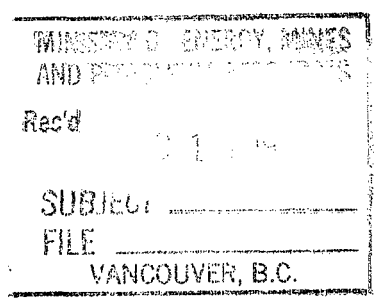
ASSESSMENT REPORT

1987 DIAMOND DRILLING UNDERTAKEN ON THE BIG MISSOURI PROPERTY STEWART, BRITISH COLUMBIA

Claims involved:	East Group; West Group
Mining Division:	Skeena
NTS Location:	Map 104B/1E
Latitude & Longitude:	56°05'N; 130°00'W
Owner of Claims:	Tournigan Mining Explorations Ltd. Westmin Resources Limited
Operator:	Westmin Resources Limited
Author:	Shaun M. Dykes Project Geologist Westmin Resources Limited
Date:	December 3, 1987

87-1060


MINISTRY OF ENERGY, MINES
AND
Rec'd
SUBJECT
FILE
VANCOUVER, B.C.

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INTRODUCTION

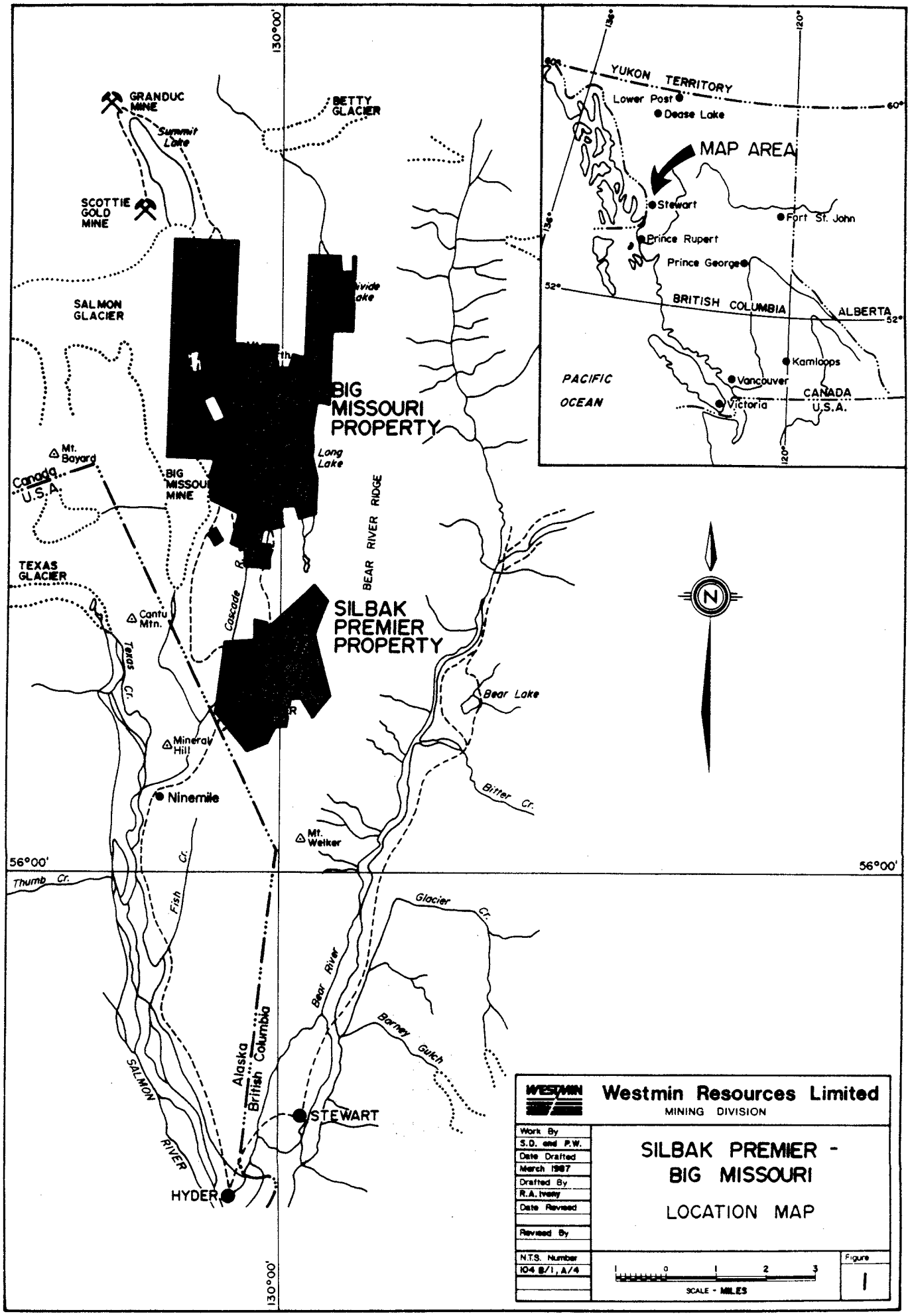
The Big Missouri Property is located 25 kilometers north of the town of Stewart, B.C. and situated between the Silbak Premier and Granduc Mines in northwestern British Columbia (Fig. 1).

The property is accessible by road during snow-free months by way of the Granduc road from Stewart to Premier and then by the Big Missouri road into Joker Flats and the claims areas (Fig. 1 and Fig. 2).

The Big Missouri Mine was discovered in 1904, and was subsequently put in production between 1938 and 1942 by Consolidated Mining and Smelting Co. (Cominco). Subsequent to the mine closure in 1942, there have been several attempts by various mining companies to re-evaluate the mineral potential in the area. This includes:

- work by Hecla Mining
- geological work by Falconbridge in 1966
- geological and geochemical work by El Paso in 1970.
- extensive underground sampling by Aetna Mines in late 1960's and early 1970's, and
- diamond drilling by Giant Mascot Mines in 1974.

Since the fall of 1973, Tournigan Mining Explorations Ltd. has held title to the property. In 1979 Tournigan and Westmin Resources Limited entered into agreement whereby Westmin Resources Limited by fullfilling certain obligations, could earn an interest in the property. It is in conjunction with this agreement that the 1986 geophysical program was undertaken.


GRANDUC MINE
BETTY GLACIER
Summit Lake
SCOTTIE GOLD MINE
SALMON GLACIER
BIG MISSOURI PROPERTY
Long Lake
Mt. Bayard
Canada U.S.A.
BIG MISSOURI MINE
TEXAS GLACIER
Cantu Mtn.
Texas Cr.
Cascade R.
BEAR RIVER RIDGE
SILBAK PREMIER PROPERTY
Bear Lake
Bitter Cr.
Mineral Hill
Ninemile
Mt. Welker
56°00'
Thumb Cr.
Fish Cr.
Glacier Cr.
Bear River
Barney Gulch
SALMON RIVER
Alaska
British Columbia
STEWART
HYDER
130°00'
YUKON TERRITORY
Lower Post
Dease Lake
MAP AREA
Stewart
Fort St. John
Prince Rupert
Prince George
BRITISH COLUMBIA
ALBERTA
Kamloops
PACIFIC OCEAN
Vancouver
Victoria
CANADA U.S.A.
60°
52°
120°
N
Westmin Resources Limited
MINING DIVISION
Work By
S.D. and P.W.
Date Drafted
March 1987
Drafted By
R.A. Ivesy
Date Revised
Revised By
N.T.S. Number
104 B/1, A/4
SILBAK PREMIER - BIG MISSOURI
LOCATION MAP
Figure
1
SCALE - MILES

GEOLOGY AND MINERALIZATION

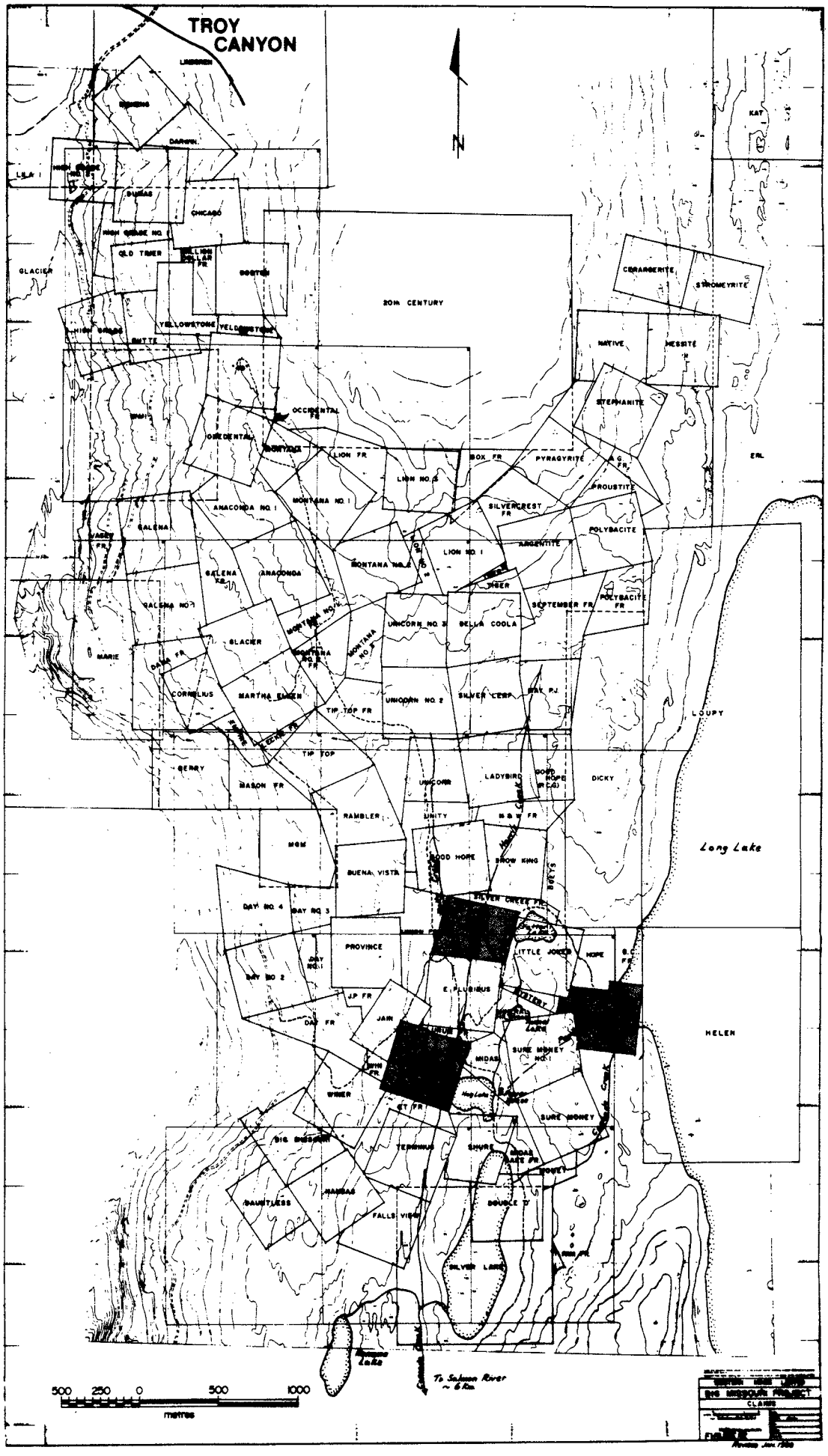
The volcanic sequence consists of agglomerates, tuffs and flows of andesitic composition intercalated with cherty tuff bands. The sequence is cross-cut by andesitic and granitic dykes, and truncated by numerous faults of several ages. The mineralization observed consists of fine grained disseminated pyrite with or without sphalerite and galena contained mainly in the cherty tuff horizons or as small sulphide stringers and veinlets within the andesite. Gold and silver values are erratic. Better intersections are commonly in the 0.10 to 0.15 oz/T Au and 0.5 to 1.0 oz/T Ag range. Lead and zinc values greater than 1% are present locally. Nature and control of the gold and silver distribution is as yet unknown.

Sericitization and silicification are the predominant alteration types within the mineralized zones. Sericitization is the most pervasive and widespread, while silicification is found locally in relationship to the mineralized horizons.

The preliminary interpretation of the geological environment is that the mineralization occurs in narrow stratabound interflow siliceous exhalative horizons.

PURPOSE

Diamond drilling described in this report was undertaken to examine the continuity of mineralization observed in surface showings on the Laura and Golden Crown claims and to determine structures and rock strengths in the vicinity of the proposed hydroelectric dam on the Pass Fraction. The drilling was undertaken by Boisvenu Diamond Drilling Ltd. under the supervision of Westmin exploration personnel and Sigma Engineering Ltd. Figure 2 shows the location of the drilling.



AREA OF 1987 ASSESSMENT DRILLING

DIAMOND DRILL PROGRAM AND RESULTS

Laura Claim

A total of 143.9 m in 3 NQ diamond drill holes was completed on the Laura claim. The purpose of the drilling was to test the up-dip extension of a zone of semi-massive sulphide (Au-Ag-Cu-Pb-Zn) known as the Creek zone (Figure 3). The sulphide is contained within the lower cherty tuff horizon hosting the Dago deposit located 500 metres to the south.

Holes 87-50, 87-51 located 50 m up-dip from the surface showing (Figures 3 & 4) intersected the cherty tuff horizon hosting the mineralization near surface. Assays returned only low grade results (Appendix C). Hole 87-52 intersected 2.5 m of the cherty tuff which assayed 0.033 oz Au/t, and 0.13 oz Ag/t over 4.21 m. The intersection is a low precious metal-zinc rich typical of those located on the edge of the high precious-base metal rich exhalative centres.

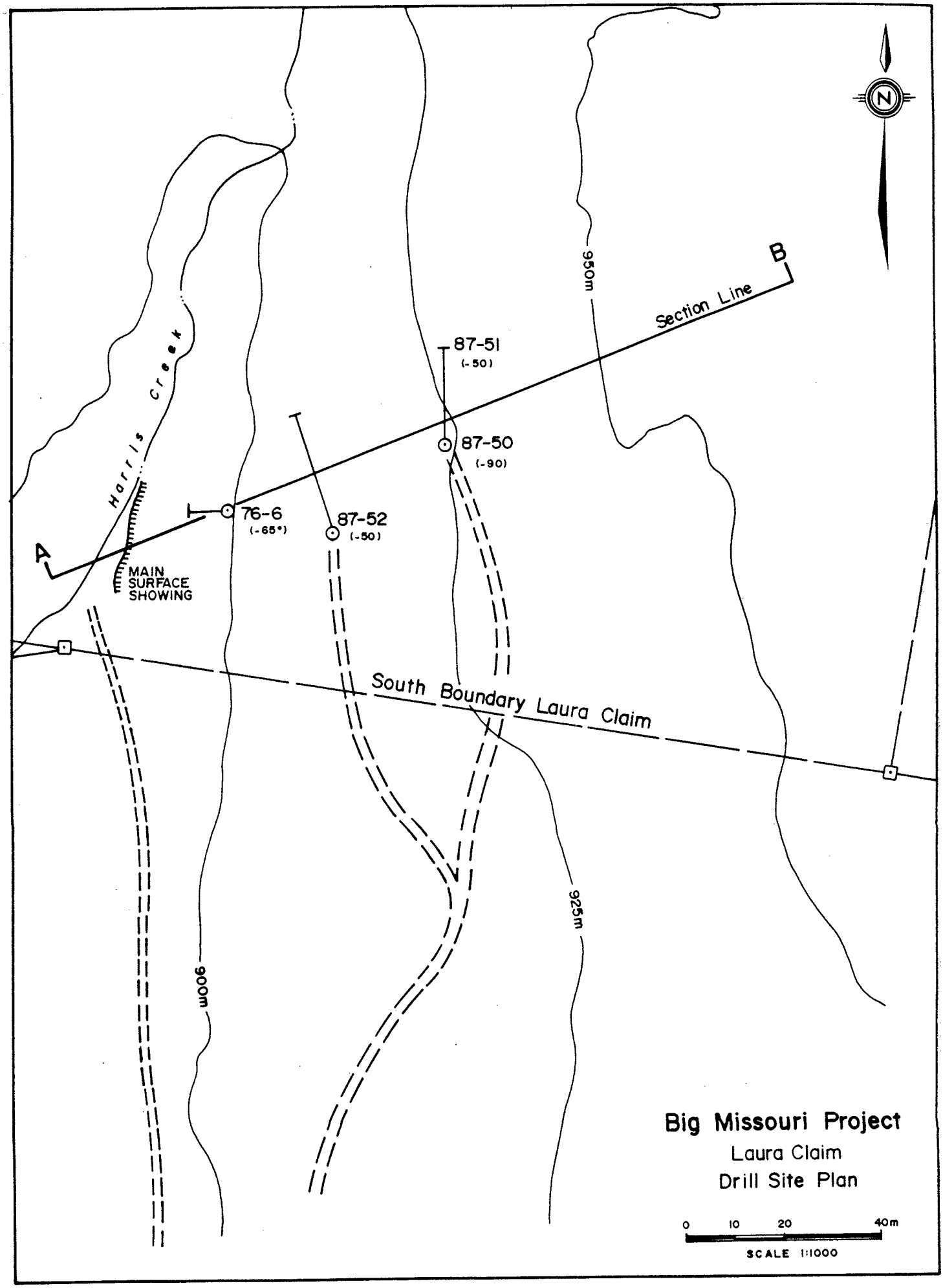
The drilling indicates the surface exposure has limited up-dip potential with mineralization confined to a narrow lens, approximately 50 m long x 25 m wide and 2.3 m thick.

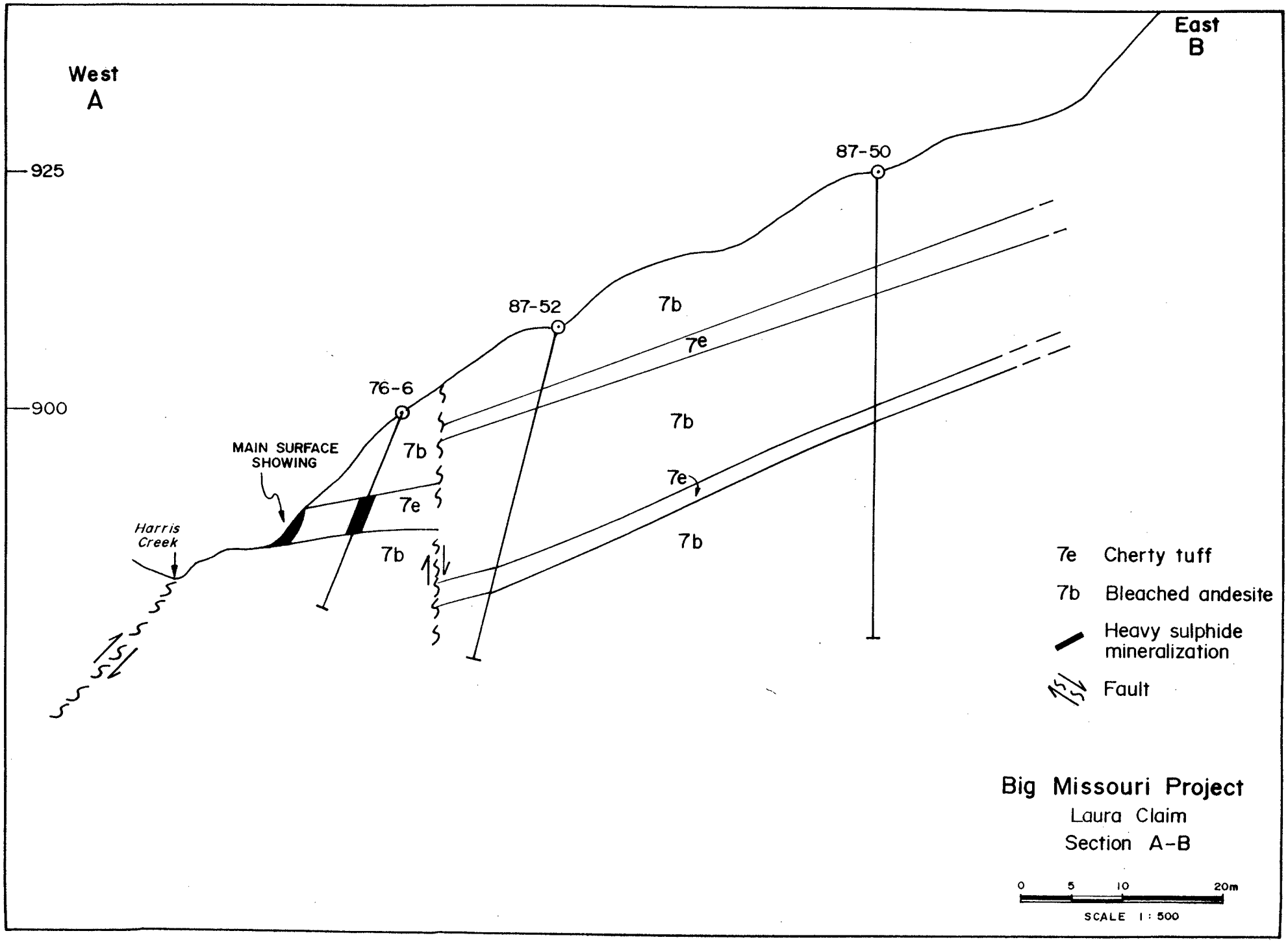
Golden Crown

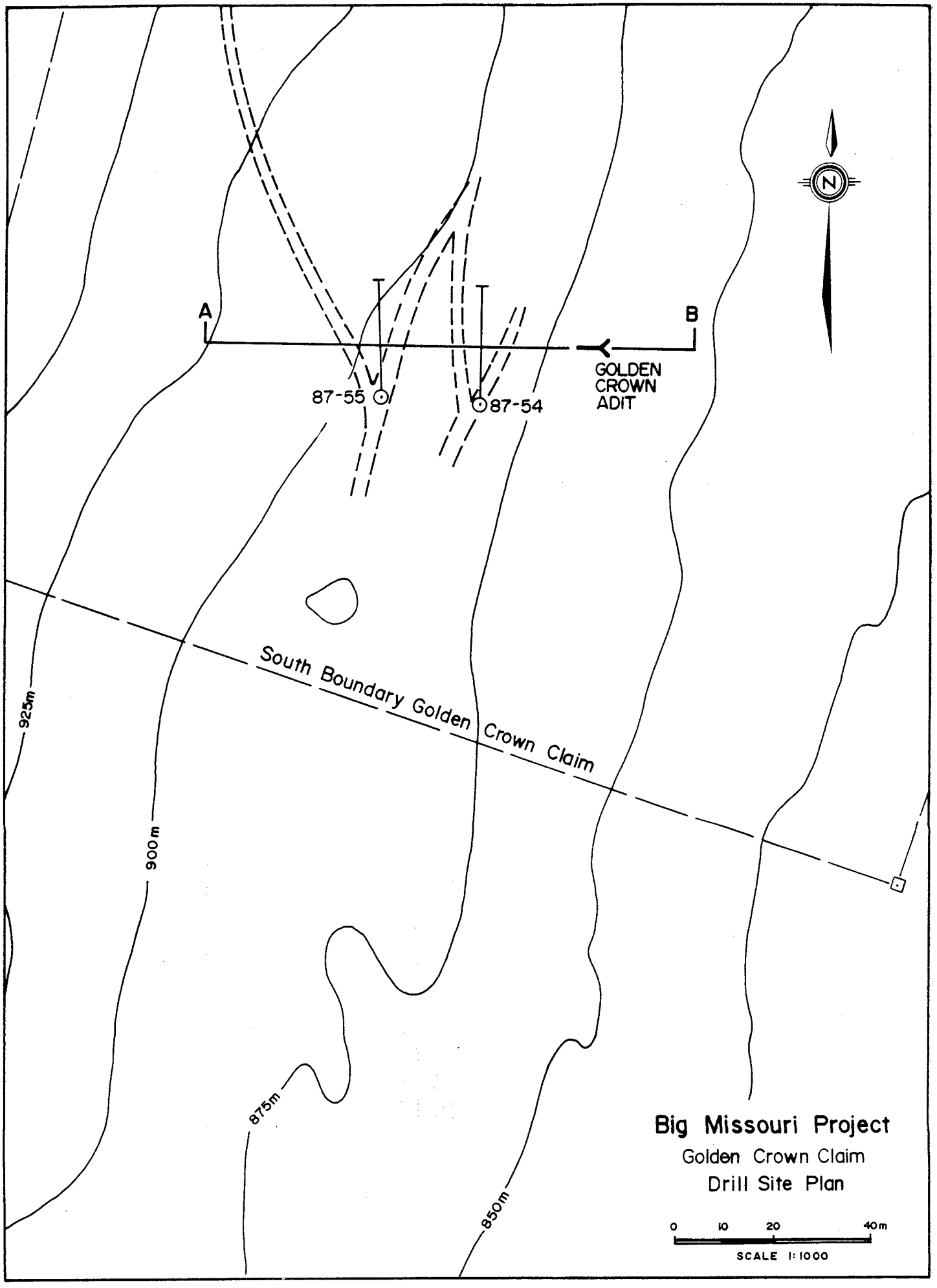
Two NQ diamond drill holes totalling 92.0 m were drilled to test a mineralized cherty tuff bed exposed in the Golden Crown Adit. The 2.5 m thick bed was not intersected in either of the drill holes 87-54, 87-55. The holes intersected footwall rocks to the zone indicating the presence of a fault between the adit and the two drill holes. The location of the drill holes is shown in Figures 5 and 6.

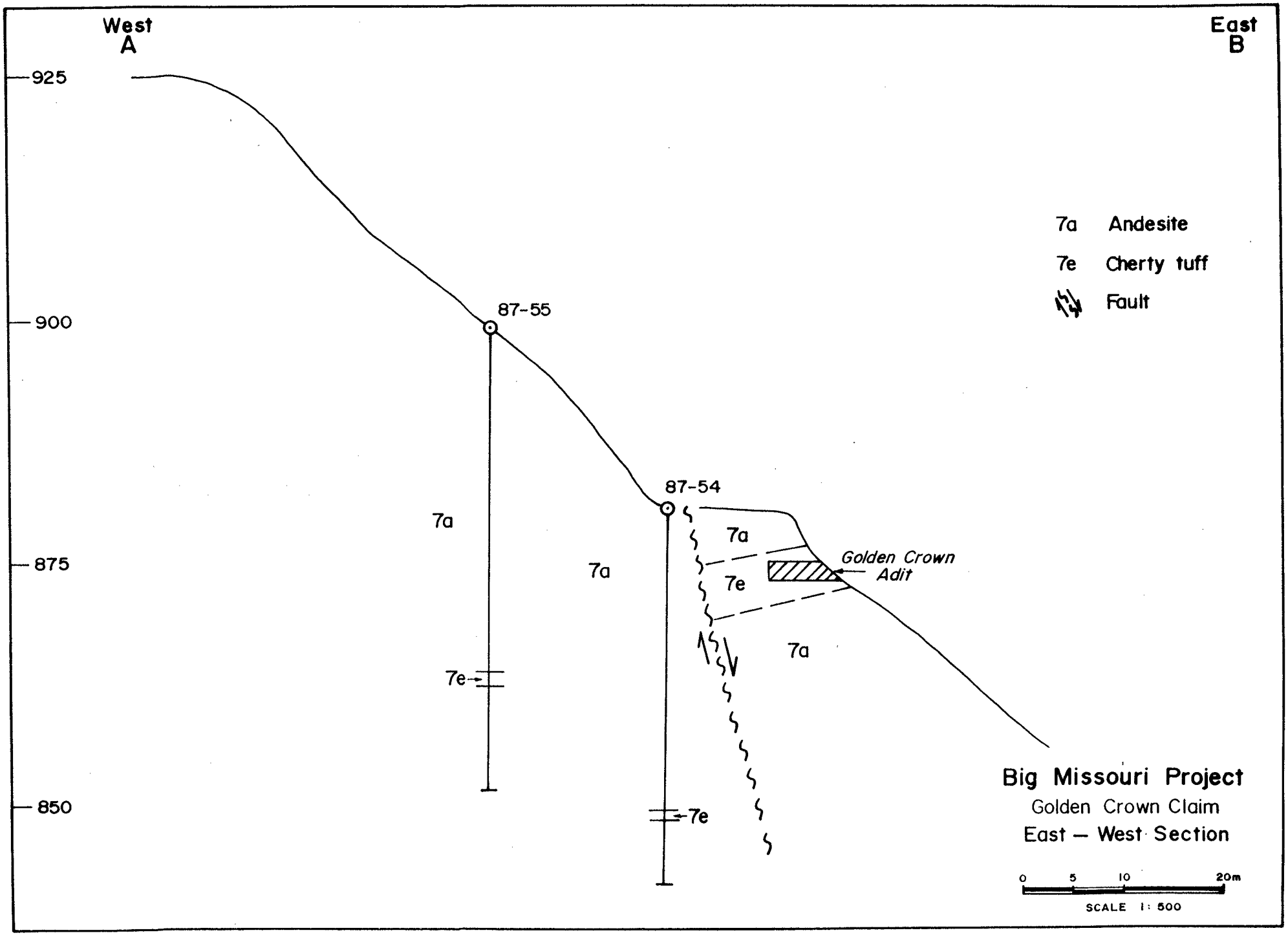
Pass Fr.

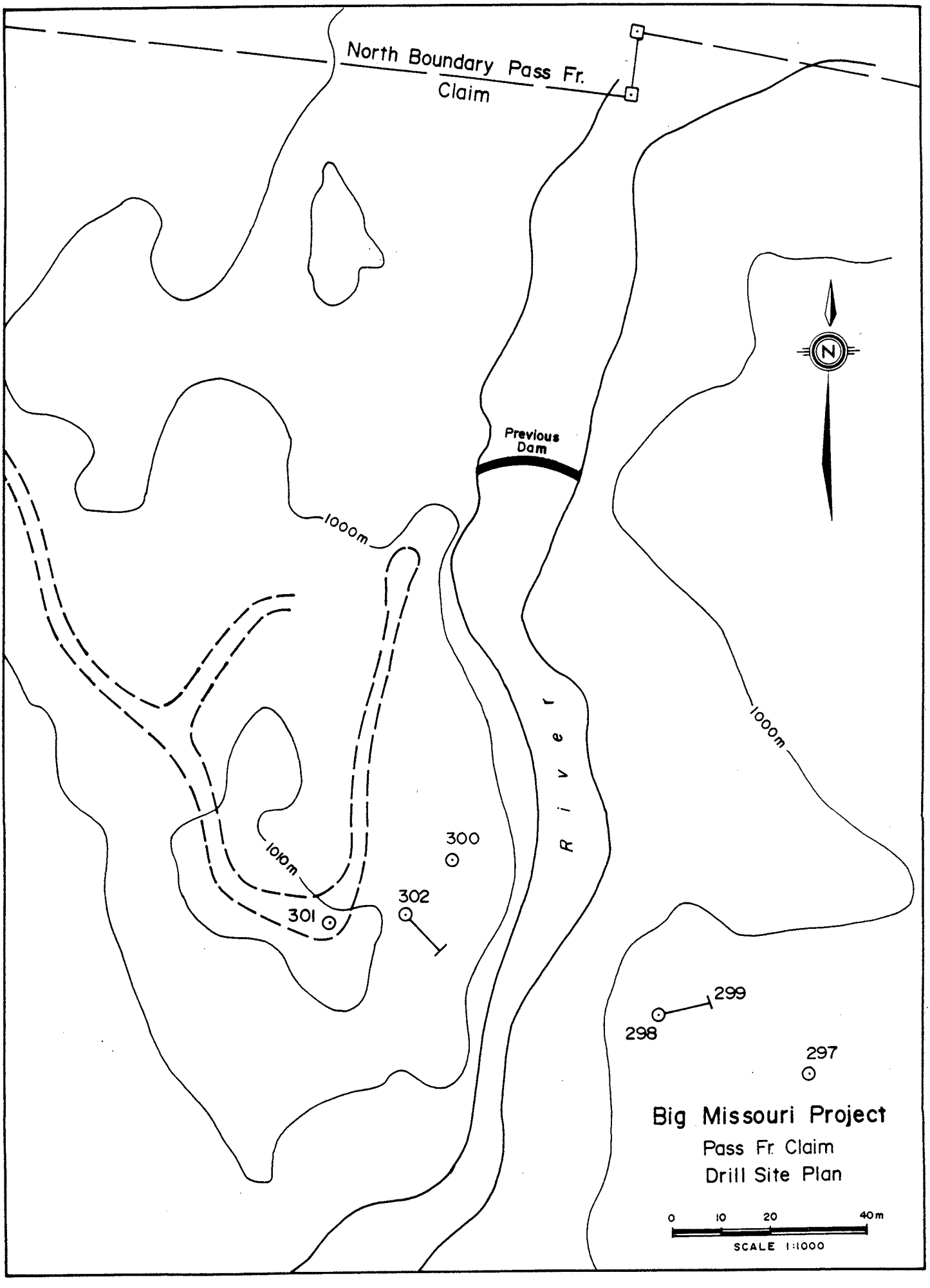
Six holes (3 on each abutment) were drilled at the damsite, to depths of 23.77 m to 28.35 m. Two of the holes on each side were vertical, while one was angled at 60° to the horizontal (Figure 7). Permeability testing using a


N
950m
B
Section Line
87-51
(-50)
87-50
(-90)
Harris Creek
76-6
(-65°)
87-52
(-50)
A
MAIN
SURFACE
SHOWING
South Boundary Laura Claim
925m
900m
Big Missouri Project
Laura Claim
Drill Site Plan
0 10 20 40m
SCALE 1:1000


West
A
East
B
925
900
87-50
87-52
76-6
7b
7e
7b
7e
7b
7b
MAIN SURFACE
SHOWING
Harris
Creek
7e Cherty tuff
7b Bleached andesite
Heavy sulphide
mineralization
Fault
Big Missouri Project
Laura Claim
Section A-B
0 5 10 20m
SCALE 1:500


A
B
87-55
87-54
GOLDEN
CROWN
ADIT
N
South Boundary Golden Crown Claim
925m
900m
875m
850m
Big Missouri Project
Golden Crown Claim
Drill Site Plan
0 10 20 40m
SCALE 1:1000


West
A
East
B
925
900
875
850
87-55
87-54
7a
7a
7a
7a
7e
7e
7e
Golden Crown
Adit
7a Andesite
7e Cherty tuff
Fault
Big Missouri Project
Golden Crown Claim
East — West Section
0 5 10 20m
SCALE 1: 500


North Boundary Pass Fr.
Claim
Previous
Dam
1000m
1010m
1000m
River
300
301
302
298
299
297
N
Big Missouri Project
Pass Fr. Claim
Drill Site Plan
0 10 20 40m
SCALE 1:1000

single packer system was carried out in each hole after drilling was completed. Results indicate that, in the majority of holes, significant water loss occurred at specific depths only, with most of the depth of the hole being fairly watertight. Standpipe piezometers were installed in the deepest vetical holes on the left and right abutments, with their tips at 25.30 m and 29.35 m respectively below ground surface. These holes were backfilled with sand to well above the piezometer intakes, and then with cement to the surface. The other four holes were filled with cement for their full length. The piezometers were read on 9 September. Water levels were 9.49 m below ground level on the left abutment and 14.57 m below ground level on the right abutment. The piezometers should be read at least once more before winter.

NQ (4.5 cm diameter) drill core was recovered from the full lnegth of each hole, except for the top 0 - 0.91 m. Geotechnical logs emphasizing recovery, fracture spacing and orientation, RQD, rock type, and flush return were made for each hole. Selected samples will be shipped to Vancouver for strength testing (uniaxial compression tests).

All holes intersected the Lower-Middle Jurassic Bowser sediments which do not contain significant mineralization.

APPENDIX A

ITEMIZED COST STATEMENT

WEST GROUP

Drilling - Direct 235.9 m @ $57.40/metre (mobilization, footage, mining)	$13,541
Site Preparation 7 man days @ $225/day ($100 for tractor, $125/operator)	1,525
Senior Supervision 5 days @ $200	1,000
Assays & Sample Preparation 54 samples @ $45 ($35 assay + $10 splitting + prep.)	2,430
Room and Board 63 man days @ $30/day	1,890
Report Preparation	150
TOTAL	$20,536
WORK APPLIED	$20,400

EAST GROUP

Note: Due to nature of drilling, all costs were done on an hourly rate basis with equipment used on a cost plus 15% basis.

Drilling (as invoiced)	$47,441.47
Supervision 7 days @ $200	1,400.00
Helicopter (204 Jet Ranger) 4 hours @ $1250/hour	5,000.00
Room and Board 60 days @ $30/day	1,800.00
Report Preparation	150
TOTAL COST	$55,791.47
WORK APPLIED	$32,100.00

APPENDIX B

STATEMENT OF QUALIFICATIONS

University Education:

- 1976 Graduated with B.Sc. (Eng.) degree in Geology from Queen's University, Kingston, Ontario.
- 1979 Graduated with M.Sc. (Eng.) degree in Geology from Queen's University, Kingston, Ontario.
- Courses taken based on mineral exploration, igneous petrology, and mineral economics.

Practical Experience:

- 4 summers experience in Northern Ontario and Northeastern British Columbia
- Since 1979 working as Project Geologist for Westmin Resources Limited with emphasis on the Big Missouri property.

Respectfully submitted,

Shaun M. Dykes

APPENDIX C : 1987 DIAMON DRILL LOGS

LAURA CLAIM	:	HOLES B87CH50 TO B87CH52
GOLDEN CROWN CLAIM	:	HOLES B87CH54 TO B87CH55
PASS FR. CLAIM	:	HOLES 297 TO 302

DATE : 12-10-87
TIME : 10:33:41

BIG MISSOURI -- LAURA CLAIM

HOLE/TRAVERSE ----------> B87CH050 GEOLOG VERSION : 6B0202

SURVEYED BY	: CD	COLLAR ELEV.	: .00	AZIMUTH(DEGREES)	: .00	GEOLOGGED BY	: SMD
TOTAL LENGTH	: 47.85	NORTHING	: .00	VERTICAL ANGLE	: .00	DATE(Y/M/DY)	: 87 09 04
CORE DIAMETER	: NQ	EASTING	: .00	COORD SYSTEM	: GRID	TRAVERSE ATTRIB	: CREEK
DRILLED BY	: BOISVEN	HOLE STARTED	: 87 09 03	HOLE ENDED	: 09 03	DRILLING HOURS	:

	SURVEY PT NUMBER	DEPTH METRES	AZIMUTH DEGREES	ANGLE DEGREES	NORTH COORD METRES	EAST COORD METRES	ELEVATION METRES
S	1	0.00	.00	.00	.00	.00	.00

0.00 2.44 CASING

2.44 8.63 ANDESITE LAPILLI TUFF light green , 10 % 2.0 mm plagioclase phenocrysts;
5 % 0.5 mm amphibole phenocrysts;
20 % more siliceous matrix to fragments; brecciated,,
40 % volcanic fragments; 2.0 mm for maximum fragment size 0.12 mm ,
40 % Feldspar-Amphibole Porphyritic as dominant fragment;
8 veins/metre or 10 % of which 5 % are mineralized;
20 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Leucoxene as spots;
2.5 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
10 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
high silicification as dominant alteration;
Pyrite Bearing Bull Quartz for dominant veins;

REMARK := 2.44 8.63 COARSE PORPHYRITIC

8.63 13.14 CHERTY TUFF light grey , 80 % recrystallized chert; 5 % volcanic fragments;
0.12 mm for maximum fragment size 0.03 mm ,
5 % Non-porphyriticas dominant fragment;
80 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
10 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
Contact at 80 Degrees to Core Axis;

REMARK := 8.63 13.14 LIGHT GREY VERY FINE GRAINED - NON MINERALIZED.

13.14 23.53 ANDESITE (UNDEFINED) light green , 5 % 0.5 mm plagioclase phenocrysts;

2.5 % 0.5 mm amphibole phenocrysts; 5 veins/metre or
2.5 % of which 0.01 % are mineralized;
1 % Quartz occurs as perv. dissem. = to veins,selvages and envelopes,
1 % Leucoxene as spots;
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
fairly low bleaching as dominant alteration;
low chloritization as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

23.53 24.11 CHERTY TUFF pale green , 20 % recrystallized chert; brecciated,,
60 % volcanic fragments; 0.5 mm for maximum fragment size 0.12 mm ,
60 % Feldspar-Amphibole Porphyritic as dominant fragment;
2 veins/metre or 1 % of which 0% are mineralized;
20 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
10 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
10 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
Barren Quartz-Carbonate for dominant veins; Contact at
80 Degrees to Core Axis;

REMARK := 23.53 24.11 INTER UNIT BRECCIA ZONE.

24.11 47.85 ANDESITE (UNDEFINED) pale green , 5 % 0.12 mm plagioclase phenocrysts;
2.5 % 0.12 mm amphibole phenocrysts; 6 veins/metre or 1 % of which
0.01 % are mineralized;
1 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Leucoxene as spots;
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
2.5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
fairly low chloritization as dominant alteration;
low bleaching as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

REMARK :=	24.11	47.85	LOCAL BLEACHED ZONES.
REMARK := SUM			HOLE INTERSECTED TWO NON-MINERALIZED CTUF ZONE WITH FINE GREY
REMARK := SUM			SIPICA - UPPER BED COULD BE CREEK ZONE HORIZON WITH COARSE
REMARK := SUM			PORPHYRY IN HWALL - FINER ANDESITE BENEATH.

DATE : 12-10-87
TIME : 10:36:54

BIG MISSOURI -- LAURA CLAIM

HOLE/TRAVERSE ----------> B87CH051 GEOLOG VERSION : 6B0202

SURVEYED BY	: CD	COLLAR ELEV.	: .00	AZIMUTH(DEGREES)	: .00	GEOLOGGED BY	: SMD
TOTAL LENGTH	: 48.16	NORTHING	: .00	VERTICAL ANGLE	: .00	DATE(Y/M/DY)	: 87 09 05
CORE DIAMETER:	NQ	EASTING	: .00	COORD SYSTEM	: GRID	TRAVERSE ATTRIB:	CREEK
DRILLED BY	: BOISVEN	HOLE STARTED	: 87 09 04	HOLE ENDED	: 09 04	DRILLING HOURS	:

	SURVEY PT NUMBER	DEPTH METRES	AZIMUTH DEGREES	ANGLE DEGREES	NORTH COORD METRES	EAST COORD METRES	ELEVATION METRES
S	1	0.00	.00	.00	.00	.00	.00

0.00 1.83 CASING

1.83 11.67 ANDESITE LAPILLI TUFF dark , 5 % 2.0 mm plagioclase phenocrysts;
2.5 % 0.5 mm amphibole phenocrysts;
20 % more siliceous matrix to fragments; 20 % volcanic fragments;
0.5 mm for maximum fragment size 0.12 mm ,
20 % Feldspar-Amphibole Porphyritic as dominant fragment;
6 veins/metre or 2.5 % of which 0.01 % are mineralized;
20 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
10 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
fairly high bleaching as dominant alteration;
very low chloritization as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

11.80 14.39 CHERTY TUFF medium grey , 60 % recrystallized chert; brecciated,,
30 % volcanic fragments; 0.12 mm for maximum fragment size 0.03 mm ,
30 % Feldspar-Amphibole Porphyritic as dominant fragment;
2 veins/metre or 0.3 % of which 0.01 % are mineralized;
60 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem.,veins,selvages and envelopes,
20 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
Pyrite Bearing Quartz-Carbonate for dominant veins; Contact at
30 Degrees to Core Axis;

REMARK := 11.80 14.39 GREY FINE CTUF MORE FRAGMENTS THAN 87-50.

14.39 36.21 ANDESITE (UNDEFINED) green grey , 5 % 0.5 mm plagioclase phenocrysts;
2.5 % 0.5 mm amphibole phenocrysts; 5 veins/metre or 1 % of which
0.01 % are mineralized;
5 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
0.3 % Leucoxene as spots;
1 % Carbonate occurs as perv. dissem.,veins,selvages and envelopes,
5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
fairly high bleaching as dominant alteration;
very low chloritization as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

26.52 28.65 0 % SAME AS 14.39 36.21 9 veins/metre or 20 % of which 60 % are mineralized;
2.5 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
0.01 % Galena as veins, 0.01 % Sphalerite as veins,
Py-Sph-Gal Vuggy Quartz Breccia for dominant veins;

REMARK := 26.52 28.65 QTZ-BX VEIN ZONE.

34.08 34.44 100 % ANDESITE DYKE palest green , 1 % 0.12 mm plagioclase phenocrysts;
0.3 % Quartz in amygdaloids or cavity fillings,
0.3 % Carbonate in amygdaloids or cavity fillings,
40 % Sericite pervasive, high bleaching as dominant alteration;
Contact at 20 Degrees to Core Axis;

REMARK := 34.08 34.44 SMALL BLEACHED DYKE - APLITE?

36.21 39.26 CHERTY TUFF medium grey , 40 % recrystallized chert; brecciated,,
50 % volcanic fragments; 0.5 mm for maximum fragment size 0.12 mm ,
50 % Feldspar-Amphibole Porphyritic as dominant fragment;
40 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
20 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
0.3 % as disseminations,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
Contact at 70 Degrees to Core Axis;

REMARK := 36.21 39.26 WK-DK GREY VARIETY CTUF

39.26 48.16 ANDESITE (UNDEFINED) pale green , 2.5 % 0.12 mm plagioclase phenocrysts;
2.5 % 0.12 mm amphibole phenocrysts; 6 veins/metre or 1 % of which
2.5 % are mineralized;
1 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
0.01 % Galena as veins, 0.01 % Sphalerite as veins,
moderate bleaching as dominant alteration;
low chloritization as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Py-Sph-Gal Vuggy Quartz Breccia for secondary veins;

REMARK := SUM HOLE INTERSECTED TWO FINE GREY CTUF ZONES NON MINERALIZED

REMARK := SUM COARSE PORPHYRITIC UPPER UNIT - UPPER CTUF GOOD POSSIBLY BE

REMARK := SUM THE CREEK ZONE HORIZON - HOLE SIMILAR TO DAGO FOOTWALL HOLES.

DATE : 12-10-87
TIME : 10:40:53

BIG MISSOURI -- LAURA CLAIM

HOLE/TRAVERSE ----------> B87CH052 GEOLOG VERSION : 6B0202

SURVEYED BY :	CD	COLLAR ELEV. :	.00	AZIMUTH(DEGREES) :	.00	GEOLOGGED BY :	SMD
TOTAL LENGTH :	47.85	NORTHING :	.00	VERTICAL ANGLE :	.00	DATE(Y/M/DY) :	87 09 07
CORE DIAMETER:	NQ	EASTING :	.00	COORD SYSTEM :	GRID	TRAVERSE ATTRIB:	CREEK
DRILLED BY :	BOISVEN	HOLE STARTED :	87 09 06	HOLE ENDED :	09 06	DRILLING HOURS :	

	SURVEY PT NUMBER	DEPTH METRES	AZIMUTH DEGREES	ANGLE DEGREES	NORTH COORD METRES	EAST COORD METRES	ELEVATION METRES
S	1	0.00	.00	.00	.00	.00	.00

0.00 2.44 CASING

2.44 8.47 ANDESITE (UNDEFINED) light to medium grey , 2.5 % 0.12 mm plagioclase phenocrysts;
2.5 % 0.12 mm amphibole phenocrysts; 21 veins/metre or
10 % of which 5 % are mineralized;
10 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
5 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
20 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
0.01 % Chlorite as spots;
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
fairly high bleaching as dominant alteration;
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

8.47 10.21 CHERTY TUFF grey black , 20 % recrystallized chert; brecciated,,
40 % volcanic fragments; 0.5 mm for maximum fragment size 0.12 mm ,
40 % Feldspar-Amphibole Porphyritic as dominant fragment;
3 veins/metre or 1 % of which 0.01 % are mineralized;
20 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
5 % Carbonate occurs as perv. dissem.,veins,selvages and envelopes,
30 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
5 % occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
Contact at 60 Degrees to Core Axis;

REMARK := 8.47 10.21 MOD CARBON CTUF - NON-MINERALIZED.

10.21 34.84 ANDESITE AGG. LAP. TUFF pale green , 5 % 0.5 mm plagioclase phenocrysts;
1 % 0.12 mm amphibole phenocrysts;
5 % more siliceous matrix to fragments; 30 % volcanic fragments;

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
CONTRACTOR Boisvenu Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1001.755 FINAL DEPTH 23.77
INCLINATION Vertical AZIMUTH —
CASING
DRILLED BY
DATE 28+29/08/87
LOGGED BY BRD
DATE 10/09/87
DRAWN BY

BOREHOLE NO. 298
Sheet 1 of 3

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
0.91		✓			—		—	Not cored				—
2.44		✓			82		0	First 20cm: loose shale rocks from surface zone Remainder of run: Fractures 0°-15° to horiz., 1-3cm typ. spcg. A few steeply inclined fractures with oxidized surfaces. Highly fractured at 1.46-1.52m, and at 2.44m				SHALE, small amount of siltstone, no quartz or calc. carbonate veins.
3.96		✓			100		30	2.44-2.55: Highly fractured 2.55-2.74: near-horiz. fractures, 2-6 cm spcg, one short, oxidized vertical fracture. 2.74-2.79: highly fractured due to combination of vertical & horiz. fractures. 2.79-3.96: fractures at 0°-15° to horizontal, 3-19 cm spcg. A few oxidized fractures at 60°-90° to horizontal				SHALE with siltstone bands, minor pyrite. No veins.
5.49		✓			100		44	3.96-4.58: Fractures at 0°-15° to horizontal, 3-16cm spacing. 4.58-4.68: Several fractures, horiz. and ~45°, quartz veins. 4.68-5.09: Intact core 5.09-5.49: Near-horiz. fractures at 2-10cm spcg., two long, near-vertical, oxidized fractures: 5.27-5.59, 5.44-5.82 m				SHALE, minor siltstone, minor pyrite. Numerous quartz veins, minor calc, some pyrite at 4.58-4.68m
7.01		✓			95		50	Only eight near-horiz. and four near-vert. fractures in entire core run. Low RQD is due to long, oxidized vertical fractures in first half of run.				SHALE, minor siltstone, minor pyrite.

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
CONTRACTOR Boisvenu Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1001.755 FINAL DEPTH 23.77
INCLINATION Vertical AZIMUTH —
CASING
BOREHOLE NO. 298
Sheet 2 of 3
DRILLED BY
DATE 28+29/08/87
LOGGED BY BRD
DATE 10/09/87
DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
8.53		✓			100		46	7.01-7.71: three near-horizontal fractures 7.71-7.76: highly fractured 7.76-8.53: Fractures at 0°-15° to horiz., 2-9cm spcg., a few steeply-inclined oxidized fractures.				SHALE, minor siltstone, minor pyrite. Minor calc. matl. on fracture surfaces in lowest 5 cm of core run
10.06		✓			100		58	8.53-8.85: Closely spaced near-horiz. & near-vertical fractures, only two pieces in 5-8 cm range. Steeply-inclined fractures oxidized. 8.85-9.63: Only five near-horiz. fractures, one of them oxidized, 11-21 cm spacing. 9.63-10.06: near-horiz. fractures at 2-11cm spacing, two fractures at 80°, one of which is oxidized				SHALE, minor siltstone, minor pyrite. No veins.
11.58		✓			100		22	10.06-11.45: near-horiz. fractures, typ. spcg. 2-16 cm, only slightly oxidized, a few slightly oxidized fractures at 70°-90°. 11.45-11.58: highly fractured both horizontally and vertically				SHALE, siltstone bands. No pyrite. 2-15mm thick band of harder rock (mainly quartz) at 11.42 m. Quartz veins common from 11.45m to 11.58m.
12.80		✓			9		0	Only 13 cm of highly fractured rock recovered				SHALE with quartz veins
14.33		✓			103		24	Most fractures 15°-25° to horiz., a few near-horiz., some 60°-80°. Typ. spcg. 3-9cm, with three 12-15cm long pieces of core. No oxidation.				SHALE, some siltstone, quartz veins. Veins mostly thin (<1mm) and parallel (50° to horiz.) but thicker and more randomly oriented in last 45 cm.
15.85		✓			100		39	14.33-14.46: Highly fractured 14.46-15.40: Near-horiz. fractures, 7-15cm typ. spcg., one 3 cm long vertical fracture, not oxidized. 15.40-15.85: highly fractured, vert. & horiz.				14.33-15.60: SHALE with thin parallel qtz. veins, 50° to horizontal 15.60-15.85: SHALE with abundant qtz. and calc. material. Minor siltstone in entire core run.

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
CONTRACTOR Boisvenu Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Flush
COORDINATES
COLLAR ELEVATION 1001.755 FINAL DEPTH 23.77
INCLINATION Vertical AZIMUTH —
CASING

BOREHOLE NO. 298
Sheet 3 of 3
DRILLED BY
DATE 28+29/08/87
LOGGED BY BRD
DATE 10/09/87
DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
17.37		✓			75		0	Highly fractured, mostly near-horiz. or near-vertical. Five pieces in 6-8 cm range, all others < 5 cm. Fractures not oxidized.				SHALE some siltstone, minor quartz. Calc. matl. common on fracture surfaces.
18.59		✓			96		52	17.37-18.32: Most Fractures 0°-30° to horiz., 4-15cm spcg., a few short near-vertical ones. 18.32-18.59: Highly fractured, horiz. and vert., lgst. piece 6 cm long.				17.37-17.77: SHALE with qtz. veins, calc. matl. on many fracture surfaces 17.77-18.59: SILTSTONE with less qtz. and calc. than above. Distinct contact @ 40° to horizontal.
19.20		✓			88		51	7 fractures at 0°-45° to horiz., one vertical. Highly fractured 19.10-19.20, core loss here.				SILTSTONE, minor shale, quartz as steep, thin veins and along the one vertical fracture.
20.73		✓			113		73	Most fractures 0°-15° to horizontal, 7-22 cm spcg. Five fractures 70°-90°, not oxidized.				SILTSTONE, minor shale, thin (< 1mm) qtz. veins at 45°-90° to horiz. 5mm thick calc. vein, 10cm long, 80° to horiz, at 20.73m
22.25		✓			100		65	20.73-21.02: Fractures 0°-15° to horiz., 3-9cm typ. spacing 21.02-21.14: Badly fractured zone 21.14-22.25: Twelve fractures, 2-29cm spacing, all except one @ 0°-15° to horiz. The one is 60° to horiz.				20.73-20.80: SILTSTONE with thin qtz. veins and the extension of the large calc. vein noted above 20.80-22.25: SHALE, minor siltstone, quartz veins. 8mm thick qtz. loose in fractured zone at 21.02 m. Siltstone/shale contact ≈ 40° to horizontal.
23.77		✓			98		43	22.25-22.53: Intact core 22.53-22.81: Highly fractured, near-horiz. and near-vertical. 22.81-23.17: Two near-horiz. fractures. 23.17-23.77: Fractures @ 10°-25° to horiz. and 60°-80° to horiz., 1-9 cm typ. spcg.				SHALE, minor siltstone. No qtz. or calc. material.
								End of log				

16-64 mm for maximum fragment size 0.12 mm ,
30 % Feldspar-Amphibole Porphyritic as dominant fragment;
8 veins/metre or 2.5 % of which 0.01 % are mineralized;
5 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
10 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
moderate bleaching as dominant alteration;
very low chloritization as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

31.58 32.92 100 % MICRODIORITE DYKE light to medium grey , 10 % 0.12 mm plagioclase phenocrysts;
5 % 0.12 mm amphibole phenocrysts; equigranular,,
0.01 % Quartz in amygdaloids or cavity fillings,
0.3 % Carbonate in amygdaloids or cavity fillings,
5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
0.01 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
Contact at 60 Degrees to Core Axis;

34.84 37.34 CHERTY TUFF green grey , 30 % recrystallized chert; brecciated,,
30 % volcanic fragments; 2.0 mm for maximum fragment size 0.12 mm ,
30 % Feldspar-Amphibole Porphyritic as dominant fragment;
3 veins/metre or 1 % of which 0% are mineralized;
30 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
0.01 % Galena as spots; 0.3 % Sphalerite as spots;
Barren Quartz-Carbonate for dominant veins; Contact at
70 Degrees to Core Axis;

REMARK := 34.84 37.34 WK-CTUF WITH PY >> BASE METALS.

37.34 47.85 ANDESITE LAPILLI TUFF pale grey , 5 % 0.5 mm plagioclase phenocrysts;
1 % 0.12 mm amphibole phenocrysts; 3 veins/metre or 1 % of which
0.01 % are mineralized;
0.3 % Quartz occurs as perv. dissem. = to veins,selvages and envelopes,

1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
20 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
very high bleaching as dominant alteration;
very low chloritization as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

REMARK := 37.34 47.85 BLEACHING DUE TO HOLE CLOSE TO SURFACE.

37.34 41.45 0 % SAME AS 37.34 47.85 light to medium green ,
5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
fairly low bleaching as dominant alteration;
low chloritization as secondary alteration

REMARK := SUM COARSE PORPHYRITIC FSPAR AXXX - UNDERLYING CB-CTUF - SEQUENCE

REMARK := SUM APPEARS TO BE IN GROUND HOG MARKER - SIMILAR TO A-VEIN AND TO

REMARK := SUM SECTION.

DATE : 12-10-87
TIME : 10:47:09

BIG MISSOURI -- GOLDEN CROWN CLAIM

HOLE/TRAVERSE ----------> B87CH054 GEOLOG VERSION : 6B0202

SURVEYED BY	: CD	COLLAR ELEV.	: .00	AZIMUTH(DEGREES)	: .00	GEOLOGGED BY	: SMD
TOTAL LENGTH	: 44.20	NORTHING	: .00	VERTICAL ANGLE	: .00	DATE(Y/M/DY)	: 87 09 09
CORE DIAMETER	: NQ	EASTING	: .00	COORD SYSTEM	: GRID	TRAVERSE ATTRIB	: GOLDEN
DRILLED BY	: BOISVEN	HOLE STARTED	: 87 09 08	HOLE ENDED	: 09 08	DRILLING HOURS	:

	SURVEY PT NUMBER	DEPTH METRES	AZIMUTH DEGREES	ANGLE DEGREES	NORTH COORD METRES	EAST COORD METRES	ELEVATION METRES
S	1	0.00	.00	.00	.00	.00	.00

0.00 5.79 CASING

5.79 35.91 ANDESITE LAPILLI TUFF pale green , 2.5 % 0.5 mm plagioclase phenocrysts;
5 % 0.5 mm amphibole phenocrysts; 8 veins/metre or 2.5 % of which
0.01 % are mineralized;
1 % Quartz occurs as perv. dissem. = to veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
fairly low chloritization as dominant alteration;
fairly low bleaching as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

REMARK := 5.79 35.91 SEVERAL QTZ VEINS (BULL) 46, 48, 64 FT.

24.38 25.91 0 % SAME AS 5.79 35.91 dark grey ,
2.5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
10 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
0.01 % Galena as veins, 0.3 % Sphalerite as veins,
fairly high chloritization as dominant alteration;
very low bleaching as secondary alteration
Py-Sph-Gal Quartz-Carbonate for secondary veins;

REMARK := 24.38 25.91 2" VGMQ WITH SPH + GAL @ 88 FT.

35.91 36.70 CHERTY TUFF grey white , 5 % recrystallized chert; brecciated,,
40 % volcanic fragments; 0.5 mm for maximum fragment size 0.12 mm ,
40 % Feldspar-Amphibole Porphyritic as dominant fragment;

1 veins/metre or 0.3 % of which 0% are mineralized;
5 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
40 % Carbonate occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
Barren Quartz-Carbonate for dominant veins; Contact at
70 Degrees to Core Axis;

REMARK := 35.91 36.70 CARBONATE RICH WK CTUF - FWALL BX DEVELOPED NARROW.

36.70 44.20 ANDESITE LAPILLI TUFF medium green , 10 % 0.5 mm plagioclase phenocrysts;
5 % 0.5 mm amphibole phenocrysts;
5 % more siliceous matrix to fragments; 30 % volcanic fragments;
2.0 mm for maximum fragment size 0.12 mm ,
30 % Feldspar-Amphibole Porphyritic as dominant fragment;
3 veins/metre or 1 % of which 0.01 % are mineralized;
5 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
2.5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
fairly low chloritization as dominant alteration;
very low bleaching as secondary alteration
Barren Quartz-Carbonate for dominant veins;
Pyrite Bearing Quartz-Carbonate for secondary veins;

REMARK := 36.70 44.20 COARSE PORPHYRITIC.

REMARK := SUM HOLE INTERSECTED WK CARBONATE CTUF WITH LOW PYRITE CONTENT

REMARK := SUM TEST ZONE SOUTH OF INTERSECTION.

DATE : 12-10-87
TIME : 10:49:37

BIG MISSOURI -- GOLDEN CROWN CLAIM

HOLE/TRAVERSE ----------> B87CH055 GEOLOG VERSION : 6B0202

SURVEYED BY :	CD	COLLAR ELEV. :	-1.00	AZIMUTH(DEGREES) :	.00	GEOLOGGED BY :	SMD
TOTAL LENGTH :	47.85	NORTHING :	.00	VERTICAL ANGLE :	.00	DATE(Y/M/DY) :	87 09 10
CORE DIAMETER:	NQ	EASTING :	.00	COORD SYSTEM :	GRID	TRAVERSE ATTRIB:	GOLDEN
DRILLED BY :	BOISVEN	HOLE STARTED :	87 09 09	HOLE ENDED :	09 09	DRILLING HOURS :	

	SURVEY PT NUMBER	DEPTH METRES	AZIMUTH DEGREES	ANGLE DEGREES	NORTH COORD METRES	EAST COORD METRES	ELEVATION METRES
S	1	0.00	.00	.00	.00	.00	-1.00

0.00 7.62 CASING

7.62 36.00 ANDESITE LAPILLI TUFF light green , 5 % 0.5 mm plagioclase phenocrysts;
2.5 % 0.5 mm amphibole phenocrysts;
5 % more siliceous matrix to fragments; 40 % volcanic fragments;
2.0 mm for maximum fragment size 0.5 mm ,
40 % Feldspar-Amphibole Porphyritic as dominant fragment;
2 veins/metre or 1 % of which 0.01 % are mineralized;
5 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
fairly low bleaching as dominant alteration;
low chloritization as secondary alteration
Barren Quartz-Carbonate for dominant veins;

REMARK := 7.62 36.00 WELL DEVELOPED FRAGMENTAL TEXTURE.

36.00 37.61 CHERTY TUFF blue grey , 10 % recrystallized chert; brecciated,,
60 % volcanic fragments; 2.0 mm for maximum fragment size 0.12 mm ,
60 % Feldspar-Amphibole Porphyritic as dominant fragment;
1 veins/metre or 1 % of which 0% are mineralized;
10 % Quartz occurs as perv. dissem.,veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
30 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
20 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
2.5 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
high bleaching as dominant alteration;

fairly high chloritization as secondary alteration
Barren Quartz-Carbonate for dominant veins; Contact at
30 Degrees to Core Axis;

REMARK := 36.00 37.61 BRECCIATED-GREY BLACK-CHLORITIC-NON-MINERALIZED.

37.61 47.85 ANDESITE LAPILLI TUFF dark to medium green , 1 % 0.12 mm plagioclase phenocrysts;
5 % 0.5 mm amphibole phenocrysts; brecciated,, 3 veins/metre or
1 % of which 0.01 % are mineralized;
1 % Quartz occurs as perv. dissem. = to veins,selvages and envelopes,
1 % Carbonate occurs as perv. dissem. = to veins,selvages and envelopes,
2.5 % Sericite occurs as perv. dissem.,veins,selvages and envelopes,
10 % Chlorite occurs as perv. dissem.,veins,selvages and envelopes,
1 % Pyrite occurs as perv. dissem.,veins,selvages and envelopes,
high chloritization as dominant alteration;
low bleaching as secondary alteration
Pyrite Bearing Quartz-Carbonate for dominant veins;
Barren Bull Quartz-Chlorite (tensional) for secondary veins;

REMARK := 37.61 47.85 GOOD HEAVY CHLORITE - INSITU BRECCIA WITH CHLORITE.

REMARK := SUM INTERSECTED.

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
CONTRACTOR Boisvenu Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1006.82 FINAL DEPTH 25.30
INCLINATION Vertical (90°) AZIMUTH —
CASING

BOREHOLE NO. 297
Sheet 1 of 3
DRILLED BY
DATE 27/08/07
LOGGED BY BRD
DATE 01/09/07
DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
1.98		✓			65		0	First 0.18m highly fractured, then most fractures 10°-15° from horiz., 1-3 cm spacing typical. Largest disc is 4.5 cm long. 17cm long highly fractured zone beginning at 0.44m				All Bowser ~~SHALE~~, no qtz. or calc. veins
2.74		✓			100		0	Similar to above, but spcg. slightly larger. 3 pcs. in 4.5-5.0 cm range. Highly fractured 2.53m - 2.60m				~~SHALE~~, same as above
3.35		✓			100		0	Similar to above. Some fractures 40°-45° to horiz. and oxidized on surface. Highly fractured 2.96 - 3.06m				Bowser ~~shale~~ SHALE 2.75 m: 1mm quartz vein, 45° to horiz. 2.92 m: two 0.5 mm qtz. veins, parallel, 1.5 cm apart, 45° to horiz.
5.18		✓			84		28	3-8 cm typ. fracture spcg. Highly fractured zones at: 3.35-3.39, 3.46-3.50, 3.70-3.80 Only two fractures in last 50 cm, one of which is 65° to horiz. and oxidized on surface.				~~Shale~~ SHALE. No dominant veins, but calc. deposits on a few fracture surfaces. Some ~~lighter colored~~ siltstone bands in the shale. ~~Note: In this log the rock described as "lighter colored" or "sandier" is probably siltstone~~
6.71		✓			100		58	5.18-5.69: Intact rock 5.69-6.71: Typical fracture spcg. 4-15cm, most almost horiz., two oxidized fractures 70° to horiz.				Shale, occasional very thin (0.3 mm) quartz veins, 45° to horiz, parallel. 1 mm thick horiz. qtz. vein at 6.63m
8.23		✓			98		67	6.71: Fracture 45° to horiz., not oxidized 6.83: Horiz. fracture 6.95: Fract. 10° to horiz. 7.41: Two fractures - one horiz, on 70° to horiz. 7.71-8.23: several near-horiz. fractures, 3-6cm typ. spcg.				~~Shale~~ SHALE, with some ~~lighter (sandier)~~ siltstone bands. Several thin qtz. veins, almost all parallel, 50° to horiz. A few veins up to 3mm thick. Veins generally thicker, more numerous, and more randomly oriented in last 0.4m

RQD = $\frac{\text{total length of all pieces } \geq 10\text{ cm long}}{\text{length of core run}} \times 100$

PROJECT Long Lake Dam
CLIENT Sigma Engineering
CONTRACTOR Boisvenu Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1006.82 FINAL DEPTH 25.30
INCLINATION Vertical (90°) AZIMUTH —
CASING

BOREHOLE NO. 297
Sheet 2 of 3
DRILLED BY
DATE 27/08/87
LOGGED BY BRD
DATE 01/09/87
DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
9.75		✓			88		41	First 15 cm highly fractured 8.38 - 8.53: 3mm thick fracture infilled with calc. matl., 80° to horiz. 8.53 - 9.31: Horiz. fractures 3-15 cm spcg. typ., a few 70°-80° to horiz., oxidized Highly fractured at 8.53 - 8.58 and 8.73 - 8.78. Highly fractured after 9.31 m, no piece larger than 4 cm.				SHALE ~~Shale~~, as above. Major calc. vein noted at left. Minor calc. on some fracture surfaces. • Some qtz. veins, but less frequent than above.
11.28		/			100		76	9.75 - 10.35: Near-horiz. fractures, 5-15 cm typ. spcg., one 24 cm long vert. fracture, slightly oxidized 10.35 - 11.28: a few horiz. fractures, 7-31 cm spcg., one 80° to horiz., not oxidized				SHALE ~~Shale~~, v. few thin quartz veins.
13.11		/			92		83	very few fractures, all 0°-15° from horiz.				~~Shale~~, some ~~lighter~~ bands, no veins SHALE siltstone
14.63		✓			100		92	Only 5 fractures, all 0°-15° to horiz. except for a highly fractured zone at 13.64 - 13.69 m				SHALE, as above. Some siltstone ~~lighter~~ bands. 2mm wide near-vertical quartz vein at ≈ 13.36 m, several randomly oriented veins near 13.60 m
16.15		No return below here →			100		87	14.63 - 15.42: 7 fractures 0°-15° to horiz., 3-17 cm spcg. One fracture 80° to horiz., v. little surface oxidation 15.42 - 16.15: Only one fracture, 5° to horiz., at 16.05 m				SHALE ~~Shale~~, some siltstone ~~Granite~~ layers. 5mm thick band of harder rock at 15.42 m, 15° to horiz.
17.68					100		85	8 fractures, 10°-15° to horiz., one vertical fracture at 16.63 - 16.72 m, with an oxidized irregular surface.				~~Shale~~ SHALE, no veins, some ~~lighter~~ siltstone zones (~~Granite~~), minor pyrite.

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water

CONTRACTOR Boisvert Drilling
COORDINATES
COLLAR ELEVATION 1006.82 FINAL DEPTH 25.30
INCLINATION Vertical AZIMUTH —
CASING

BOREHOLE NO. 297
Sheet 3 of 3
DRILLED BY
DATE 27/08/87
LOGGED BY BRD
DATE 01/09/87
DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
19.20					100		28	Numerous fractures 8-15° to horiz., typ. spcg. 1.5 - 5.0 cm in first 0.3 m, then 3 - 13cm, except a badly broken zone at 18.32 - 18.38 m. Fractures 70°-90° at 17.78 - 17.94, 18.16 - 18.22, 18.40 - 18.44, 18.57 - 18.70				~~Shale~~ SHALE with numerous quartz veins and ~~Sandier~~ siltstone zones, minor pyrite
20.73					17		0	Poor recovery of badly broken core due to a broken core spring. First 12 cm has 3 near-horiz. fractures and two at 60°-70°.				SHALE with quartz veins and lenses, no calc. or pyrite
22.25		No return			100		9	Near-horiz. fractures at typ. spcg. of 3-10 cm, and fractures at 60°-90° throughout. Badly broken zones at 21.05m, 21.22m, 21.57m				SHALE with numerous quartz veins and lenses, ~~Sandier~~ siltstone zones, minor calc., minor pyrite
23.77					100		38	22.25 - 22.74: two fractures 10° to horiz. 22.74 - 23.77: Fractures at 0°-15° to horiz. at 5-10cm spacing. Highly broken rock at 23.50 - 23.55 m due to near-horiz. and near-vertical fractures.				~~Shale~~ SHALE with large zones of ~~Sandier~~ siltstone ~~rock~~, abundant quartz veins and lenses, minor calc.
25.30					100		90	7 fractures at 0°-10° to horiz, no near-vertical fractures.				~~Shale~~ SHALE with ~~Sandier~~ siltstone zones, some thin quartz veins, minor pyrite
								End of log.				

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
CONTRACTOR Boisvenu Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1001.755 FINAL DEPTH 26.52
INCLINATION 60° to horiz. AZIMUTH 71°
CASING
DRILLED BY
DATE 29/30/08/87
LOGGED BY BRD
DATE 10/09/87
DRAWN BY

BOREHOLE NO. 299
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DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES (All depths measured along core axis)	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
2.44		✓			63		0	13 cm gravel, followed by fractured core, most fractures 0°-10° to core axis normal, typ. spcg. 0.5-2.0cm in first 50cm, then 2-5 cm. Most fractures oxidized.				SHALE, minor siltstone. Calc. matl. on a few fracture surfaces.
3.96		✓			100		43	Most fractures 15°-25° to core axis normal, a few near 0° or 90° Typical spacing 4-15cm, but two pieces 24-30cm long. Most oxidized.				SHALE, minor siltstone, minor pyrite, minor calc. matl.
5.49		✓			96		88	Fractures 0°-20° to core axis normal, typ. spacing 2-17cm, but as much as 27cm. Only slight oxidation.				SHALE with bands of siltstone, minor qtz., minor calc., minor pyrite
7.01		✓			100		95	6 Fractures 0°-10° to core axis normal, and one 45° to axis normal. Highly fractured 6.38m - 6.43 m.				SHALE with siltstone bands, calc. on surfaces of steeper fractures. No quartz or pyrite.
8.53		✓			100		60	All fractures 0°-15° to core axis normal, typ. spcg. 4-15cm, but as low as 0.5cm and as high as 30 cm. Minor oxidation on some fracture surfaces.				SHALE with siltstone bands, minor quartz, minor pyrite, v. little calc. material.
10.06		✓			100		57	8.53-8.73: Fractures 0°-10° to axis normal, 2-5 cm spacing. 8.73-8.82: Highly fractured 8.82-10.06: 2-15cm typ. fracture spacing, but one piece 24cm long. Most fractures 10°-20° or 60°-80° to core axis normal, many highly oxidized.				SHALE with sianificant siltstone, esp. one 13cm wide band starting at 8.84 m. Minor quartz, minor pyrite.

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
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MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1001.755 FINAL DEPTH 26.52
INCLINATION 60° to horiz AZIMUTH 071°
CASING

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DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES (All depths measured along core axis)	DOWNHOLE DEPTH m.	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
11.58		/			83		35	Most fractures 0°-10° to core axis normal, 1-12cm typ. spacg., but as much as 24cm. A few oxidized fractures 70°-90° to axis normal (ie almost parallel to core axis).				Bands of SHALE and SILTSTONE (est. 60% - 70% shale). Quartz veins up to 3mm thick, minor pyrite.
13.11		/			82		23	11.58-12.76: Core highly broken along fractures almost normal and almost parallel to core axis. Largest piece 7cm long, most 2-5cm. No oxidation. 12.76-13.11: Two fractures, 10° to axis normal.				11.58 - 12.76: Broken SHALE and SILTSTONE, qtz. veins, calc. matl. on many fracture surfaces. 12.76 - 13.11: Shale with thin quartz veins.
14.63		/			100		83	Most fractures 10°-20° or 60°-80° to core axis normal, 3-28cm typ. spacing, not oxidized.				SHALE with minor siltstone, quartz and calc. veins, minor pyrite
16.15		/			100		70	Most fractures 10°-20° or 60°-80° to core axis normal, 2-20cm spacing. Not oxidized.				SHALE with siltstone bands, quartz veins, minor calc. material.
17.68		/			86		10	16.15-16.30: Intact core 16.30-17.68: Fracture spacing 2-10cm, fractures are 0°-70° to core axis normal.				SHALE with siltstone bands, quartz and calc. veins.
19.20		/			100		58	Most fractures 10°-20° to core axis normal, 5cm-22cm spacing, except two fractures at 70° to axis normal at ≈ 18.65m, and a highly fractured zone at 18.91 - 18.98 m				SHALE with siltstone bands, qtz. veins, minor calc., esp. in highly fractured zone noted at left.
20.73		/			100		86	Eight fractures 0°-10° to core axis normal, one 70° to axis normal. Spacing 2-59 cm, 10-15cm typical.				SHALE with minor siltstone, thin, steeply inclined quartz veins, minor pyrite.

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MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1001.755 FINAL DEPTH 26.52
INCLINATION 60° to horiz. AZIMUTH 071°
CASING
DRILLED BY
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BOREHOLE NO. 299
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DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES (All depths measured along core axis)	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
22.25		✓			100		83	Most fractures 0°-10° to core axis normal. Two fractures about 80° to axis normal.				SHALE, minor siltstone, minor pyrite. 5 mm thick highly fractured and slickensided qtz. vein at 20.78 m, normal to core axis.
23.77		/			100		86	Eleven fractures 5°-20° to core axis normal, one 70° to axis normal. Spacing 2-35 cm, 5-20 cm typical.				SHALE with siltstone bands, a few quartz veins, minor pyrite.
25.30		✓			100		64	23.77-23.99: Broken core due to a fracture 80° to core axis normal intersected by several at about 10° to axis normal. 23.99-25.30: Most fractures 0°-10° to axis normal, a few 60°-80° to axis normal. Spacing 1-37 cm, 8-15 cm more typical. Highly fractured at 24.11-24.13 m.				SHALE with siltstone bands, minor pyrite (but a larger lense than usual: 1 cm thick at maximum), minor quartz veins.
26.52		✓			100		96	Eight fractures, all 0°-10° to core axis normal, spacing 6.5-41 cm except two 0.5 cm apart at one point.				SHALE with 20-30% siltstone, a few quartz veins.
								End of log.				

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CONTRACTOR Boisvenu Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1006.345 FINAL DEPTH 26.82
INCLINATION Vertical AZIMUTH —
CASING
DRILLED BY
DATE 31/08 - 01/09/87
BOREHOLE NO. 300
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LOGGED BY BRD
DATE 10/09/87
DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
0.61		-			-		-	Not cored				
2.13		✓			95		0	Fractures 0°-15° to horiz, 1-6 cm spacing, most not oxidized.				SHALE with very little quartz or calc. material
2.44		✓			100		0	Fracture spcg. & orientation same as above, but more sfc. oxidation.				SHALE, as above.
3.96		✓			77		0	Most fractures near-horiz. or near-vert., with most of the steeply inclined ones oxidized. Typ. spcg. 2-9 cm.				SHALE, as above, except a broken and highly oxidized qtz. + carbonate layer at 3.61 - 3.72 m.
5.18		✓			75		0	Most fractures near-horiz. or near-vert., 1.5 - 6 cm spcg. Oxidation on steeply inclined fracture surfaces				SHALE with occasional thin quartz veins.
5.79		✓			100		0	Most fractures near-horiz. or 60°-90° to horiz., spcg. 2-9 cm. Many fracture surfaces oxidized.				SHALE with occasional thin quartz veins.
6.71		✓			85		13	All fractures 0°-15° to horiz., spacing 2-12 cm. Only minor oxidation.				SHALE with some siltstone bands, one thin quartz vein.
8.23		✓			90		50	First 7 cm of core: Horiz. fractures, 1.5 cm spacing. Probable zone of core loss. Remainder of core run: Fractures 0°-15° to horiz., 2-19 cm spacing, one at 60° to horiz. Very little sfc. oxidation.				SHALE with siltstone bands, occasional thin quartz veins at 50° to horizontal.
9.14		✓			88		44	Most fractures near-horizontal, 2-19 cm spacing, not oxidized. 32 cm long vertical fracture, highly oxidized and with qtz. growth on sfc. at 8.90 - 9.20 m.				SHALE with siltstone bands, considerable quartz in last 25 cm.

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MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water

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COLLAR ELEVATION 1006.345 FINAL DEPTH 26.82
INCLINATION Vertical AZIMUTH —
CASING

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DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m.	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
10.67		✓			100		36	Most fractures 0°-20° or 70°-90° to horiz. Oxidation on steeply inclined fracture surfaces. Typ. spcg. 5-15 cm, but up to 28cm. Highly fractured 9.14-9.16m and 9.78-9.81m				SHALE with siltstone bands, qtz. veins, minor calc. matl. on some fracture surfaces.
12.19		✓			100		46	Most fractures near-horiz. or near-vert., 1-20 cm spcg. typ., but up to 34 cm. Near-vertical fractures often show oxidation or mineral growth (slickensides).				SHALE with siltstone bands, qtz. veins up to 1.5 cm thick, little or no calc. material.
13.72		✓			100		68	12.19 - 12.35: Fractures 0°-20° and 60°-80° to horizontal common. Badly fractured at ≈12.27 m, in an area of considerable qtz. growth. 12.35 - 13.72: Fractures 0°-10° to horiz., 12-25cm spacing.				SHALE with siltstone bands, qtz. crystals and veins up to 1.5cm thick in first 15cm, only one thin qtz. vein in after 12.35cm. No calc. matl.
15.24		14.35 ↑ No return below here			98		65	13.72 - 14.35: Three near-horiz. and one near-vertical fractures. Minor oxidation and minor slickensides on the steeply-inclined surface 14.35 - 14.45: At least three fractures, 10° to horiz., showing slickenside growth. Some core loss. Probable fault zone. 14.45 - 14.63: Intact core 14.63 - 14.66: Fracture 30° to horiz., along a 3mm-thick slickensided qtz. vein. 14.66 - 15.24: Fractures at 0° - 30° to horiz., some slickensides & oxidation				SHALE with siltstone bands, qtz veins and slickensides along many fracture surfaces.

PROJECT Long Lake Dam | BOREHOLE NO. 300 | Sheet 3 of 4

CLIENT Sigma Engineering (Westmin) | CONTRACTOR Boisvenu Drilling

MACHINE JKS 300. | COORDINATES | DRILLED BY | LOGGED BY BRD

CORE BARREL | COLLAR ELEVATION 1006.345 | FINAL DEPTH 26.82 | DATE 31/08-01/09/87 | DATE 11/09/87

BIT DESIGN | INCLINATION Vertical | AZIMUTH — | DRAWN BY

CORE DIAMETER, mm 45 | FLUSH Water | CASING

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
16.15					92		26	15.24 - 15.72: Highly fractured along near-vertical and near-horiz. fractures, no piece larger than 6 cm, most 2-3 cm. Many fractures slickensided. 6mm thick layer of fault gouge at 15.34m, 20° to horiz. 15.72 - 16.15: Most fractures near-horiz., 2-15 cm spacing.				SHALE with siltstone bands, thin quartz veins, except: 15.88 - 15.99: Siltstone, minor shale, qtz. veins.
17.68					100		33	16.15 - 17.00: Most fractures 10°-20° to horiz., minor slickensiding on surfaces. 3-17 cm spacing. Some near-vert. fractures. 17.00 - 17.68: Highly fractured, most pieces 2-4 cm long, but up to 8 cm.				SHALE with siltstone bands, quartz veins. Quartz crystal growth on some fracture surfaces.
19.20		No Return			100		58	Most fractures 10°-20° to horizontal, 2.5-20 cm spacing. Some fractures about 60° to horiz. Only minor slickensiding. Highly fractured 18.53-18.59.				SHALE with siltstone bands. 20-30% siltstone. 2 cm thick quartz vein at 18.06 m, a few thinner ones, all 20°-60° to horizontal.
20.42					100		73	19.20 - 19.70: Most fractures 0°-15° to horiz., 1.5 - 16 cm spacing, two fractures 60°-80° to horiz. No slickensides. 19.70 - 20.42: Just two pieces of core, with a fracture 10° to horiz. at 20.12 m				SHALE with siltstone bands, occasional thin quartz veins.
21.95					100		72	20.42 - 21.36: Only six fractures, 10°-20° to horiz, 10-26 cm spacing except two 1 cm apart. 21.36 - 21.95: Fractures 10°-20° and 60°-80° to horiz., typ. spcg. 2-6 cm, but up to 19 cm.				SHALE with siltstone bands, thin quartz veins. One qtz. vein about 10 cm thick.

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water

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COORDINATES
COLLAR ELEVATION 1006.345 FINAL DEPTH 26.82
INCLINATION Vertical AZIMUTH —
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BOREHOLE NO. 300
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DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
23.77					74		6	Broken core for entire run. Lgst. piece 10 cm long, most < 5 cm. Fractures at a variety of angles, some are slickensided.				SHALE, minor siltstone, thin quartz veins
25.30		No Return			92		43	23.77 - 24.14: Highly fractured 24.14 - 24.44: Most fractures 10° - 20° or 60° - 80° to horiz., 1.5 - 7 cm. Minor slickensiding. 24.44 - 25.30: Most fractures near-horiz. or near-vertical, 10 - 28 cm spacing, except for a highly fractured zone at 24.93 - 25.05 m				SHALE, minor siltstone, quartz veins.
26.82					81		78	Recovered core has only five near-horiz. and two near-vert. fractures, widely spaced. Lost core likely all from bottom 30 cm of run. Last fracture is slickensided, all others not.				SHALE with siltstone bands, minor pyrite, minor quartz.
								. End of Log				

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
CONTRACTOR Boisvert Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
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COORDINATES
COLLAR ELEVATION 1007.90 FINAL DEPTH 28.35
INCLINATION Vertical AZIMUTH —
CASING

BOREHOLE NO. 301
Sheet 1 of 4
DRILLED BY
DATE 02/09/87
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DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m.	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
0.61		✓			93		0	Not cored				
1.52		✓						0.61-0.77: Loose rocks from surface 0.77-1.52: Most fractures 0°-15° or 60°-80° to horiz., 1-5 cm spcg., minor oxidation on some surfaces.				SHALE with minor siltstone bands
2.44		✓			74		0	1.52-1.85: Highly fractured probable core loss zone. Oxidation on fract. sfc. 1.85-2.44: Most fractures near-horiz., one 70° to horiz, slightly oxidized. Fracture spcg. 3-5 cm typically.				SHALE with siltstone bands
3.96		✓			100		33	2.44-3.68 m: Most fractures 10°-30° to horiz., 2-14 cm spcg, except a highly fractured and weathered zone at 2.84-2.92 m 3.68 m: Fracture 40° to horiz along bottom of quartz vein 3.68-3.96: Intact core				SHALE with siltstone bands. Qtz. and weathered carbonate in fractured zone at 2.84 m, noted at left. 2 cm thick quartz vein at 3.66m, oriented 40° to horizontal.
5.49		✓			100		96	Only 6 near-horizontal and one near-vertical fracture in entire run. No surface oxidation.				SHALE with siltstone bands.
7.01		✓			100		100	Six near-horizontal fractures, not oxidized.				SHALE with siltstone bands.
8.53		✓			100		80	7.01-7.88: Just two near-horiz. fractures 7.88-8.53: Fractures 0°-20° and 60°-70° to horizontal. Slickenside growth on steeply-inclined fracture surfaces.				SHALE with siltstone bands, slickensides on two steep fracture surfaces.
10.06		✓			100		98	Nine well-spaced near-horiz. fractures, two at 60°-90°. One of the steep fractures is oxidized, the other has minor qtz. and calc-carbonate on the sfc.				SHALE with siltstone bands.

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CORE BARREL
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CORE DIAMETER, mm 45 FLUSH Water
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COLLAR ELEVATION 1007.90 FINAL DEPTH 28.35
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BOREHOLE NO. 301
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DRILLED BY
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DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m.	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
11.58		✓			97		84	10.06 - 11.34: Four fractures 0°-10° to horiz., one slightly oxidized 11.34 - 11.58: Six fractures 0°-25° to horiz. and two about 60° to horiz., 2-7cm spcg. Slickensides on one near-horiz. fracture, minor qtz. on a steep one.				SHALE with siltstone bands, minor quartz
13.11		✓			100		70	11.58 - 12.16: Six fractures 0°-15° to horiz., 2-22 cm spacing. Minor slickensides. 12.16 - 12.29: Fractures 0°-15° and 60°-90° to horiz., 1-3 cm spcg., 1 cm long highly fractured zone. Oxidation, slickensides, qtz veins all common. 12.29 - 12.72. Five near-horiz. fractures, two at 60°-80° to horiz, one of which is v. smooth and slickensided. 12.72 - 13.11: Intact core				SHALE with siltstone bands, thin quartz veins. Considerable quartz in fractured zone at 12.16-12.29m, including one vein ≈ 1 cm thick, horizontal.
14.02		✓			100		100	Three well-spaced near-horiz. fractures				SHALE, minor siltstone
15.54					100		90	Seven well-spaced near-horiz. fractures				SHALE, minor siltstone
17.07		✓			100		100	Six well-spaced near-horiz. fractures, one with minor weathered carbonate on surface.				SHALE, minor siltstone, minor calc. carbonate on one fracture surface
17.68		≈ 17.44 → No Return Below Here			100		95	Intact core except two fracture zones: 17.29 - 17.31m: core broken horizontally and vertically 17.44 m: 7-13 mm thick fractured qtz. vein, 45° to horiz. Probable water loss zone.				SHALE, minor siltstone. Single quartz vein noted at left

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CORE BARREL
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COLLAR ELEVATION 1007.90 FINAL DEPTH 28.35
INCLINATION Vertical AZIMUTH —
CASING
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DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
19.20					98		87	6 near-horizontal and one near-vertical fracture, no oxidation, only v. minor slickensiding.				SHALE with siltstone bands, one very thin quartz vein
20.73					95		85	All well-spaced near-horizontal fractures except three zones: - 19.20-19.23: three horiz. and one 60° to horiz. fractures. - highly fractured at 20.34-20.38 m - highly fractured at 20.68-20.73 m				SHALE with siltstone bands. Two 3cm thick fractured quartz veins containing shale fragments, at 20.34 m and 20.68 m. These veins are horizontal.
22.25		No Return			100		54	Most fractures 0°-15° and 60°-80° to horiz., spcg. 1.5-22 cm, two highly fractured zones near 20.83 m and 21.68 m. Slickensides on most steep fractures and some near-horiz. ones.				SHALE with siltstone bands, slickensides on fracture surfaces, occasional thin quartz veins.
23.47					94		13	22.25-22.39: 3 fractures, 0°-20° to horiz. 22.39-22.63: Highly fractured. Three pieces 3-5.5 cm long, otherwise rubble. Slickensides and qtz. veins common 22.63-22.96: Two near-horiz. fractures, one at 70° along a slickensided qtz. vein. 22.96-23.47: Highly fractured. Largest pieces 6 cm long, but split vertically. Considerable quartz and slickensides.				SHALE with siltstone bands. Unfractured zone at 22.63-22.96 m is mainly SILTSTONE with one v. thin qtz. vein and one 5 mm thick. Considerable quartz and slickensides in the two highly fractured zones, including a near-vertical quartz lense at least 2 cm thick.
24.69					81		33	Most fractures at 0°-15° or 60°-80° to horiz., typ. spcg. 3-11 cm, except highly fractured at 23.77-23.85 m and 24.47-24.54. Qtz. and slickensides in highly fractured zones.				SHALE and SILTSTONE in roughly equal amounts, quartz and slickensides in highly fractured zones noted at left. Qtz. veins are 2-4 mm thick.

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water

CONTRACTOR Boisvenu Drilling
COORDINATES
COLLAR ELEVATION 1007.90 FINAL DEPTH 28.35
INCLINATION Vertical AZIMUTH -
CASING

BOREHOLE NO. 301
Sheet 4 of 4
DRILLED BY
DATE 02/09/87
LOGGED BY BRD
DATE 11/09/87
DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
26.21					100		24	Most fractures 0°-15° or 60°-80° to horiz., spcg. 2-15 cm, 5-10 cm typ. Many fractures slickensided.				Roughly equal amounts of SILTSTONE and SHALE. Two horizontal bands of quartz and darker shale at 25.40-25.49 m and 25.88-25.97 m. Slickensides on many fracture surfaces.
27.74		No Return			100		80	Most fractures 0°-15° or 60°-70° to horiz, generally well-spaced except highly fractured zones at 26.69-26.75 m and 27.42-27.47 m. Qtz. veins in second of these zones.				26.21-27.42: SHALE with siltstone bands and occasional very thin quartz veins. 27.42-27.47: Highly fractured SHALE with qtz. veins up to 5 mm thick. 27.47-27.74: Darker SHALE with abundant thin, randomly-oriented quartz veins.
28.35					89		0	Most fractures 0-15° or 60°-90° to horizontal, typ. spcg. 3-8 cm, except highly fractured at 27.91-27.95 m.				27.74-28.07 m: Dark SHALE with abundant randomly oriented quartz veins up to 7 mm thick. 28.07-28.35: SHALE with siltstone bands, occasional very thin quartz veins
								End of log				

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
CONTRACTOR Boisvert Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 45 FLUSH Water
COORDINATES
COLLAR ELEVATION 1004.59 FINAL DEPTH 27.13
INCLINATION 60° to horiz. AZIMUTH 160°
CASING
DRILLED BY
DATE 03/09/87
LOGGED BY BRD
DATE 12/09/87
DRAWN BY

BOREHOLE NO. 302
Sheet 2 of 4

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN REFD, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH, m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
8.84					100		12	Most fractures 0°-30° to core axis normal, or 60°-90° to axis normal. Many oxidized. Typ. spcg. 3-8 cm. Highly fractured at 8.25-8.30 m and 8.74-8.79 m.				SHALE with siltstone bands and occasional thin quartz veins.
9.75					100		13	Most fractures 0°-20° to core axis normal, some 60°-90°. Typ. spcg. 4-8 cm. Minor oxidation and slickensides on a few surfaces.				SHALE with siltstone bands. A few qtz. veins, up to 3mm thick. Minor slickensiding on some fractures.
10.97		No return			94		10	9.75-10.42: Most fractures 0°-20° or 70°-90° to core axis normal, typ. spcg. 5-10 cm, some with minor oxidation or slickensiding. 10.42-10.97: highly fractured, one piece 7cm long, all others <5cm. Slickensides present, also fault gouge.				SHALE with siltstone bands. Qtz. veins up to 2 cm thick, containing shale fragments (only two such veins). Slickensides near bottom of core run, also apparent fault gouge.
12.50					98		16	10.97-11.31: Most fractures 0°-20° or 60°-90° to core axis normal, 5-8 cm spcg., minor slickensides. 11.31-11.39: Rounded gravel 11.39-12.50: Fracture orientation similar to above, but wider spcg, up to 17 cm. Slickensides more common.				SHALE with siltstone bands. GRAVEL (not all shale) at 11.31-11.39 m Thin, steeply inclined qtz. veins in the shale below the gravel zone, becoming thicker (up to 7mm) and more numerous in last 30 cm. Minor pyrite in last 10 cm.
13.72					98		28	12.50-13.28: Almost all fractures 10°-20° to core axis normal, 3-12 cm spacing, v. minor slickensiding. 13.28-13.40: Highly fractured. 13.40-13.72: Most fractures 0°-15° or 60°-90° to axis normal, 3-8 cm spcg., some slickensided.				SHALE with siltstone bands, steeply-inclined (normal to fractures) quartz veins up to 12 mm thick. Highly fractured zone at 13.28-13.40 m is mostly quartz.

PROJECT Long Lake Dam

BOREHOLE NO. 302 Sheet 1 of 4

CLIENT Sigma Engineering (Westmin)

CONTRACTOR Boisvenu Drilling

MACHINE JKS 300

CORE BARREL

BIT DESIGN

CORE DIAMETER, mm 45 FLUSH Water

COORDINATES

COLLAR ELEVATION 1004.59 FINAL DEPTH 27.13

INCLINATION 60° to horizontal AZIMUTH 160°

CASING

DRILLED BY

DATE 03/09/87

LOGGED BY BRD DATE 03/09/87

DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES (All depths measured along core axis)	DOWNHOLE DEPTH m	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
0.91					—		—	Not cored				—
2.13		?			77		0	0.91 – 1.11: Loose rocks from surface zone 1.11 – 2.13: Core broken mainly along planes 40°–50° to core axis normal, also along core axis. Larges pieces 7–9cm long. Most steeply-inclined fracture surfaces oxidized				SHALE with thin siltstone bands
3.66		?			93		0	Most fractures either ≈ 45° to core axis or parallel to axis. More closely-spaced than above: 2–6cm typically, 7.5cm max. Many surfaces oxidized.				SHALE with thin siltstone bands
4.88		?			88		0	Most fractures 30°–50° or 70°–90° to core axis normal, typ. spcg. 3–6cm, up to 8.5 cm. Oxidation and minor qtz. on many surfaces.				SHALE with thin siltstone bands. Thin, steeply-inclined quartz veins present. Minor quartz on a few fracture surfaces.
6.40		?			100		9	Most fractures 20°–40° or 70°–90° to core axis normal. Typ. spcg. 4–8cm, with several pieces 10–15cm, but most split along core axis. Oxidation, minor qtz. on many surfaces.				SHALE with thin siltstone bands, occasional thin quartz veins.
7.92	No return below here	7.42			80		15	6.40 – 7.42: Most fractures 0°–30° or 70°–90° to axis normal, typ. spcg. 3–10 cm, many oxidized 7.42 – 7.59: Highly fractured, highly oxidized zone containing apparent fault gouge. 7.59 – 7.92: Most fractures 0°–30° or 70°–90° to axis normal, oxidized, 2–6 cm spcg.				SHALE with siltstone bands, except: 6.82 – 7.06: Mostly SILTSTONE 7.42 – 7.59: Fault zone

Note: exact depth of water loss not known, but was 7.92 m or above.

PROJECT Long Lake Dam | BOREHOLE NO. 302 | Sheet 3 of 4

CLIENT Sigma Engineering (Westmin) | CONTRACTOR Boisvenu Drilling

MACHINE JKS 300 | COORDINATES | DRILLED BY | LOGGED BY BRD

CORE BARREL | COLLAR ELEVATION 1004.59 | FINAL DEPTH 27.13 | DATE 03/09/87 | DATE 03/09/87

BIT DESIGN | INCLINATION 60° to horiz. | AZIMUTH 160° | DRAWN BY

CORE DIAMETER, mm 45 | FLUSH Water | CASING

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m.	ELEVATION, m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
15.24					83		0	Core highly broken along planes in all directions, but mostly near-normal and near-parallel to core axis's. Fracture spacing 1-15cm, but larger pieces split along core axis's. Slickensides, minor oxidation, minor calc. carbonate along many surfaces.				SHALE with siltstone bands, qtz. veins up to 5mm thick.
16.76		No return			98		52	15.24 - 16.24: Almost all fractures 0°-20° to core axis normal, 3-15 cm spcg. Highly fractured 13mm thick qtz. vein at 15.64 m. Minor slickensides and calc. matl. on some fracture surfaces. 16.24 - 16.76: Most fractures 40°-80° to core axis normal, 3-8 cm spcg. Highly fractured 16.61-16.65 m.				SHALE with siltstone bands, qtz. veins (one 13mm thick, the rest < 1 mm). Minor calc. carbonate on some fracture surfaces.
18.29					31		0	Poor recovery of highly fractured core. Most fractures near-normal or near-parallel to core axis. Minor slickensides.				SHALE with siltstone bands, minor quartz, minor slickenside growth.
19.51					56		0	Highly fractured core. A few pieces up to 8 cm long, but split along core axis. Many fractures ∝ 15° to core axis normal. Minor slickensides, small amount of possible fault gouge.				SHALE with siltstone bands, minor quartz, minor slickenside growth.
21.03					93		38	19.51 - 20.50: Most fractures 0°-20° or 70°-90° to core axis normal, 2-5 cm typ. spcg., minor slickensides. Highly fractured at 19.94 - 20.10 m. 20.50 - 21.03: Three fractures, 10° to axis, normal, well-spaced.				SHALE with siltstone bands, minor quartz, minor slickenside growth.

PROJECT Long Lake Dam
CLIENT Sigma Engineering (Westmin)
CONTRACTOR Boisvenu Drilling
MACHINE JKS 300
CORE BARREL
BIT DESIGN
CORE DIAMETER, mm 46 FLUSH Water
COORDINATES
COLLAR ELEVATION 1004.59 FINAL DEPTH 27.13
INCLINATION 60° to horiz. AZIMUTH 160°
CASING
DRILLED BY
DATE 03/09/87

BOREHOLE NO. 302
Sheet 4 of 4
LOGGED BY BRD
DATE 12/09/87
DRAWN BY

DOWNHOLE DEPTH, m	DRILLING PROGRESS	FLUSH RETURNS, %	DEPTH TO WATER, m	CORE RUN DEPTH, m	TOTAL CORE RECOVERY, %	SOLID CORE RECOVERY, %	ROCK QUALITY DESIGNATION, %	DISCONTINUITIES	DOWNHOLE DEPTH m	ELEVATION m	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION
22.56					100		94	Only 9 fractures, 0°-15° to core axis normal, well-spaced, minor slickensides on two of them.				SHALE with with siltstone bands, two quartz veins 5-8 mm thick.
24.08		46 return			100		83	Nine fractures 0°-15° to core axis normal, one 60° to axis normal, typ. spcg. 4-40 cm. V. minor slickensiding on a few fracture surfaces.				SHALE with siltstone bands, minor quartz.
25.60					100		64	Most fractures 0°-20° or 70°-90° to core axis normal, generally well-spaced. Minor slickensides.				SHALE with siltstone bands, a few quartz veins, minor pyrite.
27.13					100		54	25.60-27.02: Most fractures 0°-20° or 70°-90° to core axis normal, typ. spcg. 3-17cm, but two pieces 27 & 37 cm long. Minor slickensides. 27.02-27.13: Highly fractured.				SHALE with siltstone bands, minor quartz, minor pyrite. Darker and with more quartz in last 15 cm.
								End of Log				

BRUCE RONALD DAGG

Resume: April 1988

ADDRESS: 2945 West 10th Ave, Vancouver, B. C., V6K 2K5
(604)-733-6848
BIRTH: 7 January 1958, Vancouver, British Columbia
AGE: 30 years
HEIGHT: 5' 7.5" (172 cm)
WEIGHT: 160 lbs. (72.6 kg)
HEALTH: Excellent

MAIN AREAS OF EXPERTISE/INTEREST

Slope hazards, geotechnical engineering, groundwater and surface water hydrology.

EDUCATION

Graduation (with honours), Kitsilano Secondary School, Vancouver, B.C., 1976. Main areas of study: Science, Mathematics, Music.

B.A.Sc. (Geological Engineering), University of British Columbia, Vancouver, B.C., 1981. Main areas of study: Groundwater Hydrology; Geotechnical Engineering, including Soil and Rock Mechanics; Geomorphology; Computer Modelling; Geology; Technical Writing. Bachelor's Thesis: An Analysis of the Piezometer Cone as an Instrument for Soil Investigations. Supervisor: Dr. R. G. Campanella, Civil Engineering.

Unclassified Studies in Geomorphology, Hydrology, and Rock Mechanics, University of British Columbia; Sept. 1982 - April 1983.

M.Sc. (Physical Geography), University of British Columbia, 1987. Area of study: Process Geomorphology. Thesis: Debris Supply Mechanisms to Torrent-Prone Channels on the East Side of Howe Sound, British Columbia. Supervisory Commitee: M. J. Bovis, Geography (supervisor); M. Church, Geography; S. O. Russell, Civil Engineering.

EMPLOYMENT EXPERIENCE

Geotechnical and physical geography contract work, since May 1987. Main projects have been a geotechnical investigation for a proposed hydroelectric project near Stewart (with Sigma Engineering Ltd., under the supervision of N. A. Skermer, PEng.), and an air quality study (fog water chemistry) with the Waste Management Branch, B.C. Min. of Environment). Other contracts with D. L. Hogan, consulting geomorphologist; Dr. J. M. Ryder, consulting geomorphologist, and Dr. D. G. Steyn, Associate Professor of Geography, University of B. C.

University of British Columbia, Department of Geography, Sept. 1982 - July 1987. Teaching Assistant in physical geography, Graduate Research Assistant both during thesis work and following completion. Research work included field reconnaissance, surveying, geological mapping, materials sampling, and testing to determine morpholigical, geotechnical, and hydrological properties of hillslope materials and creek channel debris, as these relate to debris torrent activity in the Howe Sound area, southwest British Columbia.

Geological Survey of Canada, Terrain Sciences Division, summer 1983. Field assistant for detailed investigations of several landslides and slope hazards in southern B.C.

Robinson Dames and Moore, Vancouver, B.C. and Calgary, Alberta, June 1981 to July 1982. Junior Engineer, involved primarily in hydrogeology and rock mechanics studies (field work included drill

core logging, pump testing, etc.) for proposed coal mines for Fording Coal (Lethbridge, Alberta) and Crows Nest Resources (Robb, Alberta). Also involved in a study of using mine tailings to reclaim river flood plains in northern Idaho (for the U. S. Bureau of Mines), and several foundation investigations in the Vancouver and Calgary areas.

Crippen Consultants, North Vancouver, B.C., summers of 1979 and 1980. Employed as a summer student at the site of the Aluminum Company of Canada's proposed Kemano Completion power project, Kemano, B.C. Work included diamond drill supervision and core logging, pump testing, surveying, and surface and subsurface geological mapping.

PUBLICATIONS

Bovis, M. J., Dagg, B. and Kaye, D., 1985. Debris flows and debris torrents in the Southern Canadian Cordillera: Discussion. Canadian Geotechnical Journal, 22, p. 608.

Bovis, M. J. and Dagg, B. R., 1987. Mechanisms of debris supply to steep channels along Howe Sound, southwest British Columbia. In: Erosion and Sedimentation in the Pacific Rim: Proceedings of the Corvallis Symposium (I.A.H.S. Publ. No. 165), pp. 191-200.

Bovis, M. J. and Dagg, B. R., 1987. A model for debris accumulation and debris torrent initiation in steep channels. Presented at: I.A.H.S. Debris Torrent Workshop, XIX General Assembly of the I.U.G.G., Vancouver, B. C., August 1987. In press.

PARTICIPATION IN ORGANIZATIONS

Geography Graduate Students, UBC: Involved with 1987 Open House, Vancouver area field trip for new students, organizer of coffee service for Faculty, Staff, and Graduate Students.

Geological Engineering Club, UBC: Member of club executive in third and fourth years, organizer of coffee service.

Kitsilano Secondary School: Student council president in Grade 12, council member in Grade 11.

Scouts Canada: Member since 1967. Most recent major project was chairing the Administration Committee of the 10th Canadian Rover Moot, an international event held in Langley in August 1986. Was West Coast Correspondent for Rovering, a national magazine, for 8 years.

Organized Sports: Played rugby and football in high school, hockey and soccer at U.B.C.

INTERESTS

Hiking, camping, downhill and cross-country skiing, cycling, tennis, most other sports, reading.

REGISTRATION

Engineer-in-training in British Columbia.
Member of the Canadian Geotechnical Society.
Member of the Canadian Association of Geographers.

REFERENCES

N. A. Skermer, P.Eng., Steffen Robertson and Kirsten, 801-1030 West Georgia Street, Vancouver, B.C., V6E 2Y3. 681-4196.

Dr. M. J. Bovis, Department of Geography, University of British Columbia, #217 1984 West Mall, Vancouver, B.C., V6T 1W5. 228-3511.

Dr. S. G. Evans, Geological Survey of Canada, Terrain Sciences Division, 601 Booth St., Ottawa, Ontario, K1A 0E8.

APPENDIX D : 1987 ASSAY RESULTS

LAURA CLAIM	:	HOLES B87CH50 TO B87CH52
GOLDEN CROWN CLAIM	:	HOLES B87CH54 TO B87CH55
PASS FR. CLAIM	:	NO ASSAY DONE ON HOLES

DATE : 12-10-87
TIME : 10:27:50

BIG MISSOURI -- LAURA CLAIM

TRAVERSE/HOLE NUMBER ----------> B87CH50

N.B. Negative number indicates an assay less than the detection limit
n.a. indicates no assay entered for data

ASSAY FIELDS

P ---> Primary value
S ---> Sub-prime value
1 ---> Rerun of original pulp
2 ---> Resplit of sample
A ---> Field average value

FROM (M)	TO (M)	SAMPLE NO.	AU OZ/T	AG OZ/T	CU PPM	PB PPM	ZN PPM	AUE OZ/T	AUR	S.G MEASUR	SAMPLE TYPE	ROCK TYPE
2.44	5.18	8929 P	0.001	0.10	100.0	100.0	200.0	0.002	0.010	0.000	HF-CORE	AXLT
5.18	7.01	8930 P	0.001	0.10	-1.0	100.0	300.0	0.002	0.010	0.000	HF-CORE	AXLT
7.01	8.53	8931 P	0.001	0.10	100.0	100.0	300.0	0.002	0.010	0.000	HF-CORE	AXLT
8.53	10.06	8932 P	0.001	0.11	-1.0	100.0	100.0	0.002	0.009	0.000	HF-CORE	CTUF
10.06	11.58	8933 P	0.001	0.17	100.0	100.0	100.0	0.003	0.006	0.000	HF-CORE	CTUF
23.16	24.69	8934 P	0.001	0.17	-1.0	100.0	100.0	0.003	0.006	0.000	HF-CORE	CTUF
24.69	26.21	8935 P	0.004	0.08	-1.0	200.0	400.0	0.005	0.050	0.000	HF-CORE	AXXX
26.21	27.74	8936 P	0.016	0.07	-1.0	300.0	400.0	0.017	0.229	0.000	HF-CORE	AXXX
36.88	38.40	8937 P	0.004	0.07	-1.0	200.0	500.0	0.005	0.057	0.000	HF-CORE	AXXX

DATE : 12-10-87
TIME : 10:27:59

BIG MISSOURI -- LAURA CLAIM

TRAVERSE/HOLE NUMBER ----------> B87CH51

N.B. Negative number indicates an assay less than the detection limit
n.a. indicates no assay entered for data

ASSAY FIELDS

P ---> Primary value
S ---> Sub-prime value
1 ---> Rerun of original pulp
2 ---> Resplit of sample
A ---> Field average value

FROM (M)	TO (M)	SAMPLE NO.	AU OZ/T	AG OZ/T	CU PPM	PB PPM	ZN PPM	AUE OZ/T	AUR	S.G MEASUR	SAMPLE TYPE	ROCK TYPE
2.74	5.49	8938 P	0.001	0.09	-1.0	100.0	200.0	0.002	0.011	0.000	HF-CORE	AXLT
10.06	11.58	8939 P	0.002	0.07	-1.0	100.0	200.0	0.003	0.029	0.000	HF-CORE	AXLT
11.58	13.11	8940 P	0.002	0.12	-1.0	100.0	100.0	0.003	0.017	0.000	HF-CORE	CTUF
13.11	14.39	8941 P	0.003	0.11	-1.0	100.0	100.0	0.004	0.027	0.000	HF-CORE	CTUF
14.39	15.85	8942 P	0.002	0.08	-1.0	100.0	100.0	0.003	0.025	0.000	HF-CORE	AXXX
15.85	17.07	8943 P	0.001	0.03	-1.0	100.0	100.0	0.001	0.033	0.000	HF-CORE	AXXX
26.52	28.04	8944 P	0.001	0.07	-1.0	100.0	100.0	0.002	0.014	0.000	HF-CORE	AXXX
28.04	29.57	8945 P	0.004	0.11	-1.0	100.0	100.0	0.005	0.036	0.000	HF-CORE	AXXX
34.81	36.21	8946 P	0.001	0.10	-1.0	100.0	400.0	0.002	0.010	0.000	HF-CORE	AXXX
36.21	37.43	8947 P	0.004	0.09	-1.0	100.0	400.0	0.005	0.044	0.000	HF-CORE	CTUF
37.43	39.01	8948 P	0.001	0.07	-1.0	100.0	200.0	0.002	0.014	0.000	HF-CORE	CTUF
45.11	46.51	8949 P	0.008	0.07	-1.0	100.0	100.0	0.009	0.114	0.000	HF-CORE	AXXX

DATE : 12-10-87
TIME : 10:28:07

TRAVERSE/HOLE NUMBER ----------> B87CH51 PAGE : 2

FROM (M)	TO (M)	SAMPLE NO.	AU OZ/T	AG OZ/T	CU PPM	PB PPM	ZN PPM	AUE OZ/T	AUR	S.G MEASUR	SAMPLE TYPE	ROCK TYPE
46.51	47.85	8950 P	0.004	0.06	-1.0	100.0	300.0	0.005	0.067	0.000	HF-CORE	AXXX

DATE : 12-10-87
TIME : 10:28:17

BIG MISSOURI -- LAURA CLAIM

TRAVERSE/HOLE NUMBER ----------> B87CH52

N.B. Negative number indicates an assay less than the detection limit
n.a. indicates no assay entered for data

ASSAY FIELDS

P ---> Primary value
S ---> Sub-prime value
1 ---> Rerun of original pulp
2 ---> Resplit of sample
A ---> Field average value

FROM (M)	TO (M)	SAMPLE NO.	AU OZ/T	AG OZ/T	CU PPM	PB PPM	ZN PPM	AUE OZ/T	AUR	S.G MEASUR	SAMPLE TYPE	ROCK TYPE
5.49	7.01	8951 P	0.003	0.10	-1.0	200.0	400.0	0.004	0.030	0.000	HF-CORE	AXXX
7.01	8.53	8952 P	0.001	0.11	-1.0	200.0	400.0	0.002	0.009	0.000	HF-CORE	AXXX
8.53	10.06	8953 P	0.004	0.09	-1.0	100.0	200.0	0.005	0.044	0.000	HF-CORE	CTUF
10.06	11.58	8954 P	0.003	0.12	-1.0	100.0	100.0	0.004	0.025	0.000	HF-CORE	AALT
11.58	13.11	8955 P	0.001	0.18	-1.0	200.0	400.0	0.003	0.006	0.000	HF-CORE	AALT
13.11	14.63	8956 P	0.001	0.11	-1.0	200.0	400.0	0.002	0.009	0.000	HF-CORE	AALT
14.63	16.15	8957 P	0.001	0.09	-1.0	100.0	200.0	0.002	0.011	0.000	HF-CORE	AALT
16.15	17.68	8958 P	0.001	0.09	-1.0	200.0	100.0	0.002	0.011	0.000	HF-CORE	AALT
25.30	26.82	8959 P	0.003	0.24	-1.0	200.0	300.0	0.006	0.013	0.000	HF-CORE	AALT
26.82	28.35	8960 P	0.001	0.42	-1.0	500.0	800.0	0.005	0.002	0.000	HF-CORE	AALT
28.35	29.87	8961 P	0.001	0.10	-1.0	200.0	600.0	0.002	0.010	0.000	HF-CORE	AALT
29.87	31.39	8962 P	0.003	0.12	-1.0	200.0	400.0	0.004	0.025	0.000	HF-CORE	AALT

TRAVERSE/HOLE NUMBER ----------> B87CH52 PAGE : 2

FROM (M)	TO (M)	SAMPLE NO.	AU OZ/T	AG OZ/T	CU PPM	PB PPM	ZN PPM	AUE OZ/T	AUR	S.G MEASUR	SAMPLE TYPE	ROCK TYPE
33.22	34.84	8963 P	0.038	0.15	-1.0	800.0	1200.0	0.040	0.253	0.000	HF-CORE	AALT
34.84	35.97	8964 P	0.028	0.12	-1.0	1000.0	2000.0	0.029	0.233	0.000	HF-CORE	CTUF
35.97	37.43	8965 P	0.034	0.11	-1.0	1000.0	1700.0	0.035	0.309	0.000	HF-CORE	CTUF
37.43	38.95	8966 P	0.011	0.08	-1.0	400.0	600.0	0.012	0.138	0.000	HF-CORE	AXLT
38.95	40.23	8967 P	0.002	0.11	-1.0	300.0	500.0	0.003	0.018	0.000	HF-CORE	AXLT
40.23	41.76	8968 P	0.003	0.10	-1.0	300.0	500.0	0.004	0.030	0.000	HF-CORE	AXLT

DATE : 12-10-87
TIME : 10:52:38

BIG MISSOURI -- GOLDEN CROWN CLAIM

TRAVERSE/HOLE NUMBER ----------> B87CH54

N.B. Negative number indicates an assay less than the detection limit
n.a. indicates no assay entered for data

ASSAY FIELDS

P ---> Primary value
S ---> Sub-prime value
1 ---> Rerun of original pulp
2 ---> Resplit of sample
A ---> Field average value

FROM (M)	TO (M)	SAMPLE NO.	AU OZ/T	AG OZ/T	CU PPM	PB PPM	ZN PPM	AUE OZ/T	AUR	S.G MEASUR	SAMPLE TYPE	ROCK TYPE
23.77	25.30	7078 P	0.003	0.09	100.0	200.0	700.0	0.004	0.033	0.000	HF-CORE	AXLT
25.30	26.82	7079 P	0.004	0.09	100.0	200.0	500.0	0.005	0.044	0.000	HF-CORE	AXLT
26.82	28.35	7080 P	0.004	0.08	100.0	100.0	200.0	0.005	0.050	0.000	HF-CORE	AXLT
28.35	29.87	7081 P	0.002	0.10	100.0	100.0	100.0	0.003	0.020	0.000	HF-CORE	AXLT
29.87	31.39	7082 P	0.001	0.09	100.0	100.0	200.0	0.002	0.011	0.000	HF-CORE	AXLT
31.39	32.92	7083 P	0.001	0.10	100.0	100.0	200.0	0.002	0.010	0.000	HF-CORE	AXLT
32.92	34.44	7084 P	0.001	0.14	100.0	100.0	100.0	0.002	0.007	0.000	HF-CORE	AXLT
34.44	35.84	7085 P	0.001	0.09	100.0	100.0	200.0	0.002	0.011	0.000	HF-CORE	AXLT
35.84	37.49	7086 P	0.008	0.10	100.0	100.0	800.0	0.009	0.080	0.000	HF-CORE	CTUF
37.49	39.01	7087 P	0.001	0.09	100.0	100.0	200.0	0.002	0.011	0.000	HF-CORE	AXLT

DATE : 12-10-87
TIME : 10:52:47

BIG MISSOURI -- GOLDEN CROWN CLAIM

TRAVERSE/HOLE NUMBER ----------> B87CH55

N.B. Negative number indicates an assay less than the detection limit
n.a. indicates no assay entered for data

ASSAY FIELDS

P ---> Primary value
S ---> Sub-prime value
1 ---> Rerun of original pulp
2 ---> Resplit of sample
A ---> Field average value

FROM (M)	TO (M)	SAMPLE NO.	AU OZ/T	AG OZ/T	CU PPM	PB PPM	ZN PPM	AUE OZ/T	AUR	S.G MEASUR	SAMPLE TYPE	ROCK TYPE
28.65	30.02	7088 P	0.003	0.07	100.0	100.0	200.0	0.004	0.043	0.000	HF-CORE	AXLT
30.02	31.39	7089 P	0.001	0.09	100.0	100.0	200.0	0.002	0.011	0.000	HF-CORE	AXLT
31.39	32.92	7090 P	0.001	0.09	100.0	100.0	200.0	0.002	0.011	0.000	HF-CORE	AXLT
32.92	36.00	7091 P	0.002	0.06	100.0	100.0	300.0	0.003	0.033	0.000	HF-CORE	AXLT
36.00	37.52	7092 P	0.001	0.06	100.0	400.0	800.0	0.002	0.017	0.000	HF-CORE	CTUF
37.52	39.08	7093 P	0.003	0.09	100.0	200.0	400.0	0.004	0.033	0.000	HF-CORE	AXLT