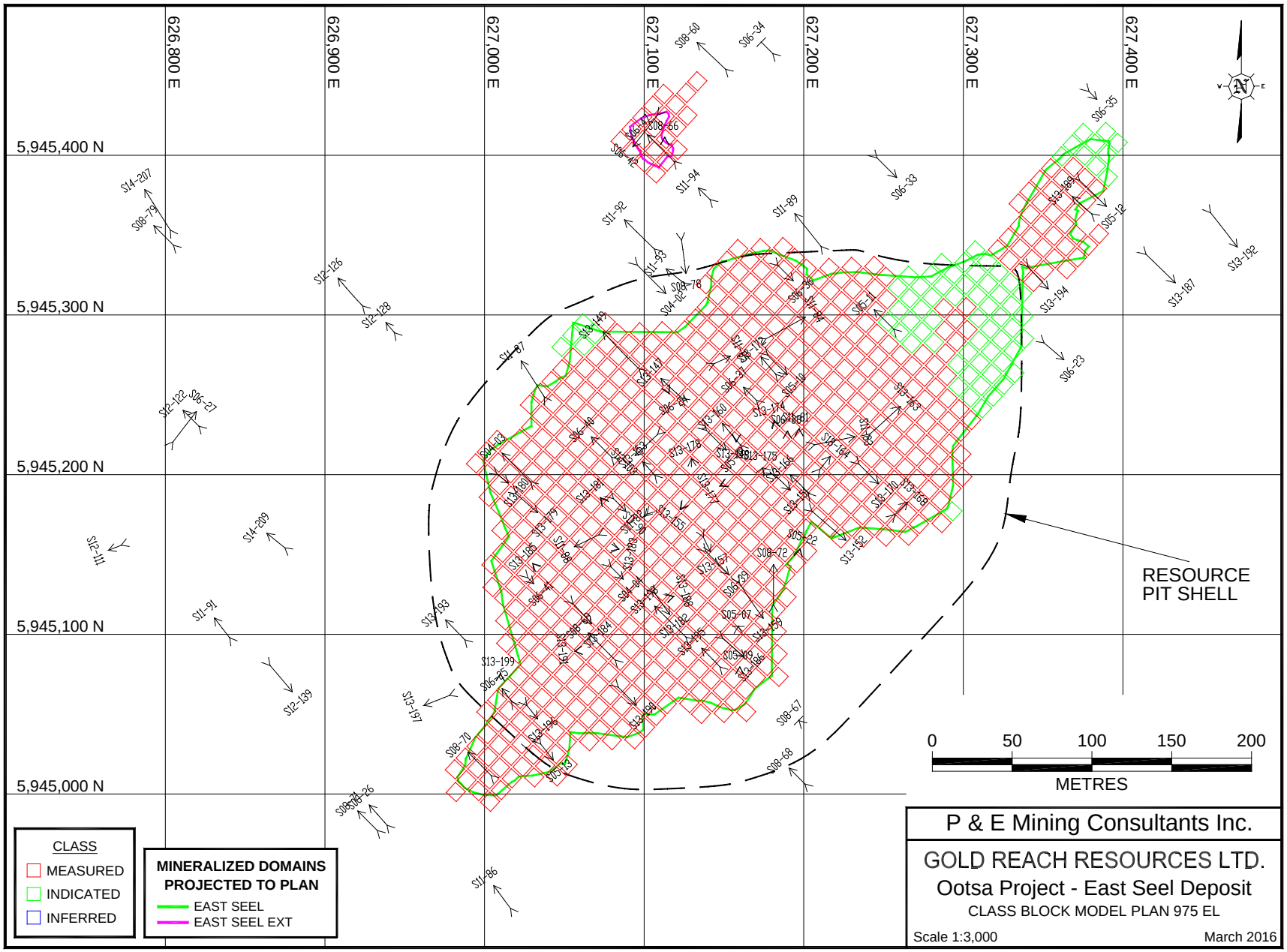
Scale 1:3,000
March 2016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INFERRED
MINERALIZED DOMAINS
PROJECTED TO PLAN
EAST SEEL
EAST SEEL EXT
P & E Mining Consultants Inc.
GOLD REACH RESOURCES LTD.
Ootsa Project - East Seel Deposit
CLASS BLOCK MODEL PLAN 975 EL
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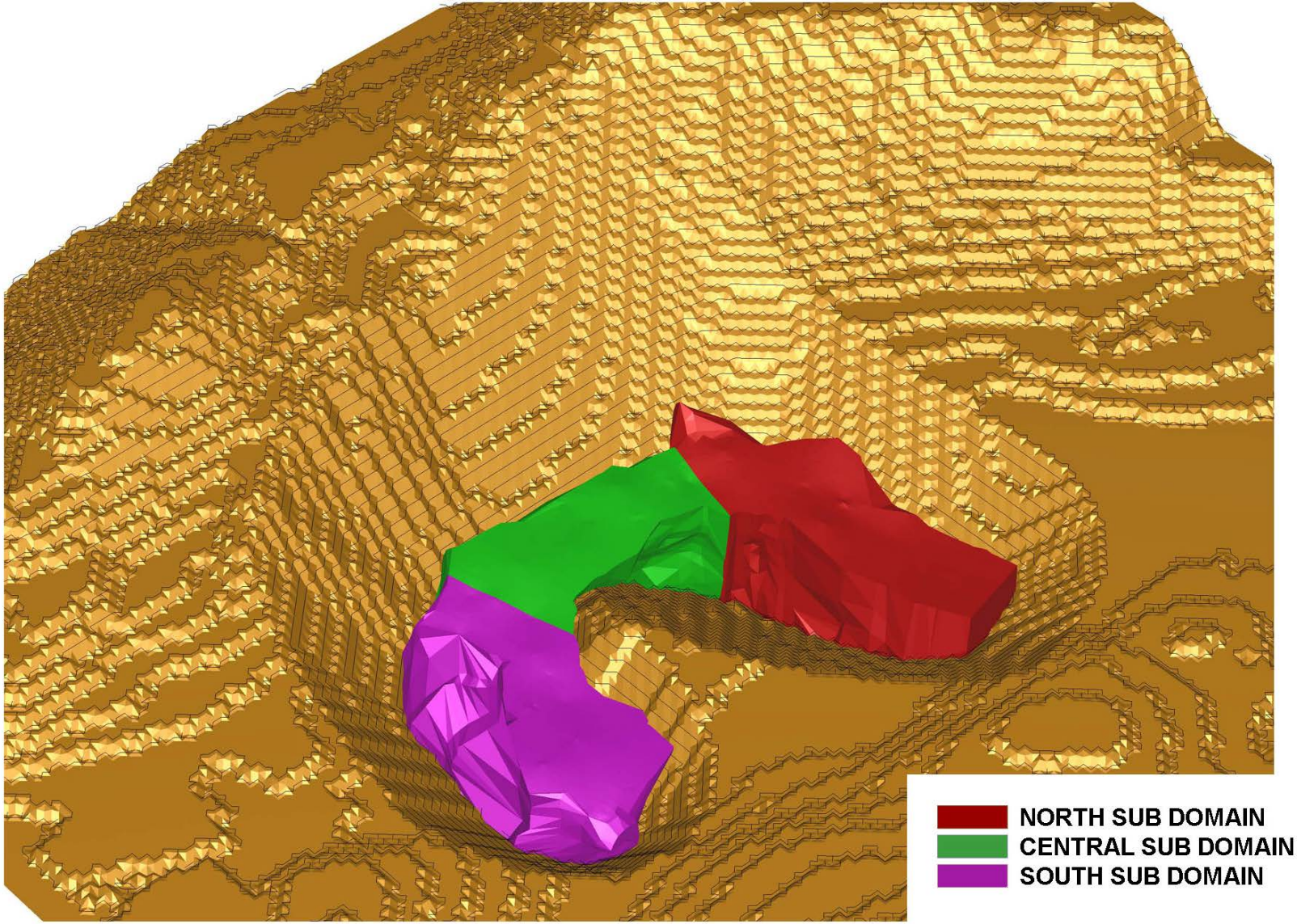
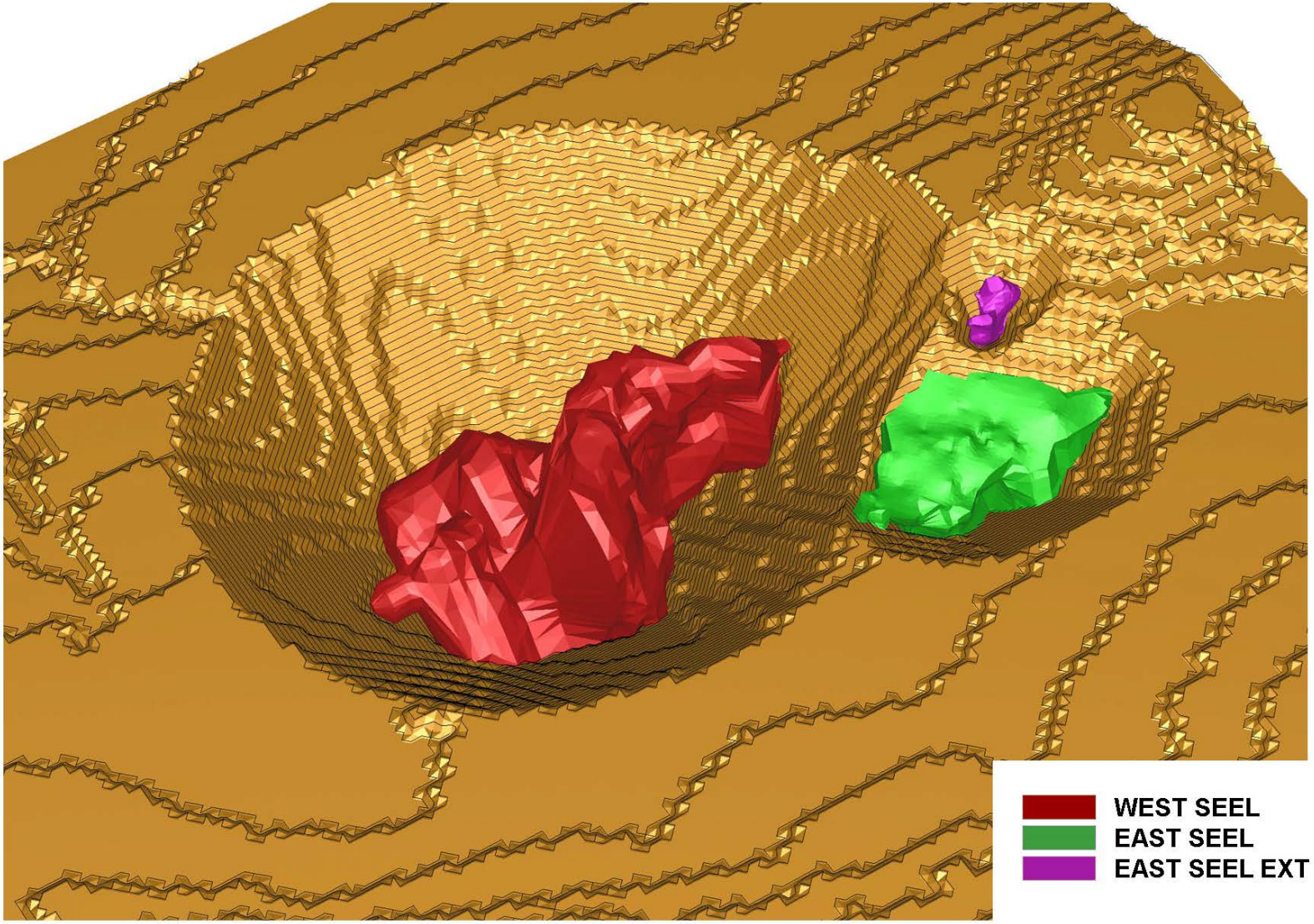
March 2016

APPENDIX VIII. OPTIMIZED PIT SHELLS

OOTSA PROJECT - OX DEPOSIT
OPTIMIZED RESOURCE PIT SHELL



OOTSA PROJECT - WEST & EAST SEEL DEPOSITS
OPTIMIZED RESOURCE PIT SHELL



APPENDIX IX. MINING SEQUENCE TRADE-OFF STUDY

December 20, 2015

TO: D. Melrose
CC: P&E Mining
FROM: P. Carter
SUBJECT: Mining Sequence Selection

1.0 INTRODUCTION

Examination of the preliminary mining schedule for the Ootsa project raises the question, "Is it better to mine the deposits from highest to lowest value or mine both of the Seel deposits first and have a single transition to Ox?" In previous iterations of the mining schedule the Ox deposit has a strip ratio > 1.6 which lowered the value of the resource even though it was higher grade than Seel W. Now, with the Ox deposit having the lowest strip ratio, the question becomes much more pertinent, despite the need to move infrastructure twice.

2.0 EVALUATION APPROACH

Two mining schedules were developed; the first sequencing mining SE–SW–Ox and the second sequencing mining SE–Ox–SW. The first schedule was considered the Base Case. A discounted cash flow model for each alternative was developed.

Two factors were identified as being primary to determining which schedule was most desirable. These were (1) timing of revenues and operating costs and (2) the timing and cost of transition both in terms sustaining capital and the potential need to stop milling during the switch.

The timing of revenues and operating costs fell directly out of the two different production schedules. The total and timing for sustaining capital was determined for each scenario based on when it was necessary to move from one pit to the next and the changes required by each move. Net present value (NPV) was the criteria used to decide which schedule should be selected.

3.0 OPERATING CONSIDERATIONS

A central aspect of both scenarios was determining how the transition between pits was to be made in order to minimize interruption to milling and any additional costs. Duplicating the crusher and overland conveyor to Ox was considered to add unnecessary additional capital expense.

Initially the alternative was to build a mill feed stockpile at the Permanent Transfer Point (PTP) and feed the mill via a portable crusher while the main crusher and Seel overland conveyor were being moved. Although practical, this option entailed added cost to haul material from Seel down to the PTP and for the portable crusher.

A review of the performance capability of the C160 jaw crusher indicated that it could produce a P80 -200 mm (8") product at a rate of 850 tph. This offered the possibility of simply raising the crusher/conveyor throughput from 700 tph to 850 tph during the 12 months prior to the change from Seel to Ox. Over that period, a stockpile of approximately 1.0 Mt would be accumulated providing a two month window during which the crusher and Seel conveyor could be moved.

The conveyor system would be designed with sufficient capacity to operate at the higher rate. Belt width and motor horsepower would be specified accordingly. The modular design of the crusher would allow the structure to be dismantled and reassembled in the time allowed.

The only additional cost of moving to the project would be the need to have a dozer on the crushed feed stockpile at the HB mill throughout the year dozing material out to build the pile up and then dozing it back in to the feeders during the transition. Feeding from the HB low grade stockpile would serve as a contingency plan if a shortage of feed was experienced during the transition.
The Ox sustaining capital, pre-stripping, draining of Ox Lake, and preparation of the conveyor corridor and crusher site, was applied in the cash flow the year prior to the move and the transition capital, the main crusher and Seel conveyor moves, was applied in the year of the transition itself. In the Base Case, this corresponded to Years 6 and 7 while in the alternative these costs were borne in Years 3 and 4. The alternative also had to bear the cost of moving the crusher and conveyor back to Seel in Years 9 and 10 to support the mining of Seel W.

The sustaining and transition capital costs applied in the cash flow model for the relocation from Seel to Ox are shown in Figure 1. In addition, the alternative scenario bore an additional $1.52 M in Years 9 and 10 to move the crusher and overland conveyor back to Seel to support the mining of Seel W.

TRANSITION CAPEX			$C x 1000
Crusher Move	16% of CAPEX		740
Seel CV move	15% of CAPEX		480
Dozing on COSP	$150/hr x 2,000 hr		300
SUBTOTAL			1,520
OX SUSTAINING CAPEX			$C x 1000
Ox Power Line	$300k/km x 3.9 km		1,200
New Ox CV	$1.6 M/km x 1.8 km		2,880
Ox Effluent Pipeline	$40/m x 5,000 m		200
Drain Ox Lake	Allowance		200
SUBTOTAL			4,480

Figure 1. Transition and Sustaining Capital to Move from Seel to Ox

4.0 RESULTS

The economic model used to evaluate the mining sequence was comprehensive. It included all the elements in the final model but represented the state of the project economics at the time evaluation. It included all the elements in the final model including OPEX, CAPEX, salvage, as well as working and sustaining capital. The two major differences between this interim version and the final model were initial CAPEX was assumed to be $100 M and the pre-production period was two years rather than one.

Figure 2 compares the results from each cash flow model and various copper prices. It can be seen that regardless of metal price, the alternative sequence mining Ox after Seel E, is clearly superior in terms of NPV despite the need to make to crusher/conveyor moves.

Mining Sequence:		SE-SW-Ox			Mining Sequence:		SE-Ox-SW	
Cu Price	NPV	IRR	Payback		Cu Price	NPV	IRR	Payback
$/lb	C$ M	%	yrs		$/lb	C$ M	%	yrs
3.25	223	37	1.8		3.25	232	40	1.8
3.00	174	32	2.0		3.00	183	35	2.0
2.50	66	17	3.8		2.50	70	19	3.1

Figure 2. Comparative Economics for Mining Sequence Options

Despite added and earlier sustaining and transition capital costs, mining the pits from highest value to lowest value delivers the highest NPV. At copper prices of $3.00/lb and above the alternative mining sequence has an NPV nominally $10 M better than the Base Case.

5.0 CONCLUSIONS & RECOMMENDATIONS

Deferring and minimizing the cost of transition brings the NPV of the Base Case closer to that of the alternative, however, the benefit derived from milling the highest value feed first more than outweighs the added capital cost at any expected price.

It is recommended that the production schedule which mines Seel E first, then Ox, and finally Seel W be adopted as the Base Case for the project economic model.

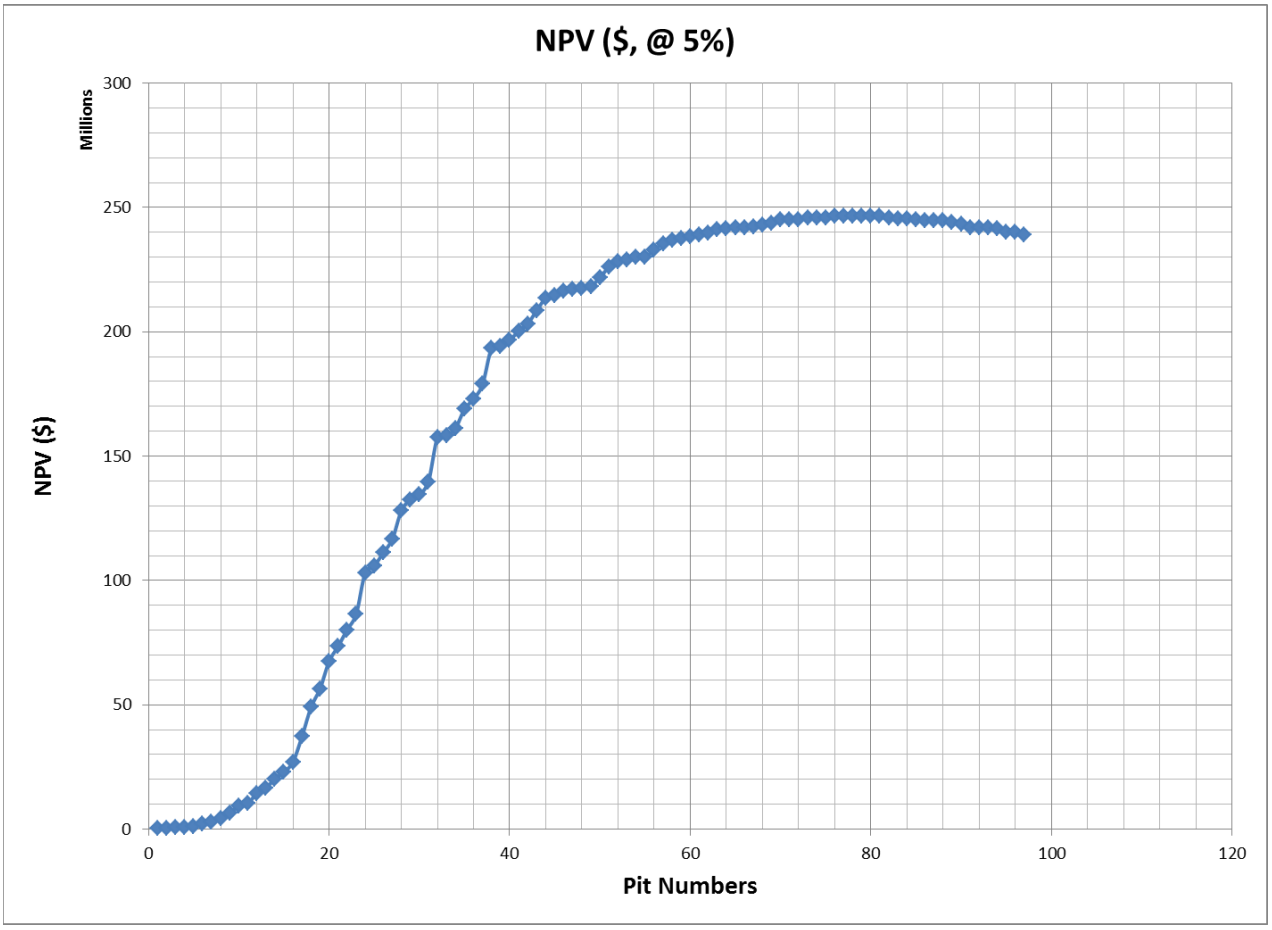
APPENDIX X. PIT OPTIMIZATION STUDY

Ox Pit Optimization

December 1, Ootsa OX Deposit Optimization Results Summary. NSR Cut-off = C$ 9.60 (including conveying cost of C$ 0.23/t)

		FINANCIAL DATA						MINING SUMMARY						NSR & GRADES				
Phase	Factor	Profit ($)	Revenue ($)	Proc. Cost ($)	Min. Cost ($)	Cap Costs ($)	NPV ($, @ 5%)	Total Rock (t)	Overburden (t)	Mined_waste (t)	Total Waste (t)	Strip Ratio	Total Ore (t)	NSR ($/t)	AU (g/t)	AG (g/t)	CU (%)	MO (%)
Pit 1	22.00%	248,319	315,792	52,851	14,622	0	248,311	7,961	0	2,456	2,456	0.45	5,505	57.36	0.12	2.64	0.630	0.049
Pit 2	24.00%	359,690	461,954	79,079	23,184	0	359,674	13,217	0	4,980	4,980	0.60	8,237	56.08	0.11	2.69	0.629	0.044
Pit 3	25.00%	707,746	922,784	167,454	47,584	0	707,687	26,478	0	9,035	9,035	0.52	17,443	52.90	0.11	2.46	0.584	0.047
Pit 4	26.00%	780,275	1,019,761	186,793	52,693	0	780,204	29,149	0	9,691	9,691	0.50	19,458	52.41	0.10	2.40	0.572	0.049
Pit 5	27.00%	1,234,790	1,641,427	314,040	92,597	0	1,234,607	53,015	0	20,303	20,303	0.62	32,712	50.18	0.10	2.29	0.545	0.049
Pit 6	28.00%	2,289,059	3,100,752	608,547	203,145	0	2,288,406	121,043	10,000	47,653	57,653	0.91	63,390	48.92	0.09	2.08	0.523	0.052
Pit 7	29.00%	2,862,191	3,902,950	783,853	256,905	0	2,861,161	152,707	10,000	61,056	71,056	0.87	81,651	47.80	0.09	2.09	0.508	0.052
Pit 8	30.00%	4,433,644	6,142,234	1,295,564	413,027	0	4,431,057	238,932	20,000	83,977	103,977	0.77	134,955	45.51	0.09	2.32	0.483	0.049
Pit 9	31.00%	6,474,017	9,089,037	1,996,066	618,954	0	6,468,242	352,246	28,000	116,322	144,322	0.69	207,924	43.71	0.09	2.61	0.461	0.048
Pit 10	32.00%	9,421,777	13,414,436	3,088,957	903,702	0	9,408,828	496,005	34,000	140,239	174,239	0.54	321,766	41.69	0.08	2.38	0.441	0.047
Pit 11	33.00%	10,262,176	14,668,071	3,405,676	1,000,219	0	10,246,679	549,362	40,000	154,604	194,604	0.55	354,758	41.35	0.08	2.32	0.439	0.046
Pit 12	34.00%	14,494,154	21,036,437	4,997,104	1,545,179	0	14,461,825	846,563	112,000	214,031	326,031	0.63	520,532	40.41	0.08	2.17	0.436	0.043
Pit 13	35.00%	16,579,625	24,318,476	5,950,484	1,788,367	0	16,536,519	967,425	116,000	231,583	347,583	0.56	619,842	39.23	0.08	2.05	0.424	0.042
Pit 14	36.00%	20,262,330	30,133,514	7,609,200	2,261,983	0	20,195,522	1,210,722	140,000	278,097	418,097	0.53	792,625	38.02	0.08	2.03	0.411	0.041
Pit 15	37.00%	23,025,369	34,667,622	9,000,201	2,642,053	0	22,936,774	1,406,223	152,000	316,702	468,702	0.50	937,521	36.98	0.07	2.13	0.400	0.039
Pit 16	38.00%	27,168,803	41,410,388	11,017,541	3,224,044	0	27,041,169	1,702,844	184,000	371,184	555,184	0.48	1,147,660	36.08	0.07	2.06	0.390	0.039
Pit 17	39.00%	37,538,152	58,889,763	16,642,945	4,708,665	0	37,273,017	2,446,121	208,000	504,481	712,481	0.41	1,733,640	33.97	0.07	1.82	0.368	0.037
Pit 18	40.00%	49,512,616	79,408,964	23,401,468	6,494,880	0	49,019,738	3,335,442	240,000	657,789	897,789	0.37	2,437,653	32.58	0.06	1.71	0.354	0.036
Pit 19	41.00%	57,177,114	92,701,835	27,785,494	7,739,227	0	56,500,660	3,965,459	286,000	785,137	1,071,137	0.37	2,894,322	32.03	0.06	1.65	0.349	0.036
Pit 20	42.00%	68,433,249	112,473,327	34,286,456	9,753,621	0	67,430,215	5,007,666	374,000	1,062,160	1,436,160	0.40	3,571,506	31.49	0.06	1.72	0.342	0.035
Pit 21	43.00%	74,713,902	124,015,859	38,370,637	10,931,320	0	73,498,945	5,598,259	420,000	1,181,318	1,601,318	0.40	3,996,941	31.03	0.06	1.72	0.336	0.035
Pit 22	44.00%	81,670,029	136,928,865	43,024,951	12,233,885	0	80,193,288	6,241,240	466,000	1,293,474	1,759,474	0.39	4,481,766	30.55	0.06	1.67	0.332	0.035
Pit 23	45.00%	88,232,886	149,524,425	47,745,295	13,546,244	0	86,480,514	6,903,936	516,000	1,414,468	1,930,468	0.39	4,973,468	30.06	0.06	1.64	0.328	0.034
Pit 24	46.00%	105,801,803	184,004,211	60,865,222	17,337,186	0	103,152,027	8,810,104	624,000	1,845,977	2,469,977	0.39	6,340,127	29.02	0.06	1.58	0.319	0.032
Pit 25	47.00%	108,727,073	189,830,340	63,062,368	18,040,899	0	105,912,589	9,158,317	662,000	1,927,320	2,589,320	0.39	6,568,997	28.90	0.06	1.59	0.318	0.032
Pit 26	48.00%	114,328,784	201,180,550	67,436,848	19,414,918	0	111,180,554	9,861,365	734,000	2,102,693	2,836,693	0.40	7,024,672	28.64	0.06	1.58	0.315	0.032
Pit 27	49.00%	120,153,864	212,956,043	71,903,118	20,899,061	0	116,636,701	10,602,623	816,000	2,296,715	3,112,715	0.42	7,489,908	28.43	0.06	1.56	0.314	0.032
Pit 28	50.00%	132,410,723	238,730,943	82,150,126	24,170,094	0	128,027,278	12,259,244	964,000	2,737,939	3,701,939	0.43	8,557,305	27.90	0.06	1.54	0.309	0.031
Pit 29	51.00%	137,262,025	248,972,793	86,024,464	25,686,305	0	132,510,808	13,045,163	1,056,000	3,028,281	4,084,281	0.46	8,960,882	27.78	0.06	1.54	0.308	0.031
Pit 30	52.00%	139,327,638	253,479,527	87,769,655	26,382,233	0	134,415,394	13,397,590	1,122,000	3,132,918	4,254,918	0.47	9,142,672	27.72	0.05	1.54	0.307	0.031
Pit 31	53.00%	145,182,662	266,461,308	93,100,642	28,178,004	0	139,792,865	14,310,684	1,210,000	3,402,700	4,612,700	0.48	9,697,984	27.48	0.05	1.52	0.305	0.030
Pit 32	54.00%	164,626,556	309,445,760	109,974,860	34,844,344	0	157,436,267	17,811,054	2,086,000	4,269,340	6,355,339	0.55	11,455,715	27.01	0.05	1.52	0.300	0.030
Pit 33	55.00%	165,419,983	311,280,900	110,709,720	35,151,196	0	158,152,199	17,966,438	2,102,000	4,332,176	6,434,175	0.56	11,532,263	26.99	0.05	1.52	0.300	0.030
Pit 34	56.00%	168,823,711	319,124,559	113,980,332	36,320,517	0	161,216,751	18,579,174	2,252,000	4,454,223	6,706,223	0.56	11,872,951	26.88	0.05	1.52	0.298	0.030
Pit 35	57.00%	177,503,447	340,129,555	122,843,116	39,782,991	0	168,976,959	20,332,310	2,492,000	5,044,152	7,536,152	0.59	12,796,158	26.58	0.05	1.52	0.295	0.030
Pit 36	58.00%	181,969,522	351,142,434	127,379,006	41,793,905	0	172,948,176	21,360,597	2,680,000	5,411,951	8,091,951	0.61	13,268,646	26.46	0.05	1.52	0.294	0.029
Pit 37	59.00%	188,793,805	368,848,928	135,234,963	44,820,160	0	178,977,276	22,874,326	2,834,000	5,953,351	8,787,351	0.62	14,086,975	26.18	0.05	1.52	0.291	0.029
Pit 38	60.00%	205,507,757	411,813,625	152,843,282	53,462,587	0	193,537,525	27,258,194	3,506,000	7,831,019	11,337,019	0.71	15,921,175	25.87	0.05	1.55	0.287	0.029
Pit 39	61.00%	206,398,252	414,193,886	153,884,901	53,910,733	0	194,309,470	27,487,111	3,550,000	7,907,434	11,457,434	0.71	16,029,677	25.84	0.05	1.55	0.287	0.029
Pit 40	62.00%	209,053,740	421,349,188	156,938,585	55,356,863	0	196,605,613	28,221,764	3,704,000	8,169,995	11,873,995	0.73	16,347,769	25.77	0.05	1.55	0.286	0.029
Pit 41	63.00%	213,428,844	433,473,895	162,252,251	57,792,800	0	200,372,271	29,465,815	3,912,000	8,652,539	12,564,539	0.74	16,901,276	25.65	0.05	1.55	0.285	0.029
Pit 42	64.00%	216,752,258	442,927,485	166,397,792	59,777,436	0	203,221,274	30,445,990	3,982,000	9,130,887	13,112,887	0.76	17,333,103	25.55	0.05	1.54	0.284	0.029
Pit 43	65.00%	223,158,858	462,080,069	175,242,346	63,678,866	0	208,674,489	32,405,477	4,244,000	9,907,066	14,151,066	0.78	18,254,411	25.31	0.05	1.53	0.282	0.029
Pit 44	66.00%	228,922,030	479,209,562	182,395,331	67,892,201	0	213,543,312	34,604,182	4,800,000	10,804,668	15,604,668	0.82	18,999,514	25.22	0.05	1.54	0.281	0.028
Pit 45	67.00%	230,354,428	483,710,546	184,546,499	68,809,619	0	214,750,358	35,061,413	4,840,000	10,997,819	15,837,819	0.82	19,223,594	25.16	0.05	1.54	0.280	0.028
Pit 46	68.00%	232,288,396	489,892,088	187,397,017	70,206,675	0	216,375,866	35,774,053	4,954,000	11,299,530	16,253,530	0.83	19,520,523	25.10	0.05	1.54	0.280	0.028
Pit 47	69.00%	233,215,150	492,899,049	188,664,820	71,019,078	0	217,153,568	36,211,770	5,096,000	11,463,185	16,559,184	0.84	19,652,585	25.08	0.05	1.54	0.279	0.028
Pit 48	70.00%	233,420,758	493,584,965	188,988,894	71,175,313	0	217,326,036	36,289,668	5,104,000	11,499,325	16,603,325	0.84	19,686,343	25.07	0.05	1.54	0.279	0.028
Pit 49	71.00%	234,638,896	497,769,265	190,802,117	72,328,252	0	218,346,315	36,886,757	5,242,000	11,769,536	17,011,536	0.86	19,875,221	25.04	0.05	1.55	0.279	0.028
Pit 50	72.00%	238,874,634	512,946,736	197,188,353	76,883,749	0	221,872,365	39,259,650	5,754,000	12,965,197	18,719,196	0.91	20,540,453	24.97	0.05	1.55	0.278	0.028
Pit 51	73.00%	244,022,458	532,308,059	206,328,724	81,956,877	0	226,122,469	41,855,733	6,282,000	14,081,158	20,363,158	0.95	21,492,575	24.77	0.05	1.54	0.276	0.028
Pit 52	74.00%	246,587,681	542,156,356	211,018,522	84,550,153	0	228,231,682	43,180,802	6,494,000	14,705,706	21,199,706	0.96	21,981,096	24.66	0.05	1.54	0.275	0.028
Pit 53	75.00%	247,482,229	545,839,064	212,762,708	85,594,127	0	228,965,649	43,712,633	6,582,000	14,967,851	21,549,851	0.97	22,162,782	24.63	0.05	1.54	0.275	0.028
Pit 54	76.00%	248,889,949	551,737,377	215,701,111	87,146,317	0	230,117,669	44,486,592	6,654,000	15,363,726	22,017,726	0.98	22,468,866	24.56	0.05	1.53	0.274	0.028
Pit 55	77.00%	248,913,721	551,857,718	215,767,767	87,176,231	0	230,137,119	44,502,576	6,654,000	15,372,767	22,026,767	0.98	22,475,809	24.55	0.05	1.53	0.274	0.028
Pit 56	78.00%	252,463,874	567,913,713	223,063,218	92,386,621	0	233,019,557	47,215,901	7,296,000	16,684,149	23,980,149	1.03	23,235,752	24.44	0.05	1.53	0.273	0.028
Pit 57	79.00%	255,616,577	583,107,550	229,972,748	97,518,225	0	235,562,430	49,921,895	8,060,000	17,906,401	25,966,400	1.08	23,955,495	24.34	0.05	1.54	0.272	0.028
Pit 58	80.00%	257,421,377	592,156,166	234,316,223	100,418,567	0	237,013,199	51,394,860	8,252,000	18,734,920	26,986,920	1.11	24,407,940	24.26	0.05	1.53	0.271	0.028
Pit 59	81.00%	257,973,758	594,985,694	235,572,809	101,439,127	0	237,456,784	51,922,114	8,334,000	19,049,280	27,383,280	1.12	24,538,834	24.25	0.05	1.54	0.271	0.028
Pit 60	82.00%	259,003,359	600,571,234	238,088,942	103,478,933	0	238,281,233	53,014,178	8,738,000	19,475,247	28,213,246	1.14	24,800,931	24.22	0.05	1.54	0.270	0.028
Pit 61	83.00%	259,967,649	606,166,564	240,861,593	105,337,323	0	239,051,174	53,970,370	8,922,000	19,958,621	28,880,621	1.15	25,089,749	24.16	0.05	1.54	0.270	0.028
Pit 62	84.00%	261,035,566	612,612,334	243,908,198	107,668,570	0	239,901,223	55,224,400	9,340,000	20,477,296	29,817,296	1.17	25,407,104	24.11	0.05	1.53	0.269	0.028
Pit 63	85.00%	262,570,796	622,341,322	248,357,404	111,413,121	0	241,117,212	57,177,502	9,824,000	21,482,939	31,306,939	1.21	25,870,563	24.06	0.05	1.54	0.269	0.028
Pit 64	86.00%	263,092,509	625,893,158	250,120,031	112,680,618	0	241,530,409	57,825,454	9,930,000	21,841,284	31,771,284	1.22	26,054,170	24.02	0.05	1.53	0.268	0.028
Pit 65	87.00%	263,532,910	629,204,283	251,790,582	113,880,791	0	241,878,502	58,424,019	9,972,000	22,223,833	32,195,833	1.23	26,228,186	23.99	0.05	1.53	0.268	0.028
Pit 66	88.00%	263,562,794	629,442,753	251,893,388	113,986,571	0	241,902,141	58,475,378	9,972,000	22,264,483	32,236,483	1.23	26,238,895	23.99	0.05	1.53	0.268	0.028
Pit 67	89.00%	264,245,275	635,515,607	254,804,687	116,465,646	0	242,439,152	59,803,985	10,426,000	22,835,830	33,261,830	1.25	26,542,155	23.94	0.05	1.53	0.267	0.028
Pit 68	90.00%	264,947,865	642,152,110	258,133,591	119,070,653	0	242,989,864	61,171,165	10,818,000	23,464,249	34,282,249	1.28	26,888,916	23.88	0.05	1.53	0.267	0.027
Pit 69	91.00%	265,982,184	652,906,131	263,084,411	123,839,536	0	243,793,988	63,713,431	11,636,000	24,672,805	36,308,805	1.32	27,404,626	23.82	0.05	1.53	0.266	0.027
Pit 70	92.00%	267,573,309	671,656,882	271,940,617	132,142,956	0	245,013,267	68,196,456	13,336,000	26,533,308	39,869,308	1.41	28,327,148	23.71	0.04	1.53	0.265	0.027
Pit 71	93.00%	267,687,699	673,145,228	272,643,104	132,814,425	0	245,101,937	68,558,173	13,434,000	26,723,850	40,157,850	1.41	28,400,323	23.70	0.04	1.53	0.265	0.027
Pit 72	94.00%	267,701,022	673,353,932	272,750,314	132,902,596	0	245,112,273	68,603,490	13,436,000	26,755,999	40,191,999	1.41	28,411,491	23.70	0.04	1.53	0.265	0.027
Pit 73	95.00%	268,675,686	690,072,781	280,326,322	141,070,774	0	245,847,394	73,144,202	15,470,000	28,473,543	43,943,543	1.50	29,200,659	23.63	0.04	1.53	0.264	0.027
Pit 74	96.00%	268,814,461	693,404,707	281,852,996	142,737,250	0	245,953,560	74,024,363	15,712,000	28,952,676	44,664,676	1.52	29,359,687	23.62	0.04	1.53	0.264	0.027
Pit 75	97.00%	268,886,872	695,407,784	282,802,395	143,718,517	0	246,008,973	74,537,362	15,802,000	29,276,779	45,078,779	1.53	29,458,583	23.61	0.04	1.53	0.264	0.027
Pit 76	98.00%	269,790,220	735,449,252	301,502,163	164,156,869	0	246,579,450	85,754,419	20,570,000	33,777,944	54,347,943	1.73	31,406,475	23.42	0.04	1.53	0.261	0.027
Pit 77	99.00%	269,919,770	742,488,847	304,792,143	167,776,933	0	246,673,958	87,720,210	21,266,000	34,705,028	55,971,028	1.76	31,749,182	23.39	0.04	1.53	0.261	0.027
Pit 78	**100.00%**	**269,925,310**	**744,077,833**	**305,532,903**	**168,619,621**	**0**	**246,677,936**	**88,166,662**	**21,402,000**	**34,938,318**	**56,340,318**	**1.77**	**31,826,344**	**23.38**	**0.04**	**1.53**	**0.261**	**0.027**
Pit 79	101.00%	269,917,509	745,556,546	306,323,947	169,315,090	0	246,671,929	88,530,657	21,478,000	35,143,912	56,621,912	1.77	31,908,744	23.37	0.04	1.53	0.261	0.027
Pit 80	102.00%	269,830,607	750,994,616	308,894,419	172,269,590	0	246,604,436	90,055,587	21,774,000	36,105,085	57,879,085	1.80	32,176,502	23.34	0.04	1.53	0.261	0.027
Pit 81	103.00%	269,742,287	754,244,482	310,713,670	173,788,525	0	246,537,511	90,826,937	21,866,000	36,594,929	58,460,929	1.81	32,366,007	23.30	0.04	1.53	0.260	0.027
Pit 82	104.00%	268,696,765	782,019,781	324,426,317	188,896,699	0	245,701,182	98,938,043	24,656,000	40,487,635	65,143,635	1.93	33,794,408	23.14	0.04	1.53	0.259	0.027
Pit 83	105.00%	268,285,935	790,460,967	328,414,825	193,760,207	0	245,392,811	101,489,995	25,306,000	41,974,117	67,280,117	1.97	34,209,878	23.11	0.04	1.53	0.258	0.027
Pit 84	106.00%	268,274,733	790,656,874	328,538,300	193,843,841	0	245,384,556	101,530,424	25,306,000	42,001,684	67,307,684	1.97	34,222,740	23.10	0.04	1.53	0.258	0.027
Pit 85	107.00%	268,110,802	793,036,717	329,788,912	195,137,004	0	245,263,435	102,232,765	25,538,000	42,341,753	67,879,753	1.98	34,353,012	23.08	0.04	1.53	0.258	0.027
Pit 86	108.00%	267,497,988	801,040,122	333,780,621	199,761,513	0	244,808,228	104,800,147	26,700,000	43,331,332	70,031,332	2.01	34,768,815	23.04	0.04	1.52	0.258	0.027
Pit 87	109.00%	267,496,631	801,055,249	333,788,242	199,770,376	0	244,807,233	104,808,049	26,700,000	43,338,440	70,038,440	2.01	34,769,609	23.04	0.04	1.52	0.258	0.027
Pit 88	110.00%	267,320,947	802,976,280	334,876,460	200,778,874	0	244,678,239	105,325,503	26,804,000	43,638,538	70,442,538	2.02	34,882,965	23.02	0.04	1.52	0.257	0.027
Pit 89	111.00%	266,629,766	809,753,188	338,068,123	205,055,299	0	244,168,355	107,506,534	27,046,000	45,245,104	72,291,104	2.05	35,215,429	22.99	0.04	1.52	0.257	0.027
Pit 90	112.00%	265,299,518	821,442,207	343,783,295	212,359,394	0	243,188,078	111,518,490	28,696,000	47,011,730	75,707,730	2.11	35,810,760	22.94	0.04	1.52	0.256	0.027
Pit 91	113.00%	263,718,764	834,150,422	349,801,282	220,630,376	0	242,029,279	115,943,280	30,036,000	49,469,646	79,505,646	2.18	36,437,634	22.89	0.04	1.53	0.256	0.027
Pit 92	114.00%	263,697,151	834,308,798	349,909,010	220,702,637	0	242,013,667	115,981,057	30,044,000	49,488,202	79,532,201	2.18	36,448,855	22.89	0.04	1.53	0.256	0.027
Pit 93	115.00%	263,536,403	835,414,035	350,541,104	221,336,529	0	241,897,513	116,308,169	30,090,000	49,703,471	79,793,470	2.19	36,514,698	22.88	0.04	1.53	0.256	0.027
Pit 94	116.00%	263,219,614	837,434,236	351,746,514	222,468,108	0	241,668,655	116,900,942	30,228,000	50,032,680	80,260,680	2.19	36,640,262	22.86	0.04	1.53	0.256	0.027
Pit 95	117.00%	261,301,080	849,277,789	357,772,120	230,204,590	0	240,275,520	121,182,603	32,198,000	51,716,674	83,914,674	2.25	37,267,929	22.79	0.04	1.52	0.255	0.027
Pit 96	118.00%	261,298,786	849,291,018	357,778,699	230,213,533	0	240,273,876	121,187,953	32,198,000	51,721,338	83,919,338	2.25	37,268,614	22.79	0.04	1.52	0.255	0.027
Pit 97	119.00%	259,481,540	859,181,513	362,501,745	237,198,228	0	238,964,648	124,975,955	33,624,000	53,591,356	87,215,356	2.31	37,760,598	22.75	0.04	1.52	0.254	0.027
Pit 98	120.00%	259,072,212	861,238,126	363,305,306	238,860,607	0	238,672,195	125,805,844	33,636,000	54,325,541	87,961,541	2.32	37,844,303	22.76	0.04	1.53	0.255	0.027

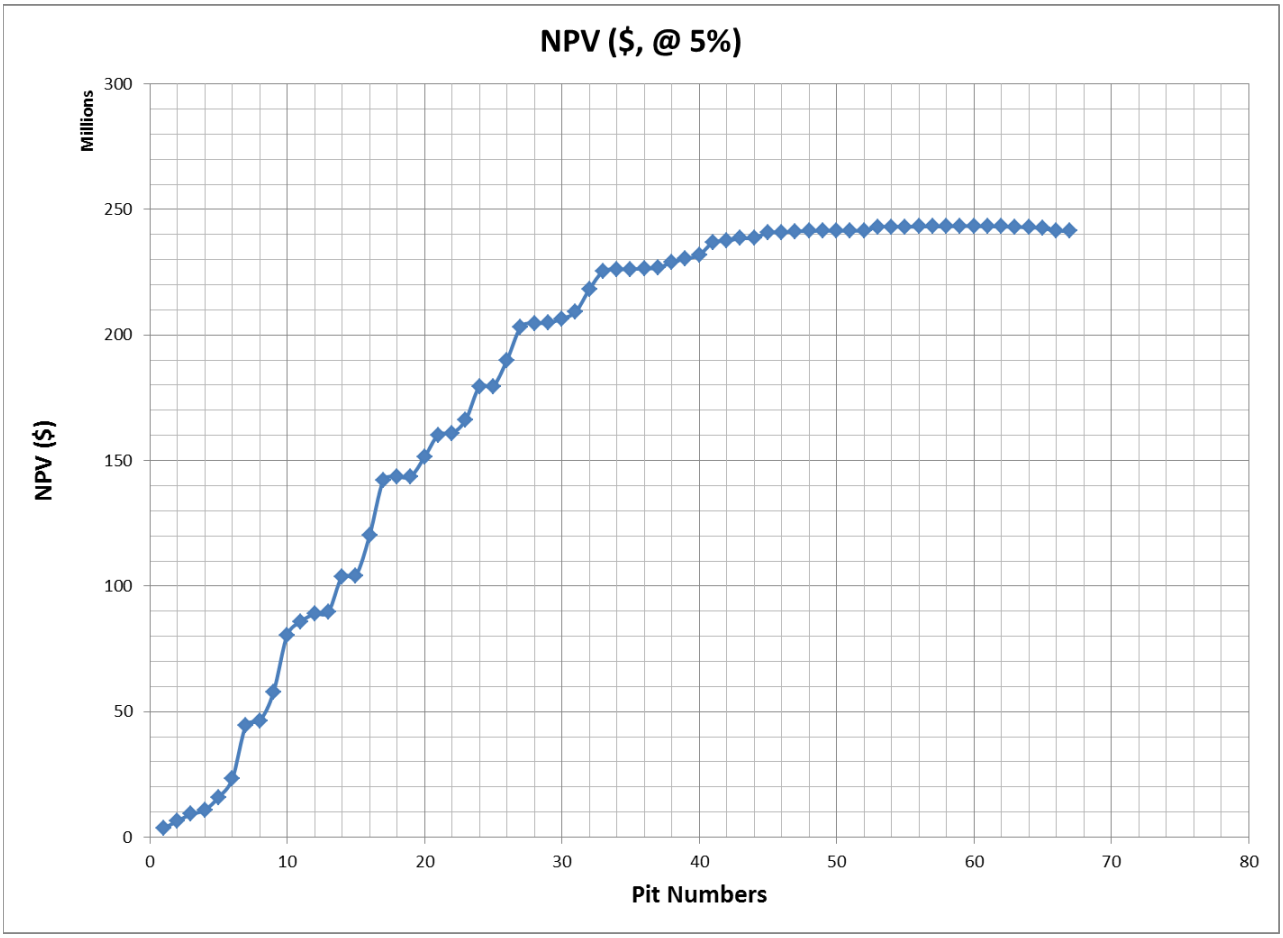
NPV CHART FOR Ox PIT



EAST SEEL Pit Optimization

December 2, Ootsa SEEL EAST Deposit Optimization Results Summary. NSR Cut-off = C$ 10.91 (including conveying cost of C$ 0.23/t)																			
	FINANCIAL DATA							MINING SUMMARY						NSR & GRADES					
Phase	Factor	Profit ($)	Revenue ($)	Proc. Cost ($)	Min. Cost ($)	Cap Costs ($)	NPV ($, @ 5%)	Total Rock (t)	Overburden (t)	Mined_waste (t)	Total Waste (t)	Strip Ratio	Total Ore (t)	NSR ($/t)	AU (g/t)	AG (g/t)	CU (%)	MO (%)
Pit 1	22.00%	3,555,291	4,608,638	788,057	265,289	0	3,553,653	146,194	14,000	59,961	73,961	1.02	72,233	63.80	0.11	19.78	0.755	0.000
Pit 2	24.00%	6,407,433	8,532,101	1,552,202	572,466	0	6,402,528	308,304	40,000	126,031	166,031	1.17	142,273	59.97	0.09	18.67	0.716	0.000
Pit 3	25.00%	9,173,695	12,230,831	2,150,341	906,795	0	9,164,154	489,980	70,000	222,882	292,882	1.49	197,098	62.05	0.10	19.34	0.740	0.000
Pit 4	28.00%	10,794,971	14,456,199	2,471,447	1,189,781	0	10,782,248	646,667	88,000	332,137	420,137	1.85	226,530	63.82	0.10	19.90	0.759	0.000
Pit 5	32.00%	15,910,360	21,899,992	3,836,351	2,153,281	0	15,883,393	1,229,883	498,000	380,247	878,247	2.50	351,636	62.28	0.30	13.59	0.684	0.001
Pit 6	33.00%	23,206,094	32,779,568	6,523,593	3,049,881	0	23,146,864	1,714,309	682,000	434,363	1,116,363	1.87	597,946	54.82	0.37	8.61	0.576	0.001
Pit 7	34.00%	44,752,780	65,162,831	14,407,963	6,002,088	0	44,496,001	3,333,993	1,426,000	587,373	2,013,373	1.52	1,320,620	49.34	0.43	4.84	0.494	0.001
Pit 8	35.00%	46,599,916	67,977,540	15,124,229	6,253,395	0	46,320,708	3,466,281	1,492,000	588,009	2,080,009	1.50	1,386,272	49.04	0.43	4.70	0.490	0.001
Pit 9	36.00%	58,108,019	86,030,953	19,737,997	8,184,938	0	57,661,984	4,541,069	2,084,000	647,903	2,731,903	1.51	1,809,166	47.55	0.44	3.97	0.468	0.001
Pit 10	37.00%	81,446,113	123,667,886	30,720,869	11,500,904	0	80,503,372	6,246,476	2,578,000	852,631	3,430,631	1.22	2,815,845	43.92	0.42	3.25	0.432	0.001
Pit 11	38.00%	87,028,638	132,658,357	33,464,184	12,165,535	0	85,939,897	6,570,442	2,608,000	895,147	3,503,147	1.14	3,067,295	43.25	0.42	3.10	0.425	0.001
Pit 12	39.00%	90,072,029	137,761,814	34,955,090	12,734,694	0	88,898,767	6,869,924	2,630,000	1,035,974	3,665,974	1.14	3,203,950	43.00	0.41	3.37	0.425	0.001
Pit 13	41.00%	90,902,105	139,151,626	35,367,977	12,881,544	0	89,705,197	6,949,271	2,666,000	1,041,477	3,707,477	1.14	3,241,794	42.92	0.41	3.35	0.424	0.001
Pit 14	42.00%	105,534,393	164,574,118	43,113,670	15,926,055	0	103,864,055	8,616,578	3,534,000	1,130,821	4,664,821	1.18	3,951,757	41.65	0.40	3.04	0.410	0.001
Pit 15	43.00%	105,879,434	165,178,408	43,323,099	15,975,874	0	104,197,077	8,638,525	3,534,000	1,133,572	4,667,572	1.18	3,970,953	41.60	0.40	3.03	0.409	0.001
Pit 16	45.00%	122,496,896	195,718,126	53,627,815	19,593,416	0	120,146,992	10,545,051	4,276,000	1,353,578	5,629,578	1.15	4,915,473	39.82	0.39	2.72	0.391	0.001
Pit 17	46.00%	145,519,149	238,697,061	66,625,280	26,552,632	0	142,038,650	14,410,202	6,052,000	2,251,394	8,303,394	1.36	6,106,808	39.09	0.38	2.82	0.385	0.001
Pit 18	47.00%	147,033,012	241,689,201	67,793,289	26,862,901	0	143,471,138	14,561,793	6,076,000	2,271,926	8,347,926	1.34	6,213,867	38.90	0.38	2.80	0.383	0.001
Pit 19	48.00%	147,273,092	242,142,577	67,872,330	26,997,155	0	143,698,240	14,638,163	6,096,000	2,321,051	8,417,051	1.35	6,221,112	38.92	0.38	2.82	0.383	0.001
Pit 20	49.00%	155,438,573	258,362,360	74,061,451	28,862,337	0	151,397,419	15,573,667	6,316,000	2,469,266	8,785,266	1.29	6,788,401	38.06	0.37	2.70	0.375	0.001
Pit 21	51.00%	164,890,881	278,965,824	82,554,887	31,520,056	0	160,249,740	16,860,004	6,384,000	2,909,103	9,293,103	1.23	7,566,901	36.87	0.36	2.54	0.364	0.001
Pit 22	53.00%	165,565,773	280,401,210	83,055,590	31,779,848	0	160,880,264	17,009,671	6,480,000	2,916,876	9,396,876	1.23	7,612,795	36.83	0.36	2.53	0.363	0.001
Pit 23	54.00%	171,347,446	293,211,528	88,349,373	33,514,710	0	166,265,637	17,901,511	6,768,000	3,035,493	9,803,493	1.21	8,098,018	36.21	0.36	2.45	0.358	0.001
Pit 24	55.00%	185,634,919	325,193,805	100,482,409	39,076,477	0	179,466,837	20,951,836	8,390,000	3,351,716	11,741,716	1.27	9,210,120	35.31	0.34	2.61	0.351	0.001
Pit 25	56.00%	185,793,905	325,548,359	100,637,102	39,117,352	0	179,613,254	20,974,703	8,390,000	3,360,404	11,750,404	1.27	9,224,299	35.29	0.34	2.62	0.351	0.001
Pit 26	57.00%	197,086,966	351,556,791	110,620,352	43,849,474	0	189,955,156	23,561,190	9,546,000	3,875,836	13,421,836	1.32	10,139,354	34.67	0.34	2.62	0.345	0.001
Pit 27	58.00%	211,640,820	387,173,740	124,822,156	50,710,764	0	203,137,168	27,239,967	10,908,000	4,890,890	15,798,890	1.38	11,441,078	33.84	0.31	2.98	0.342	0.001
Pit 28	59.00%	213,285,062	391,133,713	126,053,717	51,794,933	0	204,620,683	27,810,797	10,924,000	5,332,836	16,256,836	1.41	11,553,961	33.85	0.31	3.03	0.342	0.001
Pit 29	60.00%	213,477,452	391,608,352	126,287,355	51,843,545	0	204,794,182	27,832,212	10,924,000	5,332,836	16,256,836	1.40	11,575,376	33.83	0.31	3.02	0.342	0.001
Pit 30	61.00%	215,422,434	396,631,053	128,416,557	52,792,062	0	206,545,767	28,329,080	11,080,000	5,478,543	16,558,543	1.41	11,770,537	33.70	0.31	3.03	0.341	0.001
Pit 31	62.00%	218,385,178	404,573,746	131,891,613	54,296,955	0	209,207,050	29,116,371	11,326,000	5,701,314	17,027,314	1.41	12,089,057	33.47	0.31	3.02	0.339	0.002
Pit 32	63.00%	228,487,648	432,868,250	145,032,945	59,347,657	0	218,197,697	31,688,003	11,786,000	6,608,424	18,394,424	1.38	13,293,579	32.56	0.30	2.91	0.330	0.002
Pit 33	64.00%	236,622,028	455,379,498	154,033,743	64,723,727	0	225,379,446	34,648,897	13,112,000	7,418,314	20,530,314	1.45	14,118,583	32.25	0.30	2.92	0.328	0.002
Pit 34	65.00%	237,479,216	457,824,092	155,153,789	65,191,088	0	226,134,562	34,896,608	13,156,000	7,519,363	20,675,363	1.45	14,221,246	32.19	0.30	2.92	0.327	0.002
Pit 35	66.00%	237,605,893	458,188,565	155,347,081	65,235,591	0	226,246,116	34,918,611	13,156,000	7,523,649	20,679,649	1.45	14,238,962	32.18	0.30	2.92	0.327	0.002
Pit 36	67.00%	237,929,160	459,147,728	155,825,015	65,393,553	0	226,530,684	35,000,418	13,194,000	7,523,649	20,717,649	1.45	14,282,769	32.15	0.30	2.91	0.327	0.002
Pit 37	70.00%	238,243,505	460,213,890	156,427,041	65,543,343	0	226,807,272	35,066,406	13,194,000	7,534,456	20,728,456	1.45	14,337,951	32.10	0.30	2.91	0.326	0.002
Pit 38	71.00%	240,721,249	468,893,710	160,856,680	67,315,782	0	228,980,450	36,017,137	13,600,000	7,673,170	21,273,170	1.44	14,743,967	31.80	0.29	2.86	0.324	0.002
Pit 39	72.00%	242,376,378	474,755,360	163,739,914	68,639,068	0	230,429,085	36,686,978	13,716,000	7,962,737	21,678,737	1.44	15,008,241	31.63	0.29	2.86	0.322	0.002
Pit 40	73.00%	243,998,504	480,661,118	166,826,788	69,835,826	0	231,844,632	37,297,775	13,876,000	8,130,594	22,006,594	1.44	15,291,181	31.43	0.29	2.83	0.320	0.002
Pit 41	74.00%	249,871,117	503,463,584	177,574,220	76,018,246	0	236,924,722	40,548,893	14,606,000	9,666,613	24,272,613	1.49	16,276,280	30.93	0.29	2.73	0.314	0.002
Pit 42	75.00%	250,497,332	505,949,112	178,798,679	76,653,101	0	237,465,705	40,875,040	14,646,000	9,840,527	24,486,527	1.49	16,388,513	30.87	0.29	2.74	0.314	0.002
Pit 43	77.00%	251,767,718	511,437,955	181,381,685	78,288,552	0	238,561,143	41,709,263	14,664,000	10,419,994	25,083,994	1.51	16,625,269	30.76	0.29	2.77	0.313	0.002
Pit 44	79.00%	251,863,471	511,886,134	181,623,287	78,399,376	0	238,643,660	41,763,658	14,666,000	10,450,244	25,116,244	1.51	16,647,414	30.75	0.29	2.77	0.313	0.002
Pit 45	80.00%	254,466,401	524,720,054	188,990,346	81,263,307	0	240,873,979	43,228,438	14,968,000	10,937,767	25,905,767	1.50	17,322,671	30.29	0.28	2.70	0.309	0.002
Pit 46	81.00%	254,514,602	524,971,001	189,142,504	81,313,895	0	240,915,268	43,251,305	14,968,000	10,946,687	25,914,687	1.49	17,336,618	30.28	0.28	2.70	0.308	0.002
Pit 47	82.00%	254,961,875	527,451,960	190,563,642	81,926,443	0	241,297,901	43,561,568	14,968,000	11,126,690	26,094,690	1.49	17,466,878	30.20	0.28	2.70	0.308	0.002
Pit 48	83.00%	255,131,183	528,447,237	191,029,511	82,286,543	0	241,442,659	43,772,836	15,108,000	11,155,257	26,263,257	1.50	17,509,579	30.18	0.28	2.70	0.308	0.002
Pit 49	85.00%	255,187,576	528,810,142	191,243,347	82,379,219	0	241,490,876	43,817,248	15,108,000	11,180,069	26,288,069	1.50	17,529,179	30.17	0.28	2.70	0.307	0.002
Pit 50	86.00%	255,230,140	529,105,750	191,428,496	82,447,114	0	241,527,264	43,854,951	15,124,000	11,184,801	26,308,801	1.50	17,546,150	30.16	0.28	2.69	0.307	0.002
Pit 51	87.00%	255,258,794	529,314,968	191,568,231	82,487,943	0	241,551,761	43,877,285	15,124,000	11,194,328	26,318,328	1.50	17,558,958	30.15	0.28	2.69	0.307	0.002
Pit 52	88.00%	255,302,313	529,665,582	191,782,634	82,580,634	0	241,588,953	43,921,704	15,124,000	11,219,095	26,343,095	1.50	17,578,610	30.13	0.28	2.69	0.307	0.002
Pit 53	89.00%	257,042,496	544,659,957	199,884,957	87,732,504	0	243,058,899	46,606,996	15,532,000	12,753,735	28,285,735	1.54	18,321,261	29.73	0.28	2.63	0.303	0.002
Pit 54	91.00%	257,085,520	545,126,222	200,100,375	87,940,327	0	243,095,402	46,723,593	15,572,000	12,810,587	28,382,587	1.55	18,341,006	29.72	0.28	2.63	0.303	0.002
Pit 55	93.00%	257,108,056	545,441,209	200,342,457	87,990,696	0	243,114,530	46,745,782	15,572,000	12,810,587	28,382,587	1.55	18,363,195	29.70	0.28	2.63	0.302	0.002
Pit 56	95.00%	257,184,553	546,781,933	201,052,316	88,545,064	0	243,179,288	47,045,347	15,680,000	12,937,087	28,617,087	1.55	18,428,260	29.67	0.28	2.62	0.302	0.002
Pit 57	97.00%	257,250,690	548,828,278	202,013,099	89,564,489	0	243,235,142	47,578,170	15,684,000	13,377,845	29,061,845	1.57	18,516,324	29.64	0.28	2.63	0.302	0.002
Pit 58	99.00%	257,252,124	548,938,153	202,083,380	89,602,649	0	243,236,357	47,600,220	15,684,000	13,393,453	29,077,453	1.57	18,522,766	29.64	0.28	2.63	0.302	0.002
Pit 59	**100.00%**	**257,428,457**	**572,972,704**	**216,426,098**	**99,118,149**	**0**	**243,355,508**	**52,819,034**	**17,640,000**	**15,341,628**	**32,981,628**	**1.66**	**19,837,406**	**28.88**	**0.27**	**2.57**	**0.295**	**0.002**
Pit 60	101.00%	257,428,337	573,590,221	216,785,586	99,376,298	0	243,355,365	52,951,186	17,640,000	15,440,829	33,080,829	1.66	19,870,356	28.87	0.27	2.57	0.295	0.002
Pit 61	102.00%	257,411,892	574,977,959	217,480,888	100,085,179	0	243,341,458	53,365,771	17,824,000	15,607,684	33,431,684	1.68	19,934,087	28.84	0.27	2.57	0.295	0.002
Pit 62	105.00%	257,223,963	579,391,380	219,607,708	102,559,709	0	243,183,027	54,736,526	18,018,000	16,589,496	34,607,496	1.72	20,129,029	28.78	0.27	2.58	0.294	0.002
Pit 63	109.00%	257,140,949	580,366,951	220,200,910	103,025,093	0	243,113,584	54,977,324	18,018,000	16,775,922	34,793,922	1.72	20,183,401	28.75	0.27	2.57	0.294	0.002
Pit 64	111.00%	256,849,996	583,265,330	221,803,760	104,611,574	0	242,870,278	55,813,192	18,118,000	17,364,874	35,482,874	1.75	20,330,317	28.69	0.27	2.57	0.293	0.002
Pit 65	112.00%	256,467,601	586,701,906	223,780,478	106,453,827	0	242,550,668	56,912,458	18,878,000	17,522,956	36,400,956	1.77	20,511,501	28.60	0.27	2.57	0.293	0.002
Pit 66	113.00%	255,311,751	595,954,915	229,310,435	111,332,729	0	241,583,172	59,442,691	18,954,000	19,470,319	38,424,319	1.83	21,018,372	28.35	0.27	2.53	0.290	0.002
Pit 67	119.00%	255,109,239	597,069,912	229,989,704	111,970,969	0	241,415,219	59,773,825	18,954,000	19,739,192	38,693,192	1.84	21,080,633	28.32	0.27	2.53	0.290	0.002

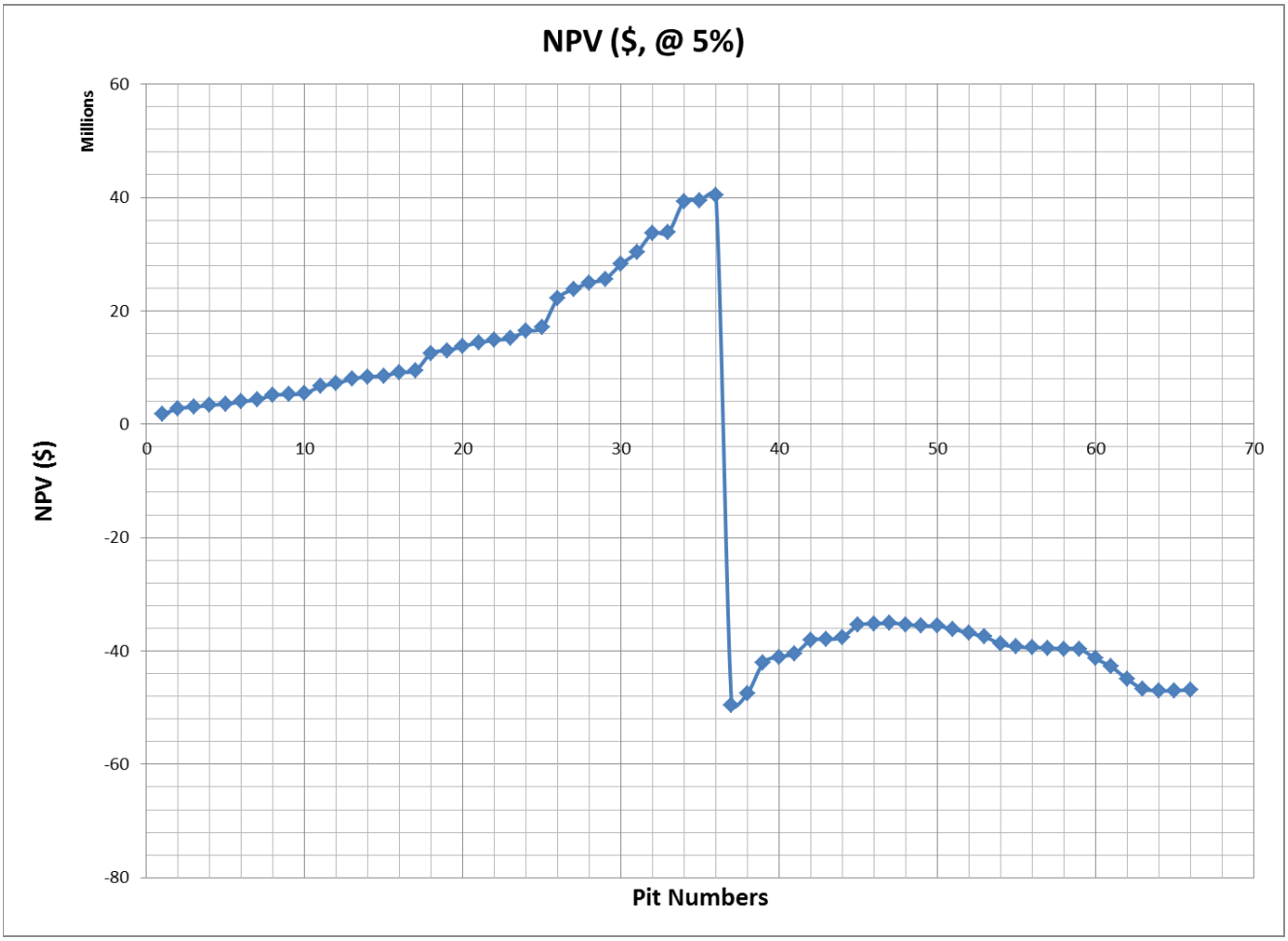
NPV CHART FOR EAST SEEL PIT



WEST SEEL Pit Optimization

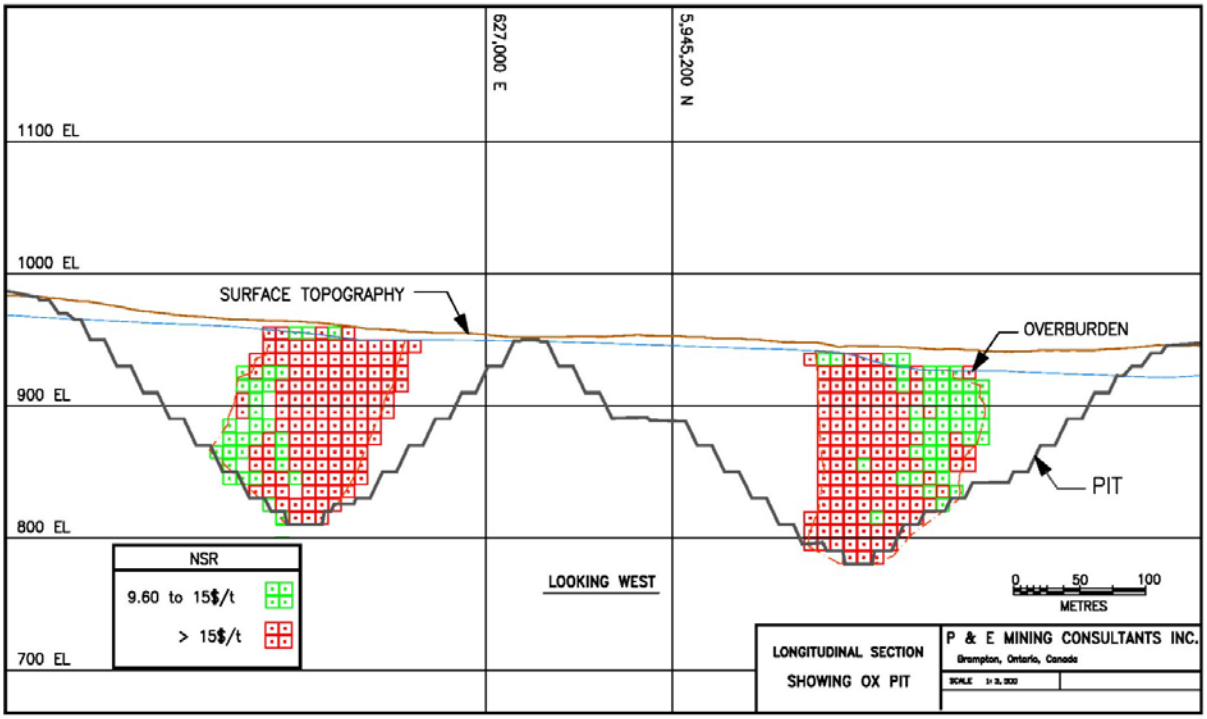
December 3, Ootsa SEEL WEST Deposit Optimization Results Summary. NSR Cut-off = C$ 10.91 (including conveying cost of C$ 0.23/t)																		
	FINANCIAL DATA							MINING SUMMARY						NSR & GRADES				
Phase	Factor	Profit ($)	Revenue ($)	Proc. Cost ($)	Min. Cost ($)	Cap Costs ($)	NPV ($, @ 5%)	Total Rock (t)	Overburden (t)	Mined_waste (t)	Total Waste (t)	Strip Ratio	Total Ore (t)	NSR ($/t)	AU (g/t)	AG (g/t)	CU (%)	MO (%)
Pit 1	20.00%	1,723,778	2,167,997	334,906	109,313	0	1,723,360	57,233	16,000	10,536	26,536	0.86	30,697	70.63	0.35	22.14	0.705	0.009
Pit 2	32.00%	2,780,208	3,715,220	705,478	229,535	0	2,779,222	117,486	32,000	20,823	52,823	0.82	64,663	57.45	0.29	17.90	0.572	0.011
Pit 3	37.00%	3,025,630	4,103,524	780,678	297,215	0	3,024,486	158,617	40,000	47,061	87,061	1.22	71,556	57.35	0.29	17.91	0.571	0.011
Pit 4	39.00%	3,362,136	4,650,278	948,401	339,740	0	3,360,731	180,695	40,000	53,765	93,765	1.08	86,930	53.49	0.26	16.01	0.509	0.024
Pit 5	40.00%	3,557,968	4,972,746	1,034,686	380,093	0	3,556,397	202,802	40,000	67,964	107,964	1.14	94,838	52.43	0.25	15.64	0.501	0.022
Pit 6	45.00%	3,972,728	5,719,524	1,300,914	445,883	0	3,970,721	236,137	40,000	76,896	116,896	0.98	119,240	47.97	0.28	13.89	0.446	0.020
Pit 7	47.00%	4,353,679	6,431,292	1,565,776	511,837	0	4,351,189	269,803	40,000	86,285	126,285	0.88	143,517	44.81	0.29	12.73	0.407	0.019
Pit 8	49.00%	5,120,854	7,970,626	2,047,151	802,621	0	5,117,131	429,837	76,000	166,197	242,197	1.29	187,640	42.48	0.27	12.17	0.395	0.017
Pit 9	54.00%	5,245,024	8,237,237	2,149,777	842,436	0	5,241,082	451,916	76,000	178,869	254,869	1.29	197,047	41.80	0.26	11.89	0.385	0.019
Pit 10	55.00%	5,441,533	8,671,103	2,336,152	893,418	0	5,437,215	478,018	80,000	183,889	263,889	1.23	214,129	40.49	0.24	11.44	0.370	0.021
Pit 11	56.00%	6,682,146	11,768,087	3,715,985	1,369,955	0	6,674,293	709,359	134,000	234,755	368,755	1.08	340,604	34.55	0.23	9.55	0.312	0.019
Pit 12	58.00%	7,210,483	13,018,216	4,165,630	1,642,103	0	7,200,833	851,743	166,000	303,925	469,925	1.23	381,818	34.10	0.22	9.51	0.310	0.018
Pit 13	60.00%	8,008,827	15,134,116	5,193,880	1,931,409	0	7,995,930	997,182	190,000	331,116	521,116	1.09	476,066	31.79	0.22	8.68	0.285	0.018
Pit 14	61.00%	8,385,583	16,091,110	5,595,182	2,110,345	0	8,370,996	1,090,997	212,000	366,148	578,148	1.13	512,849	31.38	0.22	8.53	0.280	0.018
Pit 15	62.00%	8,570,240	16,574,458	5,831,232	2,172,985	0	8,554,773	1,122,701	216,000	372,216	588,216	1.10	534,485	31.01	0.22	8.41	0.276	0.018
Pit 16	64.00%	9,188,705	18,291,587	6,625,990	2,476,892	0	9,169,974	1,284,209	286,000	390,877	676,877	1.11	607,332	30.12	0.21	8.07	0.272	0.017
Pit 17	65.00%	9,496,823	19,161,007	7,065,393	2,598,791	0	9,476,337	1,344,982	300,000	397,375	697,375	1.08	647,607	29.59	0.21	7.92	0.268	0.017
Pit 18	66.00%	12,557,194	27,992,483	11,341,718	4,093,571	0	12,512,168	2,101,675	444,000	618,104	1,062,104	1.02	1,039,571	26.93	0.19	7.06	0.242	0.018
Pit 19	67.00%	13,071,658	29,516,200	12,141,158	4,303,383	0	13,021,661	2,200,579	452,000	635,732	1,087,732	0.98	1,112,847	26.52	0.18	6.96	0.238	0.018
Pit 20	69.00%	13,781,898	31,849,869	13,405,188	4,662,782	0	13,724,340	2,370,567	468,000	673,861	1,141,861	0.93	1,228,707	25.92	0.18	6.79	0.233	0.018
Pit 21	70.00%	14,483,227	34,125,873	14,663,483	4,979,164	0	14,417,554	2,521,222	486,000	691,182	1,177,182	0.88	1,344,041	25.39	0.18	6.64	0.229	0.017
Pit 22	71.00%	14,886,450	35,482,769	15,378,319	5,217,999	0	14,815,781	2,645,637	522,000	714,075	1,236,075	0.88	1,409,562	25.17	0.18	6.57	0.228	0.017
Pit 23	72.00%	15,213,707	36,642,219	16,050,399	5,378,112	0	15,138,826	2,719,499	530,000	718,335	1,248,335	0.85	1,471,164	24.91	0.18	6.49	0.225	0.017
Pit 24	73.00%	16,517,051	41,365,824	18,673,667	6,175,106	0	16,423,169	3,111,878	590,000	810,268	1,400,268	0.82	1,711,610	24.17	0.17	6.23	0.222	0.016
Pit 25	74.00%	17,181,078	43,880,401	20,130,234	6,569,089	0	17,076,576	3,303,799	608,000	850,681	1,458,681	0.79	1,845,118	23.78	0.17	6.13	0.219	0.016
Pit 26	75.00%	22,400,037	64,454,504	30,890,506	11,163,960	0	22,169,553	5,569,900	850,000	1,888,506	2,738,506	0.97	2,831,394	22.76	0.17	5.54	0.204	0.016
Pit 27	76.00%	24,105,837	71,554,441	34,965,231	12,483,373	0	23,828,754	6,176,831	872,000	2,099,952	2,971,952	0.93	3,204,879	22.33	0.17	5.43	0.201	0.016
Pit 28	77.00%	25,261,312	76,555,564	37,879,465	13,414,787	0	24,949,691	6,616,345	872,000	2,272,350	3,144,350	0.91	3,471,995	22.05	0.17	5.31	0.199	0.015
Pit 29	78.00%	25,965,003	79,769,918	39,617,852	14,187,063	0	25,631,136	7,010,913	1,002,000	2,377,579	3,379,579	0.93	3,631,334	21.97	0.17	5.29	0.199	0.015
Pit 30	79.00%	28,657,348	92,127,472	46,397,805	17,072,319	0	28,224,737	8,469,240	1,156,000	3,060,462	4,216,462	0.99	4,252,778	21.66	0.16	5.15	0.198	0.015
Pit 31	80.00%	30,837,711	102,861,972	52,498,600	19,525,660	0	30,315,185	9,668,082	1,282,000	3,574,111	4,856,111	1.01	4,811,971	21.38	0.16	5.03	0.196	0.015
Pit 32	81.00%	34,397,511	121,125,169	62,703,524	24,024,134	0	33,698,992	11,866,797	1,422,000	4,697,453	6,119,453	1.06	5,747,344	21.08	0.16	4.89	0.194	0.015
Pit 33	82.00%	34,592,946	122,173,676	63,283,656	24,297,074	0	33,884,529	11,998,948	1,422,000	4,776,430	6,198,430	1.07	5,800,518	21.06	0.16	4.89	0.194	0.015
Pit 34	83.00%	40,425,895	156,065,687	81,766,953	33,872,839	0	39,330,160	16,751,305	1,984,000	7,272,626	9,256,626	1.24	7,494,679	20.82	0.15	4.74	0.196	0.015
Pit 35	84.00%	40,470,465	156,341,275	81,946,739	33,924,071	0	39,371,840	16,773,293	1,984,000	7,278,135	9,262,135	1.23	7,511,158	20.81	0.15	4.73	0.196	0.015
Pit 36	**85.00%**	**41,648,441**	**164,075,269**	**86,586,788**	**35,840,040**	**0**	**40,468,842**	**17,689,948**	**2,026,000**	**7,727,487**	**9,753,487**	**1.23**	**7,936,461**	**20.67**	**0.15**	**4.68**	**0.195**	**0.015**
Pit 37	86.00%	424,479,172	2,900,385,898	1,324,647,559	1,151,259,166	0	-49,491,287	574,896,481	24,590,000	428,890,573	453,480,573	3.73	121,415,908	23.89	0.16	3.38	0.220	0.023
Pit 38	87.00%	430,534,301	2,945,170,532	1,341,674,354	1,172,961,877	0	-47,504,678	585,848,064	24,782,000	438,089,496	462,871,496	3.76	122,976,568	23.95	0.16	3.37	0.220	0.023
Pit 39	88.00%	448,848,778	3,094,602,960	1,411,279,962	1,234,474,221	0	-42,119,630	616,494,654	25,908,000	461,230,104	487,138,104	3.77	129,356,550	23.92	0.16	3.34	0.220	0.024
Pit 40	89.00%	452,366,577	3,125,843,580	1,424,858,491	1,248,618,512	0	-41,043,544	623,532,990	25,966,000	466,965,845	492,931,845	3.77	130,601,145	23.93	0.16	3.33	0.220	0.024
Pit 41	90.00%	454,317,752	3,145,396,370	1,433,773,770	1,257,304,848	0	-40,448,956	627,857,283	26,140,000	470,298,972	496,438,972	3.78	131,418,311	23.93	0.16	3.32	0.220	0.024
Pit 42	92.00%	462,919,914	3,251,176,393	1,487,098,673	1,301,157,807	0	-38,100,100	649,602,468	27,042,000	486,254,448	513,296,448	3.77	136,306,019	23.85	0.16	3.29	0.219	0.024
Pit 43	93.00%	463,359,968	3,257,018,262	1,490,023,449	1,303,634,846	0	-37,970,835	650,831,510	27,094,000	487,163,408	514,257,408	3.77	136,574,102	23.85	0.16	3.29	0.219	0.024
Pit 44	94.00%	464,809,244	3,278,899,323	1,500,081,825	1,314,008,254	0	-37,556,465	656,024,626	27,200,000	491,328,583	518,528,583	3.77	137,496,043	23.85	0.16	3.28	0.219	0.024
Pit 45	95.00%	475,187,656	3,460,569,742	1,580,709,494	1,404,672,593	0	-35,450,474	701,460,116	28,534,000	528,039,820	556,573,820	3.84	144,886,296	23.88	0.16	3.25	0.219	0.024
Pit 46	96.00%	475,954,941	3,476,177,975	1,589,441,780	1,410,781,255	0	-35,244,984	704,477,621	28,698,000	530,092,932	558,790,932	3.84	145,686,689	23.86	0.16	3.24	0.219	0.024
Pit 47	98.00%	476,621,880	3,498,490,976	1,599,706,884	1,422,162,212	0	-35,075,893	710,205,738	28,866,000	534,712,159	563,578,159	3.84	146,627,579	23.86	0.16	3.23	0.219	0.024
Pit 48	**100.00%**	**476,718,151**	**3,603,039,093**	**1,651,327,198**	**1,474,993,744**	**0**	**-35,309,433**	**736,641,457**	**29,730,000**	**555,552,411**	**585,282,411**	**3.87**	**151,359,046**	**23.80**	**0.16**	**3.20**	**0.219**	**0.024**
Pit 49	101.00%	476,074,950	3,672,148,029	1,683,644,320	1,512,428,759	0	-35,591,579	755,480,708	30,604,000	570,555,506	601,159,506	3.90	154,321,202	23.80	0.16	3.19	0.219	0.024
Pit 50	103.00%	476,019,544	3,674,587,277	1,684,823,724	1,513,744,009	0	-35,605,684	756,135,811	30,612,000	571,094,506	601,706,506	3.90	154,429,305	23.79	0.16	3.19	0.219	0.024
Pit 51	105.00%	474,057,086	3,717,575,579	1,708,276,527	1,535,241,966	0	-36,136,811	766,812,849	30,924,000	579,309,883	610,233,883	3.90	156,578,967	23.74	0.16	3.18	0.218	0.024
Pit 52	106.00%	471,419,239	3,769,864,279	1,731,415,053	1,567,029,986	0	-36,842,800	782,844,353	31,332,000	592,812,531	624,144,531	3.93	158,699,821	23.75	0.16	3.17	0.218	0.024
Pit 53	107.00%	468,886,504	3,810,750,580	1,752,432,179	1,589,431,897	0	-37,490,698	794,027,152	31,446,000	601,954,921	633,400,921	3.94	160,626,231	23.72	0.16	3.15	0.218	0.024
Pit 54	108.00%	463,938,336	3,874,481,094	1,784,993,625	1,625,549,133	0	-38,748,041	812,119,259	32,134,000	616,374,478	648,508,478	3.96	163,610,781	23.68	0.16	3.14	0.217	0.024
Pit 55	109.00%	461,759,132	3,901,341,046	1,800,173,242	1,639,408,671	0	-39,267,249	819,013,104	32,348,000	621,662,974	654,010,974	3.96	165,002,130	23.64	0.16	3.13	0.217	0.024
Pit 56	110.00%	461,263,410	3,906,479,698	1,802,863,959	1,642,352,329	0	-39,381,258	820,503,602	32,456,000	622,798,843	655,254,843	3.97	165,248,759	23.64	0.16	3.13	0.217	0.024
Pit 57	111.00%	460,960,204	3,909,349,670	1,804,264,530	1,644,124,935	0	-39,450,756	821,408,912	32,480,000	623,551,778	656,031,778	3.97	165,377,134	23.64	0.16	3.13	0.217	0.024
Pit 58	112.00%	460,223,288	3,915,720,757	1,807,488,091	1,648,009,379	0	-39,619,678	823,391,569	32,662,000	625,056,967	657,718,967	3.97	165,672,602	23.64	0.16	3.13	0.217	0.024
Pit 59	113.00%	460,164,858	3,916,199,816	1,807,717,332	1,648,317,626	0	-39,632,998	823,546,470	32,662,000	625,190,856	657,852,856	3.97	165,693,614	23.64	0.16	3.13	0.217	0.024
Pit 60	114.00%	452,931,342	3,971,678,798	1,835,309,093	1,683,438,364	0	-41,338,734	841,205,057	33,328,000	639,654,409	672,982,409	4.00	168,222,648	23.61	0.16	3.12	0.217	0.024
Pit 61	115.00%	446,640,514	4,014,872,413	1,858,469,487	1,709,762,412	0	-42,772,954	854,376,643	33,788,000	650,243,136	684,031,136	4.02	170,345,507	23.57	0.16	3.11	0.217	0.024
Pit 62	117.00%	436,948,000	4,075,196,323	1,887,216,585	1,751,031,738	0	-44,952,669	875,183,682	34,012,000	668,191,244	702,203,244	4.06	172,980,438	23.56	0.16	3.09	0.216	0.024
Pit 63	118.00%	429,008,896	4,120,478,093	1,911,874,783	1,779,594,415	0	-46,674,901	889,627,299	34,932,000	679,454,714	714,386,714	4.08	175,240,585	23.51	0.16	3.09	0.216	0.024
Pit 64	119.00%	427,503,214	4,128,498,049	1,915,425,639	1,785,569,196	0	-46,991,178	892,661,691	35,034,000	682,061,638	717,095,638	4.08	175,566,053	23.52	0.16	3.09	0.216	0.024
Pit 65	120.00%	427,475,440	4,128,637,045	1,915,542,496	1,785,619,109	0	-46,996,970	892,683,113	35,034,000	682,072,349	717,106,349	4.08	175,576,764	23.51	0.16	3.09	0.216	0.024
Pit 66	120.00%	427,870,242	4,130,500,996	1,916,598,562	1,786,032,191	0	-46,848,931	892,773,910	34,558,000	682,542,348	717,100,348	4.08	175,673,562	23.51	0.16	3.09	0.216	0.024

NPV CHART FOR WEST SEEL PIT

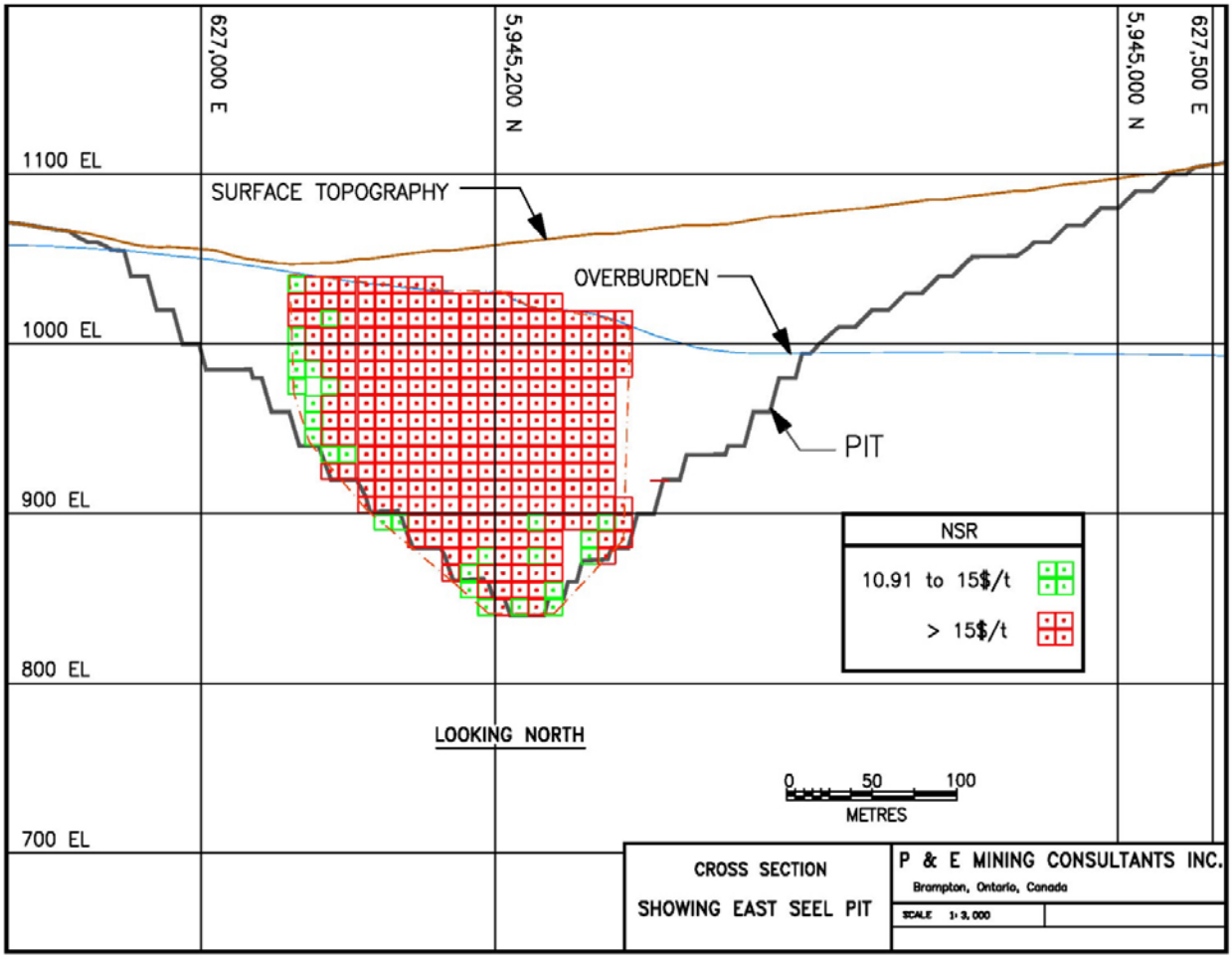


APPENDIX XI. PIT CROSS-SECTIONS

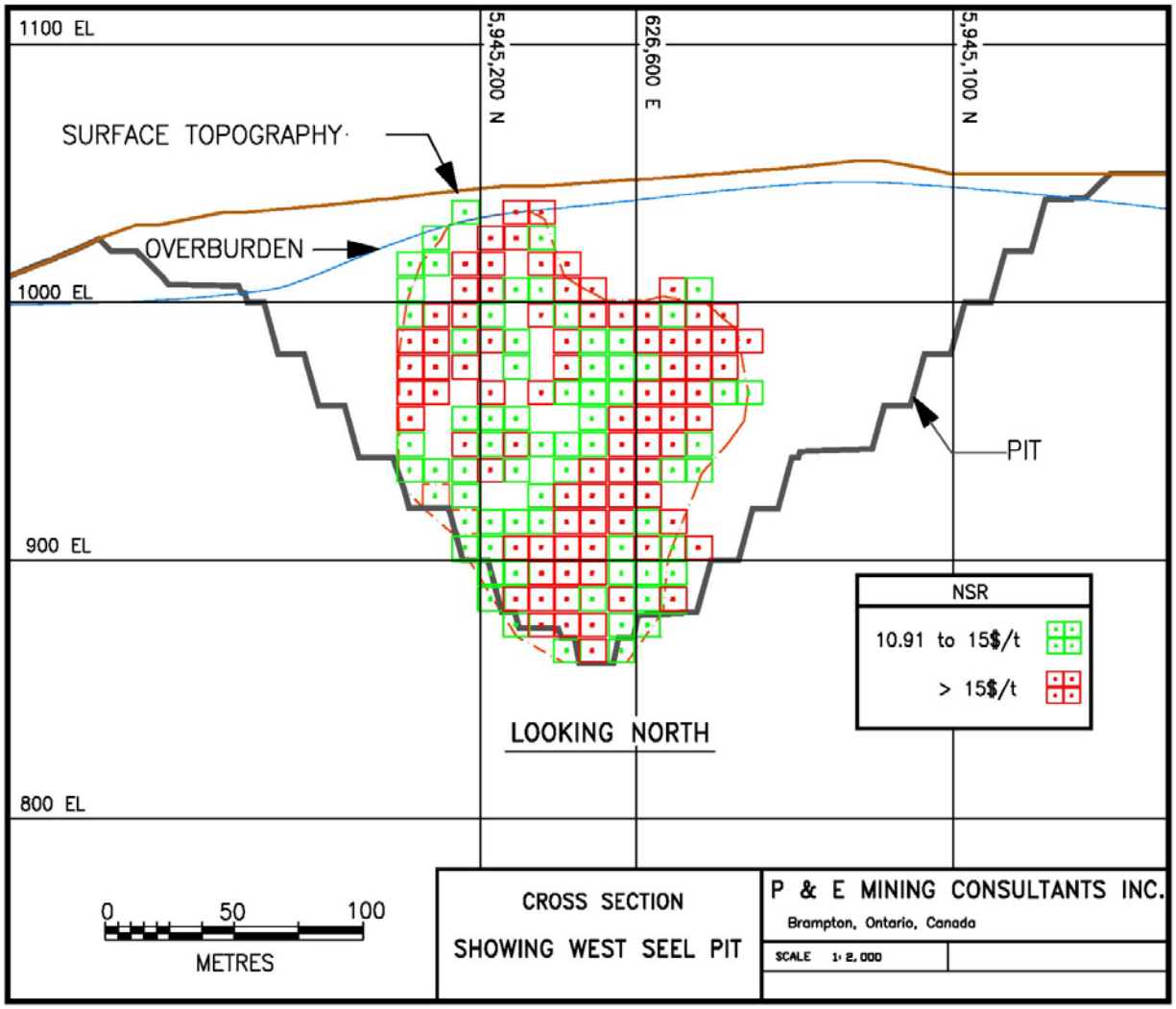
LONGITUDINAL CROSS-SECTION OF OX PIT



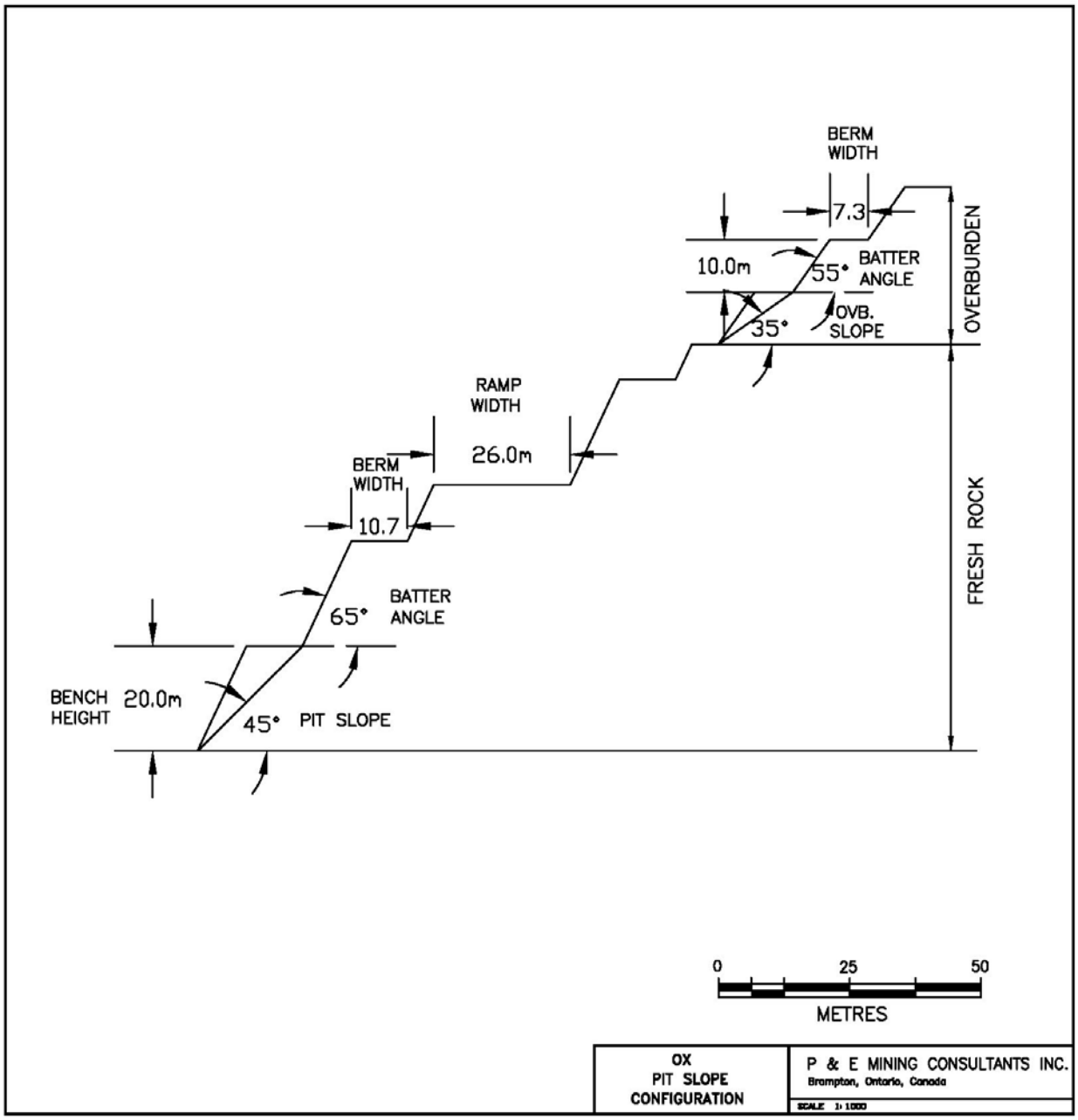
CROSS-SECTION OF EAST SEEL PIT



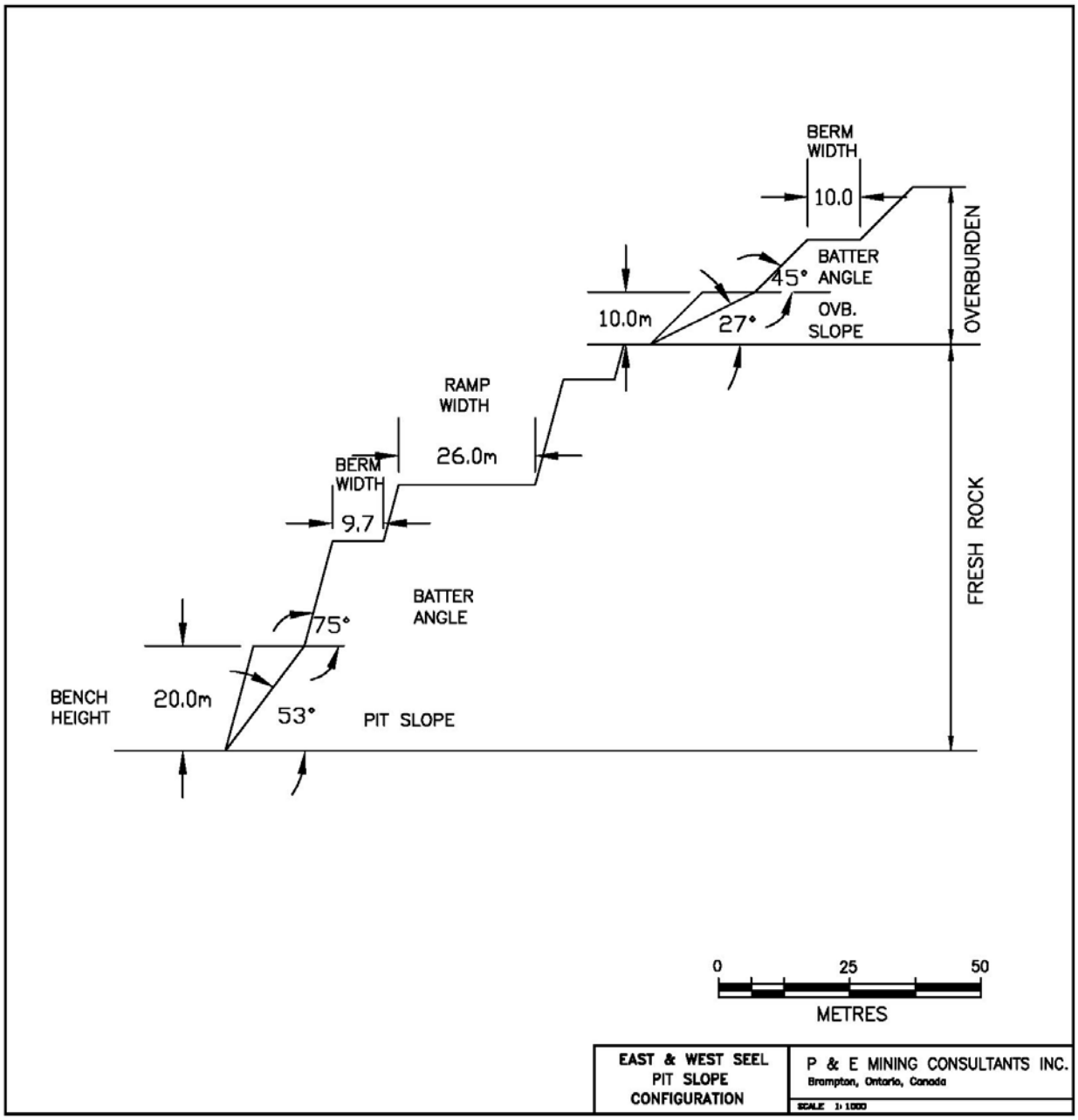
CROSS-SECTION OF WEST SEEL PIT



OX PIT SLOPE CONFIGURATION



EAST AND WEST SEEL PIT SLOPE CONFIGURATION



APPENDIX XII. DRILL AND BLAST PLANS

Annual Equipment Utilization

Time	Hrs	Comments
Total	8,760	
Unschedul	360	
Scheduled	8,400	350 d/yr
Down	1,260	85% mechanical availability
Available	7,140	
Idle	350	
Lunch	700	1.0 hr/shift
Shift Chan	350	0.5 hr/shift
GOH(1)	5,740	80% utilization
Delay(2)	976	83% efficiency
NOH(3)	4,764	Net operating hours

(1) Gross operating hours = running time
(2) Delays include moving from hole to hole and pattern to pattern
(3) Net operating hours = drilling time

Drilling Design

Burden	Spacing	Volume	Density
m	m	bcm/hole	t/m3
5.2	5.2	270.4	2.7
Tonnage	Bench Ht	Subgrade	BH Depth
t/BH	m	m	m
730.1	10.0	2.0	12.0
Production	Production	Allowance	Allowance
Mtpa	BH/yr	Wall Control	Redrills
8.2	11,232	5%	5%
Total BH	Drilling	Rate	Hrs/Drill
BH/yr	m/yr	m/NOH	NOH/yr
12,355	148,258	30.0	4,764
Production	Hrs/Drill	Drills	Total
m/drill	GOH/yr	qty	GOH/yr
142,920	5,740	1.04	5,954

Drilling Plan by Year

Yr	Mt	Metres	GOH	Drills (qty)
-1	0.09	1,627	65	0.0
1	8.20	148,258	5,954	1.0
2	13.70	247,699	9,948	1.7
3	8.20	148,258	5,954	1.0
4	10.90	197,074	7,915	1.4
5	15.60	282,051	11,328	2.0
6	12.90	233,235	9,367	1.6
7	10.40	188,034	7,552	1.3
8	8.60	155,490	6,245	1.1
9	10.40	188,034	7,552	1.3
10	14.90	269,395	10,820	1.9
11	11.20	202,498	8,133	1.4
12	5.20	94,017	3,776	1.3

Blasthole Loading Plan for Emulsion and ANFO

Blasthole Loading				
BH Design				
Hole Diameter	Column Diameter	Hole Diameter	Nominal Diameter	Hole Volume
in	in	mm	mm	m3/m
10.0	6.5	165.1	165.0	0.0214
Explosive Density	Emulsion Load	Column Height	BH Volume	Powder Factor
t/m3	kg/m	m	bcm/hole	kg/bcm
1.25	26.73	7.0	270.4	0.69
Explosive Density	ANFO Load	Column	BH Volume	PF
t/m3	kg/m	m	bcm/hole	kg/bcm
0.84	17.96	7.0	270.4	0.46

APPENDIX XIII.LOADING STUDY

Annual Equipment Utilization

Time	Hrs	Comments		
Total	8,760			
Unscheduled	360			
Scheduled	8,400	350 d/yr		
Down	1,260	85% mechanical availability		
Available	7,140			
Idle	350			
Lunch	700	1.0 hr/shift		
Shift Change	350	0.5 hr/shift		
GOH	5,740	80% utilization		
Delay	976	83% efficiency		
NOH	4,764	Net operating hours		

PC-3000 Loading Production Calculation

UNIT	PC-3000					
In-situ Density	Swell Factor	Loose Density	Bucket Size	Bucket Fill	Bucket Capacity	
t/m3	lcm/bcm	t/m3	m3	%	lcm	t
2.70	1.5	1.80	15.0	90%	13.5	24.3
Loading Passes	Total Load		Time per Pass	Spot Time	Load Time	
qty	lcm	t	s	s	s	min
5.0	67.5	121.5	30	30	180	3.00
Theoretical Productivity			Operating	Planned Productivity		
Loads	Vol	Tonnage	Efficiency	Loads	Vol	Tonnage
qty	lcm/NOH	t/NOH	%	qty	lcm/GOH	t/GOH
20.0	1,350	2,430	83%	16.6	1,121	2,017
Planned Production						
GOH	Vol	Tonnage				
/yr	lcm/yr	t/yr				
5,740	6,431,670	11,577,006				

PC-2000 Loading Production Calculation

UNIT	PC-2000					
In-situ Density	Swell Factor	Loose Density	Bucket Size	Bucket Fill	Bucket Capacity	
t/m3	lcm/bcm	t/m3	m3	%	lcm	t
2.70	1.5	1.80	10.0	90%	9.0	16.2
Loading Passes	Total Load		Time per Pass	Spot Time	Load Time	
qty	lcm	t	s	s	s	min
8.0	72.0	129.6	30	30	270	4.50
Theoretical Productivity			Operating Efficiency	Planned Productivity		
Loads	Vol	Tonnage		Loads	Vol	Tonnage
qty	lcm/NOH	t/NOH	%	qty	lcm/GOH	t/GOH
13.3	960	1,728	83%	11.1	797	1,434
Planned Production						
GOH	Vol	Tonnage				
/yr	lcm/yr	t/yr				
5,740	4,573,632	8,232,538				

Loading Production by Pit and Unit Type

Year		-1	1	2	3	4	5	6
PC-3000	Wst	3.8	11.6	11.6	2.3	7.6	11.6	8.1
PC-3000	Ore	0.0	0.0	0.0	5.6	1.3	0.0	0.0
PC-2000	Wst	0.0	1.6	2.3	3.0	0.2	1.4	5.6
PC-2000	Ore	0.0	5.0	5.6	0.0	4.3	5.6	0.0
Total		3.8	18.2	19.5	10.9	13.4	18.6	13.7
Year		7	8	9	10	11	12	Total
PC-3000	Wst	4.8	3.0	2.3	9.2	5.6	0.8	82.3
PC-3000	Ore	5.6	5.6	5.6	2.4	5.6	4.3	36.0
PC-2000	Wst	0.0	0.0	3.8	1.2	0.0	0.0	19.1
PC-2000	Ore	0.0	0.0	0.3	2.9	0.0	0.0	23.7
Total		10.4	8.6	12.0	15.7	11.2	5.1	161.1
		Seel E		Ox		Seel W		

Excavator Planned Gross Operating Hours (GOH)

Year		-1	1	2	3	4	5	6
PC-3000	Mt	3.8	11.6	11.6	7.9	8.9	11.6	8.1
	GOH	2,870	5,740	5,740	5,740	5,740	5,740	5,740
PC-2000	Mt	0.0	6.6	7.9	3.0	4.5	7.0	5.6
	GOH	0	5,740	5,740	5,740	5,740	5,740	5,740
Total	Mt	3.8	18.2	19.5	10.9	13.4	18.6	13.7
	GOH	2,870	11,480	11,480	11,480	11,480	11,480	11,480

Year		7	8	9	10	11	12	Total
PC-3000	Mt	10.4	8.6	7.9	11.6	11.2	5.1	118.3
	GOH	5,740	5,740	5,740	5,740	5,740	2,870	68,880
PC-2000	Mt	0.0	0.0	4.1	4.1	0.0	0.0	42.8
	GOH	0	0	5,740	5,740	0	0	45,920
Total	Mt	10.4	8.6	12.0	15.7	11.2	5.1	161.1
	GOH	5,740	5,740	11,480	11,480	5,740	2,870	114,800

APPENDIX XIV. HAULING STUDY

PRELIMINARY HAULAGE ESTIMATE
OOTSA PROJECT
GOLD REACH RESOURCES

YR -1

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
SE	PC-3000	Wst	3.8	10.7	121.5	679	564	83%	2,870	1.62	2.35	0.85	2.8	7,928

YR 1

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
SE	PC-3000	Wst	11.6	10.7	121.5	679	564	83%	5,740	3.24	3.58	0.85	4.2	24,201
SE	PC-2000	Wst	1.6	12.2	129.6	637	529	83%	5,740	3.04	0.53	0.85	0.6	3,558
SE	PC-2000	Ore	5.0	11.3	129.6	688	571	83%	5,740	3.28	1.53	0.85	1.8	10,299
Total			18.2										6.6	38,058

YR 2

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
SE	PC-3000	Wst	11.6	13.1	121.5	559	464	83%	5,740	2.66	4.36	0.85	5.1	29,434
SE	PC-2000	Wst	2.3	14.6	129.6	534	444	83%	5,740	2.55	0.90	0.85	1.1	6,100
SE	PC-2000	Ore	5.6	12.4	129.6	629	522	83%	5,740	2.99	1.87	0.85	2.2	12,627
Total			19.5										8.4	48,161

YR 3

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
SE	PC-3000	Wst	2.3	17.7	121.5	411	341	83%	5,740	1.96	1.17	0.85	1.4	7,924
SE	PC-3000	Ore	5.6	15.0	121.5	487	404	83%	5,740	2.32	2.41	0.85	2.8	16,300
Ox	PC-2000	Wst	3.0	14.3	129.6	544	451	83%	5,740	2.59	1.16	0.85	1.4	7,820
Total			10.9										5.6	32,044

YR 4

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
SE	PC-2000	Wst	0.2	19.2	129.6	405	336	83%	5,740	1.93	0.10	0.85	0.1	701
SE	PC-2000	Ore	4.3	16.5	129.6	472	392	83%	5,740	2.25	1.91	0.85	2.2	12,909
Ox	PC-3000	Wst	7.6	12.8	121.5	570	473	83%	5,740	2.71	2.80	0.85	3.3	18,915
Ox	PC-3000	Ore	1.3	10.4	121.5	703	583	83%	5,740	3.35	0.39	0.85	0.5	2,621
Total			13.4										6.1	35,146

YR 5

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
Ox	PC-3000	Wst	11.6	12.8	121.5	570	473	83%	5,740	2.71	4.28	0.85	5.0	28,870
Ox	PC-2000	Wst	1.4	14.3	129.6	544	451	83%	5,740	2.59	0.54	0.85	0.6	3,649
Ox	PC-2000	Ore	5.6	11.9	129.6	655	544	83%	5,740	3.12	1.79	0.85	2.1	12,117
Total			18.6										7.8	44,636

YR 6

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
Ox	PC-3000	Wst	8.1	14.8	121.5	493	409	83%	5,740	2.35	3.45	0.85	4.1	23,309
Ox	PC-2000	Ore	5.6	13.6	129.6	573	476	83%	5,740	2.73	2.05	0.85	2.4	13,852
Total			13.7										6.5	37,161

YR 7

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
Ox	PC-3000	Wst	4.8	14.8	121.5	493	409	83%	5,740	2.35	2.05	0.85	2.4	13,813
Ox	PC-3000	Ore	5.6	12.1	121.5	604	501	83%	5,740	2.88	1.95	0.85	2.3	13,142
Total			10.4										4.7	26,955

YR 8

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
Ox	PC-3000	Wst	3.0	14.8	121.5	493	409	83%	5,740	2.35	1.28	0.85	1.5	8,633
Ox	PC-3000	Ore	5.6	12.1	121.5	604	501	83%	5,740	2.88	1.95	0.85	2.3	13,142
Total			8.6										3.8	21,775

YR 9

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
Ox	PC-3000	Wst	2.3	17.9	121.5	408	339	83%	5,740	1.95	1.18	0.85	1.4	7,983
Ox	PC-3000	Ore	5.6	14.4	121.5	507	421	83%	5,740	2.42	2.32	0.85	2.7	15,647
SW	PC-2000	Wst	3.8	10.1	129.6	772	641	83%	5,740	3.68	1.03	0.85	1.2	6,975
SW	PC-2000	Ore	0.3	10.6	129.6	736	611	83%	5,740	3.51	0.09	0.85	0.1	577
Total			12.0										5.4	31,182

YR 10

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
Ox	PC-2000	Wst	0.6	19.4	129.6	402	334	83%	5,740	1.91	0.31	0.85	0.4	2,116
Ox	PC-2000	Ore	2.9	15.9	129.6	490	407	83%	5,740	2.33	1.24	0.85	1.5	8,389
SW	PC-2000	Wst	0.6	12.9	129.6	604	501	83%	5,740	2.88	0.21	0.85	0.2	1,408
SW	PC-3000	Wst	9.2	11.4	121.5	641	532	83%	5,740	3.05	3.01	0.85	3.5	20,339
SW	PC-3000	Ore	2.4	11.3	121.5	647	537	83%	5,740	3.08	0.78	0.85	0.9	5,254
Total			15.7										6.5	37,506

YR 11

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
SW	PC-3000	Wst	5.6	11.4	121.5	641	532	83%	5,740	3.05	1.83	0.85	2.2	12,380
SW	PC-3000	Ore	5.6	11.3	121.5	647	537	83%	5,740	3.08	1.82	0.85	2.1	12,260
Total			11.2										4.3	24,640

YR 12

	Loading		Tonnage	Cycle	Payload	Truck Productivity		Efficiency	Hr/Trk	Mt/Trk	Trucks	Availability	Total Fleet	
Pit	Unit	Material	Mt	min	t	t/noh	t/goh	%	goh	Mt/yr	qty	%	qty	goh
SW	PC-3000	Wst	0.8	14.2	121.5	514	427	83%	2,870	1.23	0.65	0.85	0.8	2,204
SW	PC-3000	Ore	4.3	13.6	121.5	538	446	83%	2,870	1.28	3.36	0.85	4.0	11,337
Total			5.1										4.7	13,541

Summary of Haul Truck Requirements for Ootsa LOM Plan

Year		-1	1	2	3	4	5	6
Tonnage	Mt	3.8	18.2	19.5	10.9	13.4	18.6	13.7
Trucks	calculated	2.8	6.6	8.4	5.6	6.1	7.8	6.5
Trucks	planned	3	7	9	6	7	8	7
Hours	GOH	7,928	38,058	48,161	32,044	35,146	44,636	37,161

Year		7	8	9	10	11	12	Wtd Av
Tonnage	Mt	10.4	8.6	12.0	15.7	11.2	5.1	13.4
Trucks	calculated	4.7	3.8	5.4	6.5	4.3	4.7	6.2
Trucks	planned	5	4	6	7	5	5	7
Hours	GOH	26,955	21,775	31,182	37,506	24,640	13,541	33,228

APPENDIX XV. MANPOWER

CONTRACT MINING MANPOWER SCHEDULE
OOTSA PROJECT - GOLD REACH RESOURCES
JAN 31/2016

OPERATIONS				BLASTING			
Position	Qty/Shift	Shifts	Total	Position	Qty/Shift	Shifts	Total
General Foreman	1	1	1	Foreman	1	2	2
Foreman	1	4	4	Blaster	2	2	4
Shovel Operator	2	4	8	Laborer	4	2	8
Loader Operator	1	4	4	Bulk Truck Operator	1	2	2
Drill Operator	2	4	8				
Haul Truck Driver	8	4	32				
Dozer Operator	4	4	16				
Grader Operator	2	4	8				
Sand/Water Truck Driver	2	4	8				
Overland CV Laborer	2	4	8				
Total	25		97	Total	8		16

MAINTENANCE				ENGINEERING			
Position	Qty/Shift	Shifts	Total	Position	Qty/Shift	Shifts	Total
General Foreman	1	1	1	Mine Technician	1	1	1
Foreman	1	4	4				
Planner	1	2	2				
HD Mechanic	2	4	8				
HD Mechanic Apprentice	2	4	8				
Welder	2	4	8				
Tireman	1	4	4				
Light Vehicle Mechanic	2	4	8				
Fuel/Lube Man	2	4	8				
Clerk	1	2	2				
Total	15		53	Total	1		1

MANAGEMENT				TOTAL			
Position	Qty/Shift	Shifts	Total	Position	Qty/Shift	Shifts	Total
				Operations	25		97
				Blasting	8		16
				Maintenance	15		53
				Management	0		0
				Engineering	1		1
Total	0		0	Total	49		167

MILL MANPOWER SCHEDULE
OOTSA PROJECT - GOLD REACH RESOURCES
JAN 31/2016

OPERATIONS				METALLURGY/ASSAY LAB			
Position	Qty/Shift	Shifts	Total	Position	Qty/Shift	Shifts	Total
General Foreman	1	1	1	Snr Metallurgist	1	1	1
Foreman	1	4	4	Metallurgist	2	2	4
Control Room Operator	1	4	4	Met Technician	2	2	4
Crusher Operator	2	4	8	Assayer	2	2	4
Grinding Operator	1	4	4	Assay Technician	2	2	4
Flotation Operator	1	4	4	Sample Bucker	2	4	8
Moly Circuit Operator	1	4	4	Clerk	1	2	2
Reagent Operator	2	4	8				
Tailings Operator	1	4	4				
Filter/Conc Operator	1	4	4				
Laborer	2	4	8				
Total	14		53	Total	12		27

MAINTENANCE				TOTAL			
Position	Qty/Shift	Shifts	Total	Position	Qty/Shift	Shifts	Total
General Foreman	1	1	1				
Foreman	1	2	2	Operations	14		53
Planner	1	2	2	Met/Assay Lab	12		27
Millwright	3	2	6	Maintenance	16		35
Millwright Apprentice	3	2	6				
Electrician	2	2	4				
Instrumentation Tech	1	2	2				
Lube Man	2	4	8				
Laborer	2	2	4				
Total	16		35	Total	42		115

ADMIN MANPOWER SCHEDULE
CONTRACT MINING - TOLL-MILLING SCENARIO
OOTSA PROJECT - GOLD REACH RESOURCES
JAN 31/2016

	MINING CONTRACTOR			TOLL-MILLER			OOTSA OWNER		
Position	Qty/Shift	Shifts	Total	Qty/Shift	Shifts	Total	Qty/Shift	Shifts	Total
ACCOUNTING									
Chief Accountant	0	0	0	0	0	0	1	1	1
Account	0	0	0	1	1	1	1	1	1
Clerk	1	1	1	1	1	1	0	1	0
SUBTOTAL			1			2			2
IT & COMMS									
IT Technician	0	0	0	1	1	1	0	0	0
SUBTOTAL			0			1			0
HR									
HR Manager	0	0	0	0	0	0	0	0	0
HR Clerk	1	1	1	1	1	1	1	1	1
SUBTOTAL			1			1			1
MANAGEMENT									
Superintendent	1	1	1	1	1	1	1	1	1
Secretary	1	1	1	1	1	1	1	1	1
SUBTOTAL			2			2			2
ENGINEERING									
Chief Engineer							1	1	1
Engineer							1	1	1
Geologist							1	2	2
Surveyor							2	2	4
Ore Control Technician							1	4	4
Clerk							1	1	1
SUBTOTAL	0		0	0		0	7		13
SECURITY									
Security Manager	0	0	0	1	1	1	0	0	0
Security Officer	0	0	0	1	4	4	0	0	0
SUBTOTAL			0			5			0
CAMP									
Camp Mgr	0	0	0	0	0	0	1	2	2
Cook	0	0	0	0	0	0	2	2	4
Kitchen Helper	0	0	0	0	0	0	4	2	8
Cleaner	0	0	0	0	0	0	4	2	8
SUBTOTAL			0			0			22

ADMIN MANPOWER SCHEDULE
CONTRACT MINING - TOLL-MILLING SCENARIO
OOTSA PROJECT - GOLD REACH RESOURCES
JAN 31/2016

	MINING CONTRACTOR			TOLL-MILLER			OOTSA OWNER		
Position	Qty/Shift	Shifts	Total	Qty/Shift	Shifts	Total	Qty/Shift	Shifts	Total
PURCHASING									
Purchasing Manager	0	0	0	0	0	0	0	0	0
Buyer	1	1	1	1	1	1	0	0	0
SUBTOTAL			1			1			0
MATERIALS MGMT									
Materials Manager	1	1	1	1	1	1	1	1	1
Storeman	1	2	2	1	2	2	0	0	0
SUBTOTAL			3			3			1
HSE									
HSE Manager	0	0	0	0	0	0	1	1	1
HSE Officer	1	1	1	1	1	1	1	1	1
First Aid Attendent	1	4	4	1	4	4	0	0	0
CR Coordinator	0	0	0	0	0	0	1	1	1
Environmental Technician	0	0	0	1	1	1	1	1	1
SUBTOTAL			5			6			4
TRANSPORT									
Barge Operator							1	4	4
Barge Crew							0	4	0
SUBTOTAL			0			0			4
POSITION	Qty/Shift	Shifts	Total	Qty/Shift	Shifts	Total	Qty/Shift	Shifts	Total
ACCOUNTING			1			2			2
IT & COMMS			0			1			0
HR			1			1			1
MANAGEMENT			2			2			2
ENGINEERING			0			0			13
SECURITY			0			5			0
CAMP			0			0			22
PURCHASING			1			1			0
MATERIALS MGMT			3			3			1
HSE			5			6			4
TRANSPORT			0			0			4
TOTAL	0		13	0		21	0		49

Manpower Schedule by Operating Group

CONTRACT MINING		TOLL MILLING		ADMINISTRATION				
DEPARTMENT	TOTAL	DEPARTMENT	TOTAL	DEPARTMENT	MINING	MILLING	OWNER	TOTAL
Operations	97	Operations	53	Accounting	1	2	3	6
Blasting	16	Met/Assay Lab	27	IT & Comms	0	1	0	1
Maintenance	53	Maintenance	35	HR	1	1	1	3
Engineering	1			Management	2	2	2	6
				Engineering	0	0	13	13
				Security	0	5	0	5
				Camp	0	0	22	22
				Purchasing	1	1	0	2
				Materials Mgmt	3	3	1	7
				HSE	5	6	4	15
				Transport	0	0	8	8
TOTAL	167	TOTAL	115	TOTAL	13	21	54	88
				TOTAL	370			

APPENDIX XVI. MILL FEED TRANSFER TRADE-OFF STUDY

MILL FEED TRANSFER TRADE-OFF STUDY FOR OOTSA PROJECT

BY PETER CARTER, BSc, MBA, P.Eng.
FOR GOLD REACH RESOURCES, November 2015

1.0 SUMMARY

Trucking and conveying alternatives for transporting ore from the Ootsa property across the lake to the Huckleberry mill were evaluated. The results of the comparison are shown below in Figure 1. Discounted cash flow analysis determined that conveying directly from Ootsa to Huckleberry across a rockfill causeway was the most economically attractive option with an estimated capital cost of $18.4 M, an estimated unit operating cost of $0.34/t, and a net present cost discounted at 5% over the life of the project of $33.4 M.

WHOLE ORE						
Scenario			OPEX		CAPEX	NPC
Transport	Route	Crossing	$/t ore	$/t-km	$ M	$ M
Truck & Trailer	Narrows	Bridge	2.13	0.15	15.3	115.1
HaulMax	Narrows	Bridge	1.71	0.12	24.1	103.4
Contractor	Narrows	Bridge	2.92	0.21	9.5	143.7
Truck & Trailer	Direct	Causeway	1.26	0.21	7.4	66.3
HaulMax	Direct	Causeway	1.14	0.19	12.2	65.4
Contractor	Direct	Causeway	1.72	0.29	3.7	84.7
CRUSHED ORE						
Scenario			OPEX		CAPEX	NPC
Transport	Route	Crossing	$/t ore	$/t-km	$ M	$ M
CV	Narrows	Bridge	0.41	0.03	37.2	54.9
CV	Direct	Ropecon	0.34	0.06	29.0	43.6
CV	Direct	Barge	0.48	0.06	21.2	42.7
CV	Direct	Causeway	0.34	0.06	18.4	33.4

Figure 1. Comparison of Economics for Ore Transfer Alternatives

It was recognized that economics was not the only criteria to be considered when assessing the value of each option. Options were ranked one to six on the basis of their technical, economic, environmental, social, and permitting merits, one being most desirable and six being least desirable. The outcome of the ranking can be seen in Figure 2.

Scenario			Ranking					
Transport	Route	Crossing	Technical	Economic	Environment	Social	Permitting	Total
Truck	Direct	Causeway	1	5	6	5	6	23
Truck	Narrows	Bridge	4	6	4	1	4	19
CV	Narrows	Bridge	5	4	3	4	3	19
CV	Direct	Causeway	2	1	5	6	5	19
CV	Direct	Ropecon	6	3	1	3	1	14
CV	Direct	Barge	3	2	2	2	2	11

Figure 2. Relative Ranking of Ore Transfer Alternatives

It can be seen that although conveying across a causeway was the best option economically, when other aspects of the project were considered conveying using barges to cross the lake was judged more desirable. The next most desirable option was conveying using a suspension bridge (Ropecon) system to cross the lake.

The capital cost of the conveyor-barge system was estimated to be $2.8 M more than the conveyor-causeway option at $21.2 M with an operating cost of $0.48/t. The Ropecon option was more expensive again at $29.0 M but the operating cost was comparable to that of the conveyor-causeway option. Both ranked higher than the conveyor-causeway option due to their relatively lower environmental impact.

On the basis of this comparison, the most desirable options need to be reviewed, optimized, and a final selection made to serve as the basis for the Ootsa PEA operating plan.

2.0 INTRODUCTION

The development the Ootsa property calls for ore mined from the Seel and Ox deposits to be processed at the Huckleberry (HB) mill. Various options exist for transferring ore from Ootsa to HB. Each option has its own technical, economic, environmental, social, and permitting merits. A trade-off study was conducted to determine which option represents the best net value to the project.

3.0 ORE TRANSPORT OPTIONS

3.1 TRUCK HAULAGE

Two transport options were evaluated to transfer ore from Ootsa to HB, truck and conveyor. Two types of trucks were considered:

- Standard highway-type dump truck-trailer combinations with a total capacity of 40 t
- HaulMax rigid-frame, long distance, off-road haul trucks with a capacity of 75 t

Technical details for each type of truck can be found in Appendix A. Dump truck-trailer combos are typical of rigs seen on public roads and highways while HaulMax trucks are application specific. Both types of trucks could be legally operated on the planned roads and both can handle whole ore which means crushing at Ootsa would not be necessary. In addition, a contract haulage scenario using truck-trailer combinations was considered in order to assess the benefit of a maximum reduction in CAPEX.

3.2 CONVEYING

Conveyors are electric drive, overland-style systems typical of those used for long-distance ore transport in open pit mines. Belts would be 30-36” wide with 35° idlers mounted on steel frames which conform to the prevailing terrain. For the purpose of this comparison, conveyors are assumed to follow the same or similar paths to those used by trucks. If conveyors prove to be the best choice for ore haulage then a separate exercise beyond the scope of the trade-off study will be conducted to design an optimized route which takes best advantage of topography and minimizes transfer points.

4.0 ROUTE AND TRANSPORT COMBINATIONS

For each transport option, a number of routes exist. Routes were composed of overland and lake-crossing components. The combinations include:

- Road and conventional bridge
- Road and causeway

- Conveyor and conventional bridge
- Conveyor and causeway
- Conveyor and barge
- Conveyor and suspension bridge

The different possible routes considered from Ootsa to HB are shown in Figure 3. All of the routes were measured from a common starting point on the Ootsa side of the lake called Jct 1. For this reason, the study results in a relative comparison of alternatives. The definitive cost for the chosen option will be calculated in a separate exercise taking into account the full distance and tonnage from each pit to HB.

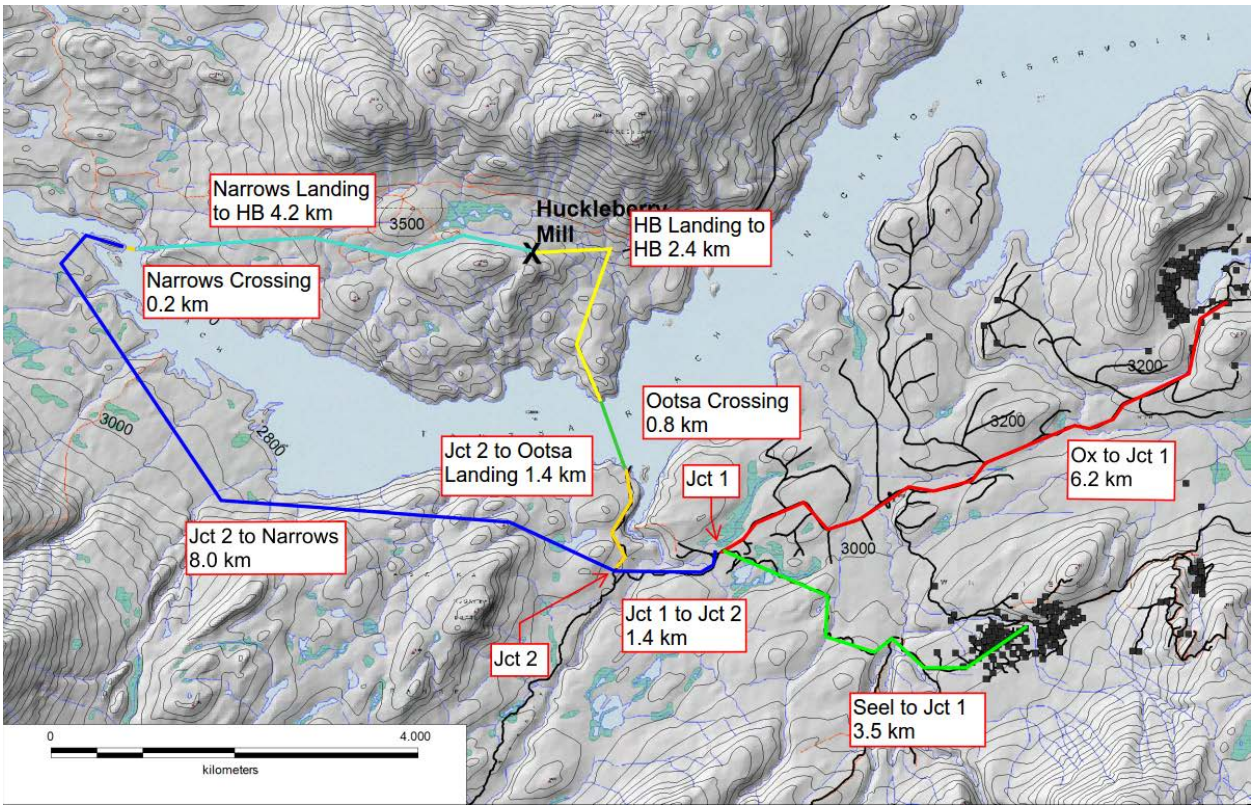


Figure 3. Considered Routes from Ootsa to Huckleberry

All of the various combinations of routes with distances and possible transport options can be found listed in Figure 4. One option considered but not evaluated was truck haulage via barge at the direct crossing. This option was not evaluated for two reasons. Firstly, the time added for the barge crossing made the turnaround on the direct route almost as long as the cycle time on the route via the Narrows Bridge.

Secondly, the mismatch between the cycle time for trucks on either side of the lake and the time it took the barge to cross and return introduced a huge amount of inefficiency into system. That inefficiency could be managed by matching a barge with every two trucks, however, this was deemed both impractical and uneconomic and as a result, not given further consideration.

Route	Distance	Crossing		Haulage	Material	
Name	km	Type	Location	Type	Type	Operator
Long Road	13.8	Bridge	Narrows	Truck+Trailer	Whole	Owner
Long Road	13.8	Bridge	Narrows	Truck+Trailer	Whole	Contractor
Long Road	13.8	Bridge	Narrows	HaulMax	Whole	Owner
Long Road	13.8	Bridge	Narrows	Conveyor	Crushed	Owner
Short Road	6.0	Causeway	Direct	Truck+Trailer	Whole	Owner
Short Road	6.0	Causeway	Direct	Truck+Trailer	Whole	Contractor
Short Road	6.0	Causeway	Direct	HaulMax	Whole	Owner
Short Road	6.0	Causeway	Direct	Conveyor	Crushed	Owner
Short Road	6.0	Barge	Direct	Conveyor	Crushed	Owner
Short Road	6.0	Ropecon	Direct	Conveyor	Crushed	Owner

Figure 4. Considered Transport and Route Combinations

5.0 OPERATING SCENARIOS

5.1 ROAD VIA THE NARROWS

The road and conventional bridge entails a 9.4 km road from the project area to the Tahtsa Narrows where Ootsa Lake is only 200 m wide. Once across the lake, a further 4.2 km of road will allow trucks to reach the HB mill. The entire route via the Narrows from the starting point in the project area to the HB mill is 13.8 km.

5.2 CAUSEWAY

The shortest route from Ootsa to the HB mill is directly across the lake from the mouth of Kasalka Creek to the north shore. At this point the lake is 800 m wide making a conventional bridge crossing estimated at $100 M uneconomic. A rock-fill causeway, however, using select material from the Seel E pre-strip could cross the lake in a technically simple manner at relatively low cost. Details regarding the configuration of the causeway can be found in Appendix G. Including the lake crossing the entire route is only 6.0 km.

5.3 CONVEYOR VIA BRIDGE OR CAUSEWAY

An overland conveyor can follow either road route. Clearly the route via the Narrows would be longer but would avoid the potential environmental impacts associated with a causeway. A conveyor laid across a causeway would be among the most attractive options both in technical and economic terms but again is potentially problematic from an environmental and permitting perspective.

5.4 CONVEYOR AND BARGE

A less impactful option for direct conveying from Ootsa to HB is to convey ore to the south shore of the lake where it is loaded by a tripper conveyor into a 2000 t barge. At the same time, an identical barge on the north side of the lake unloads onto a second overland conveyor which carries ore to the HB mill. Barges can be self-unloading or unloaded using a dedicated loader or excavator. Every three hours a tug will push the empty barge across the lake to be loaded and the full barge to the north side to discharge.

5.5 CONVEYOR AND SUSPENSION BRIDGE

Ropecon, a subsidiary of the Austrian firm, Dopplemayr, specializes in the design and manufacture of elevated conveyor systems. A standard conveyor suspended on tensioned steel cables anchored to large pylons can span distances up to 1,500 m unsupported. Ropecon systems are proven technology employed in industrial settings including mines at various sites worldwide.

An overland conveyor employing a Ropecon system for crossing the lake would have the benefit of the most direct route, lower operating costs resulting from conveying as opposed to trucking, and minimal environmental and permitting issues as no in-water construction would be required. Details regarding a Ropecon suspended conveyor bridge can be found in Appendix H.

6.0 OPERATING PARAMETERS

6.1 PRODUCTION TONNAGE

Production rates for all scenarios were based on a mill feed rate of 705 tph. The mill was assumed to operate 331 days per year, 24 hours per day, processing a total of 5.6 Mt annually.

6.2 CYCLE TIME FACTORS

All types of trucks were assumed to travel at an average speed of 50 kph. Dumping times at the HB crusher/surge pile were 2 minutes per load while loading times were calculated based on the capacity of the truck and the time to load by an appropriately sized loader. Typically this was 2 minutes per truck. In the case of the truck/trailer combinations, two small loaders were employed to achieve this rate.

For the barge scenarios, a crossing time of 7 minutes one-way was assumed based on the actual crossing time for the existing Ootsa Lake barge. Calculation indicated that it was reasonable to fill and unload barges in the same length of time. The operating scenarios were based on self-unloading barges as a result of discussions with local barge operators although a conventional front-end loader bailing into a hopper could achieve the same result.

6.3 EFFICIENCY & AVAILABILITY

Operating efficiency was based on a 50-minute working hour or 83%. Mechanical availability for trucks and loaders was assumed to be 85%. Based on these factors, gross annual operating hours for mobile equipment was estimated to be approximately 5,600 hours. Mechanical availability for conveyors was 95% with systems being sized to deliver the required tonnage in the available time.

6.4 METHOD OF OPERATION

Truck haulage scenarios assumed that ore haulage operated on the same schedule as the mill. Trucks were loaded on the Ootsa side, hauled to the HB mill, dumped, and returned on a continuous 12-hour shift basis. Two 3.5 m3 loaders were used to load the truck and trailer combinations. A single 8.5 m3 loader was used to load the HaulMax trucks. The rehandle production calculation for the trucking scenarios can be found in Appendix B.

Conveyor scenarios assumed that conveyors were loaded from a crusher surge pile by gravity via simple belt-type feeders. The cost of charging conveyors was assumed to be a function of crushing and was therefore not considered as it was part of the process cost. Overland conveyors were assumed to be long-straight runs with transfer points when belt direction changed significantly, at barge loading and unloading locations, and at the start and finish of a suspension bridge crossing.

7.0 OPERATING COSTS

7.1 TRUCKING SCENARIOS

Operating costs for trucking scenarios was based on the estimated cost of mobile equipment, labor, overheads, and dust suppression. Mobile equipment included the cost of trucks and loaders, graders and sand/water trucks for road maintenance, and transport for supervision. Rates were built-up from the estimated cost for fuel, lubes, tires, and spare parts. A fuel cost of $1.00/L was used which is similar to the bulk fuel quote GRV received from a local supplier. The build-up of equipment rates can be found in Appendix C.

Labor costs considered operators, maintenance, and supervision. Labor costs were based on 2,000 hours per year per man based on a 1-week in, 1-week out work rotation. Labor rates were based on knowledge of wages scales from existing copper mines in BC. Benchmark rates were $30/hr for a truck driver and $40/hr for a journeyman. The burden on the base rate for premiums and benefits was 30%. The breakdown of labor costs for each scenario can be found in Appendix D.

Overheads were an allowance applied for the administration of operations and maintenance in the amount of 1% and 5% of labor costs respectively. For trucking scenarios, dust suppression in the form of calcium chloride applications twice a year has been included. This is typical practice in the area on forest service roads and contributes significantly to the safety and efficiency of logging truck operations.

The 40t truck and trailer scenarios were evaluated under both owner-operated and contractor conditions. For the contractor scenarios, all equipment, labor, and other costs were marked-up 10%, the cost of owning the fleet was added to equipment operating costs amortized over the life of the project, and 20% was added to the total OPEX representing the contractor's margin.

7.2 CONVEYOR SCENARIOS

Operating costs for conveyors was based on $0.10/t for power derived from a cost for electrical power of $0.06/kW-hr. An annual allowance for maintenance of 3.4% of capital cost was applied. Operating labor included supervision, conveyor patrol and clean-up, maintenance, and loading and unloading operators for the barge scenarios. The rate for clean-up labour was $20/hr.

8.0 CAPITAL COSTS

8.1 TRUCKING SCENARIOS

Capital costs for the trucking scenarios were separated in three groups: Infrastructure, Mobile Equipment, and Facilities. Infrastructure included the roads and lake crossing, either bridge or

causeway. Dual-lane roads were priced at $40,000/km based on direct GRV experience at the project site. A conventional bridge for the crossing at the Narrows was priced at $30,000/m or $6.0 M for the span based on advice from local bridge builders. Stream crossings were costed at $10,000/m with an assumed width of 20 m each.

The causeway was considered to be built from waste pre-stripped from Seel E. As such, the cost of generating the material was common to all scenarios and not considered. The incremental cost of hauling the material from Seel E to the causeway site was included as this was scenario specific. The cost of the overhaul was estimated at $1.25 M.

Mobile equipment included trucks and loaders as well as road maintenance equipment like graders and sand/water trucks. Highway truck and trailer combinations were priced at $250,000 each based on market rates while the price for a HaulMax truck was $1.5 M based on supplier advice. Costs for loaders and other mobile equipment are based on recent quotes but are intended to reflect the size and type of unit rather than a specific make or model.

Facilities were temporary, containerized shops and offices to support maintenance and supervision. The inclusion of these costs is to ensure that the ore transport operation is self-sufficient and not reliant on making use of other facilities which may or may not be available. This was essential to evaluate the contract trucking scenarios. Details of capital cost estimates can be found in Appendix E.

8.2 CONVEYOR SCENARIOS

The capital cost of an installed overland conveyor was estimated to be $1.6 M/km. This included drives, belting, idlers, decking, and control systems. All conveyors were assumed to be constructed on a single-lane road priced at $20,000/km. The cost for lake crossings in the form of a conventional bridge or causeway were the same as for the trucking scenarios. The suspended conveyor cost for the Ropecon system was unique to that scenario.

All the conveyor scenarios include the cost of a power line to bring HV power to Ootsa at a rate of $300,000/km. All scenarios also assume that crushing is performed at Ootsa using the relocated HB gyratory crusher. Only one relocations is considered at a cost of $4.0 M. If conveying proves to be the chosen option then the sustaining CAPEX for crusher and conveyor relocations will have to be considered when estimating the actual project cost.

The conveyor-barge scenario allowed for the cost of two, 2000 t, self-unloading barges, a tug to move the barges, two simple dock structures, and a tripper conveyor for loading the barges. The self-unloading barges will be equipped to discharge to a surge bin that will feed the overland conveyor to the mill.

9.0 EVALUATION

Capital and operating costs were estimated for each scenario with the express objective of using the same cost for the same items whenever appropriate in order to facilitate comparison. Annual cash flows over a project life of 12 years were developed. It was assumed that all capital was incurred at the beginning of the project and that all assets were to last the full mine life. No consideration was given for sustaining CAPEX.

The basis for comparison of scenarios was net present cost (NPC) discounted at 5%. Other measures of performance generated by the analysis included $/t ore delivered and $/t-km. The scenario with the most attractive combination of technical simplicity, low time discounted cost, fewest environmental impacts, greatest social benefits, and best permitting outlook was judged to be most desirable.

10.0 RESULTS

10.1 ECONOMIC ANALYSIS'

The results of the economic analysis performed on the various ore transfer options for the Ootsa project are presented in Figure 5. The "whole ore" scenarios sought to minimize CAPEX by eliminating the need for crushing and power at the Ootsa site and utilizing simple means to cross the lake. In this regard, the scenarios were successful with capital costs ranging from $4-$24 M with most $15 M or less.

However, the expense of running truck fleets over the life of the project was very high, more than offsetting the initial capital savings. These factors made the trucking scenarios the least attractive on a discounted cash flow basis. This is highlighted in the net present costs which all exceed $65 M over the project life and are consistently the highest of all the options evaluated.

The crushed ore scenarios, on the other hand, all had relatively high CAPEX ranging from about $20-$40 M to pay for the purchase and installation of kilometers of conveyors as well as various means of crossing the lake. The higher CAPEX, however, was offset by operating costs 20-50% of those for trucking. Over the life of the project this resulted in lower NPCs of roughly $30-$50 M. The $/t-km values provide a check for reasonableness. As expected, the trucking scenarios are generally in the 0.15-0.20 $/t-km range while the conveyor scenarios range from 0.03-0.06 $/t-km. The discounted cash flows for each scenario can be found in Appendix F.

WHOLE ORE						
Scenario			OPEX		CAPEX	NPC
Transport	Route	Crossing	$/t ore	$/t-km	$ M	$ M
Truck & Trailer	Narrows	Bridge	2.13	0.15	15.3	115.1
HaulMax	Narrows	Bridge	1.71	0.12	24.1	103.4
Contractor	Narrows	Bridge	2.92	0.21	9.5	143.7
Truck & Trailer	Direct	Causeway	1.26	0.21	7.4	66.3
HaulMax	Direct	Causeway	1.14	0.19	12.2	65.4
Contractor	Direct	Causeway	1.72	0.29	3.7	84.7
CRUSHED ORE						
Scenario			OPEX		CAPEX	NPC
Transport	Route	Crossing	$/t ore	$/t-km	$ M	$ M
CV	Narrows	Bridge	0.41	0.03	37.2	54.9
CV	Direct	Ropecon	0.34	0.06	29.0	43.6
CV	Direct	Barge	0.48	0.06	21.2	42.7
CV	Direct	Causeway	0.34	0.06	18.4	33.4

Figure 5. Results of Economic Analysis for Ore Transfer Options

10.2 RANKINGS

The considered ore transfer alternatives were ranked on the basis of technical complexity, economic value, environmental impact, social benefit, and amenability to permitting. Every alternative received a score between one and six in each category with one being best and six worst. The alternative with the lowest total score was considered to offer the overall benefit.

10.2.1 TECHNICAL

The relative technical complexity of implementing and operating the various options was assessed based using the following guidelines:

- Trucking is less complex than conveying. Conveyors require the construction of roads as well as the conveyor system. Conveyors, although proven technology, require design, installation, operation, and maintenance which is specialized.
- Long routes are more complex than short ones. This is primarily due to the number of stream crossings (15) to be dealt with for the route via the Narrows. Although no single stream crossing is unmanageable the impact on the project is cumulative.
- Lake crossing options are viewed in order of increasing complexity as (1) causeway, (2) barge, (3) conventional bridge, and (4) conveyor suspension bridge.

On this basis, the least technically complex alternative is the trucking directly across the lake via a causeway. The causeway is easily constructed requiring minimal design and once in place can handle any manner of traffic regardless of load. A conveyor across a causeway ranks second simply because conveying is considered more complex than trucking.

The third option, conveying using barges to cross the lake, is less simple than crossing the lake via a causeway but the equipment and methods to load and unload barges using conveyors are well-known and proven. The fourth and fifth options are trucking and conveying via the Narrows. The route is long and requires the design and construction of a 200 m long bridge. Again the trucking option is ranked higher as it is considered simpler than conveying.

The most technically complex solution is a conveyor system which crosses the lake suspended by tensioned steel cables anchored to towers on each side. This proven technology but it is not commonly employed and requires a higher level of engineering expertise to design, construct, and operate than the other options. Figure 6 shows the ranking of the considered options in terms of technical complexity.

Scenario			Ranking					
Transport	Route	Crossing	Technical	Economic	Environment	Social	Permitting	Total
Truck	Direct	Causeway	1					1
Truck	Narrows	Bridge	4					4
CV	Narrows	Bridge	5					5
CV	Direct	Causeway	2					2
CV	Direct	Ropecon	6					6
CV	Direct	Barge	3					3

Figure 6. Options Ranking for Technical Aspects of Ore Transfer

10.2.2 ECONOMICS

The economic value of the considered options was ranked on the basis of net present cost (NPC) discounted at 5%. This measure takes into account both capital and operating cost and provides a single value which reflects the trade-off between the two.

Detail regarding why one option is more or less costly than another can be found in the operating capital cost sections of this report. The rankings reflect the fact that operating cost is the primary value driver. The trucking scenarios ranked lowest due to the expense of operating a fleet of trucks over the project life which is dominated by the cost for fuel and labor. It is notable that this is still the case, even hauling directly to HB via a causeway.

The conveyor scenarios were differentiated by the nature and cost of the route from Ootsa to HB. The conveyor across a causeway ranked first due to the low cost to construct the causeway and the most direct route to HB. It had an NPC about $10 M lower than the second and third ranked options, CV-Barge and the CV-Ropecon Bridge. The route via the Narrows ranked fourth due to the need for many more kilometers of conveyors in addition to the cost for bridges. The ranking of options on the basis of economics can be seen in Figure 7 where they are shown with those for technical complexity.

Scenario			Ranking					
Transport	Route	Crossing	Technical	Economic	Environment	Social	Permitting	Total
Truck	Direct	Causeway	1	5				6
Truck	Narrows	Bridge	4	6				10
CV	Narrows	Bridge	5	4				9
CV	Direct	Causeway	2	1				3
CV	Direct	Ropecon	6	3				9
CV	Direct	Barge	3	2				5

Figure 7. Options Ranking for Economic Aspects of Ore Transfer

10.2.3 ENVIRONMENTAL IMPACT

The potential environmental impact of each scenario was ranked based on a number of criteria including dust, noise, disturbance, carbon footprint, water resources, fisheries, wildlife, aesthetics, and access. Conveying was considered preferable to trucking as it resulted in less dust, noise, reduced carbon footprint, and less hazard to wildlife.

Impacts to water and fisheries were considered most serious impacts which resulted in the causeway scenarios being ranked lowest. These were followed by the long road route via the Narrows which resulted in the largest disturbed area plus impact on the lake in the form of the bridge.

The CV-Barge scenario was second best because the route was short and the impact from barging would be transient, ceasing when operations were completed. It also minimized access to the south side of the reach. The CV-Ropecon Bridge option was best because it had all the benefits of a direct conveyor route to HB with the only temporary impacts on the lake related to aesthetics.

Figure 8 shows the ranking of the considered options for environmental impact along with those for technical complexity and economics.

Scenario			Ranking					
Transport	Route	Crossing	Technical	Economic	Environment	Social	Permitting	Total
Truck	Direct	Causeway	1	5	6			12
Truck	Narrows	Bridge	4	6	4			14
CV	Narrows	Bridge	5	4	3			12
CV	Direct	Causeway	2	1	5			8
CV	Direct	Ropecon	6	3	1			10
CV	Direct	Barge	3	2	2			7

Figure 8. Options Rankings for Environmental Aspects of Ore Transfer

10.2.4 SOCIAL VALUE

Social aspects of the ore transfer trade-off considered two issues: employment and public perception. Employment was related to the number of jobs each alternative would generate while public perception was an attempt rank the options on the basis of how good or bad each would be perceived in the eyes of the local community. The local community was thought to include both local First Nations residents and the broader Bulkley Valley area.

Given the above criteria, the trucking scenario via the Narrows provided the greatest social benefit by generating the most jobs for truck drivers. This benefit was mitigated, however, in the causeway scenario because it was thought that “filling the lake with rock” would be considered a “bad thing” by the community. Thus both causeway scenarios were ranked lowest.

The CV-Barge scenario could generate a few additional jobs through direct hiring or subcontracting out to a local company. Barging activities already exist on the lake so it’s unlikely that this would be viewed negatively. For these reasons, this option was ranked second.

The CV-Bridge scenario and the conveyor scenario via the Narrows were ranked third and fourth respectively. Neither offers any incremental employment value but are thought to be perceived as “good” due to their limited impact on the lake. The bridge at the Narrows caused that scenario to be ranked lower than that employing the suspended conveyor (Ropecon) bridge. Figure 9 shows the options ranked for technical, economic, environmental, and social aspects of ore transfer.

Scenario			Ranking					
Transport	Route	Crossing	Technical	Economic	Environment	Social	Permitting	Total
Truck	Direct	Causeway	1	5	6	5		17
Truck	Narrows	Bridge	4	6	4	1		15
CV	Narrows	Bridge	5	4	3	4		16
CV	Direct	Causeway	2	1	5	6		14
CV	Direct	Ropecon	6	3	1	3		13
CV	Direct	Barge	3	2	2	2		9

Figure 9. Options Ranking for Social Aspects of Ore Transfer

10.2.5 EASE OF PERMITTING

The options were ranked as to their perceived ease of being permitted. The major consideration to permitting was environmental impact with less importance placed on social benefit and utility. The causeway scenarios had the greatest impact to the environment and are seen to be the most difficult to permit. Trucking over the causeway would generate jobs so it was ranked higher than the CV-Causeway scenario. They were ranked fifth and sixth respectively.

The CV-Bridge scenario was best as it was the least impactful followed closely by the CV-Barge scenario. The scenarios taking the route across the Narrows were ranked third and fourth with the conveyor option more desirable despite the benefit of jobs from trucking.

Permitting could be seen as a proxy for environmental impact or a means of weighting environmental and social considerations more heavily than technical aspects or economics. This approach is deemed appropriate and does not seem to have distorted the final outcome of the comparison which can be seen in Figure 10.

Scenario			Ranking					
Transport	Route	Crossing	Technical	Economic	Environment	Social	Permitting	Total
Truck	Direct	Causeway	1	5	6	5	6	23
Truck	Narrows	Bridge	4	6	4	1	4	19
CV	Narrows	Bridge	5	4	3	4	3	19
CV	Direct	Causeway	2	1	5	6	5	19
CV	Direct	Ropecon	6	3	1	3	1	14
CV	Direct	Barge	3	2	2	2	2	11

Figure 10. Overall Option Rankings for Ore Transfer

11.0 CONCLUSIONS

1. The trucking scenarios have the lowest CAPEX.
2. The conveyor scenarios have the lowest OPEX.
3. The conveyor options offer the best value on a discounted cash flow basis because higher CAPEX is offset by lower OPEX over the life of the project.
4. The simplest option offering the best value is conveyor haulage across a causeway to the HB mill.
5. Despite the technical and economic benefits of a causeway, environmental, social, and permitting considerations make this form of lake crossing least attractive.
6. When qualitative considerations are taken into account the CV-Barge option is considered best followed by the CV-Ropecon option.

12.0 RECOMMENDATIONS

1. Develop optimized conveyor layouts for the route from Ootsa to HB.
2. Review the capital and operating costs for the CV-Barge and CV-Ropecon scenarios and revise based on recently acquired information.
3. In particular, incorporate updated guidance from Catherwood to better estimate costs related to the CV-Barge scenario.
4. Review all CAPEX and OPEX over the life of the project to develop definitive estimates for each scenario.
5. Consider fully the timing and magnitude of sustaining CAPEX related to the transition of mining between deposits and the relocation of crushing and conveying infrastructure.
6. Review the overall ranking of alternatives following the detailed review to ensure that there hasn't been a fundamental change in the priority for each scenario.

APPENDIX A

TRUCK TECHNICAL DATA

HAULMAX®

3900
Off-Highway Truck

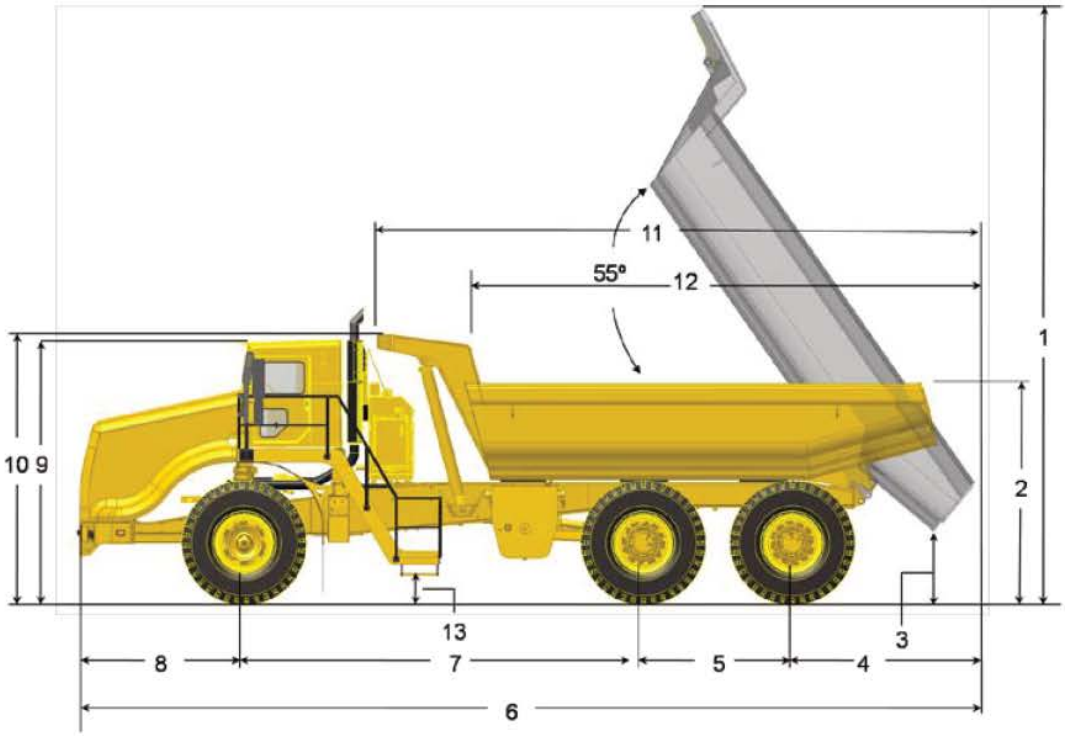
ENGINE

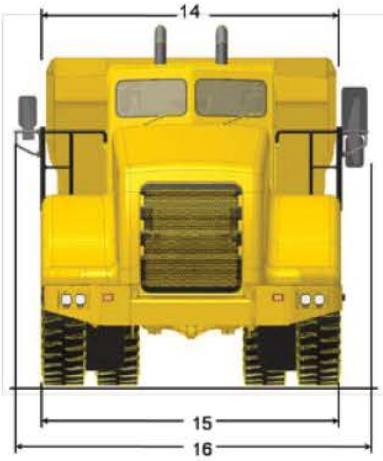
Engine Model Cat®	C27 ACERT™	
Gross Power - SAE **J1995**	**587 kW**	**787 hp**
Net Power - **SAE J1349**	**552 kW**	**740 hp**

WEIGHTS

Rated Payload	77-85 tonne	84-94 tons
Body Capacities	38-90 m³	50-117 yd³
Heaped SAE 2:1		

Dimensions - 38.5 m³



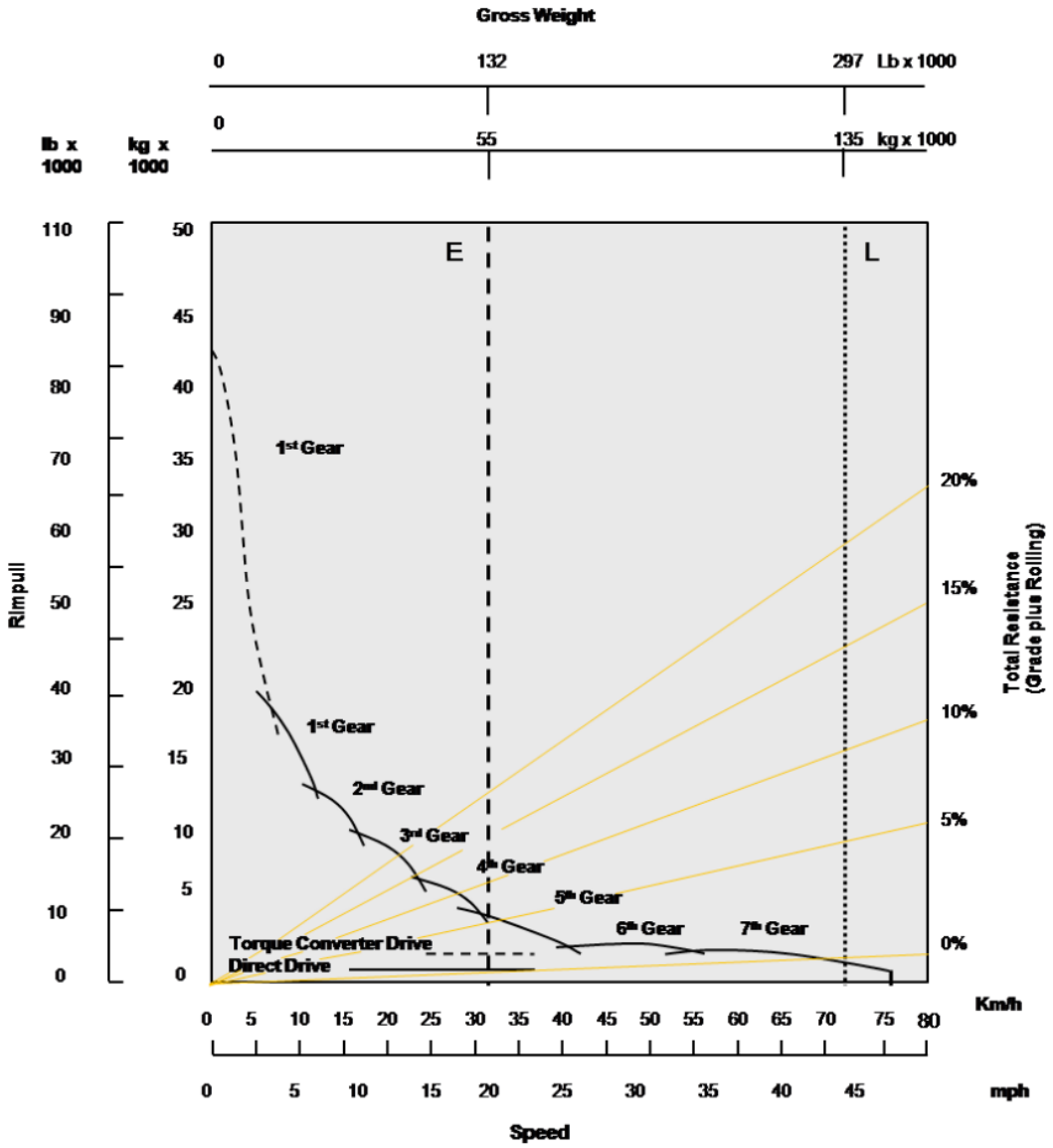


	mm	ft
1	9544	31.3
2	3524	11.6
3	1292	4.2
4	2339	7.7
5	2400	7.9
6	13858	45.5
7	6428	21.1
8	2691	8.8
9	4226	13.9
10	4299	14.1
11	9022	29.5
12	7605	24.9
13	423	12.5
14	3824	13.8
15	3945	12.9
16	4674	15.3

Gradeability/Speed/Rimpull

Read from gross weight down to the percent of total resistance. Total resistance equals actual percent grade plus 1% for each 10 kg/t (20 lb/ton) of rolling resistance. From this weight-resistance point, read horizontally to the curve with the highest obtainable gear, then down to maximum speed. Usable rimpull will depend upon traction available and weight on drive wheels.

E – Typical Field Empty Weight
L – Target Gross Machine Operating Weight 135,000 kg (297,000 lb)



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TYPICAL HIGHWAY DUMP TRUCK & TRAILER COMBINATION

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	Medium Duty
Cab	Aluminum
Hood	Metton® 108" BBC
Sleepers	N/A
Seats	Driver: Peterbilt UltraRide Passenger: Peterbilt UltraRide or 2-Person
Engines	PACCAR PX-9, 260-380 HP PACCAR PX-7, 280-360 HP
Air Cleaner(s)	Under Hood
Exhaust System	Vertical Cab Mounted or Horizontal
Exhaust Guards	Stainless Steel - Vertical
Transmissions	Fuller 6, 9, 10 or 11-Speed Manual Allison 4, 5 or 6-Speed Automatic
Frames	10 5/8", 10 3/4", 11 5/8"
Front Axles	Dana Spicer (12,000 lbs., 13,200 lbs., 14,600 lbs., 20,000 lbs.) Fabco (12,000 lbs., 13,000 lbs., 14,600 lbs. or 16,000 lbs.) Marmon Herrington (12,000 lbs., 14,000 lbs., 16,000 lbs.)
Front Springs	Taper Leaf
Front Hubs	Iron LMS or Aluminum LMS - Non Driving, Iron Front Driving Axle
Front Brakes	Air Cam Drum or Air Disc
Single Rear Axles	Drive Dana Spicer (21,000 lbs., 23,000 lbs., 25,000 lbs., 26,000 lbs., 30,000 lbs.)
Tandem Rear Axles	Dana Spicer (40,000 lbs., 44,000 lbs., 46,000 lbs.) Meritor (40,000 lbs., 44,000 lbs.)
Rear Hubs	Iron LMS, Aluminum LMS or Iron
Rear Brakes	Air Cam Drum or Air Disc
ABS Systems	Bendix 4S4M or 6S6M Air
Single Rear Suspensions	Peterbilt AirTrac (20,000 lbs., 23,000 lbs.) Reyco (23,000 lbs., 26,000 lbs. or 31,000 lbs.)

Peterbilt

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Tandem Rear Suspension	Peterbilt AirTrac Peterbilt Low Air Leaf Hendrickson RT HMX Reyco Chalmers 854
Tires	Bridgestone, Goodyear or Michelin
Wheels	22.5", 24.5" Steel or Aluminum
Quarter Fenders	Black Molded, Stainless Steel
Fifth Wheels	Jost or Holland
Air Dryers	Bendix
Air Tanks	Steel or Aluminum
Chassis Hose	Nylon
Air & Electric Mounting	Optional
Fuel Tanks	Steel 45 Gallon 23" Aluminum 50 - 100 Gallon 26" Aluminum 50 - 90 Gallon
Battery Box	Steel or Aluminum
Tool Box	Optional
Bumpers	Steel Stylized Aerodynamic, Aluminum Swept Back or Aluminum Channel

Please see your local Peterbilt dealer to use Peterbilt PROSPECTOR to specify options on your particular truck.

Peterbilt

APPENDIX B

TRUCKING OPTION PRODUCTION CALCULATIONS

PRODUCTION BASIS FOR TRUCKING VIA THE NARROWS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

LOADER REHANDLE PERFORMANCE

Unit	Bucket	Bulk	Bucket	Number	Load		Load Time	
Model	Capacity	Density	Fill Factor	of Passes	Volume	Tonnage	/pass	Total
CAT	m3	t/lcm	%	qty	lcm	t	min	min
950H	2.9	1.8	90%	4	10.4	18.8	0.5	2.0
966H	3.5	1.8	90%	4	12.6	22.7	0.5	2.0
980H	4.5	1.8	90%	4	16.2	29.2	0.5	2.0
988G	6.5	1.8	90%	4	23.4	42.1	0.5	2.0
990 II	8.5	1.8	90%	4	30.6	55.1	0.5	2.0
992G	11.5	1.8	90%	4	41.4	74.5	0.5	2.0

LOADER-HAULER MATCH

	Bucket	Bulk	Bucket	Number	Load		Target			Load Time	
Loader	Capacity	Density	Fill Factor	of Passes	Volume	Tonnage	Unit	Payload	Fill	/pass	Total
Model	m3	t/lcm	%	qty	lcm	t	Type	t	%	min	min
950H	2.9	1.8	90%	4	10.4	18.8	Dump Trk	20.0	94%	0.5	2.0
966H	3.5	1.8	90%	4	12.6	22.7	Dump Trk	20.0	113%	0.5	2.0
950H	2.9	1.8	90%	8	20.9	37.6	Trk+Trail	40.0	94%	0.5	4.0
966H	3.5	1.8	80%	8	22.4	40.3	Trk+Trail	40.0	101%	0.5	4.0
980H	4.5	1.8	80%	6	21.6	38.9	Trk+Trail	40.0	97%	0.5	3.0
990 II	8.5	1.8	80%	6	40.8	73.4	Haul Max	75.0	98%	0.5	3.0
992G	11.5	1.8	90%	4	41.4	74.5	Haul Max	75.0	99%	0.5	2.0

LOADER REHANDLE PRODUCTIVITY

	Bucket	Bulk	Bucket	Number	Load		Hauler			Load Time		Productivity		
Loader	Capacity	Density	Fill Factor	of Passes	Volume	Tonnage	Unit	Payload	Fill	/pass	Total	Theory	Efficiency	Actual
Model	m3	t/lcm	%	qty	lcm	t	Type	t	%	min	min	t/noh	%	t/goh
966H	3.5	1.8	80%	8	22.4	40.3	Trk+Trail	40.0	101%	0.5	4.0	600	83%	498
966H	3.5	1.8	80%	8	22.4	40.3	Trk+Trail	40.0	101%	0.5	2.0	1,200	83%	996
980H	4.5	1.8	80%	6	21.6	38.9	Trk+Trail	40.0	97%	0.5	3.0	800	83%	664
990 II	8.5	1.8	80%	6	40.8	73.4	Haul Max	75.0	98%	0.5	3.0	1,500	83%	1,245

CYCLE TIME CALCULATION

		Hauler	Average	Haul	Cycle Time					Productivity		
Loader	Hauler	Payload	Speed	Distance	Load	Haul	Dump	Return	Total	Theory	Efficiency	Actual
Model	Model	t	kph	km	min	min	min	min	min	t/noh	%	t/goh
966H x 2	Trk+Trail	40	50	13.8	2.0	16.6	2.0	16.6	37.1	65	83%	54
990 II	Haul Max	75	50	13.8	2.0	16.6	2.0	16.6	37.1	121	83%	101

HAULAGE - OPERATING HOURS & FLEET SIZE

	Hauler	Mill Feed	Productivity			Operating	Annual Op Hrs		Mech	Total
Hauler	Payload	Rate(1)	Theory	Efficiency	Actual	Haulers	/unit	/fleet	Availability	Haulers
Model	t	tph	t/noh	%	t/goh	qty	goh(2)	goh	%	qty
Trk+Trail	40	705	64	83%	54	13.1	5,627	73,464	85%	15.4
Haul Max	75	705	120	83%	101	7.0	5,627	39,278	85%	8.2

(1) 5.6 Mtpa / 331 d/yr / 24 hr/d
(2) 17 hr/d x 331 d/yr (mill operating schedule)

LOADING - OPERATING HOURS & FLEET SIZE

	Bucket	Mill Feed	Productivity			Operating	Annual Op Hrs		Mech	Total
Loader	Capacity	Rate(1)	Theory	Efficiency	Actual	Haulers	/unit	/fleet	Availability	Loaders
Model	m3	tph	t/noh	%	t/goh	qty	goh(2)	goh	%	qty
966H	3.5	705	600	83%	498	1.4	5,627	7,966	85%	1.7
990 II	8.5	705	1,500	83%	1,245	0.6	5,627	3,186	85%	0.7

(1) 5.6 Mtpa / 331 d/yr / 24 hr/d
(2) 17 hr/d x 331 d/yr (mill operating schedule)

PRODUCTION BASIS FOR TRUCKING DIRECT VIA A CAUSEWAY
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

LOADER REHANDLE PERFORMANCE

Unit	Bucket	Bulk	Bucket	Number	Load		Load Time	
Model	Capacity	Density	Fill Factor	of Passes	Volume	Tonnage	/pass	Total
CAT	m3	t/lcm	%	qty	lcm	t	min	min
950H	2.9	1.8	90%	4	10.4	18.8	0.5	2.0
966H	3.5	1.8	90%	4	12.6	22.7	0.5	2.0
980H	4.5	1.8	90%	4	16.2	29.2	0.5	2.0
988G	6.5	1.8	90%	4	23.4	42.1	0.5	2.0
990 II	8.5	1.8	90%	4	30.6	55.1	0.5	2.0
992G	11.5	1.8	90%	4	41.4	74.5	0.5	2.0

LOADER-HAULER MATCH

	Bucket	Bulk	Bucket	Number	Load		Target			Load Time	
Loader	Capacity	Density	Fill Factor	of Passes	Volume	Tonnage	Unit	Payload	Fill	/pass	Total
Model	m3	t/lcm	%	qty	lcm	t	Type	t	%	min	min
950H	2.9	1.8	90%	4	10.4	18.8	Dump Trk	20.0	94%	0.5	2.0
966H	3.5	1.8	90%	4	12.6	22.7	Dump Trk	20.0	113%	0.5	2.0
950H	2.9	1.8	90%	8	20.9	37.6	Trk+Trail	40.0	94%	0.5	4.0
966H	3.5	1.8	80%	8	22.4	40.3	Trk+Trail	40.0	101%	0.5	4.0
980H	4.5	1.8	80%	6	21.6	38.9	Trk+Trail	40.0	97%	0.5	3.0
990 II	8.5	1.8	80%	6	40.8	73.4	Haul Max	75.0	98%	0.5	3.0
992G	11.5	1.8	90%	4	41.4	74.5	Haul Max	75.0	99%	0.5	2.0

LOADER REHANDLE PRODUCTIVITY

	Bucket	Bulk	Bucket	Number	Load		Hauler			Load Time		Productivity		
Loader	Capacity	Density	Fill Factor	of Passes	Volume	Tonnage	Unit	Payload	Fill	/pass	Total	Theory	Efficiency	Actual
Model	m3	t/lcm	%	qty	lcm	t	Type	t	%	min	min	t/noh	%	t/goh
966H	3.5	1.8	80%	8	22.4	40.3	Trk+Trail	40.0	101%	0.5	4.0	600	83%	498
966H	3.5	1.8	80%	8	22.4	40.3	Trk+Trail	40.0	101%	0.5	2.0	1,200	83%	996
980H	4.5	1.8	80%	6	21.6	38.9	Trk+Trail	40.0	97%	0.5	3.0	800	83%	664
990 II	8.5	1.8	80%	6	40.8	73.4	Haul Max	75.0	98%	0.5	3.0	1,500	83%	1,245

CYCLE TIME CALCULATION

		Hauler	Average	Haul	Cycle Time					Productivity		
Loader	Hauler	Payload	Speed	Distance	Load	Haul	Dump	Return	Total	Theory	Efficiency	Actual
Model	Model	t	kph	km	min	min	min	min	min	t/noh	%	t/goh
966H x 2	Trk+Trail	40	50	6.0	2.0	7.2	2.0	7.2	18.4	130	83%	108
990 II	Haul Max	75	50	6.0	2.0	7.2	2.0	7.2	18.4	245	83%	203

HAULAGE - OPERATING HOURS & FLEET SIZE

	Hauler	Mill Feed	Productivity			Operating	Annual Op Hrs		Mech	Total
Hauler	Payload	Rate(1)	Theory	Efficiency	Actual	Haulers	/unit	/fleet	Availability	Haulers
Model	t	tph	t/noh	%	t/goh	qty	goh(2)	goh	%	qty
Trk+Trail	40	705	130	83%	108	6.5	5,627	36,643	85%	7.7
Haul Max	75	705	245	83%	203	3.5	5,627	19,543	85%	4.1

(1) 5.6 Mtpa / 331 d/yr / 24 hr/d
(2) 17 hr/d x 331 d/yr (mill operating schedule)

LOADING - OPERATING HOURS & FLEET SIZE

	Bucket	Mill Feed	Productivity			Operating	Annual Op Hrs		Mech	Total
Loader	Capacity	Rate(1)	Theory	Efficiency	Actual	Loaders	/unit	/fleet	Availability	Loaders
Model	m3	tph	t/noh	%	t/goh	qty	goh(2)	goh	%	qty
966H	3.5	705	600	83%	498	1.4	5,627	7,966	85%	1.7
990 II	8.5	705	1,500	83%	1,245	0.6	5,627	3,186	85%	0.7

(1) 5.6 Mtpa / 331 d/yr / 24 hr/d
(2) 17 hr/d x 331 d/yr (mill operating schedule)

APPENDIX C

EQUIPMENT RATES

MINE EQUIPMENT HOURLY OPERATING COSTS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

UNIT		Pick-Up	Dump Trk	Haul Max	K-Line	Loader	Loader	Loader	Grader	Water/
TYPE		Truck	& Trailer	Truck	Rd Train	966H	980H	990 II	16M	Sand Trk
SPEC	UNITS	1/2 t	20t/20t	75t	200t	3.5 m3	5.0 m3	8.5 m3	300 HP	20t
OP LABOUR										
OP1	$/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OP2	$/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	$/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FUEL										
RATE	L/hr	5	20	40	60	25	30	70	30	15
PRICE	$/L	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
COST	$/hr	5.00	20.00	40.00	60.00	25.00	30.00	70.00	30.00	15.00
LUBE	$/hr	0.10	1.00	1.00	1.00	1.50	1.50	9.00	2.00	1.00
MAINTENANCE										
LABOUR	$/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PARTS	$/hr	2.00	5.00	10.00	10.00	15.00	15.00	60.00	25.00	5.00
UNDERCARRIAGE										
BASE COST	$/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00
IMPACT	%	0	0	0	0	0	0	0	0	0
ABRASION	%	0	0	0	0	0	0	0	0	0
APPLICATION	%	0	0	0	0	0	0	0	0	0
TOTAL	$/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TIRES										
PRICE	$/tire	250	750	5,000	750	5,000	15,000	20,000	7,500	750
TIRES/UNIT	qty	4	20	10	62	4	4	4	6	10
TIRE LIFE	hr	1,000	2,500	2,500	2,500	5,000	5,000	6,000	6,000	4,000
COST	$/hr	1.00	6.00	20.00	18.60	4.00	12.00	13.33	7.50	1.88
GET	$/hr	0.00	0.00	0.00	0.00	10.00	15.00	17.50	5.00	0.00
BITS & STEEL	$/hr									
CONSUMABLES	$/hr	1.00	2.00	2.00	2.00	5.00	7.50	10.00	2.50	2.00
TOTAL	$/hr	9.10	34.00	73.00	91.60	60.50	81.00	179.83	72.00	24.88

APPENDIX D

OPERATING COSTS BY SCENARIO

EQUIPMENT SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
HAULAGE: Dump Truck & Trailer

Unit type	Unit spec	Unit qty	Hrs goh/yr	Rate $/hr	Total $
Loader	966H	2	7,966	60.50	481,943
Grader	16H	1	5,627	72.00	405,144
Truck/Trailer	20t + 20t	16	73,464	34.00	2,497,776
W/S Trk	20t	1	5,627	24.88	139,972
Pick-up	1/2 ton	1	1,000	9.10	9,100
TOTAL					3,533,935

EQUIPMENT SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
HAULAGE: Haul Max

Unit Type	Unit Model/spec	Unit qty	Hrs goh/yr	Rate $/hr	Total $
Loader	990 II	1	3,186	179.83	572,949
Grader	16H	1	5,627	72.00	405,144
Truck	Haul Max 75t	8	39,278	73.00	2,867,294
W/S Trk	20t	1	5,627	24.88	139,972
Pick-up	1/2 ton	1	1,000	9.10	9,100
TOTAL					3,994,459

MANPOWER SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
HAULAGE: Dump Truck & Trailer

	Per Shift	Shifts	Total	Annual	Rate	Wages	Burden	Loaded	Total
Position	qty	qty	qty	hr/yr	$/hr	$/yr	%	$/yr	$/yr
OPERATIONS									
Foreman	1	4	4	2,000	40.00	80,000	30%	104,000	416,000
Loader Op	2	4	8	2,000	35.00	70,000	30%	91,000	728,000
Grader Op	1	4	4	2,000	35.00	70,000	30%	91,000	364,000
Truck Driver	16	4	64	2,000	30.00	60,000	30%	78,000	4,992,000
W/S Truck Driver	2	4	8	2,000	30.00	60,000	30%	78,000	624,000
SUBTOTAL									7,124,000
MAINTENANCE									
HD Mechanic	1	4	4	2,000	40.00	80,000	30%	104,000	416,000
HD Mechanic Helper	1	4	4	2,000	30.00	60,000	30%	78,000	312,000
SUBTOTAL									728,000
TOTAL			96						7,852,000

MANPOWER SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
HAULAGE: Haul Max

	Per Shift	Shifts	Total	Annual	Rate	Wages	Burden	Loaded	Total
Position	qty	qty	qty	hr/yr	$/hr	$/yr	%	$/yr	$/yr
OPERATIONS									
Foreman	1	4	4	2,000	40.00	80,000	30%	104,000	416,000
Loader Op	1	4	4	2,000	35.00	70,000	30%	91,000	364,000
Grader Op	1	4	4	2,000	35.00	70,000	30%	91,000	364,000
Truck Driver	8	4	32	2,000	30.00	60,000	30%	78,000	2,496,000
W/S Truck Driver	2	4	8	2,000	30.00	60,000	30%	78,000	624,000
SUBTOTAL									4,264,000
MAINTENANCE									
HD Mechanic	1	4	4	2,000	40.00	80,000	30%	104,000	416,000
HD Mechanic Helper	1	4	4	2,000	30.00	60,000	30%	78,000	312,000
SUBTOTAL									728,000
TOTAL			60						4,992,000

MISCELLANEOUS OPERATING COST SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
HAULAGE: Dump Truck & Trailer

Cost	Type	Labor $	Rate %	Rate $/km	Distance km	Apps qty	Total $
Overhead	G&A	7,852,000	1%				78,520
Overhead	Mtnce	728,000	5%				36,400
Dust Suppression	CaCl2*			1,012	13.6	2	27,526
TOTAL							142,446

* Calcium Chloride	$220/t	Alibabab
	35% solution	Dow Chemicals guidelines
	1.75 L/m2	Dow Chemicals guidelines
	6,500 L/lane-km	"Lane" = 3.7 m x 1000 m
	13,000 L/km	2-lane road
	4.6 t CaCl2/km	

MISCELLANEOUS OPERATING COST SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
HAULAGE: Haul Max

Cost	Type	Labor $	Rate %	Rate $/km	Distance km	Apps qty	Total $
Overhead	G&A	4,264,000	1%				42,640
Overhead	Mtnce	728,000	5%				36,400
Dust Suppression	CaCl2*			1,012	13.6	2	27,526
TOTAL							106,566

* Calcium Chloride	$220/t	Alibabab
	35% solution	Dow Chemicals guidelines
	1.75 L/m2	Dow Chemicals guidelines
	6,500 L/lane-km	"Lane" = 3.7 m x 1000 m
	13,000 L/km	2-lane road
	4.6 t CaCl2/km	

EQUIPMENT SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
HAULAGE: Dump Truck & Trailer

Unit type	Unit spec	Unit qty	Hrs goh/yr	Rate $/hr	Total $
Loader	966H	2	7,966	60.50	481,943
Grader	16H	1	5,627	72.00	405,144
Truck/Trailer	20t + 20t	16	36,766	34.00	1,250,044
W/S Trk	20t	1	5,627	24.88	139,972
Pick-up	1/2 ton	1	1,000	9.10	9,100
TOTAL					2,286,203

EQUIPMENT SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
HAULAGE: Haul Max

Unit Type	Unit Model/spec	Unit qty	Hrs goh/yr	Rate $/hr	Total $
Loader	990 II	2	3,186	179.83	572,949
Grader	16H	1	5,627	72.00	405,144
Truck	Haul Max 75t	8	19,508	73.00	1,424,084
W/S Trk	20t	1	5,627	24.88	139,972
Pick-up	1/2 ton	1	1,000	9.10	9,100
TOTAL					2,551,249

MANPOWER SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
HAULAGE: Dump Truck & Trailer

	Per Shift	Shifts	Total	Annual	Rate	Wages	Burden	Loaded	Total
Position	qty	qty	qty	hr/yr	$/hr	$/yr	%	$/yr	$/yr
OPERATIONS									
Foreman	1	4	4	2,000	40.00	80,000	30%	104,000	416,000
Loader Op	2	4	8	2,000	35.00	70,000	30%	91,000	728,000
Grader Op	1	4	4	2,000	35.00	70,000	30%	91,000	364,000
Truck Driver	8	4	32	2,000	30.00	60,000	30%	78,000	2,496,000
W/S Truck Driver	2	4	8	2,000	30.00	60,000	30%	78,000	624,000
SUBTOTAL									4,628,000
MAINTENANCE									
HD Mechanic	1	4	4	2,000	40.00	80,000	30%	104,000	416,000
HD Mechanic Helper	1	4	4	2,000	30.00	60,000	30%	78,000	312,000
SUBTOTAL									728,000
TOTAL			64						5,356,000

MANPOWER SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
HAULAGE: Haul Max

	Per Shift	Shifts	Total	Annual	Rate	Wages	Burden	Loaded	Total
Position	qty	qty	qty	hr/yr	$/hr	$/yr	%	$/yr	$/yr
OPERATIONS									
Foreman	1	4	4	2,000	40.00	80,000	30%	104,000	416,000
Loader Op	1	4	4	2,000	35.00	70,000	30%	91,000	364,000
Grader Op	1	4	4	2,000	35.00	70,000	30%	91,000	364,000
Truck Driver	4	4	16	2,000	30.00	60,000	30%	78,000	1,248,000
W/S Truck Driver	2	4	8	2,000	30.00	60,000	30%	78,000	624,000
SUBTOTAL									3,016,000
MAINTENANCE									
HD Mechanic	1	4	4	2,000	40.00	80,000	30%	104,000	416,000
HD Mechanic Helper	1	4	4	2,000	30.00	60,000	30%	78,000	312,000
SUBTOTAL									728,000
TOTAL			44						3,744,000

MISCELLANEOUS OPERATING COST SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
HAULAGE: Dump Truck & Trailer

Cost	Type	Labor $	Rate %	Rate $/km	Distance km	Apps qty	Total $
Overhead	G&A	5,356,000	1%				53,560
Overhead	Mtnce	728,000	5%				36,400
Dust Suppression	CaCl2*			1,012	6.0	2	12,144
TOTAL							102,104

* Calcium Chloride	$220/t	Alibabab
	35% solution	Dow Chemicals guidelines
	1.75 L/m2	Dow Chemicals guidelines
	6,500 L/lane-km	"Lane" = 3.7 m x 1000 m
	13,000 L/km	2-lane road
	4.6 t CaCl2/km	

MISCELLANEOUS OPERATING COST SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
HAULAGE: Haul Max

Cost	Type	Labor $	Rate %	Rate $/km	Distance km	Apps qty	Total $
Overhead	G&A	3,016,000	1%				30,160
Overhead	Mtnce	728,000	5%				36,400
Dust Suppression	CaCl2*			1,012	6.0	2	12,144
TOTAL							78,704

* Calcium Chloride	$220/t	Alibabab
	35% solution	Dow Chemicals guidelines
	1.75 L/m2	Dow Chemicals guidelines
	6,500 L/lane-km	"Lane" = 3.7 m x 1000 m
	13,000 L/km	2-lane road
	4.6 t CaCl2/km	

MISCELLANEOUS OPERATING COST SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV via NARROWS
HAULAGE: CV

Cost	Type	Units qty	Rate $/hr	Hrs goh/unit	Rate $/t	Tonnage	Rate %	CAPEX	Total $
Pick-up Truck		1	10.00	1,000					10,000
Conveyor		1			0.10	5,600,000			560,000
CV Maintenance							3.4	22,080,000	750,720
TOTAL									1,320,720

MANPOWER SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV via NARROWS
HAULAGE: CV

Position	Per Shift qty	Shifts qty	Total qty	Annual hr/yr	Rate $/hr	Wages $/yr	Burden %	Loaded $/yr	Total $/yr
OPERATIONS									
Foreman	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Laborers	2	4	8	2,000	20.00	40,000	30%	52,000	416,000
SUBTOTAL									624,000
MAINTENANCE									
Millwright	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Millwright Helper	1	2	2	2,000	30.00	60,000	30%	78,000	156,000
SUBTOTAL									364,000
TOTAL			14						988,000

MISCELLANEOUS OPERATING COST SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV via CAUSEWAY
HAULAGE: CV

Cost	Type	Units qty	Rate $/hr	Hrs goh/unit	Rate $/t	Tonnage	Rate %	CAPEX $	Total $
Pick-up Truck		1	10.00	1,000					10,000
Conveyor		1			0.10	5,600,000			560,000
CV Maintenance							3.4	9,600,000	326,400
TOTAL									896,400

MANPOWER SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV via CAUSEWAY
HAULAGE: CV

Position	Per Shift qty	Shifts qty	Total qty	Annual hr/yr	Rate $/hr	Wages $/yr	Burden %	Loaded $/yr	Total $/yr
OPERATIONS									
Foreman	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Laborers	2	4	8	2,000	20.00	40,000	30%	52,000	416,000
SUBTOTAL									624,000
MAINTENANCE									
Millwright	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Millwright Helper	1	2	2	2,000	30.00	60,000	30%	78,000	156,000
SUBTOTAL									364,000
TOTAL			14						988,000

MISCELLANEOUS OPERATING COST SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV + Barge
HAULAGE: CV

Cost	Type	Units qty	Rate $/hr	Hrs goh/unit	Rate $/t	Tonnage	Rate %	CAPEX $	Total $/yr
Tugboat		1	50.00	750					37,500
Pick-up Truck		1	10.00	1,000					10,000
Conveyor		1			0.10	5,600,000			560,000
CV Maintenance							3.4	8,320,000	282,880
TOTAL									890,380

MANPOWER SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV + Barge
HAULAGE: CV

Position	Per Shift qty	Shifts qty	Total qty	Annual hr/yr	Rate $/hr	Wages $/yr	Burden %	Loaded $/yr	Total $/yr
OPERATIONS									
Foreman	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Load Op	1	4	4	2,000	25.00	50,000	30%	65,000	260,000
Unload Op	1	4	4	2,000	25.00	50,000	30%	65,000	260,000
Tugboat Op	1	4	4	2,000	25.00	50,000	30%	65,000	260,000
Laborers	2	4	8	2,000	20.00	40,000	30%	52,000	416,000
SUBTOTAL									1,404,000
MAINTENANCE									
Millwright	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Millwright Apprentice	1	2	2	2,000	30.00	60,000	30%	78,000	156,000
SUBTOTAL									364,000
TOTAL			26						1,768,000

MISCELLANEOUS OPERATING COST SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV + Suspension Bridge
HAULAGE: CV

Cost	Type	Units qty	Rate $/hr	Hrs goh/unit	Rate $/t	Tonnage	Rate %	CAPEX $	Total $
Pick-up Truck		1	10.00	1,000					10,000
Conveyor		1			0.10	5,600,000			560,000
CV Maintenance							3.4	9,600,000	326,400
TOTAL									896,400

MANPOWER SCHEDULE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV + Suspension Bridge
HAULAGE: CV

Position	Per Shift qty	Shifts qty	Total qty	Annual hr/yr	Rate $/hr	Wages $/yr	Burden %	Loaded $/yr	Total $/yr
OPERATIONS									
Foreman	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Laborers	2	4	8	2,000	20.00	40,000	30%	52,000	416,000
SUBTOTAL									624,000
MAINTENANCE									
Millwright	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Millwright Helper	1	2	2	2,000	30.00	60,000	30%	78,000	156,000
SUBTOTAL									364,000
TOTAL			14						988,000

APPENDIX E

CAPITAL COSTS BY SCENARIO

CAPITAL COST ESTIMATE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
MATERIAL: Whole Ore
HAULAGE: Truck-Trailer

		Price				Cost
Item	Qty	$/unit	Units	Value	Units	$
Major Bridge	1	30,000	m	200	m	6,000,000
Road	1	40,000	km	13.6	km	544,000
Minor Bridge	15	10,000	m	20	m	3,000,000
Truck-Trailer	16	250,000	ea			4,000,000
Loader	2	350,000	ea			700,000
Grader	1	700,000	ea			700,000
S/W Truck	1	200,000	ea			200,000
Pick-up	1	50,000	ea			50,000
Shop/Office	1	50,000	ea			50,000
Tools	1	50,000	ea			50,000
TOTAL						15,294,000

CAPITAL COST ESTIMATE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
MATERIAL: Whole Ore
HAULAGE: Haul Max

		Price				Cost
Item	Qty	$/unit	Units	Value	Units	$
Major Bridge	1	30,000	m	200	m	6,000,000
Road	1	40,000	km	13.6	km	544,000
Minor Bridge	15	10,000	m	20	m	3,000,000
Truck	8	1,500,000	ea			12,000,000
Loader	1	1,500,000	ea			1,500,000
Grader	1	700,000	ea			700,000
S/W Truck	1	200,000	ea			200,000
Pick-up	1	50,000	ea			50,000
Shop/Office	1	50,000	ea			50,000
Tools	1	50,000	ea			50,000
TOTAL						24,094,000

CAPITAL COST ESTIMATE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
MATERIAL: Whole Ore
HAULAGE: Truck-Trailer

		Price				Cost
Item	Qty	$/unit	Units	Value	Units	$
Overhaul	1	150	hr	8,318	hr	1,247,700
Causeway Bridge	1	30,000	m	60	m	1,800,000
Road	1	40,000	km	5.2	km	208,000
Minor Bridge	2	10,000	m	20	m	400,000
Truck-Trailer	8	250,000	ea			2,000,000
Loader	2	350,000	ea			700,000
Grader	1	700,000	ea			700,000
S/W Truck	1	200,000	ea			200,000
Pick-up	1	50,000	ea			50,000
Shop/Office	1	50,000	ea			50,000
Tools	1	50,000	ea			50,000
TOTAL						7,405,700

CAPITAL COST ESTIMATE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
MATERIAL: Whole Ore
HAULAGE: Haul Max

		Price				Cost
Item	Qty	$/unit	Units	Value	Units	$
Overhaul	1	150	hr	8,318	hr	1,247,700
Causeway Bridge	1	30,000	m	60	m	1,800,000
Road	1	40,000	km	5.2	km	208,000
Minor Bridge	2	10,000	m	20	m	400,000
Truck	4	1,500,000	ea			6,000,000
Loader	1	1,500,000	ea			1,500,000
Grader	1	700,000	ea			700,000
S/W Truck	1	200,000	ea			200,000
Pick-up	1	50,000	ea			50,000
Shop/Office	1	50,000	ea			50,000
Tools	1	50,000	ea			50,000
TOTAL						12,205,700

CAPITAL COST ESTIMATE						
ORE TRANSFER TRADE-OFF STUDY						
OOTSA PROJECT						
SCENARIO:	Long CV + Short Bridge					
MATERIAL:	Crushed Ore					
HAULAGE:	CV					
		Price				Cost
Item	Qty	$/unit	Units	Value	Units	$
Major Bridge	1	30,000	m	200	m	6,000,000
Road	1	20,000	km	13.6	km	272,000
Minor Bridge	15	10,000	m	20	m	3,000,000
						0
						0
Powerline	1	300,000	km	6.0	km	1,800,000
Crusher Relocation	1	4,000,000	ea			4,000,000
Overland Conveyor	1	1,600,000	km	13.8	km	22,080,000
TOTAL						37,152,000

CAPITAL COST ESTIMATE						
ORE TRANSFER TRADE-OFF STUDY						
OOTSA PROJECT						
SCENARIO:	Short CV + Causeway					
MATERIAL:	Crushed Ore					
HAULAGE:	CV					
		Price				Cost
Item	Qty	Value	Units	Value	Units	$
Causeway						
Overhaul	1	150	$/hr	8,318	hr	1,247,700
Causeway Bridge	1	20,000	$/m	60	m	1,200,000
Road	1	20,000	$/km	6.0	km	120,000
Minor Bridge	2	10,000	$/m	20	m	400,000
Powerline	1	300,000	km	6.0	km	1,800,000
Crusher Relocation	1	4,000,000	ea			4,000,000
Overland Conveyor	1	1,600,000	km	6.0	km	9,600,000
TOTAL						18,367,700

CAPITAL COST ESTIMATE
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV + Barge
MATERIAL: Crushed Ore
HAULAGE: CV

		Price				Cost
Item	Qty	$/unit	Units	Value	Units	$
Barge	2	2,500,000	ea			5,000,000
Tugboat	1	1,000,000	ea			1,000,000
Dock	2	250,000	ea			500,000
Tripper	1	500,000	ea			500,000
						0
Powerline	1	300,000	km	6.0	km	1,800,000
Road	1	20,000	km	5.2	km	104,000
Crusher Relocation	1	4,000,000	ea			4,000,000
Overland Conveyor	1	1,600,000	km	5.2	km	8,320,000
TOTAL						21,224,000

CAPITAL COST ESTIMATE						
ORE TRANSFER TRADE-OFF STUDY						
OOTSA PROJECT						
SCENARIO:	CV + Suspension Bridge					
MATERIAL:	Crushed Ore					
HAULAGE:	CV					
		Price				Cost
Item	Qty	Value	Units	Value	Units	$
Suspension Bridge	1	5,000	$/m	800	m	13,140,000
Road	1	20,000	$/km	5.2	km	104,000
Minor Bridge	2	10,000	$/m	20	m	400,000
Powerline	1	300,000	km	6.0	km	1,800,000
Crusher Relocation	1	4,000,000	ea			4,000,000
Overland Conveyor	1	1,600,000	km	6.0	km	9,600,000
TOTAL						29,044,000

APPENDIX F

DISCOUNTED CASH FLOW ANALYSIS

DISCOUNTED CASH FLOW ANALYSIS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long Rd - Short Bridge
MATERIAL: Whole Ore

		OPEX ($ M/yr)				CAPEX ($ M)				Mill Feed	Mine Life	Distance	COST		NPC $ M
Haulage	Operator	Fleet	Labor	Other	Total	Fleet	Roads	Facilities	Total	Mt	Yrs	km	$/t ore	$/t-km	5%
Truck-Trailer	Owner	3.92	7.85	0.14	11.91	5.65	9.54	0.10	15.29	67.0	12.0	13.8	2.13	0.15	115.1
Haul Max	Owner	4.40	4.99	0.14	9.53	14.45	9.54	0.10	24.09	67.0	12.0	13.8	1.71	0.12	103.4
Truck-Trailer	Contract	4.78	8.64	2.87	16.29	0.00	9.54	0.00	9.54	67.0	12.0	13.8	2.92	0.21	143.7

Yr	Operator	-1	1	2	3	4	5	6	7	8	9	10	11	12	Total
Truck-Trailer	Owner	15.29	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	11.91	158.21
Haul Max	Owner	24.09	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	138.45
Truck-Trailer	Contract	6.54	16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29	201.97

DISCOUNTED CASH FLOW ANALYSIS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short Rd - Causeway
MATERIAL: Whole Ore

		OPEX ($ M/yr)				CAPEX ($ M)				Mill Feed	Mine Life	Distance	COST		NPC $ M
Haulage	Operator	Fleet	Labor	Other	Total	Fleet	Roads	Facilities	Total	Mt	Yrs	km	$/t ore	$/t-km	5%
Truck-Trailer	Owner	2.29	4.63	0.10	7.02	3.65	3.66	0.10	7.41	67.0	12.0	6.0	1.26	0.21	66.3
Haul Max	Owner	2.55	3.74	0.08	6.37	8.45	3.66	0.10	12.21	67.0	12.0	6.0	1.14	0.19	65.4
Truck-Trailer	Contract	2.82	5.09	1.72	9.63	0.00	3.66	0.00	3.66	67.0	12.0	6.0	1.72	0.29	84.7

Yr	Operator	-1	1	2	3	4	5	6	7	8	9	10	11	12	Total
Truck-Trailer	Owner	7.41	7.02	7.02	7.02	7.02	7.02	7.02	7.02	7.02	7.02	7.02	7.02	7.02	91.60
Haul Max	Owner	12.21	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	88.69
Truck-Trailer	Contract	3.66	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	119.17

DISCOUNTED CASH FLOW ANALYSIS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Long CV + Short Bridge
MATERIAL: Crushed Ore

		OPEX ($ M/yr)				CAPEX ($ M)				Mill Feed	Mine Life	Distance	COST		NPC $ M
Haulage	Operator	CV	Labor	Other	Total	CV	Road	Facilities	Total	Mt	Yrs	km	$/t ore	$/t-km	5%
CV via Narrows	Owner	1.31	0.99	0.01	2.31	22.08	9.27	5.80	37.15	67.0	12.0	13.8	0.41	0.03	54.9
					0.00				0.00						0.0
					0.00				0.00						0.0

Yr	Operator	-1	1	2	3	4	5	6	7	8	9	10	11	12	Total
CV via Narrows	Owner	37.15	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	64.87
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DISCOUNTED CASH FLOW ANALYSIS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: Short CV + Causeway
MATERIAL: Crushed Ore

		OPEX ($ M/yr)				CAPEX ($ M)				Mill Feed	Mine Life	Distance	COST		NPC $ M
Haulage	Operator	CV	Labor	Other	Total	CV	Inf	Facilities	Total	Mt	Yrs	km	$/t ore	$/t-km	5%
CV via Causeway	Owner	0.89	0.99	0.01	1.89	9.60	2.97	5.80	18.37	67.0	12.0	6.0	0.34	0.06	33.4
					0.00				0.00						0.0
					0.00				0.00						0.0

Yr	Operator	-1	1	2	3	4	5	6	7	8	9	10	11	12	Total
CV via Causeway	Owner	18.37	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	41.05
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DISCOUNTED CASH FLOW ANALYSIS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV + Barge
MATERIAL: Crushed Ore

		OPEX ($ M/yr)				CAPEX ($ M)				Mill Feed	Mine Life	Distance	COST		NPC $ M
Haulage	Operator	CV	Labor	Other	Total	CV	Barge	Facilities	Total	Mt	Yrs	km	$/t ore	$/t-km	5%
CV + Barge	Owner	0.84	1.77	0.05	2.66	8.32	7.00	5.90	21.22	67.0	12.0	5.2	0.48	0.09	42.7
					0.00				0.00	67.0	12.0	5.2	0.00	0.00	0.0
					0.00				0.00	67.0	12.0	5.2	0.00	0.00	0.0

Yr	Operator	-1	1	2	3	4	5	6	7	8	9	10	11	12	Total
CV + Barge	Owner	21.22	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	53.14
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DISCOUNTED CASH FLOW ANALYSIS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

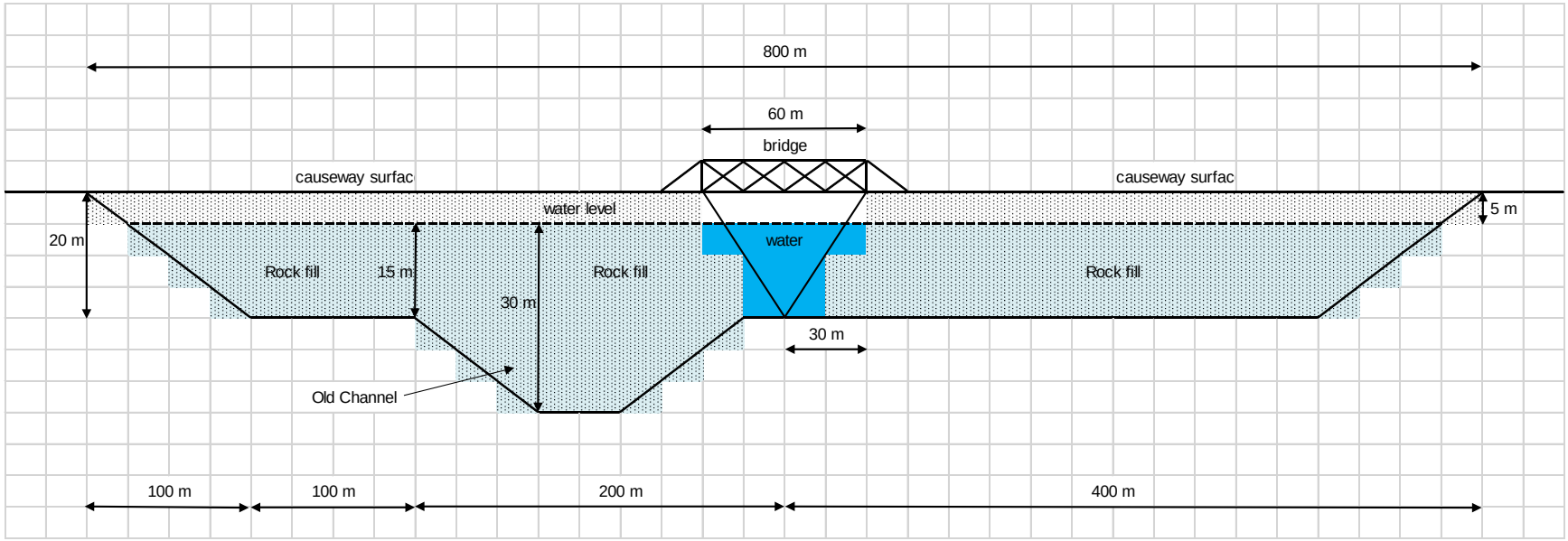
SCENARIO: Short CV + Suspension Bridge
MATERIAL: Crushed Ore

		OPEX ($ M/yr)				CAPEX ($ M)				Mill Feed	Mine Life	Distance	COST		NPC $ M
Haulage	Operator	CV	Labor	Other	Total	CV	Inf	Facilities	Total	Mt	Yrs	km	$/t ore	$/t-km	5%
CV via Suspension	Owner	0.89	0.99	0.01	1.88	9.60	13.64	5.80	29.04	67.0	12.0	6.0	0.34	0.06	43.6
Bridge					0.00				0.00						0.0
					0.00				0.00						0.0

Yr	Operator	-1	1	2	3	4	5	6	7	8	9	10	11	12	Total
CV via Suspension	Owner	29.04	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	51.66
Bridge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX G

CAUSEWAY CONFIGURATION



CAUSEWAY CONFIGURATION – LONG SECTION

APPENDIX H

ROPECON QUOTE

Doppelmayr Transport Technology GmbH
Holzriedstraße 29
6922 Wolfurt / Austria
T +43 5574 604
F +43 5574 604 1209

dtt@doppelmayr.com
www.doppelmayr-mts.com

Gold Reach Resources Ltd.
Attn. Mr. Peter Carter
888-700 West Georgia Street
Vancouver BC V7Y 1G5

CANADA

Our reference: MAD/KHN
Extension: 1216

Wolfurt 2015-11-06

Dear Mr. Carter

We thank you for your inquiry and are pleased to submit to you a price estimate for a RopeCon® system based on the information received from you.

PRICE ESTIMATE NO:	**KHN-150008-01**
PROJECT:	**OOTSA COPPER-MOLYBDENUM**
PROJECT NO.:	**VC-ID 1827**
SYSTEM:	**ROPECON SYSTEM**
COUNTRY:	**CANADA**

TECHNICAL DATA

Material	Crushed rock	
Location of drive unit	Unloading	
Horizontal length	1,750	m
Vertical rise	34	m
Hourly capacity	700	t/h
Max. lump size	300	mm
Bulk density	1.80 – 1.80	t/m³
Continuous operating speed	0.0 – 3.3	m/sec
Belt width	800	mm
Belt utilization width	1,400	mm
Side wall height	200	mm
Power required, continuously	152	kW

SCOPE OF DELIVERY

Survey	not included
Civil works incl. rock anchors, piling and grouting material	not included
Engineering parameters and applicable forces for foundations	included
Anchor bolts and templates for towers and terminals	included
Tower shafts, ladders and platforms	included
Tower heads	included
Steel structure for RopeCon equipment in terminal	included
Terminal buildings including enclosure, if necessary	not included
Drive machinery including electric motor and gearbox	included
Mechanical brake unit	included
Hydraulic tension unit	included
Track ropes	included
Steel cord belt with corrugated side walls	included
Axles including wheels	included
Track rope frames	included
Belt turning device	included
Platforms, handrails in terminals, if necessary	included
Roof cover for loaded bel	included
Loading chute (lower part, spoon)	included
Unloading chute (upper part, head)	included
Main bin and feeding system to and from the RopeCon	not included
Anemometer	included
Electric controls	included
Dedusting unit	not included

Wiring material up main switch	included
Earthing equipment	not included
Inspection and service carrier	included
Service tools	included
Parts for commissioning	included
Packing	included
Transport and insurance	not included
Construction approvals and work permits	not included
Customs clearance, duties, taxes, VAT, etc.	not included
Supervision of the installation work	included
Crane and truck work	not included
Vulcanization of belt sections	included
Technical assistance	included
Training of operating personnel (30 days)	included

PRICE ESTIMATE

- Equipment RopeCon
- Packaging of equipment
- Supervision of installation work

Total price FCA Wolfurt, Austria **EUR 9,590,000.00**

PRICE CONDITIONS

All prices stated above are net prices in Euro (EUR), FCA Wolfurt, Austria (Incoterms 2010) for delivery in 2016. Prices are based on the information received from you. Final prices can only be determined after receipt of the final survey.

Validity of offer:	30	calendar days
Delivery (ex works):	6 - 14	months after receipt of L/C, down payment and clarification of technical and commercial details.
Total expected time frame:	20 - 22	months after order.

We hope our proposal meets your expectations. Should you require any further or more detailed information, please do not hesitate to contact us any time.

Yours sincerely,

Doppelmayr Transport Technology GmbH

i.A.

Nafiseh Khodadadi
Sales & Project Engineer

ppa.

Dietmar Mazagg
Sales Director

Encs.:
Longitudinal profile
General Terms of Delivery of the Austrian Association for the Machine-Building and Steel Construction Industry

APPENDIX XVII. ADDENDUM TO MILL FEED TRANSFER TRADE-OFF STUDY FLOATING CONVEYOR EVALUATION

FLOATING CONVEYOR EVALUATION

BY PETER CARTER, BSc, MBA, P.Eng.
FOR GOLD REACH RESOURCES, November 20, 2015

1.0 SUMMARY

Floating conveyors were examined as an option for transporting ore across Tahtsa Reach after completion of the trade-off study. Based on information from a manufacturer in Illinois, the approach appeared practical. Capital cost for the option was estimated at $17.2 M compared to $18.4 M for a conveyor across a causeway. Operating cost was slightly higher than the causeway option resulting in a similar net present cost of $33.5 M. From an environmental, social, and permitting perspective the floating conveyor option is considered more desirable than the causeway and is therefore recommended as the basis for the ore transfer plan for the Ootsa PEA.

2.0 INTRODUCTION

The Ootsa ore transfer trade-off study concluded that an overland conveyor crossing the lake via a rockfill causeway was the most economic and technically simple way to transport ore mined at Ootsa to the Huckleberry mill. This alternative was not, however, judged to be most desirable due to environmental impact, public perception, and permitting challenges. Overland conveying using barges or a suspension bridge above the lake were considered more desirable despite their higher cost.

The decision was to adopt the causeway concept and continue to look for alternatives which minimized cost while limiting environmental, social, and permitting drawbacks. Floating conveyors were investigated and found to offer a viable solution.

3.0 SCENARIO DESCRIPTION

Floating conveyors are typically used to support dredging or aggregate loading and unloading operations in Europe and North America. TCI Manufacturing of Illinois, USA, is engaged in the design and manufacture of bulk materials handling systems for the aggregate industry. They offer self-contained, floating conveyor units which can be linked together to create a modular floating system with capacities up to 1,000 tph.

Each unit is composed of a single-flight, 40” (1,000 mm) wide, 200 ft (65 m) long belt driven by a separate 480 volt, 30 HP electric motor. A belt-tensioner is designed into each unit to take up slack. Three pairs of pontoons are attached to the superstructure supporting the conveyor. A walkway is mounted on one side of the conveyor to allow for access and maintenance.

An 800 m crossing as envisioned in the trade-off study would require about 13 units. The floating conveyor units would rise and fall with changes in the level of the reservoir. Hinge structures at each shore would allow the overland conveyor to feed and unload the floating system despite changes in lake level.

A bridge structure would be made on the Ootsa shore to permit small boats to pass under the end of the overland conveyor before it discharges onto the first floating unit. As the floating conveyors are modular, a spare unit can be used to allow for maintenance or to permit a large vessel such as a tug and barge to pass.

The conveyors would be covered to prevent dusting and the accumulation of snow and ice on the belts. The design allows for motors and drives to be enclosed and heated during winter. A bubble system would keep the surrounding water clear of ice during freezing conditions.

4.0 ECONOMIC ANALYSIS

Each floating conveyor unit is priced at US$156,000 ex works or approximately C$184,000 at forecast exchange rates. Based on guidance from the manufacturer, shipping and assembly would each add an additional 10% making the installed cost for a unit about C$220,000.

The floating part of the conveyor system is about twice as expensive as the overland portion, C$3,400/m versus C$1,600/m. However, the extra cost for the floating system is about the same as the additional cost to haul rock from the Seel E pre-strip to build the causeway so that capital cost for both options is similar.

The estimated capital cost for floating conveyor system based on the trade-off study parameters is C$17.2 M. Annual operating cost is estimated at C$2.03 M, slightly higher than that for the conveyor-causeway scenario. Net present cost (NPC) discounted at 5% over the 12 year mine life used in the trade-off study is C$33.5 M. The operating cost is estimated at $0.36/t or $0.06/t-km.

Figure 1 shows how the Floating Conveyor scenario compares to the other conveyor options on an economic basis. It can be seen that a scenario employing floating conveyors has the lowest capital cost. Operating costs are slightly higher than those for the causeway due to additional maintenance and operation of the bubble system.

Scenario			OPEX		CAPEX	NPC
Transport	Route	Crossing	$/t ore	$/t-km	$ M	$ M
CV	Narrows	Bridge	0.41	0.03	37.2	54.9
CV	Direct	Ropecon	0.34	0.06	29.0	43.6
CV	Direct	Barge	0.48	0.06	21.2	42.7
CV	Direct	Floating CV	0.36	0.06	17.2	33.5
CV	Direct	Causeway	0.34	0.06	18.4	33.4

Figure 1. Comparison of Ore Transfer Economics for Conveyor Scenarios

5.0 RANKING

The Floating Conveyor scenario was ranked on the basis of technical, economic, environmental, social, permitting merit in order to compare its desirability to other options. Figure 2 shows how the Floating Conveyor scenario was ranked relative to the alternatives.

Technically, the floating conveyor units are more complex than the causeway but less so than a barge system, a suspended conveyor, or a conventional bridge. As discussed above, the Floating Conveyor scenario has among the lowest capital and operating costs of all the conveyor options.

The Floating Conveyor scenario has transient environmental impact in terms of disturbance of the lake and aesthetics which is eliminated once operations cease. This comparable to the barge scenario, however, no dock facilities would need to be constructed.

From a social perspective it is believed that the use of floating conveyors would be seen as a good compromise between cost and impact that would enable jobs to be sustained with minimal effect on the environment. The floating conveyor approach does nothing, however, to create additional employment.

In terms of permitting, it is believed that by mitigating most of the impacts associated with the other alternatives, it is second best after the suspended conveyor option. Navigable waterway issues will have to be address, however, as noted earlier it should be possible to manage these through design and operating procedures which add little cost to the project.

Scenario			Ranking					
Transport	Route	Crossing	Technical	Economic	Environment	Social	Permitting	Total
Truck	Direct	Causeway	1	6	7	6	7	27
Truck	Narrows	Bridge	4	7	5	1	5	22
CV	Narrows	Bridge	5	5	4	5	4	23
CV	Direct	Causeway	2	1	6	7	6	22
CV	Direct	Ropecon	6	4	1	4	1	16
CV	Direct	Barge	3	3	3	2	3	14
CV	Direct	Floating CV	3	2	2	3	2	12

Figure 2. Overall Ranking of Conveyor Options

6.0 CONCLUSIONS

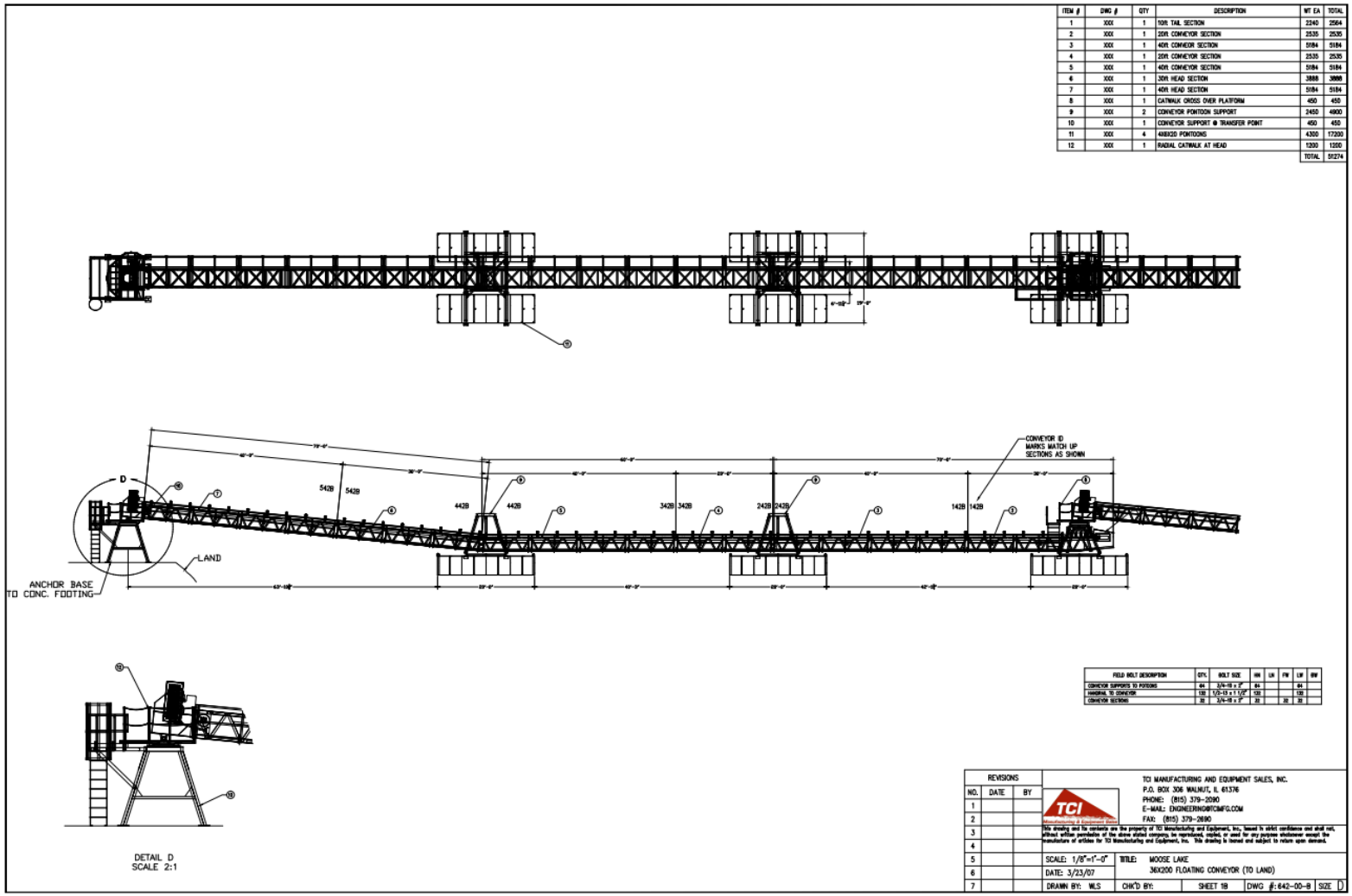
- The Floating Conveyor option is a practical alternative to transport ore across Tahtsa Reach.
- The Floating Conveyor option has the lowest capital cost of all the ore transport options considered.
- The Floating Conveyor option has among the lowest operating cost of any of the ore transport scenarios.
- The Floating conveyor option has economics and technical simplicity nearing that of the causeway without the negative environmental, social, and permitting aspects making it most desirable.
- Further investigation will be required to establish issues related to winter operation and navigable waterways.

7.0 RECOMMENDATIONS

- Adopt the Floating Conveyor option the way to transport ore across Tahtsa Reach for the purpose of the PEA.
- Investigate further design and operating issues related to winter operation and navigable waterways.

APPENDIX A

PHOTOGRAPHS AND DRAWINGS



Floating Conveyor Unit Schematic Diagram

Floating Conveyors in Operation

Floating Conveyor Shore Connection and Anchor

Floating Conveyor Pontoon Arrangement

APPENDIX B

CAPITAL COST ESTIMATE

CAPITAL COST ESTIMATE						
ORE TRANSFER TRADE-OFF STUDY						
OOTSA PROJECT						
SCENARIO:	CV + Floating CV					
MATERIAL:	Crushed Ore					
HAULAGE:	CV					
		Price				Cost
Item	Qty	Value	Units	Value	Units	$
Floating CV	1	3,400,000	km	800	m	2,880,000
Road	1	20,000	$/km	5.2	km	104,000
Bubble System	1			100,000		100,000
Powerline	1	300,000	km	6.0	km	1,800,000
Crusher Relocation	1	4,000,000	ea			4,000,000
Overland Conveyor	1	1,600,000	km	5.2	km	8,320,000
TOTAL						17,204,000

APPENDIX C

TCI FLOATING CONVEYOR QUOTATION

TCI Manufacturing & Equipment Sales, Inc.
P.O. Box 306 28524 1250 E St.
Walnut, IL 61376
Ph. 815/379-2090 Fax 815/379-2690

Screening Equipment, Conveyors, Feeders, Custom Fabrication

SOLD TO:	Gold Reach Resources 888-700 West Georgia St. Vancouver BC Canada V7YIG5	DATE: QUOTE #: TERMS:	11/18/15 9953 25% down w/ P.O. Balance on/before shipment

QTY	DESCRIPTION	*Page 1*
1	**TCI 42" x 200' Floating Transfer Conveyor**	

To include the following:
Drive Arrangement – Head drive with a manual take-up and snub
Main Frame - 36" deep truss design
Walkway – From 24" Gripstrut and handrails from square tube (on one side only)
Chord Angles - 3" x 5"
Lattice Angles – 2" x 2"
Gear Reducer - Dodge size # 5TA II
Motor – 30 HP, 230/460 V, 3 Ph., 1800 RPM, Nema Premium Efficiency
Belt Speed - 350 FPM
Capacity – 800 TPH of 90#/cu. ft. material @ 10ft./3° incline
Backstop - Included
Head Pulley - 18" x 44" with 3/8" herringbone lagging
Tail Pulley - 16" x 44" self-cleaning wing-type
Snub Pulley – 14" x 44" with 1/4" smooth lagging
Head Bearings - Dodge 4 7/16" S2000
Tail Bearings - Dodge 3 15/16" S2000
Snub Bearings - Dodge 2 15/16" SCM
Head Shaft – 4-7/16" turned, ground, and polished
Tail Shaft – 3-15/16" turned, ground, and polished
Bend Shaft – 2-15/16" turned, ground, and polished
Take-Ups – 36" screw-type
Loading Area Idlers – CEMA C 5" troughing idlers on 1' centers
Troughing Idlers - CEMA C 5" on 4' centers
Return Idlers - CEMA C 5" on 10' centers with return roller guards
Belting – 3-ply 330, 1/4" x 1/16", Grade 2, skived
Primary Belt Cleaner - Martin "Pit Viper"
Receiving Hopper – 1/4" plate, 5' long w/adjustable rubber flashing
Pontoons – 2 at each location (3 locations total), 5' dia. x 20' long ea., sand-blasted and painted Coal Tar Black
E-Stops - Along the walkway side
Head End Turn- Style - Included
Guarding - Tail pulley, V-belt drive, all pinch points
Supports – Included on pontoons as well as one land support
Conveyor Covers- 22ga. galvanized
Head Discharge Box – From 1/4" plate with 3/8" AR400 liners and wrap around walkway
Paint and Primer - 1 coat primer, 1 coat finish enamel – TCI Grey Metallic with guarding and handrails Safety Yellow

PRICE FOB WALNUT, IL: $ 158,374.00

APPENDIX D

OPERATING COST ESTIMATE

MISCELLANEOUS OPERATING COST SCHEDULE									
ORE TRANSFER TRADE-OFF STUDY									
OOTSA PROJECT									
SCENARIO:	CV + Flaoting CV								
HAULAGE:	CV								
		Units	Rate	Hrs	Rate	Tonnage	Rate	CAPEX	Total
Cost	Type	qty	$/hr	goh/unit	$/t		%	$	$
Pick-up Truck		1	10.00	1,000					10,000
Bubble System		1	30.00	3,000					90,000
Conveyor		1			0.10	5,600,000			560,000
CV Maintenance							3.4	11,200,000	380,800
TOTAL									1,040,800

MANPOWER SCHEDULE									
ORE TRANSFER TRADE-OFF STUDY									
OOTSA PROJECT									
SCENARIO:	CV + Floating CV								
HAULAGE:	CV								
	Per Shift	Shifts	Total	Annual	Rate	Wages	Burden	Loaded	Total
Position	qty	qty	qty	hr/yr	$/hr	$/yr	%	$/yr	$/yr
OPERATIONS									
Foreman	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Laborers	2	4	8	2,000	20.00	40,000	30%	52,000	416,000
SUBTOTAL									624,000
MAINTENANCE									
Millwright	1	2	2	2,000	40.00	80,000	30%	104,000	208,000
Millwright Helper	1	2	2	2,000	30.00	60,000	30%	78,000	156,000
SUBTOTAL									364,000
TOTAL			14						988,000

APPENDIX E

CASH FLOW ANALYSIS

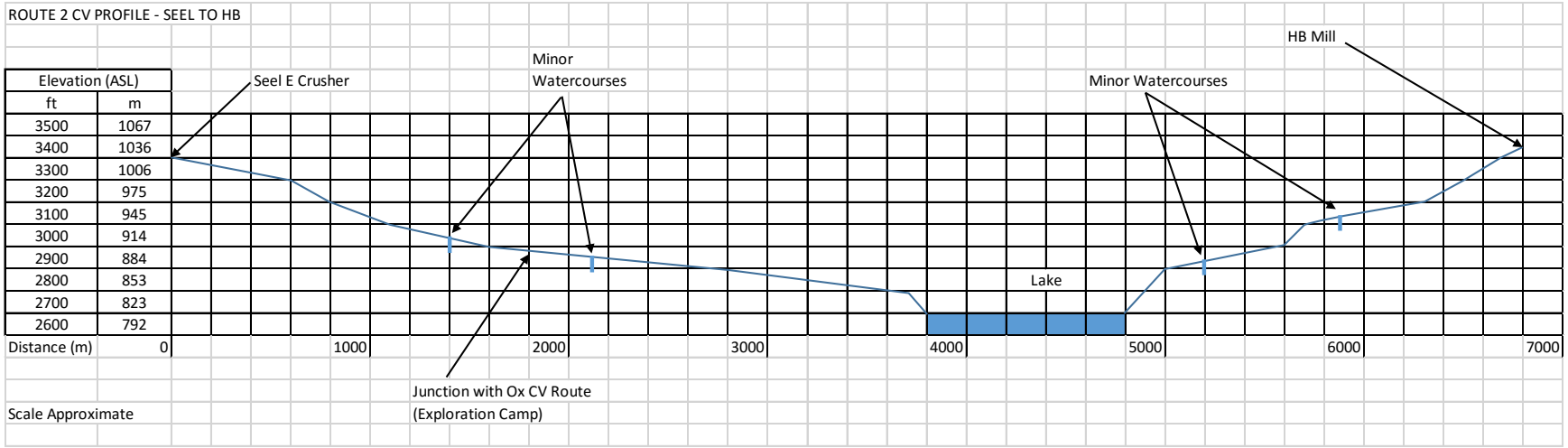
DISCOUNTED CASH FLOW ANALYSIS
ORE TRANSFER TRADE-OFF STUDY
OOTSA PROJECT

SCENARIO: CV + Floating CV
MATERIAL: Crushed Ore

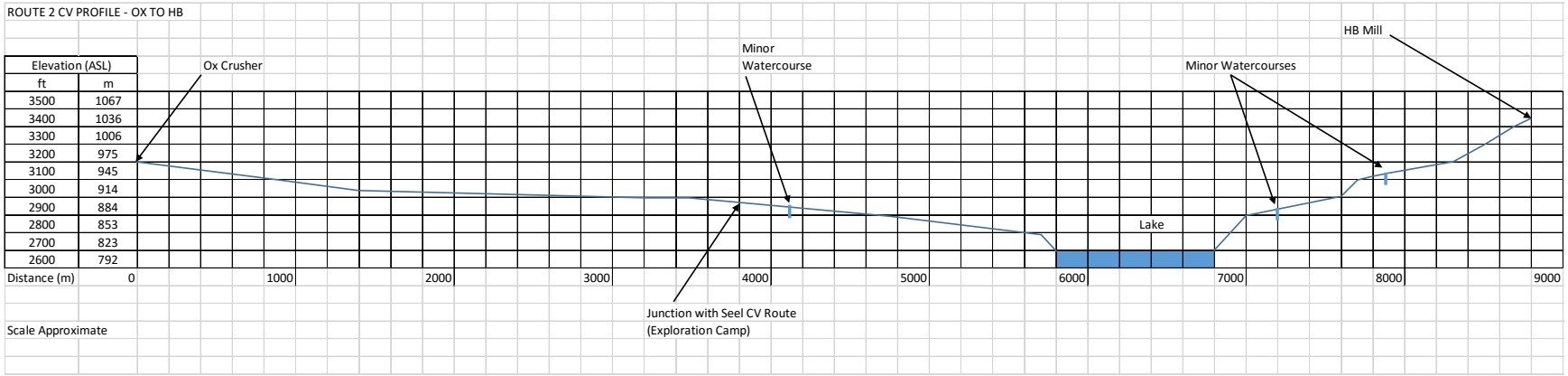
		OPEX ($ M/yr)				CAPEX ($ M)				Mill Feed	Mine Life	Distance	COST		NPC $ M
Haulage	Operator	CV	Labor	Other	Total	CV	Inf	Facilities	Total	Mt	Yrs	km	$/t ore	$/t-km	5%
CV via Suspension	Owner	0.94	0.99	0.10	2.03	8.32	3.08	5.80	17.20	67.0	12.0	6.0	0.36	0.06	33.5
Bridge					0.00				0.00						0.0
					0.00				0.00						0.0

Yr	Operator	-1	1	2	3	4	5	6	7	8	9	10	11	12	Total
CV via Suspension	Owner	17.20	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	41.55
Bridge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX XVIII. CONVEYOR PROFILES



OX CONVEYOR PROFILE



APPENDIX XIX. PROCESSING COST BASIS

Reagents West Seel

Item	Consumption kg/t	Annual t/a	Delivered Cost $/kg	Delivered Cost $/t
Lime CaO	0.820	4,639	0.550	0.451
PEX	0.035	198	3.180	0.111
AP 3302	0.040	226	3.180	0.127
FDF250	0.011	62	1.200	0.013
MIBC	0.025	141	3.700	0.093
NaHS	1.689	9,556	1.340	2.263
Flocculant	0.020	113	8.910	0.178
Grinding steel 5"	0.207	1,171	1.800	0.373
Grinding steel 2"	0.404	2,287	1.800	0.728
Grinding steel 1.5"	0.065	368	1.800	0.117
Total				**4.45**

Reagents Ox

Item	Consumption kg/t	Annual t/a	Delivered Cost $/kg	Delivered Cost $/t
Lime CaO	0.125	707	0.550	0.069
PEX	0.040	226	3.180	0.127
AP 3302	0.045	255	3.180	0.143
FDF250	0.017	96	1.200	0.020
MIBC	0.037	209	3.700	0.137
NaHS	0.945	5,346	1.340	1.266
Flocculant	0.020	113	8.910	0.178
Grinding steel 5"	0.207	1,171	1.800	0.372
Grinding steel 2"/1.5"	0.469	1,284	1.800	0.842
Total				**3.15**

Reagents East Seel

Item	Consumption kg/t	Annual t/a	Delivered Cost $/kg	Delivered Cost $/t
Lime CaO	0.820	4,639	0.550	0.451
PEX	0.035	198	3.180	0.111
AP 3302	0.040	226	3.180	0.127
FDF250	0.011	62	1.200	0.013
MIBC	0.025	141	3.700	0.093
NaHS	0.000			0.000
Flocculant	0.020	113	8.910	0.178
Grinding steel 5"	0.207	1,171	1.800	0.373
Grinding steel 2"	0.404	2,287	1.800	0.728
Grinding steel 1.5"	0.065	368	1.800	0.117
Total				**2.19**

APPENDIX XX. G&A COST BASIS

		Direct Cost Distribution					Ownership			Margin			Total Admin Cost			
	Direct	Mining	Toll	Ootsa	% Split	Cost	Mining	Toll	Ootsa	Mining	Ootsa	Owner	Mining	Toll	Ootsa	Total
Cost Element	Cost	Contractor	Miller	Owner	Mine/Mill/Own	Basis	Contractor	Miller	Owner	Contractor	Owner	GRV	Contractor	Miller	Owner	Cost
	C$ x 1000	C$ x 1000	C$ x 1000	C$ x 1000			C$ x 1000	C$ x 1000	C$ x 1000	C$ x 1000	C$ x 1000	C$ x 1000	C$ x 1000	C$ x 1000	C$ x 1000	C$ x 1000
Salaries	3,000	800	1,400	800		Estimated				120	210		920	1,610	800	3,330
Comms/IT	180	27	45	108	15-25-60	Admin manpower				4	7		31	52	108	191
Office Supplies	30	5	8	18	15-25-60	Admin manpower				1	1		5	9	18	32
Travel	70	11	18	42	15-25-60	Admin manpower				2	3		12	20	42	74
Permits	50	8	13	30	15-25-60	Admin manpower				1	2		9	14	30	53
Insurance	500	65	375	60	13-75-12	Asset value				10	56		75	431	60	566
Legal	---	0	0	0												
Recruiting	40	20	14	6	50-35-15	Total manpower				3	2		23	16	6	45
Safety Supplies	40	20	14	6	50-35-15	Total manpower				3	2		23	16	6	45
Vehicles	30	15	11	5	50-35-15	Total manpower				2	2		17	12	5	34
CSR																
Community Relations	500	0	0	500		Scope				0	0		0	0	500	500
Environment	500	50	50	400		Scope				8	8		58	58	400	515
Consultants	200	0	50	150		Scope				0	8		0	58	150	208
Accomodation & Meals	2,500	1,250	875	375	50-35-15	Total manpower				188	131	56	1,438	1,006	431	2,875
Cleaning	60	30	21	9	50-35-15	Total manpower				5	3	1	35	24	10	69
Camp Maintenance	50	25	18	8	50-35-15	Total manpower	50	35	15	4	3	1	79	55	24	158
Road maintenance	250	125	88	38	50-35-15	Total manpower				19	13	6	144	101	43	288
Power	40	20	14	6	50-35-15	Total manpower				3	2	1	23	16	7	46
Bussing	86	43	30	13	50-35-15	Total manpower	8	5	2	6	5	2	57	40	17	114
Barge	250	0	0	250					200	0	0	38	0	0	488	488
Total	8,376	2,513	3,041	2,822			58	40	217	377	456	105	2,947	3,537	3,144	9,629
Throughput	5,600	5,600	5,600	5,600			5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600
$/t	1.50	0.45	0.54	0.50			0.01	0.01	0.04	0.07	0.08	0.02	0.53	0.63	0.56	1.72
(1) Engineering labor in Mining										Difference between Direct and Total Cost (%)			17%	16%	11%	15%

APPENDIX XXI. ECONOMIC MODEL

PROJECT CASH FLOW
OOTSA PROJECT
GOLD REACH RESOURCES
JAN 31/2016

Year		-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
MINING																						
(all material)																						
Seel E	kt	0	3,804	18,212	19,537	7,921	4,507	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53,981
Seel W	kt	0	0	0	0	0	0	0	0	0	0	4,112	12,181	11,153	5,161	0	0	0	0	0	0	32,607
Ox	kt	0	0	0	0	3,020	8,894	18,598	13,713	10,394	8,606	7,871	3,554	0	0	0	0	0	0	0	0	74,650
TOTAL	kt	0	3,804	18,212	19,537	10,941	13,401	18,598	13,713	10,394	8,606	11,983	15,735	11,153	5,161	0	0	0	0	0	0	161,238
MILLING																						
Mill Feed	kt	0	0	5,026	5,598	5,604	5,606	5,591	5,597	5,606	5,596	5,596	5,597	5,598	4,343	0	0	0	0	0	0	65,358
Grade																						
Cu	%	0.00	0.00	0.33	0.30	0.26	0.24	0.26	0.26	0.25	0.25	0.25	0.22	0.17	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.25
Au	g/t	0.00	0.00	0.33	0.25	0.22	0.20	0.05	0.05	0.04	0.04	0.04	0.08	0.14	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Ag	g/t	0.00	0.00	2.24	2.90	2.61	1.73	1.38	1.40	1.45	1.57	1.59	3.22	4.09	3.70	0.00	0.00	0.00	0.00	0.00	0.00	2.30
Mo	%	0.000	0.000	0.000	0.000	0.000	0.005	0.025	0.025	0.026	0.028	0.028	0.022	0.014	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.016
Contained Metal	x 1000																					
Cu	lb	0	0	36,210	37,335	32,086	29,707	31,763	32,087	30,813	30,674	30,406	27,723	21,569	16,434	0	0	0	0	0	0	356,807
Au	oz	0	0	53	45	40	36	9	8	7	7	7	14	24	19	0	0	0	0	0	0	269
Ag	oz	0	0	362	522	470	312	249	251	261	282	287	580	737	517	0	0	0	0	0	0	4,829
Mo	lb	0	0	0	0	0	676	3,140	3,045	3,222	3,449	3,436	2,665	1,695	1,303	0	0	0	0	0	0	22,631
Recovery																						
Cu	%	0	0	90	90	90	90	91	91	91	91	91	91	92	92	0	0	0	0	0	0	91
Au	%	0	0	70	70	70	70	70	70	70	70	70	66	65	65	0	0	0	0	0	0	69
Ag	%	0	0	60	60	60	61	65	65	65	65	65	61	60	60	0	0	0	0	0	0	62
Mo	%	0	0	0	0	0	70	70	70	70	70	70	70	70	70	0	0	0	0	0	0	70
Recovered Metal	x 1000																					
Cu	lb	0	0	32,589	33,602	28,878	26,805	28,905	29,199	28,040	27,914	27,669	25,337	19,844	15,119	0	0	0	0	0	0	323,899
Au	oz	0	0	37	32	28	25	6	6	5	5	5	10	16	12	0	0	0	0	0	0	185
Ag	oz	0	0	217	313	282	190	162	163	170	183	186	356	442	310	0	0	0	0	0	0	2,975
Mo	lb	0	0	0	0	0	473	2,198	2,131	2,255	2,414	2,405	1,866	1,187	912	0	0	0	0	0	0	15,841
REVENUE																						
Metal Price																						
Cu	US$/lb	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
Au	US$/oz	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	
Ag	US$/oz	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	
Mo	US$/lb	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	
Exchange Rate	US$:C$	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
Gross Revenue	x 1000																					
Cu	C$	0	0	122,209	126,006	108,291	100,519	108,392	109,496	105,148	104,676	103,760	95,013	74,414	56,698	0	0	0	0	0	0	1,214,622
Au	C$	0	0	58,050	49,955	43,706	39,843	9,445	9,083	7,689	7,676	7,676	15,051	24,899	19,024	0	0	0	0	0	0	292,097
Ag	C$	0	0	4,616	6,651	5,996	4,032	3,437	3,469	3,604	3,896	3,959	7,568	9,393	6,592	0	0	0	0	0	0	63,213
Mo	C$	0	0	0	0	0	6,090	28,297	27,439	29,036	31,086	30,964	24,022	15,277	11,747	0	0	0	0	0	0	203,958
Total	C$	0	0	184,875	182,613	157,993	150,485	149,572	149,487	145,477	147,333	146,358	141,655	123,982	94,060	0	0	0	0	0	0	1,773,889

DIRECT OPEX																						
Unit Rates																						
Mining - Mill Feed	C$/t mined	0.00	0.00	2.95	2.95	2.95	2.94	2.90	2.90	2.90	2.90	2.90	2.95	3.02	3.02	0.00	0.00	0.00	0.00	0.00	0.00	
Mining-OB	C$/t mined	0.00	0.00	2.06	2.06	0.00	2.09	2.09	2.09	0.00	0.00	0.00	2.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mining-Wst	C$/t mined	0.00	0.00	2.50	2.50	2.50	2.66	2.67	2.67	2.67	2.67	2.67	2.57	2.56	2.56	0.00	0.00	0.00	0.00	0.00	0.00	
Milling	C$/t milled	0.00	0.00	9.03	9.03	9.03	9.28	10.13	10.13	10.13	10.13	10.13	10.85	11.64	11.64	0.00	0.00	0.00	0.00	0.00	0.00	
G&A	C$/t milled	0.00	0.00	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.00	0.00	0.00	0.00	0.00	0.00	
Site Operating Costs	x 1000																					
Mining - Mill Feed	C$	0	0	14,824	16,514	16,532	16,473	16,214	16,231	16,257	16,228	16,228	15,724	16,906	13,116	0	0	0	0	0	0	191,247
Mining-OB	C$	0	0	20,619	12,035	0	5,290	6,366	1,716	0	0	0	1,617	0	0	0	0	0	0	0	0	47,642
Mining-Wst	C$	0	0	7,945	20,243	5,793	14,021	26,596	19,478	12,784	8,037	6,074	24,714	14,221	2,094	0	0	0	0	0	0	161,998
Milling	C$	0	0	45,376	50,550	50,604	52,048	56,637	56,698	56,789	56,687	56,687	60,722	65,161	50,553	0	0	0	0	0	0	658,511
G&A	C$	0	0	2,814	3,135	3,138	3,139	3,131	3,134	3,139	3,134	3,134	3,134	3,135	2,432	0	0	0	0	0	0	36,600
Total	C$	0	0	91,577	102,476	76,067	90,971	108,944	97,257	88,970	84,086	82,124	105,910	99,422	68,195	0	0	0	0	0	0	1,095,998
INDIRECT OPEX	x 1000																					
Royalties	C$	0	0	924	913	790	592	0	0	0	0	0	307	620	470	0	0	0	0	0	0	4,617
Transport & Storage	C$	0	0	4,105	4,233	3,638	3,408	3,788	3,821	3,683	3,677	3,646	3,316	2,579	1,966	0	0	0	0	0	0	41,860
Ocean Freight	C$	0	0	4,105	4,233	3,638	3,408	3,788	3,821	3,683	3,677	3,646	3,316	2,579	1,966	0	0	0	0	0	0	41,860
Treatment	C$	0	0	6,295	6,491	5,578	5,758	8,280	8,255	8,184	8,355	8,296	7,184	5,289	4,040	0	0	0	0	0	0	82,005
Refining	C$	0	0	2,403	2,494	2,155	1,952	1,945	1,963	1,889	1,890	1,876	1,866	1,615	1,214	0	0	0	0	0	0	23,262
Smelter Charge	C$	0	0	7,395	7,305	6,320	6,385	7,681	7,626	7,561	7,758	7,712	7,108	5,876	4,467	0	0	0	0	0	0	83,193
Total	C$	0	0	25,228	25,668	22,118	21,504	25,482	25,485	24,999	25,358	25,176	23,097	18,558	14,123	0	0	0	0	0	0	276,797
NET REVENUE	C$ x 1000	0	0	68,069	54,469	59,808	38,010	15,146	26,745	31,508	37,889	39,057	12,648	6,002	11,742	0	0	0	0	0	0	401,093
CAPEX	x 1000																					
Construction		0	58,754	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58,754
Deferred - Plant		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deferred - Mine		0	0	0	0	16,863	0	0	0	0	0	12,089	0	0	0	0	0	0	0	0	0	28,952
Salvage		0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2,000	0	0	0	0	0	-2,000
Reclamation		0	4,970	0	0	2,530	0	0	0	0	0	1,540	0	0	0	3,040	0	0	0	0	-4,520	7,560
Post-Closure		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	246	246	246	246	246	1,230
Total		0	63,724	0	0	19,393	0	0	0	0	0	13,629	0	0	0	1,040	246	246	246	246	-4,274	93,266
PRE-TAX CASH FLOW	C$ x 1000	0	-63,724	68,069	54,469	40,415	38,010	15,146	26,745	31,508	37,889	25,429	12,648	6,002	11,742	-1,040	-246	-246	-246	-246	4,274	306,598
TAXATION	x 1000																					
Depreciation	C$	0	0	7,309	7,309	7,309	7,309	7,309	7,309	7,309	7,309	7,309	7,309	7,309	7,309	0	0	0	0	0	0	87,706
Tax Rate	%	0	0	2	2	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	0	
Corporate Tax	C$	0	0	1,215	943	8,608	7,982	2,038	5,053	6,292	7,951	4,711	1,388	1,560	1,153	0	0	0	0	0	0	48,894
FREE CASH FLOW	C$ x 1000	0	-63,724	66,854	53,526	31,808	30,027	13,108	21,691	25,216	29,938	20,717	11,260	4,441	10,590	-1,040	-246	-246	-246	-246	4,274	257,703

NPV @ 5%	C$ x 1000	185,562	
IRR	%	80.7%	
Payback	yrs	1.0	