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Introduction to Mineral Processing Industry and Mining Projects

January 23, 2011

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Overview

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- Geology/Exploration
  - Resource Estimate
- Mining/Exploitation
  - Reserve Estimate
- Mineral Processing
  - Metallurgical Testwork/Process Design
- Metal Processing
  - Extractive Metallurgy
- Projects

Geology

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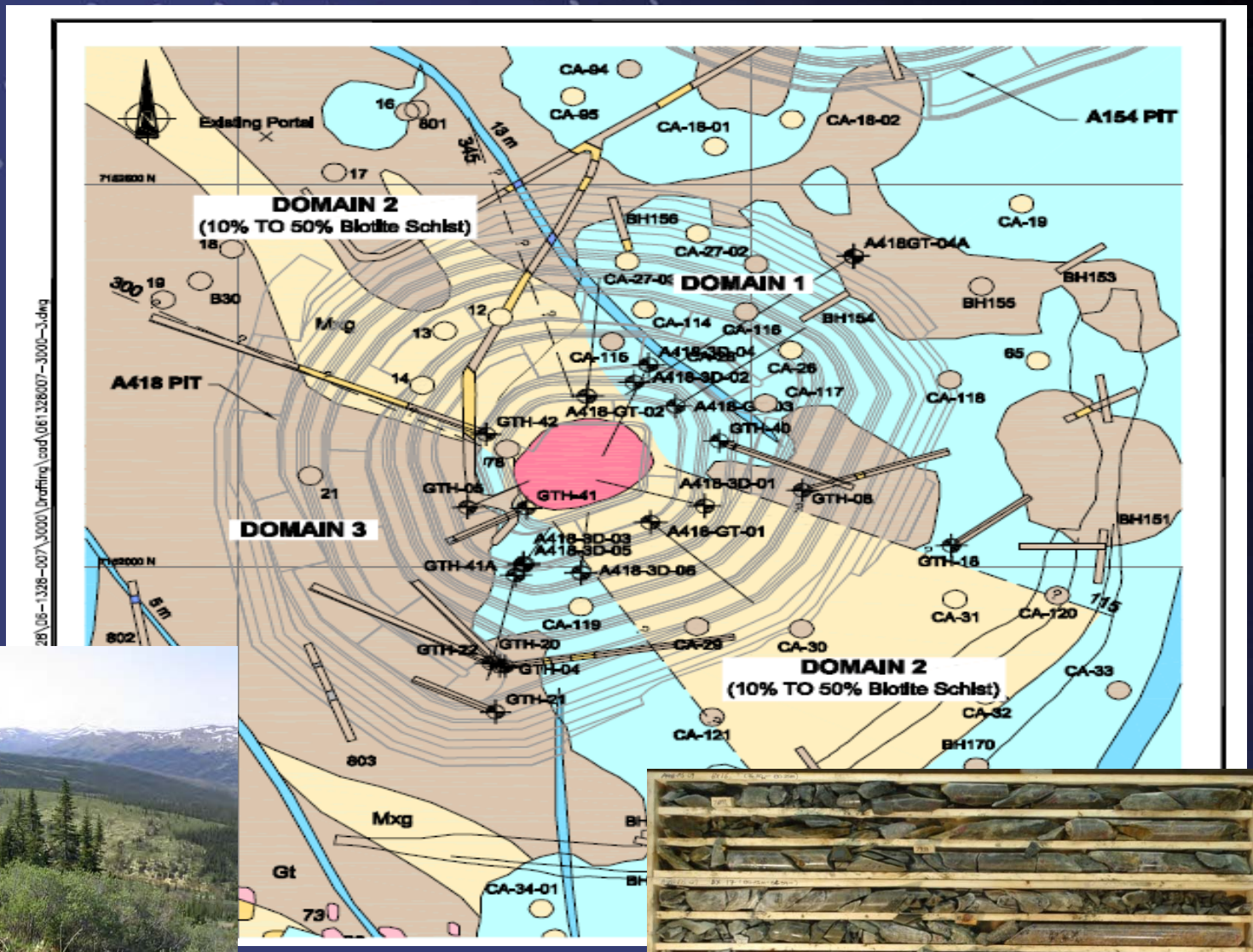

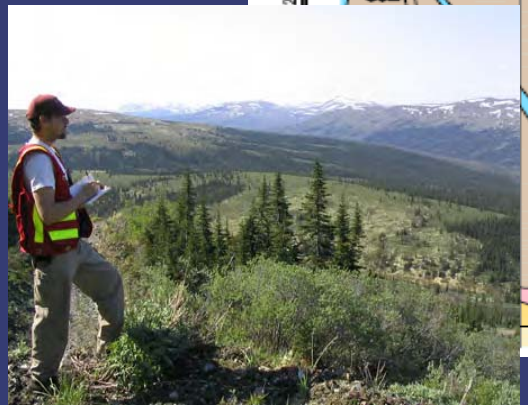

Mining

Diamond Mine in Sakha, Russia

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Gold Mine in Australia

Milling

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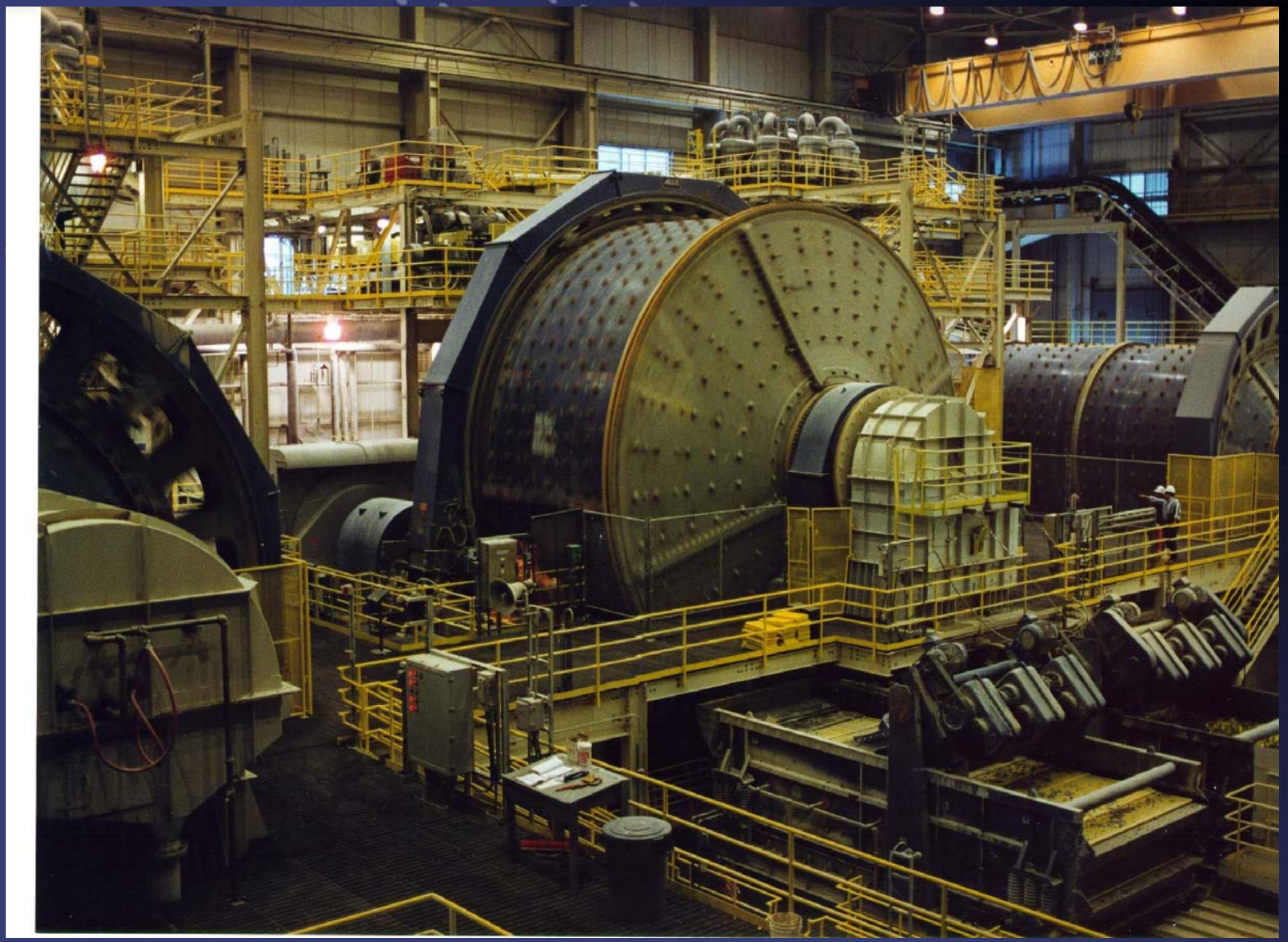


Large SAG Mill

Project Study & EPCM

- Resource Estimate
- Scoping Study
- Pre-feasibility Study
- Feasibility Study
- Basic Engineering
- Detail Engineering & Procurement (EP)
- Construction Management (CM)
- Erection, Commissioning and Start up

Engineering Disciplines

- Geology
- Mining
- Metallurgy/Process
- Layout & GA's
- Piping
- Mechanical/Material Handling
- Civil/Geotechnical
- Structural
- Architectural
- Electrical
- Instrumentation & Control
- Building Services (Dust Control/HVAC/Fire Protection)

Engineering Disciplines

- Environmental and Socio-Economics
- Permitting
- Tailings Design
- Procurement & Logistics
- Scheduling/Planning
- Cost Estimates (Capex & Opex)
- Financial Analysis (NPV, IRR, etc.)
- QA/QC/Document Control
- Contracts Administration
- Project Administration Services
- Others

New Technologies

- Saving Energy in Mining Industry using New Technologies
  - Case Study

  (High Pressure Grinding Rolls)
- Scavenging Flotation Tailings using Continuous Centrifugal Gravity Concentrator
  - Case Study

  (Knelson CVD)

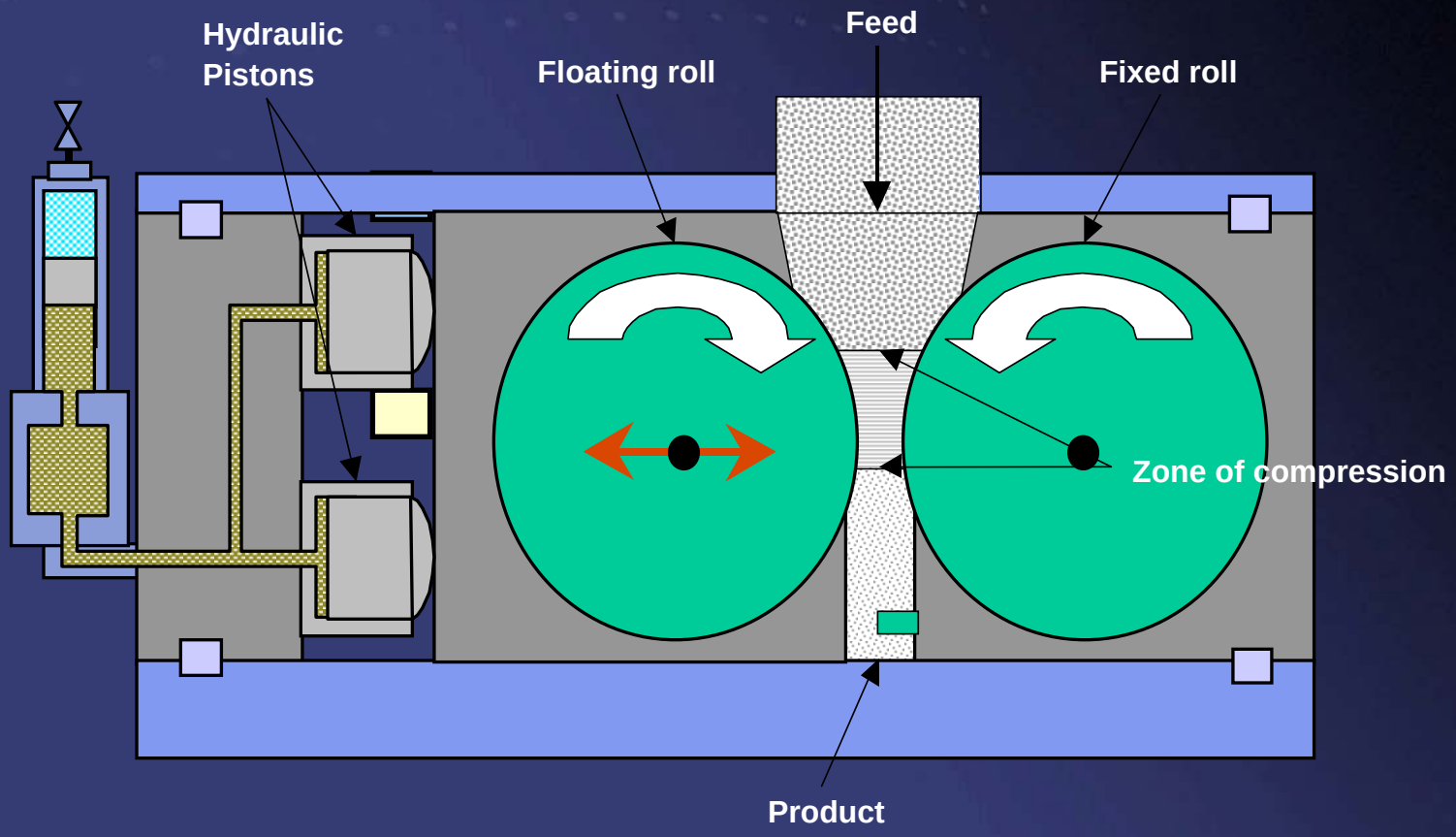
HPGR

- HPGR overview
- Process
- Why HPGR?
- Mine Operations using HPGR
- Projects
- Economic Benefits

The Process

Major parts :

- Counter-rotating Rolls
- One fixed roll, one moving roll



HPGR Installations

HPGR Assembly from the workshop, view from the hydraulic Side

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Hinged Frame Side

Roll

Hydraulic System

Torque Arms

Gear Reducers

Cerro Verde Maintenance Shop, Peru

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Why HPGR?

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Advantages

- Significant energy cost savings
- Reduced grinding media consumption
- Reduced overall operating costs
- Reduced footprint
- Higher mechanical availability
- Faster Equipment Delivery
- More Environmentally Friendly

Disadvantages

- Can increase initial capital costs
- Increased material handling

Mine Operations Using HPGR

- Phelps Dodge (now Freeport), Cerro Verde, Peru
  - 2.4 m Dia x 1.7 m wide, 5 MW (2x2.5), processing 2,500 tph
- Freeport McMoran, Grasberg Mine, Irian Jaya, Indonesia
  - 2.0 m Dia x 1.8 m wide, 3.6 MW, processing 1,450 tph
- Nurkazgan Gold, Kazakhstan
  - 1.7 m Dia x 1.4 m wide, 2.3 MW, processing 1,000 tph
- Zapadnoe Gold, Russia
  - 1.0 m Dia x 0.9 m wide, 0.8 MW, processing 320 tph
- Newmont, Boddington Copper/Gold , Australia
- Spinifex Ridge Moly/Copper, Australia
  - Three HPGRunits (2x2650 kw each)

Mine Operations Using HPGR

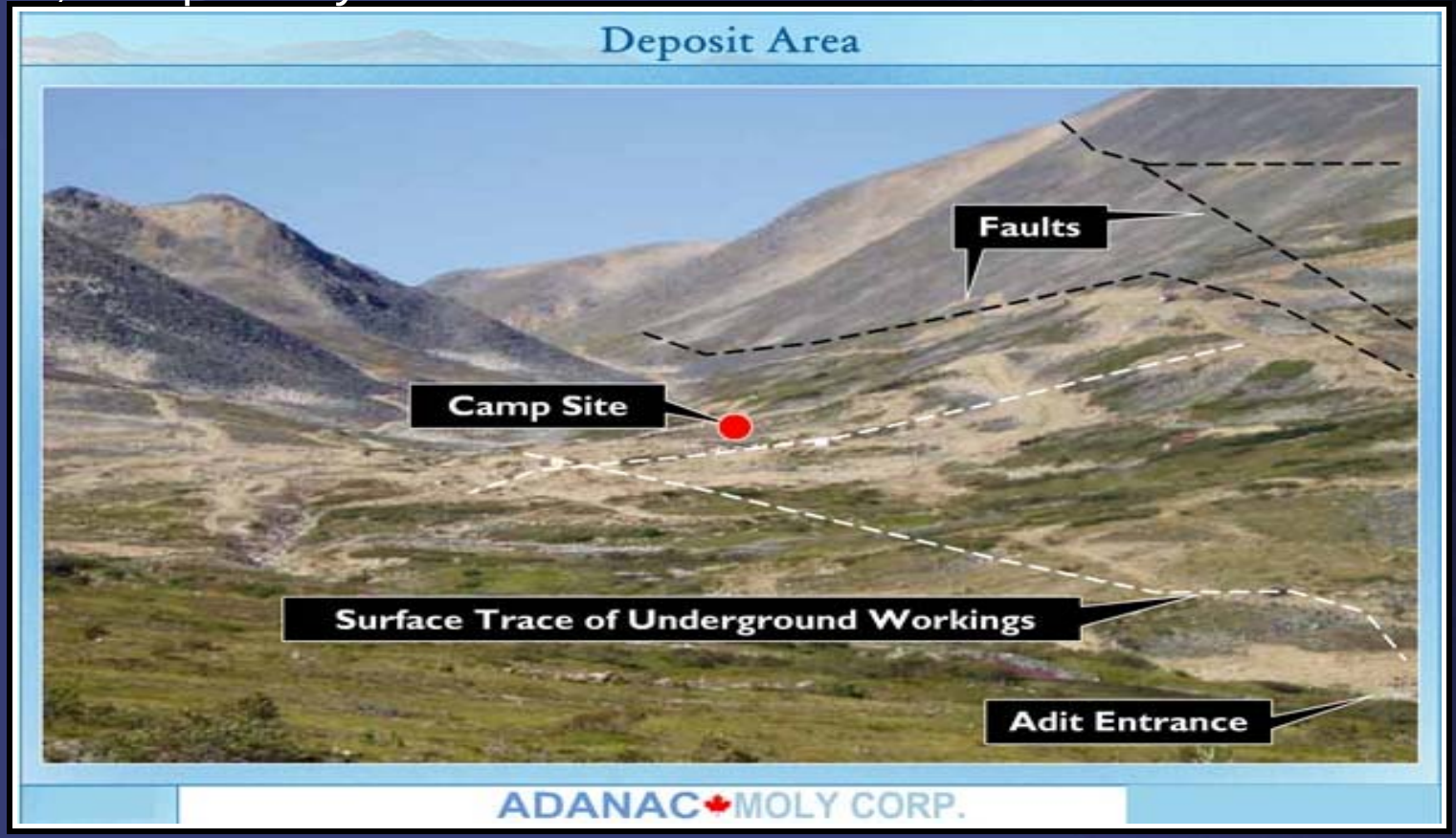
- Anglo Platinum, Mogalakwena Platinum Mine, South Africa
  - 2.2 m Dia x 1.6 m wide, 5.6 MW (2 x 2.8 MW), processing 2,160 tph

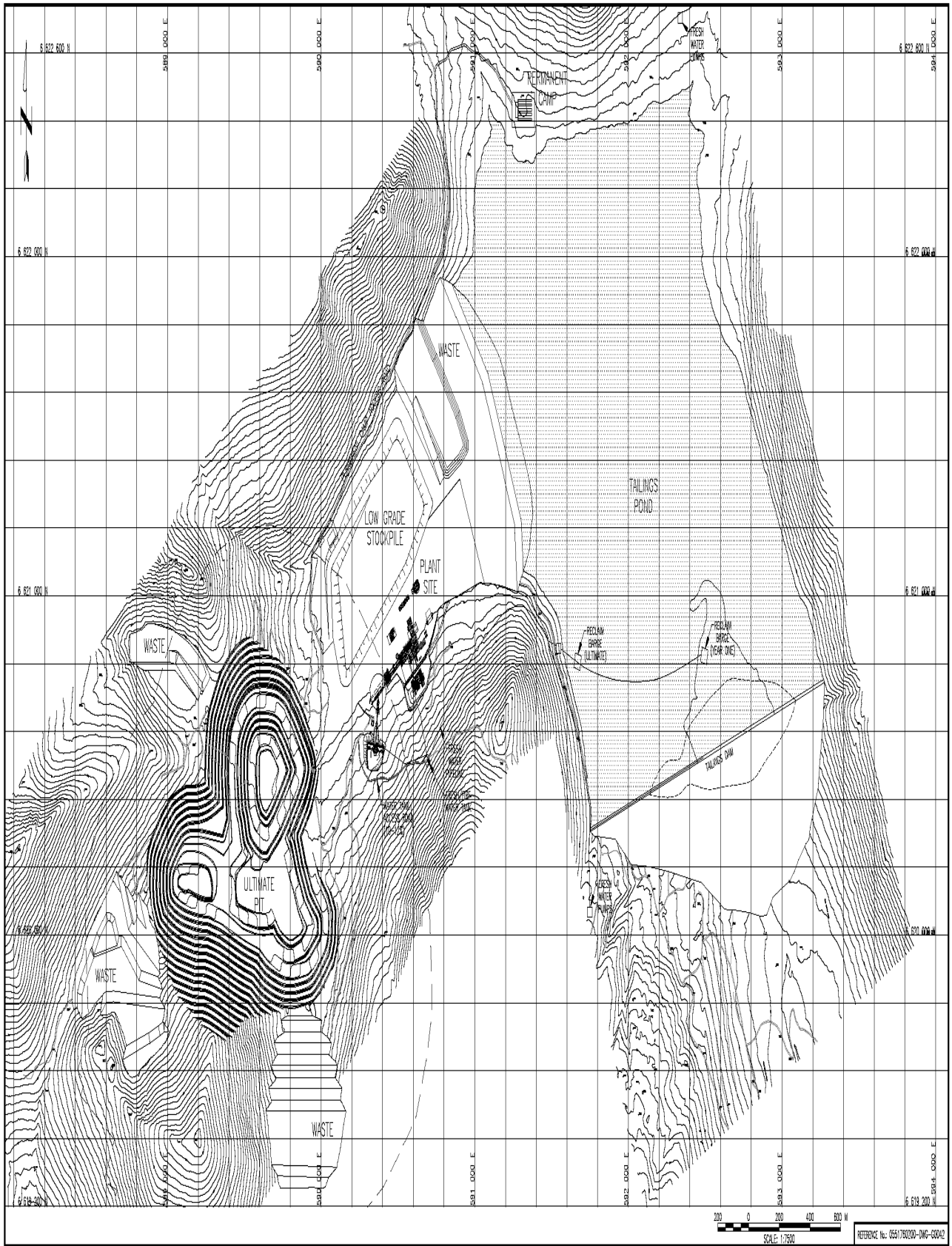
Projects

Adanac Moly Corporation

Ruby Creek Project

20,000 tpd Moly Ore





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DWG. NO.	REFERENCE DRAWINGS

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A	1	ISSUED FOR FEASIBILITY STUDY	08.06.09	CC

SECTION: GENERAL
SCALE: 1:7500 DATE:
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DRAWN BY: CC 08.05.10
CHECK BY:
APP. BY:

ADANAC MOLY CORPORATION

ATLIN, B.C.

WARDROP | Engineering Inc.

TITLE: RUBY CREEK - HPGR
OVERALL SITE GENERAL ARRANGEMENT PLAN

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
A010402.DWG	0551780200	A0-10-402	A

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I-METRIC

Ruby Creek Moly - Overall Site Plan

Projects

Imperial Metals Inc

Mount Polley Project

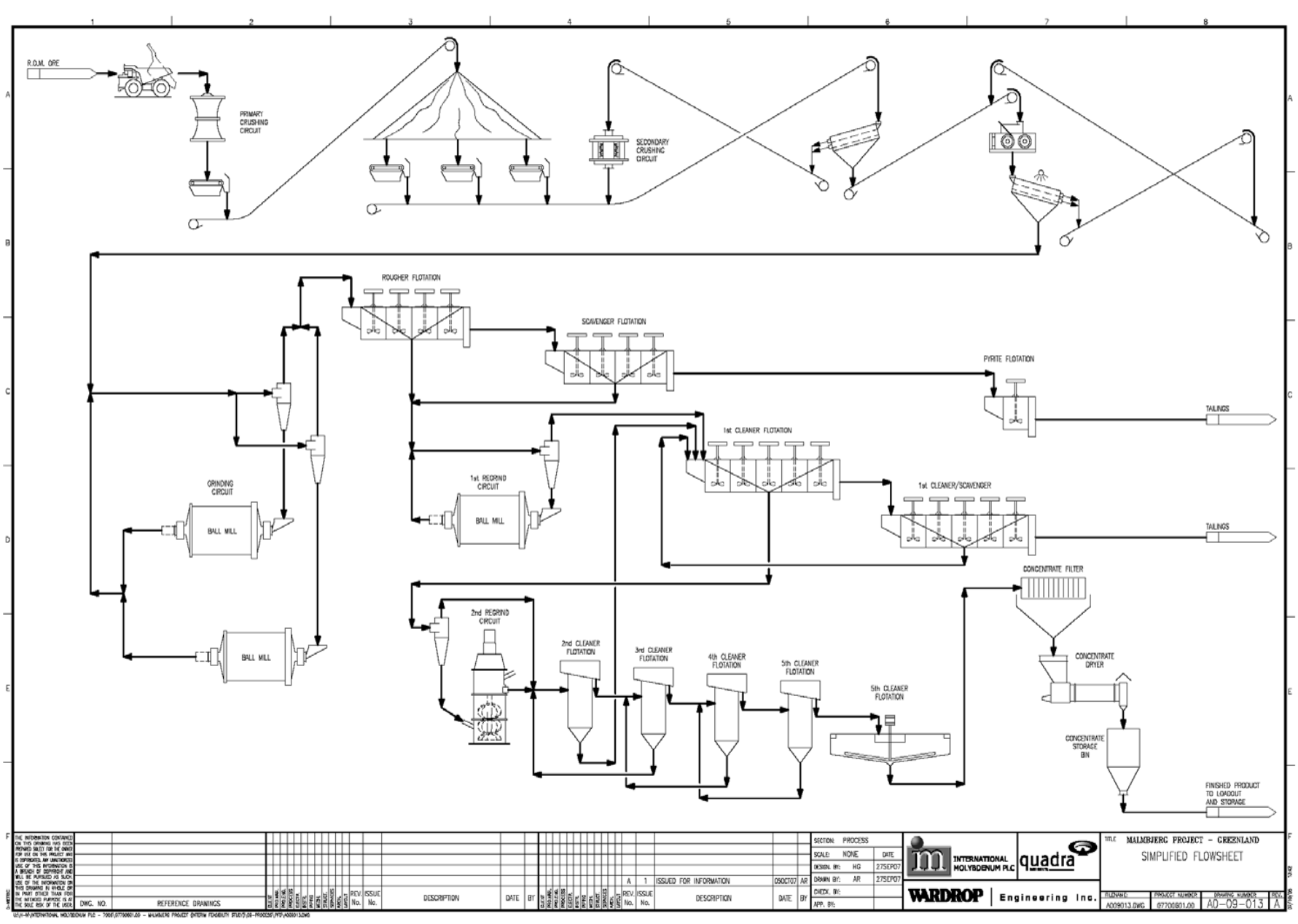
Expansion from 20,000 to 30,000 tpd Copper Gold Ore

Projects

International Molybdenum PLC

Malmbjerg Project

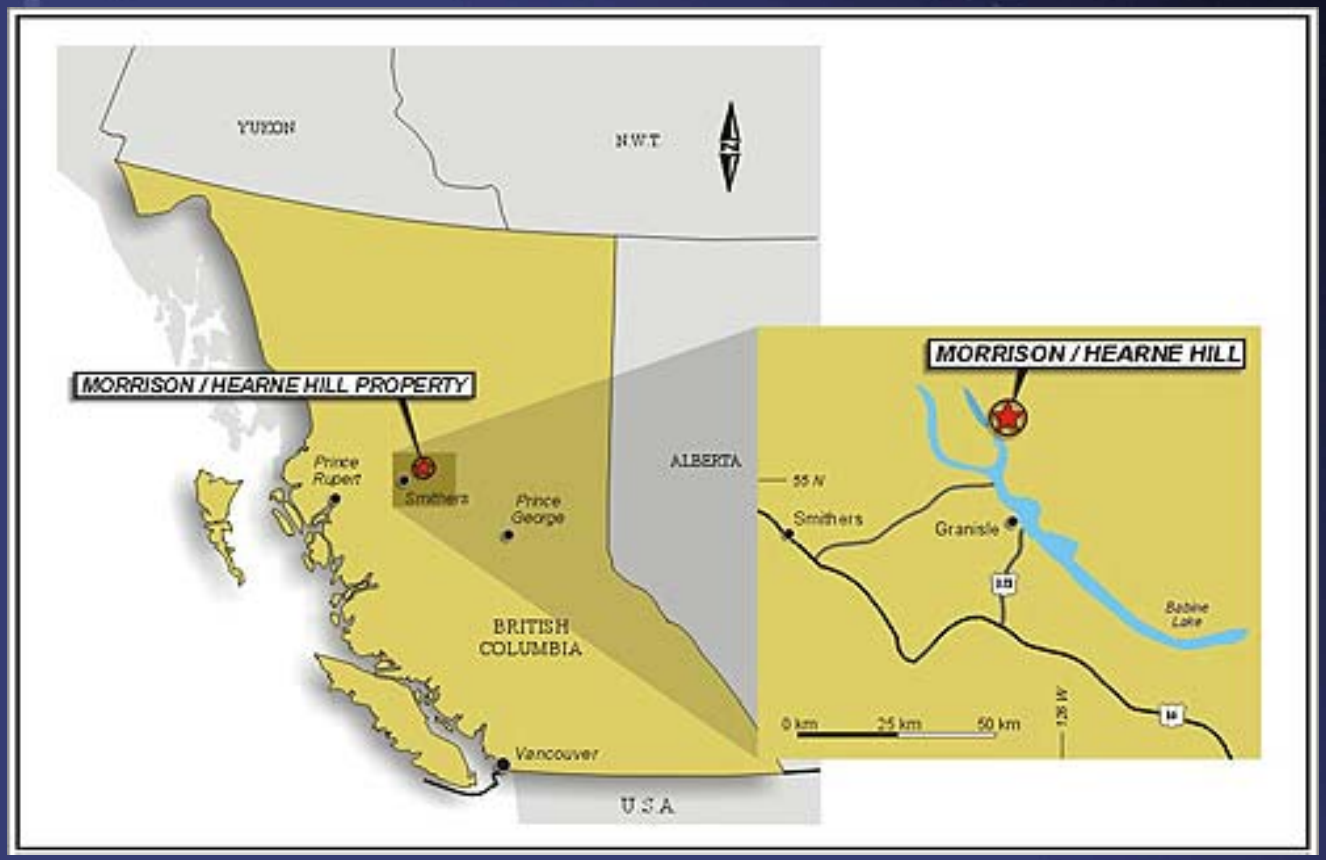
30,000 tpd Moly Ore



Process Flowsheet for Malmbjerg Mo Ore in Greenland

Projects

- Pacific Booker Minerals Inc
- Morrison Project
- 30,000 tpd Copper/Gold/Moly Ore



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Projects

Russian Project

60,000 tpd Copper Gold Ore

Projects

Seabridge Gold Inc

Courageous Lake Project

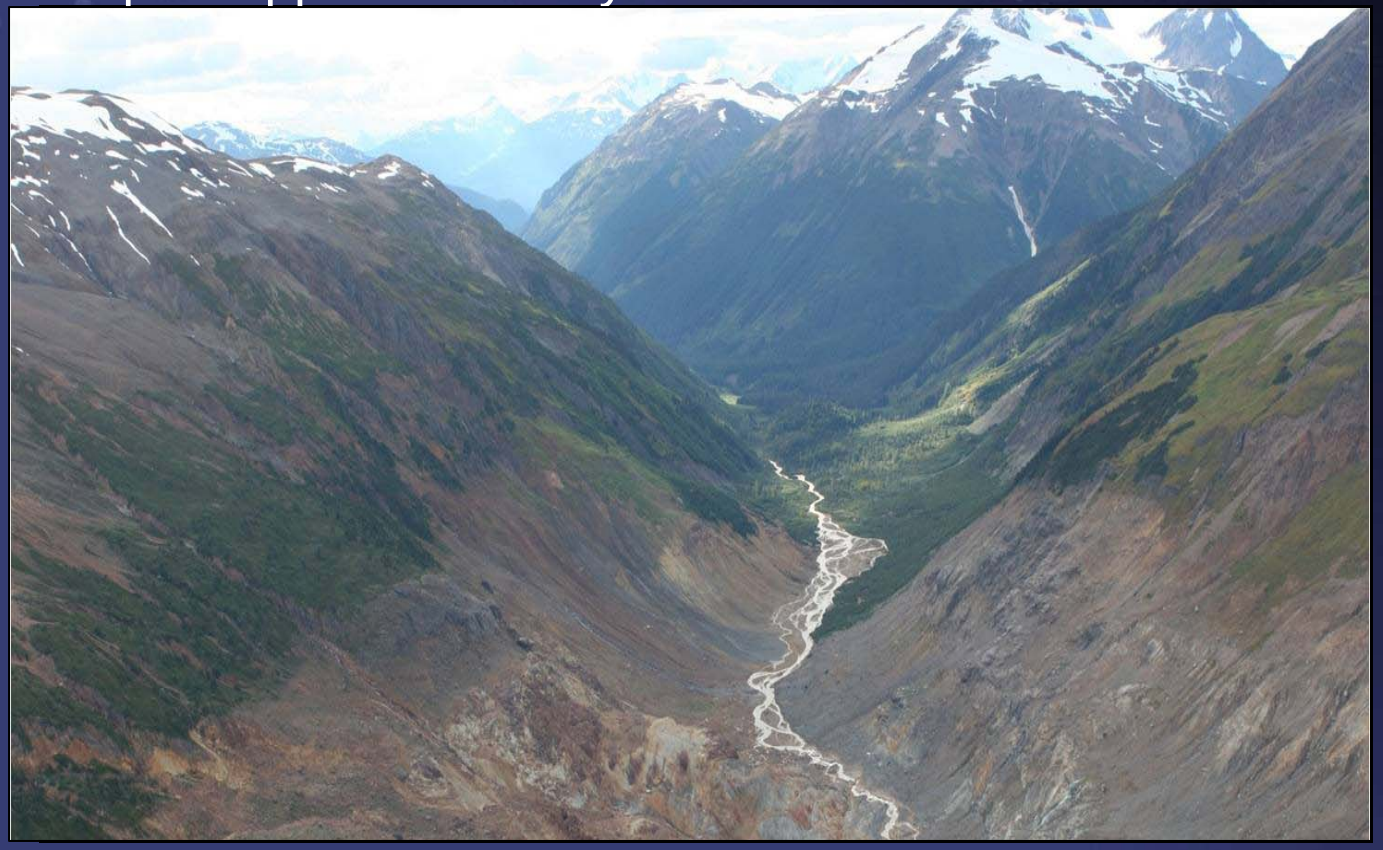
25,000 tpd Gold Ore

Projects

Seabridge Gold Inc

KSM Project

120,000 tpd Copper/Gold/Moly Ore



Projects

- **Continental** Minerals

China Project

40,000 tpd Gold Ore

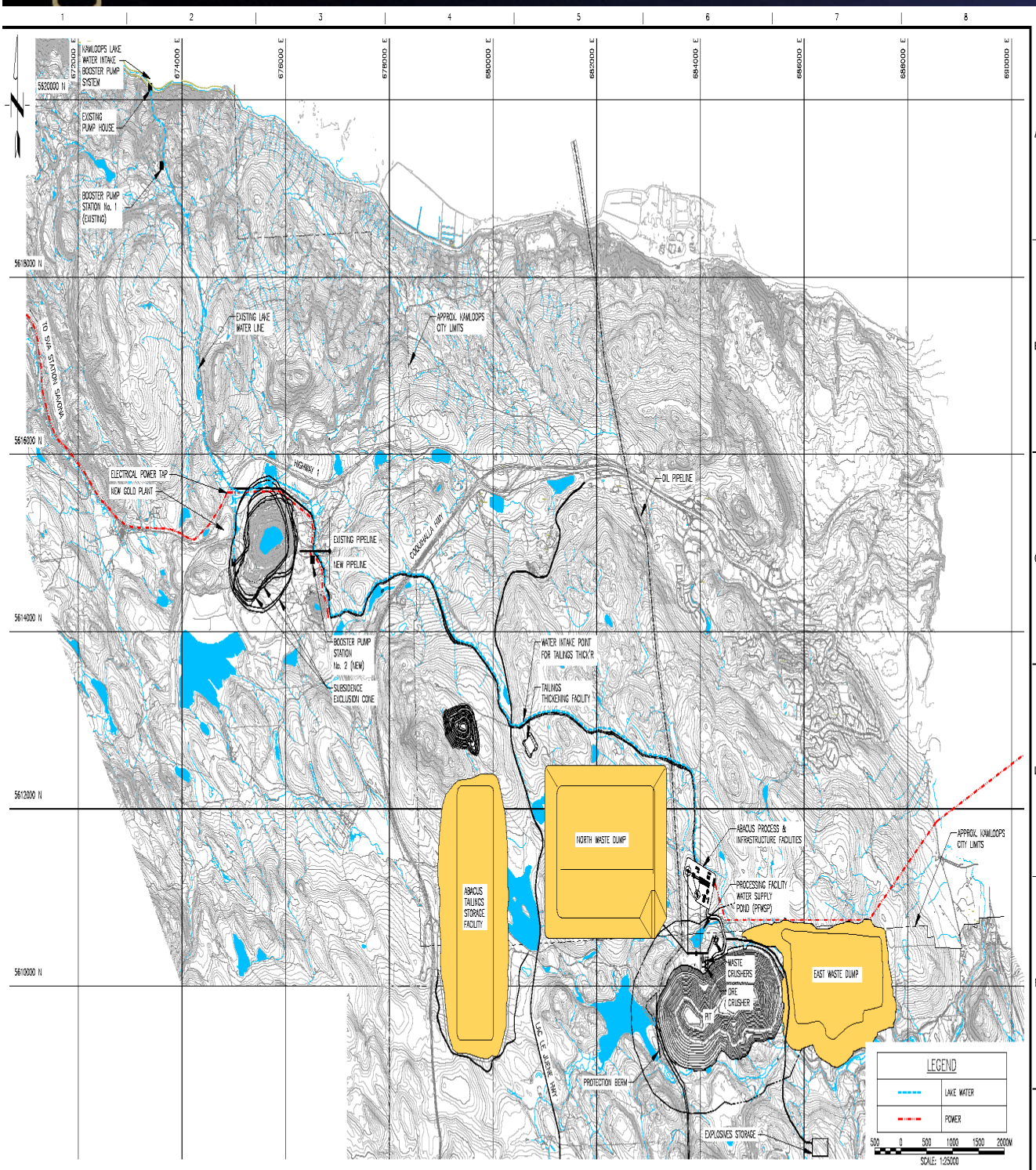
Projects

- **Abacus Mining & Exploration Corp.**

  Ajax Project

  60,000 tpd Copper/Gold Ore

Ajax Copper/Gold Project- Overall Site Plan



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B	1	ISSUED FOR INFORMATION	14JUL10	JTR
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DRAWN BY: DH 15JUN10
CHECK BY:
APP. BY:

Abacus MINING & EXPLORATION CORP.
BRITISH COLUMBIA
WARDROP Engineering Inc.

TITLE: AJAX PROJECT (FEASIBILITY)
OVERALL SITE GENERAL ARRANGEMENT PLAN

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV
A0010001.DWG	1054B103.00	A00-10-001	C

17-NOV-10

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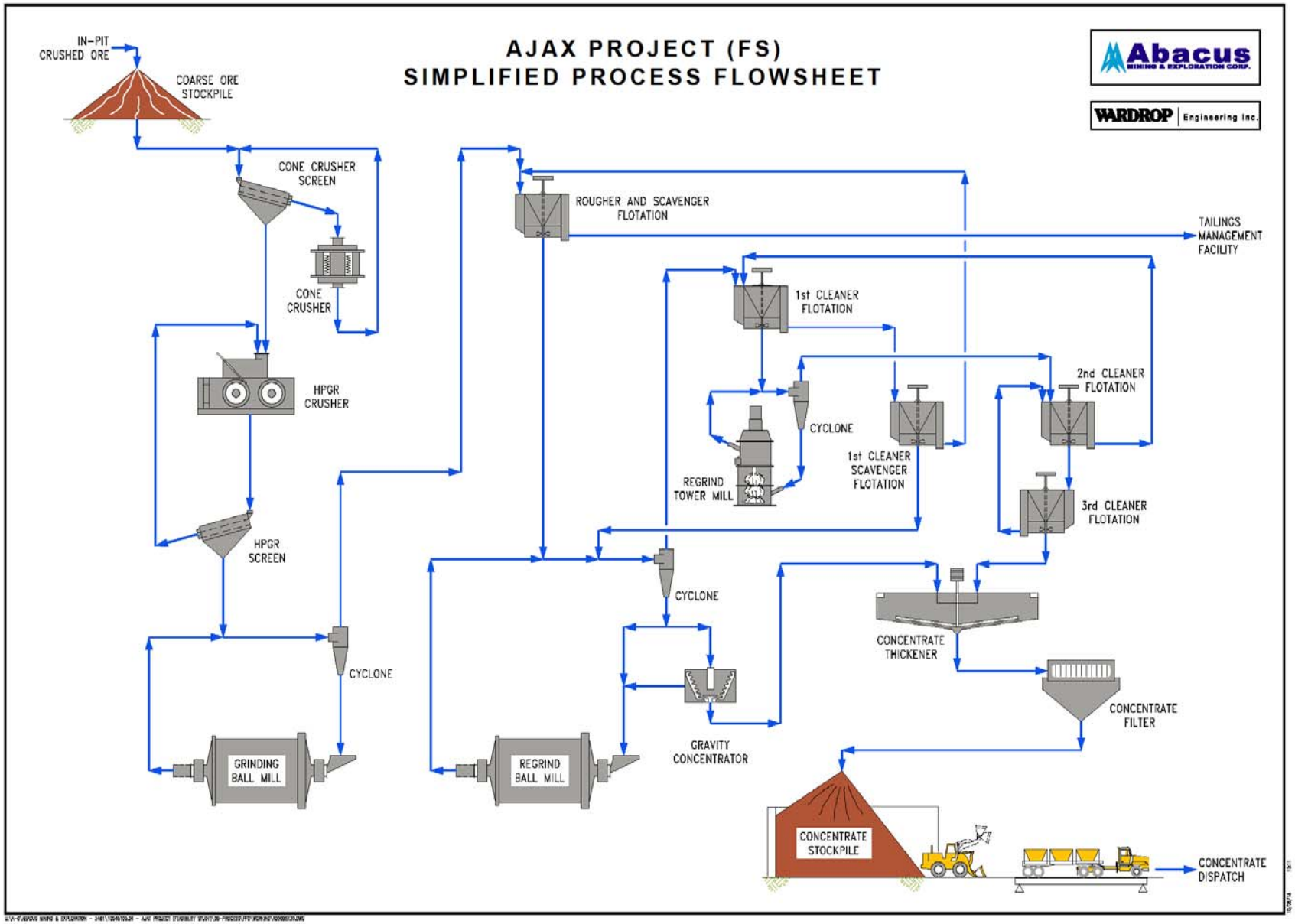
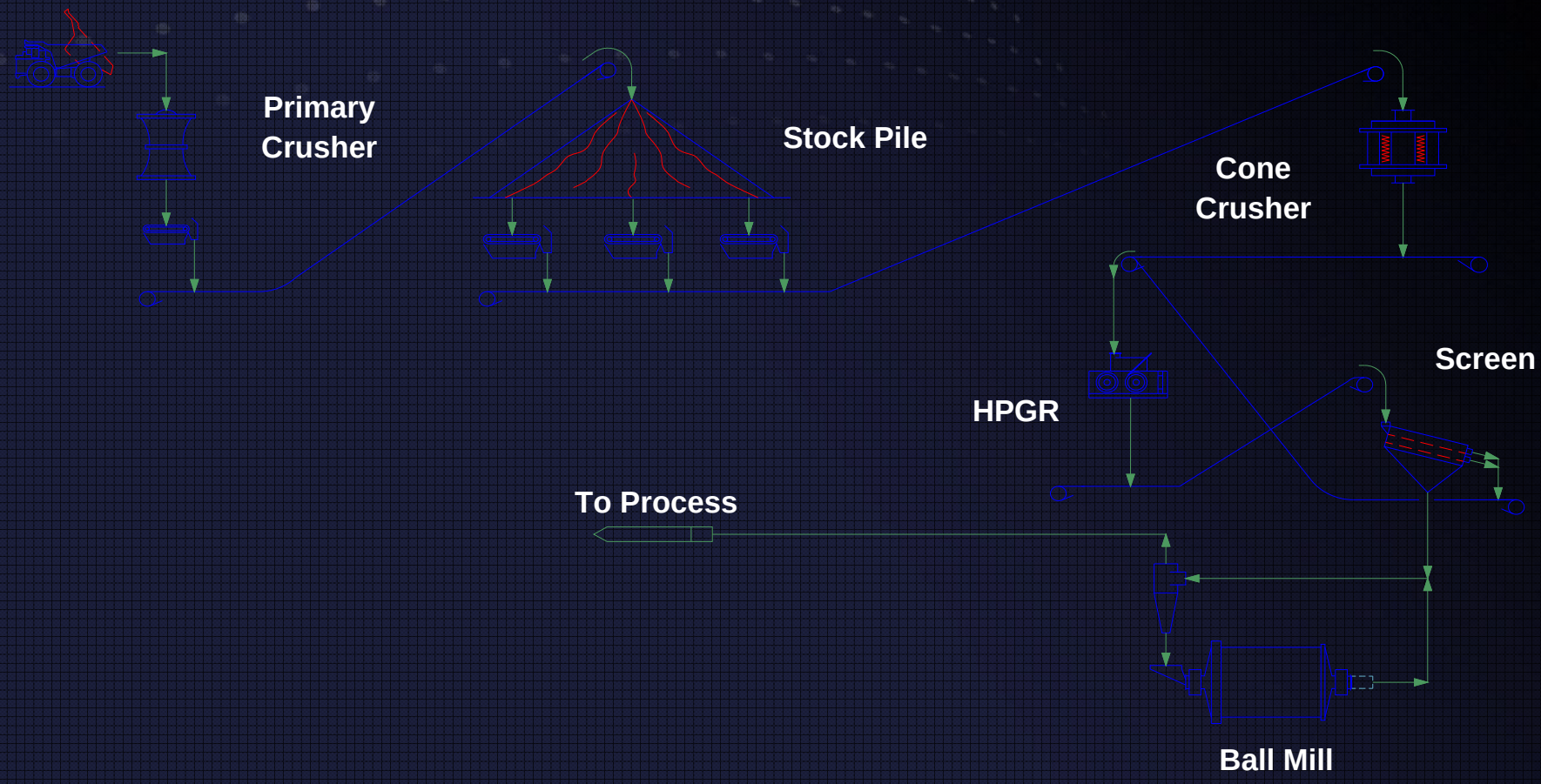
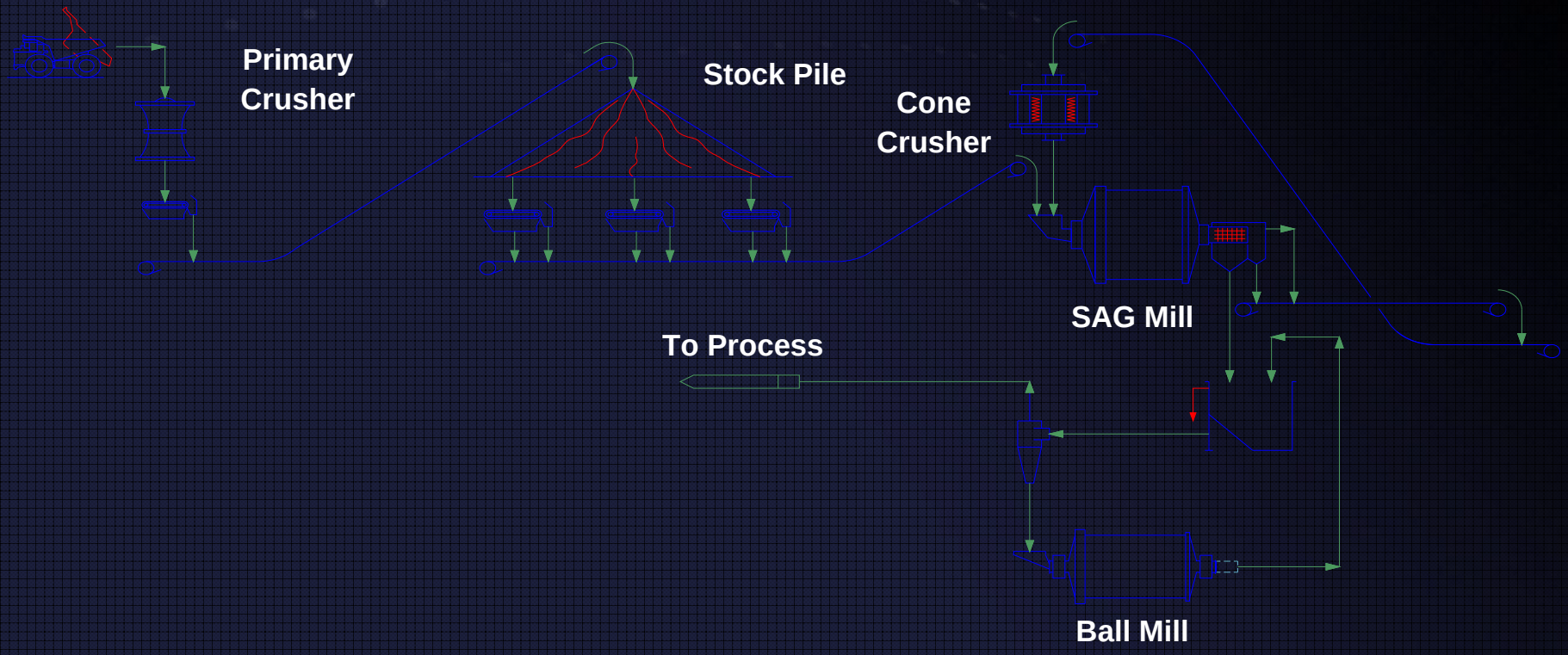


Process Flowsheet for Ajax Copper Deposit

HPGR


Primary
Crusher
Stock Pile
Cone
Crusher
Screen
HPGR
To Process
Ball Mill

SAG Mill


Primary
Crusher
Stock Pile
Cone
Crusher
SAG Mill
To Process
Ball Mill

Economic Benefits

Overall Operating Costs	SAG	HPRG
▪ Adanac Moly Corp	5.30 $/t	4.56 $/t
▪ Imperial Metals Inc	n/a	0.73 $/t*
▪ International Moly	4.66 $/t	3.52 $/t
▪ Russian Project	2.24 $/t	1.63 $/t
▪ Seabridge Gold Inc	4.98 $/t	3.62 $/t
▪ Pacific Booker Minerals Inc	2.66 $/t	2.03 $/t

* Additional costs for expansion project

Capital Costs

Capital Costs	SAG vs. HPGR
Adanac Moly Corp	-6.4%
Imperial Metals Inc	$35 mln*
International Moly	-9.6%
Russian Project	14.3%
Seabridge Gold Inc	-8.2%
Pacific Booker Minerals Inc	-9.6%

* Additional costs for expansion project

Power Consumption Greenland Project

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Plant Concept	SAG Circuit	HPGR Circuit
Equipment	1 x SAG Mill 9.8 MW	1 x Secondary Crusher 750 kW
	1 x Pebble crusher 450 kW	1 x HPGR 4.0 MW
	2 x Ball Mills 5.6 MW each	2 x Ball Mills 5.6 MW each
	Screens and conveyors 0.5 MW	Screens and Conveyors 1.5 MW
Total drive capacity installed	21.95 MW	17.45 MW

Environmental Benefits

Estimation of CO2 reduction based on EIA*

Reduction of	TPY, CO_2
Adanac Moly Corp	21,000
Imperial Metals Inc	n/a
International Moly	23,000
Russian Project	141,000
Seabridge Gold Inc	41,000
Pacific Booker Minerals Inc	20,000

* Energy Information Administration

** Based on data for EIA USA, 1MWH = 0.606 t CO_2

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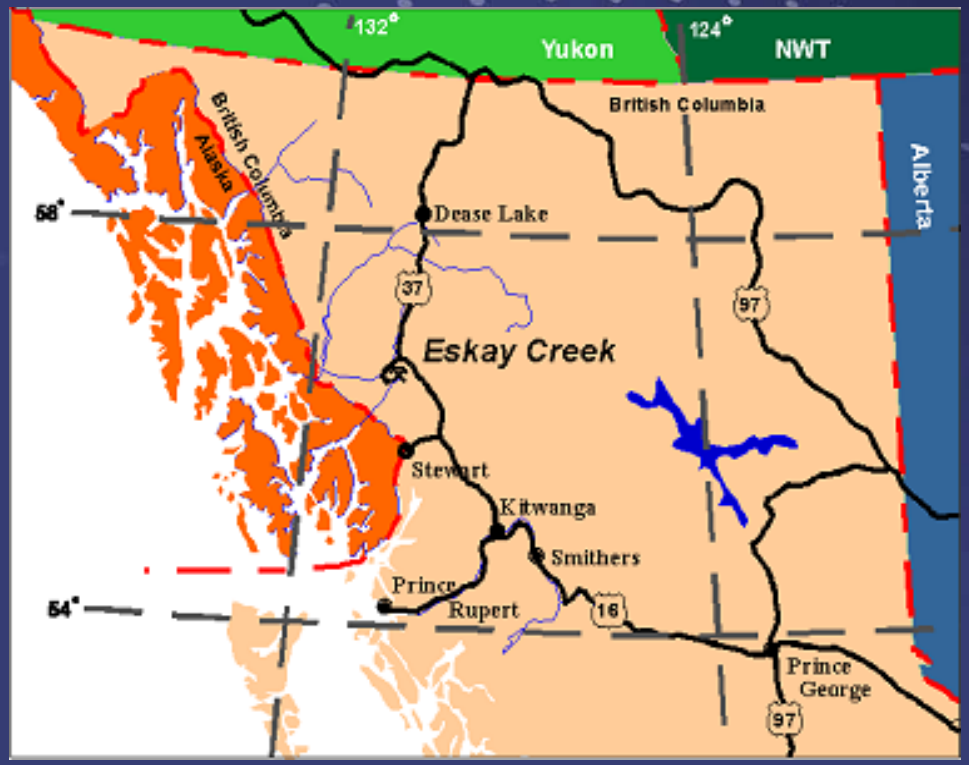
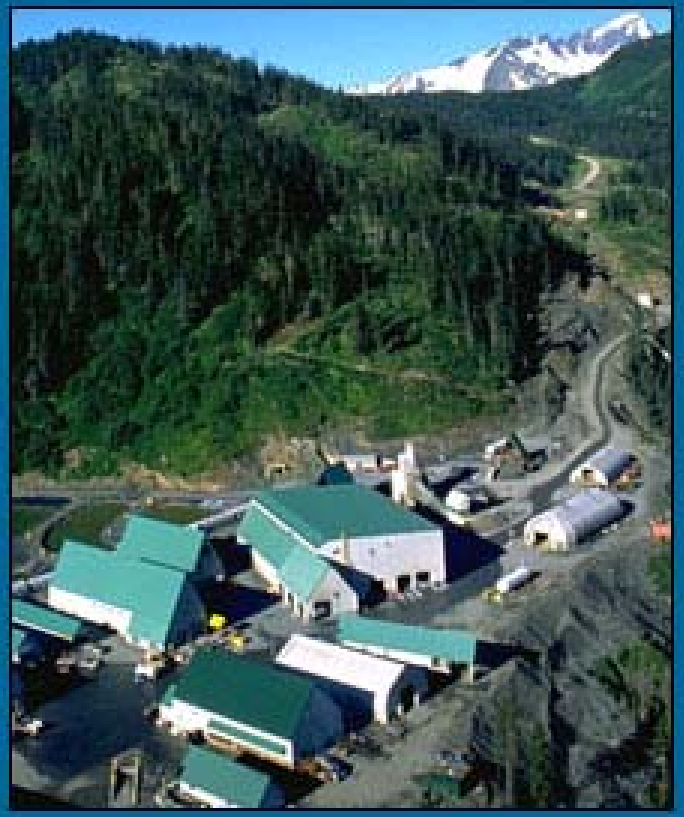
Gold & Silver Recovery from Tailings

Scavenging Flotation Tailings using a Continuous Centrifugal Gravity Concentrator

Eskay Creek Mine





- Au/Ag Mine
- Flotation of bulk sulfide concentrate grading 100 g/t Au_{eq}

Continuous Centrifugal Gravity Concentrators

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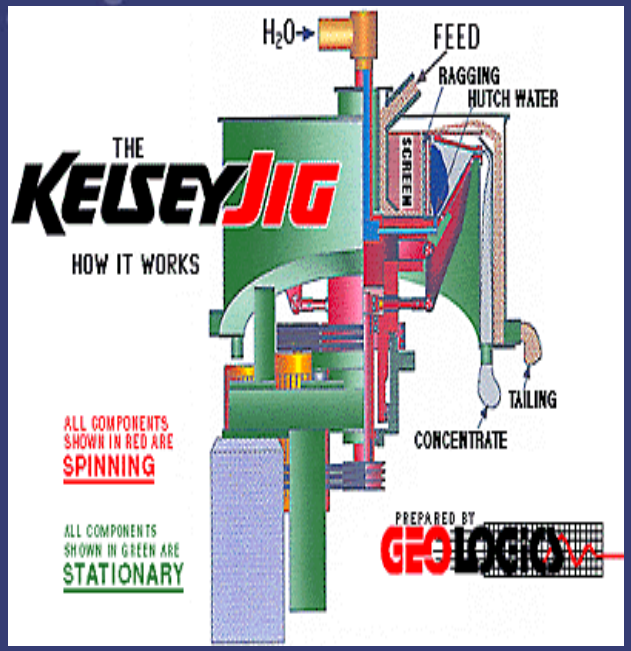
Kelsey Jig

Falcon Model C

Knelson CVD



CVD Concentrator

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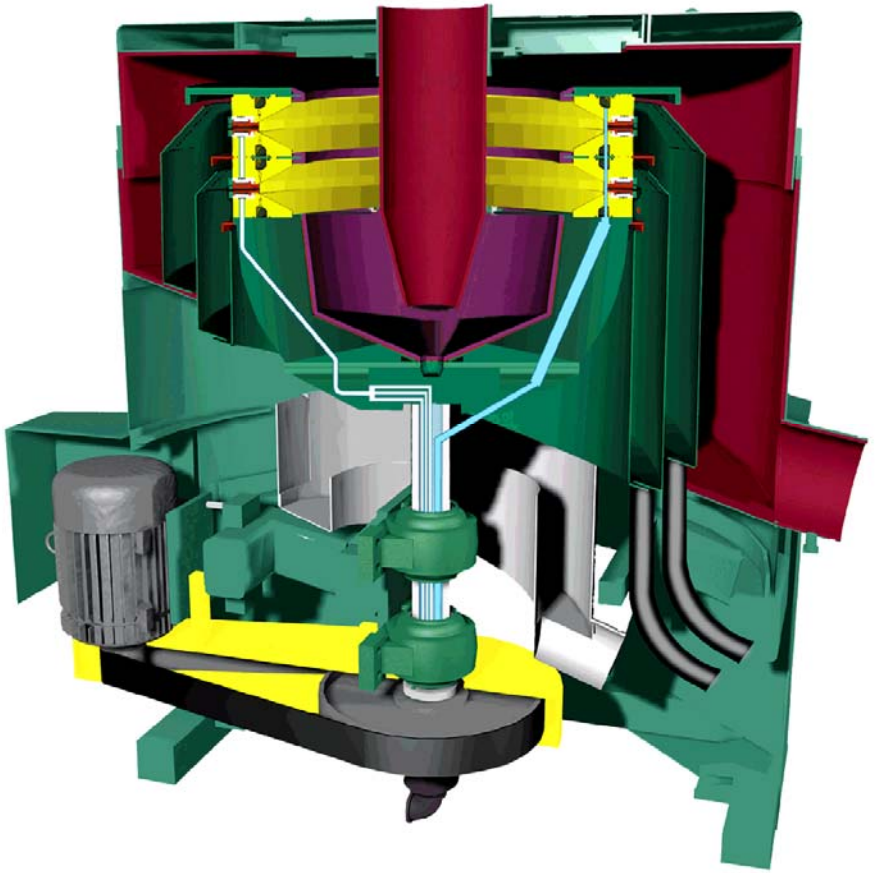
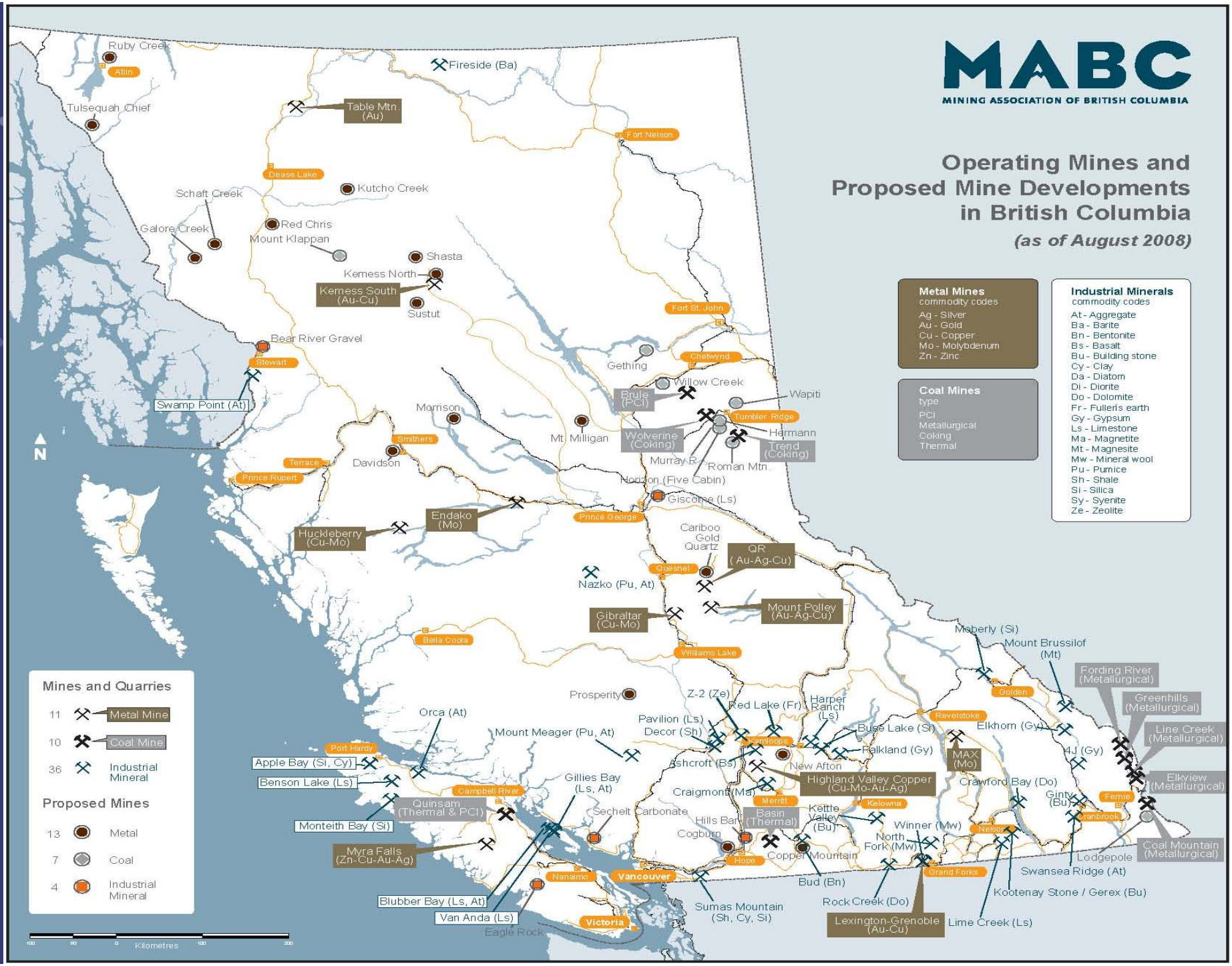
- **Operating Variable**
  - **Bowl speed**
  - **Fluidization water**
  - **Pinch valve open time**
  - **Pinch valve closed time**
  - **Variable interactions**

Model	Feed Rate (t/h)
CVD6-1	0.5 – 2
CVD32-1	40 – 70
CVD32-2	40 – 70
CVD42-1	70 – 100




MABC
MINING ASSOCIATION OF BRITISH COLUMBIA
Operating Mines and Proposed Mine Developments in British Columbia
(as of August 2008)
Metal Mines
commodity codes
Ag - Silver
Au - Gold
Cu - Copper
Mo - Molybdenum
Zn - Zinc
Coal Mines
type
PCI
Metallurgical
Coking
Thermal
Industrial Minerals
commodity codes
At - Aggregate
Ba - Barite
Bn - Bentonite
Bs - Basalt
Bu - Building stone
Cy - Clay
Da - Diatom
Di - Diorite
Do - Dolomite
Fr - Fullerís earth
Gy - Gypsum
Ls - Limestone
Ma - Magnetite
Mt - Magnesite
Mw - Mineral wool
Pu - Pumice
Sh - Shale
Si - Silica
Sy - Syenite
Ze - Zeolite
Mines and Quarries
11 Metal Mine
10 Coal Mine
36 Industrial Mineral
Proposed Mines
13 Metal
7 Coal
4 Industrial Mineral
Kilometres
N
Ruby Creek
Atlin
Tulsequah Chief
Fireside (Ba)
Table Mtn. (Au)
Fort Nelson
Dease Lake
Kutcho Creek
Schaft Creek
Galore Creek
Red Chris
Mount Klappan
Shasta
Kemess North
Kemess South (Au-Cu)
Sustut
Fort St. John
Bear River Gravel
Stewart
Swamp Point (At)
Gething
Chetwynd
Willow Creek
Brule (PCI)
Wapiti
Morrison
Tumbler Ridge
Hermann
Mt Milligan
Wolverine (Coking)
Trend (Coking)
Murray R.
Roman Mtn
Smithers
Davidson
Terrace
Prince Rupert
Noridon (Five Cabin)
Giscome (Ls)
Endako (Mo)
Huckleberry (Cu-Mo)
Prince George
Cariboo Gold Quartz
QR (Au-Ag-Cu)
Quesnel
Nazko (Pu, At)
Gibraltar (Cu-Mo)
Mount Polley (Au-Ag-Cu)
Bella Coola
Williams Lake
Moberly (Si)
Mount Brussilof (Mt)
Fording River (Metallurgical)
Golden
Greenhills (Metallurgical)
Line Creek (Metallurgical)
Prosperity
Z-2 (Ze)
Red Lake (Fr)
Harper Ranch (Ls)
Orca (At)
Pavilion (Ls)
Decor (Sh)
Revelstoke
Elkhorn (Gy)
Buse Lake (Si)
Mount Meager (Pu, At)
Kamloops
Falkland (Gy)
MAX (Mo)
4J (Gy)
Port Hardy
Apple Bay (Si, Cy)
Ashcroft (Bs)
New Afton
Highland Valley Copper (Cu-Mo-Au-Ag)
Crawford Bay (Do)
Elkview (Metallurgical)
Benson Lake (Ls)
Gillies Bay (Ls, At)
Craigmont (Ma)
Ginty (Bu)
Fernie
Campbell River
Merritt
Kelowna
Quinsam (Thermal & PCI)
Sechelt Carbonate
Kettle Valley (Bu)
Basin (Thermal)
Hills Bar
Winner (Mw)
Monteith Bay (Si)
Cranbrook
Cogburn
North Fork (Mw)
Nelson
Myra Falls (Zn-Cu-Au-Ag)
Hope
Copper Mountain
Lodgepole
Coal Mountain (Metallurgical)
Nanaimo
Vancouver
Bud (Bn)
Swansea Ridge (At)
Blubber Bay (Ls, At)
Grand Forks
Kootenay Stone / Gerex (Bu)
Sumas Mountain (Sh, Cy, Si)
Rock Creek (Do)
Van Anda (Ls)
Victoria
Eagle Rock
Lexington-Grenoble (Au-Cu)
Lime Creek (Ls)

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