XC ⇒ GSW, AJD
File - Mt Sicker Environmental

HATFIELD CONSULTANTS LTD

resource and pollution management

May 7, 1987.

827423
92B/13

Mr. Alex J Davidson
Exploration Manager
Western Canada
Corporation Falconbridge Copper
6415 - 64th Street
Delta, B.C.
V4K 4E2

Dear Mr. Davidson:

Re: Mount Sicker Project, Chemainus, B.C.

As an interim report, I have enclosed for your review the water quality results for samples collected on March 27, 1987 from both the Mount Sicker and Lara Properties. Sample sites are shown on the attached map. Note that sample sites 1,2,3,4, and 5 are common to both studies but only the analytical costs for sites 6,7,8 and 9 are proportioned to Corporation Falconbridge Copper.

I wish to draw your attention to the water quality data for sample sites 4 and 7. These sites are located downstream of the former operations (site 4) and downstream of the abandoned tailings disposal area (site 7). Whereas the natural water quality in the Chemainus watershed is relatively soft (<50 mg/L $CaCO_3$), low in dissolved and suspended solids (<30 mg/L) and low in conductivity (<50 umhos/cm), sample sites 4 and 7 exhibit abnormally high dissolved solids content (167 to 280 mg/L) and hardness (119 to 165 mg/L $CaCO_3$). The majority of these high values are reflected in high dissolved calcium and magnesium, but components such as sulphate levels and heavy metals are much above background and are an indication of a leachate source. Metals of concern include arsenic, barium, cadmium, copper, lead and particularly zinc which presently exceeds the provincial standards for an allowable discharge.

Staff gauges were also installed at sites 6,7,8 and 9, and calibrated using Rhodamine WT dye techniques. Flows and corresponding gauge heights were as follows:

201-1571 Bellevue Avenue,
West Vancouver, B.C., Canada V7V 1A6

Telephone: (604) 926-3261
Telex: 04-352798

Station No. 6 :	Nugget Creek	Flow 0.67 ft^3/s (0.019 m^3/s) Gauge Reading 0.86 ft (0.26 m)
Station No. 7 :	Unnamed Creek	Flow 0.011 ft^3/s (0.0003 m^3/s) Gauge Reading 0.18 ft (0.055m)
Station No. 8 :	Bonsall Creek	Flow 4.95 ft^3/s (0.139 m^3/s) Gauge Reading 0.76 ft (0.23 m)
Station No. 9 :	Whitehouse Creek	Flow 14.0 ft^3/s (0.396 m^3/s) Gauge Reading 1.94 ft (0.59 m)

Subject to your direction, we are proposing to supply Harold Gibson or Michael Gray with sufficient equipment to complete a second sampling. This would occur later this year in conjunction with a low flow sampling at the Lara Property. At that time we would also provide you with a more complete water quality report.

Should you have any questions on the foregoing please do not hesitate to give me a call.

Yours truly
HATFIELD CONSULTANTS LIMITED

ROBERT L. HALLAM
Associate Biologist

Enclosures (2)

cc Mr. Harold Gibson
Corporation Falconbridge Copper
5215 Hykaway Road
Duncan, B.C.

Table 1
Corporation Falconbridge Copper
Mount Sicker Property, Chemainus, B.C.

Analyses of Water Quality Samples Collected March 27, 1987.

D/S of tailing

PARAMETER		6	7	8	9
Physical Tests					
pH		5.92	6.54	5.84	6.39
Conductivity (µmhos/cm)		40.6	331.	74.9	102.
Turbidity (NTU)		<1.0	4.6	<1.0	5.2
Suspended Solids (mg/L)		2.4	14.4	2.4	17.2
Dissolved Solids (mg/L)		28.3	280.	58.3	65.6
Hardness (mg/L)	$CaCO_3$	16.9	165.	32.8	41.5
Dissolved Anions (mg/L)					
Bicarbonate	HCO_3	17.6	90.3	29.3	39.3
Chloride	Cl	<1.0	<1.0	<1.0	<1.0
Sulfate	SO4	<1.0	63.6	3.75	3.10
Nitrate	N	0.072	0.116	0.200	0.602
Nitrite	N	<0.001	<0.001	<0.001	0.025
Phosphorus	P	0.004	0.004	0.007	0.025
Other Tests (mg/L)					
Ammonia	N	<0.005	0.024	<0.005	<0.005
Total Cyanide	CN	<0.005	<0.005	<0.005	<0.005
Total Metals (mg/L)					
Aluminum	Al	0.036	0.46	0.067	0.29
Arsenic	As	<0.0001	0.0033	0.0001	0.0002
Barium	Ba	0.005	0.14	0.005	0.009
Cadmium	Cd	0.0005	0.0088	<0.0005	<0.0005
Copper	Cu	0.001	0.092	<0.001	0.002
Iron	Fe	<0.03	0.97	0.07	0.21
Lead	Pb	<0.001	0.026	0.001	<0.001
Mercury	Hg	<0.000005	0.00007	<0.00005	<0.00005
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	0.004	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	4.66	0.032	0.007
Dissolved Metals (mg/L)					
Calcium	Ca	5.44	60.6	10.4	13.4
Magnesium	Mg	0.81	3.27	1.65	1.95
Sodium	Na	1.41	1.52	2.58	2.65
Potassium	K	0.14	0.48	0.20	0.47
Aluminum	Al	0.027	0.059	0.038	0.067
Arsenic	As	<0.0001	0.0008	<0.0001	<0.0001
Barium	Ba	0.005	0.13	<0.005	0.007
Cadmium	Cd	<0.0005	0.0067	<0.0005	<0.0005
Copper	Cu	<0.001	0.021	<0.001	0.002
Iron	Fe	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	0.004	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	3.89	0.031	0.005

< = Less than
Results expressed as milligrams of element per liter of sample

Table 2
Abermin Corporation
Lara Property, Chemainus, B.C.

Analyses of Water Quality Samples Collected March 27, 1987.

Chemainus River at mouth / Chemainus River d/s of tailings & waste rock / d/s of waste rock

PARAMETER		1	2	3	4
Physical Tests					
pH		6.43	6.49	6.29	6.41
Conductivity (µmhos/cm)		47.1	31.8	33.9	196.
Turbidity (NTU)		<1.0	<1.0	<1.0	<1.0
Suspended Solids (mg/L)		2.0	<1.0	1.2	<1.0
Dissolved Solids (mg/L)		38.7	27.3	25.3	167.
Hardness (mg/L)	$CaCO_3$	28.0	14.1	15.4	119.
Dissolved Anions (mg/L)					
Bicarbonate	HCO_3	19.5	14.6	14.6	29.3
Chloride	Cl	2.00	2.00	1.50	2.50
Sulfate	SO4	2.68	1.26	<1.0	78.7
Nitrate	N	0.037	0.006	0.028	0.26
Nitrite	N	<0.001	<0.001	<0.001	<0.001
Phosphorus	P	0.016	0.003	0.006	0.040
Other Tests (mg/L)					
Ammonia	N	<0.005	<0.005	<0.005	<0.005
Total Cyanide	CN	<0.005	<0.005	<0.005	<0.005
Total Metals (mg/L)					
Aluminum	Al	0.072	0.047	0.045	0.063
Arsenic	As	0.0002	<0.0001	<0.0001	<0.0001
Barium	Ba	0.009	0.007	0.007	0.039
Cadmium	Cd	<0.0005	<0.0005	<0.0005	0.012
Copper	Cu	<0.001	0.001	<0.001	0.21
Iron	Fe	0.07	0.04	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001
Mercury	Hg	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	0.004
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	0.034	<0.005	4.25
Dissolved Metals (mg/L)					
Calcium	Ca	9.97	4.61	5.16	38.3
Magnesium	Mg	0.80	0.63	0.62	5.91
Sodium	Na	1.42	1.25	1.19	1.94
Potassium	K	0.11	0.12	0.07	0.29
Aluminum	Al	0.037	0.024	0.021	0.036
Arsenic	As	<0.0001	<0.0001	<0.0001	<0.0001
Barium	Ba	0.008	0.007	0.007	0.036
Cadmium	Cd	<0.0005	<0.0005	<0.0005	0.009
Copper	Cu	<0.001	<0.001	<0.001	0.17
Iron	Fe	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	0.007	<0.005	3.96.

< = Less than
Results expressed as milligrams of element per liter of sample

Table 2 (continued)
Abermin Corporation
Lara Property, Chemainus, B.C.

Analyses of Water Quality Samples Collected March 27, 1987.

PARAMETER		5	6	7	8
Physical Tests					
pH		6.36	6.22	6.24	5.68
Conductivity (µmhos/cm)		55.1	31.8	21.0	15.9
Turbidity (NTU)		<1.0	<1.0	<1.0	<1.0
Suspended Solids (mg/L)		2.0	2.8	1.2	1.2
Dissolved Solids (mg/L)		47.3	25.6	15.7	12.3
Hardness (mg/L)	$CaCO_3$	26.8	13.1	7.63	8.35
Dissolved Anions (mg/L)					
Bicarbonate	HCO_3	19.5	14.6	7.32	4.88
Chloride	Cl	2.00	1.58	1.50	1.00
Sulfate	SO4	7.93	<1.0	<1.0	<1.0
Nitrate	N	0.035	0.042	0.031	<0.005
Nitrite	N	<0.001	<0.001	<0.001	<0.001
Phosphorus	P	0.007	0.001	0.003	0.007
Other Tests (mg/L)					
Ammonia	N	<0.005	<0.005	<0.005	<0.005
Total Cyanide	CN	<0.005	<0.005	<0.005	<0.005
Total Metals (mg/L)					
Aluminum	Al	0.027	0.038	0.051	0.065
Arsenic	As	<0.0001	<0.0001	0.0001	<0.0001
Barium	Ba	0.021	0.007	0.007	0.007
Cadmium	Cd	0.0015	<0.0005	<0.0005	<0.0005
Copper	Cu	0.031	<0.001	0.036	<0.001
Iron	Fe	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001
Mercury	Hg	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	0.46	0.008	0.011	<0.005
Dissolved Metals (mg/L)					
Calcium	Ca	9.36	4.29	2.33	2.75
Magnesium	Mg	0.84	0.59	0.44	0.36
Sodium	Na	1.60	1.11	0.94	0.79
Potassium	K	0.09	0.07	0.02	<0.01
Aluminum	Al	0.018	0.014	0.033	0.059
Arsenic	As	<0.0001	<0.0001	<0.0001	<0.0001
Barium	Ba	0.020	0.006	0.005	0.005
Cadmium	Cd	0.0005	<0.0005	<0.0005	<0.0005
Copper	Cu	0.028	<0.001	0.002	<0.001
Iron	Fe	<0.03	<0.03	<0.03	<0.03
Lead	Pb	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	0.45	0.008	0.011	<0.005

< = Less than
Results expressed as milligrams of element per liter of sample

Table 2 (continued)
Abermin Corporation
Lara Property, Chemainus, B.C.

Analyses of Water Quality Samples Collected March 27, 1987.

PARAMETER		9	10	11	DDH 85-25
Physical Tests					
pH		5.50	6.10	5.80	6.43
Conductivity (µmhos/cm)		18.9	15.9	12.7	106.
Turbidity (NTU)		<1.0	<1.0	<1.0	<1.0
Suspended Solids (mg/L)		2.4	1.3	4.0	14.
Dissolved Solids (mg/L)		18.3	15.2	12.0	79.3
Hardness (mg/L) CaCO3		12.1	6.85	8.00	49.3
Dissolved Anions (mg/L)					
Bicarbonate	HCO_3	8.88	6.73	4.88	43.9
Chloride	Cl	0.50	1.00	1.50	0.50
Sulfate	SO4	<1.0	<1.0	<1.0	6.32
Nitrate	N	0.016	0.020	0.075	0.010
Nitrite	N	<0.001	<0.001	<0.001	<0.001
Phosphorus	P	0.004	0.015	0.002	0.013
Other Tests (mg/L)					
Ammonia	N	<0.005	<0.005	<0.005	<0.005
Total Cyanide	CN	<0.005	<0.005	<0.005	<0.005
Total Metals (mg/L)					
Aluminum	Al	0.080	0.042	0.085	0.78
Arsenic	As	<0.0001	<0.0001	<0.0001	0.0012
Barium	Ba	0.007	0.005	0.007	0.021
Cadmium	Cd	<0.0005	<0.0005	<0.0005	0.0042
Copper	Cu	<0.001	<0.001	<0.001	0.030
Iron	Fe	<0.03	<0.03	0.03	0.46
Lead	Pb	<0.001	<0.001	<0.001	0.021
Mercury	Hg	<0.00005	<0.00005	<0.00005	0.00008
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	<0.005	<0.015	0.11
Dissolved Metals (mg/L)					
Calcium	Ca	4.32	2.03	2.66	16.1
Magnesium	Mg	0.33	0.45	0.33	2.20
Sodium	Na	0.75	1.19	0.84	2.08
Potassium	K	0.05	0.10	0.14	0.35
Aluminum	Al	0.064	0.041	0.080	0.31
Arsenic	As	<0.0001	<0.0001	<0.0001	0.0023
Barium	Ba	0.005	0.004	0.004	0.015
Cadmium	Cd	<0.0005	<0.0005	<0.0005	0.0030
Copper	Cu	<0.001	<0.001	<0.001	0.011
Iron	Fe	<0.03	<0.03	<0.03	0.22
Lead	Pb	<0.001	<0.001	<0.001	<0.001
Molybdenum	Mo	<0.005	<0.005	<0.005	<0.005
Nickel	Ni	<0.001	<0.001	<0.001	<0.001
Selenium	Se	<0.0005	<0.0005	<0.0005	<0.0005
Silver	Ag	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	Zn	<0.005	<0.005	0.010	0.080

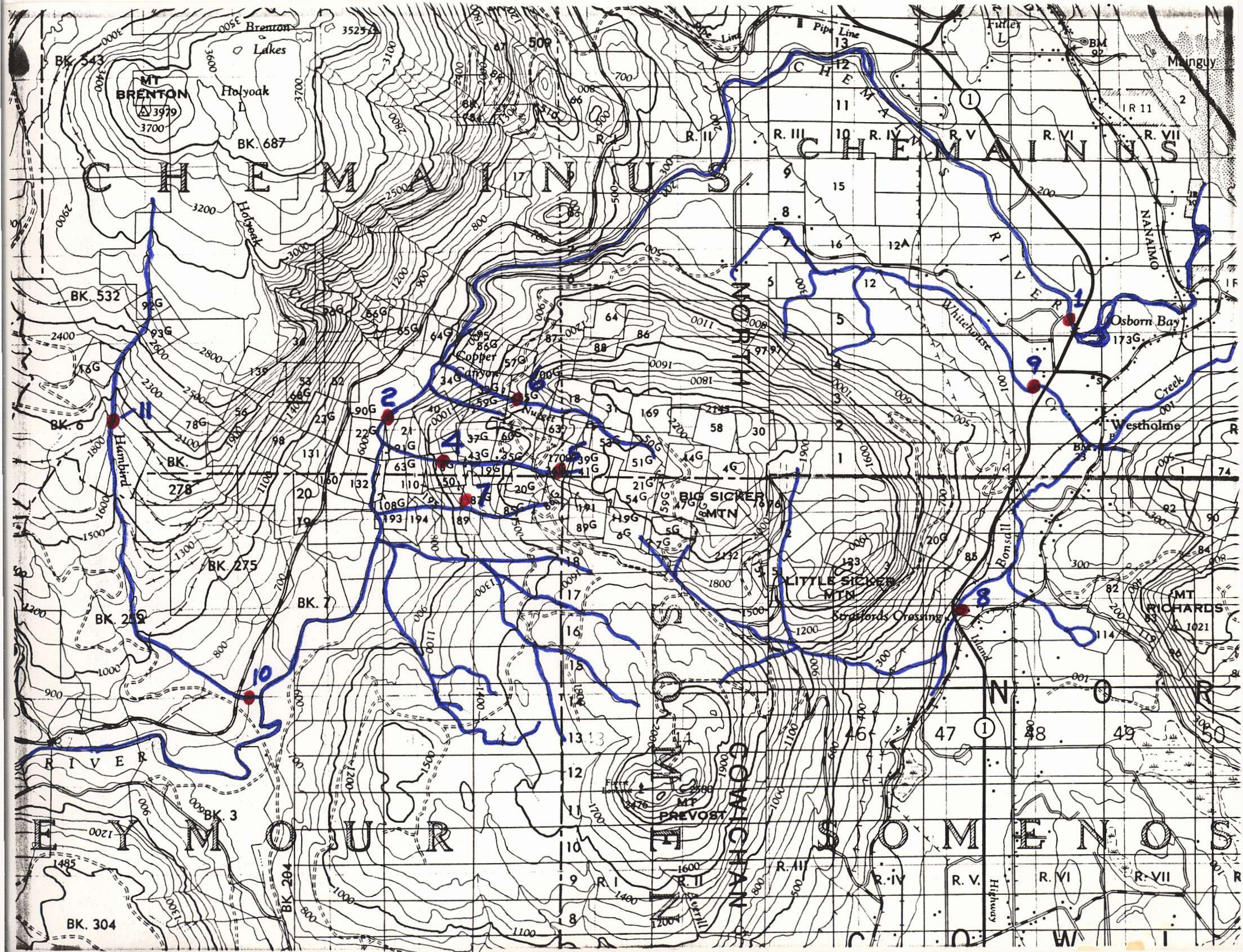
< = Less than
Results expressed as milligrams of element per liter of sample

Table 2 (continued)
Abermin Corporation
Lara Property, Chemainus, B.C.

Analyses of Water Quality Samples Collected March 27, 1987.

PARAMETER		DDH 85 - 86
Physical Tests		
pH		7.18
Conductivity (µmhos/cm)		172.
Turbidity (NTU)		<1.0
Suspended Solids (mg/L)		1.6
Dissolved Solids (mg/L)		165.
Hardness (mg/L)	$CaCO_3$	76.2
Dissolved Anions (mg/L)		
Bicarbonate	HCO_3	121.
Chloride	Cl	2.50
Sulfate	SO4	4.39
Nitrate	N	<0.005
Nitrite	N	<0.001
Phosphorus	P	0.015
Other Tests (mg/L)		
Ammonia	N	<0.005
Total Cyanide	CN	<0.005
Total Metals (mg/L)		
Aluminum	Al	0.018
Arsenic	As	0.0049
Barium	Ba	0.061
Cadmium	Cd	<0.0005
Copper	Cu	<0.001
Iron	Fe	<0.03
Lead	Pb	<0.001
Mercury	Hg	0.0001
Molybdenum	Mo	<0.005
Nickel	Ni	<0.001
Selenium	Se	<0.0005
Silver	Ag	<0.0005
Zinc	Zn	<0.005
Dissolved Metals (mg/L)		
Calcium	Ca	22.5
Magnesium	Mg	4.86
Sodium	Na	9.24
Potassium	K	0.38
Aluminum	Al	0.013
Arsenic	As	0.0042
Barium	Ba	0.055
Cadmium	Cd	<0.0005
Copper	Cu	<0.001
Iron	Fe	<0.03
Lead	Pb	<0.001
Molybdenum	Mo	<0.005
Nickel	Ni	<0.001
Selenium	Se	<0.0005
Silver	Ag	<0.0005
Zinc	Zn	<0.005

< = Less than
Results expressed as milligrams of element per liter of sample


MT BRENTON
3979
Brenton Lakes
Holyoak L
Holyoak
CHEMAINUS
CHEMAINUS RIVER
Pipe Line
Fuller L
Mainguy
IR 11
R. II
R. III
R. IV
R. V
R. VI
R. VII
NANAIMO
Osborn Bay
Whitehouse Cr
Westholme
Creek
Copper Canyon
Nugget
Humbird
BIG SICKER MTN
LITTLE SICKER MTN
Stratfords Crossing
Bonsall
Island Highway
MT RICHARDS
1021
MT PREVOST
NORTH COWICHAN
SEYMOUR
SOMENOS
RIVER
BK. 543
BK. 687
BK. 532
BK. 6
BK. 278
BK. 275
BK. 252
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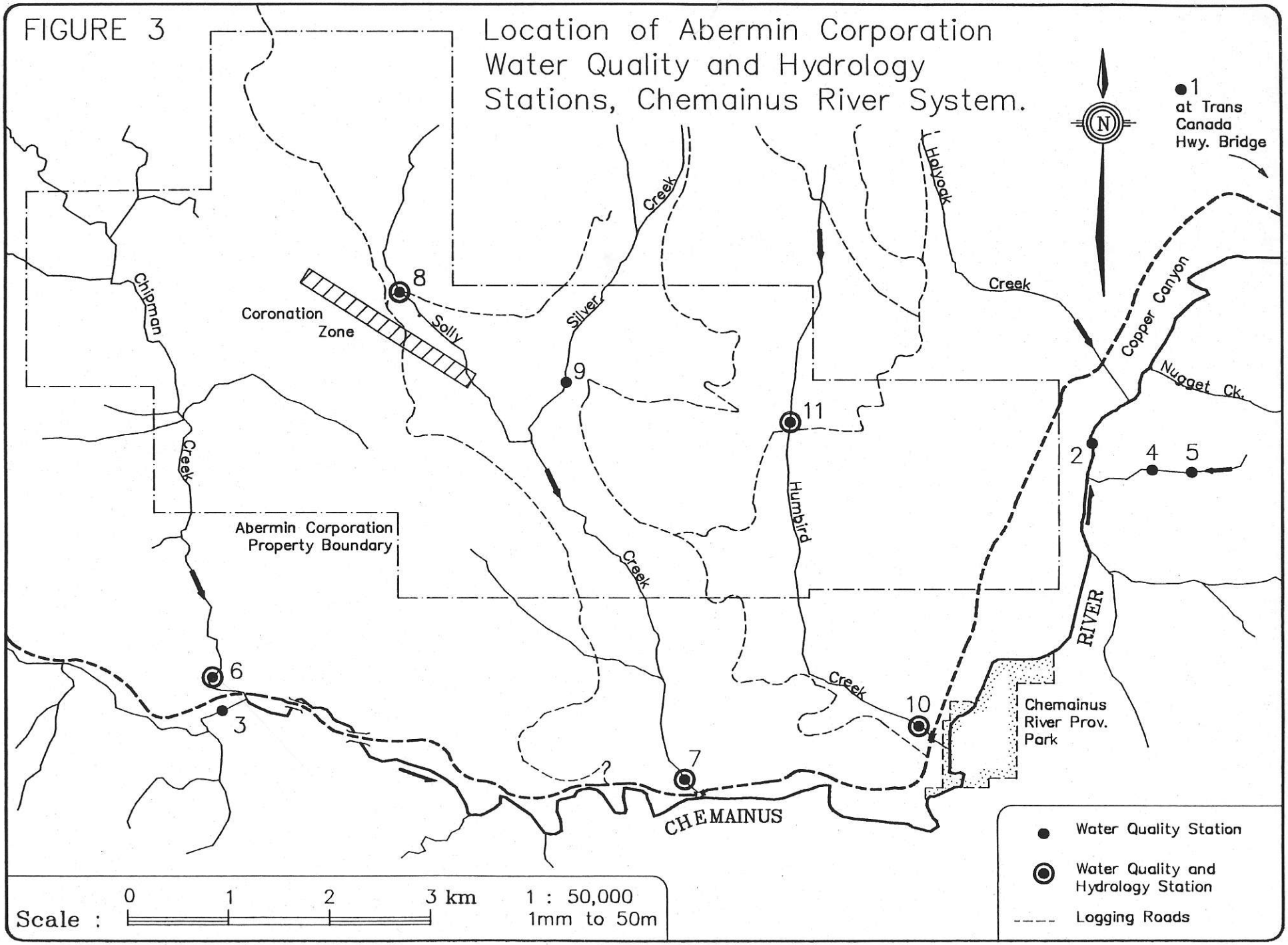
FIGURE 3
Location of Abermin Corporation
Water Quality and Hydrology
Stations, Chemainus River System.
N
1
at Trans
Canada
Hwy. Bridge
Halvoak
Creek
Silver
Creek
Chipman
Creek
Coronation
Zone
Solly
8
9
11
Copper Canyon
Nugget Ck.
2
4
5
Humbird
Creek
Abermin Corporation
Property Boundary
Creek
RIVER
6
3
Creek
10
Chemainus
River Prov.
Park
7
CHEMAINUS
Water Quality Station
Water Quality and
Hydrology Station
Logging Roads
Scale :
0
1
2
3 km
1 : 50,000
1mm to 50m