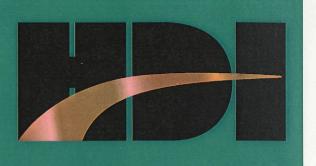
887909 Cinola Von Schretz Jan. 9/98



# MISTY MOUNTAIN GOLD LIMITED HARMONY PROJECT





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- Location, Access, Transportation
- Regional Geology
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- Mine Design
- Production Scheduling

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TAB 5: EXPLORATION POTENTIAL & SITE PHOTOS

#### MIST MOUNTAIN GOLD LIMITED

#### **Harmony Gold Project**

- The Harmony Gold Project is located on Graham Island, Queen Charlotte Islands, British Columbia. The site is approximately 770 km north of Vancouver and is accessed locally via logging roads from the towns of Queen Charlotte City and Port Clements.
- Transportation to the Queen Charlotte Islands is by aircraft to the airports at Sandspit and Masset (regular flights daily). Ferry transportation from the mainland (Prince Rupert) has sailings every few days.



#### **SITE LOCATION**





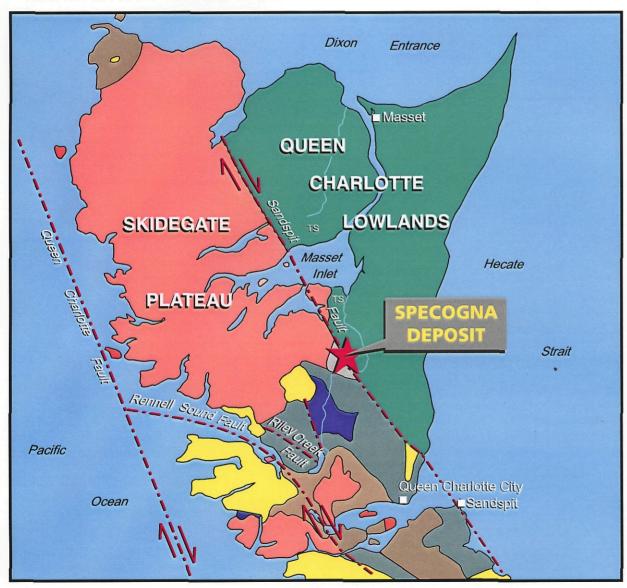
HARMONY GOLD PROJECT

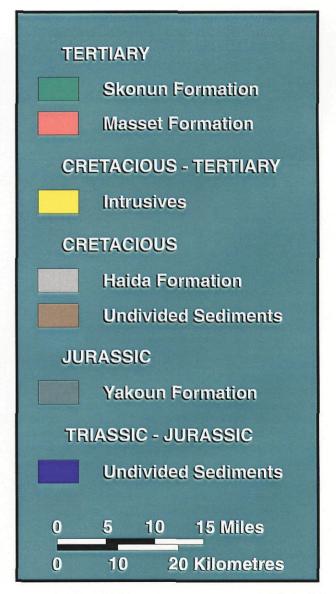
#### Plate # 2 & 3

- The Queen Charlotte Islands are within the Insular Belt of the Canadian Cordillera. The Islands are separated from the Pacific Ocean plate by the Queen Charlotte Fault and are included within the Pacific Continental Shelf. The physiographic region has been divided into the Queen Charlotte Ranges (Moresby Island), Skidegate Plateau and Queen Charlotte Lowlands. The boundaries between each of these physiographic units follow major northwest trending fault zones.
- The Late Tertiary faulting along the Sandspit fault and related faults was the mechanism for the uplifting and downwarping forming the basin (Queen Charlotte Lowlands).
- Epithermal gold deposits have been explored and developed all over the world and are most prevalent along the Pacific Rim.
   Pacific Rim epithermal gold deposits are associated with Tertiary subduction-related volcanoplutonism, commonly within Island arcs occurring at convergent plate boundaries.
- In tectonic settings of oblique convergence the plates slide past each other and major transform fault systems accommodate much of the displacement (e.g. Queen Charlotte Fault). Numerous subsidiary, parallel faults also develop as a result of this oblique plate convergence (e.g. Sandspit Fault). Other subsidiary fault structures also form between the strike-slip faults and often represent sites of compression or dilation (opening) due to the differential movement of the transcurrent faults. It is these dilational settings within fault systems that are favourable for epithermal gold mineralization (e.g. Specogna Deposit).



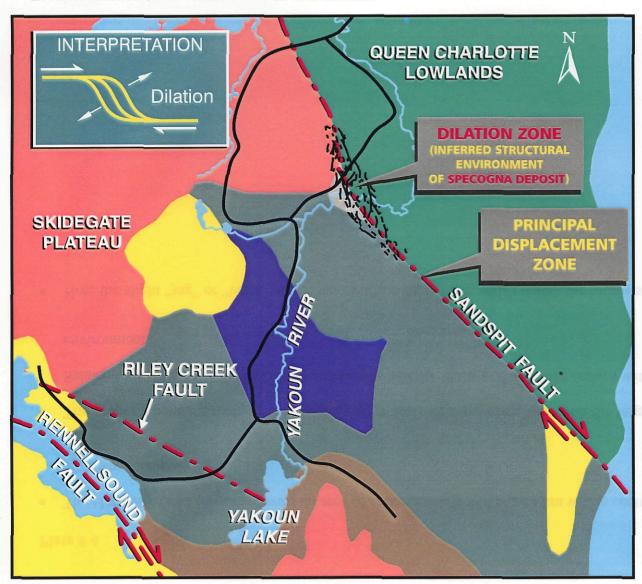
#### **REGIONAL GEOLOGY**

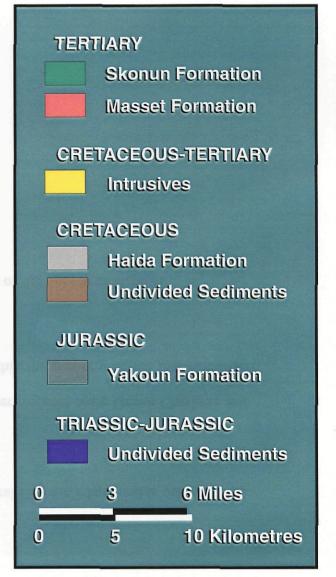






#### DILATIONAL FAULT SYSTEM

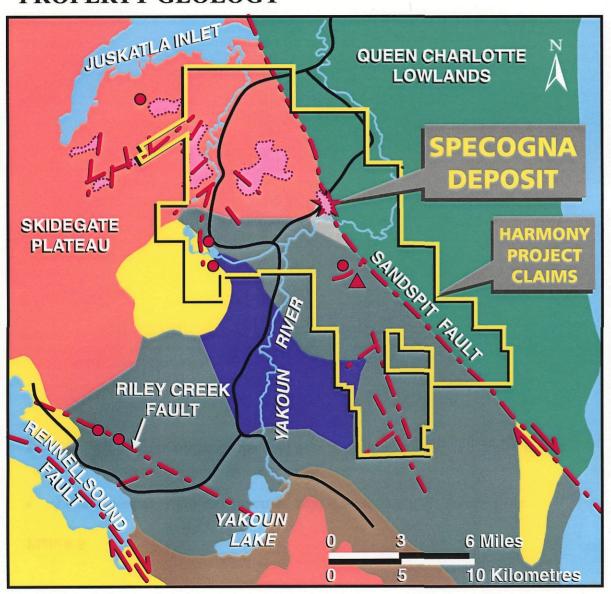




- The Harmony Gold property covers an area of approximately 444 square km within central Graham Island and is owned 100% by Misty Mountain Gold.
- The property contains many of the extensional tectonic features associated with the larger regional scale Queen Charlotte and Sandspit transform faults. Numerous subsidiary parallel faults and volcanic centres within the property define this extension environment.
- Note the slight "jog" or "bend" in the Sandspit/Specogna Fault which marks the location of the Specogna Deposit.



#### PROPERTY GEOLOGY

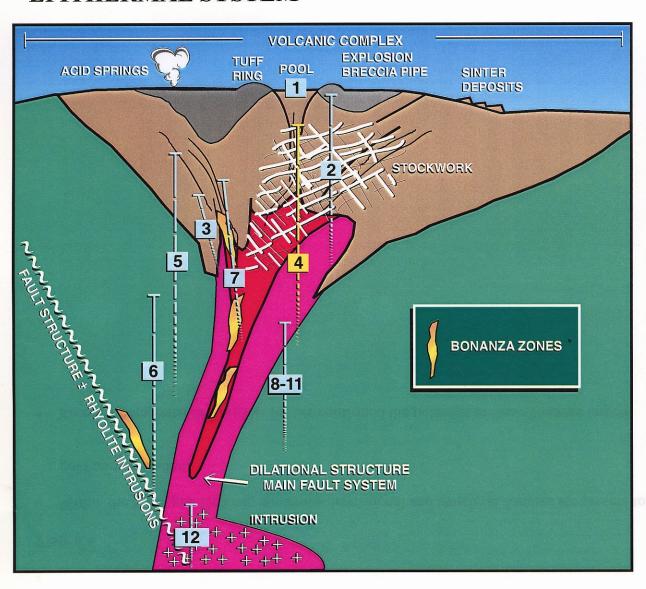


**Newly Discovered Gold Occurrence Gold Occurrence** Rhyolite **TERTIARY Skonun Formation Masset Formation CRETACEOUS-TERTIARY Intrusives CRETACEOUS Haida Formation Undivided Sediments JURASSIC** Yakoun Formation TRIASSIC-JURASSIC **Undivided Sediments** 

- A conceptual model of an epithermal gold system within the Pacific Rim.
- Note depth relationships for the gold deposits depicted in the conceptual model.



#### **EPITHERMAL SYSTEM**

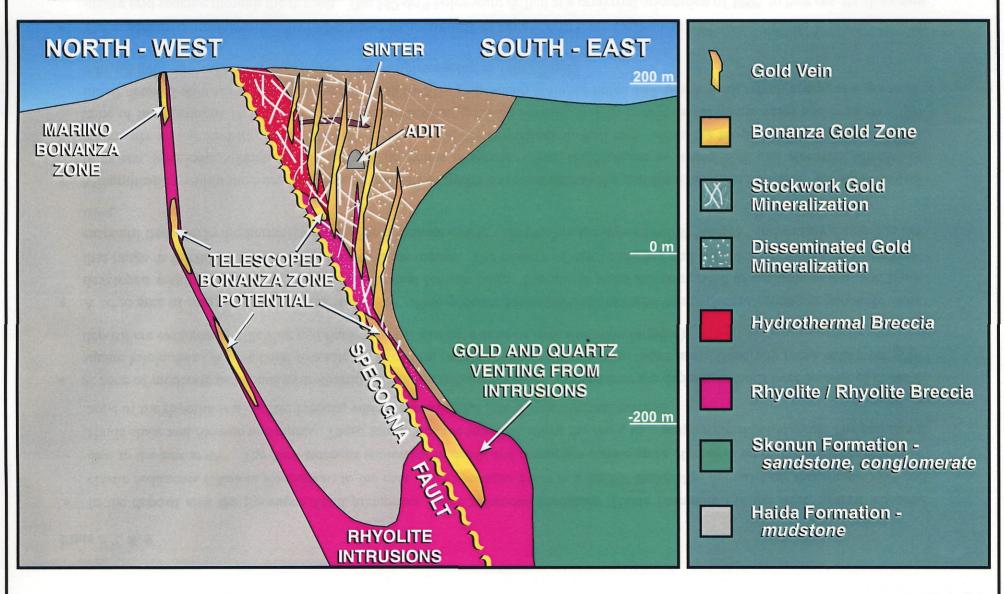


### **DEPTH RELATIONSHIPS Champagne Pool** McLaughlin Sleeper Specogna Karangahake 6 Waihi Hishikari 8 Sado Konami Tolukuma Misima Porgera

- Within the Specogna Deposit, numerous depositional and structural features are present to indicate potential targets for bonanza gold mineralization.
- Recently completed drilling has further confirmed the potential of these bonanza targets.



#### SPECOGNA DEPOSIT MODEL

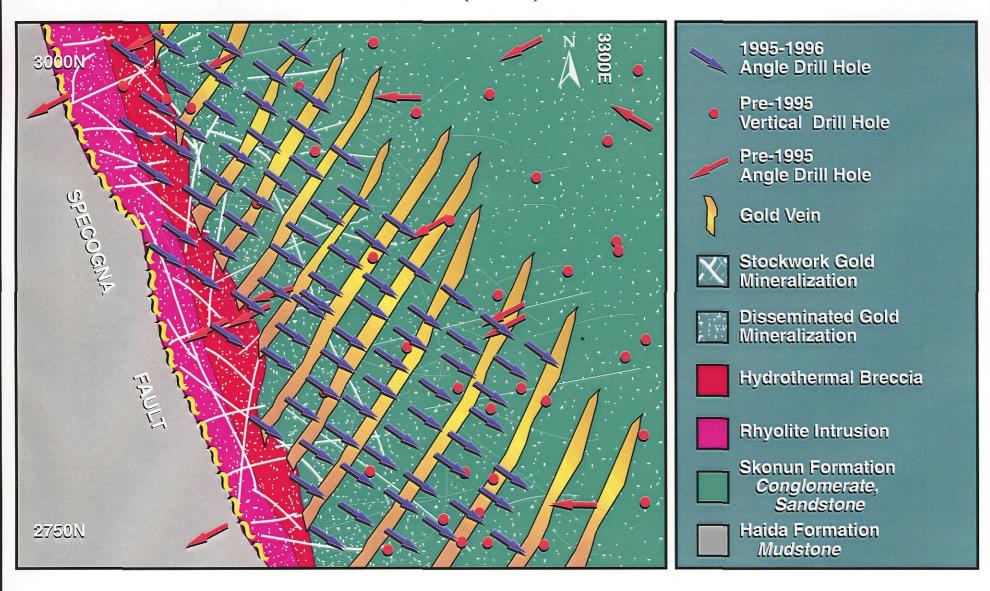


#### Plate # 7, 8, 9

- In the deposit area the Specogna Fault juxtaposes Late Cretaceous mudstone (Haida Formation) to the west, against Miocene clastic sediments (Skonun Formation) to the east. The Specogna Fault is a dextral strike-slip, normal fault that trends 162° and dips to the east at 48°. The fault steepens somewhat to depth and comprises a zone up to 70 metres wide that encloses blocks of Haida shale and Skonun sediments. These formations are intruded, along the fault, by a porphyritic rhyolite dyke. The peripheral zone of the rhyolite is a crackle breccia, which is transitional into a hydrothermal breccia.
- A zone of moderate to intense hydrothermal alteration (silicic-potassic), centred over the deposit, extends over an area of about 2 square kilometres. A peripheral less intense alteration (argillic) occurs over an even larger area. Generally rocks within the gold deposit are extensively silicified and flanked to the east by a zone of clay alteration (argillic).
- A large area of quartz veining occurs within the silicic-potassic hydrothermal alteration zone. Quartz veining is generally most developed within and adjacent to the hydrothermal breccia body. The quartz veins are comprised of multiple phases and types that range in thickness from a centimetre to three metres. The density of quartz veining and stockwork development decreases eastward from the hydrothermal breccia. The dominant quartz vein trend in the deposit is 020° to 045° and steeply dipping to the west.
- Mineralization within the Specogna deposit consists of pyrite and marcasite as the dominant sulphide minerals. Rarely observed is galena, sphalerite, cinnabar and chalcopyrite grains in quartz veins. Gold occurs as native gold and electrum, which are commonly visible in drill core. Gold also occurs as fine disseminations in wall rock within the broad silicic-potassic alteration zone of the Specogna Deposit. Higher concentrations of gold are associated with hydrothermal quartz veins and breccias. The initial detailed chip sampling of the adit in 1995 by Misty Mountain Gold, sampled 137 quartz veins which averaged a grade of 9.61 g/t gold while the intervening wall rock samples averaged 3.00 g/t gold.
- The exploration drilling programs in 1995 and 96 completed 147 angle drill holes totaling 34,627 metres of core at regular 20 × 20 -metre grid spacing through the deposit. The 147 drill holes were drilled at a preferred orientation of 120° to best cut the dominant trend of the quartz veining as determined in the underground sampling program. This drilling provided MGL with the necessary data to complete a sound resource estimate for the deposit.

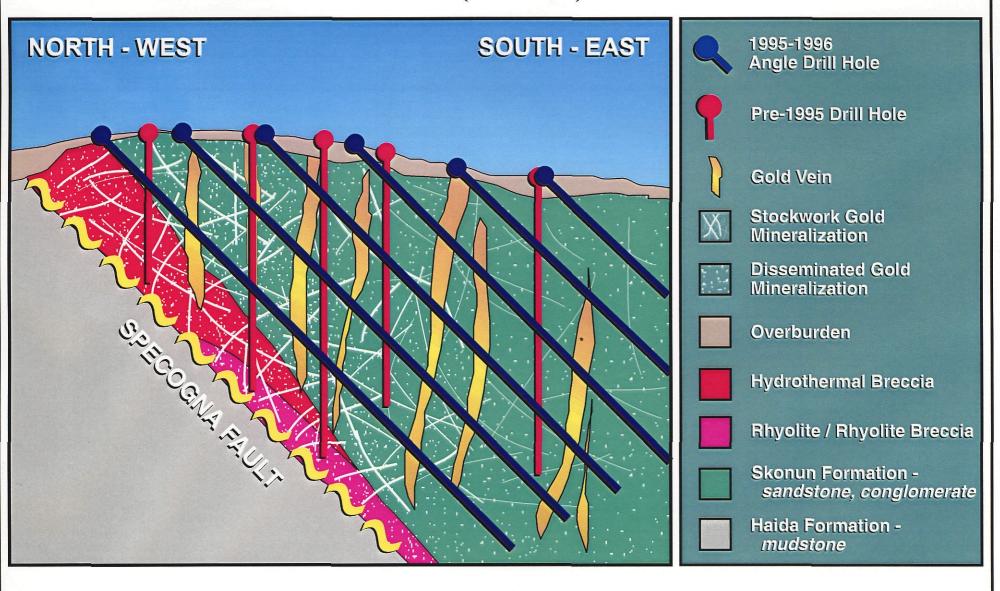


#### **VEIN VERSUS HOLE ORIENTATION (PLAN)**



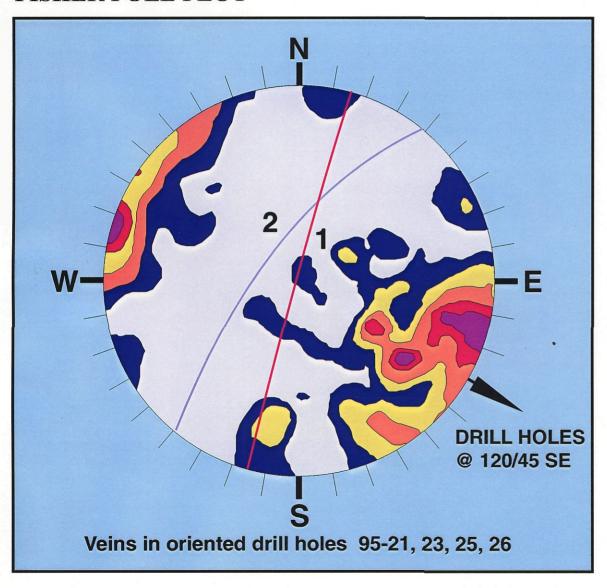


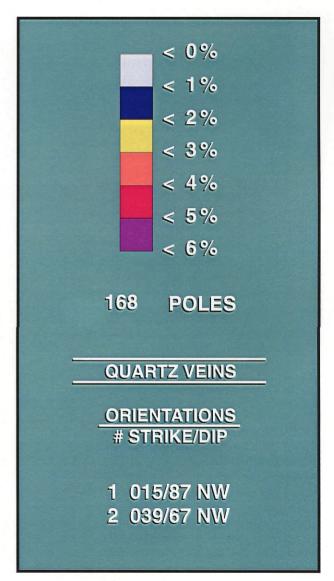
#### **VEIN VERSUS HOLE ORIENTATION (SECTION)**





#### FISHER POLE PLOT





#### Plate # 10, 11, 12, 13, 14, 15

- The MGL geological model incorporated all geological data prior to the MGL drilling and the 147 holes drilled by MGL in 1995-96.

  This model included 496 drill holes with 41,669 assay samples within the deposit.
- The initial step in the geological model construction was to verify all digital data versus the original hard copy data.
- The geological data were plotted onto cross-sections and a geological interpretation constructed.
- The cross-sectional interpretation was then transferred to level plans and a final geological interpretation completed.
- The geological model provided the basis for the interpretation of the Grade Model.
- The lithological boundary conditions were established for all lithologies used in the block model.
- Indicator variograms were calculated for all the lithologies and the preferred models were chosen to best represent the distribution of gold concentrations. These directions of continuity were in agreement with the directions of veining in the deposit.
- Multiple indicator kriging was used to estimate blocks in each of the six rock types from the geology model and two kriging passes
   were made to complete the resource estimate.
- A 10x10x10 metre block model, extending from surface (maximum 215-metre elevation) to the minus 160-metre elevation defined the limits of the geological resource. Using a 1.00 gram cut-off grade, slightly over 2.9 million ounces is contained in approximately 50 million tonnes grading 1.87 grams.

#### **DRILL HOLE DATA BASE (1971 - 1996)**

- € 496 Drill Holes (Core & Rotary) (MGL 147 holes, 34,629 m)
- € Gold Assays 41,669

#### **GEOLOGICAL ROCK TYPES**

	Specific Gravity
Skonun	2.55
Hydrothermal Breccia	2.60
Rhyolite	2.60
Mudflow Breccia	2.55
Haida Mudstone	2.54
Vein Sinter	2.51
Overburden	2.12



#### **DRILL HOLE DATA BASE (1971 - 1996)**

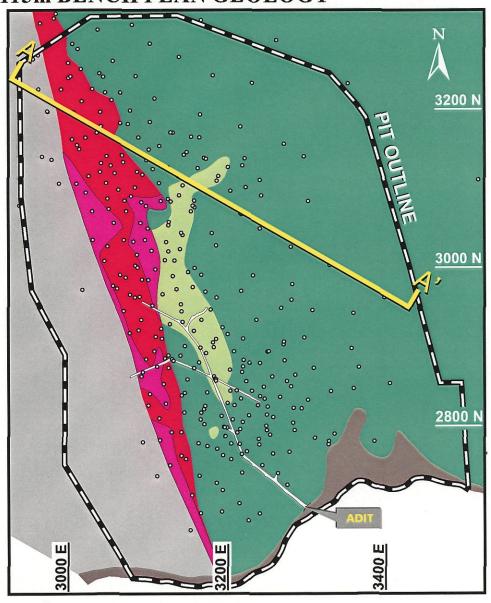
- 496 Drill Holes (Core & Rotary)
   (MGL 147 holes, 34,629 m)
- € Gold Assays 41,669

#### **GEOLOGICAL ROCK TYPES**

	Specific Gravity
Skonun	2.55
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Haida Mudstone	2.54
Vein Sinter	2.51
Overburden	2.12



#### 115m BENCH PLAN GEOLOGY



- Drill Hole Pierce Point
- Overburden
- Hydrothermal Breccia
- Rhyolite/Rhyolite Crackle Breccia/Rhyolite Breccia

### **Skonun Formation**

- Mudflow Breccia
- Conglomerate/Mudstone/ Sandstone

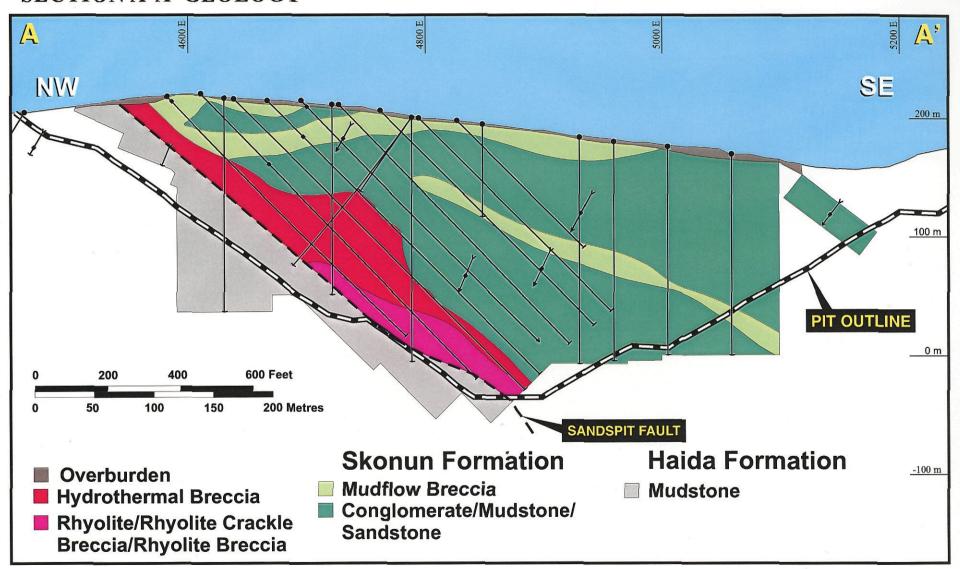
### **Haida Formation**

Mudstone



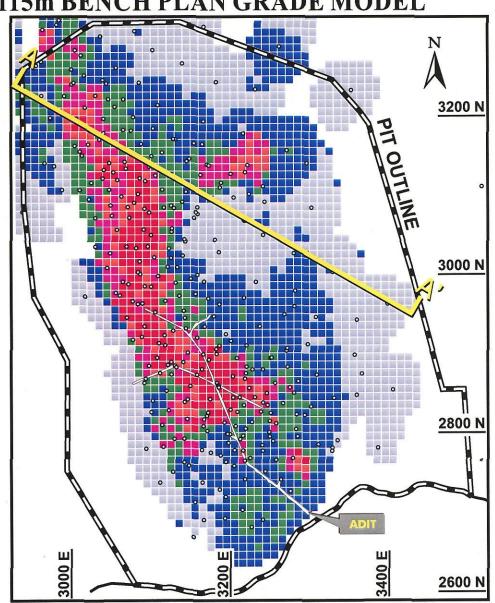


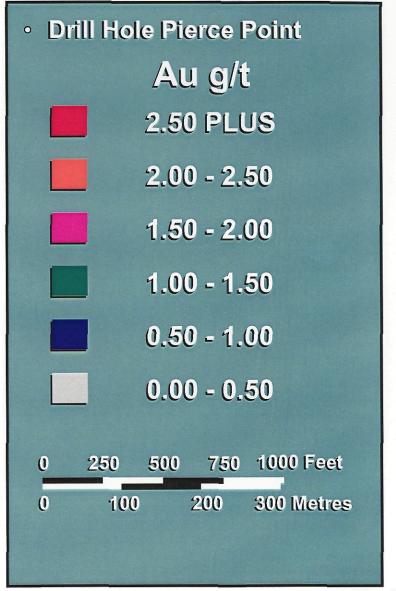
#### **SECTION A-A' GEOLOGY**





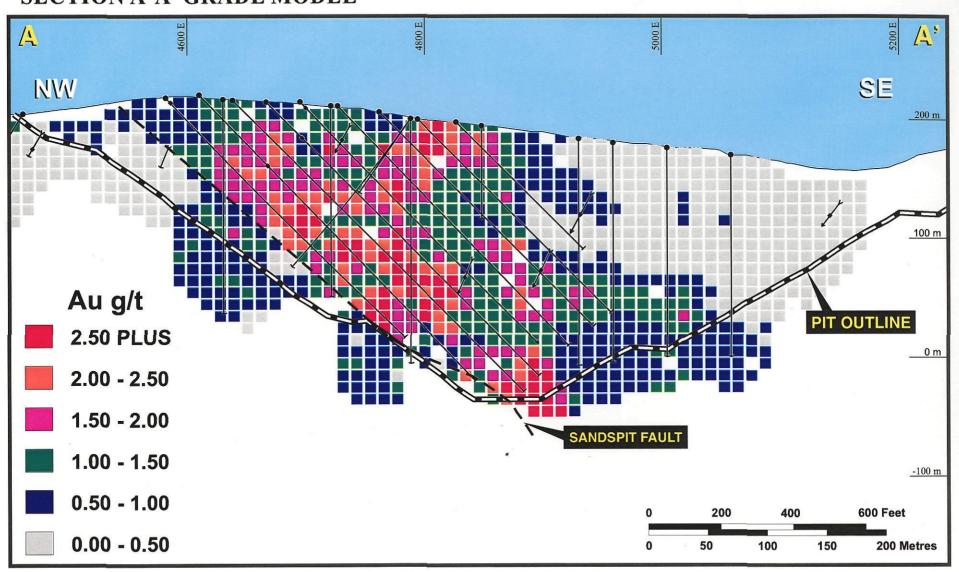
#### 115m BENCH PLAN GRADE MODEL







#### **SECTION A-A' GRADE MODEL**



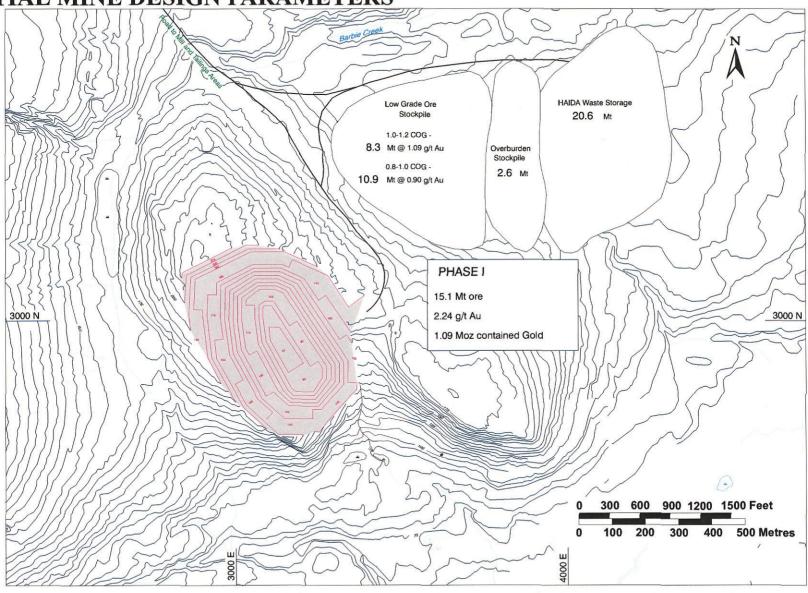


#### **BLOCK MODEL**

	GEOLOGICAL RESOURCE			
Cut-Off g/t Au	Million tonnes	Average Grade g/t Au	Contained Gold ounces	
2.00	14.3	3.00	1,380,460	
1.50	26.3	2.42	2,040,700	
1.00	48.8	1.87	2,926,970	

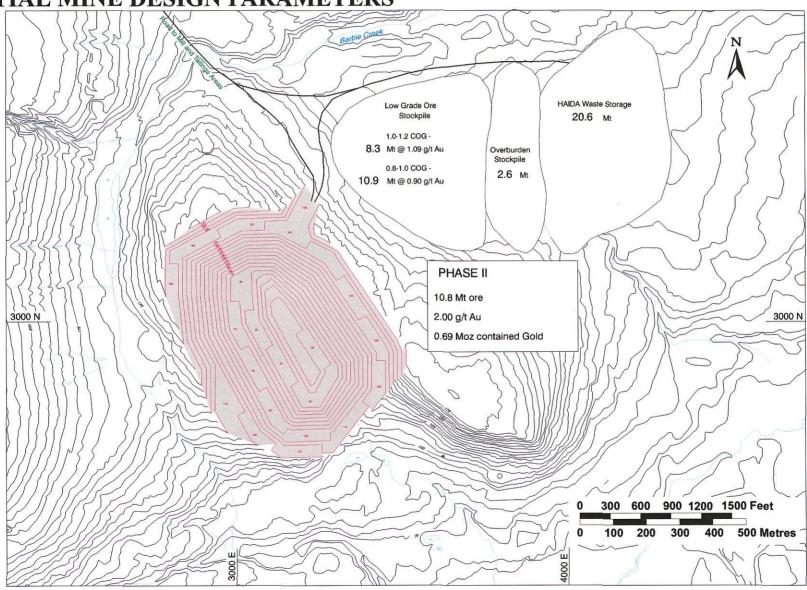


#### **INITIAL MINE DESIGN PARAMETERS**



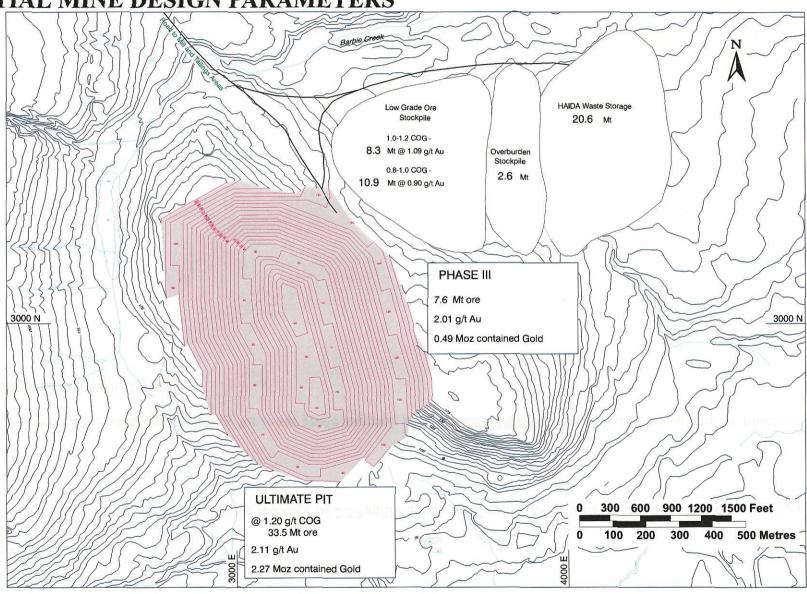


#### INITIAL MINE DESIGN PARAMETERS





#### INITIAL MINE DESIGN PARAMETERS



- At a 1.2 gram cut-off grade, a mineable resource of 2.27 million ounces of gold is contained in 33.5 million tonnes having an average grade of 2.11 grams.
- By incorporating a stockpiling policy for lower grade material, an additional 600,000 ounces would be available for processing after pit activities had ceased.



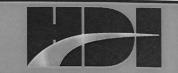
	MINEABLE RESOURCE			
Cut-Off g/t Au	K Tonnes	Average Grade g/t Au	Contained Gold K oz	
1.20	33,499	2.11	2,270	
1.00 - 1.20	8,300	1.09	292	
0.80 - 1.00	10,857	0.89	313	
Totals	52,656	1.70	2,875	

- The Skonun sediments represent the highest portion of the resource in terms of tonnage at 63% and represent 57% in contained ounces. The hydrothermal breccia and rhyolite units host the majority of the remaining gold mineralization.
- These three lithologies account for 91% of the contained gold within the mineable resource.



MATERIAL DISTRIBUTION						
Material Type	K Tonnes	Average Grade	Contained Gold			
		g/t Au	K oz	%		
Skonun	33,200	1.53	1,638	57		
Hydrothermal Breccia	9,678	2.20	684	24		
Rhyolite	4,118	2.18	288	10		
Mudflow Breccia	4,201	1.53	207	7		
Haida Mudstone	1,030	1.04	34	1		
Vein Sinter	429	1.76	24	1		
Total	52,656	1.70	2,875	100		

- A nominal production rate of 7,500 tonnes per day of ore was chosen as the base case (2.7 million tonnes per year).
- IMC calculated the annual production schedule over the 20 year period.
- Overall gold production of approximately 2.2 million ounces has been based on 76% recovery.



#### FORECASTED ANNUAL GOLD PRODUCTION

**Years 1 - 5** 

Average Grade

2.64 g/t Au

**Annual Ounces** 

174,200

**Years 6 - 10** 

Average Grade

1.95 g/t Au

**Annual Ounces** 

128,900

Years 11 - 20 (Stockpile Retrieval and Processing)

Average Grade

1.11 g/t Au

**Annual Ounces** 

73,400

#### **Estimated Recovered Gold**

2,185,000 ounces @ 76% recovery

• Mining at higher cut-off grades during the initial five years will provide an average grade of 2.64 grams. The remaining ore in the pit will be mined at a 1.20 gram cut-off grade.



### PRODUCTION SCHEDULE - ORE DELIVERIES TO BIOHEAP

	Direct Mining Open Pit Ore	Total to BioHeap		Waste (<0.80 g/t)
Years	Cut-Off	k tonnes	g/t Au	k tonnes
pre-prod.	1.80	0	0	184
1	1.80	2000	2.415	6742
2	1.80	2700	2.564	6444
2 3	1.80	2700	2.694	6538
4	1.50	2700	2.709	7731
5	1.50	2700	2.741	8040
6	1.20	2700	2.065	9596
7	1.20	2700	1.799	9199
8	1.20	2700	1.909	6549
9	1.20	2700	2.302	2902
10	1.20	2700	1.694	149
11		2700	1.458	
12		2700	1.458	to the state of th
13		2700	1.337	
14		2700	1.094	
15	*	2700	1.094	
16		2700	1.043	
17		2700	0.898	×
18	CO DELITOR MONTH IN SET	2700	0.898	d og na ba obsanærne
19		2700	0.898	
20		2056	0.898	
Total		52,656	1.699	64,074

Overall waste to ore stripping ratio 1.2:1.0

• Delivering lower grade material in the earlier years to a stockpile for reclaiming at the end of the pit operations will extend the project life by almost 10 years.



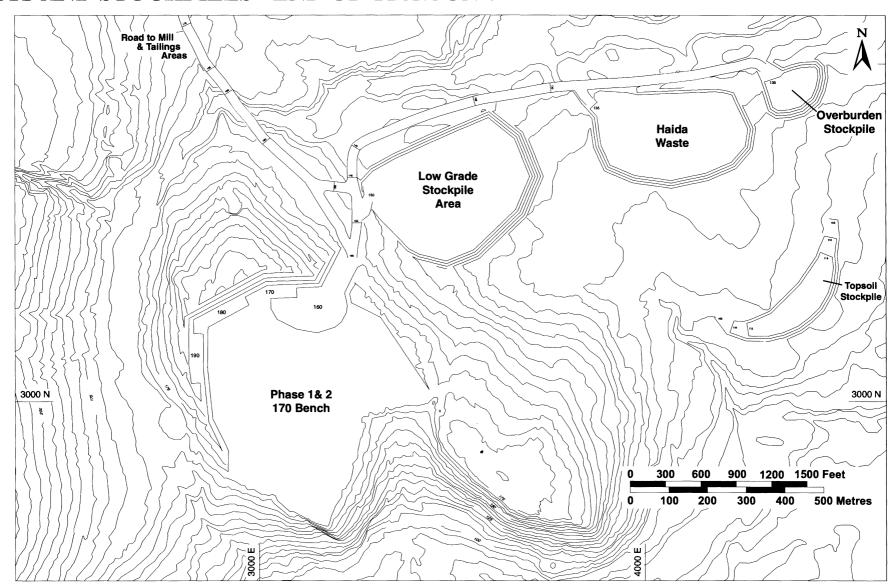
### STOCKPILE DELIVERIES

	High (		Potential Low Grade Stockpiles				
	Stock 1.20 g/t to CC	BioHeap	1.00 - 1.20 Stockpile		0.80 - 1.00 Stockpile		
Years	k tonnes	g/t Au	k tonnes	g/t Au	k tonnes	g/t Au	
pre-prod.	156	1.484	96	1.085	109	0.895	
1	2318	1.488	877	1.102	1163	0.899	
2	3103	1.494	641	1.091	812	0.898	
3	2311	1.487	995	1.098	1156	0.899	
4	1071	1.347	961	1.095	1237	0.900	
5	1078	1.331	920	1.094	962	0.899	
6			616	1.094	788	0.887	
7			876	1.089	925	0.900	
8			1189	1.093	1633	0.896	
9		j 6 8821.11	1103	1.090	1994	0.899	
10			26	1.102	78	0.898	
1	10,037	1.458	8,300	1.094	10,857	0.898	

• IMC has prepared annual drawings depicting the development of the open pit as well as the advancement of the stockpile areas.

TELE IMOUNTAIN COL

### PIT AND STOCKPILES - END OF YEAR ONE



#### Plates # 25, 26, 27, 28

- Illustrations of the sequence over the 10 year period while mining from the open pit.
- Initial requirements for the mining fleet include:

Two 250mm drills

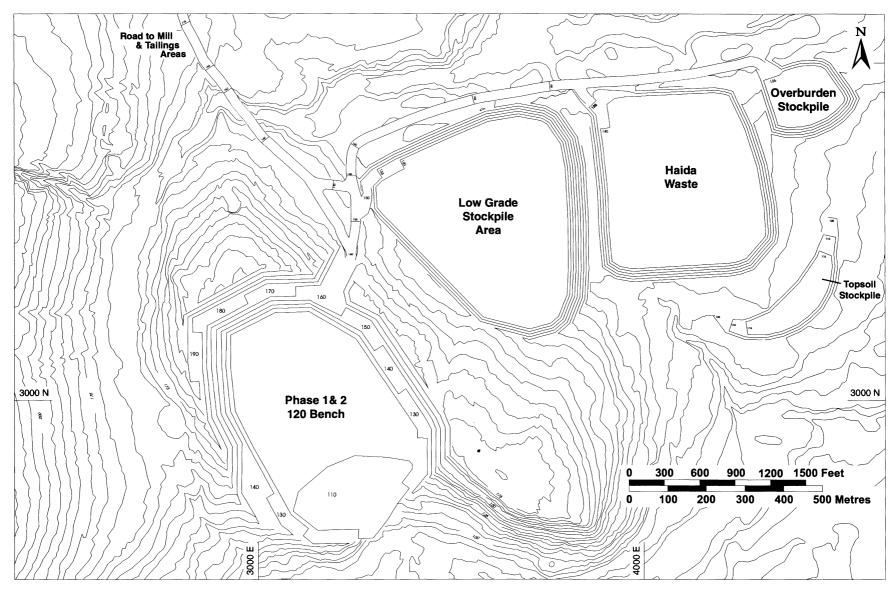
Two 10.3 cubic metre hydraulic shovels

One 10.7 cubic metre front end bader

Eight 80 tonne haulers

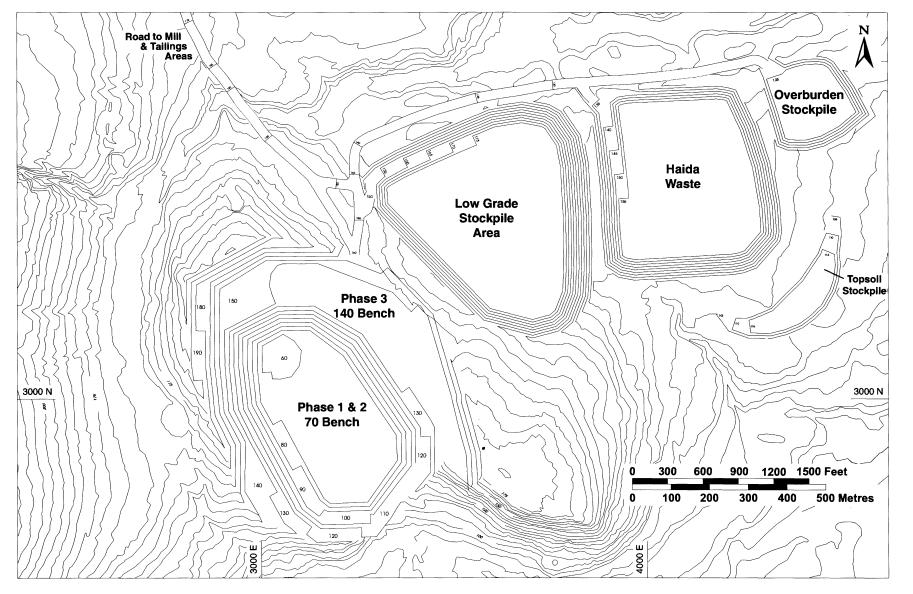
as well as the usual complement of track and rubber tired dozers, graders and service equipment.

#### PIT AND STOCKPILES - END OF YEAR THREE

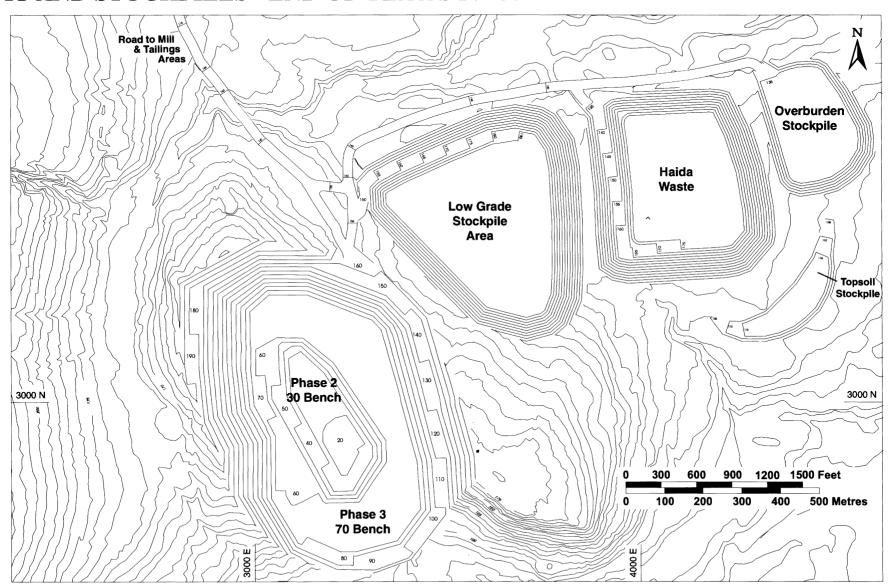


**Plate # 25** 

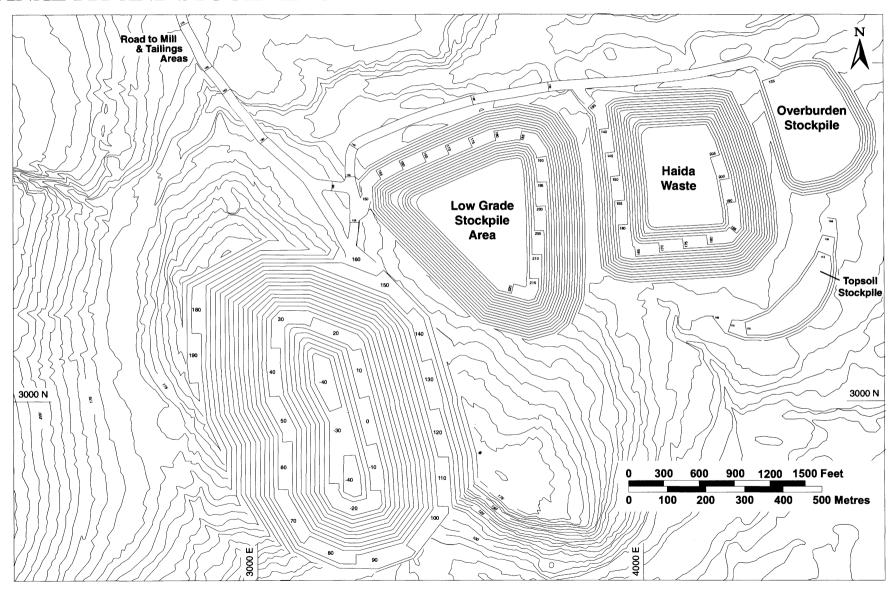
#### PIT AND STOCKPILES - END OF YEAR FIVE



### PIT AND STOCKPILES - END OF YEAR SEVEN



#### FINAL PIT AND STOCKPILES - END OF YEAR TEN





#### METALLURGICAL TESTING OBJECTIVES

Determine The Process That Suits The Ore

Dispel Unfounded Myths
 Like: - Refractory - Sulphidic Difficult
 - Silica Encapeulation - Pyrite Interlocking

Make The Best Suited Process Acceptable

#### METALLURGICAL TESTING STRATEGY

- Gravity Concentration
  - for coarse free gold
- Froth Flotation
- conventional process
- mineralogical information
- Fine Particle Technology
  - optimize recovery / extraction
- Diagnostic Leach
- determine ore constituents

• Although froth flotation achieved high gold recovery, the low concentration ratios encouraged the investigation of Bio-Oxidation leach processes.



			Grade (g Au/tonne)			% Gold Recovery			
Test number	Composite	Overall Con Weight %	Calc Head	Gravity Con	Ro Con+ Scav Con	Overall Con	Gravity Con	Ro Con+ Scav Con	Overall
F70	Overall	38.72	2.44	156	5.19	5.45	4.1	77.8	81.9
F78	Overall	46.12	2.41	160	4.17	4.41	4.8	78.5	84.3
F81	Overall	37.75	2.52	138	5.02	5.21	3.0	75.0	78.0
F82	Overall	48.57	3.03	191	5.17	5.40	3.7	82.9	86.6
F83	Overall	56.21	2.51	127	3.67	3.89	5.5	81.8	87.1

#### **DIAGNOSTIC LEACH**

Reactive	Carbon	float
110001110	Calbul	noat

4.3%

Cyanide

- free gold

30.4%

Carbonate float

- carbonates & oxides

22.3%

• HCI:HNO<sub>3</sub>/Cyanide

- sulphides

39.6%

Residual

- silicates

3.4%



### **BIO - OXIDATION PLANTS HAVING OXIDOR INPUT AND DESIGN**

Bio - Oxidation processes have been or are being installed in the following plants.

1.	1984	Fairview	South Africa	40 tpd of concentrate	
2.	1990	Sao Bênto	Brazil	Biox then pressure oxidation at 150 tpd concentrate	
3.	1991	Harbor Lights	Australia	45 tpd concentrate (mining completed)	
4.	1993	Willuna	Australia	115 tpd concentrate presently expanding to 150 tpd concentrate	
5.	1993	Ashanti Gold Fields	Ghana	1000 tpd concentrate @10% sulphur	
6.	1997	Pamboraque	Peru	60 tpd to treat pyrite (under construction)	
7.	1998	Amantaytau	Uzbekistan	1000 tpd of concentrate at 2x the sulphur of Ashanti (engineering in progress)	
	A 1900 tpd Bio-Oxidation plant at harmony would be well within existing and proven technology as the sulphur throughput would be equal to Ashanti.				



#### **BIO-OXIDATION / AMMONIUM THIOSULPHATE TESTING**

### OXIDOR / LAKEFIELD

Bio - Oxidation Ore Amenability Tests

- Completed

Bio - Oxidation Flotation Concentrate

- Completed

Ammonium Thiosulphate Amenability Tests

- Completed

 BioHeap Column Tests with Cyanide and **Ammonium Thiosulphate Extraction** 

- In Progress
- Bio Oxidation Low Grade Ore Amenability Tests In Progress

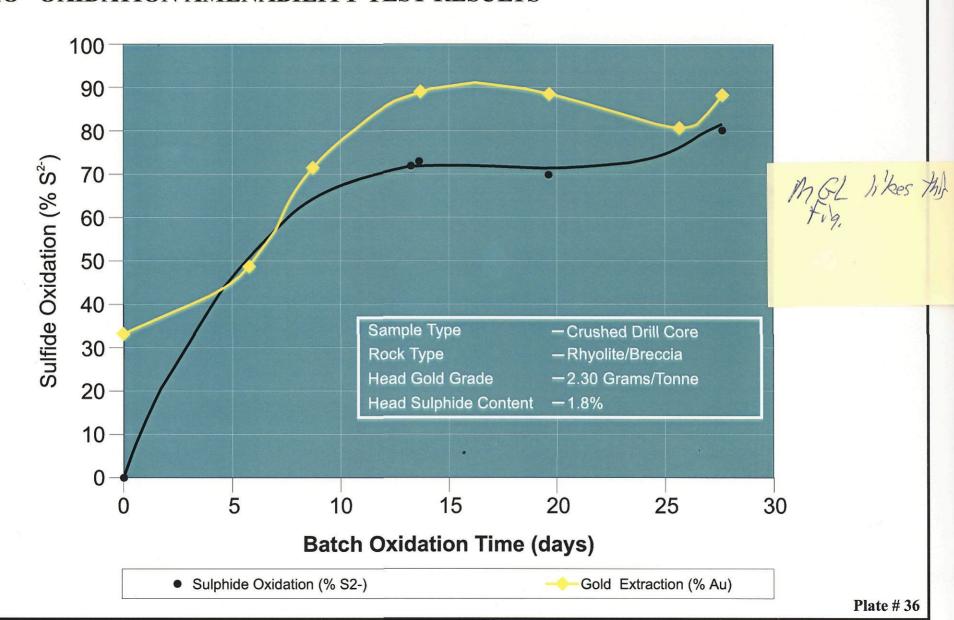
#### **BIO-OXIDATION AMENABILITY TESTWORK**

### Other Notable Results

- No preg' robbing of base line cyanidations
- Net acid consumption's:
  - ▲ HBRL-X 5.0 kg/tonne
- Initial acid Inoculation only No additional acid or lime
- ▲ SEDL-X 39.5 kg/tonne Initial acid Inoculation only No additional acid. Some limestone to regulate pH

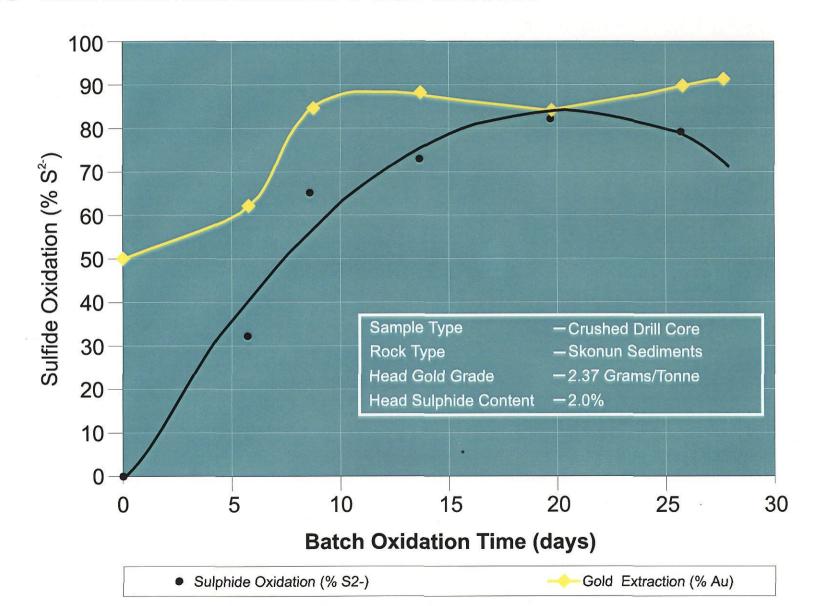


#### **BIO-OXIDATION AMENABILITY TEST RESULTS**



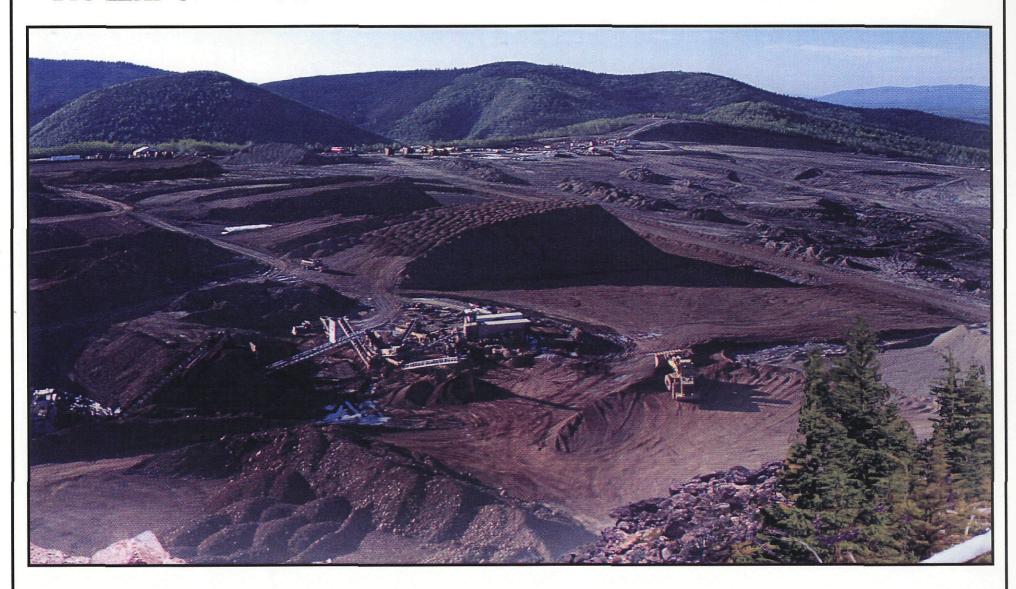


#### **BIO-OXIDATION AMENABILITY TEST RESULTS**



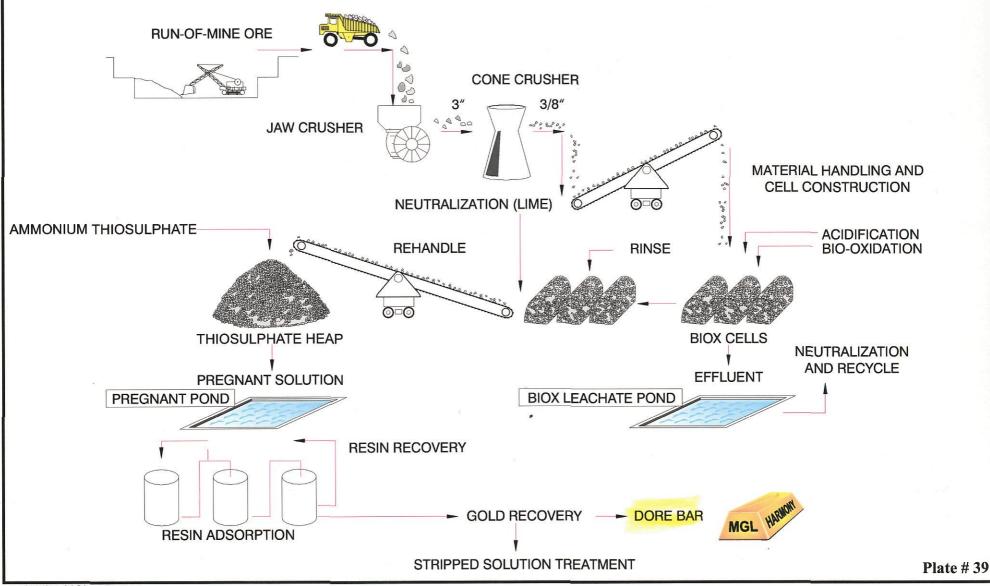


### **BIOHEAP OPERATION**



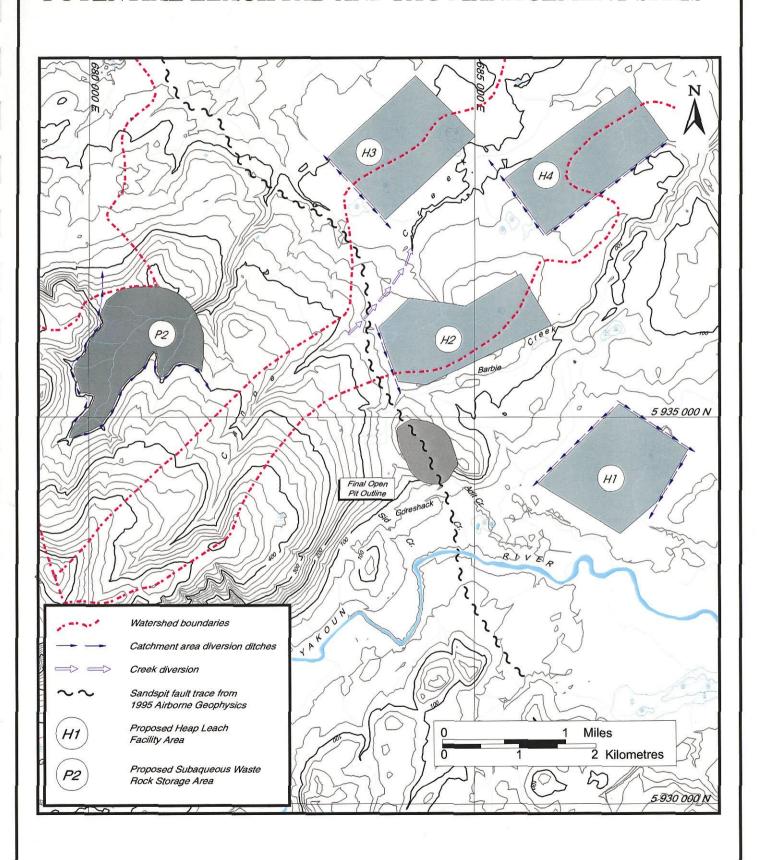


### CONCEPTUAL PROCESS FLOWSHEET HEAP BIO-OXIDATION /AMMONIUM THIOSULPHATE EXTRACTION





#### POTENTIAL LEACH PAD AND PAG MANAGEMENT SITES





#### **SOUND PROJECT**

- advanced stage of approval reached in prior review.....no "fatal flaws"
- not located in *virgin wilderness*
- extensive engineering and environmental studies
- innovative new approach to mine development planning
- focus on 'environmental stewardship'



#### IDEAL SOCIO-POLITICAL CLIMATE

- Deficit/debt issues reinforce government focus on stimulating economic development
- "Browning" of the B.C. cabinet Premier Clark's new mantra is jobs, jobs, jobs
- Significant deterioration in QCI economy
  - ▲ shutdown of Masset CFB
  - ▲ decline in sport/comm. fish harvest
  - ▲ cutbacks in timber harvest quotas
- Economic/job issues ranked highest concern by 67% of QCI residents
- Environmental issues ranked highest concern by only 15 % of QCI residents



### IDEAL SOCIO-POLITICAL CLIMATE (cont'd)

- Contrary to popular belief .....B.C. Mine approvals continue
  - 9 new mines opened since 1987
  - ↑ This is a project of a project of the pr
  - ▲ 12 mines in review process
- No mine approvals denied due to First Nations Issues

 New streamlined, single window review -Canada/B.C. Cooperation Agmt. on Environmental Assessment (Apr/97)



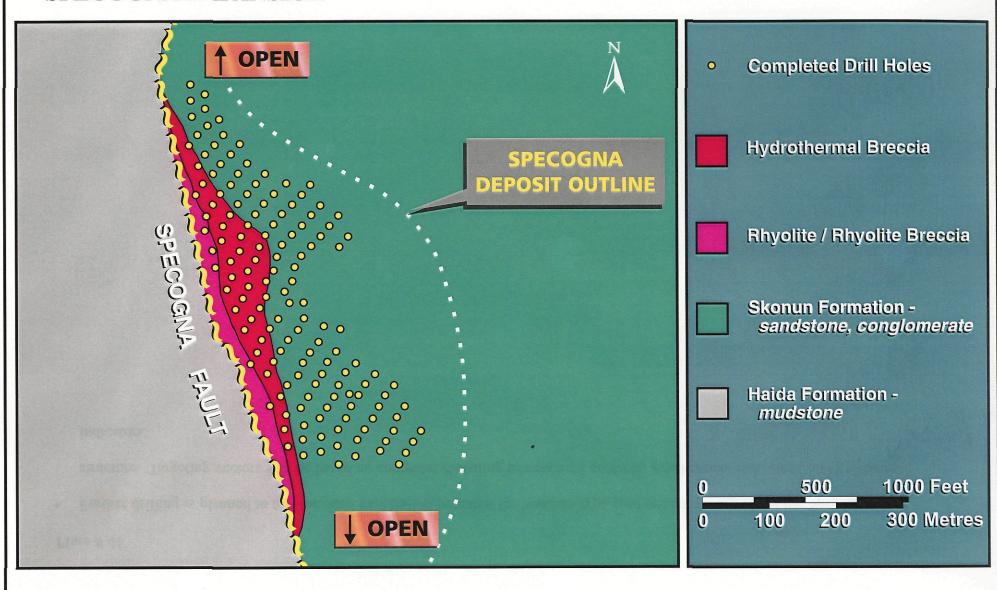
### SUMMARY

- Harmony is permittable
- Socio-political climate ideal
- Timing is right.....timing is now

• A plan view of the deposit area and geology with the completed 1995 & 1996 drill collars. Further areas along strike of the Specogna Fault in both the north and south direction are untested.



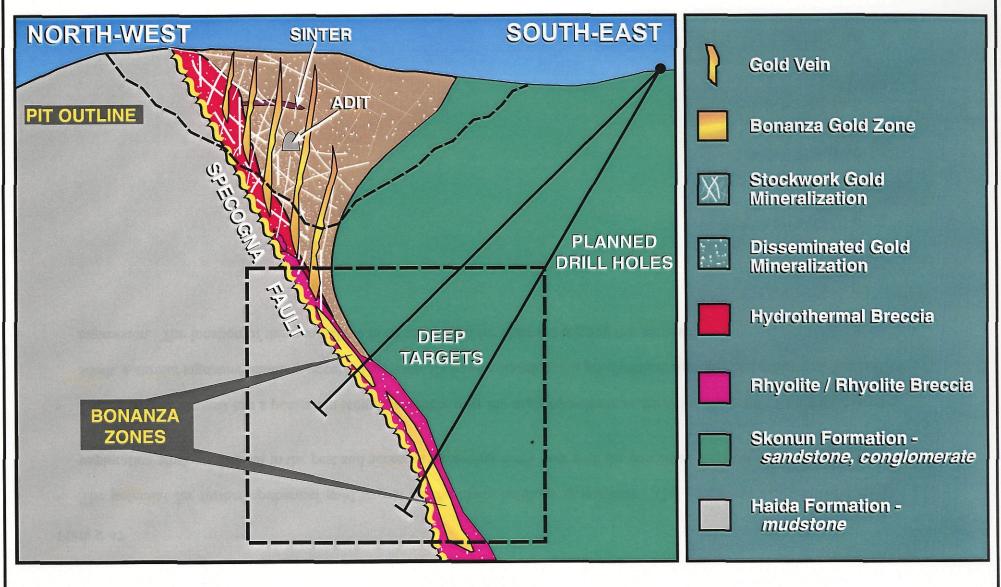
#### **SPECOGNA EXPANSION**



• Further drilling is planned to test the deep exploration potential for bonanza type gold mineralization along the Specogna Fault structure. Targeting vectors will be based on computer modeling of structural controls, geochemical indicators, and geothermal indicators.



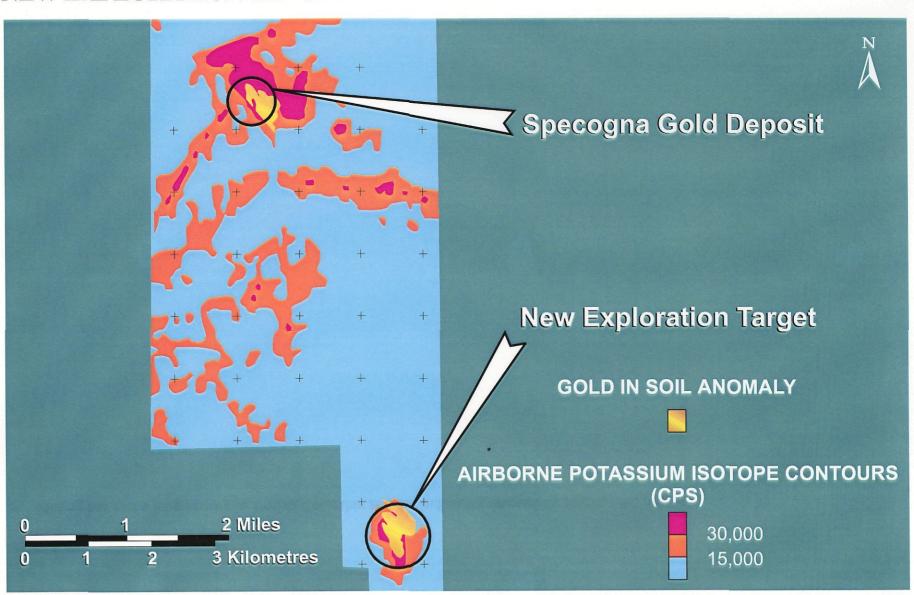
#### **DEEP EXPLORATION TARGETS**



- The potential for further epithermal gold targets on the claim holdings is immense. The region has had relatively minor exploration work carried out in the past and access is improving every year with the continued clear cut logging in the region.
- The Specogna Deposit has a potassium isotope anomaly over the main hydrothermal alteration zone, and within 8 km to the south, a similar signature anomaly occurs. This anomaly has a coincident Au geochemical signature and resistive topographic expression. The location of this anomaly is in an area slated for clear-cut logging this summer.



### **NEW EXPLORATION TARGET**



• Mining has had a long history in British Columbia and the industry continues throughout the province.

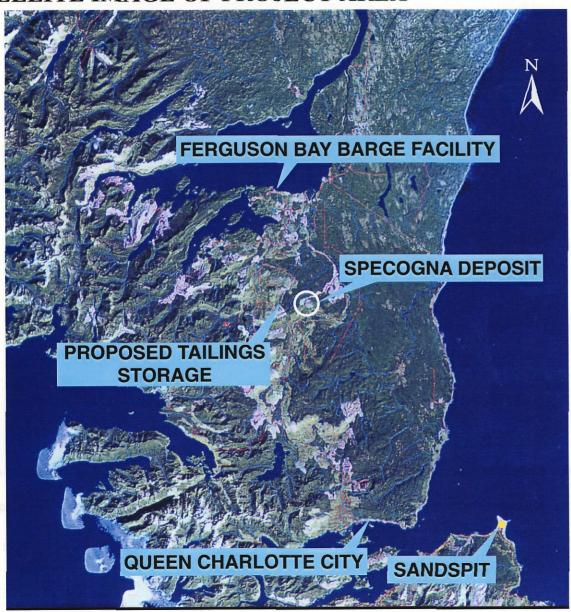
### **MISTY MOUNTAIN GOLD LIMITED HARMONY PROJECT B.C. OPERATING MINES** Erickson Golden Bear Snip Eskay Premier Coal Mines **Metal Mines Bullmoose** Quintette | **Endako** QR Gibraltar Goldstream **Island Copper Highland Valley** Fording Greenhills Sullivan Line Creek Quinsam Elkview Byron Creek Similco Westmin **Nickel Plate**

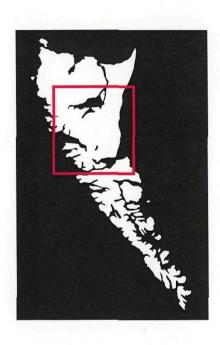
**Plate # 48** 

• Satellite image of central Graham Island showing the areas of industrial activity in the region.



### SATELLITE IMAGE OF PROJECT AREA





• Aerial photograph of the local area of the Specogna Deposit. The deposit is located in the center of the photograph and is covered by second growth forest. Note recent clear cut logging adjacent to the deposit both east (right) and west (left).



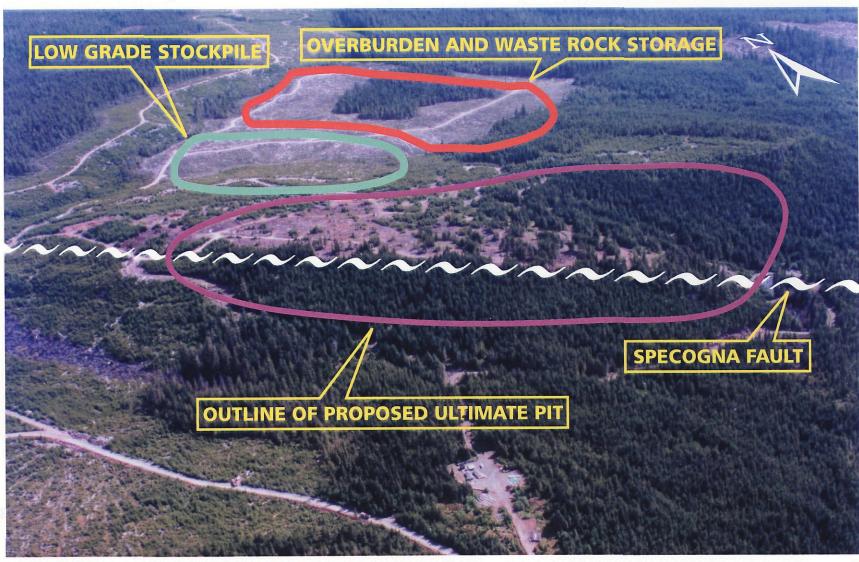
## RESOURCE DEVELOPMENT AND ENVIRONMENT



• Photograph showing the conceptualized areas of the mine site development.



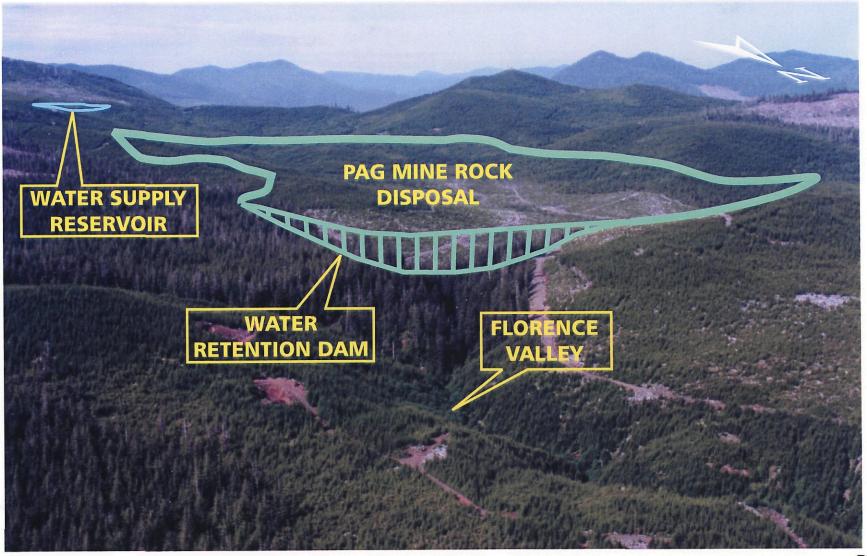
# OPEN PIT AND STOCKPILE SITES (LOOKING EAST)



• Photograph of the proposed Potential Acid Generating, mine rock disposal site northwest of the deposit.

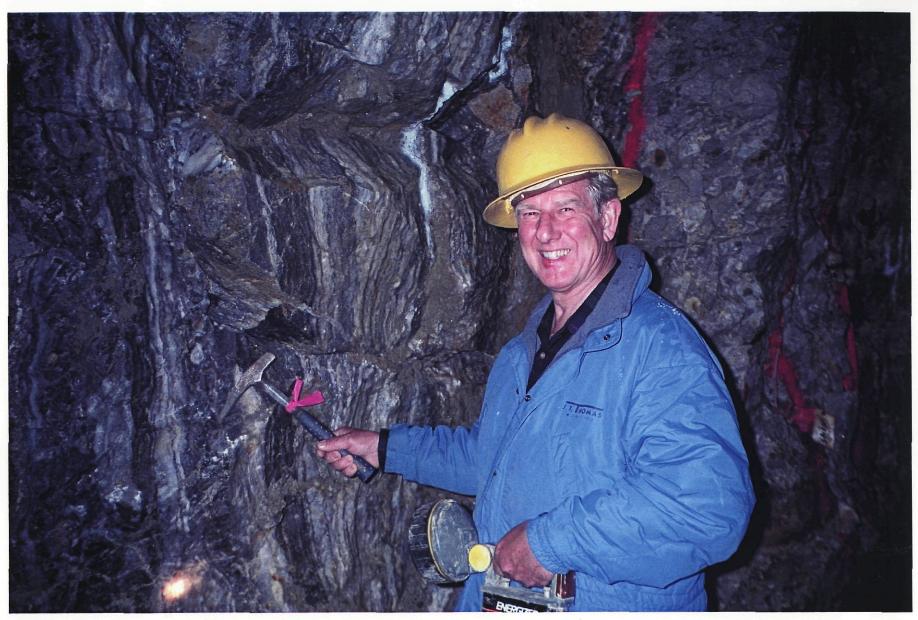


# TAILINGS AND WASTE ROCK DISPOSAL SITES (LOOKING WEST)



• Mr. Robert Hunter (Chief Executive Officer) standing in front of a large, multibanded, epithermal quartz vein underground in the 114-metre level adit.





• Sample of drill core from the 1996 dr ram showing regregates of free gold within a dark silica vein.



### **BONANZA GOLD**

